DD-901 West Rail
Environmental Support Services

Essential Public Infrastructure Works
Yuen Long, Tin Shui Wai and Tuen Mun Centre

Final EIA Report

21 June 1999

For and on behalf of ERM-Hong Kong, Ltd
Approved by: Peter Marsden .
Signed: _____
Position: Consultant's Representative .
Date: 21 June 1999 .

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1. INTRODUCTION

1.1 Background of the Study

The West Rail Phase I development will provide a domestic passenger train service linking Tuen Mun and West Kowloon, and includes nine new stations. In connection with the new stations at Yuen Long, Tin Shui Wai and Tuen Mun Centre, *Essential Public Infrastructure Works* (EPIWs) are to be undertaken to provide highway realignments and accommodate the development of the West Rail.

The scope of the Project includes three designated projects as defined in Schedule 2 of *Environmental Impact Assessment Ordinance* (EIAO) (Section A1 of Part I):

- modification to Long Yat Road and Roads L1, L2, and L3 serving Yuen Long Station;
- modification to Tin Fuk Road, Ping Ha Road and Tin Yiu Road serving Tin Shui Wai Station; and
- improvement to Tuen Mun Heung Sze Wui Road, Yan Ching Street, Pui To Road and Ho Pong Street serving Tuen Mun Centre Station.

The Kowloon-Canton Railway Corporation (KCRC) has commissioned Environmental Resources Management Limited (ERM) to undertake an Environmental Impact Assessment of the EPIWs.

1.2 Scope of the Environmental Impact Assessment

This EIA Report is submitted to the Environmental Protection Department (EPD) under the EIA Study Brief No. ESB-014/1998 and provides information on the nature and extent of environmental impacts arising from the construction and operational phases of the project and related activities taking place concurrently. The purpose of the EIA is to determine the acceptability of the EPIWs in terms of any adverse environmental impacts that may arise, provide mitigation requirements for the control of construction and operational consequences in the detailed design and determine the acceptability of any residual impacts after the application of mitigation measures.

1.3 Objectives of the Environmental Impact Assessment

The Project Profile submitted to EPD by KCRC describes the nature, description, history of the sites and the possible impacts on the environment. This has assisted the EPD in defining the scope of work to be undertaken in this EIA. The scope includes assessment of the following key areas:

- Construction and Operational Air Quality;
- Construction and Operational Noise;
- Water Quality;

- Waste Management;
- Cultural Heritage;
- Landscape and Visual Issues; and
- Environmental Monitoring and Audit Requirements.

The objectives of the EIA Study are:

- to describe the EPIWs and associated works together with the requirements for carrying out their development;
- to identify and describe the elements of the community and environment likely to be affected by the proposed EPIWs;
- to identify and quantify emission sources and determine the significance of impacts on sensitive receivers and potential affected uses;
- to identify any negative impacts on sites of cultural heritage and to propose mitigation measures;
- to identify potential landscape and visual impacts and recommend appropriate mitigation measures;
- to propose the provision of infrastructure or mitigation measures so as to minimise pollution, environmental disturbance and nuisance during construction and operation of the EPIWs;
- to evaluate, predict and evaluate the residual (i.e. after practicable mitigation) environmental impacts and the cumulative effects expected to arise during the construction and operation phases of the EPIWs in relation to sensitive receivers and potential affected uses;
- to identify, assess and specify methods, measures and standards, to be included in the detailed design, construction and operation of the EPIWs which are necessary to mitigate these impacts and reducing them to acceptable levels;
- to investigate the extent of side effects of the proposed mitigation measures that may lead to other forms of impacts;
- to identify constraints associated with the mitigation measures recommended; and
- to design and specify the environmental monitoring and audit requirements, if required, to ensure the implementation and the effectiveness of the environmental protection and pollution control measures adopted.

1.4 The Project Design Focus

The KCRC has also engaged the services of engineering Design Consultants to develop design and engineering proposals for the three EPIWs in conjunction with the West Rail Phase 1 project. These engineering studies have been proceeding in parallel with the EIA

study and involved the collaboration of the EIA Study Team and Design Consultants in determining constraints and opportunities to accommodate environmental mitigation.

In the preparation of the EIA Study, significant focus has been placed upon operational noise based upon a series of preliminary assessments which identified adverse impacts from road traffic noise in the baseline and future unmitigated scenarios. As a result, the requirement of the Project Proponent's assignment has been to ensure that sensitive property will continue to enjoy an "open windows" lifestyle. Consequently, this has placed considerable focus upon the engineering design of "at-source" (direct technical remedies) noise screening measures. The solutions presented in the EIA represent the result of a collaborative design by the Detailed Design Consultants, KCRC and Highways Department (HyD). With the "as-developed" solutions completed, the EIA Study has sought wherever possible to ameliorate the potential side effect of these measures while being cognisant of the design assignment to ensure direct physical adverse impacts are prioritised in the overall mitigation programme.

For each of the proposed EPIWs, drainage studies have been undertaken as part of the initial feasibility studies and subsequently during the engineering design works. Each of the EPIWs and the associated drainage systems have been designed, and will be constructed to appropriate drainage design standards to ensure that any potential drainage or flooding concerns will be suitably controlled. It is envisaged that the proposed EPIW works will improve the drainage in each of the areas. As drainage and flooding issues are not areas requiring specific study under the EIAO, this EIA Report does not specifically address these areas, however, it is not envisaged that these issues should give rise to any specific environmental concerns.

1.5 Compatibility with West Rail Phase I

As the majority of the EPIWs are within the gazetted boundary of the West Rail Phase I, the Design Consultants have been planning the works in accordance with the recommendations of the West Rail Final Assessment Report (FAR) dated 11 February 1998. The FAR has provided full reference to all potential construction related issues such as noise, dust, water and waste management as well as cultural resources within the boundary of the EPIWs. As such, the findings of the FAR for water quality, waste management and cultural heritage have been used as a basis within this report for assessing the impacts to these media and for recommending appropriate mitigation measures. Specific quantitative and detailed assessment of construction and operational noise, air quality, landscape and visual issues and the review of all environmental monitoring and audit recommendations form the substantial focus of this EIA Study.

The relevant conclusions of the FAR are described below for the issues of water quality, waste management and cultural heritage.

For water quality, the FAR described the Water Sensitive Receivers in the Yuen Long, Tin Shui Wai and Tuen Mun Centre areas, potential sources of impact and recommends mitigation measures. The Study recommends that measures are to be implemented during construction to prevent suspended solid loadings from entering the water courses

through proper site management to minimise surface runoff and soil erosion. These recommendations, including the implementation of the EPD's Practice Note for Professional Persons, Construction Site Drainage (ProPECC PN 1/94), will be required for the EPIWs together with all conditions specified in the West Rail Environmental Permit relating to works within the gazetted boundary. With the implementation of these permit controls on all construction activities and proper site management procedures, residual water quality impacts will be to acceptable levels. The FAR concluded that on the basis of the mitigation measures to be implemented there will be no insurmountable water quality impacts.

The FAR described the volume and content of waste arising in the Western Section of West Rail including Yuen Long, Tin Shui Wai and Tuen Mun Centre. The key issues identified are the need to implement effective waste management planning during the construction phase with a strong preference for reuse of clean surplus material rather than disposal at public dumps. The FAR provided waste management methods and practices and other mitigation measures to ensure that potential impacts will either be avoided or residual impacts controlled to acceptable levels.

For cultural heritage, the FAR provided an inventory of existing historic buildings located within 100 m of the railway alignment. Of these, the Tsui Shing Lau Pagoda is in close vicinity of the EPIW at Tin Shui Wai and the FAR recommended sensitive treatment of the adjacently proposed environs and construction mitigation measures to ensure the preservation of the Pagoda structure. As a direct result of the FAR, and agreement with Antiquities and Monument Office (AMO), the setting of the Pagoda has been preserved within the design of the railway and this will not be encroached by the EPIW alignment and construction works.

1.6 Requirements of the Study

The assessment of impacts arising from the EPIWs will be undertaken in accordance with the requirements stated in the Study Brief issued on 18 November 1998, ESB-014/1998 of the Register established under the EIAO.

The key source of potential impact will be from road traffic noise in the operational phase and the introduction of mitigation measures may give rise to side effects in terms of air quality and landscape and visual effects. Having examined the available noise mitigation requirements and an appropriate engineering design from an exhaustive inventory of control strategies in conjunction with physical engineering constraints, the EIA is to provide an assessment of air quality, landscape and visual effects to develop recommendations that ensure any residual impacts will be acceptable or ameliorated as far as is possible. The findings of the West Rail FAR have been drawn upon during the assessment of waste, water and cultural heritage impacts, and, where required, during the recommendation of mitigation measures.

Site specific construction related impacts in respect of noise and air emissions are to be assessed and appropriate mitigation measures recommended to ensure the construction

programme will not result in unacceptable impacts: where appropriate, EM&A requirements are to be defined.

1.7 Data Sources

In compiling this report, the Consultants have drawn upon existing data sources, and used information gathered whilst researching and undertaking the EIA for the related West Rail FAR. Additionally, use has also been made of the EIA Report produced in February 1997 by Binnie Consultants Limited for the *Tin Shui Wai Development: Engineering Investigations for Development of Areas 3, 30 & 31 of the Development Zone and the Reserve Zone*.

1.8 Structure of EIA Report

This Report is structured as follows:

- *Section 2* presents the scope of the EPIWs;
- *Section 3* details the criteria stipulated by Government legislation and environmental standards relevant to the study, which shall be adopted for the evaluation of potential environmental impacts;
- *Section 4* describes the existing environment and identifies sensitive receivers potentially affected by the EPIWs;
- *Section 5* examines the potential noise impacts arising from the construction and operation of the EPIWs and where appropriate, recommends practical mitigation measures;
- *Section 6* examines the potential air quality impacts arising from the construction and operation of the EPIWs and where appropriate, recommends practical mitigation measures;
- *Section 7* describes the existing water sensitive receivers, the likelihood of impact during the construction and operational phases and recommends appropriate methods of control;
- *Section 8* examines the potential landscape and visual impacts arising during the "as-built" operational phase of the EPIWs and where appropriate, recommends practical mitigation measures (to be included in the Final EIA Report);
- *Section 9* describes the potential for waste arisings and recommends handling and disposal techniques to ensure impacts will be minimised;
- *Section 10* reviews the likelihood of cultural heritage impacts and describes measures to be taken to ensure no loss to these resources;
- *Section 11* outlines the requirement of Environmental Monitoring and Audit for the EPIWs;

- *Section 12* summarises the findings of the EIA and presents the implementation schedule of any environmental mitigation measures proposed; and
- *Section 13* presents the conclusions of the EIA Study.

2. PROJECT DESCRIPTION

2.1 Scope of Project

The scope of the project involves the modification and improvement of existing highways in the town centres of Yuen Long (YUL), Tin Shui Wai (TIS) and Tuen Mun (TMC) to enhance the effectiveness of the existing highway network, facilitate natural future traffic growth in the areas as a result of planning demand and to accommodate the localised growth associated with the future public use of the West Rail stations.

The EPIWs will be constructed within the majority of the gazetted boundary of West Rail Phase I. The extent and limit of the EPIWs in Yuen Long, Tin Shui Wai and Tuen Mun Centre are shown by *Figures 2.1a-c* and described in the sub-sections below.

2.1.1 Yuen Long EPIW

All the roads within the scope of Yuen Long EPIW are at-grade. The existing Long Yat Road will be re-aligned to provide access to the proposed Public Transport Interchange (PTI) to be located at ground level below the future station related Comprehensive Development Area (CDA) south of the Sun Yuen Long Centre, and to provide Emergency Vehicle Access (EVA) for Yuen Long station.

Prior to the re-alignment of Long Yat Road, Roads L1, L2 and L3 will be constructed to accommodate the existing traffic using Long Yat Road and maintain a functional highway network during the construction of West Rail. In association with the construction and re-alignment of these roads, the road junctions at L1/L2, L2/L3 and Long Yat Road/Castle Peak Road will be widened.

2.1.2 Tin Shui Wai EPIW

All roads within the scope of Tin Shui Wai EPIW are at-grade. The Tin Fuk Road and Ping Ha Road junction will be moved approximately 25 m to the north to accommodate development of the West Rail station: these works will require the realignment of both Tin Fuk Road and Ping Ha Road.

Approximately 400 m of the existing Tin Fuk Road, to the east of the junction, will be widened to a dual two lanes. The westbound carriageway of Tin Fuk Road will gradually be increased to four lanes towards the Tin Fuk Road/Ping Ha Road junction. Tin Yiu Road will also be modified in the realignment works.

2.1.3 Tuen Mun Centre EPIW

All the roads considered in Tuen Mun Centre EPIW are at-grade. In Tuen Mun, the existing roads and junctions at Tuen Mun Heung Sze Wui Road, Yan Ching Street, Pui To Road and Ho Pong Street will be widened.

At the junction of Tuen Mun Heung Sze Wui Road and Yan Ching Street, the existing carriageway of Tuen Mun Heung Sze Wui Road will be widened to dual two lanes in both northbound and southbound directions.

At the junction of Tuen Mun Heung Sze Wui Road and Pui To Road, each carriageway approaching the junction will be widened to four lanes and one additional lane will be provided at the exits of the junction. The road improvements works will also include widening at the Ho Pong Street and Pui To Road junction.

2.2 Project Programme

The precise details of the construction programming of the EPIWs have still to be finalised. These details will be confirmed during the detailed design phase and subsequently by the Contractor(s) appointed to undertake the Works. However, it is currently envisaged that construction of the EPIWs will be undertaken in accordance with the preliminary programme dates defined in Table 2.2a below.

Table 2.2a Preliminary Construction Programme Dates for the EPIWs

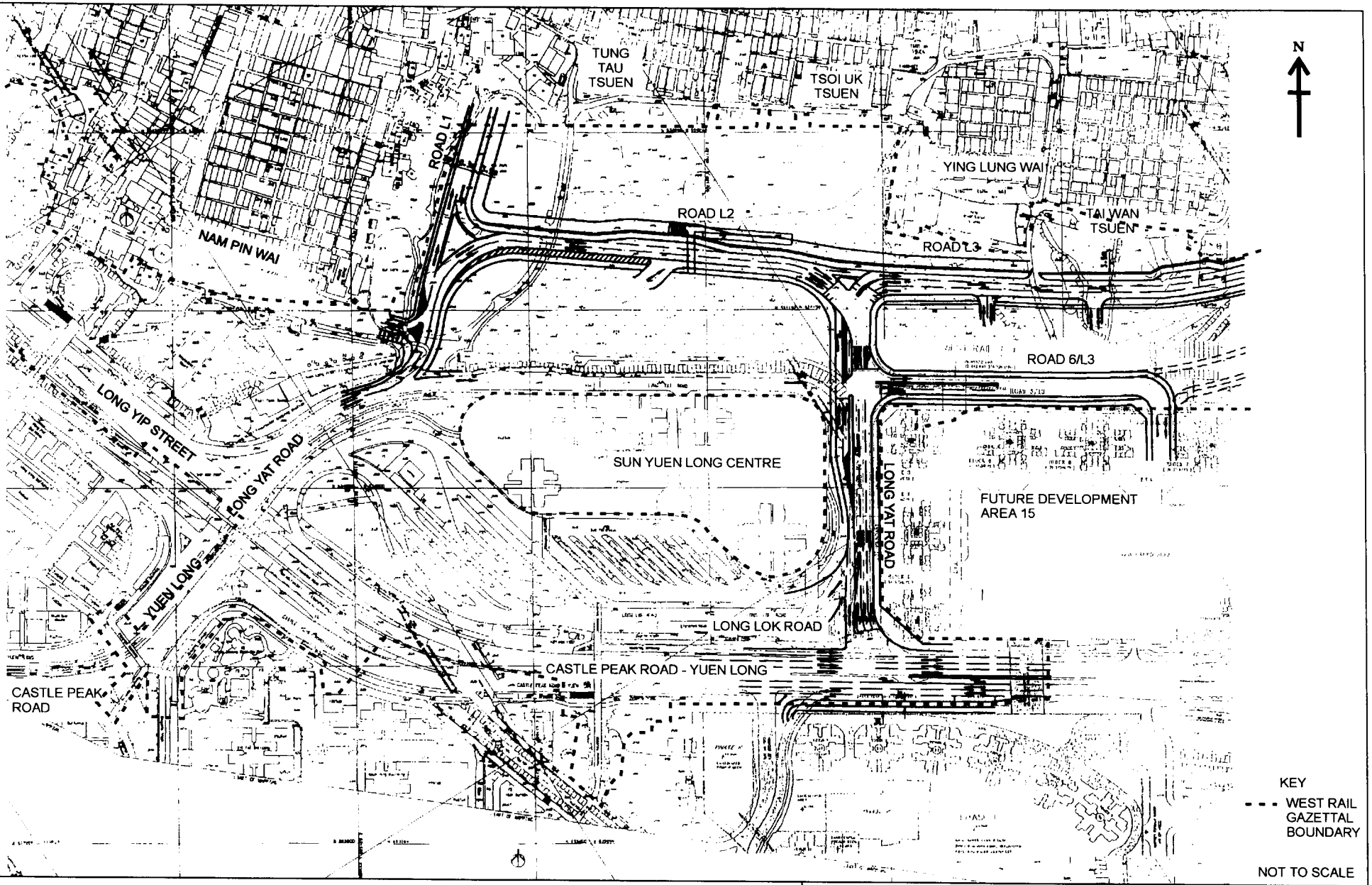
EPIW	Preliminary Construction Commencement Date	Preliminary Construction Completion Date
Yuen Long	February 2000	January 2001
Tin Shui Wai	October 1999	October 2000
Tuen Mun Centre	June 2001	June 2003

Construction works for the stations associated with the EPIWs are scheduled to begin in May 1999 and are expected to be completed by November 2003, consequently, there is the potential for cumulative impacts as the construction works are likely to occur concurrently, however, the EPIWs will be operational before the stations are completed.

For the purposes of defining relevant dates for the operational assessment, the EPIWs scheduled dates provide a worst case scenario: this is an earliest assessment date for prevailing noise assessment and the latest date for future noise assessment.

In the assessment of construction related impacts, since a detailed construction programme is not defined, consideration of cumulative effects of both railway and EPIW activities has been made on the basis of judgement. Since in most locations the EPIW site activities will be closest to sensitive properties, a doubling of the localised plant inventory is likely to represent cumulative impacts.

In accordance with the programme and the *Technical Memorandum on Environmental Impact Assessment Process* (EIA TM), the predictions of prevailing road traffic noise will based upon 1999 traffic data for the existing highway network and planning assumptions. The future road traffic noise will be based upon traffic forecasts for the worst case scenario within a 15 year period from commencement of operation of the EPIWs, natural traffic growth, the relevant future planning scenarios and the full operation of West Rail and the supporting public road transport infrastructure.



EXTENT OF ROAD WORKS PROPOSED FOR YUEN LONG

FIGURE 2.1a

ERM

KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES

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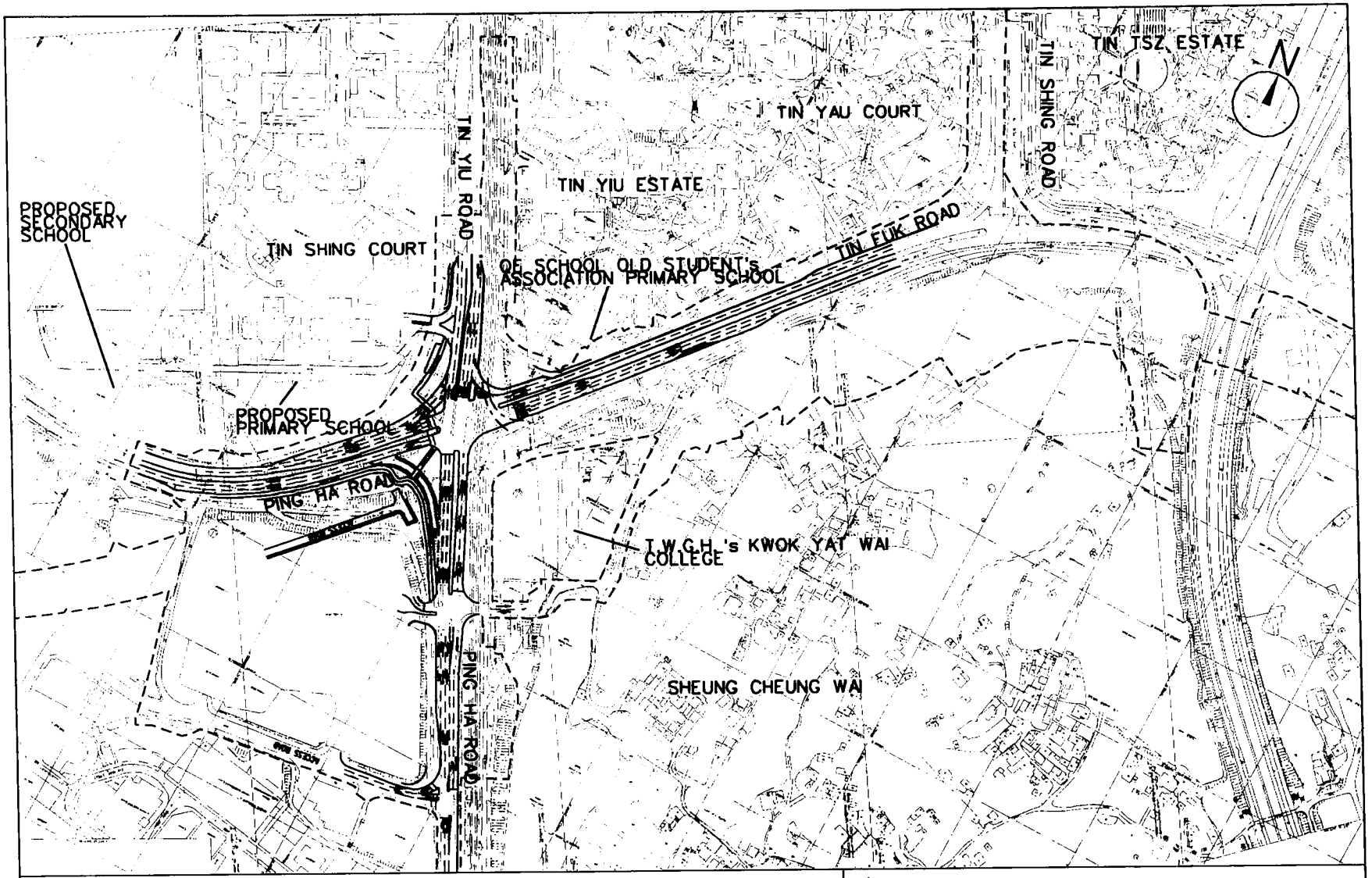


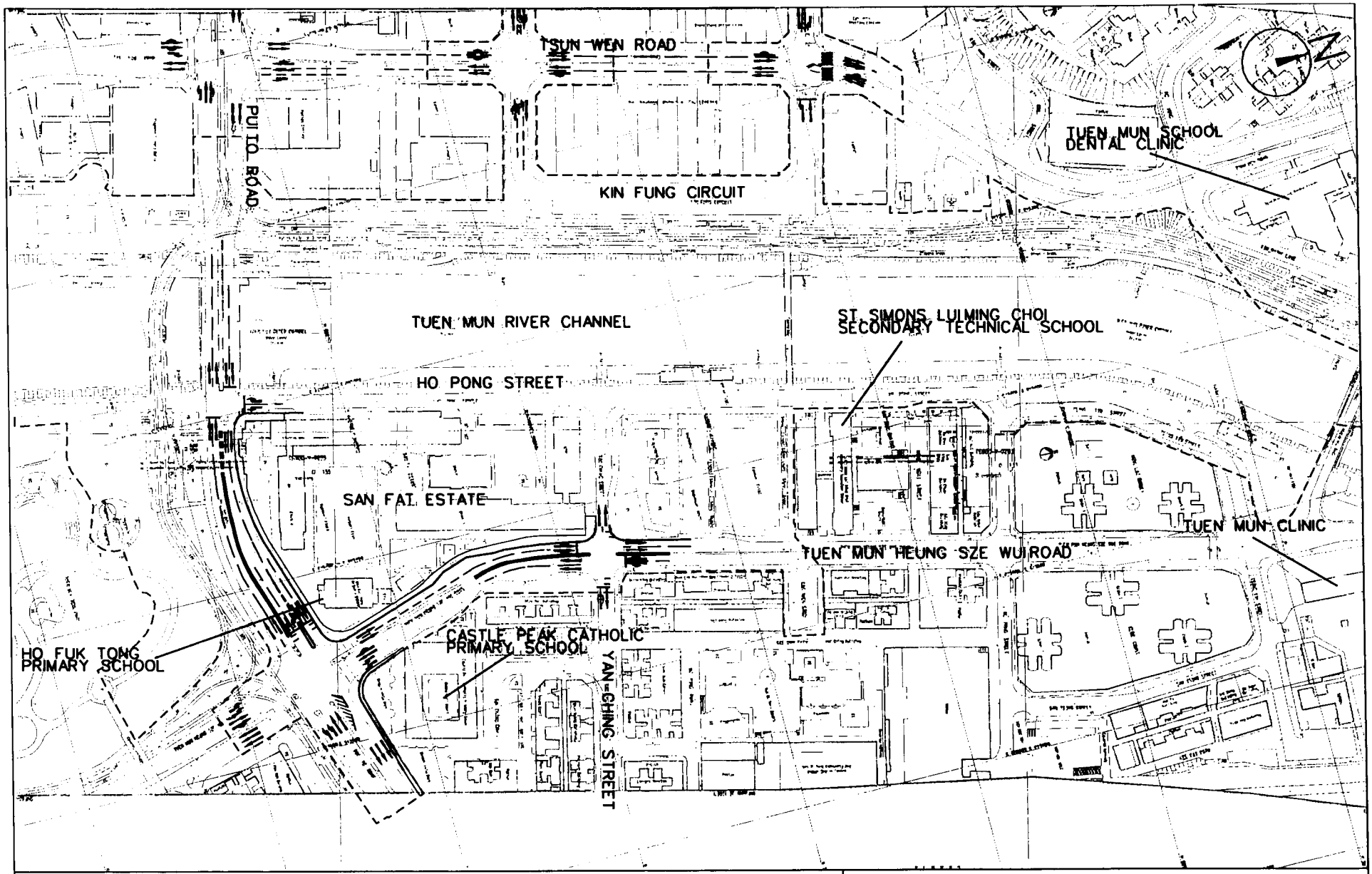
WEST RAIL GAZETTAL BOUNDARY

EXTENT OF ROAD WORKS PROPOSED FOR TIN SHUI WAI FIGURE 2.1b

SCALE: 1/5,000

KOWLOON - CANTON RAILWAY CORPORATION

ERM WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES



WEST RAIL GAZETTAL BOUNDARY

FIGURE 2.1c

EXTENT OF ROAD WORKS PROPOSED FOR TUEN MUN CENTRE

SCALE: 1/3,000

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KOWLOON - CANTON RAILWAY CORPORATION

BRM

WEST RAIL: DD-981 ENVIRONMENTAL SUPPORT SERVICES

From analysis of the forecasted traffic data, it is expected that the maximum traffic projection for the peak hour traffic flow within the Project will occur in the year 2018. This Study has, therefore, been based upon the change in road traffic noise in the environment resulting from traffic growth over a full 19 year period from the existing situation to the future maximum use of the EPIWs. The traffic data prepared for this Study by KCRC and its traffic consultants are presented in *Annex A*.

2.3 Consideration of Alternatives

All of the EPIW schemes involve the alteration and widening of existing highways. As such, since the roads already exist and have been identified, through Traffic Impact Assessment studies undertaken for the Project proponent as part of the West Rail Project, as areas where road improvements are required, the scope for the consideration of alternative schemes is very limited. The location of the EPIW works has predominantly been selected on the grounds of engineering practicality and highway feasibility. It is not considered relevant to undertake a comparison of the proposed schemes against the location or siting of alternative schemes as these would not fulfil the objectives of the EPIW schemes, namely to enhance the effectiveness of the existing highway network, facilitate natural future traffic growth in the areas as a result of planning demand and to accommodate the localised growth associated with the future public use of the West Rail stations.

2.4 Do Nothing Scenario

Without the implementation of the proposed EPIW works, the increased traffic flows associated with natural future traffic growth and projected increases associated with the future public use of the West Rail stations will place a burden on road junctions that have already been identified as requiring enhancement. The future traffic modelling of the area has predicted that this will result in traffic congestion at the identified road junctions. This traffic congestion will result in the road vehicles having to accelerate and decelerate more regularly than few flowing traffic which will lead to an increase in air pollutant levels in the area of the EPIWs. It is predicted that the proposed junction improvements will lead to an improvement in the local air quality, (when assuming the same volume of traffic volumes flowing through the areas of the EPIWs).

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3. ENVIRONMENTAL LEGISLATION AND STANDARDS

3.1 Introduction

This *Section* describes the regulatory requirements and criteria against which the potential or predicted construction and operational impacts of the EPIWs were evaluated. All of the relevant legislation, criteria or guidelines are those produced, adopted or accepted by the Hong Kong Government. The standards and guidelines set out below are in accordance with the *Environmental Impact Assessment Ordinance* (EIAO) and associated *Technical Memorandum on Environmental Impact Assessment Process* (EIA TM).

3.2 Noise

3.2.1 Construction Noise Standards

3.2.1.1 General

The principal legislation on the statutory control of construction noise is the *Noise Control Ordinance* (NCO) (Cap 400). Various Technical Memoranda, which stipulate control approaches and criteria, have been issued under the NCO. The following technical memoranda are applicable to the control of noise from construction activities:

- *Technical Memorandum on Noise from Percussive Piling* (PP-TM);
- *Technical Memorandum on Noise from Construction Work other than Percussive Piling* (GW-TM); and
- *Technical Memorandum on Noise from Construction Work in Designated Areas* (DA-TM);

The EIAO and the EIA TM also provide guidelines for the assessment of noise impacts associated with construction activities.

Despite any description or assessment made in the subsequent paragraphs, the Noise Control Authority will be guided by the Technical Memorandum (Memoranda) in assessing an application, once filed, for a Construction Noise Permit (CNP). He will consider all the factors affecting his decision taking contemporary situations/conditions into account. Nothing in this Report shall bind the Authority in making his decision. There is no guarantee that a CNP will be issued. If a permit is to be issued, the Authority shall include any condition he thinks fit and such conditions are to be followed while the works covered by the permit are being carried out. Failing which will lead to cancellation of the permit and prosecution action under the NCO.

It is anticipated that general construction works during restricted hours are not required, thus no assessment in this Study had been conducted.

3.2.1.2 Percussive Piling

Percussive piling is prohibited at any time on Sundays and public holidays and during the weekday evening and night time hours (1900-0700 hours, Monday through Saturday). A CNP is required for such works during the weekday daytime hours (0700-1900 hours, Monday through Saturday), which needs to be applied from the Noise Control Authority.

When assessing a CNP application for the carrying out of percussive piling, the Noise Control Authority is guided by the PP-TM. The Noise Control Authority will look at the difference between the Acceptable Noise Levels (ANLs), as defined in the PP-TM, and the Corrected Noise Levels (CNLs) that are associated with the proposed piling activities. Depending on the level of noise impact on nearby Noise Sensitive Receivers (NSRs), the Noise Control Authority would determine the time periods for percussive piling operation; *Table 5A* of PP-TM is reproduced , in *Table 3.2a* below.

Table 3.2a Permitted Hours of Operation for Percussive Piling (not involving the use of diesel, pneumatic and/or steam hammers)

Amount by which CNL exceeds ANL	Permitted hours of operation on any day not being a holiday
more than 10 dB(A)	0800 to 0900 and 1230 to 1330 and 1700 to 1800
more than 0 dB(A) and less than or equal to 10 dB(A)	0800 to 0930 and 1200 to 1400 and 1630 to 1800
no exceedance	0700 to 1900

For any educational institutions, the ANLs should be adjusted by a -10 dB(A) correction factor in the noise assessment, taking account of the relative noise sensitivity of these uses.

The Government is committed to phase out the use of diesel, pneumatic and steam hammer pile drivers, which are particularly noisy. Such pile drivers cannot be used after 1 October 1999. In preparation for the incoming legislative control, the Government has already (since July 1997) administratively banned the use of diesel hammers in Government projects.

As the issuance of a CNP by the Noise Control Authority would depend on the application submitted by the Contractor, noise assessment of percussive piling activities has been excluded from this study.

3.2.1.3 General Construction Works

Noise arising from general construction works during normal working hours (i.e. 0700 to 1900 hours on any day not being a Sunday or public holiday) at the openable windows of any noise sensitive buildings is governed by the EIA TM. The recommended noise standards are presented in *Table 3.2b* below.

Table 3.2b EIA TM Daytime Construction Noise Limit ($L_{eq,\ 30\ min}$ dB(A))

Uses	Noise Standards
Domestic Premises	75
Educational Institutions (normal periods)	70
Educational Institutions (during examination periods)	65

The NCO provides statutory controls on general construction works during the restricted hours (i.e. 1900-0700 hours Monday to Saturday and at any time on Sundays and public holidays). The use of powered mechanical equipment (PME) for the carrying out of construction works during the restricted hours would require a CNP. The Noise Control Authority is guided by the GW-TM when assessing such an application.

When assessing an application for the use of PME, the Noise Control Authority will compare the ANLs, as promulgated in the GW-TM, and the CNLs (after accounting for factors such as barrier effects and reflections) associated with the proposed PME operations. A CNP may be issued if the CNL is equal to or less than the ANL. The ANLs are related to the noise sensitivity of the area in question and different Area Sensitivity Ratings have been drawn up to reflect the background characteristics of different areas. The relevant ANLs are shown in *Table 3.2c*.

Table 3.2c Acceptable Noise Levels (ANL, $L_{eq,\ 5\ min}$ dB(A))

Time Period	Area Sensitivity Rating		
	A	B	C
All days during the evening (1900-2300 hours) and general holidays (including Sundays) during the day and evening (0700-2300 hours)	60	65	70
All days during the night-time (2300-0700 hours)	45	50	55

In addition to the general controls on the use of PME during the restricted hours, the Noise Control Authority has implemented a more stringent scheme via the DA-TM. The DA-TM regulates the use of five types of Specified Powered Mechanical Equipment (SPME) and three types of Prescribed Construction Work (PCW), which are non-PME activities, in primarily densely populated neighbourhoods called Designated Areas (DAs). The SPME and PCW are:

SPME:

- Hand-held breaker
- Bulldozer
- Concrete lorry mixer
- Dump truck
- Hand-held vibratory poker

PCW:

- Erection or dismantling of formwork or scaffolding
- Loading, unloading or handling or rubble, wooden boards, steel bars, wood or scaffolding material
- Hammering

In the interest of offering additional protection to the population, the carrying out of PCW is generally banned inside a DA. As for the use of SPME, it would be necessary to comply with DA-TM noise level requirements that are 15 dB(A) more stringent than those listed in the GW-TM before a CNP may be issued.

There are some factors affecting the assessment results of a CNP application, such as the assigning of Area Sensitivity Rating, ANLs etc. The Noise Control Authority would decide these at the time of assessment of such an application based on the contemporary situations/conditions. It should be noted that the situations/conditions around the sites may change from time to time.

3.2.2 Road Traffic Noise Standards

3.2.2.1 Traffic Noise Criteria

The EIA TM requires that road traffic noise levels outside the façades of any sensitive buildings which rely upon openable windows for ventilation should not exceed the criteria given in *Table 3.2d*.

Table 3.2d EIA TM Road Traffic Noise Criteria

Sensitive Uses	Road Traffic Noise $L_{10,(1hr)}$ (dB(A))[1]
Domestic Premises	70
Offices	70
Educational Institutions	65

(1) Maximum permissible noise level assessed at 1 m from the external façade.

Any measured or predicted road traffic noise levels which exceed these criteria will be considered to be an adverse environmental impact.

Since the EPIWs are for permanent use, the long term effect is to be assessed by this Study and practicable direct mitigation measures will be recommended, where appropriate and within the terms of the Study Brief, to ensure any adverse impacts are reduced to acceptable levels.

While it is generally accepted that roads are a significant source of ambient noise within the community, it would not be practicable to mitigate all sources of adverse impact within or adjacent to the spatial scope or boundary of the EPIWs. The Study Brief

recognises that only those roads within the boundaries of the EPIWs that are subject to significant variation would be candidates for noise mitigation measures where adverse impacts occur. This effectively limits the extent of mitigation to new highway works but requires the impact assessment to consider the effect of all roads within a spatial scope of 300 m from the boundary of EPIWs. In essence, the intent of the noise criteria is to ensure that new highways will not cause adverse environmental impacts and that existing noise exceedances (i.e. those prevailing before the EPIWs) are reduced as far as practicable to acceptable levels. The project proponent therefore has the opportunity to bring about an environmental improvement, where adverse impacts pre-exist, in the vicinity of the EPIWs.

In accordance with the Study Brief, the definition of a significant variation of a road is where:

- the Project would result in a 25% increase in lanes; or
- substantial alterations in alignment or traffic character such as an increase in vehicle speed restriction.

Where a significant variation occurs, the road (or section to be varied) will be classified as "new". Roads that will remain either completely unchanged or will undergo only very minor alterations such that the above conditions would not be triggered will be classified as "unaltered".

3.2.2.2 Criterion for Indirect Technical Remedies

Indirect remedies (i.e. noise insulation of a sensitive property's windows and provision of air conditioning) will be provided according to the *ExCo Directive, Equitable Redress for Persons Exposed to Increased Noise Resulting From The Use of New Roads*. These remedies will be provided by the Proponent where practicable direct mitigation measures would not be feasible in terms of traffic or engineering constraints or would not be wholly effective: the residual impacts at NSRs after direct mitigation would be assessed according to the *ExCo Directive* criteria to consider if, as a very last resort, the affected noise sensitive receivers would qualify for noise insulation.

The *ExCo Directive* criteria would have to be exceeded (when rounded to the nearest 0.1 dB(A)) for the NSRs to qualify for insulation. The criteria follow the conditions, as embodied in the *ExCo Directive* are:

- 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) $L_{10, (1\ hr)}$ for domestic premises);
- the predicted overall noise level is at least 1.0 dB(A) more than the prevailing traffic noise level, i.e. the total traffic noise level existing before the works to construct or improve the road were commenced; and
- the contribution to the increase in the predicted overall noise level from the "new" road must be at least 1.0 dB(A).

Within the context of this EIA Study, the objective is to identify the approximate extent of properties being eligible for indirect technical remedies. The detailed scheduling and specification of noise insulation works would be undertaken by the Proponent after the EIA and in accordance with EPD's specification requirements incorporating Annex 5 of the EIA TM. The noise insulation would be installed prior to the opening of the EPIWs

3.3 Air Quality

The principal legislation for the management of air quality is the *Air Pollution Control Ordinance* (APCO) (Cap 311). The whole of the Hong Kong SAR is covered by the *Hong Kong Air Quality Objectives* (AQOs) which stipulate the statutory limits of some typical air pollutants and the maximum allowable numbers of exceedance over specific periods. In addition, the EIA TM stipulates an hourly TSP limit of 500μg m^{-3} measured at 298K (25^{o}C) and 101.325 kPa (1 atm) for construction dust impact assessment. Mitigation measures required to reduce the impact of dust from construction sites have also been specified in the *Air Pollution Control (Construction Dust) Regulation*.

The AQOs are shown in *Table 3.*3a and, under *Annex 4* of the EIA TM, are to be met during the construction and operational phases of the EPIWs.

Table 3.3a Hong Kong Air Quality Objectives (μg m^{-3})

Pollutant	Averaging Time			
	1 Hour (2)	8 Hours (3)	24 Hours (3)	1 Year (4)
Total Suspended Particulates (TSP)	-	-	260	80
Respirable Suspended Particulates (5) (RSP)	-	-	180	55
Nitrogen Dioxide (NO_2)	300	-	150	80
Sulphur Dioxide (SO_2)	800	-	350	80
Carbon Monoxide (CO)	30,000	10,000	-	-

Notes:

(1) All the pollutant concentrations in μg m^{-3} should be measured at 298K (25 C) and 101.325 kPa (one atmosphere).

(2) Not to be exceeded more than three times per year.

(3) Not to be exceeded more than once per year.

(4) Arithmetic means.

(5) Respirable suspended particulates are defined as particles suspended in the air with a nominal aerodynamic diameter of 10 m and smaller.

3.4 Water Quality

The regulatory requirements and standards to protect water quality include the *Water Pollution Control Ordinance* (WPCO), its subsidiary technical memoranda, and various technical circulars issued by the Works Branch and the EPD as described below. Whilst

the technical circulars are non-statutory, they are generally accepted as best practice guidelines in Hong Kong and have been adopted as relevant for this assessment.

3.4.1 Water Pollution Control Ordinance (WPCO)

Under the WPCO, Hong Kong waters are divided into 10 Water Control Zones (WCZs). Each WCZ has a designated set of statutory Water Quality Objectives (WQO). The standards to be met in each WCZ depend on the classification of the receiving waters (e.g. inland, inshore, marine or foul sewer). The standards are applied to effluents through licences issued by the EPD under Sections 15, 16 and 20 of the WPCO. The relevant standards are set out in the *Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters.*

3.4.2 Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters

This TM issued under Section 21 of the WPCO defines acceptable discharge limits to different types of receiving waters.

Effluents discharged into the inshore and marine waters of the Victoria Harbour WCZ are subject to standards stipulated in Tables 9a and 9b of the TM. The standards in Tables 10a and 10b of the TM apply to effluents discharged into the inshore and marine waters respectively of the North Western and Western Buffer WCZs. For the Deep Bay WCZ, the standards in Table 8 of the TM apply, although reference should also be made to *Section 3.4.3* below.

Relevant criteria for effluents discharged to inland waters depend on the classification of beneficial uses downstream. The majority of inland water bodies potentially affected by West Rail are used for agriculture (defined in the TM as Group B inland waters) and freshwater fish culture (Group C inland waters). Discharge standards for Group B and Group C inland waters are listed in Tables 4 and 5 of the TM respectively.

Discharges of effluents into the foul sewerage system need to comply with the standards listed in Tables 1 and 2 of the TM.

For cooling water discharges, in addition to the TM requirements (which only apply to discharges of up to 6,000 m^3 per day), the EPD has required that discharges of between 6,000 and 1,000,000 m^3 per day have a temperature of not more than 35 ^oC and not more than 10 ^oC above influent temperature, and contain not more than 0.2 mg/l of total residual chlorine.

3.4.3 The Deep Bay "Zero Discharge Policy"

In addition to Table 8 of the TM, this policy aims to limit the decline of water quality in Deep Bay and its catchments. It requires that major developments within Deep Bay catchments and all new developments in sensitive areas of the catchment, where a

connection to public sewer system is not feasible, do not increase existing pollution loads.

3.4.4 Construction Site Drainage Guidelines

The *Practical Note for Professional Persons on Construction Site Drainage* (PN1/94) issued by the EPD provides basic environmental guidelines for the handling and disposal of construction site discharges to minimise impacts on water quality.

3.5 Landscape and Visual Impact

The assessment of the landscape and visual impacts of the proposed development has been carried out in accordance with the Technical Memorandum of the Environmental Impact Assessment (EIA) issued under the EIA Ordinance. Particular reference has been made to *Annexes 1, 2, 3, 10, 11,18 and 20* of the *Technical Memorandum.*

Government restrictions on the preservation and felling of trees in Hong Kong are detailed in *"Government General Regulation 740", WBTC 24/94 and PELB 3/94 Tree Preservation.*

3.6 Waste

The following legislation relates to the handling, treatment and disposal of wastes in Hong Kong, and will be considered in assessing potential impacts and their avoidance or mitigation:

- *The Waste Disposal Ordinance (Cap 354);*
- *The Waste Disposal (Chemical Waste) (General) Regulation (Cap 354);*
- The *Crown Land Ordinance (Cap 28);*
- The *Public Health and Municipal Services Ordinance (Cap 132) - Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws;* and
- *Dumping At Sea Ordinance (Cap 466).*

The *Waste Disposal Ordinance* (WDO) prohibits the unauthorised disposal of wastes. Construction waste is not directly defined in the WDO but is considered to fall within the category of "trade waste". Under the WDO, wastes can only be disposed of at sites licensed by the EPD.

Under the *Waste Disposal (Chemical Waste) (General) Regulation* all producers of chemical wastes (including asbestos) must register with the EPD and treat their wastes, either utilising on-site plant licensed by the EPD, or arranging for a licensed collector to take the wastes to a licensed facility. The regulation also prescribes the storage facilities to be provided on site, including labelling and warning signs, and requires the preparation of written procedures and training to deal with emergencies such as spillages, leakages or accidents arising from the storage of chemical wastes.

Construction wastes which are wholly inert may be taken to public dumps. Public dumps usually form part of land reclamation schemes operated by the Civil Engineering Department (CED). The *Crown Land Ordinance* requires that dumping licences are obtained by individuals or companies who deliver suitable construction wastes to public dumps. The licences are issued by the CED under delegated powers from the Director of Lands.

The *Public Cleansing and Prevention of Nuisances By-Laws* provide further controls on the illegal tipping of wastes on unauthorised (unlicensed) sites.

The following documents and guidelines also relate to waste management and disposal in Hong Kong:

- *Waste Disposal Plan for Hong Kong (December 1989), Planning, Environment and Lands Branch, Hong Kong Government Secretariat;*
- *Environmental Guidelines for Planning In Hong Kong (1990), Hong Kong Planning and Standards Guidelines, Hong Kong Government;*
- *New Disposal Arrangements for Construction Waste (1992), Environmental Protection Department and Civil Engineering Department;*
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992), Environmental Protection Department*;
- *Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste, Environmental Protection Department;*
- *Works Branch Technical Circular No 2/93, Public Dumps;*
- *Works Branch Technical Circular No 16/96, Wet Soil in Public Dumps;*
- *Environmental Protection Department Technical Circular No. 1-1-92, Classification of Dredged Sediments for Marine Disposal; and*
- *Technical Circular No. 22/92, Marine Disposal of Dredged Mud, Works Branch.*

3.7 Archaeological and Cultural Resources

The *Antiquities and Monuments Ordinance (Cap. 53),* provides powers for the designation of Antiquities and Monuments Sites or Declared Monuments in Hong Kong. The Ordinance provides statutory protection against the threat of development for gazetted monuments, historic buildings and archaeological sites which have been approved by the Antiquities Advisory Authority (AAA) to enable rehabilitation and maintenance works and facilitate public visits.

Deemed Monuments have been identified by the Antiquities and Monuments Office (AMO) and agreement reached with the owners of the Monument to provide for specific measures to ensure preservation. Deemed Monuments have the potential to be upgraded to statutory Declared Monuments.

The AMO has also assigned gradings to buildings of historic interest ranging from the most valued buildings at Grade 1 down to Grade 3. This classification is for AMO internal reference and has no statutory protection power.

Although there are no statutory provisions for the protection of Sites of Historical Interest, Deemed Monuments and Graded Buildings in Hong Kong, the Government has administrative procedures which state that consideration must be given to protect listed and locally designated historic buildings and sites of cultural interest. However, the current record of archaeological sites is known to be incomplete as many areas are not yet surveyed. Although *Section 11* (and its relevant sub-sections) of the *Antiquities and Monuments Ordinance* require any person who discovers an antiquity or supposed antiquity to report the discovery to the Antiquities Authority, there is a need to ensure that procedures and mechanisms, which ensure the preservation or formal notification of previously unknown archaeological resources that may be revealed or discovered during project assessment or construction, are identified at an early stage in Project planning.

4. EXISTING ENVIRONMENT AND SENSITIVE RECEIVERS

4.1 Noise

4.1.1 Baseline Conditions

From site inspections the existing ambient noise within each of the EPIW Study areas is dominated by local road traffic. Based on the general trend in Hong Kong for traffic flows to grow in the future as well as the planned growth for the North West New Territories, the existing noise baseline (i.e. without the EPIWs) would be likely to increase.

There are no major fixed industrial noises in the vicinity affecting the noise baseline and the existing LRT lines in Yuen Long, Tin Shui Wai and Tuen Mun generally influence localised corridors along the routes. These noise sources would, by design, be controlled at source by the stringent criteria given by the NCO to achieve acceptable levels at pre-existing sensitive properties. Subsequent property development would be required to implement appropriate mitigation through the planning approval process to meet the same criteria.

The planned West Rail alignment and future extensions of the LRT will also be strictly controlled by the NCO and EIAO and therefore it is concluded that that the baseline noise environment within the EPIWs will be dominated by road traffic noise.

4.1.2 Noise Sensitive Receivers

Representative NSRs, including existing properties and future developments, have been identified within a spatial scope of 300m from the Project boundaries and are shown by *Figures 4.1a-c*. The identified NSRs in Yuen Long, Tin Shui Wai and Tuen Mun Centre are listed in *Tables 4.1a-c* below and have been selected according to *Annex 13* (*Guidelines for Noise Assessment)* of the EIA TM.

4.1.2.1 Yuen Long

Table 4.1a - Identified Noise Sensitive Receivers in Yuen Long

NSR	Description
1	Nam Pin Wai (west)
2	Tai Wong Temple - Nam Pin Wai
3	Nam Pin Wai (south-west)
4	Nam Pin Wai (south)
5	Shung Tak School
6	Nam Pin Wai (east)
7	Tung Tau Tsuen

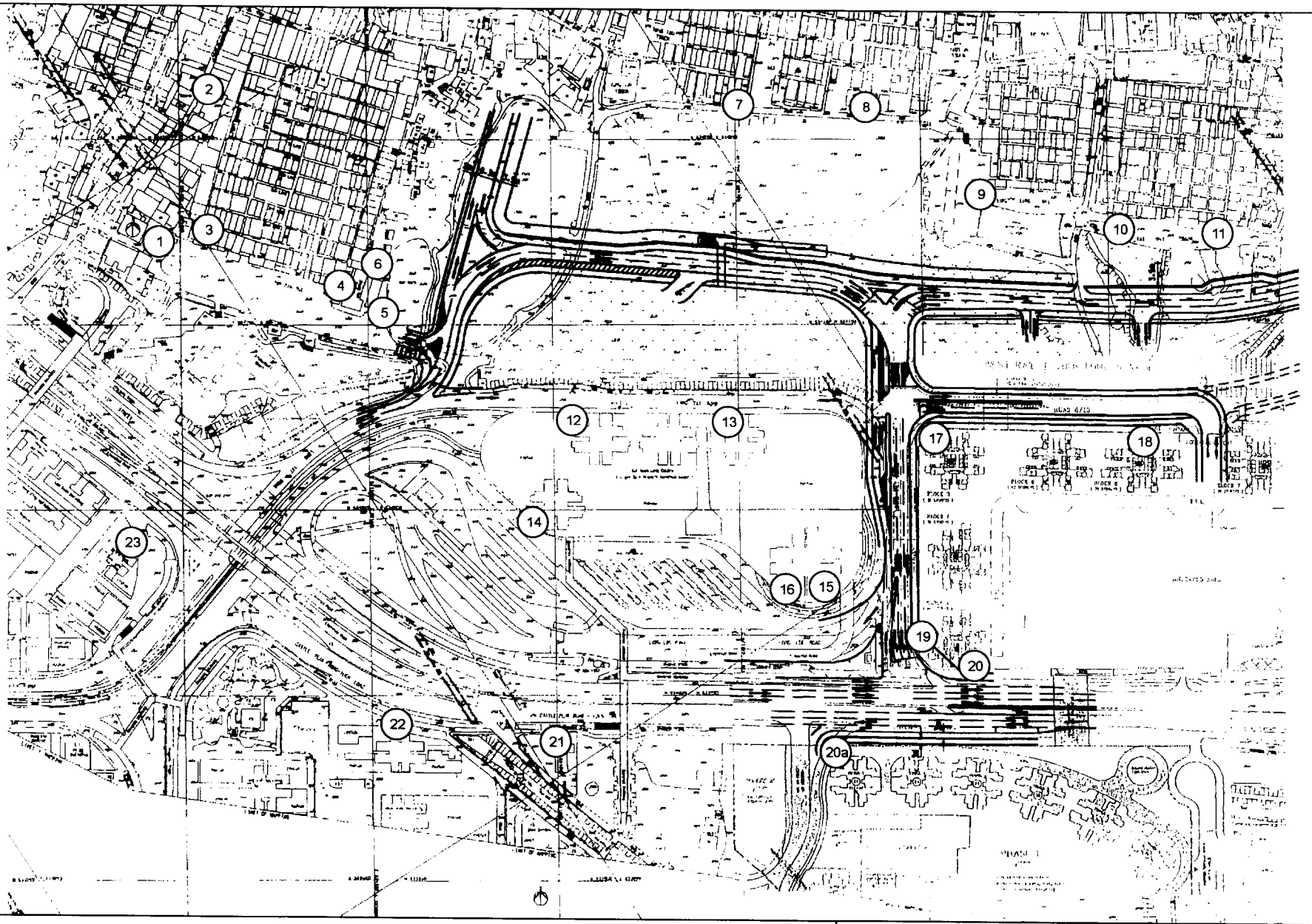
NSR	Description
8	Tsoi Uk Tsuen
9	Ying Lung Wai
10	Tai Wai Tsuen (west)
11	Tai Wai Tsuen (east)
12	Sun Yuen Long Centre (north-west)
13	Sun Yuen Long Centre (north-east)
14	Sun Yuen Long Centre (west)
15	Sun Yuen Long Centre (south)
16	Sun Yuen Long Centre (south)
17	Future Residential Development Area 15 (north-west)
18	Future Residential Development Area 15 (north-east)
19	Future Residential Development Area 15 (south-west)
20	Future Residential Development Area 15 (south)
20a	Future Residential Development Area 12 (north)
21	Shap Pat Heung Rural Committee Building
22	Cheong Wai
23	Far East Consortium Yuen Long Building

The existing noise climate is dominated by the traffic on Castle Peak Road, Long Yat Road, Long Yip Street and Yuen Long On Lok Road. Without the project, the identified NSRs are affected mainly from traffic noise. In addition, noise from the LRT and the opened public transport interchange are also potential sources of noise which will contribute to the baseline environment.

The residential towers proposed above the future West Rail Yuen Long Station and PTI/CDA site have been excluded from this assessment as they will be designed with appropriate mitigation to ensure adverse road traffic noise impacts will not occur.

The CDA sites in Yuen Long Areas 15 and 12 which are surrounded by Castle Peak Road, Long Yat Road and Road 6/L3, have been planned for future residential development prior to the gazettal of West Rail (and the EPIWs). As such, these developments have been identified as NSRs. The extent of mitigation measures to be provided by the developer of these two sites in respect of the adjacent highways is based upon the latest Section 16 applications for these sites. With this information, this EIA will take account of these proposals and the planning criteria adopted during the approval of the site layout to recommend additional measures where required in accordance with *Planning, Environment and Lands Bureau Technical Circular no. 10/98: Procedures for EIA of Development Projects and Projects*, issued by Works Bureau in October 1998.

According to *KCRC West Rail EIA FAR*, noise insulation has been proposed for Shung Tak School during construction of West Rail to reduce the predicted noise impacts.



LOCATION OF NOISE SENSITIVE RECEIVERS IN YUEN LONG

FIGURE 4.1a

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KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES

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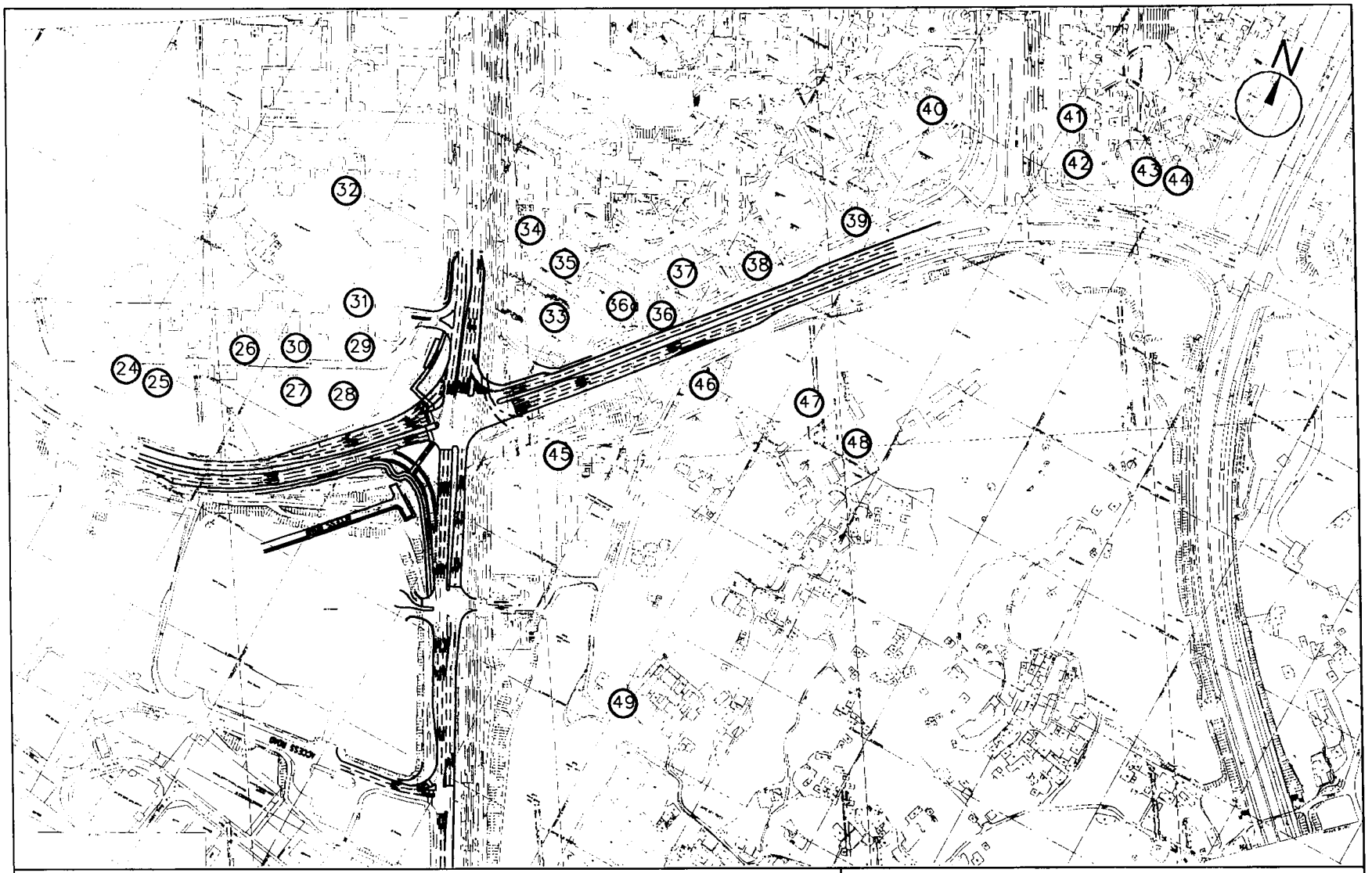

LOCATION OF NOISE SENSITIVE RECEIVERS IN TIN SHUI WAI FIGURE 4.1b

SCALE: 1/5000

KOWLOON - CANTON RAILWAY CORPORATION

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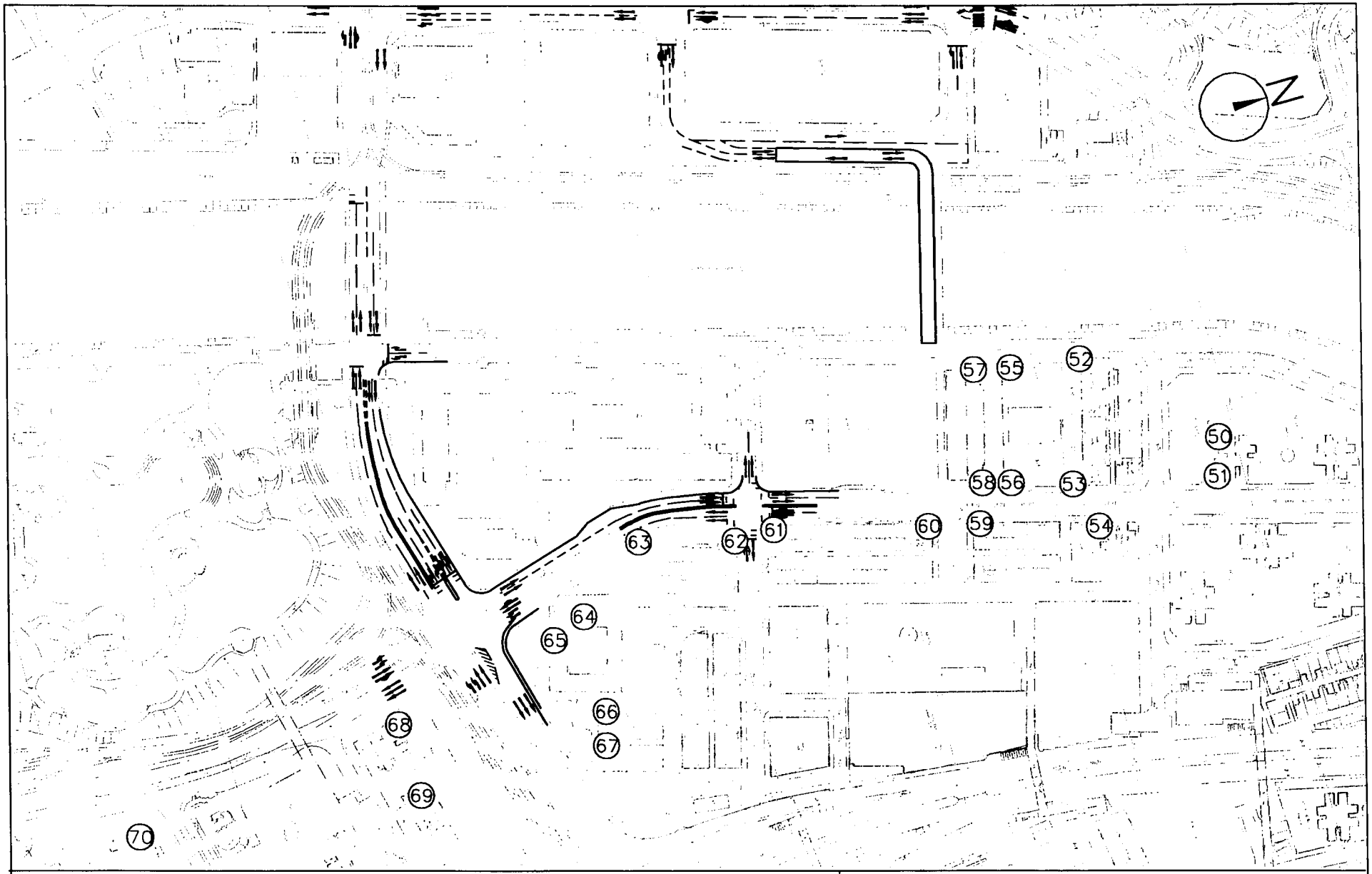
WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES



LOCATION OF NOISE SENSITIVE RECEIVERS IN TUEN MUN CENTRE FIGURE 4.1c

SCALE: 1/3000

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KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES

Assessment of noise will also be made for this NSR to check the adequacy of the noise mitigation measures.

4.1.2.2 Tin Shui Wai

Table 4.1b - Identified Noise Sensitive Receivers in Tin Shui Wai

NSR	Description
24	Proposed Secondary School (west)
25	Proposed Secondary School (south)
26	Tin Shing Court (west)
27	Proposed Primary School
28	Proposed Primary School (east)
29	Tin Shing Court (east)
30	Tin Shing Court (south)
31	Tin Shing Court (east)
32	Tin Shing Court (north)
33	QE School Old Student's Association Primary School
34	Yiu Hong House (west)
35	Yiu Hong House (east)
36	Yiu Foo House (south) – Tin Yiu Estate
36a	Yiu Foo House (west) – Tin Yiu Estate
37	Yiu Foo House (north) – Tin Yiu Estate
38	Yiu Yat House – Tin Yiu Estate
39	Yau Hong House
40	Yau Ning House
41	Tin Tsz Estate (west)
42	Tin Tsz Estate (south)
43	Tin Tsz Estate (south)
44	Tin Tsz Estate (east)
45	TWGHs Kwok Yat Wai College
46	Residence in Ping Shan (west)
47	Residence in Ping Shan (north)
48	Residence in Ping Shan (east)
49	Sheung Cheung Wai

The main sources of noise in Tin Shui Wai originates from the traffic on Tin Fuk Road, Ping Ha Road, Tin Yiu Road and the LRT line. Existing NSRs are currently affected by these sources.

The proposed primary and secondary schools in Tin Shui Wai Area 3 (immediately north west of Ping Ha Road/Tin Yiu Road junction) have also been included in this assessment as NSRs. From information available from Education Department (ED), these schools have not, as yet, been planned with noise insulation.

However, TWGH's Kwok Yat Wai College will be provided with noise insulation by the Education Department (ED)/KCRC in connection with the construction of the Tin Shui Wai West Rail Station and for tackling the existing baseline traffic noise problems. Noise insulation and air conditioners were also noted at QE School Old Student's Association Primary School during a site visit. The adequacy of indirect measures adopted for these schools will be reviewed in this Study.

During the operational phase of the Project, NSR 46 (Residence in Ping Shan West) will be resumed for LRT extension development and this NSR has thus been taken out in subsequent assessment.

4.1.2.3 Tuen Mun Centre

Table 4.1c - Identified Noise Sensitive Receivers in Tuen Mun Centre

NSR	Description
50	Hong Lai Garden (west)
51	Hong Lai Garden (east)
52	Hong King Building
53	Bit Hing Building
54	Honeley Court
55	St Simon's Lui Ming Choi Secondary School (south-west)
56	St Simon's Lui Ming Choi Secondary School (south-east)
57	St Simon's Lui Ming Choi Secondary School (south-west)
58	St Simon's Lui Ming Choi Secondary School (south-east)
59	Tuen Mun Mansion
60	Tai Hing Building
61	Koon Hing Building
62	Ming Wai Building (north)
63	Ming Wai Building (south)
64	Castle Peak Catholic Primary School (west façade)
65	Castle Peak Catholic Primary School (south façade)
66	Top Court
67	Man Shing Building
68	Kam Wah Garden (west)
69	Kam Wah Garden (north)

NSR	Description
70	The Trend Plaza

Existing NSRs are affected by the traffic noise from Pui To Road, Tuen Mun Road and Castle Peak Road. The LRT lines on both sides of Tuen Mun River Channel will also contribute to the background noise levels.

Following the gazettal approval for KCRC's development of the Tuen Mun Centre West Rail Station, the Ho Fuk Tong Primary School and those residences within the San Fat Estate will be resumed. These existing NSRs will therefore be excluded from this assessment.

With reference to *KCRC West Rail FAR*, noise insulation has been proposed for St Simon's Lui Ming Choi Secondary School during construction of West Rail to reduce the predicted noise impacts. In addition, this school will also be upgraded, and noise abatement measures will be provided by ED to address the existing baseline traffic noise issues. The adequacy of indirect measures adopted for this school will be reviewed in this Study.

4.2 Air Quality

4.2.1 Baseline Conditions

The existing landuses within the study areas of Yuen Long, Tin Shui Wai and Tuen Mun Centre include residential developments, schools and industrial premises. Recreational uses are also found in Tuen Mun.

In accordance with *EPD's Draft Guidelines for Local-scale Air Quality Assessment Using Models*, the monitored air quality data in the Yuen Long, Tin Shui Wai and Tuen Mun areas are classified as Rural/New Development categories. The concentrations of pollutants based on the annual average of EPD's fixed monitoring station for the years 1992 to 1996 have been calculated and the background air quality for Rural/New Development Areas are summarised in *Table 4.2a*. Background CO levels have not been provided in the guidelines and annual average CO data for 1996 of Kwai Chung Monitoring Station was used to indicate the CO background. This background data will be considered in the impact assessment for the operational phase of the EPIWs.

Table 4.2a Background Air Quality of Yuen Long, Tin Shui Wai and Tuen Mun Centre (μgm^{-3})

Pollutant	Annual Average
NO2[(i)]	39
RSP[(i)]	51
TSP[(i)]	87
CO[(ii)]	490

Note:

(i) Data based on *EPD's Draft Guidelines for Local-scale Air Quality Assessment Using Models*

(ii) Monitored at Kwai Chung Monitoring Station

4.2.2 Air Sensitive Receivers

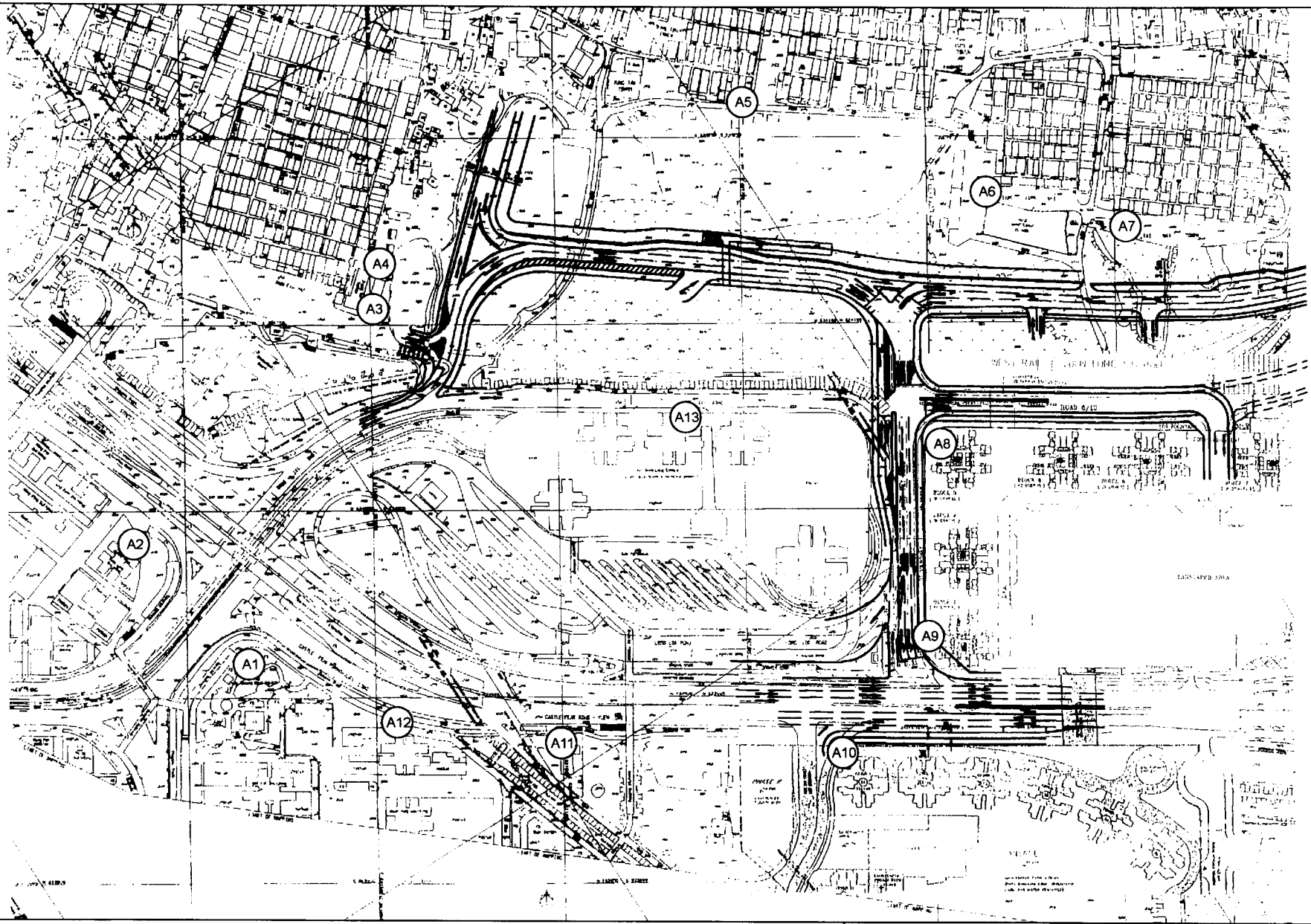
In accordance with the Study Brief, the spatial scope for the assessment of air quality is defined as 500m from the project boundary. The assessment includes representative *Air Sensitive Receivers* (ASR) which are defined by *Annex 12* of the EIA TM as the following: domestic premises, hotel, hostel, hospital, clinic, nursery, temporary housing accommodation, school, educational institution, office, factory, shop, shopping centre, place of public worship, library, court of law, sports stadium and performing arts centre. Any premises which are considered to have similar sensitivity to these landuses will also be considered as an ASR. In accordance with *Annex 12*, representative ASRs in Yuen Long, Tin Shui Wai and Tuen Mun Centre have been identified and are listed in *Tables 4.2b-d* together with the horizontal separation distance from the EPIWs: the locations of ASRs are presented by *Figures 4.2a-c*.

Table 4.2b Identified Representative Air Sensitive Receivers in Yuen Long

Air Sensitive Receivers	Description	Horizontal Distances (m)
A1	Fung Cheung Road Garden	120
A2	Far East Consortium Yuen Long Building	120
A3	Shung Tak School	30
A4	No.7, Nam Pin Wai	30
A5	Tung Tau Tsuen	60
A6	No.5, Ying Lung Wai	50
A7	No.30, Tai Wai Tsuen	40
A8	Proposed Residential Development, Block 9	5
A9	Proposed Residential Development, Block 11	5
A10	Proposed Development in Area 12	5
A11	Proposed Development in Area 12	70
A12	Cheong Wai Building	160
A13	Sun Yuen Long Centre	60

Table 4.2c Identified Representative Air Sensitive Receivers in Tin Shui Wai

Air Sensitive Receivers	Description	Horizontal Distance (m)
A14	Proposed Primary School	10
A15	Planned Residential Development	20



LOCATION OF AIR SENSITIVE RECEIVERS IN YUEN LONG

FIGURE 4.2a

ERM

KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES

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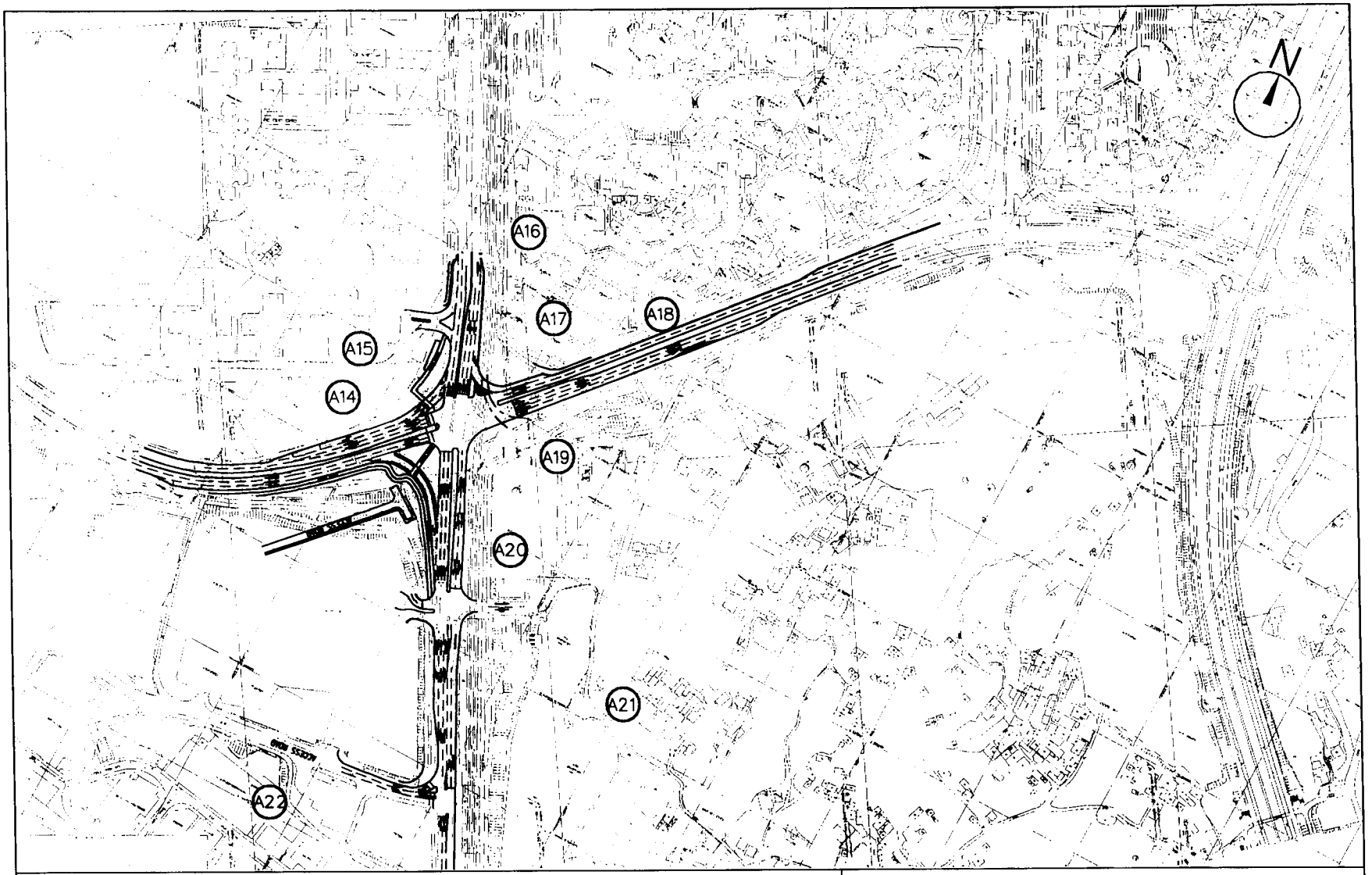

LOCATION OF AIR SENSITIVE RECEIVERS IN TIN SHUI WAI

FIGURE 4.2b

SCALE: 1/5000

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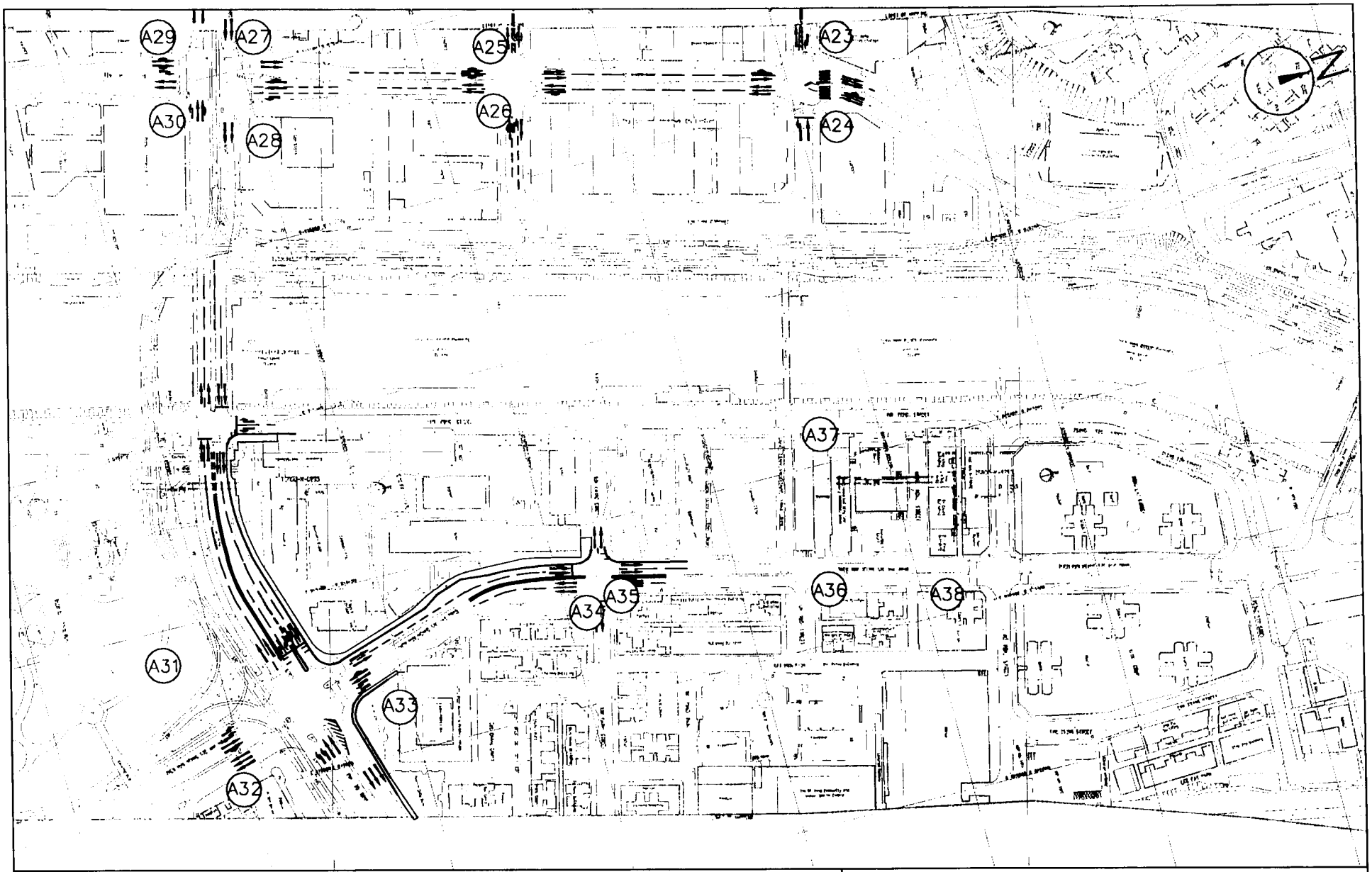
WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES



LOCATION OF AIR SENSITIVE RECEIVERS IN TUEN MUN CENTRE FIGURE 4.2c

SCALE: 1/3000

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KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES

Air Sensitive Receivers	Description	Horizontal Distance (m)
A16	Yiu Hong House	14
A17	QE School Old Student's Association Primary School	10
A18	Yiu Foo House	14
A19	TWGHs Kwok Yat Wai College	35
A20	Indoor Sport Hall	25
A21	Sheung Cheung Wai	130
A22	Factory	51

Table 4.2d Identified Representative Air Sensitive Receivers in Tuen Mun Centre

Air Sensitive Receivers	Description	Horizontal Distance (m)
A23	Tung Ah Factory	10
A24	Tung Ming Building	15
A25	Tak Wing Industrial Building	10
A26	Yau Shing Industrial Building	10
A27	Fire Station	10
A28	Police Station	15
A29	Lek Sin Industrial Centre	15
A30	Choi Sing Industrial Building	15
A31	Tuen Mun Town Park	60
A32	Kam Wah Garden Block 1	43
A33	Castle Peak Catholic Primary School	38
A34	Ming Wai Building	15
A35	Koon Hing Building	10
A36	Tuen Mun Mansion	90
A37	St Simon's Lui Ming Choi Secondary School	90
A38	Honeley Court	150

4.3 Water Quality

4.3.1 Baseline Conditions

In general, the streams along the West Rail Phase I alignment are grossly polluted by discharges from livestock farms, unsewered villages and, in some cases, industrial establishments. The existing downstream water quality is generally poor, and EPIW construction activities should not cause any further deterioration in baseline conditions.

Site investigations were conducted during the West Rail Phase I EIA to check for any recent changes in water quality and any noticeable discharge sources. During site visits, no ground water abstraction points were found within the alignment of West Rail and EPIW study area. It is therefore unlikely that any ground water catchment falls within the EPIW study area.

4.3.1.1 Yuen Long Creek and Tin Shui Wai Nullah

Yuen Long Creek has a length of 60 km and a catchment area of 26.7 km^2. It begins at Tai Lam Country Park and passes through Yuen Long new town as a 12 km long open nullah before discharging into Inner Deep Bay. The relatively limited dispersive capacity of Inner Deep Bay exacerbates the sedimentation and retention of pollutants at the lower part of the creek during in-coming tides.

Tin Shui Wai nullah is part of the Tin Shui Wai drainage basin that drains into the Inner Deep Bay. The water quality of Tin Shui Wai Nullah varied from "fair" to "good" in 1997, as reported in the EPD's River Water Quality in Hong Kong in 1997.

The water quality of Yuen Long Creek and Tin Shui Wai nullah is regularly monitored by EPD's river water monitoring programme. Monitoring stations YL3 and YL4 are located downstream of the tributary of the Yuen Long Creek which will be crossed by the proposed alignment of the Yuen Long and Long Ping sections. Stations TSR1 and TSR2 are relevant to the Tin Shui Wai section. A summary of EPD monitoring data (for 1997) for the closest monitoring stations, YL3, YL4, TSR1 and TSR2 is given in *Table 4.3a*.

Table 4.3a Summary Statistics of 1997 Water Quality of Yuen Long Creek (YL) and Tin Shui Wai Nullah (TSR)

Parameter	YL3	YL4	TSR1	TSR2	WQOs for inland waters of Deep Bay WCZ
DO (% Saturation)	n.a.	n.a.	n.a.	n.a.	n.a.
DO (mg/l)	3.2 (0.5-6.9)	2.8 (1.1-6.6)	7.6 (5.9-17.3)	10.5 (7.8-15.5)	4 mg/l
BOD5 (mg/l)	91.0 (7.0-290.0)	82.0 (19.0-140.0)	14.0 (3.0-76.0)	3.0 (1.0-7.0)	3 mg/l
COD (mg/l)	99.0 (13.0-310.0)	60.0 (19.0-290.0)	19.0 (11.0-130.0)	14.0 (4.0-41.0)	15 mg/l
Oil and Grease (mg/l)	10.5 (0.5-84.0)	8.8 (0.7-33.0)	0.8 (0.5-7.6)	0.5 (0.5-1.2)	n.a.
SS (mg/l)	130.0 (13.0-310.0)	76.0 (24.0-220.0)	30.0 (7.0-140.0)	15.0 (5.0-93.0)	Annual median 20 mg/l

Parameter	YL3	YL4	TSR1	TSR2	WQOs for inland waters of Deep Bay WCZ
Turbidity (NTU)	n.a.	n.a.	n.a.	n.a.	n.a.
Ammoniacal N (mg/l)	24.50 (2.60-38.00)	6.0 (2.8-10.0)	2.5 (0.36-11.0)	0.46 (0.12-10.0)	n.a.
Total Kjeldahl N (mg/l)	37.00 (3.40-60.00)	9.30 (5.50-16.00)	4.20 (0.78-20.00)	1.20 (0.23-14.00)	n.a.
Total P (mg/l)	7.40 (0.69-15.00)	1.50 (0.84-2.10)	0.88 (0.19-3.90)	0.17 (0.05-1.70)	n.a.
pH value	7.4 (7.3-7.8)	7.3 (7.1-7.8)	8.2 (7.6-9.6)	8.2 (7.6-9.5)	6.5 - 8.5
Flow (l/s)	256 (52-1,104)	209 (52-276)	NM	28 (3-570)	n.a.

Notes:

1. Data presented are annual arithmetic means, except where specified otherwise.

2. Data enclosed in brackets are ranges.

3. NM indicates no measurement taken

4. n.a. = not available

Source: EPD River Water Quality in Hong Kong 1997

The water quality of Yuen Long Creek was very bad, reflected in non-compliance with the WQOs throughout 1996, with high annual means of BOD_5 , COD and SS levels, and low DO. There are a number of livestock waste discharges and industrial effluent discharges in the catchment which adversely affect water quality.

The water quality of Tin Shui Wai Nullah also suffers from pollution with a number of livestock waste and industrial effluent polluting discharges having been identified in the catchment.

4.3.1.2 Tuen Mun River

The 38 km long Tuen Mun River has a catchment of about 16.5 km^2. The upstream section of the river passes through Lam Tei, San Hing Tsuen and Fu Tei where the West Rail alignment will be parallel to the Tuen Mun River. There are six monitoring stations (TN1-TN6) along the Tuen Mun River monitored by EPD and located close to the alignment and a summary of EPD monitoring data (for 1997) for these six stations is given in *Table 4.3b*.

Table 4.3b Summary Statistics of 1997 Water Quality of Tuen Mun River

Parameter	TN1	TN2	TN3	TN4	TN5	TN6	WQOs for inland waters of Deep Bay WCZ
DO (% Saturation)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
DO (mg/l)	4.0	9.2	4.4	4.5	4.5	5.2	4 mg/l
	(1.9-7.9)	(7.5-11.5)	(0.5-9.5)	(2.3-7.2)	(0.6-8.5)	(2.8-8.6)	
BOD5 (mg/l)	31	5	4	5	5	2	3 mg/l
	(11-120)	(1-15)	(2-14)	(2-11)	(2-12)	(1-6)	
COD (mg/l)	48	18	135	107	130	140	15 mg/l
	(13-120)	(6-77)	(44-280)	(8-270)	(12-310)	(20-350)	
Oil and Grease (mg/l)	2.3	1.0	0.5	0.5	0.5	0.5	n.a.
	(0.5-25.0)	(0.5-3.7)	(0.5-1.3)	(0.5-1.2)	(0.5-1.6)	(0.5-1.1)	
SS (mg/l)	29	12	6	8	7	5	Annual median
	(12-320)	(4-3,500)	(3-29)	(5-25)	(4-22)	(3-25)	20 mg/l
Turbidity (NTU)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Ammoniacal N (mg/l)	9.55	1.75	0.56	0.55	0.59	0.44	n.a.
	(0.39-31.00)	(0.19-8.40)	(0.07-1.50)	(0.24-1.20)	(0.10-1.50)	(0.23-0.76)	
Total Kjeldahl N (mg/l)	12.00	2.25	0.96	1.05	1.03	0.82	n.a.
	(0.72-38.00)	(0.26-13.00)	(0.74-2.00)	(0.72-2.10)	(0.41-2.00)	(0.54-1.20)	
Total P (mg/l)	1.80	0.47	0.15	0.17	0.16	0.12	n.a.
	(0.21-3.90)	(0.06-3.40)	(0.07-0.32)	(0.09-0.26)	(0.07-0.38)	(0.07-0.38)	
pH value	8.0	7.6	7.6	7.7	7.6	7.3	6.5 - 8.5
	(7.5-8.2)	(7.1-9.9)	(7.4-8.2)	(7.4-8.3)	(7.5-8.4)	(7.0-7.9)	
Flow (l/s)	85	27	NM	NM	NM	NM	n.a.
	(30-1,100)	(8-162)					

Notes:

1. Data presented are annual arithmetic means, except where specified otherwise.
2. Data enclosed in brackets are ranges.
3. NM indicates no measurement taken
4. n.a. = not available

Source: EPD River Water Quality in Hong Kong 1997

The monitoring data for 1997 showed that the water quality of the lower section (TN3-TN6) of the river was better than the upper sections (TN1-TN2). However, the overall water quality is poor, reflected in non-compliance with the WQOs for DO, BOD_5 and COD, as well as SS on occasions.

4.3.2 Water Sensitive Receivers (WSRs)

Potential WSRs likely to be affected by the EPIW construction works comprise:

- Surface waters, including Yuen Long Creek, Tin Shui Wai Nullah and Tuen Mun River; and
- Fish/duck ponds near the Yuen Long, and Tin Shui Wai Stations.

4.4 Landscape and Visual

4.4.1 Baseline Landscape and Visual Conditions at Yuen Long Station

4.4.1.1 Planning Context

The study site lies in the east of Yuen Long New Town. As the focal point of existing and planned transport networks in the region the town is considered suitable for development into the Regional Centre of the North West N.T. The south and east of the existing built-up area are the areas where new development is proposed in the form of higher order commercial and residential development.

The study site centres on the existing LRT terminus and commercial residential development. This is surrounded by land zoned as 'CDA' on the Yuen Long OZP No. S/YL/5. CDAs 12 and 15 located north and south of Castle Peak Road are intended for comprehensive commercial and residential development. The CDA to the south of the LRT terminus is the site of a proposed Public Transport Interchange with associated commercial and residential development and the CDA to the north is the site of the proposed KCRC West Rail Station. Further north land is zoned as 'V' (village type development) reflecting the existing village landuse. Two areas zoned as open space ('O') lie to the north and west of the LRT terminus.

4.4.2 Baseline Landscape and Visual Conditions at Tin Shui Wai

4.4.2.1 Planning Context

Tin Shui Wai is a New Town in the North west N.T. built in the last decade on flat land reclaimed from fishponds. The intention was to create a well designed New Town of open character and engineering infrastructure and building works have been completed for a population of 150,000 people. Further development to the north is planned.

The study site lies on the southern edge of the existing development. Ping Ha Road and Tin Fuk Road lie on the boundary of the OZP. Land to the north is zoned 'R/A' (Residential Group A) on the Tin Shui Wai OZP No. S/TSW/3 and new school and

residential estate construction is currently in progress. To the north west lie the existing residential areas of Tin Yiu Estate and Tin Yau Court. Land to the south of Ping Ha Road outside the OZP consists largely of open storage merging into village development. Land to the south west of Ping Ha Road is the proposed site of the West Rail Station and associated Public Transport Interchange. Land to the south east of Tin Fuk Road is the proposed site of a new LRT station and stabling yards. The existing Kwok Yat Wai College north east of Sheung Cheung Wai is to remain.

4.4.3 Baseline Landscape and Visual Conditions at Tuen Mun

4.4.3.1 Planning Context

The study site lies centrally within the urban core of Tuen Mun New Town and straddles the Tuen Mun River Channel. Landuses surrounding the site are well established and any future proposals will involve the redevelopment of existing development.

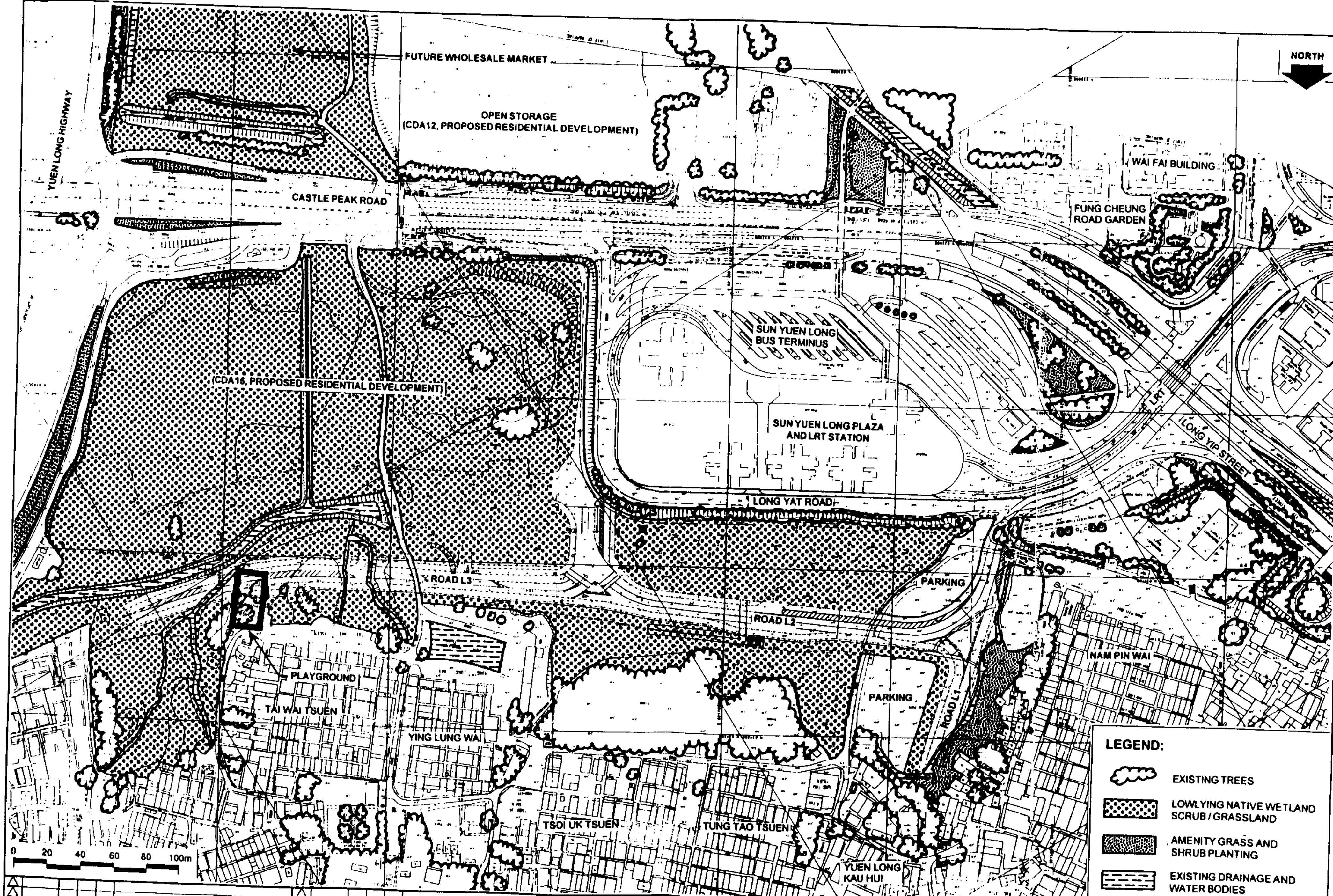
The land to the west of the Tuen Mun River is zoned 'I' (Industrial) on the Tuen Mun OZP No.S/TM/11and consists of existing dense industrial development and public service facilities (fire, police and ambulance stations). To the west of the River and south of Pui To Road the land is zoned as open space ('O') and is occupied by Tuen Mun Town Park. East of this, land is zoned as commercial and residential ('C/R') and is occupied by the Tuen Mun Cultural Square development. North of Pui To Road and east of the River land is zoned as 'Residential Group A' ('R/A') and is occupied by existing housing estates, commercial uses and schools. The San Fat Estate is the site of the proposed West Rail Station and Public Transport Interchange with associated commercial and residential development.

4.4.4 Baseline Landscape and Visual Conditions at Yuen Long Station

4.4.4.1 Landscape Resources at Yuen Long Station

The surrounding landscape resources at Yuen Long Station are illustrated *by Figure 4.4a 'Baseline Landscape Conditions'* and *Figures 4.4b and 4.4c'Site Photographs'* and comprise:

- naturalised scrub and woodland to the southern boundary of Tung Tau Tsuen;
- a village pond at Ying Lung Wai;
- playground and mature trees at Tai Wai Tsuen;
- open grassland (agricultural land no longer in active use) between Tai Wai Tsuen, Ying Lung Wai, Tung Tau Tsuen and Castle Peak Road;
- mature roadside trees along southern edge of Castle Peak Road adjacent to open storage;
- mature embankment tree planting along northern edge of Long Yip Street;



REV	DATE	BY	SUB	APP	DESCRIPTION
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A	23/2/99	TC			ADDITIONAL TEXT

DESIGNED BY
DRAWN BY J LAM
CHECKED BY T OSBORNE
IN CHARGE A DUGGIE
DATE March 22, 1999
APPROVED
DATE

KOWLOON-CANTON RAILWAY CORPORATION

WEST RAIL

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION

MODIFICATIONS TO LONG YAT ROAD, AND ROAD L2 TO SERVE YUL STATION

BASELINE LANDSCAPE CONDITIONS

CADD FILE NO SKC080.DGN
SCALE 1: 2,000
DRAWING NUMBER 4.4a
CONTRACT NO
REV B

SUN YUEN LONG PLAZA

TUNG TAU TSUEN / TSOI UK TSUEN

AGRICU RAL LAND NO LONGER ACTIVE USE (CDA 15, PROPOSED RESIDENTIAL DEVELOPMENT)

TAI WAI TSUEN

LOCAL SERVICE ROAD

YUEN LONG HIGHWAY NOISE BARRIERS

VIEW FROM CASTLE PEAK ROAD LOOKING NORTH

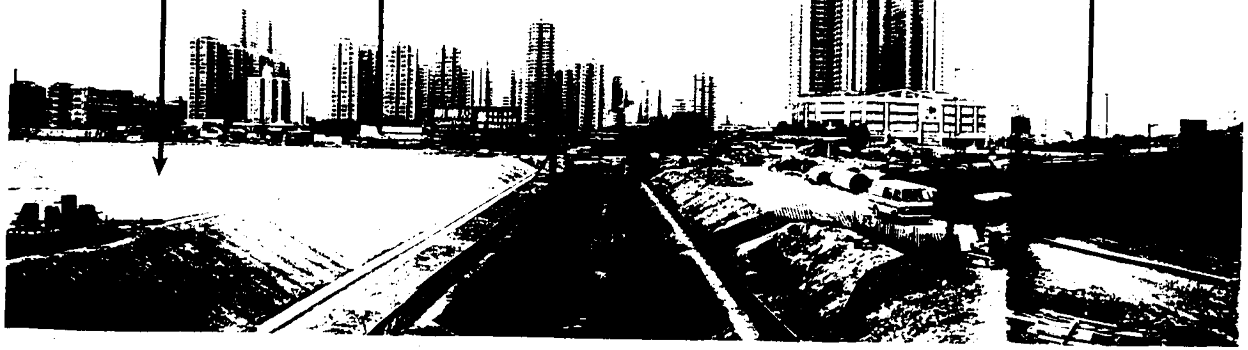
CDA 12, PROPOSED RESIDENTIAL DEVELOPMENT

FUTURE WHOLESALE FOOD MARKET

NORTH-EAST YUEN LONG RESIDENTIAL TOWER BLOCKS

SUN YUEN LONG PLAZA

CAS E PEAK ROAD ROUNDABOUT SLIP ROAD



VIEW FROM CASTLE PEAK ROAD LOOKING WEST

PUMPING STATION

TONG TAU TSUEN / TSOI UK TSUEN

VIEW FROM LONG YAT ROAD LOOKING NORTH-EAST

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A	23/3/99	HF	7D	[illegible]	TEXT AMMENDMENT

DESIGNED BY -
DRAWN BY J. LAM
CHECKED BY T. OSBORNE
IN CHARGE A. DUGGIE
DATE 22/2/99

APPROVED ... DATE

KOWLOON-CANTON RAILWAY CORPORATION
WEST RAIL

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION
MODIFICATIONS TO LONG YAT ROAD, AND ROAD L2 TO SERVE YUL STATION
SITE PHOTOGRAPHS

CADD FILE NO SKC888.DGN
CADD DATE
SCALE -
DRAWING NUMBER 4.4b
CONTRACT NO
REV A
SHEET NO

VIEW FROM NAM PIN WAI LOOKING EAST

VIEW FROM CASTLE PEAK ROAD LOOKING NORTH

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A	23/3/99	HF	TO	AW	TEXT AMMENDMENT

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IN CHARGE A DUGGIE
DATE 22/3/99

KOWLOON-CANTON RAILWAY CORPORATION
WEST RAIL

APPROVED DATE

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION
MODIFICATIONS TO LONG YAT ROAD, AND ROAD L2 TO SERVE YUL STATION
SITE PHOTOGRAPHS

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SCALE
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CONTRACT NO
REV A
SHEET NO

- mature trees adjacent to the northern end of the Castle Peak Road pedestrian footbridge;
- tree planting at Sun Yuen Long Centre Bus Terminus;
- Fung Cheung Road Garden south west of Yuen Long Centre adjacent to Wai Fai Building; and
- traditional low rise village development at Nam Pin Wai, Yuen Long Kau Hui, Tung Tau Tsuen, Tsoi Uk Tsuen, Ying Lung Wai and Tai Wai Tsuen.

4.4.4.2 Landscape and Visual Character

The proposed Yuen Long Station site lies within a transitional landscape of traditional low rise village development to the north and the modern high rise residential, commercial and industrial fabric of Yuen Long to the south west. An extensive corridor of open area (agricultural land no longer in active use) is located between the villages and Castle Peak Road 250m to the south. The western half of the open area has been developed for the Sun Yuen Long Centre and Bus Terminus, which visually dominates both the villages to the north and the Castle Peak Road corridor to the south. The eastern half is ***zoned "CDA" in Area 15 on the draft Yuen Long OZP No. S/YL/5*** and is the site of a proposed residential development.

Topography within the study area is flat and the landscape character is open and degraded. Space to the south of the village is not maintained and is criss-crossed randomly by dirt tracks and footpaths. Land on the southern periphery of the villages is used for car parking and open storage. An extensive tract of previously agricultural land to the south of Castle Peak Road is currently being used for lorry parking and open storage, but it is ***zoned "CDA" in Area 12 on the draft Yuen Long OZP No. S/YL/5*** and a major residential development is proposed for the site. Land to the east is the site of a new wholesale food market under construction.

4.4.4.3 Zone of Visual Influence of EPIW at Yuen Long Station

The zone of visual influence (ZVI) and the Visually Sensitive Receivers (VSR's) found within the ZVI are illustrated on *Figure 4.4d 'Visually Sensitive Receivers at Yuen Long'*.

The ZVI is delineated to the north by the southern boundaries of the village development north of the Sun Yuen Long Centre. Roads L1 and L2 will be clearly visible across open grassland from Tai Wai Tsuen and Ying Lung Wai though vegetation will screen the majority of views from Tung Tau Tsuen and Tsoi Uk Tsuen.

The ZVI is delineated to the east by the north bound carriageway of the Yuen Long Highway which is elevated on embankment. However, views from traffic are screened by noise barriers north of the roundabout junction at Castle Peak Road.

The roadworks will be visible from residents above the proposed PTI south of Sun Yuen Long Centre, from the residents in the proposed development in CDA15, and from pedestrians and cyclists along Castle peak road. South of Castle Peak Road the roadworks will be visible from residents in the proposed development in CDA12 and residents in the existing tower blocks to the west.

The ZVI is delineated to the west by the north east facing facades of residential tower blocks south west of the Sun Yuen Long Centre and along the elevated east bound carriageway of Castle Peak Road. To the north the ZVI includes the east facing facade of the Far East Construction Yuen Long Building and the eastern edge of Nam Pin Wai.

4.4.5 Baseline Landscape and Visual Conditions at Tin Shui Wai

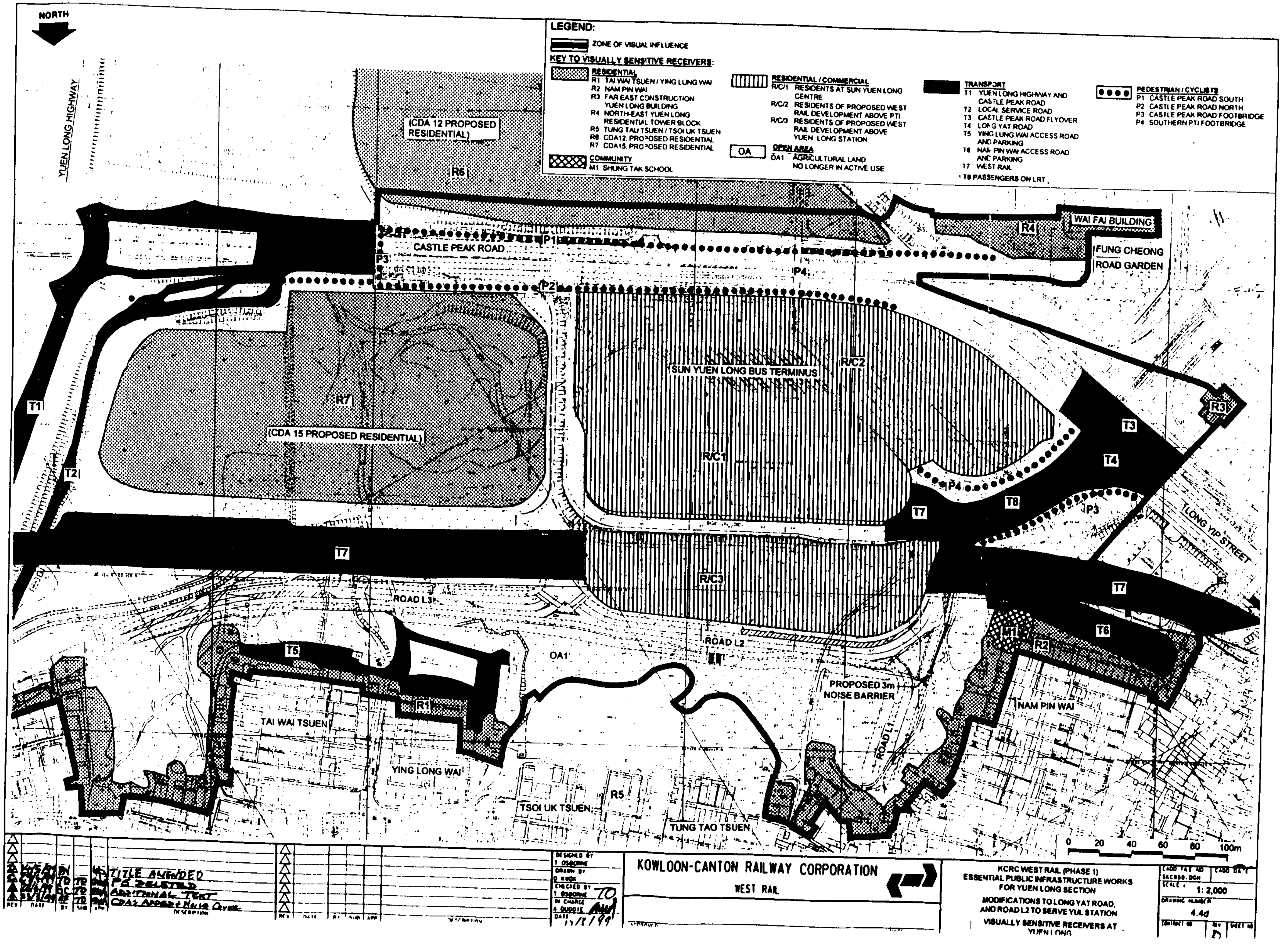
4.4.5.1 Landscape Resources at Tin Shui Wai

The surrounding landscape resources at Tin Shui Wai are illustrated on *Figure 4.4e 'Baseline Landscape Conditions'* and *Figures 4.4f* and *4.4g 'Site Photographs'* and comprise:

- mature vegetation including trees and shrubs along the south boundary of Tin Yiu Estate;
- mature vegetation including trees and shrubs along the south-west boundary of Queen Elizabeth Primary School;
- palm trees within Tin Fuk Road and Ping Ha Road central medians;
- mature trees along the northern boundary of the open storage area adjacent to Tin Fuk Road;
- traditional Chinese-style pagoda within Tsui Shing Lau, and part of the Ping Shan Heritage Trail;
- mature woodland across the undulating hills south-east of the open storage area and Tsui Shing Lau;
- woodland and agricultural land south of TWGH Kwok Yat Wai College;
- mature trees around the north-east corner of the vacant land adjacent to Tin Fuk Road/Ping Ha Road interchange; and
- mature trees on the highway embankments around the south-east corner of the construction site (proposed school and HOS development in Tin Shui Wai Area 3) adjacent to Tin Fuk Road/Ping Ha Road Interchange.

4.4.5.2 Landscape and Visual Character

The subject site is located on each side of the Ping Ha Road/Tin Fuk Road interchange and is divided into four separate character zones.


NORTH
LEGEND:
ZONE OF VISUAL INFLUENCE
KEY TO VISUALLY SENSITIVE RECEIVERS:
RESIDENTIAL
R1 TAI WAI TSUEN / YING LUNG WAI
R2 NAM PIN WAI
R3 FAR EAST CONSTRUCTION YUEN LONG BUILDING
R4 NORTH-EAST YUEN LONG RESIDENTIAL TOWER BLOCK
R5 TUNG TAU TSUEN / TSOI UK TSUEN
R6 CDA12 PROPOSED RESIDENTIAL
R7 CDA15 PROPOSED RESIDENTIAL
COMMUNITY
M1 SHUNG TAK SCHOOL
RESIDENTIAL / COMMERCIAL
R/C/1 RESIDENTS AT SUN YUEN LONG CENTRE
R/C/2 RESIDENTS OF PROPOSED WEST RAIL DEVELOPMENT ABOVE PTI
R/C/3 RESIDENTS OF PROPOSED WEST RAIL DEVELOPMENT ABOVE YUEN LONG STATION
OPEN AREA
OA1 AGRICULTURAL LAND NO LONGER IN ACTIVE USE
TRANSPORT
T1 YUEN LONG HIGHWAY AND CASTLE PEAK ROAD
T2 LOCAL SERVICE ROAD
T3 CASTLE PEAK ROAD FLYOVER
T4 LONG YAT ROAD
T5 YING LUNG WAI ACCESS ROAD AND PARKING
T6 NAM PIN WAI ACCESS ROAD AND PARKING
T7 WEST RAIL
T8 PASSENGERS ON LRT
PEDESTRIAN / CYCLISTS
P1 CASTLE PEAK ROAD SOUTH
P2 CASTLE PEAK ROAD NORTH
P3 CASTLE PEAK ROAD FOOTBRIDGE
P4 SOUTHERN PTI FOOTBRIDGE
YUEN LONG HIGHWAY
(CDA 12 PROPOSED RESIDENTIAL)
R6
CASTLE PEAK ROAD
WAI FAI BUILDING
R4
FUNG CHEONG ROAD GARDEN
SUN YUEN LONG BUS TERMINUS
R/C2
R/C1
R/C3
R7
(CDA 15 PROPOSED RESIDENTIAL)
T1
T2
T3
T4
T5
T6
T7
T8
P1
P2
P3
P4
R1
R2
R3
R5
M1
OA1
LONG YIP STREET
ROAD L3
ROAD L2
ROAD L1
PROPOSED 3m NOISE BARRIER
NAM PIN WAI
TAI WAI TSUEN
YING LONG WAI
TSOI UK TSUEN
TUNG TAO TSUEN
0 20 40 60 80 100m
TITLE AMENDED
P5 DELETED
ADDITIONAL TEXT
CDA2 ADDED + NOISE ...
KOWLOON-CANTON RAILWAY CORPORATION
WEST RAIL
KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION
MODIFICATIONS TO LONG YAT ROAD, AND ROAD L2 TO SERVE YUL STATION
VISUALLY SENSITIVE RECEIVERS AT YUEN LONG
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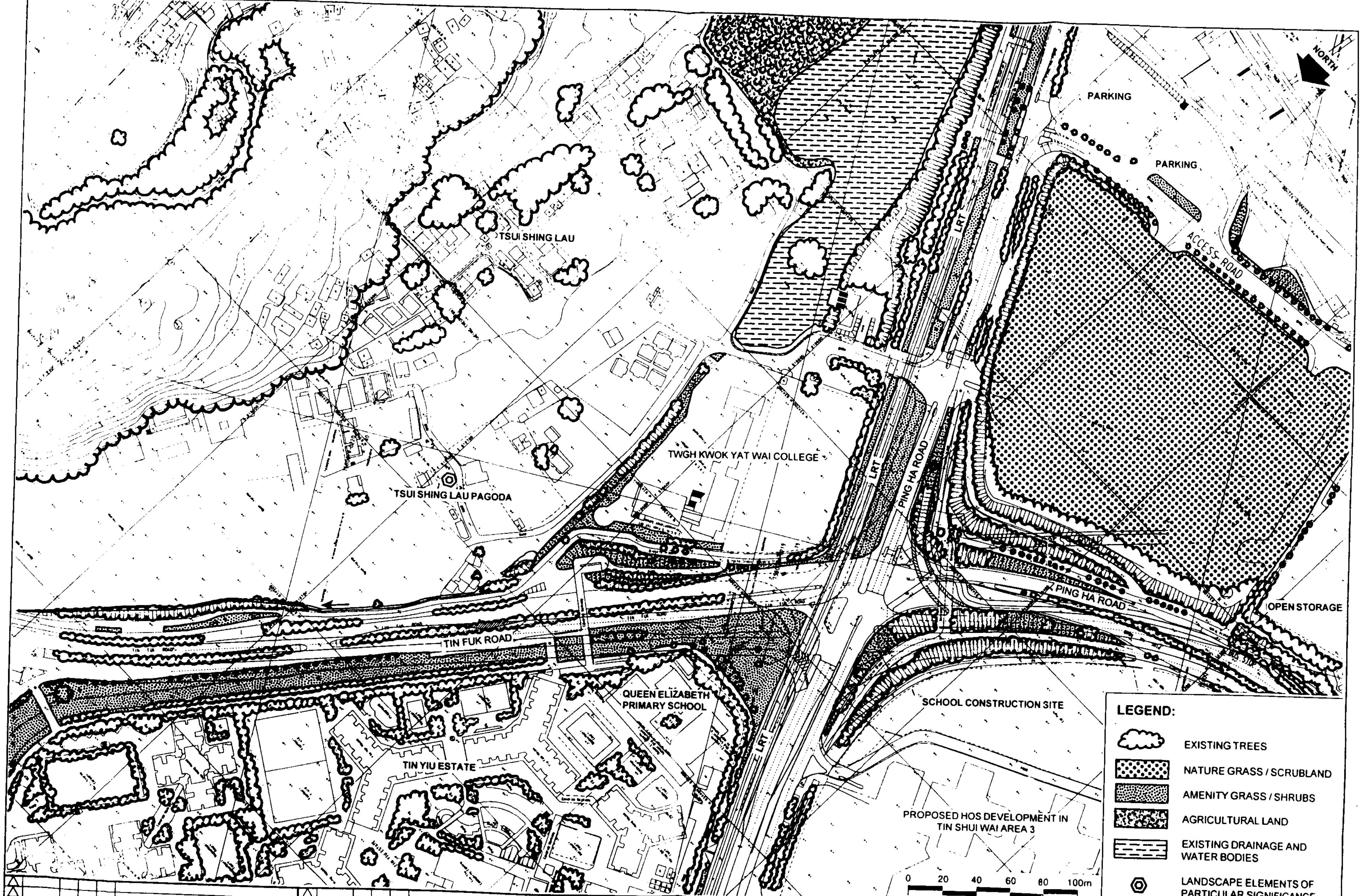

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DRAWN BY J. LAM

CHECKED BY T. OSBORNE TO

IN CHARGE A. DUGGIE

DATE March 23 1999

APPROVED

DATE

KOWLOON-CANTON RAILWAY CORPORATION

WEST RAIL

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS
FOR YUEN LONG SECTION

MODIFICATIONS TO TIN FUK ROAD,
PING HA ROAD AND TIN YIU ROAD TO SERVE TIS STATION
BASELINE LANDSCAPE CONDITIONS

CADD FILE NO SKC888.DGN

SCALE 1: 2,000

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CONTRACT NO

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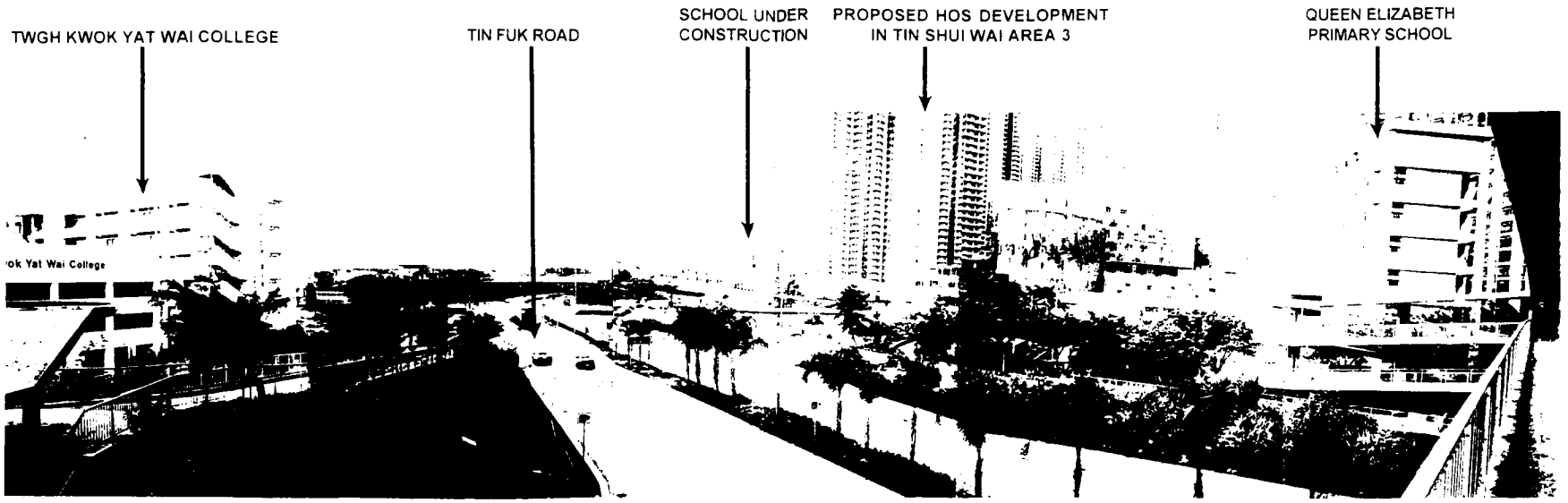
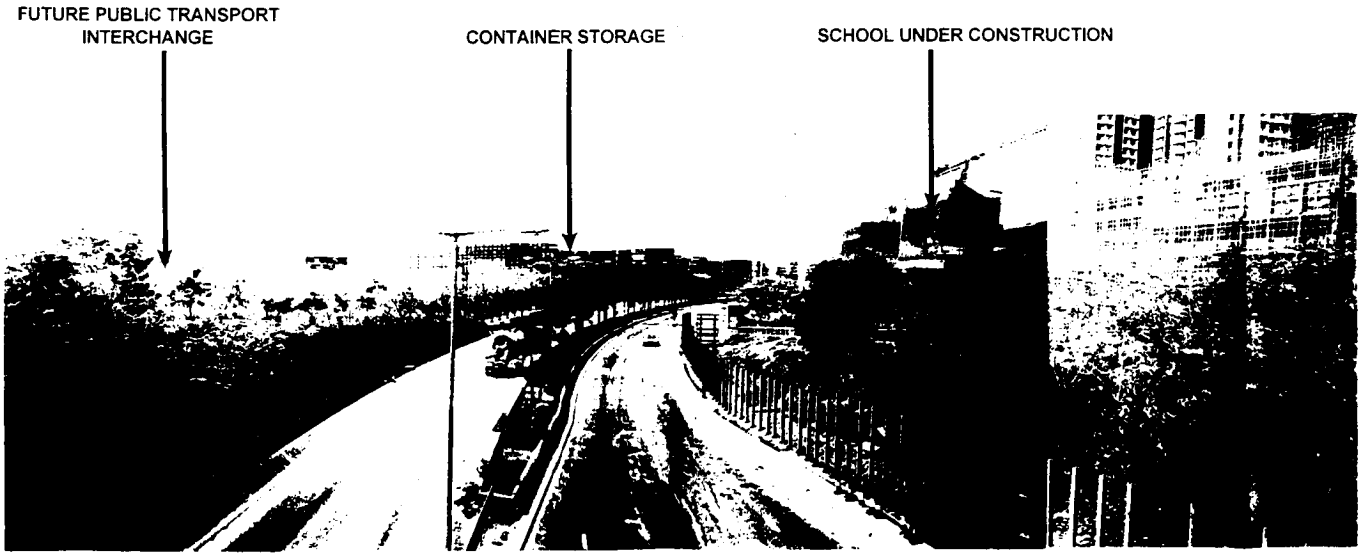


VIEW FROM TIN FUK ROAD FOOTBRIDGE LOOKING SOUTH-WEST



VIEW FROM PING HA ROAD FOOTBRIDGE LOOKING SOUTH-WEST

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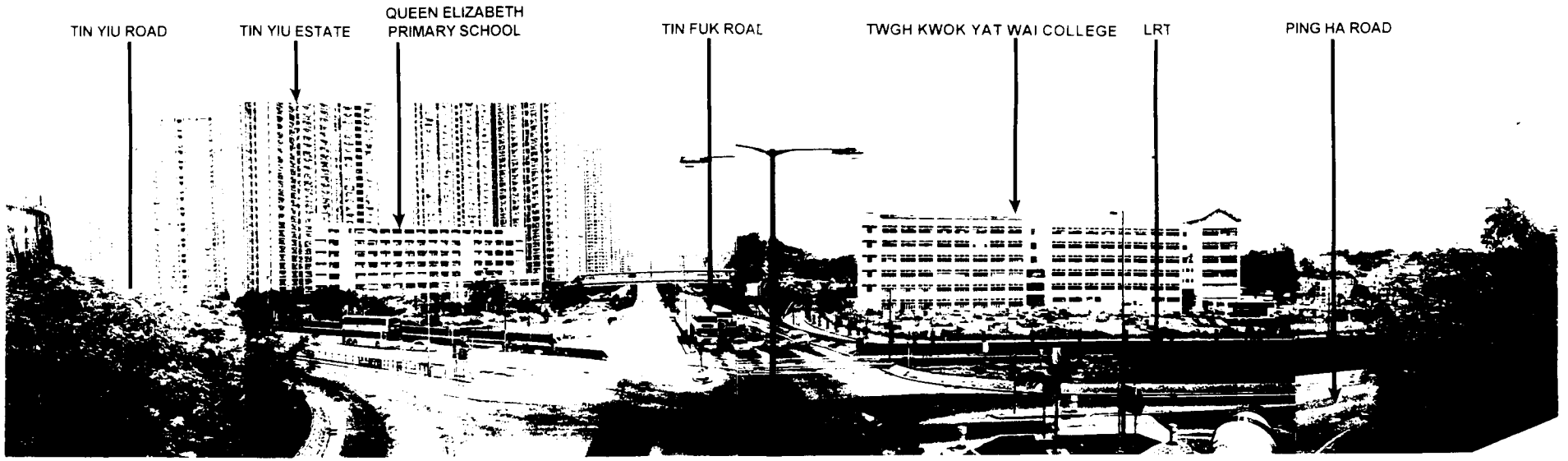
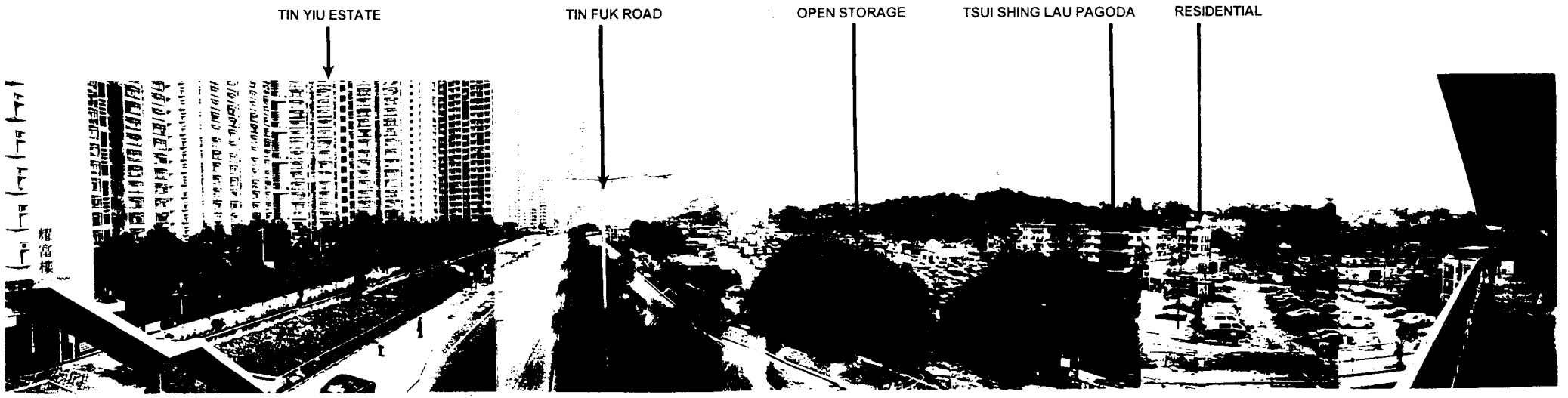
WEST RAIL

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION
MODIFICATIONS TO TIN FUK ROAD AND TIN YIU ROAD TO SERVE TIS STATION
PING
SITE PHOTOGRAPHS

4.41



VIEW OF JUNCTION LOOKING NORTH-EAST



VIEW FROM TIN FUK ROAD LOOKING NORTH-EAST

KOWLOON-CANTON RAILWAY CORPORATION

WEST RAIL

KCRC WEST RAIL (PHASE 1)
SSENTIAL PUBLIC INFRASTRUCTURE WORKS
FOR YUEN LONG SECTION

MODIFICATIONS TO TIN FUK ROAD,
PIN ... ROAD AND TIN YIU ROAD TO SERVE TIS STATION

SITE PHOTOGRAPHS

4 4g

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To the north east are located the high rise residential tower blocks of Tin Yiu Estate with a generous allocation of landscaped open area and podium planting. On the southern boundary of the estate, adjacent to Tin Fuk Road, is a footpath with mature and semi-mature vegetation effectively screening Tin Fuk Road from residents and pedestrians at ground level. Between the footpath and the road the LRT reserve forms a wide grass verge. In the south west corner of Tin Yiu Estate the Queen Elizabeth Primary School is screened from the adjacent interchange by mature trees planted along it's south western boundary.

Tin Fuk Road is a dual carriageway with palm trees accommodated in the central median. A pedestrian footbridge links the Tin Yiu Estate with scattered village development and open storage to the south east. Much of the land in this area has recently undergone a transition from agricultural use to car parking and open storage. The space has a degraded character and is the location for a proposed LRT station. An elevated railway will be located along the northern boundary of the area adjacent to Tin Fuk Road, thereby reducing visual impacts to villagers caused by road junction works. Land to the south of the villages and open storage sites is undulating and densely vegetated. TWGH Kwok Yat Wai College is located at the north west corner of the area adjacent to the Tin Fuk Road/Ping Ha Road interchange.

To the south west of Ping Ha Road is a large vacant site with mature vegetation along it's roadside boundaries. The LRT alignment runs north-south along Ping Ha Road and Hang Mei Station is located south west of Kwok Tai Prevocational School. The vacant site is the location for a proposed public transport interchange and is connected to the north by a footbridge across Ping Ha Road.

The area to the north-west (Tin Shui Wai Area 3) is currently being developed with an HOS development and a school under construction. Development is likely to be similar to the Tin Yiu Estate in the east. A mature band of vegetation is located upon embankments adjacent to the Tin Fuk Road/Ping Ha Road interchange at the south east corner of the site.

4.4.5.3 Zone of Visual Influence at Tin Shui Wai

The zone of visual influence (ZVI) and the Visually Sensitive Receivers (VSR's) found within the ZVI are illustrated by *Figure 4.4h 'Sensitive Visual Receivers at Tin Shui Wai Station'*.

The roadworks at Tin Shui Wai will be visible from adjacent footpaths, cycle tracks and the road carriageways themselves. Additional visual vantage points, from which there will be a limited opportunity for screening, will be proposed pedestrian footbridges over Tin Fuk Road, Tin Fuk Road/Ping Ha Road junction, Ping Ha Road and Ping Ha Road South.

Road junction developments including noise barriers, pedestrian footbridges and re-aligned carriageways, will be particularly visible from upper south facing floors of towers along the southern edge of Tin Yiu Estate. Existing mature vegetation will provide

screening to lower floors within the estate. Direct views of the revised Tin Fuk Road/Ping Ha Road junction will be possible from the upper south-west facing floors of Queen Elizabeth Primary School.

Village development and open land to the south east will only receive distant filtered views of the road and junction due primarily to an at-grade LRT alignment and an elevated West Rail viaduct which will pass along its northern boundary. Partial views of the Tin Fuk Road/Ping Ha Road junction will be available from upper west and north facing floors of TWGH Kwok Yat Wai College.

There are no direct VSRs, except vehicular traffic and pedestrians, within the south west area of the subject site. Distant views of the revised road alignment will be possible from the Hang Mei LRT station south west of TWGH Kwok Yat Wai College and from car parking directly west of the station.

Direct views of the revised road layout will be possible from new residential towers north west of the Tin Fuk Road/Ping Ha Road interchange, and from the proposed school directly south. Views will initially be unscreened due to the loss of mature vegetation along the south-eastern boundary of the construction site.

4.4.6 Baseline Landscape and Visual conditions at Tuen Mun

4.4.6.1 Landscape Resources at Tuen Mun.

The surrounding landscape resources at Tuen Mun are illustrated *by Figure 4.4i 'Baseline Landscape Conditions'* and *Figures 4.4j* and *4.4k 'Site Photographs'* and comprise:

- Tuen Mun Town Park;
- Tuen Mun River and associated riverside walkways and cycletracks;
- children's play areas and seating areas south of San Fat Estate adjacent to Pui To Road
- Deacon Chui Park;
- playgrounds and park north of Yan Ching Street;
- street tree planting at the bus stop east of Tuen Mun Heung Sze Wui Road;
- planting beneath footbridge at San Fat LRT Station;
- street tree planting along Pui To Road west of Tuen Mun River; and
- street tree planting along Tsun Wen Road.

4.4.6.2 Landscape and Visual Character at Tuen Mun

The proposed road works lie within the densely developed urban area of Tuen Mun. The site is divided in a north-south direction by the Tuen Mun River, a 60 m wide channelled

LEGEND:

ZONE OF VISUAL INFLUENCE
(NOTE THE ZVI AND PEDESTRIAN / CYCLISTS BEST DONE WITH TAPE)

KEY TO VISUALLY SENSITIVE RECEIVERS:

RESIDENTIAL
- R1 TIN YIU ESTATE
- R2 ESTATE AT PING HA ROAD

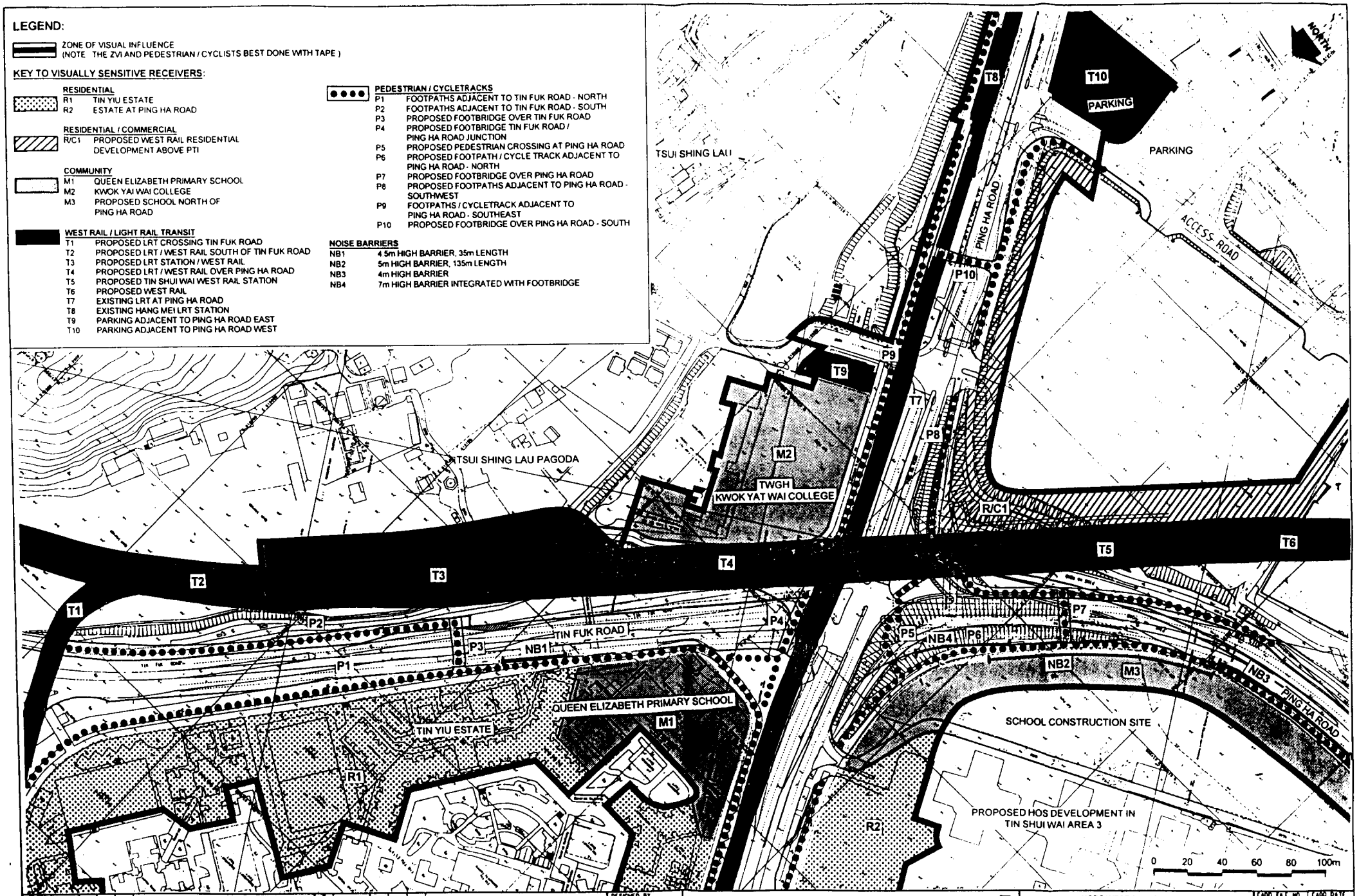
RESIDENTIAL / COMMERCIAL
- R/C1 PROPOSED WEST RAIL RESIDENTIAL DEVELOPMENT ABOVE PTI

COMMUNITY
- M1 QUEEN ELIZABETH PRIMARY SCHOOL
- M2 KWOK YAI WAI COLLEGE
- M3 PROPOSED SCHOOL NORTH OF PING HA ROAD

WEST RAIL / LIGHT RAIL TRANSIT
- T1 PROPOSED LRT CROSSING TIN FUK ROAD
- T2 PROPOSED LRT / WEST RAIL SOUTH OF TIN FUK ROAD
- T3 PROPOSED LRT STATION / WEST RAIL
- T4 PROPOSED LRT / WEST RAIL OVER PING HA ROAD
- T5 PROPOSED TIN SHUI WAI WEST RAIL STATION
- T6 PROPOSED WEST RAIL
- T7 EXISTING LRT AT PING HA ROAD
- T8 EXISTING HANG MEI LRT STATION
- T9 PARKING ADJACENT TO PING HA ROAD EAST
- T10 PARKING ADJACENT TO PING HA ROAD WEST

PEDESTRIAN / CYCLETRACKS
- P1 FOOTPATHS ADJACENT TO TIN FUK ROAD - NORTH
- P2 FOOTPATHS ADJACENT TO TIN FUK ROAD - SOUTH
- P3 PROPOSED FOOTBRIDGE OVER TIN FUK ROAD
- P4 PROPOSED FOOTBRIDGE TIN FUK ROAD / PING HA ROAD JUNCTION
- P5 PROPOSED PEDESTRIAN CROSSING AT PING HA ROAD
- P6 PROPOSED FOOTPATH / CYCLE TRACK ADJACENT TO PING HA ROAD - NORTH
- P7 PROPOSED FOOTBRIDGE OVER PING HA ROAD
- P8 PROPOSED FOOTPATHS ADJACENT TO PING HA ROAD - SOUTHWEST
- P9 FOOTPATHS / CYCLETRACK ADJACENT TO PING HA ROAD - SOUTHEAST
- P10 PROPOSED FOOTBRIDGE OVER PING HA ROAD - SOUTH

NOISE BARRIERS
- NB1 4.5m HIGH BARRIER, 35m LENGTH
- NB2 5m HIGH BARRIER, 135m LENGTH
- NB3 4m HIGH BARRIER
- NB4 7m HIGH BARRIER INTEGRATED WITH FOOTBRIDGE



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C	10/6/99	TO			TEXT AMENDED
B	11/5/99	TO			NOISE BARRIERS AMENDED
A	4/5/99	TO			NOISE BARRIERS AMENDED
	26/4/99	TO			ADDITIONAL TEXT

DESIGNED BY T OSBORNE
DRAWN BY D KWOK
CHECKED BY T OSBORNE
IN CHARGE A DUGGIE
DATE 22/3/99

KOWLOON-CANTON RAILWAY CORPORATION
WEST RAIL
APPROVED DATE

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION
MODIFICATIONS TO TIN FUK ROAD, PING HA ROAD AND TIN YIU ROAD TO SERVE TIS STATION
VISUALLY SENSITIVE RECEIVERS AT TIN SHUI WAI

CADD FILE NO 5AC888.DGN
CADD DATE
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DRAWING NUMBER 4.4h
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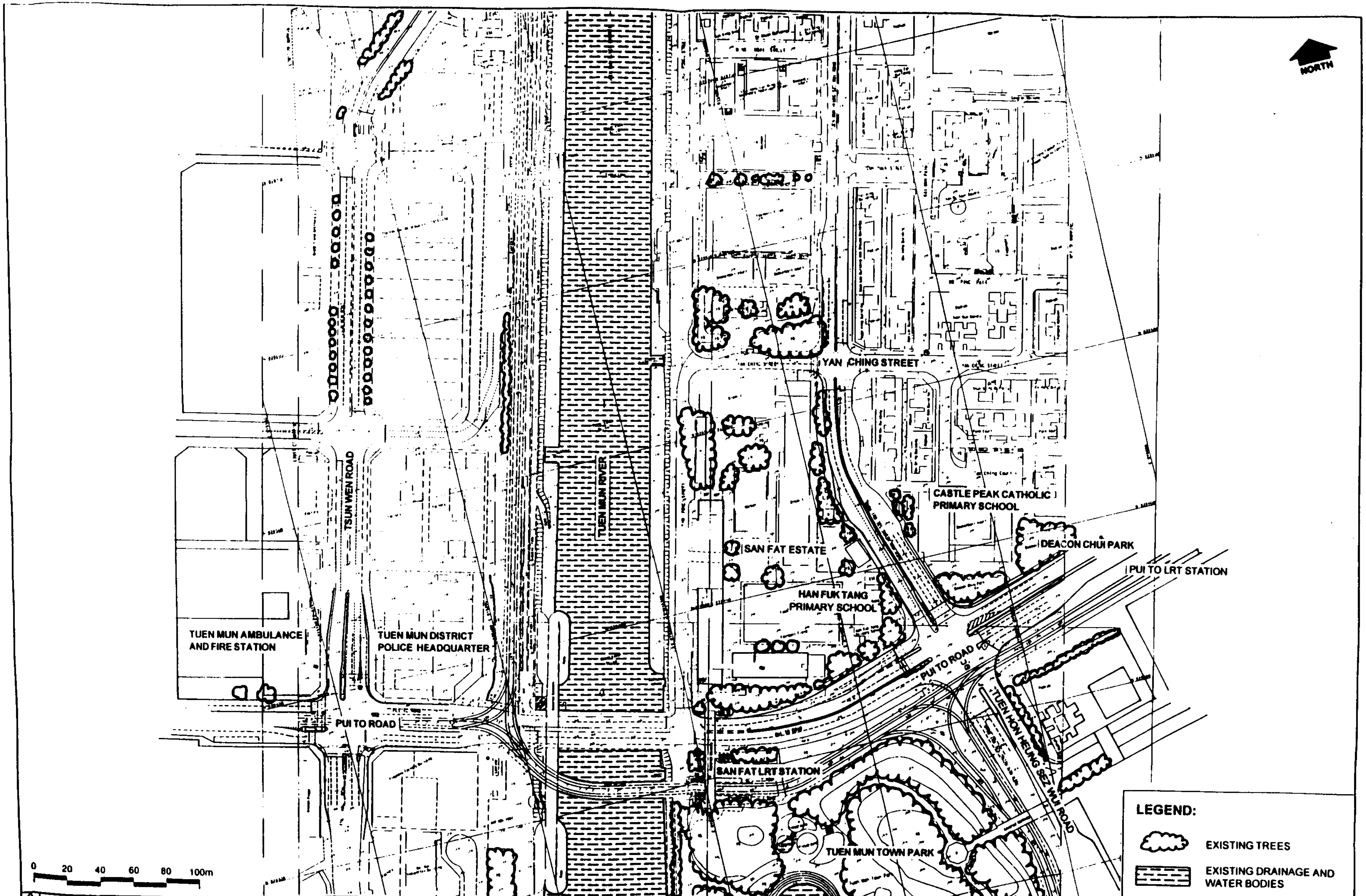
SHEET NO



KOWLOON-CANTON RAILWAY CORPORATION

WEST RAIL

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION

IMPROVEMENTS TO TUEN MUN HEUNG SZE WUI ROAD, YAN CHING STREET, PUI TO ROAD, HO PONG STREET AND KIN FUNG CIRCUIT SERVING TMC STATION

BASELINE LANDSCAPE CONDITIONS PLAN

SCALE: 1: 2,000

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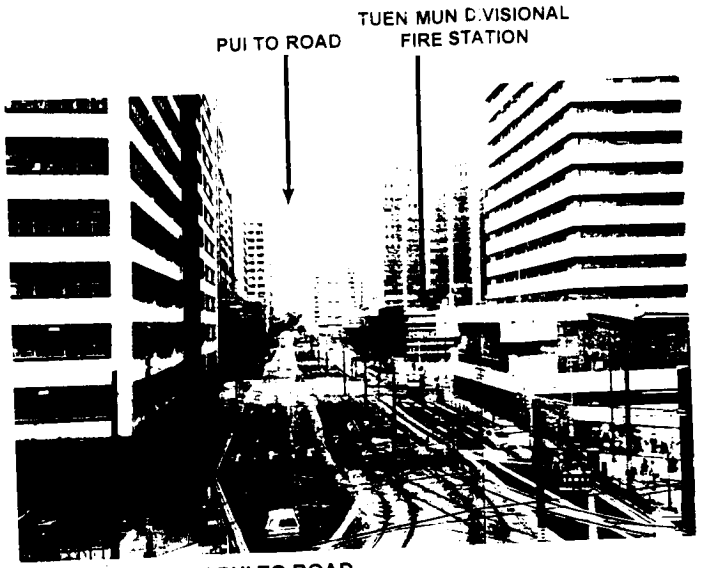
REV: A

DATE: 23/3/99

A ... ADDITIONAL TEXT

VIEW WEST ACROSS TUEN MUN RIVER DOWN PO TUI ROAD



VIEW WEST DOWN PUI TO ROAD

VIEW SOUTH DOWN TSUN WEN ROAD

VIEW EAST TO TUEN MUN RIVER ACROSS TSUN WEN ROAD

REV	DATE	BY	SUB	APP	DESCRIPTION

REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED BY T OSBORNE
DRAWN BY D KWOK
CHECKED BY T OSBORNE
IN CHARGE A DUGGIE
DATE 22/8/99

KOWLOON-CANTON RAILWAY CORPORATION
WEST RAIL
APPROVED DATE

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION
IMPR EMENTS TO TUEN MUN HEUNG SZE WUI ROAD, YANC JG STREET, PUI TO ROAD, HO PONG STREET AND IN FUNG CIRCUIT SERVING TMC STATION
SITE PHOTOGRAPHS

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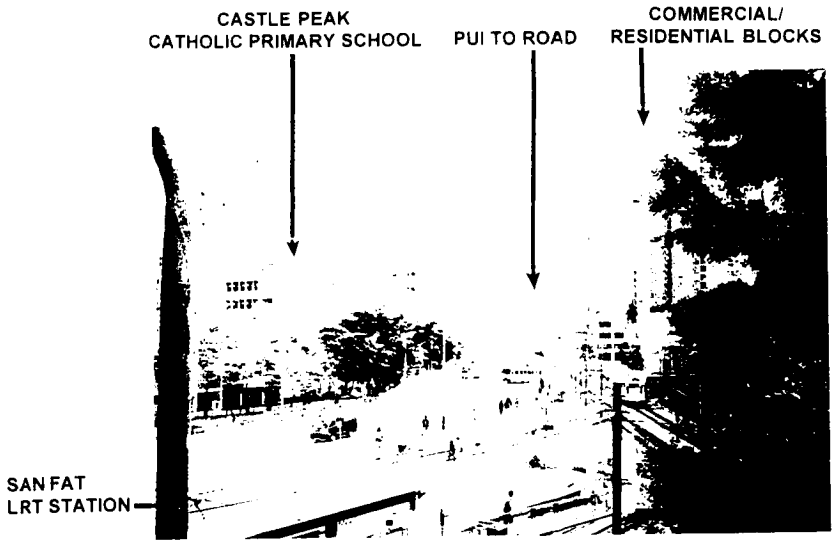
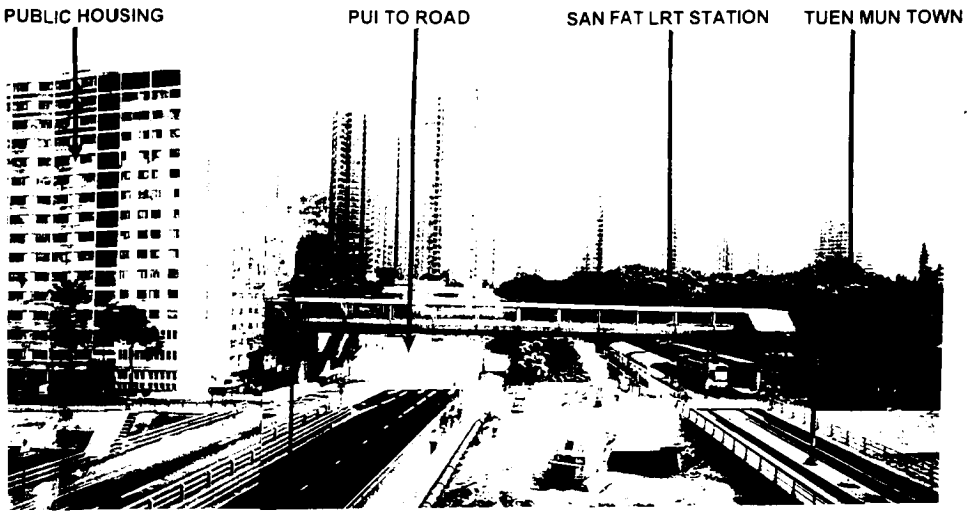
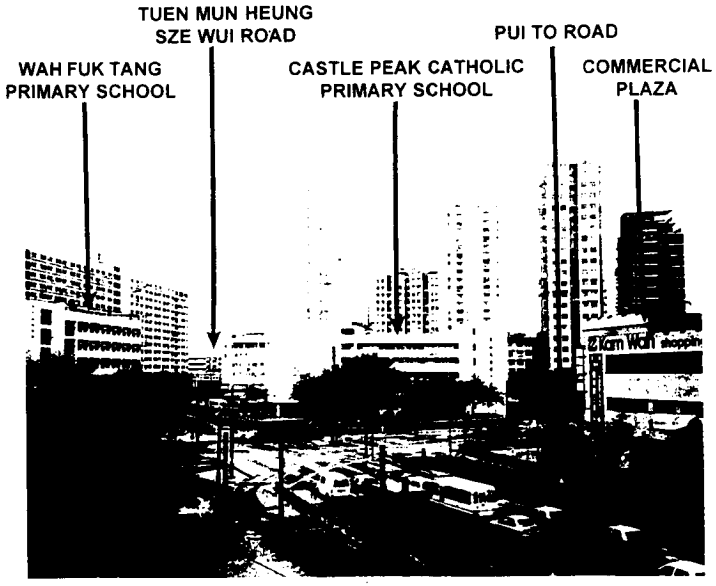


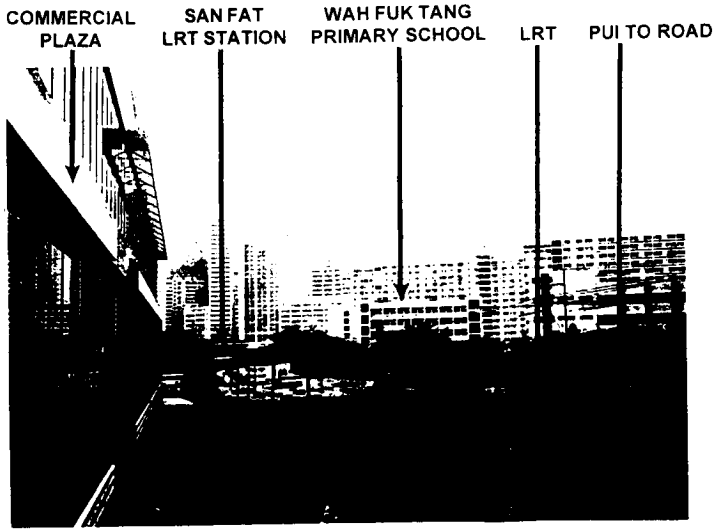
VIEW NORTH-EAST UP PUI TO ROAD



VIEW ACROSS TUEN MUN RIVER AND PUI TO ROAD FROM FOOTBRIDGE



VIEW NORTH-WEST DOWN TUEN MUN HEUNG SZE WUI ROAD



VIEW SOUTH WEST FROM PUI TO LRT STATION FOOTBRIDGE

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DESIGNED BY T OSBORNE
DRAWN BY O KWOK
CHECKED BY T OSBORNE
IN CHARGE A DUGGIE
DATE 22/3/94

KOWLOON-CANTON RAILWAY CORPORATION
WEST RAIL

APPROVED DATE

KCRC WEST RAIL (PHASE 1)
SSENTIAL PUBLIC INFRASTRUCTURE WORKS
FOR YUEN LONG SECTION

IM VEMENTS TO TUEN MUN HEUNG SZE WUI ROAD,
YAI ING STREET, PUI TO ROAD, HO PONG STREET AND
KIN FUNG CIRCUIT SERVING TMC STATION

SITE PHOTOGRAPHS

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watercourse affording open vistas in an otherwise built-up area. The Pui To road bridge, the LRT river crossing and associated footbridges forms a focal point to the area. The river forms a distinct boundary in terms of land use and visual character.

To the west of the river lies dense, drab industrial and service development (Police, Fire and Ambulance stations) in multi-storey blocks. The LRT runs north-south down the west river bank as far as Pui To Road where it divides east and west. South of Pui To Road a small riverside park provides a green transition from built-up area to river. East of the river Pui To Road curves north east and is crossed at right angles by Tuen Mun Heung Sze Wui Road. To the south is Tuen Mun Town Park, an extensive high quality green open area fronting onto a riverside promenade with cycle-track. East of Tuen Mun Heung Sze Wui Road is an area of dense commercial and residential development with large shopping plazas supporting podiums and residential tower blocks. North of Pui To Road is an ageing public housing estate with courtyards and a landscaped fringe. North and east of Tuen Mun Heung Sze Wui Road is an area of mixed commercial and residential uses with a large Catholic school and church and Deacon Chui Park fringing Pui To Road.

The existing roads and LRT system form significant visual elements and physical barriers to circulation. Large footbridges either side of the river and linking Tuen Mun Town Park to the east over Tuen Mun Heung Sze Wui Road allow pedestrians open views across the road, LRT system and river. Pui To Road rises east onto a flyover with pedestrian circulation beneath.

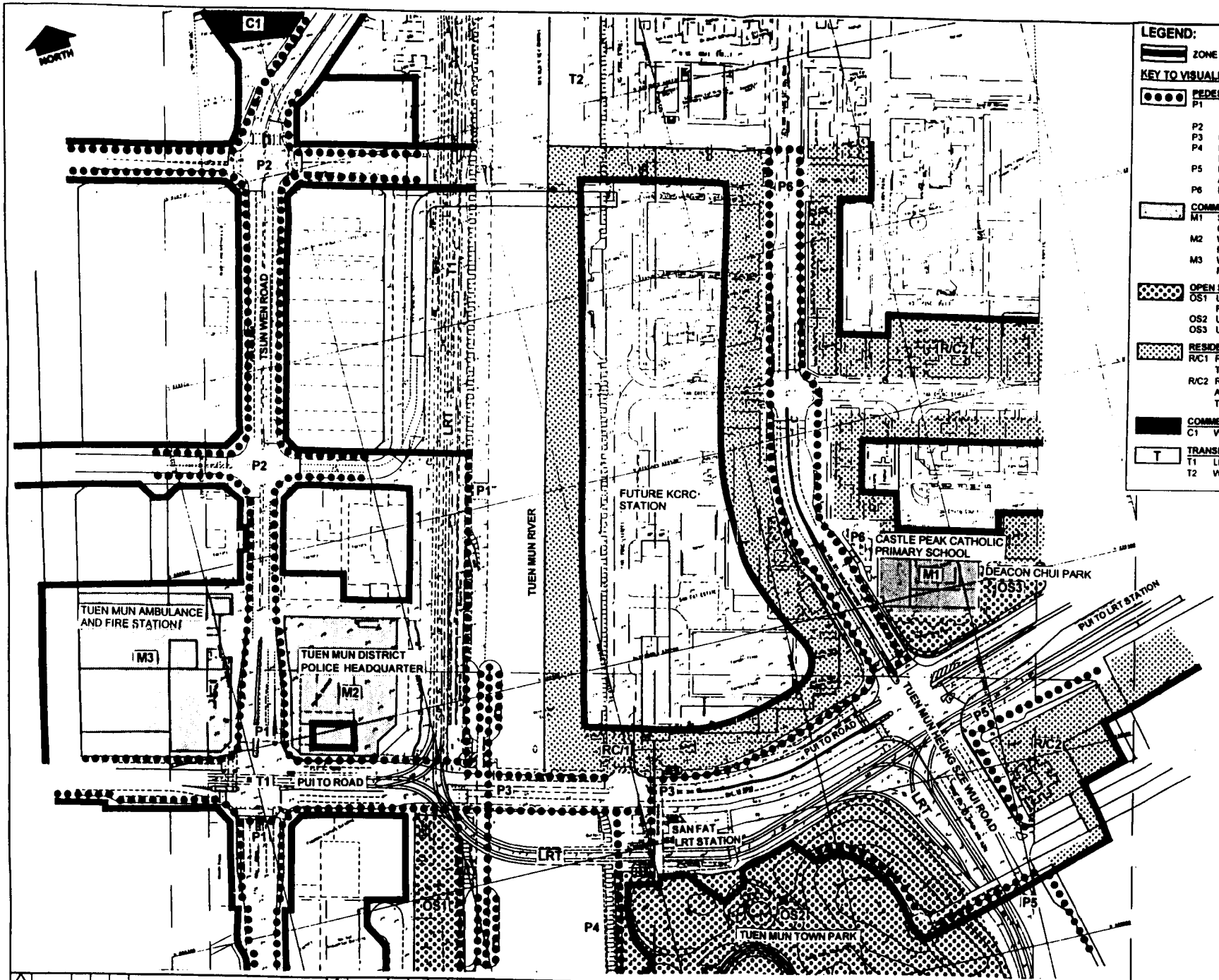
4.4.6.3 Zone of Visual Influence at Tuen Mun

The zone of visual influence (ZVI) and the Visually Sensitive Receivers (VSR's) found within the ZVI are illustrated *by Figure 4.4l 'Sensitive Visual Receivers at Tuen Mun'*.

The ZVI of the roadworks is tightly defined by the built form of Tuen Mun and to the west of the Tuen Mun River largely reflects the street pattern. To the east of the river the pattern of development is more relaxed and a greater proportion of open area is reflected in a more extensive ZVI.

To the west of the Tuen Mun River the major VSR's are the Police, Fire and Ambulance stations north of Pui To Road. Pedestrians using Tsun Wen Road, Tin Hau Road and Pui To Road will also be affected. The surrounding industrial development is not considered a sensitive receiver. At the riverside the roadworks will be seen by users of the open area south of the bridge crossings, pedestrians and cyclists on the road and footbridges and pedestrians and cyclists on the riverside paths to the north and also passengers on the LRT.

East of the river and south of Pui To Road the roadworks will be visible from Tuen Mun Park and riverside promenade. Pedestrians and LRT passengers will have direct views from the footbridge and Pui To LRT Station. Views from the commercial plazas are limited but residents in the apartment blocks above will have clear views. LRT passengers on the Tuen Mun Heung Sze Wui Road and Pui To Road lines will also have



LEGEND:

ZONE OF VISUAL INFLUENCE

KEY TO VISUALLY SENSITIVE RECEIVERS:

PEDESTRIAN CIRCULATION
- P1 PEDESTRIANS ALONG PUI TO ROAD, TIN HAU ROAD AND TSUN WEN ROAD
- P2 PEDESTRIANS ALONG TSUN WEN ROAD
- P3 PEDESTRIANS ON FOOTBRIDGES
- P4 PEDESTRIANS ALONG TUEN MUN RIVER PROMENADE EAST BANK
- P5 PEDESTRIANS SOUTH-EAST OF PUI TO ROAD AND TUEN MUN HEUNG SZE WUI ROAD
- P6 PEDESTRIANS ALONG TUEN MUN HEUNG SZE WUI ROAD

COMMUNITY
- M1 STUDENTS AND TEACHERS IN CASTLE PEAK CATHOLIC PRIMARY SCHOOL
- M2 WORKERS AT TUEN MUN DISTRICT POLICE HEADQUARTER
- M3 WORKERS AT TUEN MUN AMBULANCE AND FIRE DEPARTMENT

OPEN SPACE
- OS1 USERS OF RIVERSIDE OPEN SPACE SOUTH OF ROADBRIDGE, WEST RIVER BANK
- OS2 USERS OF TUEN MUN TOWN PARK
- OS3 USERS OF DEACON CHUI PARK

RESIDENTIAL / COMMERCIAL
- R/C1 RESIDENTS AND USERS OF PROPOSED TUEN MUN WEST RAIL STATION DEVELOPMENT
- R/C2 RESIDENTS AND SHOPPERS AT COMMERCIAL AND RESIDENTIAL BLOCKS ALONG EAST SIDE OF TUEN MUN HUENG SZE WUI ROAD

COMMERCIAL
- C1 WORKERS AND DRIVERS AT PETROL STATION

TRANSPORT
- T1 LRT PASSENGERS ALONG PUI TO ROAD
- T2 WEST RAIL ALIGNMENT

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A	14/5/1999	WF	TO	AMM	TITLE AMENDED
B	21/5/1999	WF	TO	AMM	ADDITIONAL TEXT
C	25/11/99	WF	TO	AMM	WEST RAIL ALIGNMENT ADDED

DESIGNED BY: I OSBORNE
DRAWN BY: D KWOK
CHECKED BY: I OSBORNE
IN CHARGE: A RUDDLE
DATE: 22/3/99

KOWLOON-CANTON RAILWAY CORPORATION

WEST RAIL

APPROVED DATE

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION

IMPROVEMENTS TO TUEN MUN HEUNG SZE WUI ROAD YAN CHING STREET, PUI TO ROAD, HO PONG STREET AND KIN FUNG CIRCUIT SERVING TMC STATION

SENSITIVE VISUAL RECEIVERS

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direct views. North of the river the existing residential areas and open area's will be redeveloped as part of the West Rail station complex. Users of this complex will have views of the roadworks along Pui To Road and Tuen Mun Heung Sze Wui Road. Residents and pedestrians in the mixed commercial and residential area north-east of Tuen Mun Heung Sze Wui Road will also have views of the roadworks. Visual impact on Deacon Chui Park is only slight as the adjacent flyover of Pui To Road provides an effective screen.

4.4.7 Visually Sensitive Receivers

4.4.7.1 Visually Sensitive Receivers at Yuen Long

4.4.7.1.1 Visually Sensitive Receivers during the Construction Phase

Visually Sensitive Receivers (VSRs) associated with the Yuen Long Station access roads development during the Construction Phase are illustrated on *Figure 4.4d* and are listed below:

- motorists, passengers and cyclists on Castle Peak Road, cycle track, footpaths and footbridges;
- residents and users of the Sun Yuen Long Centre;
- passengers at the Sun Yuen Long Centre Bus Terminus and LRT depot;
- residents and workers at developments located within Yuen Long to the south-west;
- residents at the villages of Yuen Long Kau Hui, Nam Pin Wai, Tsoi Uk Tsuen, Ying Lung Wai and Tai Wai Tsuen
- users of the open space between village developments to the north and Castle Peak Road to the south;
- residents at the Far East Construction Yuen Long Building;
- motorists, passengers and pedestrians on Long Yat Road;
- students and teachers at Shung Tak School.

4.4.7.1.2 Visually Sensitive Receivers during the Operational Phase

Visually Sensitive Receivers (VSRs) associated with the Yuen Long Station access roads development during the Operational Phase are illustrated on *Figure 4.4d* and are listed below:

- motorists, passengers and cyclists on Castle Peak Road, cycle track, footpaths and footbridges;
- residents and users of the Sun Yuen Long Centre;
- residents in the CDA12 development;

- residents in the CDA15 development;
- passengers at the Sun Yuen Long Centre Bus Terminus and LRT depot;
- residents of the proposed West Rail property developments above Yuen Long station and the PTI south of the Sun Yuen Long Centre;
- residents and workers at developments located within Yuen Long to the south-west;
- residents at the villages of Yuen Long Kau Hui, Nam Pin Wai, Tsoi Uk Tsuen, Ying Lung Wai and Tai Wai Tsuen
- users of the open space between village developments to the north and Castle Peak Road to the south;
- residents at the Far East Construction Yuen Long Building;
- motorists, passengers and pedestrians on Long Yat Road;
- passengers on West Rail; and
- students and teachers at Shung Tak School.

4.4.7.2 Visually Sensitive Receivers at Tin Shui Wai

4.4.7.2.1 Visually Sensitive Receivers during the Construction Phase

Visually Sensitive Receivers (VSRs) associated with the Tin Shui Wai Station road works during the Construction Phase are illustrated on *Figure 4.4h* and are listed below:

- residents at Tin Yiu Estate;
- residents of the proposed HOS development in Tin Shui Wai Area 3;
- motorists, passengers, cyclists and pedestrians on Tin Fuk Road, Ping Ha Road and adjacent footpaths, cycle tracks and footbridges;
- students and teachers at TWGH Kwok Yat Wai College;
- students and teachers at Queen Elizabeth Primary School;
- students and teachers at proposed school north of Ping Ha Road; and
- passengers on LRT at Ping Ha Road including Hang Mei Station.

4.4.7.2.2 Visually Sensitive Receivers during the Operational Phase

Visually Sensitive Receivers (VSRs) associated with the Tin Shui Wai Station road works during the Operational Phase are illustrated on *Figure 4.4h* and are listed below:

- residents at Tin Yiu Estate;
- residents of proposed HOS development in Tin Shui Wai Area 3.;

- residents of proposed West Rail residential development above proposed PTI at Ping Ha Road;
- motorists, passengers, cyclists and pedestrians on Tin Fuk Road, Ping Ha Road and adjacent footpaths, cycle tracks and footbridges;
- passengers on the proposed LRT and West Rail alignments along the southern side of Tin Fuk Road and Ping Ha Road;
- passengers on the proposed LRT and West Rail stations at Tin Fuk Road;
- students and teachers at TWGH Kwok Yat Wai College;
- students and teachers at Queen Elizabeth Primary School;
- students and teachers at proposed school north of Ping Ha Road; and
- passengers on LRT at Ping Ha Road including Hang Mei Station.

4.4.7.3 Visually Sensitive Receivers at Tuen Mun

4.4.7.3.1 Visually Sensitive Receivers during the Construction Phase

Visually Sensitive Receivers (VSRs) associated with the Tuen Mun road improvement works during the Construction Phase are illustrated on *Figure 4.4l* and are listed below:

- workers at the Fire, Ambulance and Police Stations at Pui To Road;
- pedestrians on Pui To and Tsun Wen Roads;
- LRT passengers on Pui To Road and at San Fat and Pui To LRT Stations;
- pedestrians and cyclists on the western riverside footpaths and cycleways;
- pedestrians on the Pui To Road footbridges;
- users of the Tuen Mun Town Park;
- LRT passengers and pedestrians on Tuen Mun Heung Sze Wui Road and footbridge;
- residents in tower blocks east of Tuen Mun Heung Sze Wui Road;

4.4.7.3.2 Visually Sensitive Receivers during the Operational Phase

Visually Sensitive Receivers (VSRs) associated with the Tuen Mun road improvement works during the Operational Phase are illustrated on *Figure 4.4l* and are listed below:

- workers at the Fire, Ambulance and Police Stations at Pui To Road;
- pedestrians on Pui To and Tsun Wen Roads;
- LRT passengers on Pui To Road and at San Fat and Pui To LRT Stations;
- pedestrians and cyclists on the western riverside footpaths and cycleways;
- pedestrians on the Pui To Road footbridges;

- users of the Tuen Mun Town Park;
- LRT passengers and pedestrians on Tuen Mun Heung Sze Wui Road and footbridge;
- residents in tower blocks east of Tuen Mun Heung Sze Wui Road;
- travellers, residents and shoppers in the proposed West Rail Station complex;
- students and teachers at the Castle Peak Catholic Primary School;
- residents and shoppers north of Castle Peak Catholic Primary School; and

4.5 Cultural and Heritage

4.5.1 Existing Conditions

No buildings or structures of known historical interest are to be directly impacted by the EPIW's. However, the ***Tsui Shing Lau Pagoda*** is located some 40 m south of Tin Shui Wai West Rail station from Tin Fuk Road, and is the only historical pagoda still standing in Hong Kong. Local tradition credits Tang Yin-tung, a member of the 7th generation of the Tang clan, as having built the Pagoda in 1486 during the Ming Dynasty. The three storey Pagoda is six-sided and built of grey brick with granite blocks around the entrance doorway; it is said to have been originally seven storeys high. Although To Ti and Kwan Tai are worshipped at Tsui Shing Lau, the Pagoda is said to principally serve a *fung shui* purpose and is associated with a number of *fung shui* elements within the local landscape, including the *fung shui* hill at Hang Mei Tsuen to the east.

Preliminary data gathering during the West Rail EIA has shown that no known archaeological sites will be directly affected by the EPIW's or indeed the West Rail Phase I alignment.

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5. NOISE IMPACT ASSESSMENT

5.1 Introduction

This section presents the assessment of potential noise impacts associated with the construction and operational phases of the EPIWs. Practical mitigation measures are recommended, where appropriate, to reduce the noise impacts at the identified NSRs in order to satisfy the relevant noise standards described in *Section 3.1*.

For the operational phase impact assessment of road traffic noise, the key requirements of the study are as follows:

- use approved noise calculation methodologies, traffic data prepared by the traffic specialists and consultants of KCRC which is acceptable to Transport Department (see Annex A), sites visits and the latest mapping information available to identify the existing sensitive uses, identify planned development and draw direct reference to appropriate Governmental guidance in the application of mitigation measures;
- predict the existing road traffic noise levels ($L_{A10,peak\ hour}$) based on the peak hour traffic flow in the year prior to commencement of EPIWs' construction (the prevailing year) and describe the existing noise environment;
- predict future road traffic noise levels ($L_{A10,peak\ hour}$) based on the peak hour traffic flow of the maximum traffic projection within 15 years of the Project opening;
- assess the potential impact of the maximum future change in noise levels within 15 years of opening of the EPIWs;
- recommend direct technical remedies (mitigation measures) to reduce traffic noise levels to the established criteria or to maximise the protection of the noise sensitive receivers as far as practicably possible;
- as a last resort, nominate indirect technical remedies for existing eligible sensitive receivers (in accordance with the ExCo directive, *Equitable Redress for Persons Exposed to Increased Noise resulting from the Use of New Roads*) where the practicable application of direct methods would leave residual impacts; and
- all the recommended direct and indirect technical remedies should be included in the Implementation Schedule for relevant parties to act on.

The mitigation options that may be considered to reduce any identified noise impacts in are, but not restricted to, the following:

- all forms of acoustic barriers and screening measures;
- low noise road surfacing;
- buffer zones and landscaping; and

- site layout and building design.

Since the EPIWs principally involve minor modification of existing roads, the application of buffer zones and landscaping for noise mitigation will be limited by the existing spatial relationship between the roads and the as-built receiving environment.

For future development that is presently uncommitted or not finalised in detailed design, it will not wholly be feasible for this assessment to pre-empt the design of sensitive receivers, although modification of site layout and or building design will be a subsequent option to the developer and the project proponent. Therefore, the application of direct mitigation within the boundaries of the EPIWs (principally at or close to the roadside) will be the primary available method of control for noise impacts: where the practicable maximisation of these measures within the boundaries of the EPIWs and civil and traffic imposed constraints would leave residual impacts, it is taken that the formal development planning process (i.e. review of *Section 16* application) will ensure appropriate site and building layout measures are incorporated in the future by the developer to meet the road traffic noise standards.

Where direct technical remedies for existing dwellings and schools are considered by this assessment to be exhausted, the identification of the property that may be eligible for indirect technical remedies will be defined, and the details of the mitigation proposals detailed in the Implementation Schedule in order to ensure that they are fully and appropriately addressed at the correct stages of the Project's development. The detailed specification of noise insulation works and schedule of eligible property would be undertaken by the Project Proponent following approval of the EIA Study and in accordance with guidelines approved by the EPD and the *ExCo Directive*. This will include inter alia review of existing glazing performance, condition of existing windows and casements as well as review of electrical service provisions for air conditioners and the full and detailed inventory and specification of all noise insulation works.

5.2 Construction Phase

5.2.1 Potential Sources of Impact

The source of noise during each construction stage of the EPIWs is mainly from the use of PME on site. The works will require a number of noisy activities including the use of heavy plant for excavation, filling, concreting and road paving. The key construction stages and activities for each EPIW are outlined below:

- Drainage Works (for Yuen Long, Tin Shui Wai and Tuen Mun)
  i) excavation;
  ii) preparation of formation;
  iii) laying of pipes;
  iv) construction of manholes; and
  v) backfilling.
- Road Construction (for Yuen Long, Tin Shui Wai and Tuen Mun)

i) excavation;
ii) placement of road base;
iii) levelling of new road (not required in Tuen Mun); and
iv) curbing and road paving.

- Barrier Construction (for Yuen Long and Tin Shui Wai)

  i) excavation for foundation;
  ii) bored piling; and
  iii) barrier erection.

The relocation of footbridge in Tin Shui Wai and the construction of access ramp in Tuen Mun Centre are outside the scope of EPIW package, noise impacts associated with the works are not addressed in this Study.

5.2.2 Assessment Methodology

The assessment of daytime (and all unrestricted hours) noise impact from the works associated with the EPIWs will be undertaken based on the procedure outlined in the GW-TM and *Annex 13* of the EIA TM. In general, the methodology is as follows:

- locate representative NSRs that may be affected by the works (the temporal scope of the EIA study assumes all committed and planned development will be operational during the works);
- determine plant teams for corresponding construction activities; based on agreed plant inventories;
- assign sound power levels (SWL) to the PME proposed based on the GW-TM or other sources;
- calculate the correction factors based on the distance between the NSRs and the notional noise source position of the work sites;
- apply corrections such as potential screening effect and acoustic reflection, if any, in the calculations; and
- predict construction noise levels at NSRs in the absence of any mitigation measures.

The total SWL associated with each activity has been established based on the assumed plant inventory and are presented in *Annex B*. The notional "noise source" point of each work site is established in accordance with the procedure stated in the GW-TM. Noise impacts at selected representative NSRs have been quantified by comparing the predicted noise levels with the EIA TM daytime construction noise limits ($L_{eq,\ 30\ min}$ dB(A)), as given in *Section 3.1.1*.

Given that the detailed construction programme information is not presently available for the EPIW works and West Rail construction works, an assessment of cumulative noise levels has been assessed by assuming that construction activities would be undertaken

simultaneously at work sites with the same distance from a particular NSR: in practice, noise from other sites, in particular, West Rail Phase I, will be more distant given the close proximity of EPIWs to the majority of NSRs. Based upon this assumption, the cumulative noise levels are therefore calculated using a worst case factor of +3 dB(A) for the EPIW construction noise.

As evening and night-time (restricted hours) construction works are not expected for the EPIWs, noise from the EPIW work sites has not been assessed during this period. However, as the criteria stipulated for the restricted hours period apply to the EPIWs, should work be planned during these times, it will be the responsibility of the contractor to ensure compliance with the NCO and relevant technical memoranda: in this event, the contractor will be required to submit CNP applications to the Noise Control Authority. These will be assessed by the Noise Control Authority and approval on a strictly "case by case" basis. Should approval be granted (and this cannot be guaranteed), the contractor will be required to strictly follow the conditions stated in the CNP.

In the assessment of planned daytime construction activities, mitigation measures are considered where noise impacts at the NSRs are identified. The assessment is based upon a re-evaluation of the total SWL for each construction activity by the use of practical mitigation measures such as quiet plant, purpose-built noise barriers and limiting the usage of noisy plant in a particular location or within particular busy construction period.

5.2.3 Prediction and Evaluation of Impacts

5.2.3.1 Yuen Long

The unmitigated construction noise levels at the worst case representative NSRs have been predicted and the results based upon the detailed construction noise calculations as presented in *Annex C* are given in *Table 5.2a*. The predictions were undertaken by taking account of distance attenuation and façade reflection at the worst receiver level of representative NSRs.

The predicted results show that the majority of NSRs would be adversely impacted by the works during daytime period in the absence of any noise abatement measures. During drainage works and road construction, noise levels at representative NSRs exceed the daytime noise criteria (i.e. 75 dB(A) for residential use, 70 dB(A) for educational use and 65 dB(A) for schools during examination periods) by a range of 1-10 dB(A). The construction of the proposed noise barrier close to Nam Ping Wai would also cause adverse impacts to the surrounding uses. Owing to the close proximity of the construction activities, NSRs at Ying Lung Wai, Nam Pin Wai, Tai Wai Tsuen and the residential development in Areas 12 and 15 would be affected.

The construction activities found to cause the highest unmitigated adverse impacts include excavation works during various stages of construction, placement of road base and road paving in road construction. The cumulative noise impacts at the NSRs would be high and in the range of 4-15 dB(A), when there are works on two or more closely

adjacent sites. The estimated indicative number of affected dwellings during the construction phase would be about 1,000, and there would be approximately 10 classrooms likely to be impacted by the works (the estimation excluded the developments in CDA 12 and CDA 15 as the design of these two sites has not been finalised yet).

Table 5.2a Yuen Long EPIW - Predicted Construction Noise Levels (dB(A))

NSR	Description	Max. PNL(1) - Drainage Works	Max. PNL - Road Construction	Max. PNL- Barrier Construction	Worst Case Max. Cumulative PNL
1	Nam Pin Wai (west)	69	71	-	74
2	Tai Wong Temple - Nam Pin Wai	69	71 (1)	-	74 (4)
5	Shung Tak School	76 (6)	78 (8)	82 (12)	85 (15)
6	Nam Pin Wai (east)	78 (3)	80 (5)	83 (8)	86 (11)
7	Tung Tau Tsuen	75	76 (1)	70	79 (4)
8	Tsoi Uk Tsuen	75	76 (1)	67	79 (4)
9	Ying Lung Wai	78 (3)	80 (5)	-	83 (8)
10	Tai Wai Tsuen (west)	81 (6)	83 (8)	-	86 (11)
12	Sun Yuen Long Centre (north-west)	75	76 (1)	74	79 (4)
15	Sun Yuen Long Centre (south)	76 (1)	77 (2)	-	80 (5)
17	Future Residential Development Area 15 (north-west)	82 (7)	84 (9)	-	87 (12)
19	Future Residential Development Area 15 (south-west)	81 (6)	83 (8)	-	86 (11)
20a	Future Residential Development Area 12	84 (9)	85 (10)	-	88 (13)
21	Shap Pat Heung Rural Committee Building	71	72	-	75
22	Cheong Wai	69	70	-	73
23	Far East Consortium Yuen Long Building	70	71	-	74

Notes:

(1) - Predicted Noise Level

(2) - Figure in brackets indicates the level of noise exceedance

In view of the small buffer distance between the work sites and NSRs and consequent adverse impacts, effective mitigation measures and proper environmental control practises should be considered during the construction phase of the EPIW. The recommended noise mitigation measures to address the construction noise impacts are presented in *Section 5.2.4.*

5.2.3.2 Tin Shui Wai

The unmitigated predicted noise levels at the worst case representative NSRs of Tin Shui Wai are listed in *Table 5.2b* below and the detailed construction noise calculations are presented in *Annex C*.

Table 5.2b Tin Shui Wai EPIW - Predicted Construction Noise Levels (dB(A))

NSR	Description	Max. PNL(1) - Drainage Works	Max. PNL - Road Construction	Max. PNL- Barrier Construction	Worst Case Max. Cumulative PNL
25	Proposed Secondary School (south)	78 (8)	79 (9)	85 (15)	88 (18)
26	Tin Shing Court (west)	73	74	76 (1)	79 (4)
28	Proposed Primary School (east)	80 (10)	82 (12)	88 (18)	91 (21)
29	Tin Shing Court (east)	75	76 (1)	80 (5)	83 (8)
31	Tin Shing Court (east)	74	75	77 (2)	80 (5)
33	QE School Old Student's Association Primary School	74 (4)	76 (6)	82 (12)	85 (15)
35	Yiu Hong House (east)	77 (2)	78 (3)	78 (3)	81 (6)
36	Yiu Foo House (south) – Tin Yiu Estate	80 (5)	82 (7)	92 (17)	95 (20)
38	Yiu Yat House – Tin Yiu Estate	78 (3)	80 (5)	86 (11)	89 (14)
39	Yau Hong House	82 (7)	84 (9)	76 (1)	87 (12)
40	Yau Ning House	70	72	-	75
42	Tin Tsz Estate (south)	69	70	-	73
45	TWGHs Kwok Yat Wai College	79 (9)	81 (11)	75 (5)	84 (14)
46	Residence in Ping Shan (west)	80 (5)	82 (7)	82 (7)	85 (10)
49	Sheung Cheung Wai	70	72	-	75

Notes:

(1) - Predicted Noise Level

(2) - Figure in brackets indicates the level of noise exceedance

The predicted results indicate that noise impacts during construction phase of the EPIW would be likely at the identified NSRs. Noise levels at the worst representative NSRs would exceed the daytime noise criteria in the range of 1-12 dB(A) during drainage works and road construction. Noise impacts of up to 18 dB(A) associated with the works for barrier construction were also predicted. Given the small buffer distance from the work sites, NSRs such as the proposed schools in Tin Shui Wai Area 3, Yiu Foo House and Yau Hong House would be the worst affected. A higher degree of construction noise

impact at school is expected during the examination period due to the increased sensitivity at this time.

The construction activities found to cause the highest unmitigated adverse impacts are excavation works during various stages of construction, placement of road base and road paving in road construction. Cumulative noise impacts of up to 21 dB(A) were predicted. The estimated indicative number of affected dwellings during the construction phase would be about 1,500, and there would be approximately 180 classrooms likely to be impacted by the works.

Mitigation measures and proper environmental control practises are therefore required to reduce the predicted noise impacts during the construction phase of the EPIW. These are presented in detail in *Section 5.2.4*.

5.2.3.3 Tuen Mun Centre

The unmitigated predicted noise levels at the worst case representative NSRs of Tuen Mun Centre are listed in *Table 5.2c* and the results of the detailed construction noise calculations are presented in *Annex C*.

The prediction results indicate that the majority of NSRs would adversely be impacted by the works in the absence of any noise mitigation measures. During drainage works and road construction, noise exceedances of up to 14 dB(A) beyond the daytime construction noise criteria were predicted. The NSRs at Koon Hing Building, Ming Wai Building and Castle Peak Catholic Primary School would be the worst affected.

Table 5.2c Tuen Mun Centre EPIW - Predicted Construction Noise Levels (dB(A))

NSR	Description	Max. PNL[(1)] - Drainage Works	Max. PNL - Road Construction	Worst Case Max. Cumulative PNL
50	Hong Lai Garden (west)	68	70	73
52	Hong King Building	71	73	76 (1)
53	Bit Hing Building	73	74	77 (2)
54	Honeley Court	72	73	76 (1)
57	St Simon's Lui Ming Choi Secondary School (south-west)	75 (5)	76 (6)	79 (9)
59	Tuen Mun Mansion	80 (5)	82 (7)	85 (10)
61	Koon Hing Building	86 (11)	88 (13)	91 (16)
63	Ming Wai Building (south)	88 (13)	89 (14)	92 (17)
64	Castle Peak Catholic Primary School (west façade)	82 (12)	83 (13)	86 (16)
66	Top Court	85 (10)	87 (12)	90 (15)
68	Kam Wah Garden (west)	76 (1)	77 (2)	80 (5)

Notes:

(1) - Predicted Noise Level

(2) - Figure in brackets indicates the level of noise exceedance

Noisy construction activities in conjunction with the EPIW in Tuen Mun include excavation works during various stages of construction, placement of road base and road paving during road construction.

The cumulative unmitigated noise impacts on the NSRs, with two concurrent work sites would be higher: a maximum cumulative noise exceedance of 17 dB(A) at Ming Wai Building (south) was predicted and is due to a small buffer distance between the works and the nature of activities. The estimated indicative number of affected dwellings during the construction phase would be about 800, and there would be approximately 90 classrooms likely to be impacted by the works.

The use of effective mitigation measures and proper environmental control practises are therefore required and these are recommended in *Section 5.2.4*.

5.2.4 Environmental Mitigation Measures During Construction Phase

Noise emissions from construction sites can be minimised through good site practice, selecting quiet plant, adopting quieter working methods and restriction on the use of noisy equipment deployed on the site. The recommended control philosophies detailed in this section should be incorporated into the Contract Specification and Implementation Schedule in order to ensure the acceptable environmental performance of construction works.

The contractor may develop a different package of environmental control measures to meet the required noise standards, but the following illustrates a feasible approach to mitigate the predicted noise impacts during the construction phase. Should the Contractor propose alternative mitigation measures, these shall be demonstrated to the Proponent and the Noise Control Authority, to meet or better the performances given below to fully comply with the EIA TM noise criteria and all the measures should be compatible with the construction programme.

5.2.4.1 Good Site Practice

Good site practice and noise management can considerably reduce the noise impact from construction site activities on nearby NSRs. The following package of measures should be followed during each phase of construction:

- only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction works;
- machines and plant that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;

- plant known to emit noise strongly in one direction, should, where possible, be orientated to direct noise away from nearby NSRs;
- silencers or mufflers on construction equipment should be utilised and be properly maintained during the construction works;
- mobile plant should be sited as far away from NSRs as possible; and
- material stockpiles and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.

Although it is difficult to quantify the noise reduction achieved, the environmental performance of the works would be improved through these control practices.

5.2.4.2 Selecting Quieter Plant and Working Methods

The use of quiet plant is identified to be a feasible solution to tackle the adverse impacts associated with the construction works. The contractor may obtain particular models of plant that are quieter than standard types as given in GW-TM. As the benefits achievable in this way will depend on the details of the contractors' chosen methods of working, it is considered too restrictive to specify that a contractor has to use specific items of plant for the construction operations. It is therefore both preferable and practical to specify an overall plant noise performance specification in terms of the total SWL of all PME on site so that the Contractor is allowed some flexibility to select plant to suit his needs.

Quiet plant is defined as PME whose actual SWL is less than the value specified in GW-TM for the same piece of equipment. Examples of SWLs for specific silenced PME taken from a British Standard, namely *Noise Control on Construction and Open Sites, BS5228 : Part 1 : 1997*, which are known to be used are given in *Table 5.2d*. The total SWLs for each construction activity with the recommended silenced PMEs are detailed in *Annex B*.

Table 5.2d Sound Power Levels for Specific Silenced PME

PME	BS5228		SWL dB(A)	Relative size or power rating (where applicable)
	Table no.	Ref no.		
Bulldozer	C3	65	111	46 kW
Mobile Crane	C7	110	106	56 kW
Air Compressor	C7	25	98	7 m^3/min
Concrete Pump	C6	36	106	100 kW
Dump Truck	C9	29	109	35 t
Excavator	C3			
- for trenching		97	105	52 kW
- for ground excavation		35	106	45 kW
Generator	C7	62	100	-

PME	BS5228 Table no.	BS5228 Ref no.	SWL dB(A)	Relative size or power rating (where applicable)
Lorry	C9	27	105	35 t
Loader	C3	97	105	52 kW
Concrete Lorry Mixer	C6	35	100	5 m^3
Vibratory Roller	C3	115	102	9 kW
Grader	C3	76	111	-
Breaker	C2	10	110	35 kg
Road Roller	C8	27	104	10 t
Poker Vibrator	C6	32	100	-

It should be noted that while various types of silenced equipment can be found in Hong Kong, the Noise Control Authority, when processing a CNP application, will apply the SWLs specified in the GW-TM, unless the noise emission of a particular piece of equipment can be validated by certificate or demonstration. The onus is therefore placed with the Contractor to prove that his proposed plant deployment meets with the quiet plant noise levels should he choose this method of noise mitigation. With the use of quiet plant on site, the overall noise reduction in the worst case predicted unmitigated noise levels would be about 6 to 7 dB(A).

5.2.4.3 Use of Temporary Noise Barriers

In general, noise barriers of 3 m to 5 m height located between noisy construction activities and NSRs could give a noise reduction of up to 5 dB(A) from screening (estimated in accordance with the GW-TM). It would be possible for the Contractor to provide purpose-built noise barriers or screens constructed of appropriate material (minimum superficial density of 15 kg/m^2) located close to operating PME, in order to achieve this level of noise reduction. This could also be achieved by erecting temporary noise barriers along the proposed roads and at active work sites. Certain types of PME, such as generators and compressors, can be completely screened by portable barriers with skid footings and giving a total noise reduction of 10 dB(A) or more.

It is anticipated that a movable noise barrier with a suitable skid type footing and a small cantilevered upper portion can be located within a few metres of a static plant and within about 5 m of a mobile equipment such as excavator and mobile crane etc. such that the line of sight could be blocked by the barriers viewed from the NSRs. The estimated noise reduction by means of screening, provided that the barriers are carefully located, can provide at least 5 dB(A) attenuation for the plant used on site. This measure is particularly effective for low-rise noise sensitive premises or schools.

Based on the NSR heights and site geometry, it is estimated that movable noise barriers built on site can achieve a 10 dB(A) noise reduction for static plant and 5 dB(A) noise reduction for mobile plant provided that they are properly arranged before any activities

proceed. The noise screening benefit for general plant types considered in this Study is listed as follows:

- stationary plant - 10 dB(A) screening for PME such as air compressor, generator, concrete pump and bar bender; and
- mobile plant - 5 dB(A) screening for PME such as excavator, breaker, concrete lorry mixer, mobile crane, poker vibrator, roller, loader and asphalt paver.

Any barriers designed by the contractor should satisfy this noise performance in order to control the emission of noise from PME. The Contractor may pay particular attention to ensure barriers are close fitting around plant items and gain greater benefit, but since this cannot be guaranteed such measures are left to his own planning of the site works.

5.2.4.4 Restriction of Plant Usage On-site During Critical Construction Stages

For most works involving contracting it is usually preferable to allow the onsite team to determine the usage of construction plant according to the construction programme or work schedule. However, in locations where adverse noise impacts may arise, it will be appropriate to restrict the usage of particular noisy equipment operating within certain parts of the site that are very close to the NSRs. The percentage of time that the noisy equipment is in operation may also need to be controlled so as to reduce the noise emissions during critical construction stages.

By restricting the percentage of operation (in terms of time usage) of PME to 50% within a 30-minute period, a noise reduction of 3 dB(A) could be achieved. Construction plant including excavator, grader, concrete pump, dump truck, asphalt paver, loader and breaker should be used with careful attention to ensure the engines are switched off or only idling at a low power setting when not in direct use. For these PMEs the operating time should be carefully controlled such that they are only operating for 15 minutes in every consecutive 30-minute period. This measure should be monitored and supervised by the Contractor and the Resident Engineer during implementation as this measure would have impact on the construction programme.

5.2.4.5 Noise Assessment with the Recommended Mitigation Packages

Without mitigation measures, construction activities associated with the works of EPIWs would cause exceedances of the 75 dB(A) noise standard for residential uses and 70 dB(A) (and 65 dB(A) during the examination period) for schools. Three mitigation packages, as outlined below, have been considered in this Study to develop the required control measures for tackling the noise impacts from construction works:

- **M1 - Use of Quiet/Silenced PMEs;**
- **M2 - M1 with the use of noise barriers; and**
- **M3 - M2 plus limiting the operating time of PMEs by 50%.**

The mitigated noise levels predicted for Yuen Long, Tin Shui Wai and Tuen Mun Centre EPIWs are shown in *Tables 5.2e-g*. The noise reduction which could be achieved with the use of silenced equipment ranges from 2 to 11 dB(A) for individual construction activity (mitigation package M1), depending on the type of silenced equipment chosen. For mitigation package M2 (use of quiet plant and barriers), noise reduction achieved would be around 1-8 dB(A). Further limiting the operating time of PME on site could offer an extra 3 dB(A) noise reduction.

As it is considered too restrictive to insist that the Contractor to use specific items of plant, recommendations for mitigation to achieve the applicable noise standards have been specified as a combination of noise barriers and a plant noise performance specification. This performance specification requires the Contractor to incorporate silenced construction equipment not exceeding the SWL as given above or reduced plant inventories for the construction activities so that noise levels at nearby NSRs are kept below the relevant noise standards.

Table 5.2e Yuen Long EPIW - Mitigated Construction Noise Levels (dB(A))

NSR	Description	Max. PNL[1] - Drainage Works	Max. PNL - Road Construction	Max. PNL- Barrier Construction	Worst Case Max. Cumulative PNL
1	Nam Pin Wai (west)	62/-/-	65/-/-	-	68/-/-
2	Tai Wong Temple - Nam Pin Wai	62/-/-	64/-/-	-	67/-/-
5	Shung Tak School	69/68/65	72(2)/69/66	76(6)/73(3)/70	79(9)/76(6)/73(3)
6	Nam Pin Wai (east)	71/70/67	74/71/68	77(2)/74/71	80(5)/77(2)/74
7	Tung Tau Tsuen	67/-/-	70/-/-	64/-/-	73/-/-
8	Tsoi Uk Tsuen	67/-/-	70/-/-	61/-/-	73/-/-
9	Ying Lung Wai	71/70/-	74/71/-	-	77(2)/74/-
10	Tai Wai Tsuen (west)	74/72/69	76(1)/74/71	-	79(4)/77(2)/74
12	Sun Yuen Long Centre (north-west)	67/-/-	70/-/-	68/-/-	73/-/-
15	Sun Yuen Long Centre (south)	68/-/-	71/-/-	-	74/-/-
17	Future Residential Development Area 15 (north-west)	75/73/70	77(2)/75/72	-	80(5)/78(3)/75
19	Future Residential Development Area 15 (south-west)	74/72/69	76(1)/74/71	-	79(4)/77(2)/74
20a	Future Residential Development Area 12	76(1)/75/72	79(4)/77(2)/74	-	82(7)/80(5)/77(2)
21	Shap Pat Heung Rural Committee Building	63/-/-	66/-/-	-	69/-/-
22	Cheong Wai	61/-/-	64/-/-	-	67/-/-
23	Far East Consortium Yuen Long Building	62/-/-	65/-/-	-	68/-/-

Notes:

(1) - Predicted Noise Level

(2) - Figure in brackets indicates the level of noise exceedance

(3) - Predicted Noise Levels with mitigation package M1/M2/M3

Potential adverse noise impacts associated with drainage works, road construction and barrier construction could be controlled with the use of quiet plant (mitigation package M1) in most cases in Yuen Long. In view of the small buffer distance between NSRs and work sites, mitigation package M3 (use of quiet plant and noise barriers, with restriction on the operating time of PMEs on site) would be necessary for NSRs likely to be affected by the Project, as indicated in *Table 5.2e*. These measures are required for the works close to Shung Tak School, Nam Pin Wai, Tai Wai Tsuen and the residential developments in Areas 12 and 15.

Residual cumulative noise exceedances were still predicted at Shung Tak School and the residential development in Area 12 as shown in *Table 5.2e*. These residual impacts could be further mitigated by avoiding simultaneous construction activities to be undertaken at work sites close to these NSRs, through appropriate planning and scheduling of construction works. In addition, noise insulation has been proposed for Shung Tak School to reduce the predicted noise impacts associated with the construction works of West Rail; this measure will help to relieve any noise impacts caused by the EPIW works. Alternatively, construction activities could be scheduled during non-school hours during daytime period or during school holidays to avoid the potential noise nuisance.

Table 5.2f Tin Shui Wai EPIW - Mitigated Construction Noise Levels (dB(A))

NSR	Description	Max. PNL(1) - Drainage Works	Max. PNL - Road Construction	Max. PNL- Barrier Construction	Worst Case Max. Cumulative PNL
25	Proposed Secondary School (south)	70/69/66	73(3)/70/67	79(9)/76(6)/ 73(3)	82(12)/79(9)/76 (6)
26	Tin Shing Court (west)	65/-/-	68/-/-	70/-/-	73/-/-
28	Proposed Primary School (east)	73(3)/71(1)/ 68	75(5)/73(3)/70	82(12)/79(9)/ 76(6)	85(15)/82(12)/7 9(9)
29	Tin Shing Court (east)	67/66/-	70/67/-	74/71/-	77(2)/74/-
31	Tin Shing Court (east)	66/-/-	69/-/-	71/-/-	74/-/-
33	QE School Old Student's Association Primary School	67/65/62	69/67/64	76(6)/73(3)/70	79(9)/76(6)/73(3)
35	Yiu Hong House (east)	69/-/-	72/-/-	72/-/-	75/-/-
36	Yiu Foo House (south) – Tin Yiu Estate	73/71/68	75/73/70	86(11)/84(9)/ 81(6)	89(14)/87(12)/8 4(9)
38	Yiu Yat House – Tin Yiu Estate	71/70/67	74/71/68	80(5)/77(2)/74	83(8)/80(5)/77(2)

NSR	Description	Max. PNL(1) - Drainage Works	Max. PNL - Road Construction	Max. PNL- Barrier Construction	Worst Case Max. Cumulative PNL
39	Yau Hong House	75/74/71	78(3)/75/72	70/68/65	81(6)/78(3)/75
40	Yau Ning House	63/-/-	66/-/-	-	69/-/-
42	Tin Tsz Estate (south)	61/-/-	64/-/-	-	67/-/-
45	TWGHs Kwok Yat Wai College	72(2)/70/67	75(5)/72(2)/69	69/67/64	78(8)/75(5)/ 72(2)
46	Residence in Ping Shan (west)	73/71/68	75/73/70	76(1)/73/70	79(4)/76(1)/73
49	Sheung Cheung Wai	63/-/-	66/-/-	-	69/-/-

Notes:

(1) - Predicted Noise Level

(2) - Figure in brackets indicates the level of noise exceedance

(3) - Predicted Noise Levels with mitigation package M1/M2/M3

For the construction works in Tin Shui Wai, mitigation packages M1 or M2 (use of quiet plant and/or noise barriers) would be adequate to address the noise problems for NSRs located relatively remote from the sites. While for other NSRs such as the proposed schools in Area 3, QE School Old Student's Association Primary School, high-rise residential developments in Tin Yiu Estate and TWGHs Kwok Yat Wai College, which are located close to the works of the Project, mitigation package M3 (use of quiet plant and noise barriers, with restriction on the operating time of PMEs on site) is recommended as indicated in *Table 5.2f*.

Residual impacts of 3-6 dB(A) were still predicted at the proposed schools in Area 3 and Yiu Foo House of Tin Yiu Estate from the works for barrier construction. Analysis of the prediction results indicates that the cause of residual noise impact is the use of dump truck during excavation works for the foundation of barrier. Further control measure such as using a lorry of small size or lower capacity as a substitute to dump truck will be considered and addressed in the following section. To address the noise impacts at schools, construction activities could also be scheduled during non-school hours during daytime period or during school holidays to avoid the potential noise nuisance. Cumulative noise impacts in the range of 2-9 dB(A) were also predicted, after implementing all the suggested measures. To eliminate the cumulative noise nuisance from the works, it is recommended to avoid simultaneously noisy activities at locations close to nearby NSRs.

Table 5.2g Tuen Mun Centre EPIW - Mitigated Construction Noise Levels (dB(A))

NSR	Description	Max. PNL(1) - Drainage Works	Max. PNL - Road Construction	Worst Case Max. Cumulative PNL

50	Hong Lai Garden (west)	61/-/-	64/-/-	67/-/-
52	Hong King Building	64/-/-	67/-/-	70/-/-
53	Bit Hing Building	65/-/-	68/-/-	71/-/-
54	Honeley Court	64/-/-	67/-/-	70/-/-
57	St Simon's Lui Ming Choi Secondary School (south-west)	67/66/63	70/68/65	73(3)/71(1)/68
59	Tuen Mun Mansion	73/72/69	76(1)/73/70	79(4)/76(1)/73
61	Koon Hing Building	79(4)/78(3)/75	82(7)/79(4)/76 (1)	85(10)/82(7)/79 (4)
63	Ming Wai Building (south)	80(5)/79(4)/ 76(1)	83(8)/80(5)/ 77(2)	86(11)/83(8)/80 (5)
64	Castle Peak Catholic Primary School (west façade)	74(4)/73(3)/70	77(7)/74(4)/71 (1)	80(10)/77(7)/74 (4)
66	Top Court	78(3)/77(2)/74	81(6)/78(3)/75	84(9)/81(6)/78(3)
68	Kam Wah Garden (west)	68/-/-	71/-/-	74/-/-

Notes:

(1) - Predicted Noise Level

(2) - Figure in brackets indicates the level of noise exceedance

(3) - Predicted Noise Levels with mitigation package M1/M2/M3

Referring to the results presented in T*able 5.2g*, mitigation package M3 is required for the works in Tuen Mun Centre. Residual noise impacts of up to 2 dB(A) were predicted for drainage works and road construction. Examination of the prediction results indicates that the use of dump truck during excavation activities and road paving would result in adverse noise impacts at nearby NSRs. These affected NSRs include Koon Hing Building, Ming Wai Building and Castle Peak Catholic Primary School. Further mitigation measure by substituting dump truck with lorry of appropriate capacity will be considered. To address the noise impacts at schools, construction activities could also be scheduled during non-school hours during daytime period or during school holidays to avoid the potential noise nuisance.

Cumulative noise exceedances in the range of 3-5 dB(A) were predicted when there are works in two adjacent sites undertaken at the same time. Accordingly, the planning and programming of construction activities in a strategic and "environmental friendly" manner to avoid works undertaken in parallel at critical areas should be considered.

5.2.5 Residual Impacts and Constraints

In the preceding section, mitigation measures to tackle the noise issues associated with the works in Yuen Long, Tin Shui Wai and Tuen Mun Centre were discussed. The suggested environmental control measures include:

- good site practices;
- selecting quieter plant and working methods;
- use of temporary noise barriers;
- restriction of plant usage on-site during critical construction stages; and
- avoidance of simultaneous noisy activities to eliminate cumulative noise impact.

With the recommended measures, predicted noise impacts could be well controlled and no residual noise impacts are anticipated at most of the NSRs. However, residual noise impacts were still predicted at:

- Yuen Long - Shung Tak School and the residential development in Area 12;
- Tin Shui Wai - the proposed schools in Area 3, QE School Old Student's Association Primary School, Yiu Foo House and Yiu Yat House of Tin Yiu Estate and TWGHs Kwok Yat Wai College; and
- Tuen Mun Centre - Koon Hing Building, Ming Wai Building, Castle Peak Catholic Primary School and Top Court.

Analysis of the prediction results indicates that the cause of residual noise impact is the use of dump truck during various construction activities. According to *BS 5228 : Part 1 : 1997 - Noise and Vibration Control on Construction and Open Sites*, a lorry of 10 t with SWL of 98 dB(A) could be used as a substitute for dump truck in performing the same construction activities. The associated changes in the SWL of individual construction activity will be 3-4 dB(A). A further noise reduction of 1-2 dB(A) for those noisy construction activities (i.e. excavation works for drainage and road construction, foundation construction for noise barrier and road paving exercise) should be considered by limiting the operating time of PME used on site (say the "on-time" percentage reduced to 30%). With these measures in place, residual noise impacts at NSRs would be limited. To eliminate the cumulative noise nuisance from the works, it is recommended to avoid simultaneously noisy activities at locations close to nearby NSRs.

According to *KCRC West Rail EIA FAR*, noise insulation has been proposed for some of the affected schools close to the West Rail works. These schools include Shung Tak School in Yuen Long, TWGHs Kwok Yat Wai College in Tin Shui Wai and St Simon's Lui Ming Choi Secondary School in Tuen Mun. Noise insulation and air conditioners were also noted at QE School Old Student's Association Primary School in Tin Shui Wai during a site visit. Since with the recommended mitigation controls, noise impacts at schools could be minimised, the indirect measures proposed would provide additional protection for the schools.

As a high degree of noise control is required to avoid adverse impacts, regular monitoring at the NSRs will be required during the construction phases. The purpose of the monitoring will be to examine the effectiveness of all the on-site measures, to enable the contractor to be aware of his environmental performance and provide necessary action if

the assessment criteria are exceeded. Monitoring will also provide a direct response mechanism for the Project Proponent to manage the contractors action in effecting reductions in noise emissions at specific areas. The monitoring requirements are described in *Section 11* of this report.

With the adoption of appropriate measures as stated above and the implementation of an effective monitoring exercise which would draw the contractor's attention to any adverse impact and to trigger appropriate corrective actions, it is expected that the residual impacts can be reduced to acceptable levels in accordance with the EIA TM requirements.

5.3 Operational Phase

5.3.1 Potential Sources of Impact

As described in *Section 4.1*, road traffic noise is the dominant noise source affecting the existing NSRs and future development within each of the Study areas. This is principally due to the traffic flows being carried by existing highway network and the extent of land available for buffer distances during the past and present planning of noise sensitive development.

The prevailing road traffic noise and future levels expected from natural growth and West Rail associated traffic growth and the realignment proposed in the Project are addressed in the following sections. All traffic data used in this Study have been approved by Transport Department (see *Annex A*).

5.3.2 Assessment Methodology

5.3.2.1 Calculation of Prevailing Noise Levels

The road traffic noise calculations presented in this Study follow the methodology described by *Calculation of Road Traffic Noise* (CRTN), published by the UK Department of Transport in 1988, and is required by the Study Brief. The computer software, *HFANoise*, developed by Halcrow Fox to implement CRTN on a wide scale basis using a links and nodes representation of the road network and receiving environment, was used for the implementation of this methodology.

The modelling scheme for the determination of prevailing noise levels is based upon a digitised representation of the existing unaltered roads in the vicinity and spatial scope of the Project. Each of the existing unaltered highway networks were divided into discrete road segments of homogeneous traffic and road layout characterisation. The segment parameters define the key elements of a road link with respect to traffic noise emissions such as traffic volume, composition, vehicle speed, road layout, and vertical and horizontal alignment. Road surfaces were taken to be standard wearing course based on existing conditions.

For the propagation of noise, a worst-case hard ground attenuation was assumed throughout the three Study areas given the urban nature of the receiving environments and predominance of reflective ground planes. All other features that could potentially provide noise screening or reflection were defined in the *HFANoise* models.

Peak hour traffic flows for the year 1999, the year immediately prior to the commencement of construction of the Project, were used for the determination of prevailing noise levels. A design vehicular speed of 50 kph was used in the modelling scheme for all roads.

All road traffic noise levels presented in this Report are expressed in the $L_{A10,peak\ hour}$ dB index and have been predicted at representative and worst affected floor heights. Where the design of a proposed development is not presently defined, noise levels have been predicted at representative heights according to the type of planning zone and expected type of development. For the proposed primary and secondary schools in Tin Shui Wai Area 3, the latest school layout designs were used.

5.3.2.2 Prediction of Future Noise Levels

The prediction of future road traffic noise levels was based on a modelling methodology similar to the prevailing situation with road layouts and alignment derived from the Proponent's engineering design.

All roads that would be subject to significant variation and those which remain unaltered or subject to minor changes were classified in the *HFANoise* model as "new " and "unaltered" respectively with reference to the Study Brief. This has enabled the model to calculate noise levels classified by road link description according to the Study Brief and the *ExCo Directive*. The roads classified as "new" in this Study are shown in *Figures 5.3a-c*.

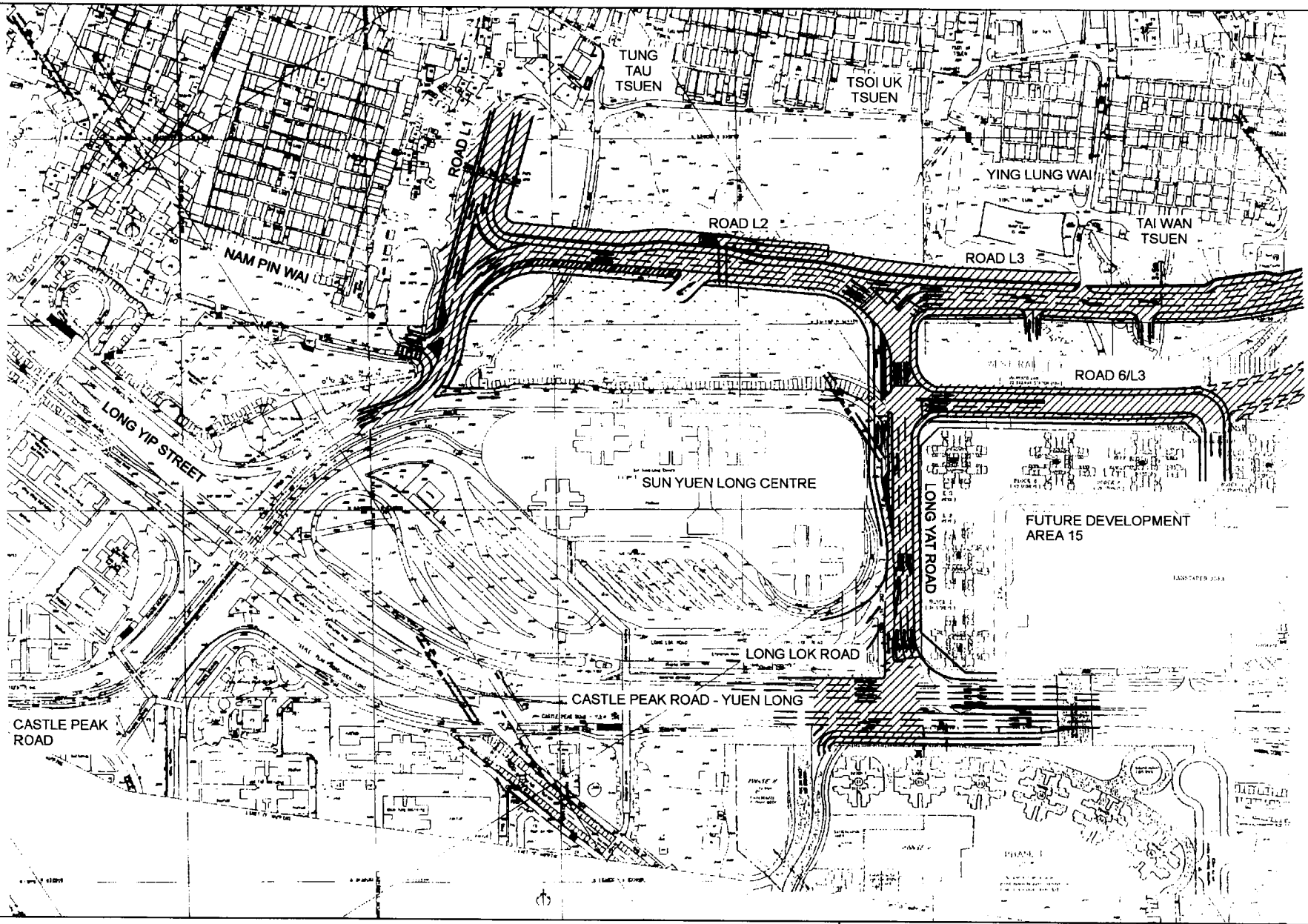
As with the prevailing road network, the Project was divided into discrete road segments and examples of the *HFANoise* digitised representation of these segments and the receiving environment are shown by *Figures 5.3d-f*. An example of the *HFANoise* results file is presented in *Annex D*.

Regarding the noise predictions for Tin Shui Wai EPIW, a comparison of noise emissions with respect to the traffic conditions in Years 2011 and 2018 has been made (see *Annex A*). The results concluded that the traffic condition in Year 2018 represents the worst case scenario of this Study for the determination of required noise mitigation measures.

5.3.3 Prediction and Evaluation of Impacts

5.3.3.1 Traffic Noise Levels in Yuen Long

The predicted road traffic noise levels at identified NSRs in Yuen Long for the model years of 1999 and 2018 are discussed below. Assessment has been undertaken at three different receiver heights (low, mid and high) representing the NSRs and the unmitigated



ROAD CLASSIFIED AS "NEW" IN TRAFFIC NOISE ASSESSMENT FOR YUEN LONG

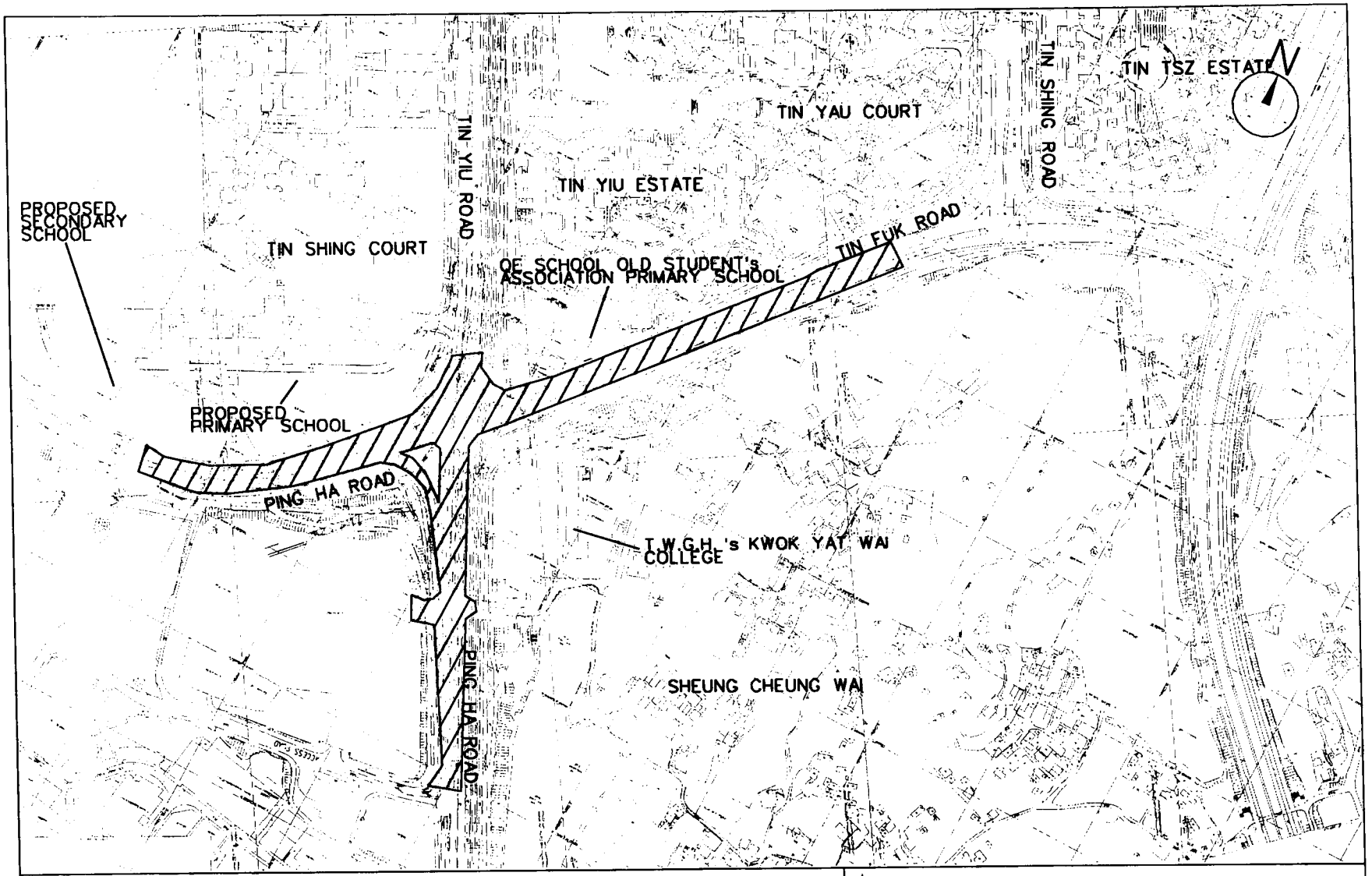
FIGURE 5.3a

ERM

KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES

C1800r26



ROAD CLASSIFIED AS "NEW" IN TRAFFIC NOISE ASSESSMENT FOR TIN SHUI WAI

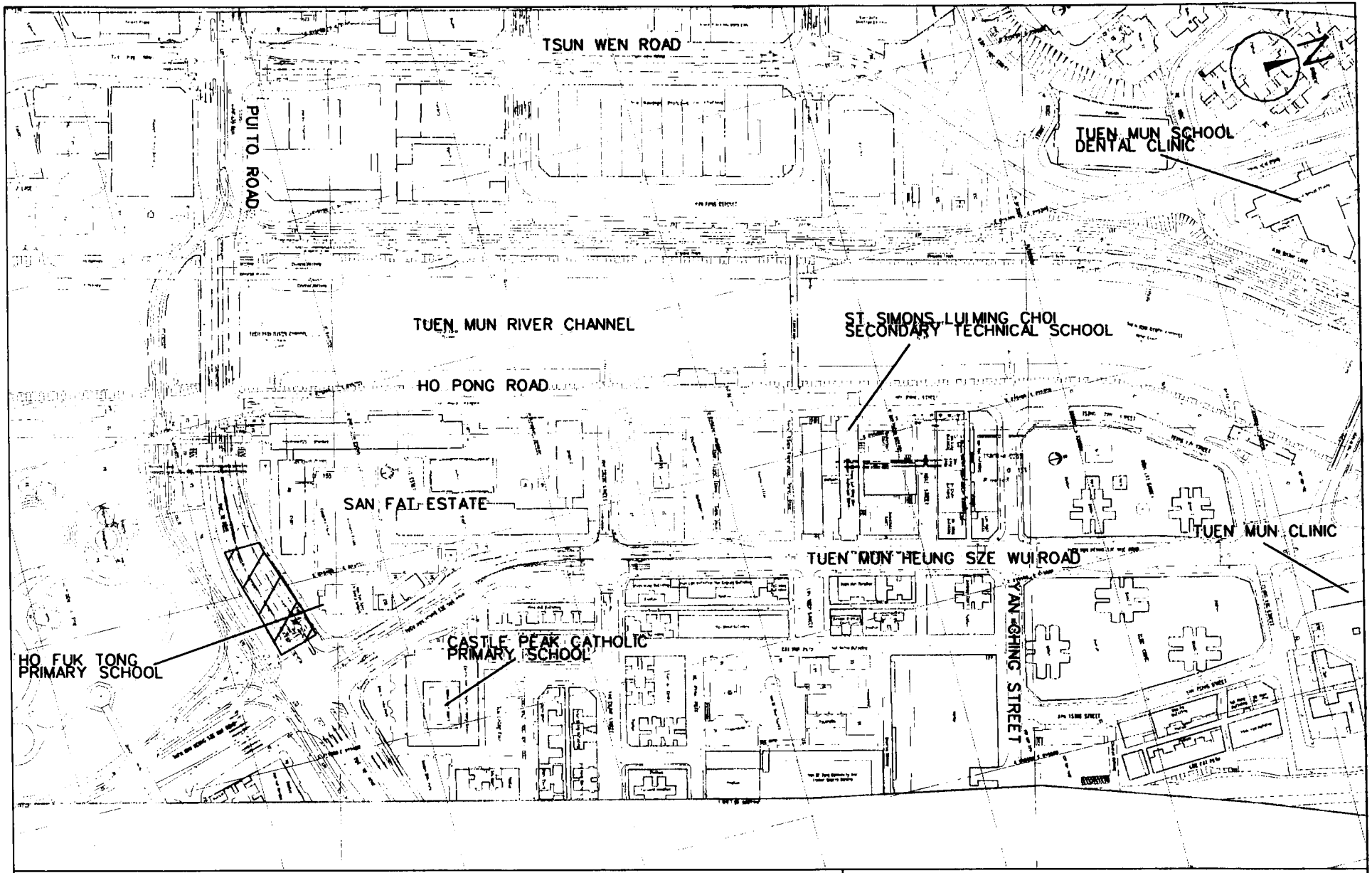
FIGURE 5.3b

SCALE: 1/5000

KOWLOON - CANTON RAILWAY CORPORATION

ERM

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES



ROAD CLASSIFIED AS "NEW" IN TRAFFIC NOISE ASSESSMENT FOR TUEN MUN CENTRE

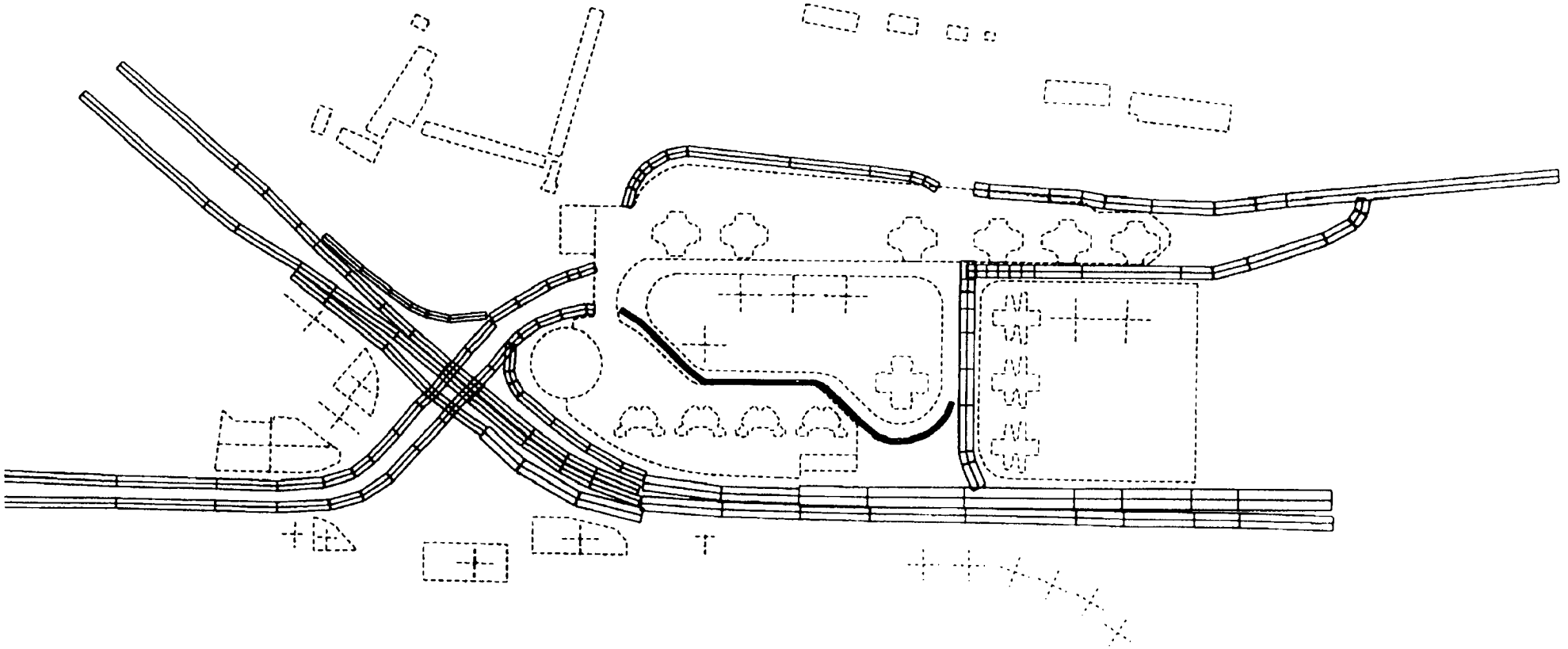
FIGURE 5.3c

SCALE: 1/3000

erwhk/ol888/munnew.dgn

KOWLOON - CANTON RAILWAY CORPORATION

ERM WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES



NOT TO SCALE

DIGITISED ROAD SCHEME FOR YUEN LONG

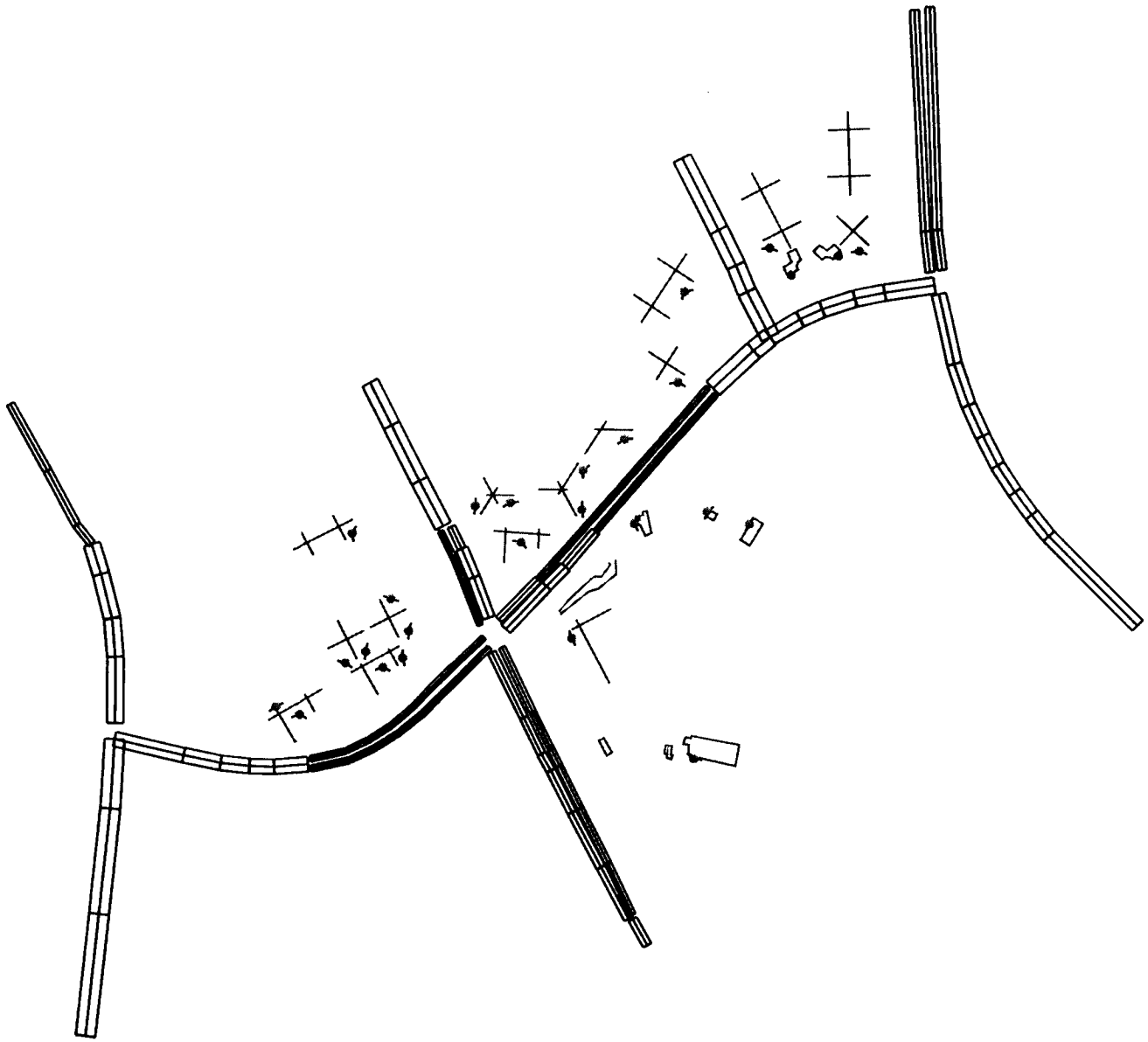
FIGURE 5.3d

C1800o1

ERM

KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES



NOT TO SCALE

DIGITISED ROAD SCHEME FOR TIN SHUI WAI

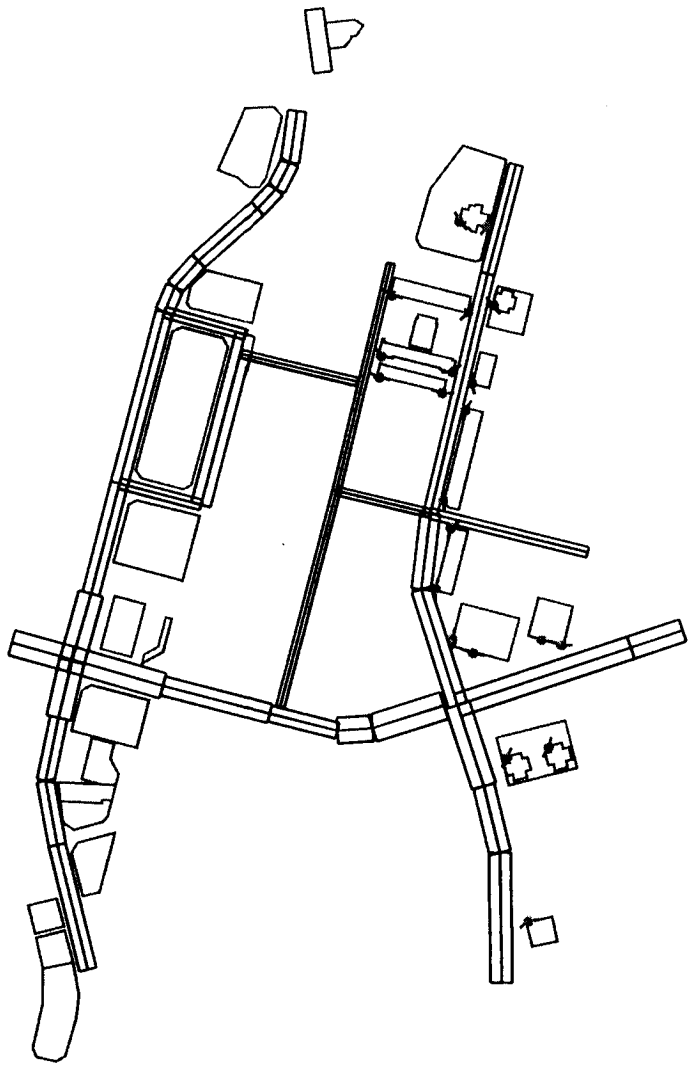
FIGURE 5.3e

Contract/C1800o

ERM

KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES



NOT TO SCALE

DIGITISED ROAD SCHEME FOR TUEN MUN CENTRE

FIGURE 5.3f

Contract/C1800o2

ERM

KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES

predicted noise levels are given in *Table 5.3a*; in addition, during the assessment and design of mitigation, intervening receiver heights have been tested to ensure a worst case review of all NSRs. Assessment of impacts associated with the Project during the worst prediction year (i.e. Year 2018) would base on the prediction results and compare with the road traffic noise criteria stipulated in EIA TM.

According to *Table 5.3a*, adverse impacts in the range of 1-10 dB(A) were predicted at 15 of the 24 identified NSRs in the prevailing situation. In the future case, noise exceedances in the range of 1-14 dB(A) were predicted at 15 of the 24 NSRs.

Three NSRs will experience new adverse noise impacts: these will be Nam Pin Wai (west); Nam Pin Wai (east) and, the north-west towers of the CDA development in Area 15. Existing adverse impacts at two NSRs will be mitigated. These are the north-east and north-west towers of the Sun Yuen Long Centre, where, due to the realignment of Long Yat Road and the development of the proposed property at West Rail Yuen Long Station surrounding these NSRs, noise levels will reduce by 3 dB(A) to very substantially over 10 dB(A).

Table 5.3a Yuen Long EPIW - Predicted Noise Levels $L_{10, 1hour}$ (dB(A)) for the Prevailing Year and Future Year (1999 & 2018)

NSR	Name or Location of NSR	Low Level	Year 1999	Year 2018	Mid Level	Year 1999	Year 2018	High Level	Year 1999	Year 2018
		mPD	dB(A)	dB(A)	mPD	dB(A)	dB(A)	mPD	dB(A)	dB(A)
1	Nam Pin Wai (west)	5	69	71 (1)	7.2	70	72 (2)	11	70	72 (2)
2	Tai Wong Temple - Nam Pin Wai	5.5	61	65	-	-	-	8.5	62	65
3	Nam Pin Wai (south-west)	4.5	70	72 (2)	7.5	71 (1)	72 (2)	10.5	71 (1)	73 (3)
4	Nam Pin Wai (south)	4.5	70	72 (2)	7.5	71 (1)	72 (2)	10.5	71 (1)	72 (2)
5	Shung Tak School	4.4	73 (8)	73 (8)	-	-	-	7.4	73 (8)	74 (9)
6	Nam Pin Wai (east)	4.5	69	71 (1)	7.5	70	71 (1)	10.5	70	71 (1)
7	Tung Tau Tsuen	4.6	67	70	7.6	67	70	10.6	68	70
8	Tsoi Uk Tsuen	4.9	66	69	7.9	66	69	10.9	66	69
9	Ying Lung Wai	4	66	69	7	66	69	10	66	69
10	Tai Wai Tsuen (west)	4.5	65	68	7.5	65	69	10.5	65	69
11	Tai Wai Tsuen (east)	4.5	64	69	7.5	64	69	10.5	64	70
12	Sun Yuen Long Centre (north-west)	34.5	74 (4)	56	70.5	72 (2)	67	109.5	70	67
13	Sun Yuen Long Centre (north-east)	34.5	74 (4)	46	70.5	71 (1)	58	109.5	69	59
14	Sun Yuen Long Centre (west)	34.5	73 (3)	69	70.5	73 (3)	71 (1)	109.5	72 (2)	71 (1)
15	Sun Yuen Long Centre	34.5	59	63	70.5	71 (1)	76 (6)	109.5	70	74 (4)

NSR	Name or Location of NSR	Low Level	Year 1999	Year 2018	Mid Level	Year 1999	Year 2018	High Level	Year 1999	Year 2018
		mPD	dB(A)	dB(A)	mPD	dB(A)	dB(A)	mPD	dB(A)	dB(A)
	(south)									
16	Sun Yuen Long Centre (south)	34.5	64	60	70.5	71 (1)	74 (4)	109.5	70	73 (3)
17	CDA Development in Area 15 (north-west)	37.7	72 (2)	70	89.2	70	72 (2)	145.2	69	70
18	CDA Development in Area 15 (north-east)	37.7	53	62	89.2	53	69	145.2	53	66
19	CDA Development in Area 15 (south-west)	37.7	76 (6)	79 (9)	89.2	74 (4)	77 (7)	145.2	73 (3)	75 (5)
20	CDA Development in Area 15 (south)	37.7	75 (5)	79 (9)	89.2	73 (3)	76 (6)	145.2	71 (1)	74 (4)
20a	CDA Development in Area 12 (north)	27	77 (7)	81 (11)	83.5	74 (4)	78 (8)	141.5	72 (2)	76 (6)
21	Shap Pat Heung Rural Committee Building	5.9	79 (9)	84 (14)	-	-	-	8.9	80 (10)	84 (14)
22	Cheong Wai	12.1	80 (10)	83 (13)	39.1	77 (7)	80 (10)	69.6	75 (5)	78 (8)
23	Far East Consortium Yuen Long Building	19.4	78 (8)	80 (10)	46.4	77 (7)	79 (9)	76.4	75 (5)	77 (7)

Note : Figure in brackets indicates the level of predicted noise exceedance.

In general, the noise level changes in the future year at NSRs experiencing adverse impacts will be in the range of -4 to +5 dB(A). This is attributed to the diversion of Long Yat Road, growth in road traffic in the majority of the highway network and the construction of Roads L1, L2, and L3. A large increase in noise will occur at the north-east towers of the CDA development in Area 15 owing to the construction of Road 6/L3 but adverse impacts are not expected.

The dominant noise sources contributing to adverse noise impacts will be Long Yat Road, Castle Peak Road and Road L2. The estimated indicative number of dwellings affected by the project would be about 250, and there would be approximately 10 classrooms likely to be impacted by the EPIW. The estimation has excluded the developments in CDA 12 and CDA 15 as the design of these two sites has not been finalised yet. Direct mitigation measures should be considered for these highways to reduce the future adverse impacts.

5.3.3.2 Traffic Noise Levels in Tin Shui Wai

Prediction results for the prevailing and future cases are presented in *Table 5.3b*. There will be adverse impacts in both the prevailing and future scenarios. As shown by *Table 5.3b*, noise exceedances in the range of 1 to7 dB(A) were predicted at 11 of the 26

identified NSRs. For the future case, noise exceedances in the range of 1 to 8 dB(A) would occur at 15 of the 26 NSRs.

Five NSRs will experience new adverse noise impacts: these will be the proposed secondary school (western facade), the proposed primary school (NSR 27), Tin Shing Court (east); Yiu Yat House - Tin Yiu Estate; and, Yau Ning House.

Table 5.3b Tin Shui Wai EPIW - Predicted Noise Levels $L_{10, 1hour}$ (dB(A)) for the Prevailing Year and Future Year (1999 & 2018)

NSR	Name or Location of NSR	Low Level	Year 1999	Year 2018	Mid Level	Year 1999	Year 2018	High Level	Year 1999	Year 2018
		mPD	dB(A)	dB(A)	mPD	dB(A)	dB(A)	mPD	dB(A)	dB(A)
24	Proposed Secondary School (west)	7.5	65	68 (3)	14.3	65	68 (3)	24.5	65	68 (3)
25	Proposed Secondary School (south)	11.8	67 (2)	61	18.6	67 (2)	63	28.8	69 (4)	67 (2)
26	Tin Shing Court (west)	11.8	64	65	60.3	66	69	110.3	66	70
27	Proposed Primary School	11.8	57	67 (2)	18.6	65	69 (4)	28.8	70 (5)	72 (7)
28	Proposed Primary School (east)	11.8	63	72 (7)	18.6	64	66 (1)	28.8	70 (5)	72 (7)
29	Tin Shing Court (east)	11.4	65	70	59.9	70	72 (2)	109.9	69	71 (1)
30	Tin Shing Court (south)	11.8	51	58	60.3	68	70	110.3	67	70
31	Tin Shing Court (east)	11.4	67	68	59.9	67	69	109.9	66	68
32	Tin Shing Court (north)	11.8	66	68	60.3	67	69	110.3	66	68
33	QE School Old Student's Association Primary School	12.0	65	65	18.8	66 (1)	67 (2)	29.0	68 (3)	72 (7)
34	Yiu Hong House (west)	11.3	71 (1)	72 (2)	59.8	69	70	109.8	68	68
35	Yiu Hong House (east)	11.5	61	61	59.8	67	69	109.8	67	68
36	Yiu Foo House (south) – Tin Yiu Estate	11.1	72 (2)	73 (3)	59.6	69	69	109.6	67	68
36a	Yiu Foo House (west) – Tin Yiu Estate	11.1	68	69	59.6	68	69	109.6	67	68
37	Yiu Foo House (north) – Tin Yiu Estate	11.1	69	69	59.6	68	69	109.6	67	67
38	Yiu Yat House – Tin Yiu Estate	11.1	70	71 (1)	59.6	68	69	109.6	67	68
39	Yau Hong House	11.0	70	70	59.5	67	68	109.5	65	66
40	Yau Ning House	11.4	69	71 (1)	59.9	69	70	109.9	67	69
41	Tin Tsz Estate (west)	10.3	72 (2)	73 (3)	58.8	70	72 (2)	108.8	70	71 (1)
42	Tin Tsz Estate (south)	10.3	75 (5)	76 (6)	31.8	74 (4)	76 (6)	52.8	73 (3)	75 (5)

NSR	Name or Location of NSR	Low Level	Year 1999	Year 2018	Mid Level	Year 1999	Year 2018	High Level	Year 1999	Year 2018
		mPD	dB(A)	dB(A)	mPD	dB(A)	dB(A)	mPD	dB(A)	dB(A)
43	Tin Tsz Estate (south)	11.3	74 (4)	75 (5)	32.8	73 (3)	75 (5)	53.8	72 (2)	74 (4)
44	Tin Tsz Estate (east)	11.3	73 (3)	75 (5)	59.8	72 (2)	73 (3)	109.8	70	71 (1)
45	TWGHs Kwok Yat Wai College	11.5	72 (7)	72 (7)	18.3	72 (7)	73 (8)	28.5	72 (7)	73 (8)
47	Residence in Ping Shan (north)	5.8	69	68	-	-	-	-	-	-
48	Residence in Ping Shan (east)	5.9	66	66	8.9	66	67	11.9	67	67
49	Sheung Cheung Wai	5.3	62	65	8.3	63	66	11.3	64	66

Note : Figure in brackets indicates the level of predicted noise exceedance.

In general, the noise level changes in the future year at NSRs experiencing adverse impacts are in the range of -4 to +10 dB(A) and are attributed to the growth in traffic across the majority of the highway network and the realignment of Tin Fuk Road, Ping Ha Road and Tin Yiu Road. The highest increases in noise will be to the north-west of the Ping Ha Road and Tin Yiu Road, particularly at the proposed primary school in Area 3, as a result of the junction realignment.

The modifications at these junctions will also resume an existing earth bund noise barrier on the northern side of the eastbound carriageway. Noise barriers previously proposed by Territory Development Department along Ping Ha Road have been incorporated in the noise predictions. The predicted noise levels at the proposed secondary school (NSR 25) therefore drop for the future case, although noise exceedance of 2 dB(A) is identified as indicated in T*able 5.3b* given the limited length and height of TDD's proposed barrier. In this regard, KCRC has liaised with ED and agreed to re-erect a new noise barrier adjacent to the new highway boundary to maximise protection of the schools: the design of the barrier will be defined in this Study as well as the consideration of direct mitigation for adverse impacts at all affected NSRs.

The estimated indicative number of dwellings affected by the project would be about 360 in Tin Shui Wai, while there would be approximately 120 classrooms likely to be impacted by the EPIW during the operational phase.

5.3.3.3 Traffic Noise Levels in Tuen Mun Centre

Predicted traffic noise levels in Tuen Mun Centre are given in *Table 5.3c*. At NSRs identified within Tuen Mun Centre, there will be adverse impacts in both the prevailing and future scenarios. In the prevailing situation, adverse impacts in the range of 1 to 13 dB(A) occur at 15 of the 21 NSRs. While in the future case, adverse impacts in the range of 1 to15 dB(A) are predicted at 15 of the 21 NSRs.

In general, the noise level changes in the future year at NSRs experiencing existing adverse impacts will be in the range of -12 to +9 dB(A) owing to: traffic growth; the improvement works which will enhance the Pui To Road junction to the south of the station; the traffic in association with the operation of public transport interchange; and, the traffic management scheme that will attract/distribute traffic away from the NSRs to the north of the Station. The changes in the noise levels at NSRs, as presented in *Table 5.3c* reflect the difference between the prevailing and future traffic condition of the area. The reduction in the predicted noise levels at Hong Lai Garden (east) and St Simon's Lui Ming Choi Secondary School (NSRs 56 and 58) is due to the drop in traffic volume on Tuen Mun Heung Sze Wui Road of that particular section; while the noise levels increase at Ming Wai Building and Castle Peak Catholic Primary School in the future because of the increased traffic across the major road junctions next to the West Rail Tuen Mun Centre Station.

The dominant noise sources will be the unaltered road sections of Tuen Mun Heung Sze Wui Road and Pui To Road which cause noise exceedances at the NSRs. The noise impacts associated with the new road section identified for the study is minimal.

Table 5.3c Tuen Mun Centre EPIW - Predicted Noise Levels $L_{10, 1hour}$ (dB(A)) for the Prevailing Year and Future Year (1999 & 2018)

NSR	Name or Location of NSR	Low Level	Year 1999	Year 2018	Mid Level	Year 1999	Year 2018	High Level	Year 1999	Year 2018
		mPD	dB(A)	dB(A)	mPD	dB(A)	dB(A)	mPD	dB(A)	dB(A)
50	Hong Lai Garden (west)	25	60	61	73.5	65	66	123.5	65	66
51	Hong Lai Garden (east)	25	70	58	73.5	70	62	123.5	68	63
52	Hong King Building	9.6	62	71 (1)	19.1	62	70	24.6	63	69
53	Bit Hing Building	9.6	64	55	19.1	64	57	24.6	64	58
54	Honeley Court	19.9	74 (4)	63	42.3	71 (1)	66	67.5	69	67
55	St Simon's Lui Ming Choi Secondary School (south-west)	10.7	64	73 (8)	17.5	68 (3)	73 (8)	27.7	68 (3)	72 (7)
56	St Simon's Lui Ming Choi Secondary School (south-east)	10.7	69 (4)	62	17.5	69 (4)	66 (1)	27.7	68 (3)	66 (1)
57	St Simon's Lui Ming Choi Secondary School (south-west)	6.4	68 (3)	73 (8)	-	-	-	9.4	68 (3)	73 (8)
58	St Simon's Lui Ming Choi Secondary School (south-east)	6.4	75 (10)	66 (1)	-	-	-	9.4	75 (10)	67 (2)
59	Tuen Mun Mansion	9.2	65	65	18.7	65	66	24.2	64	67
60	Tai Hing Building	9.6	65	66	19.1	65	67	24.6	65	67

NSR	Name or Location of NSR	Low Level	Year 1999	Year 2018	Mid Level	Year 1999	Year 2018	High Level	Year 1999	Year 2018
		mPD	dB(A)	dB(A)	mPD	dB(A)	dB(A)	mPD	dB(A)	dB(A)
61	Koon Hing Building	9.6	75 (5)	75 (5)	19.1	74 (4)	75 (5)	24.6	74 (4)	74 (4)
62	Ming Wai Building (north)	9.6	76 (6)	77 (7)	19.1	75 (5)	76 (6)	24.6	74 (4)	75 (5)
63	Ming Wai Building (south)	9.6	79 (9)	80 (10)	19.1	77 (7)	78 (8)	24.6	76 (6)	77 (7)
64	Castle Peak Catholic Primary School (west façade)	10.2	78 (13)	79 (14)	18.7	76 (11)	78 (13)	27.2	75 (10)	77 (12)
65	Castle Peak Catholic Primary School (south façade)	10.2	77 (12)	80 (15)	18.7	76 (11)	79 (14)	27.2	76 (11)	79 (14)
66	Top Court	9.7	76 (6)	79 (9)	38.4	74 (4)	78 (8)	66.4	73 (3)	76 (6)
67	Man Shing Building	9.7	78 (8)	82 (12)	38.4	75 (5)	79 (9)	66.4	73 (3)	77 (7)
68	Kam Wah Garden (west)	24.2	73 (3)	76 (6)	72.7	73 (3)	76 (6)	122.7	71 (1)	74 (4)
69	Kam Wah Garden (north)	24.2	66	70	72.7	71 (1)	75 (5)	122.7	70	73 (3)
70	The Trend Plaza	24.2	75 (5)	78 (8)	72.7	71 (1)	74 (4)	122.7	69	72 (2)

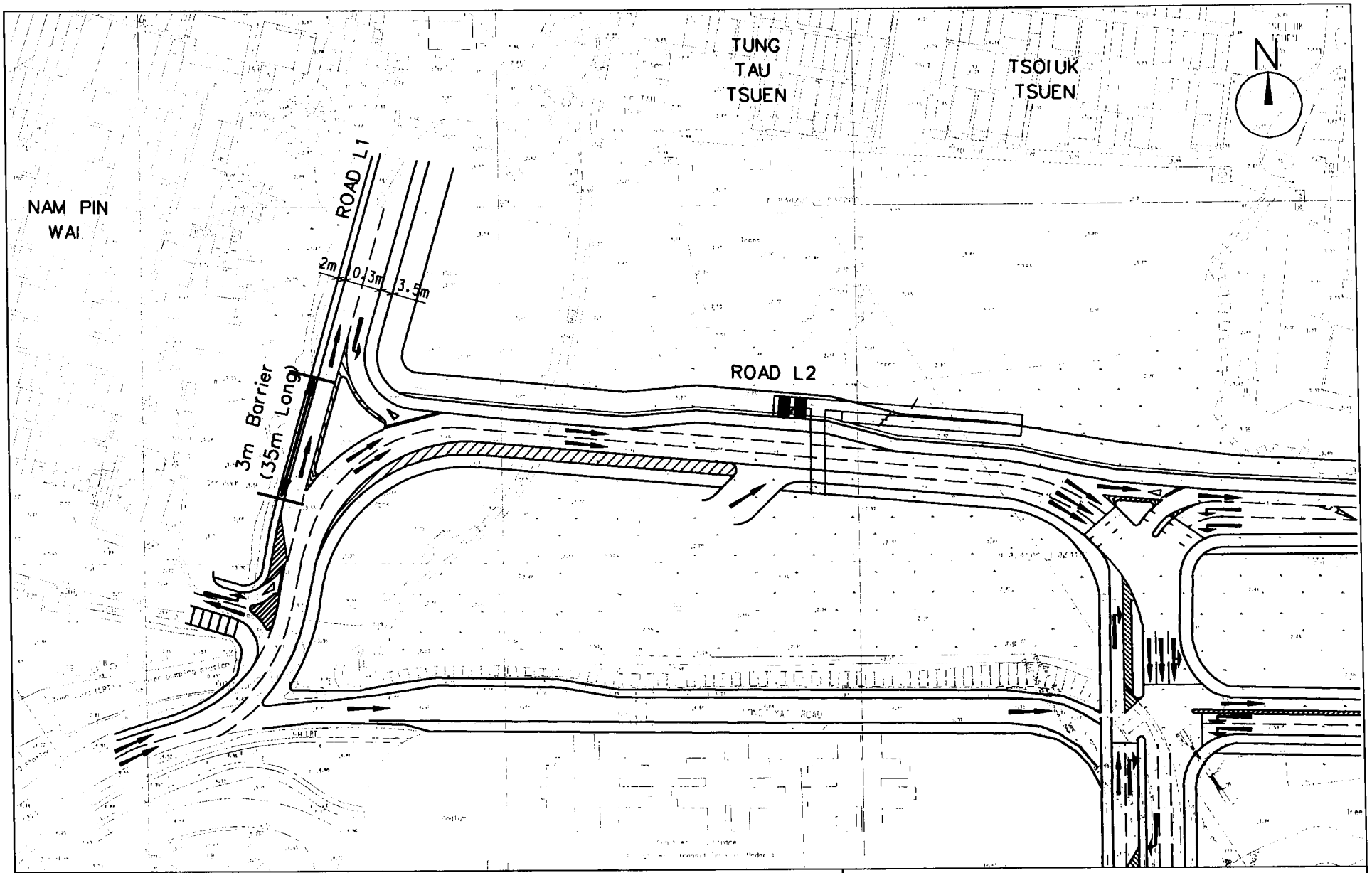
Note : Figure in brackets indicates the level of predicted noise exceedance.

5.3.4 Environmental Mitigation Measures During Operational Phase

The results of the assessment show that over half of the representative NSRs within the spatial scope of the Project will be adversely impacted with exceedances in the range of 1 to 13 dB(A) before work on the Project commences. Without the Project, such exceedances would only be exacerbated in the future fifteen years and beyond as a result of traffic growth. During the operational phase of the Project the number of adverse impacts will increase by just under ten *per cent* (by comparing the prevailing case and the worst future case), with exceedances in the range of 1 to 15 dB(A).

In accordance with the Study Brief, the Proponent is required to provide direct mitigation to new highways that contribute to noise exceedances or, where direct mitigation is not feasible or wholly ineffective, to provide indirect mitigation. The application of these assessment procedures and implementation of technical remedies is seen by HyD to be an opportunity to provide environmental improvements for noise sensitive property within the vicinity of the West Rail and in the wider context through the spatial scope of the Project.

For the design of barriers, reference has been made to Transport Department's *Transport Planning & Design Manual (TPDM)* which outlines the need to design barrier installations so as to preserve the driver's visibility of approaching traffic at road junctions. The *Manual* does not specify such visibility splay requirements for signalised junctions that will present in the Project and therefore guidance was taken from the



PROPOSED DIRECT ROAD TRAFFIC NOISE MITIGATION MEASURES, YUEN LONG

FIGURE 5.3g

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design recommendations for priority junctions which are given as a function of vehicle speed. With a vehicle speed of 50 kph, barrier installations (barriers located at the kerb side) on new roads should not encroach within 70m of any adjoining major road at signalised junctions in general, and within 50m of adjoining minor roads.

Based on the predictions of future road traffic noise and identified adverse impacts, direct noise mitigation has been reviewed in detail for Yuen Long, Tin Shui Wai and Tuen Mun Centre and is presented *Sections 5.3.4.1, 5.3.4.2* and *5.3.4.3*. It is the objective of this EIA Study to recommend mitigation measures and to assess any potential side effects in conjunction with the proposed noise mitigation measures.

5.3.4.1 Yuen Long

Figure 5.3g indicates the location of proposed noise barriers in Yuen Long. The mitigated future noise levels are presented in *Table 5.3d*.

A curb side barrier of 3 m high and 35 m in length is proposed on Road L1 (0.5 m from road kerb, starts at the location 28 m north of the village access of Nam Pin Wai, extending towards the north by 35 m) to protect the NSRs in Nam Pin Wai. A reflective barrier made of plexi-glass or concrete with a transmission loss of not less than 20 dB(A) (for road traffic noise spectrum) will be appropriate in this location and the barrier should be maintained by HyD to ensure the acoustic performance of the measure. The purpose of this barrier is to provide screening of traffic noise from Road L2 to Nam Ping Wai, about 25% of residential premises in Nam Ping Wai (those with sensitive facades facing east) will be protected.

Table 5.3d Yuen Long EPIW - Mitigated Noise Levels $L_{10, 1hour}$ (dB(A)) for the Future Year (2018)

NSR	Name or Location of NSR	Low Level		Mid Level		High Level	
		mPD	dB(A)	mPD	dB(A)	mPD	dB(A)
1	Nam Pin Wai (west)	5	71 (1)	7.2	72 (2)	11	72 (2)
2	Tai Wong Temple - Nam Pin Wai	5.5	65	-	-	8.5	65
3	Nam Pin Wai (south-west)	4.5	72 (2)	7.5	72 (2)	10.5	73 (3)
4	Nam Pin Wai (south)	4.5	72 (2)	7.5	72 (2)	10.5	72 (2)
5	Shung Tak School	4.4	73 (8)	-	-	7.4	74 (9)
6	Nam Pin Wai (east)	4.5	68	7.5	69	10.5	70
7	Tung Tau Tsuen	4.6	70	7.6	70	10.6	70
8	Tsoi Uk Tsuen	4.9	69	7.9	69	10.9	69
9	Ying Lung Wai	4	69	7	69	10	69
10	Tai Wai Tsuen (west)	4.5	68	7.5	69	10.5	69
11	Tai Wai Tsuen (east)	4.5	69	7.5	69	10.5	70
12	Sun Yuen Long Centre (north-west)	34.5	56	70.5	67	109.5	67

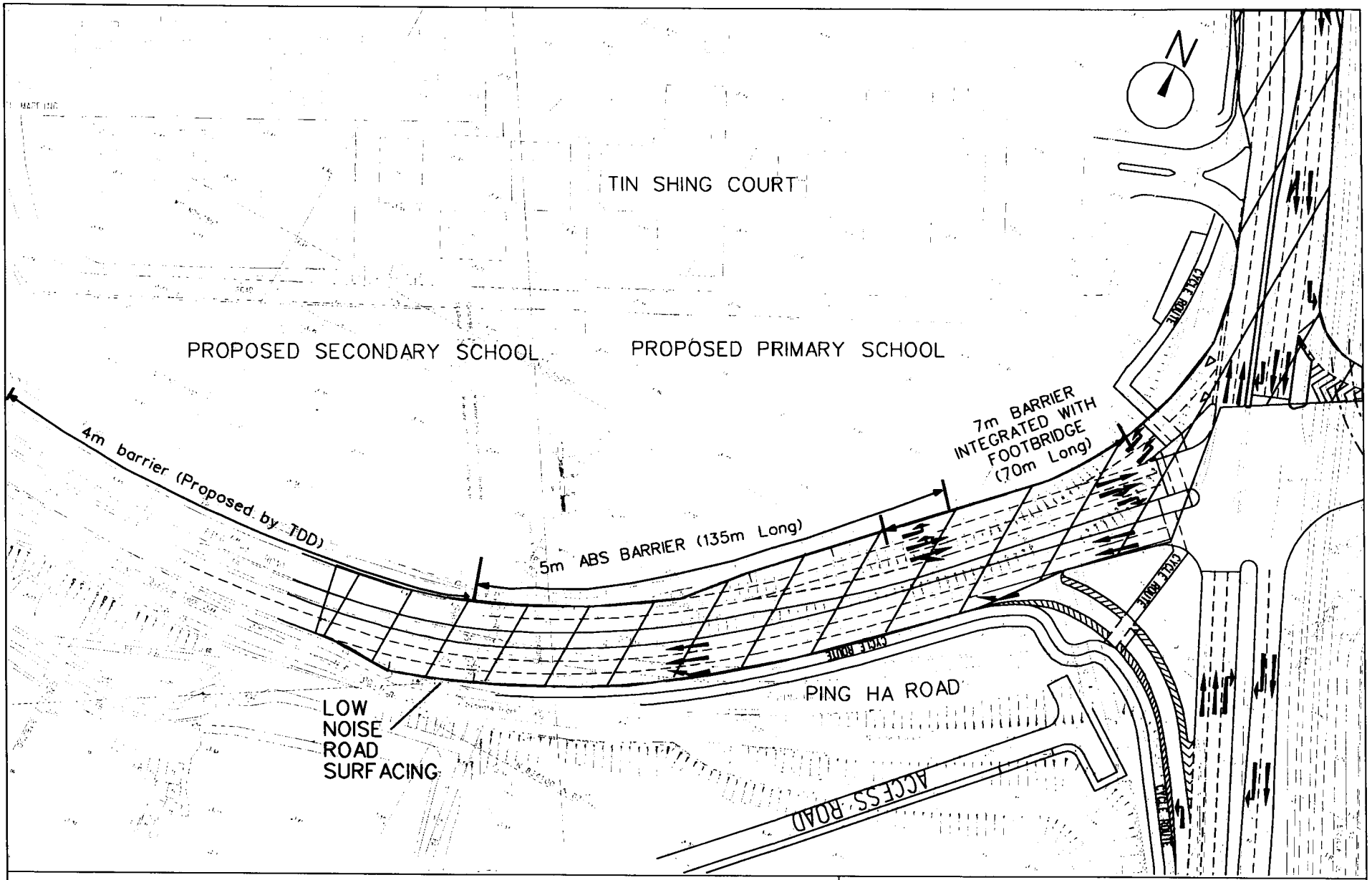
NSR	Name or Location of NSR	Low Level		Mid Level		High Level	
		mPD	dB(A)	mPD	dB(A)	mPD	dB(A)
13	Sun Yuen Long Centre (north-east)	34.5	46	70.5	58	109.5	59
14	Sun Yuen Long Centre (west)	34.5	69	70.5	71 (1)	109.5	71 (1)
15	Sun Yuen Long Centre (south)	34.5	63	70.5	76 (6)	109.5	74 (4)
16	Sun Yuen Long Centre (south)	34.5	60	70.5	74 (4)	109.5	73 (3)
17	CDA Development in Area 15 (north-west)	37.7	68	89.2	72 (2)	145.2	70
18	CDA Development in Area 15 (north-east)	37.7	62	89.2	69	145.2	66
19	CDA Development in Area 15 (south-west)	37.7	79 (9)	89.2	77 (7)	145.2	75 (5)
20	CDA Development in Area 15 (south)	37.7	79 (9)	89.2	76 (6)	145.2	74 (4)
20a	CDA Development in Area 12 (north)	27	81 (11)	83.5	78 (8)	141.5	76 (6)
21	Shap Pat Heung Rural Committee Building	5.9	84 (14)	-	-	8.9	84 (14)
22	Cheong Wai	12.1	83 (13)	39.1	80 (10)	69.6	78 (8)
23	Far East Consortium Yuen Long Building	19.4	80 (10)	46.4	79 (9)	76.4	77 (7)

Note : Figure in brackets indicates the level of predicted noise exceedance.

The NSRs at Nam Pin Wai facing Long Yip Street and those with sensitive facades facing west are affected by the noise from Long Yip Street and Yuen Long On Lok Road. In arriving at the final mitigation solution, the following considerations have been taken during the course of the EIA and engineering studies :

- The application of direct technical remedies to provide further protection to Nam Pin Wai is limited by the project boundary and the access to Nam Ping Wai village. Further increasing the height of the proposed 35 m long noise barrier was found to be acoustically ineffective in view of the low-rise nature of the sensitive premises. Subject to the alignment of any future road extension to the north of Road L1 and the future traffic conditions, additional technical remedies within or beyond the project limit may be required to protect the residents of Nam Pin Wai. However, this is outside the scope of this study and should be undertaken by the proponent of the future extension..

- The NSRs of Sun Yuen Long Centre and CDA Development in Areas 12 and 15 would be affected by the traffic on Long Yat Road, Road 6/L3 and Castle Peak Road. Both developments are constructed on podia which provide a degree of self noise screening but not sufficient to protect from all residual exceedances. However, given the characteristics of the area, further opportunity to implement more mitigation is heavilly constrained. The use of roadside barriers will not be effective given the high-rise nature of the nearby noise sensitive premises. In addition, the use of cantilever barrier, semi-enclosure or full noise cover to protect these premises is not feasible as Long Yat Road serves as an emergency vehicle access for these developments and such measures would otherwise create obstruction to fire services in the case of an



PROPOSED DIRECT ROAD TRAFFIC NOISE MITIGATION MEASURES ON PING HA ROAD, TIN SHUI WAI

FIGURE 5.3h

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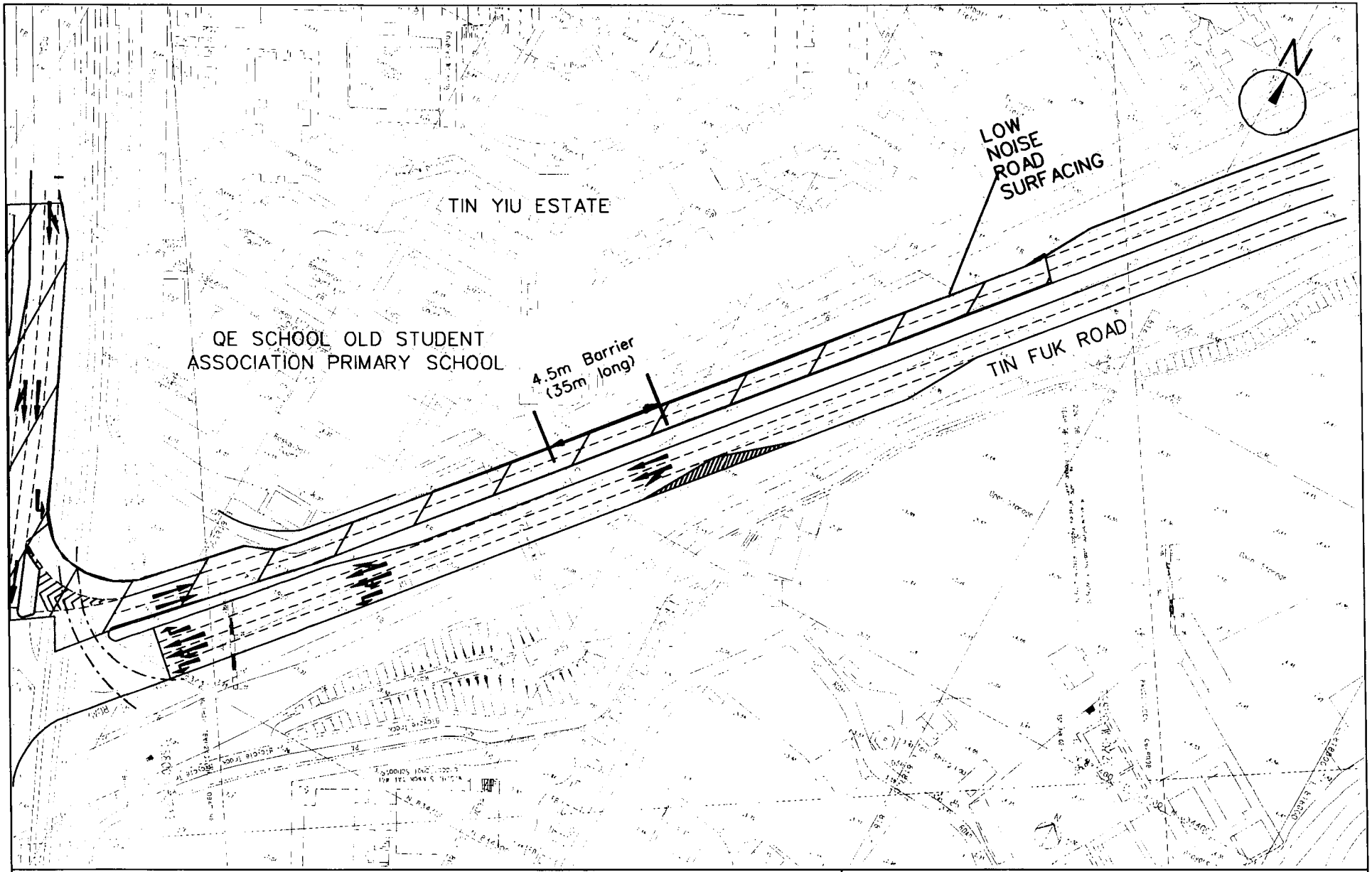

PROPOSED DIRECT ROAD TRAFFIC NOISE MITIGATION MEASURES ON TIN FUK ROAD, TIN SHUI WAI

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FIGURE 5.3i

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emergency. And finally, the high percentage of heavy vehicles (exceeding 35%) in the traffic streams along Long Yat Road and Castle Peak Road for the future worst prediction year will render the use of low noise road surfacing within the scope of EPIW as not being feasible.

The remaining NSRs with adverse noise impacts, such as Cheong Wai and Far East Consortium Yuen Long Building, would predominantly be affected by the unaltered sections of Castle Peak Road (not subject to physical alteration in the Project) and are beyond the boundary of the Project. Direct technical remedies could therefore not be provided by the Proponent in these locations and, indeed, the properties would not be eligible for noise insulation under the ExCo Directive.

With the proposed feasible direct remedies, the NSRs of Nam Pin Wai (those facing Roads L1 and L2) would be protected. The estimated number of dwellings protected by the proposed measure would be about 70. In other areas, noise exceedances in the range of 1 to 14 dB(A) will be unavoidable at 14 NSRs as a result of the above highlighted constraints. Therefore, as last resort, the requirement for indirect technical remedies to protect the affected NSRs will be considered and addressed in *Section 5.3.5*.

Figures showing the alternative mitigation strategies considered in this study are presented in Annex G.

5.3.4.2 Tin Shui Wai

Figures 5.3h-i indicate the location of the proposed final noise barrier mitigation scheme and the extent of low noise road surfacing recommended in Tin Shui Wai for the Project. *Table 5.3e* below presents the results of mitigated noise levels. These measures have been proposed following analysis of environmental and engineering constraints during the course of this study.

Low noise road surfacing is considered in this area as the percentage heavy vehicles will be less than 35 %. The surface is designed to reduce tyre noise generated by the rolling action between tyres and road surface (see *Annex F* regarding the agreement on the use of low noise road surfacing for this EIA Study). The factors affecting the quantity of sound energy emitted with respect to this rolling action include vehicle speed, tyre loading and structure and road surface texture. According to CRTN, for impervious bituminous and concrete road surfaces, the reduction in tyre noise is 1 dB(A) for any traffic speed not higher than 75 kph. While for low noise road surfacing, CRTN specifies a reduction of 3.5 dB(A) for all traffic speeds. In Hong Kong, low noise road surfacing is normally made of pervious macadam.

During the course of the study alternative mitigation proposals have been considered and rejected because of certain practical constraints. These discarded options have included the following :

- Extensive high barriers up to 9.5 m in height were initially considered to protect the high-rise developments in the vicinity of the EPIW and close to the junction of Ping

Ha Road/Tin Yiu Road/Tin Fuk Road. While such barriers would have afforded full protection to all of the noise sensitive property, having considered the potential visual intrusion to the residents and other engineering constraints to the Project including sight-line requirement, spatial requirement for foundation of tall barriers, conflicts with existing sub-surface utilities, highway maintenance and road safety issues, a combination of both low noise road surface and lower height barriers that avoided these restrictions has been taken forward.

- Another set of options based upon a semi-enclosure and full noise cover of the highways have been considered for this area in the early stage of the Study. However, these too were also rejected in favour of the proposed mitigation strategy as the measures would have resulted in spatial conflict with other essential environs, road safety problems, unattainable highway maintenance implications, emergency access restrictions as well as sight-line issues.

Figures showing some of the discarded mitigation options are presented in Annex G.

In the final proposed mitigation scheme, the road segments around the junction of Tin Fuk Road, Tin Yiu Road and Ping Ha Road are proposed to be surfaced with low noise road surface(see *Figures 5.3h* and *5.3i*). The extent will cover the east bound carriageway of Tin Fuk Road (approximately 290 m long), Tin Yiu Road (north and south bound carriageways, approximately 120 m long) and Ping Ha Road West (east and west bound carriageways, approximately 240 m long). In order to maintain the acoustic performance of this surface, the Highways Department will conduct routine site inspection regarding any defects, cracks or other physical deterioration and provide re-surfacing as and when required.

The final noise barrier scheme will comprise a 5 m high absorptive noise barrier of length 135 m adjacent to the outside edge of drainage reserve, along the school boundary of Area 3 and next to the eastbound carriageway of Ping Ha Road. The Project Proponent will provide a non-reflective barrier made of absorptive panels with a transmission loss of not less than 20 dB(A) (for road traffic noise spectrum) and sound absorption coefficient of not less than 0.9 in the 125 Hz to 2 kHz frequency range will be required. In addition, a reflective noise barrier of 7 m high, 70 m long, situated at a setback of 2 m from road kerb will also be provided along Ping Ha Road. This barrier will be constructed of plexi-glass or concrete with a transmission loss of not less than 20 dB(A) (for road traffic noise spectrum). The design of this barrier will also be integrated with the proposed footbridge. All the proposed noise barriers will be maintained by HyD to ensure the acoustic performance of the measure for protecting the NSRs.

The purpose of these barriers is to protect the proposed primary and secondary schools in Area 3. The use of absorptive barrier is to minimise potential noise reflection adversely affecting the proposed sensitive development above the West Rail Station PTI; the development will otherwise take full account of EPIW infrastructure. The 4 m high noise barrier along Ping Ha Road previously proposed by TDD has been considered in the noise predictions together with the direct measures recommended in this Study.

With the final package of mitigation, noise reductions in the range of 1 to 15 dB(A) will be achieved but there will be unavoidable residual impacts of up to 6 dB(A) at the proposed schools. However, further increasing the barrier height will not be effective for the schools. In addition, the linear extent of treatment in these locations has been maximised within the boundary of the Project with due regard to the sight line requirements at the Ping Ha Road and Tin Yiu Road junction and therefore no further avenues exist by which the criteria may be met by the use of direct technical remedies.

For Tin Yiu Estate, a 4.5 m high noise barrier of 35 m long, 1m from road kerb is proposed in conjunction with low noise road surface, as indicated in *Figure 5.3i*, to be integrated with the proposed footbridge located adjacent to the eastbound carriageway of Tin Fuk Road. The Project Proponent will provide a reflective barrier made of plexi-glass or concrete with a transmission loss of not less than 20 dB(A) (for road traffic noise spectrum) and this will be fully maintained by Highways Department. Residual noise impacts of up to 5 dB(A)would remain at QE School Old Student's Association Primary School. The provision of further direct mitigation is limited by the sight line requirements at the Tin Yiu Road and Tin Fuk Road junction, spatial constraints caused by the drainage reserve of Ping Shan culvert, room for pedestrian access and the planned LRT reserve.

Table 5.3e Tin Shui Wai EPIW - Mitigated Noise Levels $L_{10, 1hour}$ (dB(A)) for the Future Year (2018)

NSR Identity	Description	Low Level		Mid Level		High Level	
		mPD	dB(A)	mPD	dB(A)	mPD	dB(A)
24	Proposed Secondary School (west)	7.5	68 (3)	14.3	68 (3)	24.5	68 (3)
25	Proposed Secondary School (south)	11.8	57	18.6	60	28.8	65
26	Tin Shing Court (west)	11.8	64	60.3	68	110.3	69
27	Proposed Primary School	11.8	55	18.6	65	28.8	70 (5)
28	Proposed Primary School (east)	11.8	57	18.6	65	28.8	71 (6)
29	Tin Shing Court (east)	11.4	68	59.9	70	109.9	69
30	Tin Shing Court (south)	11.8	56	60.3	69	110.3	68
31	Tin Shing Court (east)	11.4	67	59.9	67	109.9	66
32	Tin Shing Court (north)	11.8	68	60.3	68	110.3	67
33	QE School Old Student's Association Primary School	12.0	64	18.8	67 (2)	29.0	70 (5)
34	Yiu Hong House (west)	11.3	71 (1)	59.8	70	109.8	68
35	Yiu Hong House (east)	11.5	58	59.8	68	109.8	67
36	Yiu Foo House (south) – Tin Yiu Estate	11.1	67	59.6	69	109.6	67
36a	Yiu Foo House (west) – Tin Yiu Estate	11.1	67	59.6	68	109.6	67
37	Yiu Foo House (north) – Tin Yiu Estate	11.1	67	59.6	68	109.6	67
38	Yiu Yat House – Tin Yiu Estate	11.1	70	59.6	68	109.6	67

NSR Identity	Description	Low Level		Mid Level		High Level	
		mPD	dB(A)	mPD	dB(A)	mPD	dB(A)
39	Yau Hong House	11.0	69	59.5	68	109.5	66
40	Yau Ning House	11.4	71 (1)	59.9	70	109.9	69
41	Tin Tsz Estate (west)	10.3	73 (3)	58.8	72 (2)	108.8	71 (1)
42	Tin Tsz Estate (south)	10.3	76 (6)	31.8	76 (6)	52.8	75 (5)
43	Tin Tsz Estate (south)	11.3	75 (5)	32.8	75 (5)	53.8	74 (4)
44	Tin Tsz Estate (east)	11.3	75 (5)	59.8	73 (3)	109.8	71 (1)
45	TWGHs Kwok Yat Wai College	11.5	71 (6)	18.3	72 (7)	28.5	72 (7)
47	Residence in Ping Shan (north)	5.8	68	-	-	-	-
48	Residence in Ping Shan (east)	5.9	66	8.9	66	11.9	67
49	Sheung Cheung Wai	5.3	65	8.3	66	11.3	66

Note : Figure in brackets indicates the level of predicted noise exceedance.

Residual noise impacts of 1 to 6 dB(A) were predicted at the residential blocks of Tin Tsz Estate owing to the predominance of noise from the unaltered Tin Shing Road and Tin Fuk Road. However, since the highways are outside of the Project boundary, the application of further direct technical remedies is not practicable.

The further application of direct technical remedies to protect TWGHs Kwok Yat Wai College is adversely restricted by sight line requirements as the predicted impacts were caused by the traffic on Tin Fuk Road, Ping Ha Road and the road junction; screening of these sections of highway would create poor forward visibility for drivers at the junction. However, as the school will be equipped with suitable window glazing and air-conditioning prior to the West Rail Phase I station construction works commencing, adverse impacts at this NSR are not expected during the operational phase of the EPIWs.

After exhausting all possible mitigation alternatives but developing a workable proposal of barriers and low noise road surface, some residual adverse impacts are still predicted at the schools only. The number of affected classrooms reduced to about 110 with the proposed measures and all the noise impacts previously identified at the residential dwellings in conjunction with the EPIW could be reduced. Accordingly,. the requirements for indirect technical remedies to protect the affected schools will be considered and addressed in *Section 5.3.5*.

5.3.4.3 Tuen Mun Centre

The assessment results indicate that adverse impacts at NSRs are dominated by existing or unaltered roadways and not from the new road section identified for the Study. Given the potential constraints such as sight-line requirement and spatial constraints adjacent to the new roadway section identified, no direct technical remedies have been proposed for Tuen Mun Centre. Indirect technical remedies will therefore be considered.

5.3.5 Residual Impacts and Noise Insulation Eligibility

In the preceding section, direct technical remedies in the form of roadside barriers and low noise road surfacing are proposed in order to mitigate adverse impacts. Given the potential traffic constraints such as visibility splay and road safety aspect, emergency access requirements, the boundary limits of Project and presence of DSD culverts, the use of direct technical remedies will not fully mitigate adverse impacts within the spatial scope of the Project.

Since the use of direct technical remedies were seen to be exhausted, the residual noise impacts at NSRs were assessed against the noise insulation criteria embodied in the *ExCo Directive, Equitable Redress for Persons Exposed to Increased Noise Resulting From The Use of New Roads*.

The assessment results are detailed in *Annex F* and *Table 5.3f* summarises the NSRs eligible for noise insulation. As an initial indication and for the Project Proponent to determine the type of insulation for schools, in conjunction with the requirements for the construction phase, the type of insulation for NSRs is defined.

According to EIA TM, the type of noise insulation, if proved to be eligible for existing NSRs, depends on the level of noise exceedance over the standard limit (i.e. 70 dB(A) for residential uses and 65 dB(A) for schools). For adverse impacts less than 10 dB(A), Type I noise insulation would be required: this specifies existing openable well-gasketted window, 6 mm pane, or transmission loss (TL) of 28 dB or above in the 250 Hz octave band and sound transmission class (STC) 31 or above. For predicted noise exceedances equal to 10 dB(A) or below 15 dB(A), Type II insulation would be required: openable well-gasketted window, 8 mm pane, or transmission loss (TL) of 32 dB or above in the 250 Hz octave band and STC 34 or above. For habitable rooms with adverse impacts, provided the transmission loss of the existing glazing systems meets with these requirements and air conditioners are already installed, no further work would be required. However, thorough site inspection and sample sound transmission loss testing will be required to confirm the extent of works. This would be undertaken by the Project Proponent between the EIA approval and the opening of the Project

As the developments in CDA 12 and CDA 15 of Yuen Long are not fully developed, it is the purpose of this Study to define an approximate scope of indirect measures required to protect the future residents due to the noise impacts associated with the Project. Should additional noise insulation be required as a result of this Study, there will be adequate opportunity to install the works prior to occupation by agreement between the Project Proponent and the developer.

For St Simon's Lui Ming Choi Secondary School, the noise impacts predicted are attributed to the traffic on a new access ramp of West Rail Station, which is outside the scope of the Designated Project under the EIAO. As previously mentioned in *Section 4*, this school will be upgraded and noise abatement measures will be provided by ED to relieve the traffic noise issues. For existing school eligible for noise insulation (i.e. QE School Old Student's Association Primary School), the glazing system should be checked

against the specifications mentioned above and should be reviewed with respect to the adequacy of indirect measures adopted. These should be undertaken by the Project Proponent before the opening of the roadworks through site inspection and sample sound transmission loss testing. The glazing system for the affected school should be upgraded by the Project Proponent in accordance with the recommendations made in this EIA Study if the existing systems are found to be inadequate. All the installation works or upgrading of existing glazing systems must be implemented before the commissioning of the EPIWs.

Table 5.3f Noise Sensitive Receivers Eligible for Noise Insulation

NSR Identity	Description	Type of Insulation Proposed
Yuen Long		
15 & 16	Sun Yuen Long Centre (Block 5, facades facing Long Yat Road and Castle Peak Road (road segment within EPIW scope), 3/F to top floor, about 180 dwellings requires noise insulation)	Type I
17 & 19	CDA Development in Area 15 (Blocks 1, 2 and 3, facades facing Long Yat Road and Castle Peak Road (road segment within EPIW scope): for Blocks 1 and 2, 1/F to top floor require noise insulation and for Block 3, 5/F to 36/F)	Type I
20a	CDA Development in Area 12 (Blocks 1 and 2, facades facing Castle Peak Road (road segment within EPIW scope) and those facades have a direct line of sight to Long Yat Road, 1/F to top floor)	Type II (1/F to 10/F) and Type I (11/F to top floor)
Tin Shui Wai		
		I
33	QE School Old Student's Association Primary School (classrooms facing road junction, 5/F to top floor, about 15 classrooms requires noise insulation)	Type I

5.4 Conclusion

Unmitigated construction activities associated with the Project would cause exceedances of daytime construction noise standards stipulated in EIA TM at most of the nearby NSRs. Noise exceedances in the range of 1 to 12 dB(A) have been predicted at Yuen Long. NSRs at Tin Shui Wai and Tuen Mun Centre would also be adversely impacted by the works, with predicted exceedances of up to 18 dB(A) and 14 dB(A) respectively. The critical noisy construction activities identified were excavation works during various construction stages and road paving in road construction.

Adequate control measures would be required for construction works to meet the EIA TM daytime construction noise criteria. Mitigation measures including good site practices, use of quiet plant, installation of temporary noise barriers, reduce the percentage of time of noisy equipment in operation, avoidance of simultaneous construction activities on sites and substitution of particular noisy equipment were

recommended. Regular monitoring of noise at NSRs would be required during the construction phase of the Project in order to ensure the environmental performance of the works. The monitoring requirements and implementation schedule for mitigation measures are addressed in *Sections 11* and *12* respectively.

With the adoption of appropriate measures as stated above and the implementation of an effective monitoring exercise which would draw the contractor's attention to any excessive impact and to trigger appropriate corrective actions, it is expected that the residual impacts can be reduced to acceptable levels in accordance with the EIA TM requirements.

Operational road traffic noise impact is a key issue raised by this EIA Study. Based upon the worst case traffic forecasts of year 2018, unmitigated noise impacts would be likely at most of the identified NSRs within the locality of the Project although the majority of these are already adversely affected prior to the opening of the EPIWs. The use of direct technical remedies including roadside barriers and low noise road surfacing for the proposed scheme has been considered in Yuen Long and Tin Shui Wai, taking account of existing and potential engineering constraints for each site, and other controlling factors including visibility splay at junctions, presence of drainage reserve and proposed footbridge.

With an exhaustive research of direct measures being completed, the residual noise impacts have been assessed against the noise insulation criteria. The Study finds that there will be three residential developments in Yuen Long (Sun Yuen Long Centre, residential development in CDA 12 and CDA15) and one school in Tin Shui Wai (QE School Old Student's Association Primary School) eligible to be considered for noise insulation. Type I and II noise insulation are required for the EPIWs and the existing/proposed noise insulation works under other projects will need to be reviewed in order to satisfy this requirement.

The recommended mitigation measures for the EPIWs are given in *Table 5.4a*.

Table 5.4a - Summary of Recommended Mitigation Measures During Construction and Operation of the Project

EPIW	Recommended Mitigation Measures
Yuen Long	
• Construction Phase	◊ Good site practice;
	◊ Use of quiet construction plant on all work sites and adopt quieter construction method;
	◊ Install noise barriers next to all operating construction equipment at work sites (within a separation distance of 20 m) close to Shung Tak School, Nam Ping Wai, Ying Lung Wai, Tai Wai Tsuen, residential development in CDA 12 and CDA15;
	◊ Restriction of plant usage (quiet plant) at work sites for drainage works, road construction and barrier construction (within a separation distance of 20 m) to protect Shung Tak School, Nam Ping Wai, Tai Wai Tsuen, residential development in CDA

EPIW	Recommended Mitigation Measures
	12 and CDA15; and
	◊ Avoidance of simultaneous noisy activities or construction works near Shung Tak School and residential development in CDA 12.
	◊
• Operational Phase	◊ 3 m high noise barrier (35 m long) on Road L1 to protect the residence of Nam Ping Wai; and
	◊ Use of indirect technical remedies, in the form of suitable window glazing and air-conditioning to protect the affected NSRs (Sun Yuen Long Centre, residential development in CDA 12 and CDA15).
Tin Shui Wai	
• Construction Phase	◊ Good site practice;
	◊ Use of quiet construction plant on all work sites and adopt quieter construction method;
	◊ Install noise barriers next to all operating construction equipment at all work sites to protect the nearby NSRs;
	◊ Limit the plant usage on all work sites for drainage works, road construction and barrier construction to protect the nearby NSRs;
	◊ Avoidance of simultaneous noisy activities or construction works near the proposed schools in Area 3, QE School Old Student's Association Primary School, Tin Yiu Estate and TWGHs Kwok Yat Wai College; and
	◊ Use lorry of 10t or other model with a SWL of 98 dB(A) or lower to substitute dump truck within work sites close to the proposed schools in Area 3, QE School Old Student's Association Primary School, Tin Yiu Estate and TWGHs Kwok Yat Wai College, further limiting the plant usage on site may be required.
• Operational Phase	◊ 5 m high absorptive noise barrier (135 m long) on the outside edge of drainage reserve and next to the eastbound carriageway of Ping Ha Road;
	◊ 7m high barrier (70 m long) next to the eastbound carriageway of Ping Ha Road and integrated with the proposed footbridge;
	◊ Use of low noise road surfacing on the east bound carriageway of Tin Fuk Road (approximately 290 m long), Tin Yiu Road (north and south bound carriageways, approximately 120 m long) and Ping Ha Road West (east and west bound carriageways, approximately 240 m long);
	◊ 4.5 m high barrier integrated with the proposed footbridge at Tin Fuk Road (35 m long); and
	◊ Use of indirect technical remedies, in the form of suitable window glazing and air-conditioning to protect the affected NSR (QE School Old Student's Association Primary School).
Tuen Mun Centre	
• Construction Phase	◊ Good site practice;
	◊ Use of quiet construction plant on all work sites and adopt quieter construction method;
	◊ Install noise barriers to protect the affected NSRs including St Simon's Lui Ming Choi

EPIW	Recommended Mitigation Measures
	Secondary School, Koon Hing Building, Ming Wai Building, Castle Peak Catholic Primary School and Top Court; ◊ Limit the plant usage on-site during drainage works and road construction protect the nearby NSRs including Koon Hing Building, Ming Wai Building, Castle Peak Catholic Primary School and Top Court ; ◊ Avoidance of simultaneous noisy activities or construction works near Koon Hing Building, Ming Wai Building, Castle Peak Catholic Primary School and Top Court; and ◊ Use lorry of 10t or other model with a SWL of 98 dB(A) or lower to substitute dump truck within work sites close to Koon Hing Building, Ming Wai Building and Castle Peak Catholic Primary School further limiting the plant usage on site may be required.
• Operational Phase	◊ None required.

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6. AIR QUALITY IMPACT ASSESSMENT

6.1 Introduction

This section presents the potential air quality impacts on ASRs during the construction phase and operational phase of the road networks near the West Rail Yuen Long, Tin Shui Wai and Tuen Mun Centre stations. Dust impact upon the ASR is the major issue during the construction phase, while vehicle emissions are the major source of pollutants during the operation phase. Mitigation measures will be recommended, where necessary, to reduce the identified impacts on the ASRs to acceptable levels.

6.2 Construction Phase

6.2.1 Potential Sources of Impacts

Dust nuisance is the major potential impact during the construction phase of the roadworks. The major construction works of the Project in Yuen Long, Tin Shui Wai and Tuen Mun Centre are outlined below:

- the improvement of the new distributor roads A1, L1, L2, L3, 6/L3, PTI access and Castle Peak Road;
- the improvement of the junction on Tin Fuk Road and Ping Ha Road; and the widening of Tin Fuk Road, Ping Ha Road and Tin Yiu Road; and
- the improvement of the junctions at Pui To Road and Tuen Mun Heung Sze Wu Road, Yan Ching Street and Tuen Mun Heung Sze Wui Road, Kin Fung Circuit and Tsun Wen Road and Tsun Wen Road and Pui To Road; and widening of Kin Fung Circuit, Pui To Road, Ho Pong Street, Tuen Mun Heung Sze Wui Road and Yan Ching Street.

General road work activities such as materials handling, top soil removal, site clearance and wind erosion are the main dust generating sources. As the worksites will be small and restricted by existing highway boundaries, excavated fill materials will be transported off-site and therefore, stockpiling is not expected. Also, the existing road networks will be used as the route for transportation, and haulage within the small worksite is not expected.

SO_2 and NO_2 will be emitted from the diesel-powered mechanical equipment used on-site. However, the number of such plant required on-site will be limited and gaseous emissions will be minor. It is therefore not expected to cause an exceedance of the AQO for these pollutants due to the limited construction plant on site.

Due to the small scale of the sites, the volume of excavated material and the rate of excavation are anticipated to be low. It is therefore, expected that the dust impact due to the improvement work is low. However, in order to ensure the environmental performance of construction works, environmental control and mitigation measures are

recommended and checked by environmental monitoring and audit to ensure that the dust criteria will be satisfied. The mitigation measures are described in *Section 6.2.2*.

6.2.2 Mitigation Measures During Construction Phase

Under the *Air Pollution (Construction Dust) Regulation*, the following requirements should be followed and incorporated in the contract specification to limit the dust emission from the site:

- the heights from which materials are dropped should be controlled to a minimum practical height to control fugitive dust arising from unloading;
- materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport;
- water sprays should be applied to maintain the worksite wet;
- all dusty materials should be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet;
- the load carried by the vehicle should be covered by clean impervious sheeting to ensure that the dusty materials do not escape from the vehicle; and
- the excavation working area should be sprayed with water after the operation so as to maintain the entire surface wet.

6.2.3 Residual Impacts

With the implementation of the above suggested mitigation measures, the dust emissions from the site should be minimised and residual adverse impacts on the nearby sensitive receivers are not expected. To scrutinise the effectiveness of the recommended dust control measures, environmental monitoring is recommended to ensure that dust levels during the construction are controlled to within the specified dust criteria. The locations and requirements of dust monitoring are identified in *Section 11*.

6.2.4 Cumulative Impacts

Although the exact programming of the construction works has still to be finalised, it is currently envisaged that the construction period for each of the EPIW will be approximately one year. The EPIW construction works are expected to be undertaken either partially in advance of, or in parallel with the construction for the West Rail station works. The potential for cumulative dust impact therefore exists, and this is discussed below.

Yuen Long

The *West Rail EIA Report* concluded that the major dust source during the construction of Yuen Long station would be from the concrete batching plants sited at Nam Pin Wai and Tung Tau Tsuen. It is proposed that the batching plant will be located to the west of Nam Pin Wai (the worst affected ASR identified in the West Rail EIA Report); whilst the

site of the EPIW works is located to the east of Nam Pin Wai. As a consequence, Nam Pin Wai is predicted to experience dust impact from the batching plant under the influence of a westerly wind, however, Nam Pin Wai would only potentially receive dust impacts from the EPIW site under the influence of an easterly wind. It is therefore considered unlikely that cumulative dust impacts will be experienced at Nam Pin Wai from the West Rail station construction works and EPIW works.

Tin Shui Wai

According to the *West Rail EIA Report*, the dust impact at the identified ASRs from the station construction works is low and lower than the dust criteria by 14%. As the scale of the EPIW is small, cumulative dust impact will be low and within the dust criteria.

Tuen Mun Centre

Similar to the construction of Yuen Long Station, the major dust source associated with the construction of the West Rail Station is predicted to be the concrete batching plant located to the west of the Lui Ming Choi Secondary School (the worst affected ASR). A high dust impact was identified at this receiver position in the West Rail EIA Report. However, the high dust emissions were assumed in the West Rail EIA Study as a worst case scenario. In actuality, the emissions from the concrete batching plant will be controlled through the implementation of the measures defined within the Best Practicable Means Requirement for Cement Works (Concrete Batching Plant). Emission from the batching plant may therefore be reduced to 15% of the total emission from the site, i.e., the potential dust contribution from the batching plant is likely to be reduce to 15% of that stated in the West Rail EIA Report. In addition, as the scale of the EPIW works is small and the dust impacts will be low, any potential cumulative dust impacts are predicted to be within the required dust criteria.

6.3 Operational Phase

6.3.1 Potential Sources of Impact

With the operation of West Rail Yuen Long, Tin Shui Wai and Tuen Mun Centre Stations, and the associated supporting facilities such as public transport interchanges, traffic flows within the study areas will be increased. The increased traffic volumes will give rise to air quality impacts at adjacent sensitive developments. Vehicular exhaust will be the major source of impacts, and pollutants like NO_2, CO and RSP have been identified as the major components of vehicle exhaust for the assessment.

6.3.2 Assessment Methodology

Nitrogen dioxide (NO_2), carbon monoxide (CO) and respirable suspended particulates (RSP) are considered as the major pollutants associated with the vehicular exhaust emission. The emission factors for each of these pollutants are based on *EURO III* criteria. Cumulative air quality impact taking account of air emissions from traffic on existing road networks, new distributor roads and the widened road networks will be

assessed. Castle Peak Road - Yuen Long, Ping Ha Road and Tuen Mun Heung Sze Wui Road, being the major road of Yuen Long, Tin Shui Wai and Tuen Mun area, is the major pollutant source of the areas. The total traffic flow of Castle Peak Road, Ping Ha Road and Tuen Mun Heung Sze Wui Road including the traffic breakdowns and vehicle exhaust emission rates for the year 2003, 2011 and 2018 have been forecasted and presented in *Tables 6.3 a, 6.3 b* and *6.3 c* respectively. The details of the traffic breakdown and the emission calculations for each link are presented in *Annex H*.

Table 6.3a NO_x Emission Rate from Castle Peak Road - Yuen Long

	Year 2003	Year 2011	Year 2018
Total Traffic Flow (veh/hr)	3,492	4,173	5,053
% Traffic Breakdown of P-c/p(i)	25	25	25
% Traffic Breakdown of Taxi	20	20	20
% Traffic Breakdown of PuLB(i)	11.5	11.5	11.5
% Traffic Breakdown of LGV(I)	18	17.5	17.5
% Traffic Breakdown of HGV(i)	15	15	15
% Traffic Breakdown of PuBus(i)	10.5	11	11
Fleet Emission Rate of NO_x of P/c-p (g/km)(ii)	0.90	0.71	0.71(iii)
Fleet Emission Rate of NO_x of Taxi (g/km)(ii)	1.27	0.73	0.73(iii)
Fleet Emission Rate of NO_x of PuLB (g/km)(ii)	1.91	1.54	1.54(iii)
Fleet Emission Rate of NO_x of LGV (g/km)(ii)	1.53	1.23	1.23(iii)
Fleet Emission Rate of NO_x of HGV (g/km)(ii)	6.21	3.84	3.84(iii)
Fleet Emission Rate of NO_x of PuBus (g/km)(ii)	10.53	6.43	6.43(iii)
NO_x Emission Rate of the fleet (g/km-hr)	10,594	5,334	10,046

Note:

(i) P-c/p : Petrol Private Car; PuLB : Public Light Bus; LGV : Light Goods Vehicles; HGV : Heavy Goods Vehicles; PuBus : Public Bus

(ii) Fleet Emission Rate based on EURO III criteria

(iii) 2018 NO_x emission rates are not available and 2011 emission rate is used.

Table 6.3b NO_x Emission from Ping Ha Road of Tin Shui Wai

	Year 2003	Year 2011	Year 2018
Total Traffic Flow (veh/hr)	864	1,588	1,826
% Traffic Breakdown of P-c/p(i)	25	25	70
% Traffic Breakdown of Taxi	20	19.5	-
% Traffic Breakdown of PrBus(i)	8	8	-
% Traffic Breakdown of LGV(i)	15	16	-

	Year 2003	Year 2011	Year 2018
% Traffic Breakdown of HGV(i)	24	24.5	30
% Traffic Breakdown of PuBus(i)	8	7	-
Fleet Emission Rate of NO_x of P/c-p (g/km)(ii)	0.90	0.71	0.71(iii)
Fleet Emission Rate of NO_x of Taxi (g/km)(ii)	1.27	0.73	-
Fleet Emission Rate of NO_x of PrBus (g/km)(ii)	9.08	5.54	-
Fleet Emission Rate of NO_x of LGV (g/km)(ii)	1.53	1.23	-
Fleet Emission Rate of NO_x of HGV (g/km)(ii)	6.21	3.84	3.84(iii)
Fleet Emission Rate of NO_x of PuBus (g/km)(ii)	10.53	6.43	-
NO_x Emission Rate of the fleet (g/km-hr)	3,248	3,771	3,104

Note:

(i) P-c/p : Petrol Private Car; PrBus : Public Light Bus; LGV : Light Goods Vehicles; HGV : Heavy Goods Vehicles; PuBus : Public Bus

(ii) Fleet Emission Rate based on EURO III criteria

(iii) 2018 NO_x emission rates are not available and 2011 emission rate is used.

Table 6.3c NO_x Emission from Tuen Mun Heung Sze Wui Road at Year 2018

	Year 2003	Year 2011	Year 2018
Total Traffic Flow (veh/hr)	2,000	2,460	3,280
% Traffic Breakdown of P-c/p(i)	35	33	32
% Traffic Breakdown of Taxi	34	34	34
% Traffic Breakdown of PrBus(i)	2	20	10.5
% Traffic Breakdown of HGV(i)	19	10	19.5
% Traffic Breakdown of PuBus(i)	10	3	4
Fleet Emission Rate of NO_x of P/c-p (g/km)(ii)	0.90	0.71	0.71(iii)
Fleet Emission Rate of NO_x of Taxi (g/km)(ii)	1.27	0.73	0.73(iii)
Fleet Emission Rate of NO_x of PrBus (g/km)(ii)	9.08	5.54	5.54(iii)
Fleet Emission Rate of NO_x of HGV (g/km)(ii)	6.21	3.84	3.84(iii)
Fleet Emission Rate of NO_x of PuBus (g/km)(ii)	10.53	6.43	6.43(iii)
NO_x Emission Rate of the fleet (g/km-hr)	6,350	5,318	8,946

Note:

(i) P-c/p : Petrol Private Car; PrBus : Public Light Bus; HGV : Heavy Goods Vehicles; PuBus : Public Bus

(ii) Fleet Emission Rate based on EURO III criteria

(iii) 2018 NO_x emission rates are not available and 2011 emission rate is used

A comparison of total emission rate of the fleet for the critical pollutant, NO_x, from the Castle Peak Road, Ping Ha Road and Tuen Mun Heung Sze Wui Road for the year 2003, 2011 and 2018 has been carried out. It was suggested that the NO_x emissions will be larger for Castle Peak Road in year 2003 and for Ping Ha Road in year 2011 and Tuen Mun Heung Sze Wui Road in year 2018. For Yuen Long area, traffic data for year 2003 were, therefore, employed for the assessment of worst case impact while traffic data for year 2018 were employed to Tuen Mun area for the assessments. For Tin Shui Wai area, traffic data for year 2011 were employed for the assessment.

The air dispersion model, *CALINE4*, approved by the EPD was used to predict the pollutant levels of NO_2, CO and RSP.

Peak hour traffic will occur during the daytime period, resulting in the worst case meteorological conditions; as specified in the 1998 *EPD's Draft Guidelines for Local-scale Air Quality Assessment Using Models*, these conditions will be used for the dispersion model which include:

- wind speed 1 ms^{-1};
- wind direction worst case for each receivers;
- stability class D;
- mixing height 500 m;
- standard deviation of wind direction 18 degrees; and
- temperature 298K

The NO_x gas was assumed to be inert and levels of conversion to NO_2 were taken as 20% of total NO_x emission.

The cumulative air quality impacts at ASRs in association with the proposed improvement of road networks, together with the background air quality were assessed against the AQOs.

6.3.3 Prediction and Evaluation of Impacts

The hourly concentrations of pollutants from vehicular emissions at ground level and 10m above ground were predicted; and the results are presented in *Tables 6.3d-f* for Yuen Long, Tin Shui Wai and Tuen Mun Centre.

Table 6.3d Yuen Long EPIW - Predicted Hourly Concentration of Pollutants (μgm^{-3})

ASRs	Predicted Hourly Concentration [(i)] (μgm^{-3})					
	At Ground Level			At 10 m Above Ground		
	NO_2	CO	RSP	NO_2	CO	RSP
A1	144	1180	78	122	950	73
A2	178	1410	87	152	1180	80

ASRs	Predicted Hourly Concentration [i] (μgm^{-3})					
	At Ground Level			At 10 m Above Ground		
	NO_2	CO	RSP	NO_2	CO	RSP
A3	103	835	67	92	835	65
A4	118	950	70	95	835	65
A5	99	835	67	92	835	64
A6	114	950	70	92	835	64
A7	95	835	65	84	720	63
A8	152	1180	80	103	835	67
A9	174	1295	86	122	950	72
A10	171	1295	85	144	1180	78
A11	171	1295	87	148	1180	79
A12	156	1180	81	133	1065	75
A13[ii]	-	-	-	88	835	63
Criteria	300	30,000	180 [iii]	300	30,000	180 [iii]

Notes:

(i) Background included in the above prediction

(ii) Since the ground level of A13 is the LRT Station, therefore, the assessments are only predicted at 10 m above ground

(iii) Since no hourly RSP level stipulated in the AQO, daily RSP criteria is used.

The results of evaluation indicate that all the predicted hourly concentration of pollutants for Yuen Long EPIW are within the AQO criteria. The predicted hourly concentration of NO_2, CO and RSP at ground level are in the range of 95 - 178 μgm^{-3}, 835 - 1,410 μgm^{-3} and 65 - 87 μgm^{-3} respectively. While the predicted hourly concentration of NO_2, CO and RSP at receiver height of 10 m above ground range from 84 - 152 μgm^{-3}, 720 - 1180 μgm^{-3} and 63 - 80 μgm^{-3} respectively. The highest concentrations of the critical pollutant, NO_2, at the worst level, i.e., ground level was predicted at A2 (Far East Consortium Yuen Long Building).

The isopleth of NO_2 of the Yuen Long area at ground level is shown in *Figure 6.3a*. It confirms that the AQO criteria of the area will be satisfied during the operational phase of the Project in Yuen Long. No mitigation measures are necessary for this road scheme.

Noise barriers of 3m height have been recommended near Nam Pin Wai (referred *to Section 5.3.4.1*). With the barrier in place, pollutants will be dispersed over the barrier and pollutant levels at ASRs close to the EPIW works, such as those at Nam Pin Wai, would be slightly increased. However, maximum NO_2 level is predicted to be well within the AQO (59% of AQO). Consequently, adverse air quality impacts are not expected as a result of the presence of the noise barriers.

Table 6.3e Tin Shui Wai EPIW - Predicted Hourly Concentration of Pollutants (μgm^{-3})

ASRs	Predicted Hourly Concentration [(i)] (μgm^{-3})					
	At Ground Level			At 10 m Above Ground		
	NO_2	CO	RSP	NO_2	CO	RSP
A14	92	950	62	80	835	60
A15	77	835	59	73	720	58
A16	69	720	58	65	720	56
A17	69	720	58	65	720	56
A18	77	720	58	69	720	57
A19	84	835	60	80	835	59
A20	65	720	56	62	720	56
A21	69	720	57	65	720	56
A22	99	950	64	88	835	61
Criteria	300	30,000	180 [(ii)]	300	30,000	180 [(ii)]

Notes:

(i) Background included in the above prediction

(ii) Since no hourly RSP level stipulated in the AQO, daily RSP criteria is used.

The results of the evaluation indicate that all the predicted hourly concentrations of pollutants for Tin Shui Wai EPIW are within the AQO criteria. The predicted hourly concentration of NO_2, CO and RSP at ground level are in the range of 65 - 99 μgm^{-3}, 720 - 950 μgm^{-3} and 56 - 64 μgm^{-3} respectively. While the predicted hourly concentration of NO_2, CO and RSP at a receiver height of 10 m above ground range from 62 - 88 μgm^{-3}, 720 - 835 μgm^{-3} and 56 - 61 μgm^{-3} respectively. The highest concentrations of the critical pollutant, NO_2, at the worst affected height, ground level, was predicted at A22.

The isopleth of NO_2 for the Tin Shui Wai area at ground level is shown in *Figure 6.3b*. It confirms that the AQO criteria of the area will be satisfied during the operational phase. No mitigation measures are necessary for this road scheme.

Noise barriers of 5 m and 7 m high at Ping Ha Road and 4.5 m high barrier at Tin Yiu Estate have been recommended to mitigate traffic noise. As discuss above, the presence of the barriers is likely to result in slightly increased levels of pollutants. However, at this location, the maximum NO_2 level is predicted to be 31% of AQO. Adverse air quality impacts are not therefore predicted.

Table 6.3f Tuen Mun Centre EPIW - Predicted Hourly Concentration of Pollutants (μgm^{-3})

ASRs	Predicted Hourly Concentration [(i)] (μgm^{-3})					
	At Ground Level			At 10 m Above Ground		
	NO_2	CO	RSP	NO_2	CO	RSP

ASRs	Predicted Hourly Concentration [i] (μgm^{-3})					
	At Ground Level			At 10 m Above Ground		
	NO_2	CO	RSP	NO_2	CO	RSP
A23	99	950	64	65	720	56
A24	88	835	62	62	720	56
A25	110	1065	65	62	720	56
A26	110	1065	65	62	720	56
A27	80	835	60	62	720	56
A28	84	835	60	62	720	56
A29	103	1065	64	65	720	56
A30	99	1065	64	65	720	56
A31	99	950	63	84	835	60
A32	141	1295	71	92	950	61
A33	125	1180	68	99	950	62
A34	99	950	63	84	835	60
A35	110	1065	65	84	835	59
A36	73	720	58	69	720	57
A37	69	720	57	69	720	57
A38	65	720	57	65	720	56
Criteria	300	30,000	180 [ii]	300	30,000	180 [ii]

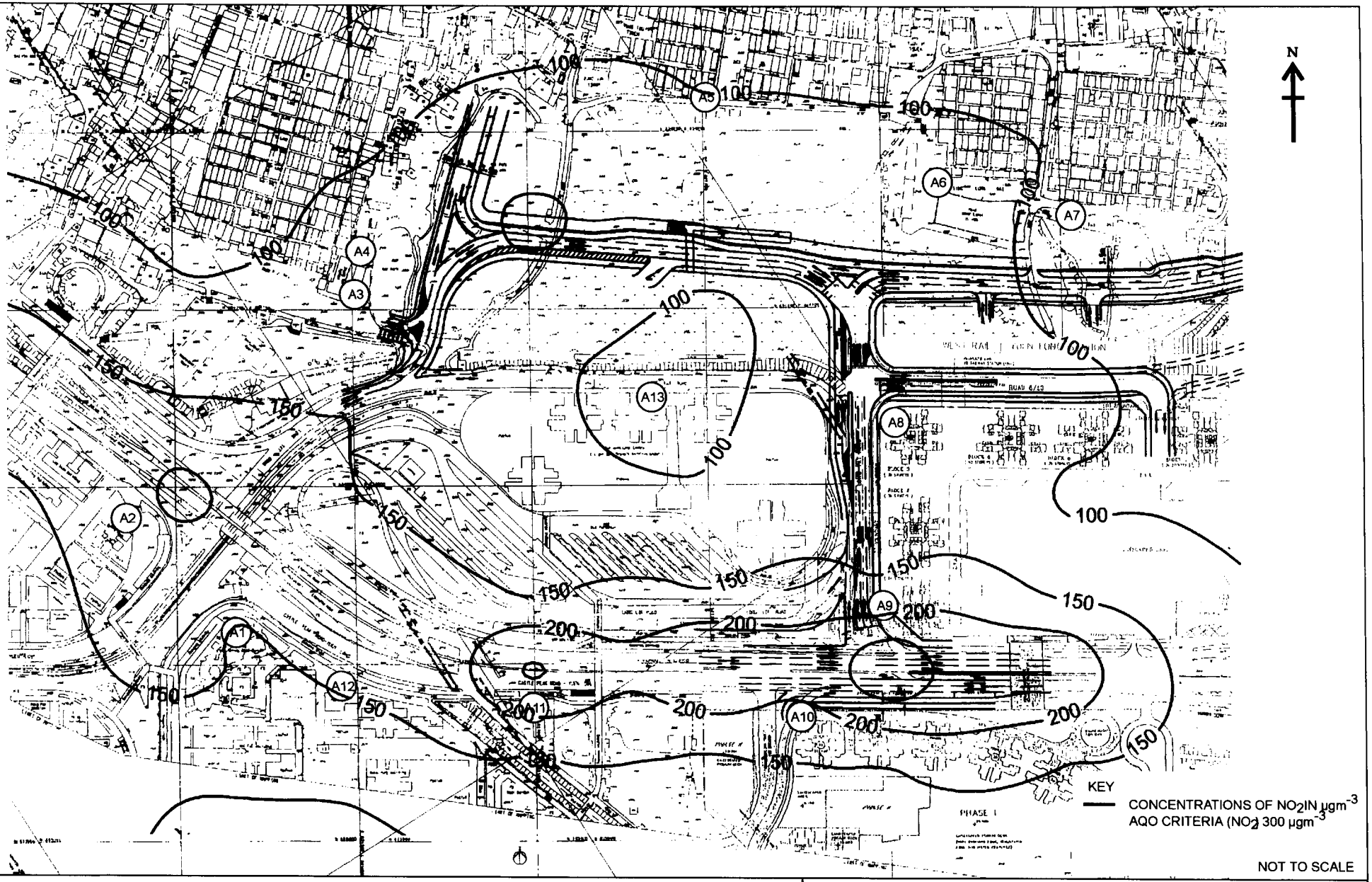
Notes:

(i) Background included in the above prediction

(ii) Since no hourly RSP level stipulated in the AQO, daily RSP criteria is used.

The results of evaluation indicate that all the predicted hourly concentration of pollutants for Tuen Mun Centre EPIW are within the AQO criteria. The predicted hourly concentration of NO_2, CO and RSP at ground level are in the range of 65 - 141 μgm^{-3}, 720 - 1,295 μgm^{-3} and 57 - 71 μgm^{-3} respectively. While the predicted hourly concentration of NO_2, CO and RSP at receiver height of 10 m above ground range from 62 - 99 μgm^{-3}, 720 - 950 μgm^{-3} and 56 - 62 μgm^{-3} respectively. The highest concentration of the critical pollutant, NO_2 at the worst level, i.e., ground level, was predicted at A32 (Kam Wah Garden Block 1).

The isopleth of NO_2 for Tuen Mun Centre at ground level is shown in *Figure 6.3c*. It confirms that the AQO criteria of the area will be satisfied during the operational phase of the Project. No mitigation measures are required for this road scheme.



ISOPLETHS OF NO2 AT THE WORST AFFECTED LEVEL (GROUND LEVEL) FOR YUEN LONG

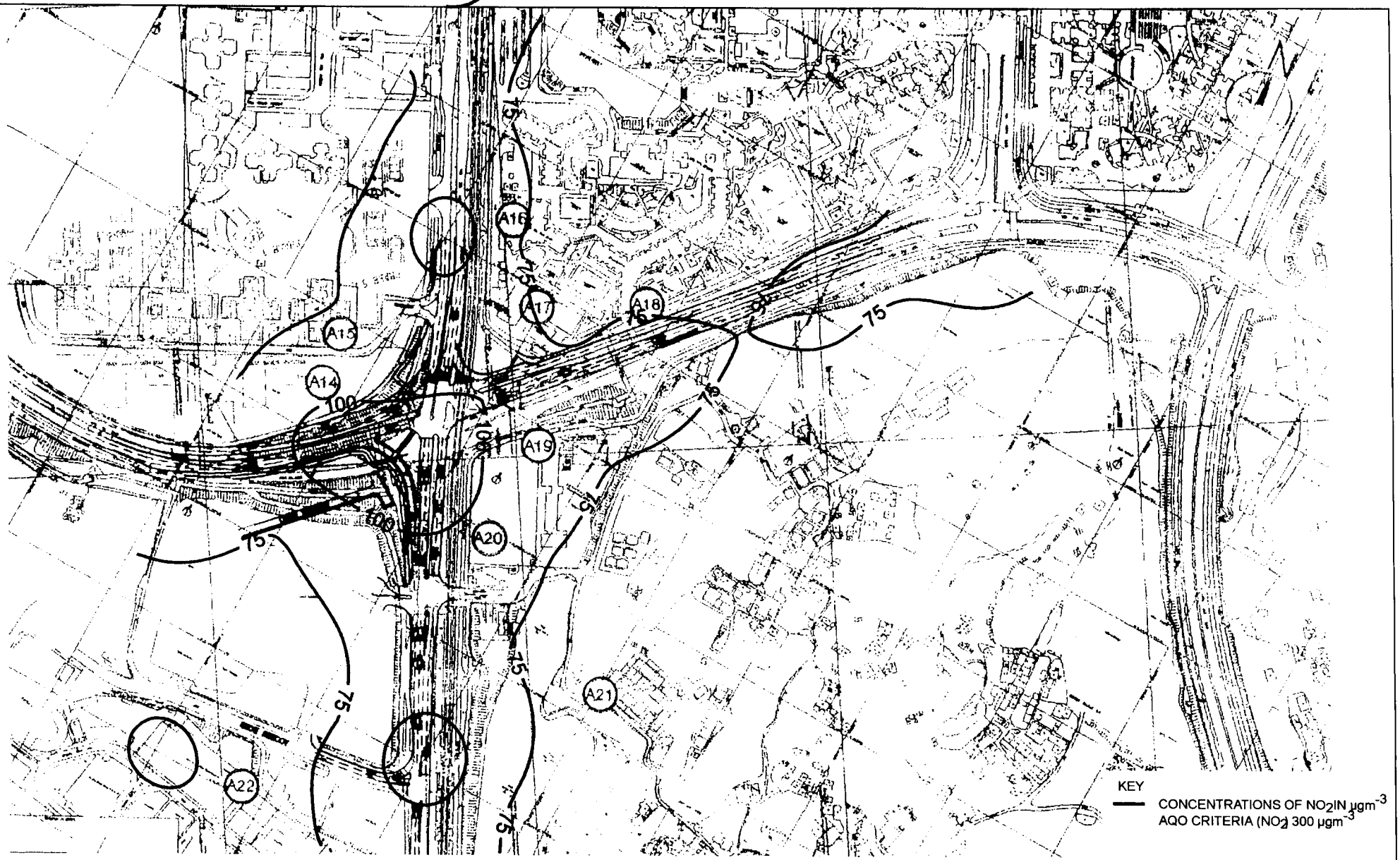
FIGURE 6.3a

Contract/C1600r28

ERM

KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES



NOT TO SCALE

ISOPLETHS OF NO2 AT WORST AFFECTED LEVEL (GROUND LEVEL) FOR TIN SHUI WAI

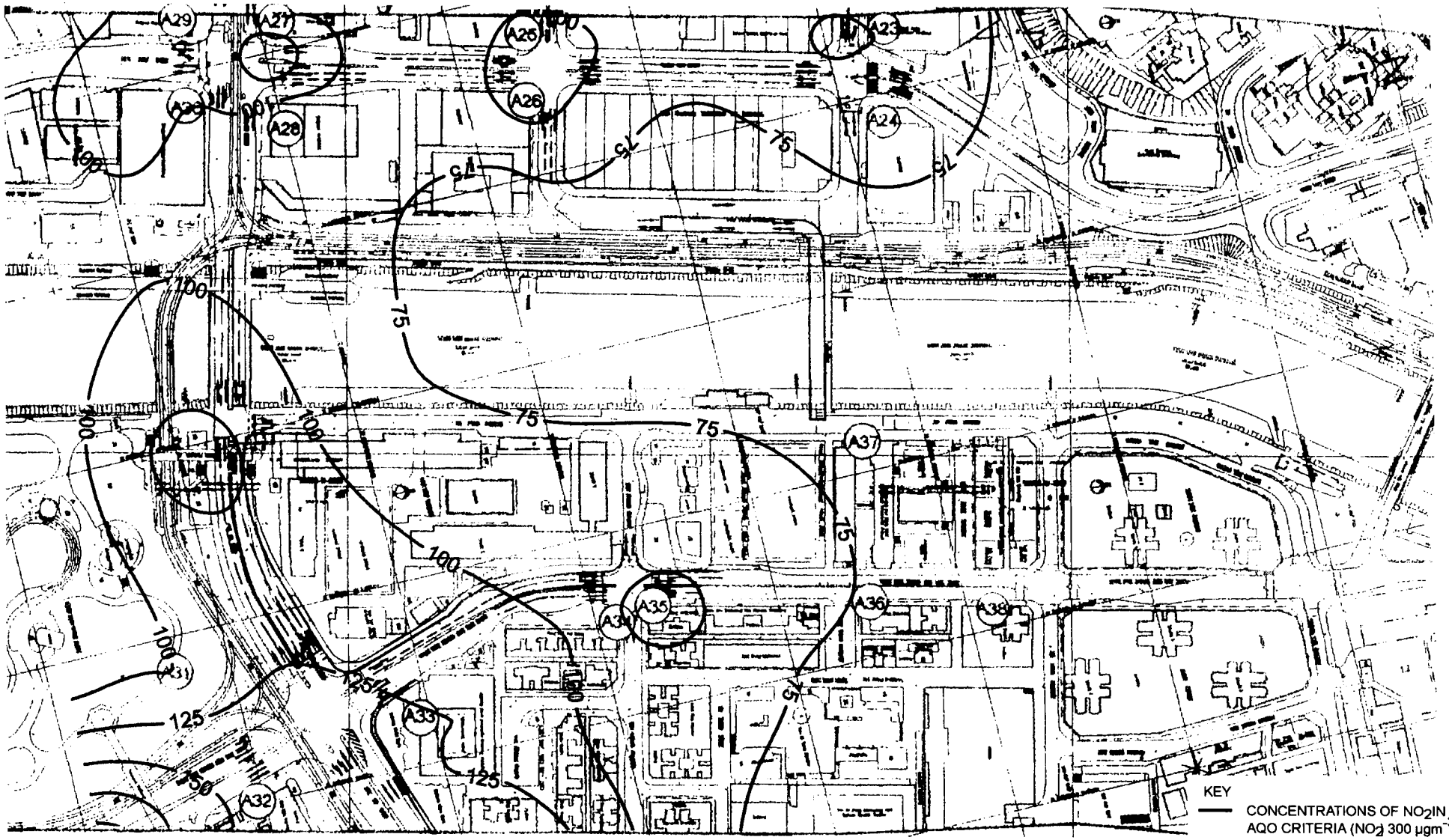
FIGURE 6.3b

C1800r29

ERM

KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES



NOT TO SCALE

ISOPLETHS OF NO2 AT WORST AFFECTED LEVEL (GROUND LEVEL) FOR TUEN MUN CENTRE

FIGURE 6.3c

C1800r30

ERM

KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES

6.3.4 Residual Impacts

No mitigation measures are required for these road schemes to meet the AQO criteria, and therefore, there is no requirement to assess the residual impacts (after the implementation of mitigation). As the operation of the EPIWs will comply with the AQO criteria, there will be no adverse impacts to the local community.

6.3.5 Cumulative Effects

The cumulative effects of the operation of the proposed EPIWs and the air emissions from traffic on existing road networks, new distributor roads and the widened road networks have been assessed. However, the cumulative effects from the operation of West Rail have not been considered due to the minimal air pollutants emitted from the electric trains operating on this system.

6.4 Conclusion

6.4.1 Construction Phase

Dust nuisance would be the major air pollutants during construction phase. The major dust generating activities have been identified to be material handling, top soil removal and wind erosion. It was envisaged that the volume of material to be handled on site and the excavation rate for road construction would be low. Adverse dust impact on the nearby ASRs was not expected. However, mitigation measures have been recommended, as outlined in *Table 6.4a* below, to ensure there is no exceedance of the dust criteria, and consequently no adverse impacts on the health of the local community.

Cumulative dust impact is expected due to the same phasing of the EIPW and the station works. However, due to the small scale of EPIW and the different influence of the wind to the worst affected ASRs, no cumulative impact is expected.

6.4.2 Operational Phase

The assessment indicated that the air quality levels at the identified ASRs would be within the AQO criteria under the worst case scenario. Consequently, there should be no adverse impacts on the health of the local community. No mitigation measures are necessary.

Table 6.4a - Summary of Recommended Mitigation Measures During Construction and Operation of the Project

Phase	Recommended Mitigation Measures
Construction Phase	Requirements stated in the *Air Pollution (Construction Dust) Regulation* should be followed and incorporated in the contract specification to limit the dust emission from work sites. These include: • the heights from which materials are dropped should be controlled to a minimum practical height to control fugitive dust arising from unloading; • materials should not be loaded to a level higher than the side and tail boards, and

Phase	Recommended Mitigation Measures
	should be dampened or covered before transport; • water sprays should be applied to maintain the worksite wet; • all dusty materials should be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet; • the load carried by the vehicle should be covered by clean impervious sheeting to ensure that the dusty materials do not leak from the vehicle; and • the excavation working area should be sprayed with water after the operation so as to maintain the entire surface wet.
Operation Phase	None required.

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7. WATER QUALITY

7.1 Introduction

This section provides a qualitative assessment of potential water quality impacts associated with the EPIWs.

Key issues addressed in this section are the generation of construction runoff and operational wastewater which may cause adverse water quality impacts on water sensitive receivers if not properly controlled. Where appropriate, mitigation measures have been described to control potential water quality impacts so that residual (post-mitigation) discharge levels meet the *Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (*TM) standards and EPD's "zero discharge" policy for the Deep Bay catchment.

7.2 Construction Phase

Construction activities in areas currently occupied by fish/duck ponds and streams may cause disturbance to these water bodies. Potential sources of impacts to water quality from the construction of the EPIWs could include the following:

- Construction runoff and drainage;
- Runoff from general construction activities; and
- Sewage effluents generated from the construction workforce.

7.2.1 Construction Runoff and Drainage

7.2.1.1 Construction Runoff and Drainage

Runoff from construction sites may contain increased loads of suspended solids (SS) and contaminants. Potential sources of water pollution from site runoff include:

- Runoff and erosion from site surfaces, drainage channels, earth working areas and stockpiles;
- Wash water from dust suppression sprays and wheel washing facilities; and
- Fuel, oil and lubricants from maintenance of construction vehicles and equipment.

Construction runoff and drainage may cause physical, chemical and biological impacts. In view of the scale of the works, the impact associated with construction runoff would be minimal.

Since the EPIWs include minor road junction improvements and widening of existing roadways, existing storm water drainage and sewerage systems may be affected.

However, the impact would be limited given the fact that all the storm water drainage and sewerage system would be properly re-designed.

7.2.1.2 Runoff from General Construction Activities

General construction activities have the potential to cause water pollution from debris and rubbish, such as packaging and used construction materials, which may enter the water column, resulting in floating refuse in the vicinity of the site that reduces the aesthetic quality of any receiving water body. Spillages of liquids stored on site, such as oil, diesel and solvents could also result in water quality impacts if they enter surrounding water bodies and soils.

The effects on water quality from these construction activities are likely to be minimal provided that site boundaries are well maintained and good construction practices are observed to ensure that litter, fuels and solvents are managed, stored and handled properly.

7.2.1.3 Sewage Effluents

Sewage effluents will arise from sanitary facilities provided for the on-site construction workforce for the EPIWs, and these have the potential to cause water pollution. Sewage is characterised by high levels of biochemical oxygen demand (BOD), ammonia and *E. coli* counts. This sewage is expected to be connected to the existing sewerage system, since all the EPIWs lie within town centres which are connected to public foul sewerage and treatment systems. However, construction workers are likely to be dispersed along the alignment so that the installation of portable toilets and the proper disposal of sewage may be necessary to ensure that discharge standards are met.

7.2.2 Recommended Environmental Control Considerations

It is important that appropriate measures are implemented to control runoff and drainage to prevent SS loadings from entering the water courses and impacting on downstream WSRs. Proper site management will be essential to minimise surface water runoff, soil erosion and sewage effluents.

Construction site runoff and drainage should be controlled in accordance with the guidelines stipulated in the EPD's *Practice Note for Professional Persons, Construction Site Drainage* (ProPECC PN 1/94). Good housekeeping and stormwater best management practices should be implemented to ensure that runoff from construction areas and any stored excavated material comply with the WPCO and no unacceptable impact on the WSRs arises due to the construction of West Rail. All discharges from the construction site should be controlled to comply with the TM standards and the “zero discharge” policy.

The followings are measures to further improve the environmental performance of the works in order to minimise water quality problems.

7.2.2.1 Construction Runoff and Drainage

Exposed soil areas should be minimised to reduce the potential for increased siltation, contamination of runoff, and erosion. Runoff-related impacts associated with above ground construction activities can be readily controlled through the use of appropriate mitigation measures, which include:

- The use of sediment traps; and
- The adequate maintenance of drainage systems to prevent flooding and overflow.

The boundaries of critical areas of earthworks should be marked and surrounded by dykes or embankments for flood protection. Temporary ditches should be provided to facilitate runoff discharge into appropriate watercourses, via a silt retention pond. Permanent drainage channels should incorporate sediment basins or traps and baffles to enhance deposition rates.

All temporary and permanent drainage pipes and culverts provided to facilitate runoff discharge should be adequately designed for the controlled release of storm flows. All sediment traps should be regularly cleaned and maintained. The temporarily diverted drainage should be reinstated to its original condition when the construction work has finished or the temporary diversion is no longer required.

Sand and silt in the wash water from the wheel washing facilities should be settled out and removed before discharging into storm drains. A section of the road between the wheel washing bay and the public road should be paved with backfall to prevent wash water or other site runoff from entering public road drains.

Oil interceptors should be provided in the drainage system downstream of any oil/fuel pollution sources associated with construction, and regularly emptied to prevent the release of oils and grease into the storm water drainage system after accidental spillages. The interceptor should have a bypass to prevent flushing during periods of heavy rain.

7.2.2.2 General Construction Activities

Debris and rubbish on site should be collected, handled and disposed of properly to avoid entering the water column and cause water quality impacts. The solid waste management requirement on site to prevent such impact is detailed in *Section 9* of this report.

All fuel tanks and storage areas should be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank, to prevent spilled fuel oils from reaching the receiving water bodies.

7.2.2.3 Sewage Effluent

Construction workforce sewage is expected to be connected to the existing trunk sewer or sewage treatment facilities, although precise information on the size of the on-site

workforce is not available at this stage. Construction sewage may need to be handled by portable chemical toilets and sewage holding tanks if the construction workers are likely to be dispersed along the alignment. Appropriate and adequate portable toilets should be provided by a licensed contractor who will be responsible for appropriate disposal and maintenance activities.

7.2.3 Residual Impacts

General construction activities associated with EPIWs could lead to site runoff containing elevated concentrations of SS and associated contaminants. However, water quality impacts will generally be temporary and localised during construction. Therefore, no unacceptable residual water quality and drainage impacts are anticipated from the construction of EPIWs, provided that:

- All of the recommended mitigation measures including appropriate drainage and silty runoff collection facilities are adopted; and
- All construction site discharges comply with the TM.

It is considered that controls on discharges from land based construction activities and proper site management procedures, as discussed above, will minimise residual water quality impacts to acceptable levels, and that there should be no adverse impacts on local environmental resources.

7.2.4 Cumulative Impacts

The construction of EPIWs will be undertaken either in advance, or together with, the construction of the West Rail Stations at Tuen Mun, Tin Shui Wai and Yuen Long. The environmental impact associated with the land-based EPIWs construction works is similar to that of West Rail, such that the control measures recommended in Section 7.2.2 can be incorporated into the West Rail construction mitigation measures. However, as the relative scale of the EPIWs is much smaller than the West Rail project, the additional environemental impact asssociated with the EPIWs is minimal. Provided the environmental control measures and specifications (stated in Section 7.2.2 and 7.2.3 respectively) are observed it is not anticipated that there will be any significant cumulative water quality impacts from undertaking the EPIW construction works together with the West Rail construction works.

7.2.5 Operational Phase

No water quality impacts are expected during the operational phase of EPIWs.

7.3 Conclusion

The water quality assessment has determined that no insurmountable water quality impacts should result from the construction and operation of the EPIWs, provided that the recommended mitigation measures, as outlined below in *Table 7.3a* are implemented.

Table 7.3a - Summary of Recommended Mitigation Measures During Construction and Operation of the Project

Phase	Recommended Mitigation Measures
Construction Phase	Appropriate mitigation measures are required to control construction runoff and drainage to prevent SS loadings from entering into nearby water courses and impacting on downstream WSRs. Proper site management will be essential to minimise surface water runoff, soil erosion and sewage effluents. Construction site runoff and drainage should be controlled in accordance with the guidelines stipulated in the EPD's *Practice Note for Professional Persons, Construction Site Drainage* (ProPECC PN 1/94). Good housekeeping and storm water best management practices should be implemented to ensure that runoff from construction areas and any stored excavated material comply with the WPCO and no unacceptable impact on the WSRs arises due to the construction of EPIWs. All discharges from the construction site should be controlled to comply with the TM standards and the "zero discharge" policy.
Operation Phase	None required.

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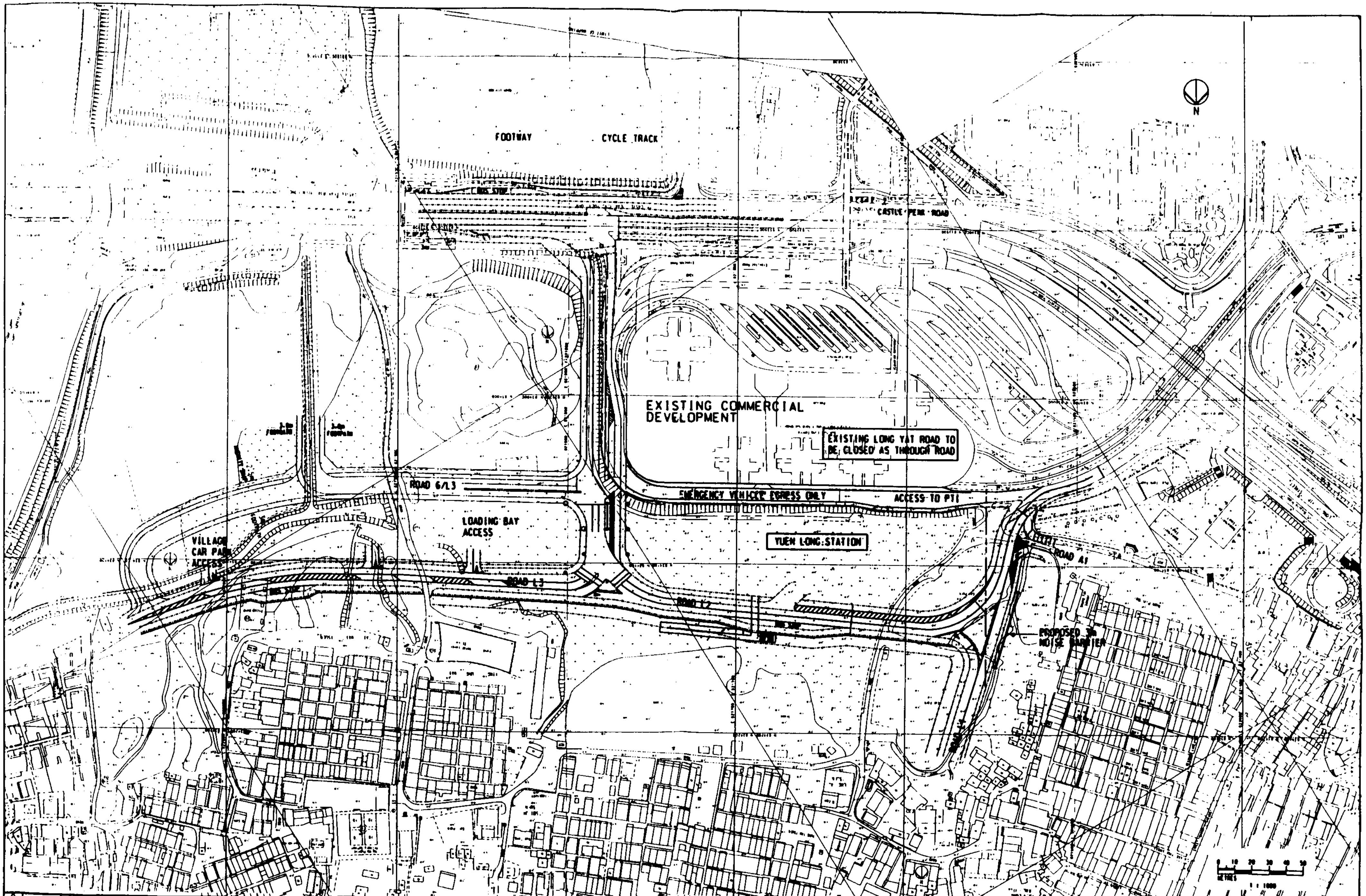

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DESIGNED BY: I. OSBORNE
DRAWN BY: D. KWOK
CHECKED BY: I. OSBORNE — TO
IN CHARGE: A. DUGGIE
DATE: 22/3/99

KOWLOON-CANTON RAILWAY CORPORATION

WEST RAIL

APPROVED — DATE

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION

MODIFICATIONS TO LONG YAT ROAD AND ROAD L2 TO SERVE YUL STATION

SOURCES OF LANDSCAPE AND VISUAL IMPACTS

SCALE: 1:2,000
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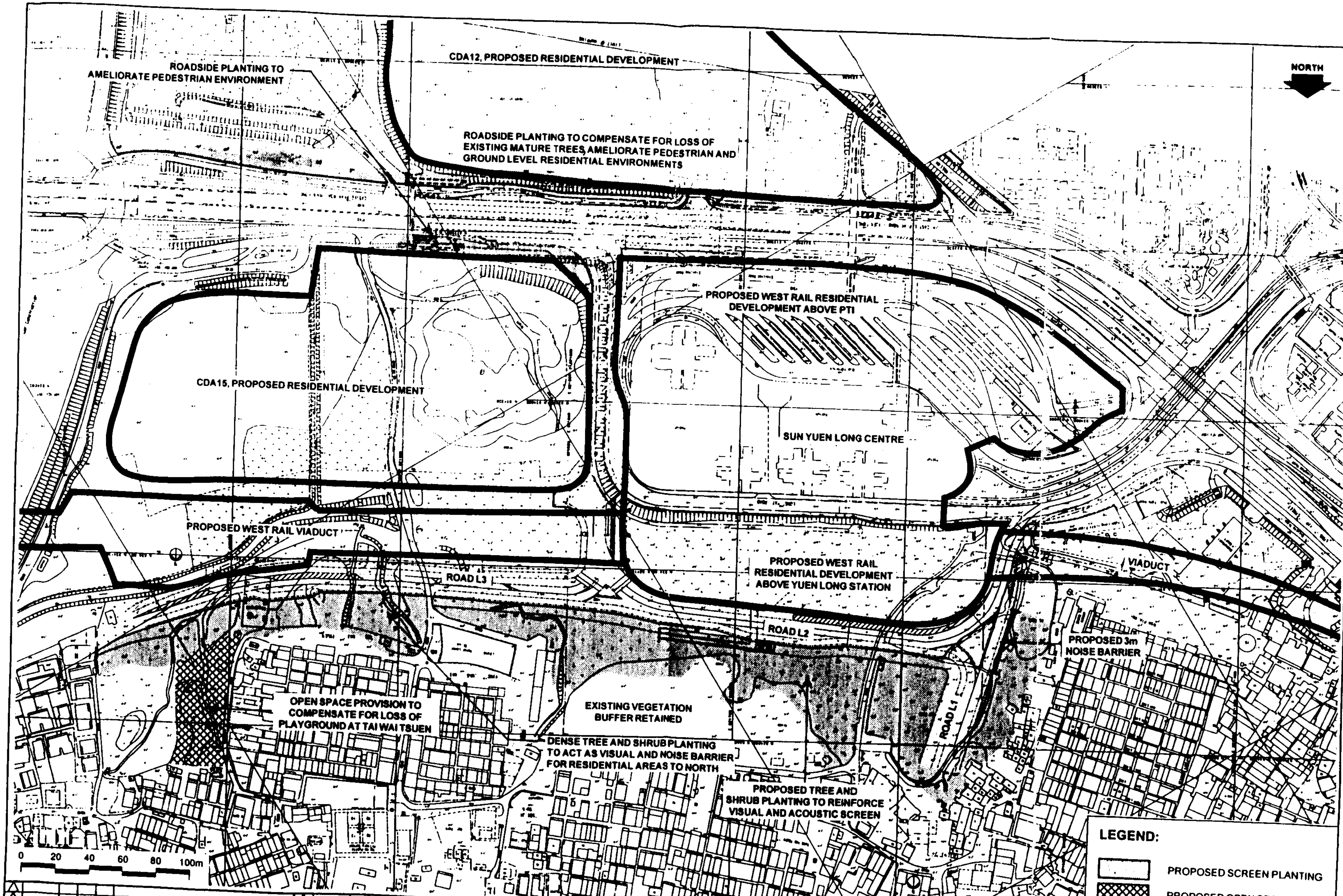
REV: A



KOWLOON-CANTON RAILWAY CORPORATION

WEST RAIL

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION

MODIFICATIONS TO LONG YAT ROAD AND ROAD L2 TO SERVE YUL STATION

LANDSCAPE MITIGATION MEASURES

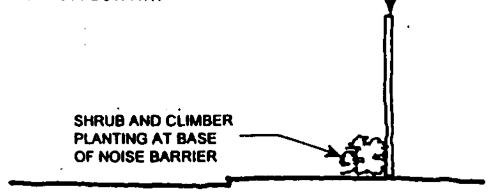
SCALE: 1: 2,000

DRAWING NUMBER: 8.3b

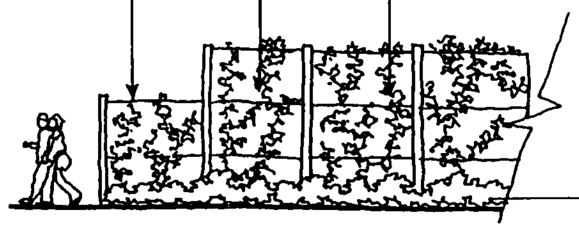
REV: R

DESIGNED BY: T OSBORNE
CHECKED BY: T OSBORNE
IN CHARGE: A DUGGIE

DATE: 22/3/99



INDICATIVE SECTION OF NOISE BARRIER AT ROAD L1
SCALE 1: 100



INDICATIVE ELEVATION OF NOISE BARRIER AT ROAD L1
SCALE 1: 100

A 12 Mar 99 Noise Cover Deleted

DESIGNED BY T. OSBORNE
DRAWN BY
CHECKED BY T. OSBORNE
DATE 24.3.99

KOWLOON-CANTON RAILWAY CORPORATION
WEST RAIL

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION

MODIFICATIONS TO LONG YAT ROAD AND ROAD L2 TO SERVE YUL STATION

LANDSCAPE AND VISUAL MITIGATION MEASURES FOR PROPOSED NOISE BARRIERS

DRAWING NUMBER 8.3c
REV A

8. LANDSCAPE AND VISUAL IMPACT ASSESSMENT

8.1 Introduction

The study areas for the consideration of the landscape and visual impacts arising from the three EPIWs are generally defined by a distance of 500m from the roadworks, expanded, where appropriate, to include either key sensitive receiver groups that are located beyond this.

The project will have two distinct phases - construction and operation.

8.2 Prediction and Assessment Methodology

The assessment and prediction of the degree of sensitivity of landscape and visual impacts is based on reasoned professional judgement and not on scoring or weighting of impacts.

The degree of significance of an impact depends on the nature and sensitivity of the receptor (whether this is a landscape element or a visual receptor) and the nature and magnitude of the impact itself.

8.2.1.1 Sensitivity

The potential sensitivity of a landscape resource depends on a number of factors including:

- Whether the element is commonplace or rare (e.g. a common tree species, or a rare, protected tree species)
- Whether the element constitutes an area of particular landscape interest (e.g. a prominent ridgeline, an old native forest)
- Whether the element is of statutory importance (e.g. Nature Reserves, SSSI's, landscape buffer zones etc.)
- Whether the element is of particular cultural interest (e.g. a Fung Shui Woodland).

The potential sensitivity of a visual receptor is primarily related to whether the person is at work, at play or at rest. Visual receptors may be broadly categorised into four groups as follows.

- Those who view the impact from their homes are considered to be highly sensitive as the attractiveness or otherwise of the outlook from their home will have a substantial effect on their perception of the quality and acceptability of their home environment and their general quality of life.
- Those who view the impact from their workplace are considered to be moderately sensitive, because the attractiveness or otherwise of the outlook

will have a less important, although still material, effect on their perception of their quality of life. The degree to which this applies depends on whether the workplace is industrial, retail or commercial.

- Those who view the impact whilst taking part in an outdoor leisure activity may display varying sensitivity depending on the type of leisure activity. Football players, for example, would be less concerned with the quality of their surroundings than hill walkers.
- Those who view the impact whilst travelling on a public thoroughfare will also display varying sensitivity depending on the speed of travel and whether the view is continuous or occasionally glimpsed.

8.2.1.2 Magnitude

The magnitude of a landscape or a visual impact will depend on a number of factors including:

- the nature of the development;
- the physical area of the impact, both in absolute terms and relative to it's landscape and visual context;
- the duration of the impact;
- the distance of the impact from the viewer;
- the number of viewers;
- the landscape context of the impact; and
- the visual context of the impact

8.2.1.3 Degree of Impact

By synthesising the magnitude of the various impacts and the sensitivity of the various receptors it is possible to identify a series of thresholds to be used as a basis for the categorisation of the degree of significance of the impacts in a logical, well reasoned and consistent fashion.

Table 8.2a indicates a rationale for dividing the degree of significance into five thresholds, namely Very substantial, Substantial, Moderate, Slight and Very Slight depending on the combination of low-medium-high magnitude of impacts (these may be positive or negative impacts) and a low-medium-high degree of sensitivity of receptors.

For example, a negative impact of high magnitude which affects receptors of high sensitivity may be assessed as being a very substantial negative impact. A moderate positive impact could result from a positive impact of low magnitude on receptors of high sensitivity as well as from a positive impact of high magnitude on receptors of low sensitivity. This is not a rigid matrix but serves as a basis for the rational categorisation of impacts.

For the purposes of this assessment, a 'negligible' category has been included within the broad classification of the degree of impact. This is necessary because a negligible impact is different from a 'low' magnitude of impact. A 'low' magnitude impact will cause a varying degree of resultant visual impact depending on whether the receptor's sensitivity is low, medium or high. However, a negligible magnitude impact will always cause a negligible visual impact, irrespective of the sensitivity of the receptor.

Table 8.2a The relationship between sensitivity and magnitude in defining significance thresholds.

Magnitude of Impact (+ve or -ve)	Low	Medium	High
High	Moderate (+ve or -ve)	Substantial (+ve or -ve)	Very substantial (+ve or -ve)
Medium	Slight (+ve or -ve)	Moderate (+ve or -ve)	Substantial (+ve or -ve)
Low	Very Slight (+ve or -ve)	Slight (+ve or -ve)	Moderate (+ve or -ve)

Receptor Sensitivity

8.3 Construction and Operation Phase Impacts at Yuen Long

8.3.1 Sources of Impact at Yuen Long

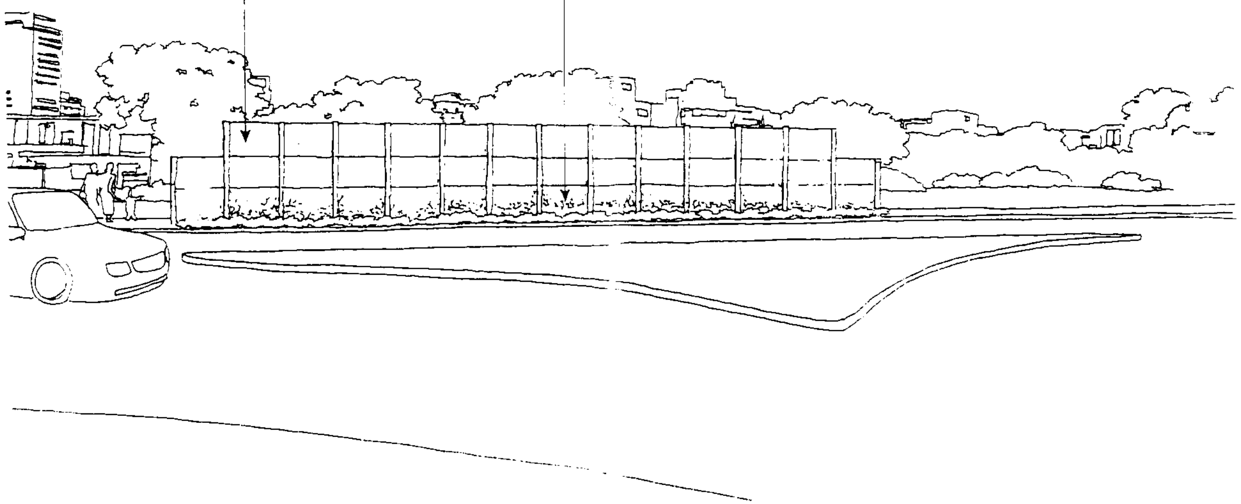
Potential sources of landscape and visual impacts during the operation phase are illustrated in *Figure 8.3a* and are identified below:

- increased road area at Castle Peak road junction;
- new roads L1 and L2;
- increased road traffic;
- 3m noise barrier west of Road L1;
- diverted drainage channel and retaining wall south-east of Nam Pin Wai;
- vehicular and street lighting.

EXISTING CONDITIONS LOOKING WEST TO NAM PIN WAI

REINFORCED CONCRETE PANELS TEXTURED AND PATTERNED ON BOTH SIDES TO ADD VISUAL INTEREST FOR SENSITIVE VISUAL RECEIVERS

CLIMBER AND GROUND COVER PLANTING TO SOFTEN NOISE BARRIER ELEVATION



VIEW OF PROPOSED NOISE BARRIER ON ROAD L1 IMMEDIATELY AFTER CONSTRUCTION

DESIGNED	T. OSBORNE
DRAWN	D. KWOK
CHECKED	T. OSBORNE

KOWLOON-CANTON RAILWAY CORPORATION

WEST RAIL

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS
FOR YUEN LONG SECTION

MODIFICATIONS TO LONG YAT ROAD, AND ROAD L2 TO SERVE YUL STATION

LANDSCAPE AND VISUAL MITIGATION MEASURES FOR PROPOSED NOISE BARRIER

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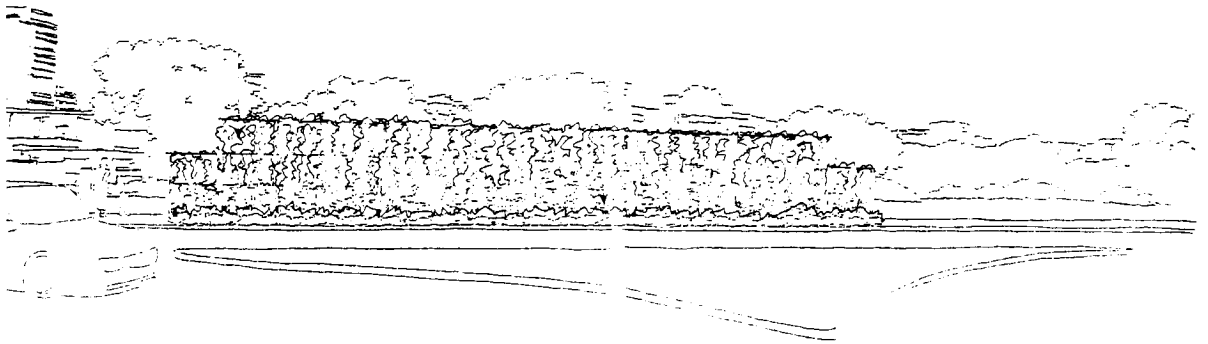
EXISTING CONDITIONS LOOKING WEST TO NAM PIN WAI

REINFORCED CONCRETE PANELS TEXTURED AND PATTERNED ON BOTH SIDES TO ADD VISUAL INTEREST FOR SENSITIVE VISUAL RECEIVERS

SUMMER AND GROUND COVER PLANTING TO SOFTEN NOISE BARRIER ELEVATION



VIEW OF PROPOSED NOISE BARRIER ON ROAD L1 10 YEARS AFTER CONSTRUCTION

KOWLOON-CANTON RAILWAY CORPORATION

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION
MODIFICATIONS TO LONG YAT ROAD AND ROAD L2 TO SERVE YUL STATION
LANDSCAPE AND VISUAL MITIGATION MEASURES FOR PROPOSED NOISE BARRIER

8.3.2 Prediction and Evaluation of Impacts at Yuen Long

8.3.2.1 Landscape Impacts at Yuen Long

8.3.2.1.1 Impact on Landscape Resources at Yuen Long

Landscape impacts associated with the roadworks at Yuen Long Station will include:

- loss of 15000 sq.m of open area (agricultural land no longer in active use) caused by Road L1 and L2;
- loss of a 450 sq.m children's playground and mature trees at Tai Wai Tsuen;
- loss of 16 no**.** mature trees screening open storage along southern edge of Castle Peak Road; and
- loss of 11 no. mature trees south-east of Shung Tak School at Nam Pin Wai.

8.3.2.1.2 Impact on Landscape Character at Yuen Long

The roadworks along Castle Peak road will not represent a significant impact on the existing environment as they are only modifying an existing road system. However, the proposed works to the north of the Sun Yuen Long Plaza will constitute a moderately substantial new impact to the environment. The existing open aspect of agricultural land (no longer in active use) south of the village development will be reduced in size by the new road. This will in turn lessen the degree of visual separation between the traditional villages with the urban area of Yuen Long. The villages can be effectively screened by retaining existing vegetation and providing new planting but the residents will register the presence of the road through traffic noise and vibration and night lighting.

8.3.2.1.3 Visual Impacts

Tables 8.3a and 8.3b list the sources of the visual impacts as described in *Section 8.3.1* above; the key VSR's as described in *Section 4.2.3*; the approximate distance between the VSR's and the sources of impact; the magnitude of the impact; the degree of sensitivity of the VSR's; and the predicted degrees of visual impact on each of the VSR's before and after mitigation.

8.3.3 Mitigation Measures

8.3.3.1 Landscape Mitigation Measures

Suggested landscape mitigation measures for the Yuen Long Station road improvements are illustrated on *Figures 8.3b* and *8.3c* are listed below. Generally, the landscape mitigation measures proposed below seek to minimise potential impacts of development, reinstate vegetation that would be lost and to blend the new development into the landscape pattern of the surrounding area, and to provide compensation in the form of environmental improvements such as road side planting to off-set the adverse effects of the scheme. Landscape mitigation measures should include:

- storage and re-use of topsoil in areas impacted by the road improvements***;***
- dust control measures to prevent the deterioration of adjacent landscape elements;
- transplantation of existing trees impacted by the road improvements to compensatory planting sites or offsite to amenity sites identified by Government Departments;
- stabilisation and planting of all disturbed areas where appropriate;
- compensatory ***new*** tree and shrub planting; consideration should be given to the feasibility of advance planting works;
- compensatory new tree and shrub planting;
- reprovision of children's playground at Tai Wai Tsuen at a location close to Tai Wai Tsuen.

It is assumed that the proposed mitigation measures would be funded by KCRC and carried out under the EPIW contracts. After an initial 12 month maintenance period of planting works by the implementing Contractor, the Highways Department would normally assume the long term maintenance responsibility of hard landscape elements such as planter walls and tree grilles, and the Regional Services Department would maintain the soft landscape. The children's playground at Tai Wai Tseun would be maintained and managed by the Regional Services Department.

8.3.3.2 Visual Mitigation Measures

Generally, the visual mitigation measures proposed below seek to minimise potential impacts of development and to blend the new development into the landscape pattern of the surrounding area. Visual mitigation measures should include:

- site hoardings to screen works areas during the construction period; consideration should be given to the design and surface treatment, particularly adjacent to pedestrian environments;
- sensitively designed noise barrier at Road L1; careful choice of materials, colours and textures and associated planting;
- control of lighting during night construction activity;
- amenity roadside tree and shrub planting to screen the road alignment and associated structures, particularly new Roads L1 and L2 (consideration should be given to planting in advance of completion of the works where possible to maximise visual mitigation on day one; other planting works should be carried out as soon as practicable after the road works are completed).*Figures 8.3d and 8.3e* show, respectively, the proposed landscape and visual mitigation measures at Yuen Long both immediately and 10 years after their implementation.

Key to Table 8.3a:

Magnitude of Impact	=	Negligible, Low, Medium or High (Positive or Negative)
Receptor Sensitivity	=	Low, Medium or High
Impact Significance Thresholds	=	Negligible, Very Slight, Slight, Moderate, Substantial or Very Substantial (Positive or Negative)
Types of Visually Sensitive Receivers (VSR's)	I =	Industrial (including Agricultural), R = Residential, C = Commercial, C/I = Mixed Commercial/Industrial,
	R/I =	Mixed Residential/Industrial, C/R = Mixed Commercial/Residential, OS = Open Space,
	M =	Community, T =Transport Related

(*For ease of cross-referencing between Tables and Plans, each key VSR is numbered given an Identity Number according to the foregoing categories - see column 3 of Table.)

Table 8.3a VISUAL IMPACT DURING THE CONSTRUCTION PHASE

Sources of Impacts	Key Visually Sensitive Receivers (VSR's) :	Type and Identity No. of VSR*	Minimum Distance Between VSR and Sources	Magnitude of Impact	Receptor Sensitivity	Impact During Construction Phase before Mitigation Measures	Residual Impact During Construction Phase after Mitigation Measures take effect.
Construction of 3m Noise Barrier, diverted drainage channel and retaining wall south east of Nam Pin Wai	Students and teachers at Shung Tak School facing south east	M1	30m	Medium	Medium	Moderate Negative	Moderate Negative
	Residents located at southern edge of Nam Pin Wai facing south east	R2	50m	Medium	High	Substantial Negative	Substantial Negative
Construction of Access roads L1 & L2 between Tung Tau Tsuen and Sun Yuen Long Centre	Students and teachers at Shung Tak School facing east	M1	40m	Medium	Medium	Moderate Negative	Moderate Negative

Sources of Impacts	Key Visually Sensitive Receivers (VSR's) :	Type and Identity No. of VSR*	Minimum Distance Between VSR and Sources	Magnitude of Impact	Receptor Sensitivity	Impact During Construction Phase before Mitigation Measures	Residual Impact During Construction Phase after Mitigation Measures take effect.
	Residents located at southern edge of Ying Lung Wai and Tai Wai Tsuen facing south	R1	30m	High	High	Very Substantial Negative	Very Substantial Negative
	Residents located at eastern edge of Nam Pin Wai facing east	R2	50m	Medium	High	Substantial Negative	Substantial Negative
	Residents at Far East Construction Yuen Long Building facing north-east	R3	250m	Negligible	High	Negligible	Negligible
	Residents at north-east Yuen Long tower blocks facing north-east	R4	300m	Negligible	High	Negligible	Negligible
	Residents located at southern edge of Yuen Long Kau Hui and Tung Tau Tsuen facing south	R5	70m	Negligible	High	Negligible	Negligible
	Residents at Sun Yuen Long Centre facing north and east	R/C1	30m	Low	High	Moderate Negative	Moderate Negative
	Users of open space south of villages	OS1	0m	High	High	Very Substantial Negative	Very Substantial Negative
	Motorists/ passengers on Yuen Long Highway adjacent to Castle Peak Road roundabout	T1	320m	Negligible	Medium	Very Slight Negative	Negligible
	Motorists/ passengers on Local Service Road	T2	50m	Low	Low	Very Slight Negative	Very Slight Negative

Sources of Impacts	Key Visually Sensitive Receivers (VSR's) :	Type and Identity No. of VSR*	Minimum Distance Between VSR and Sources	Magnitude of Impact	Receptor Sensitivity	Impact During Construction Phase before Mitigation Measures	Residual Impact During Construction Phase after Mitigation Measures take effect.
	Motorists/ passengers on Castle Peak Road Flyover	T3	50m	Low	Low	Negligible	Negligible
	Motorists/ passengers on Long Yat Road	T4	0m	Low	Low	Very Slight Negative	Very Slight Negative
	Motorists/ passengers on Ting Lung Wai Access Road & Parking	T5	20m	High	Low	Moderate Negative	Moderate Negative
	Motorists/ passengers on Nam Pin Wai Access Road & Parking	T6	20m	High	Low	Moderate Negative	Moderate Negative
	Passengers on LRT north of Castle Peak Road	T8	10m	High	Medium	Substantial Negative	Substantial Negative
Access road junction with Castle Peak Road	Residents at North East Yuen Long tower blocks facing east	R4	200m	Negligible	High	Very Slight Negative	Negligible
	Residents of Sun Yuen Long Centre facing south east	R/C1	60m	Low	High	Moderate Negative	Moderate Negative
	Motorists/ passengers on Castle Peak Road	T1	0m	Medium	Medium	Moderate Negative	Moderate Negative
	Pedestrians and cyclists on Castle Peak Road	P1	0m	High/Medium	High	Very slight Negative	Negligible

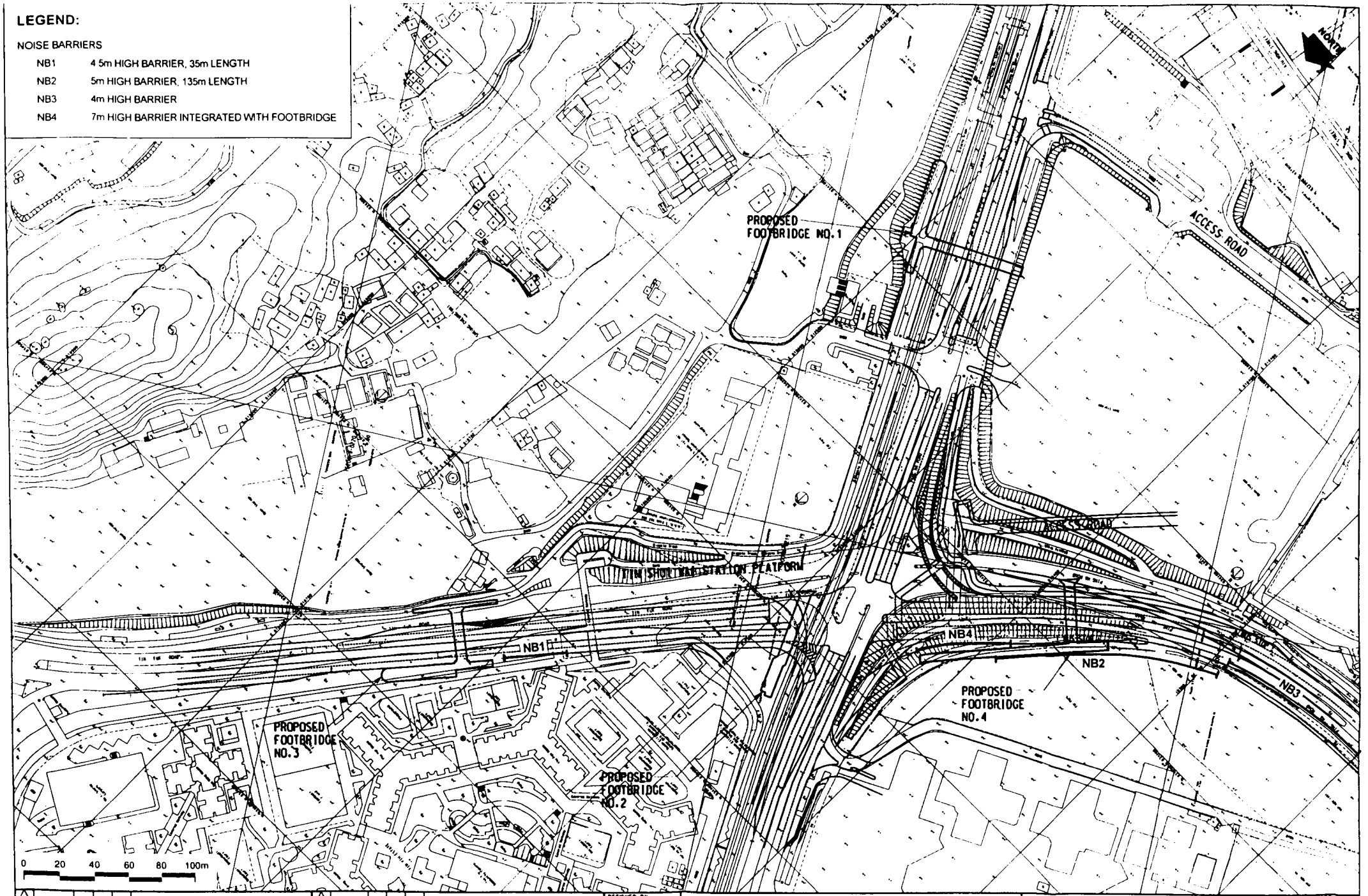
Key to Table 8.3b:

Magnitude of Impact	=	Negligible, Low, Medium or High (Positive or Negative)
Receptor Sensitivity	=	Low, Medium or High
Impact Significance Thresholds	=	Negligible, Very Slight, Slight, Moderate, Substantial or Very Substantial (Positive or Negative)
Types of Visually Sensitive Receivers (VSR's)	I =	Industrial (including Agricultural), R = Residential, C = Commercial, C/I = Mixed Commercial/Industrial,
	R/I =	Mixed Residential/Industrial, C/R = Mixed Commercial/Residential, OS = Open Space,
	M =	Community, T =Transport Related

(*For ease of cross-referencing between Tables and Plans, each key VSR is numbered given an Identity Number according to the foregoing categories - see column 3 of Table.)

Table 8.3b VISUAL IMPACT DURING THE OPERATIONAL PHASE

Sources of Impacts	Key Visually Sensitive Receivers (VSR's) :	Type and Identity No. of VSR*	Minimum Distance Between VSR and Sources	Magnitude of Impact	Receptor Sensitivity	Impact During Operation Phase before Mitigation Measures	Residual Impact During Operational Phase after Mitigation Measures take effect.
3m Noise Barrier, diverted drainage channel and retaining wall south east of Nam Pin Wai	Students and teachers at Shung Tak School facing south east	M1	30m	Low	Medium	Moderate Negative	Slight Negative
	Residents located at southern edge of Nam Pin Wai facing south east	R2	50m	Low	High	Moderate Negative	Slight Negative
	Residents of proposed West Rail development above Yuen Long station	R/C2	20m	Low	High	Slight Negative	Very Slight Negative



REV	DATE	BY	SUB	APP	DESCRIPTION
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A	8/3/99	IN			

DESIGNED BY –
DRAWN BY J.L.L.
CHECKED BY T.B. TO
IN CHARGE A.P.
DATE 22/3/99

KOWLOON-CANTON RAILWAY CORPORATION
WEST RAIL

APPROVED DATE

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION
MODIFICATIONS TO TIN FUK ROAD, PING HA ROAD AND TIN YIU ROAD TO SERVE TIS STATION
SOURCES OF LANDSCAPE AND VISUAL IMPACTS

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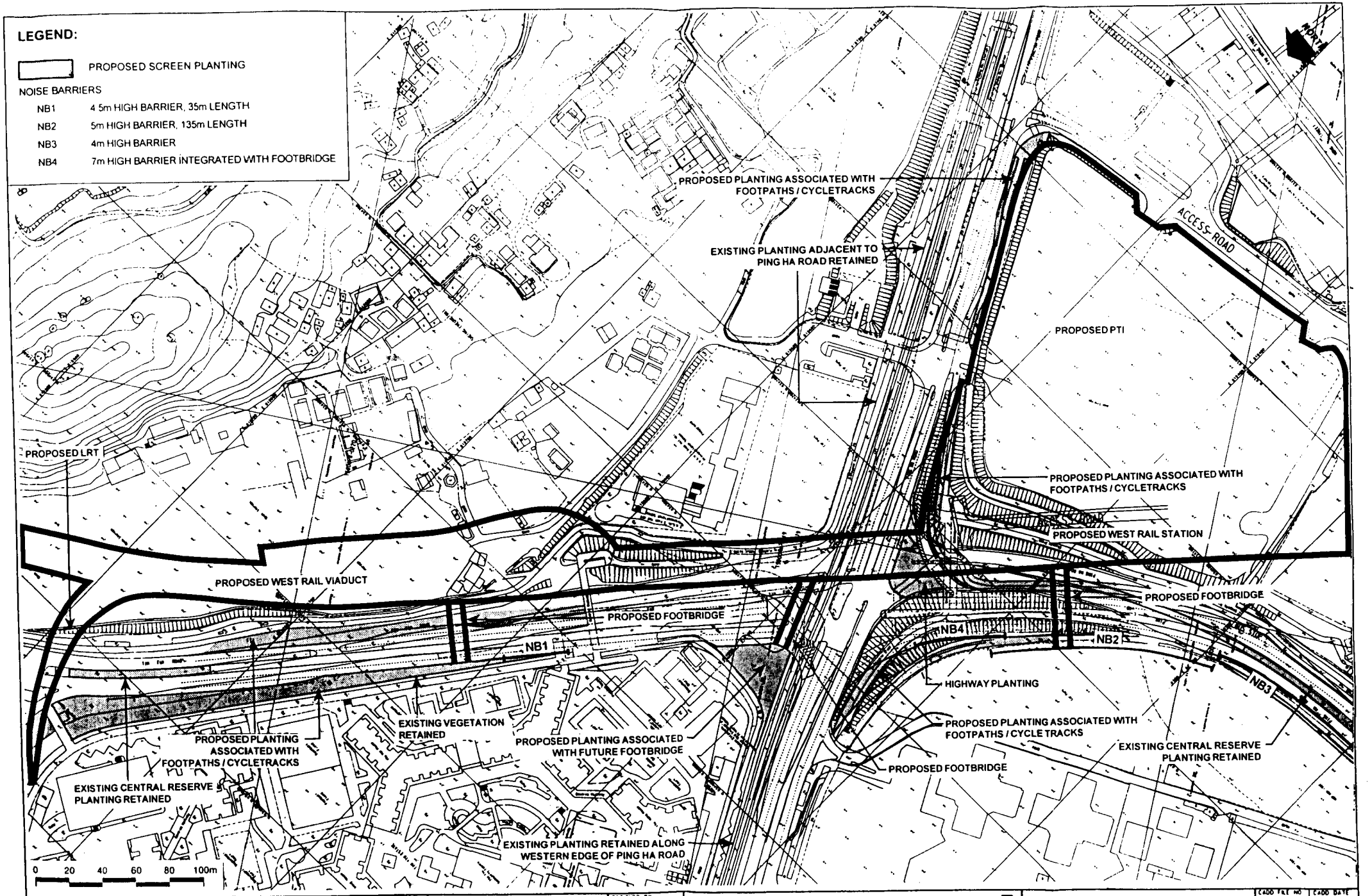
CADD DATE
SCALE 1: 2,000
DRAWING NUMBER 8.48
CONTRACT NO.
REV B
SHEET NO.

Sources of Impacts	Key Visually Sensitive Receivers (VSR's) :	Type and Identity No. of VSR*	Minimum Distance Between VSR and Sources	Magnitude of Impact	Receptor Sensitivity	Impact During Operation Phase before Mitigation Measures	Residual Impact During Operational Phase after Mitigation Measures take effect.
Access roads L1 & L2 between Tung Tau Tsuen and Sun Yuen Long Centre	Students and teachers at Shung Tak School facing east	M1	40m	Medium/Low	Medium	Slight Negative	Very Slight Negative
	Residents located at southern edge of Ying Lung Wai and Tai Wai Tsuen facing south	R1	30m	High/Medium	High	Substantial Negative	Moderate Negative
	Residents located at eastern edge of Nam Pin Wai facing east	R2	50m	Low	High	Slight Negative	Very Slight Negative
	Residents at Far East Construction Yuen Long Building facing north-east	R3	250m	Negligible	High	Negligible	Negligible
	Residents at north-east Yuen Long tower blocks facing north-east	R4	300m	Negligible	High	Negligible	Negligible
	Residents located at southern edge of Yuen Long Kau Hui and Tung Tau Tsuen facing south	R5	70m	Negligible	High	Negligible	Negligible
	Residents at Sun Yuen Long Centre facing north and east	R/C1	30m	Low	High	Negligible	Negligible
	Residents of proposed West Rail development above Yuen Long station	R/C3	20m	Low	Medium	Slight Negative	Very Slight Negative
	Users of open space south of villages	OS1	0m	High	High	Very Substantial Negative	Substantial Negative

Sources of Impacts	Key Visually Sensitive Receivers (VSR's) :	Type and Identity No. of VSR*	Minimum Distance Between VSR and Sources	Magnitude of Impact	Receptor Sensitivity	Impact During Operation Phase before Mitigation Measures	Residual Impact During Operational Phase after Mitigation Measures take effect.
	Motorists/ passengers on Yuen Long Highway adjacent to Castle Peak Road roundabout	T1	320m	Negligible	Medium	Very Slight Negative	Negligible
	Motorists/ passengers on Local Service Road	T2	50m	Low	Low	Negligible	Negligible
	Motorists/ passengers on Castle Peak Road Flyover	T3	50m	Low	Low	Negligible	Negligible
	Motorists/ passengers on Long Yat Road	T4	0m	Low	Low	Negligible	Negligible
	Motorists/ passengers on Ting Lung Wai Access Road & Parking	T5	20m	Medium	Low	Negligible	Negligible
	Motorists/ passengers on Nam Pin Wai Access Road & Parking	T6	20m	Low	Low	Negligible	Negligible
	Passengers on West Rail	T7	20m	Low	Low	Negligible	Negligible
	Passengers on LRT north of Castle Peak Road	T8	10m	Low	Medium	Very Slight Negative	Negligible
Access road junction with Castle Peak Road	Residents at North East Yuen Long tower blocks facing east	R4	200m	Negligible	High	Very Slight Negative	Negligible
	Residents of Sun Yuen Long Centre facing south east	R/C1	60m	Negligible	High	Very Slight Negative	Negligible
	Residents of proposed West Rail development above PTI	R/C2	20m	Negligible	High	Very Slight Negative	Negligible



REV	DATE	BY	SUB	APP	DESCRIPTION
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A	9/6/99	PN			NOISE BARRIERS AMENDED

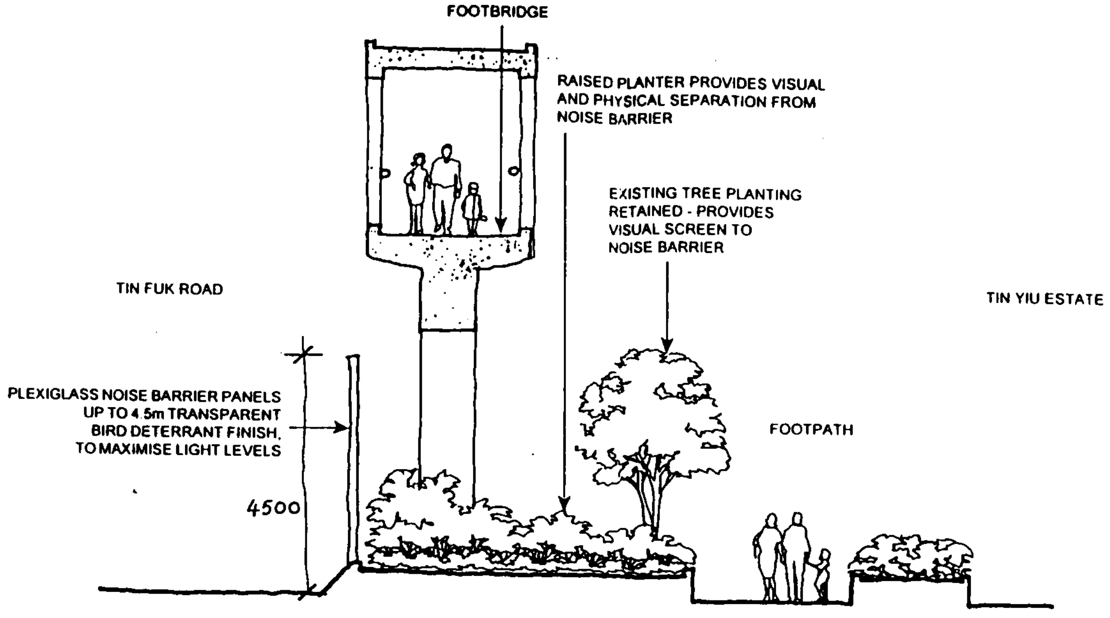
DESIGNED BY T OSBORNE
DRAWN BY D KWOK
CHECKED BY T OSBORNE TO
IN CHARGE A DUGGIE
DATE 23/2/99

KOWLOON-CANTON RAILWAY CORPORATION
WEST RAIL

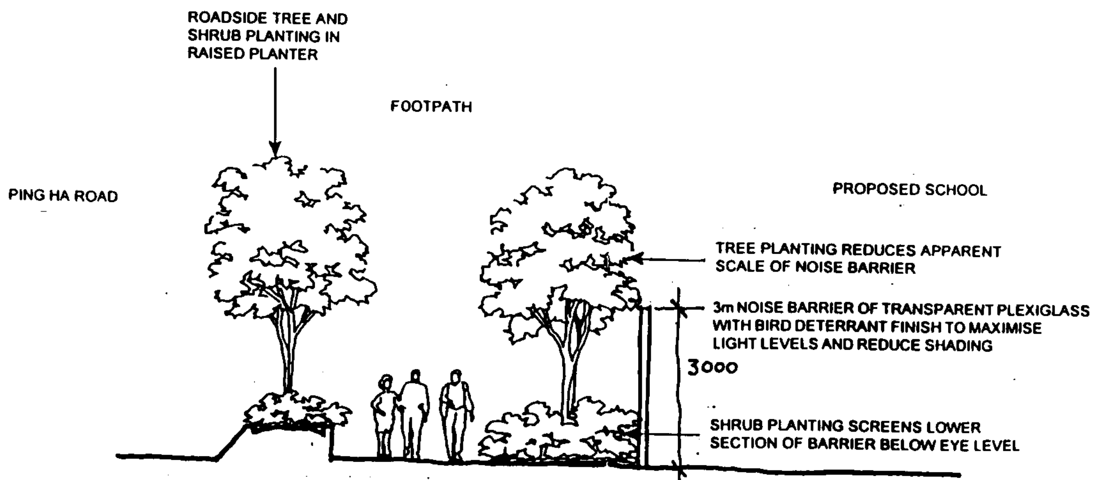
APPROVED DATE

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION
MODIFICATIONS TO TIN FUK ROAD, PING HA ROAD AND TIN YIU ROAD TO SERVE TIS STATION
LANDSCAPE MITIGATION MEASURES

CADD FILE NO SKC088.DGN
CADD DATE
SCALE 1: 2,000
DRAWING NUMBER 8.4b
CONTRACT NO
REV B
SHEET NO



INDICATIVE SECTION OF MITIGATION OF NOISE BARRIER AT TIN FUK ROAD
SCALE 1: 100



INDICATIVE SECTION OF MITIGATION OF NOISE BARRIER AT PING HA ROAD
SCALE 1: 100

A	17.1.99	TO		NOISE BARRIER AMENDED
REV	DATE	BY	SUB APP	DESCRIPTION

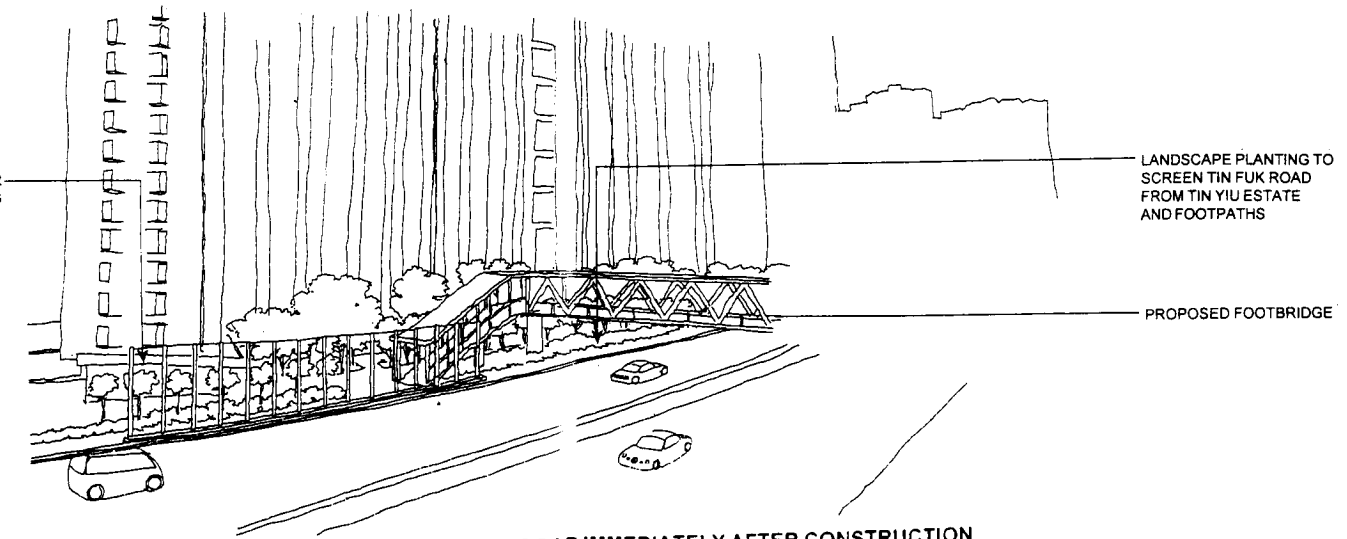
DESIGNED BY T. OSBORNE
DRAWN BY O. KWOK
CHECKED BY T. OSBORNE TO
IN CHARGE A. BUDGE
DATE 24.3.99

KOWLOON-CANTON RAILWAY CORPORATION
WEST RAIL

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS
FOR YUEN LONG SECTION
MODIFICATIONS TO TIN FUK ROAD, PING HA ROAD AND TIN YIU ROAD TO SERVE TIS STATION
LANDSCAPE AND VISUAL MITIGATION MEASURES FOR PROPOSED NOISE BARRIERS

DRAWING NUMBER 8.4c
REV A

EXISTING CONDITIONS LOOKING NORTH EAST ALONG TIN FUK ROAD



PROPOSED MITIGATION MEASURES AT TIN FUK ROAD IMMEDIATELY AFTER CONSTRUCTION

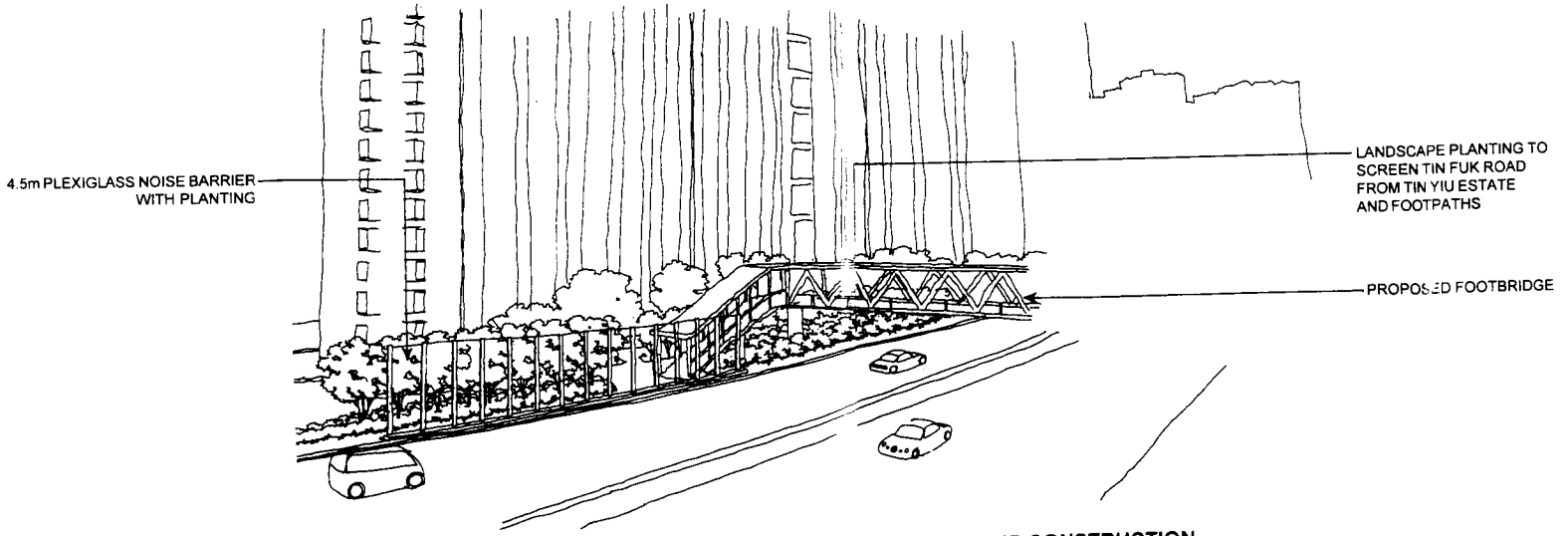
DESIGNED BY T OSBORNE
DRAWN BY D WOO
CHECKED BY T OSBORNE
APPROVED BY I DUGGIN
DATE 18/5/99

KOWLOON-CANTON RAILWAY CORPORATION
WEST RAIL

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS
FOR YUEN LONG SECTION
MODIFICATIONS TO TIN FUK ROAD,
PIK HA ROAD AND TIN YIU ROAD TO SERVE TIS STATION
LANDSCAPE AND VISUAL MITIGATION MEASURES
FOR PROPOSED NOISE BARRIERS

CADD FILE NO. SKC888.DGN
CADD DATE
SCALE
DRAWING NUMBER
8.4d
CONTRACT NO.

EXISTING CONDITIONS LOOKING NORTH EAST ALONG TIN FUK ROAD



PROPOSED MITIGATION MEASURES AT TIN FUK ROAD 10 YEARS AFTER CONSTRUCTION

REV	DATE	BY	SUB	APP	DESCRIPTION

REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED BY T OSBORNE
DRAWN BY D KWOK
CHECKED BY T OSBORNE TC
IN CHARGE A DUGGIE
DATE 18/5/94

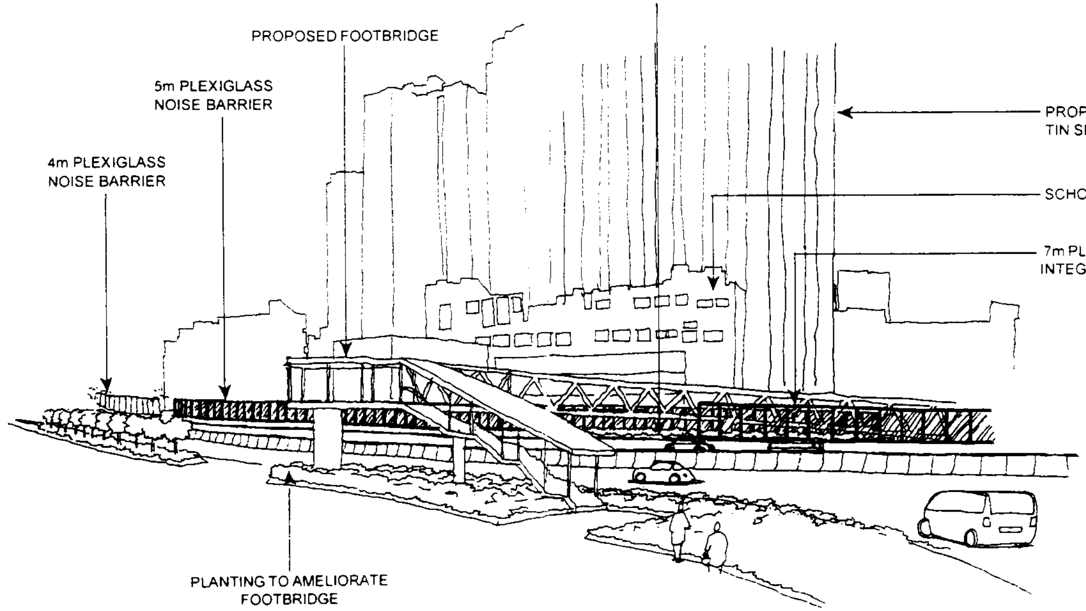
KOWLOON-CANTON RAILWAY CORPORATION
WEST RAIL

APPROVED DATE

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS
FOR YUEN LONG SECTION
MODIFICATIONS TO TIN FUK ROAD,
PING H OAD AND TIN YIU ROAD TO SERVE TIS STATION
LAN SCAPE AND VISUAL MITIGATION MEASURES
FOR PROPOSED NOISE BARRIERS

CADD FILE NO SKC888.DGN
CADD DATE
SCALE 1:
DRAWING NUMBER 8.4e
CONTRACT NO
REV
SHEET NO

EXISTING VIEW WEST ACROSS PING HA ROAD



VIEW WEST ACROSS PING HA ROAD IMMEDIATELY AFTER CONSTRUCTION

NOTE PROPOSED KCRC WEST RAIL STATION AND VIADUCT OMITTED FROM FOREGROUND TO AVOID OBSCURRING MITIGATION MEASURES

B 16/6/99 NOISE BARRIERS AMENDED
C 12/6/99 TEXT AMENDED

DESIGNED BY T. OSBORNE
DRAWN BY D. KWOK
CHECKED BY T. OSBORNE
IN CHARGE A. DUGGIE
DATE 8/5/99

KOWLOON-CANTON RAILWAY CORPORATION

WEST RAIL

KCRC WEST RAIL (PHASE 1)
SENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION
MODIFICATIONS TO TIN FUK ROAD, PING ROAD AND TIN YIU ROAD TO SERVE TIS STATION
OSCAPE AND VISUAL MITIGATION MEASURES FOR PROPOSED NOISE BARRIERS

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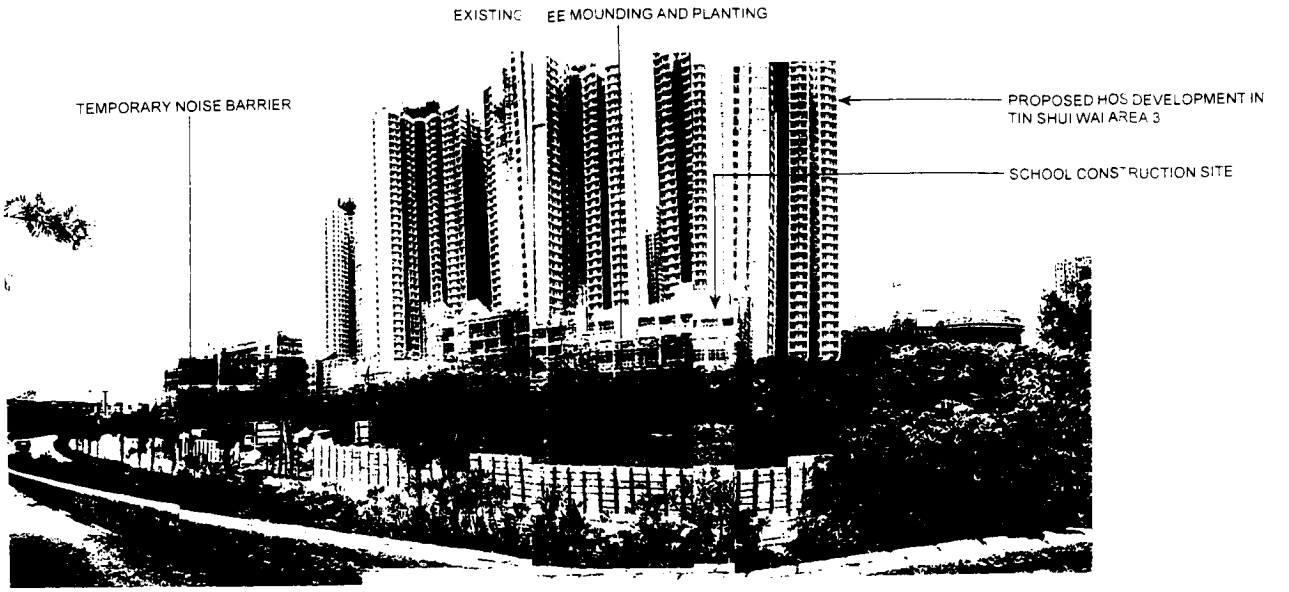
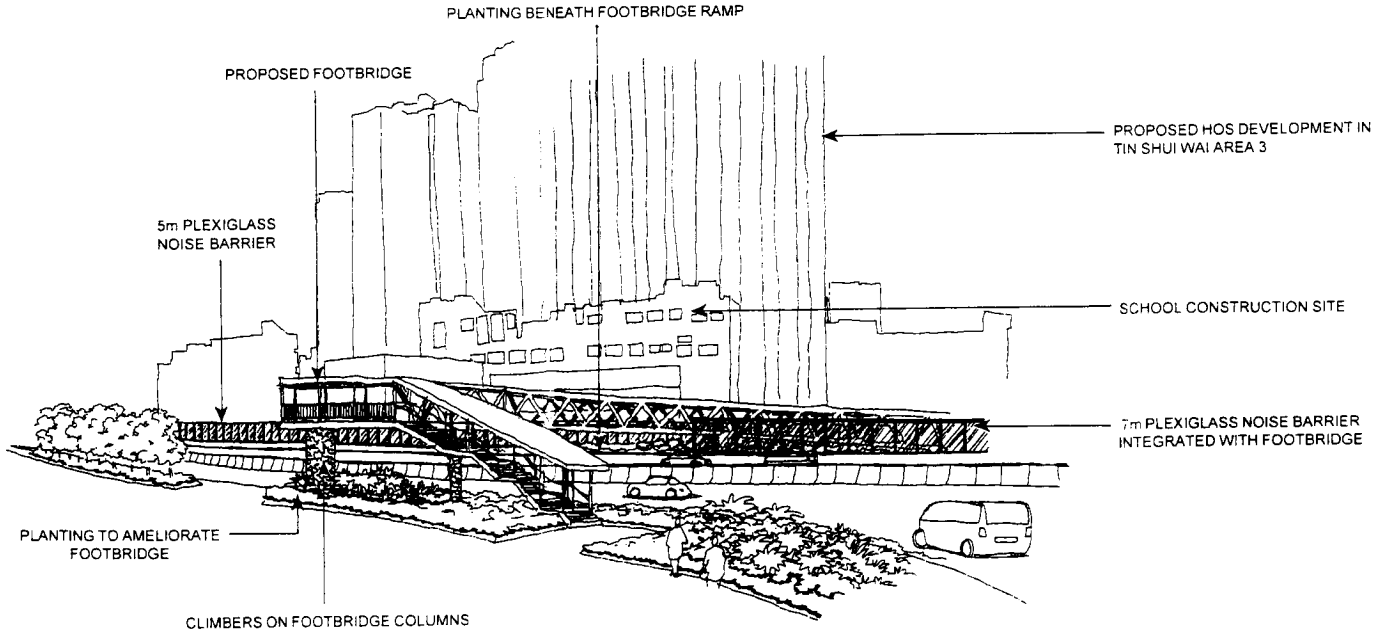
8.4f



EXISTING VIEW WEST ACROSS PING HA ROAD



VIEW WEST ACROSS PING HA ROAD 10 YEARS AFTER CONSTRUCTION

NOTE PROPOSED KCRC WEST RAIL STATION AND VIADUCT OMITTED FROM FOREGROUND TO AVOID OBSCURRING MITIGATION MEASURES

B 10/6/98 TO NOISE BARRIERS AMENDED
A 10/4/98 TO TEXT AMENDED

DESIGNED BY T OSBORNE
DRAWN BY G KWOK
CHECKED BY T OSBORNE
M MARCI
A DUGGETT

KOWLOON-CANTON RAILWAY CORPORATION
WEST RAIL

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION
MODIFICATIONS TO TIN FUK ROAD PING I ROAD AND TIN YIU ROAD TO SERVE TIS STATION
LANDSCAPE AND VISUAL MITIGATION MEASURES FOR PROPOSED NOISE BARRIERS

CADD FILE NO. SKC888.DGN
CADD DATE
SCALE
DRAWING NUMBER 8.49

Sources of Impacts	Key Visually Sensitive Receivers (VSR's) :	Type and Identity No. of VSR*	Minimum Distance Between VSR and Sources	Magnitude of Impact	Receptor Sensitivity	Impact During Operation Phase before Mitigation Measures	Residual Impact During Operational Phase after Mitigation Measures take effect.
	Residents in proposed development in CDA12	R6	20m	Negligible	High	Very Slight Negative	Negligible
	Residents in proposed development in CDA15	R7	0m	Negligible	High	Very Slight Negative	Negligible
	Motorists/ passengers on Castle Peak Road	T1	0m	Medium/Low	Medium	Very slight Negative	Negligible
	Pedestrians and cyclists on Castle Peak Road	P1	0m	High/Medium	High	Very slight Negative	Negligible

8.4 Construction and Operation Phase Impacts at Tin Shui Wai

8.4.1 Sources of Impact at Tin Shui Wai

Potential sources of landscape and visual impacts are illustrated *in Figure 8.4a* and identified below:

- four noise barriers (including the proposed 4m high TDD barrier alongside Ping Ha Road), with the three EPIW barriers being 4.5m high and 35m long, and 5m high and 135m long and 7m high and 70m long;
- increased road area;
- increased road traffic;
- highways structures (including safety barriers, signage and gantries); and
- vehicular and street lighting.

8.4.2 Prediction and Evaluation of Impacts at Tin Shui Wai

8.4.2.1 Landscape Impacts at Tin Shui Wai

8.4.2.1.1 Impact on Landscape Resources at Tin Shui Wai

Landscape impacts associated with the modifications to Tin Fuk Road and Ping Ha Road are listed below:

- 1600 sq.m loss of central median planting;
- 3300sq.m loss of mature embankment tree and shrub planting to boundary of future public transport interchange south of Ping Ha Road;
- 4550 sq.m loss of mature embankment tree and shrub planting to south east boundary of proposed HOS development in Tin Shui Wai Area 3;
- 4000 sq.m loss of grass verge at Tin Fuk Road; and
- 13375 sq.m loss of planter adjacent to Ping Ha Road.

8.4.2.1.2 Impact on Landscape Character at Tin Shui Wai

The impact on the landscape character of the road works at Tin Shui Wai will be relatively minor due to the scale of the existing road layout and junction and when seen in the context of the proposed West Rail and LRT developments which will introduce new and far more dominant elements into the existing landscape. However, the character of the pedestrian environments adjacent to the roads will be substantially modified by the noise barriers. West of Ping Ha road the extensive earth mounding and mature planting will be lost and replaced with footpaths and reduced planting at grade. Proposed noise barriers will constitute new visual elements to the pedestrian environment. The road works do however offer the opportunity for the enhancement of some roadside environments such as the disused LRT reserve adjacent to Tin Fuk Road.

8.4.2.2 Visual Impacts

Tables 8.3a and *8.3b* list the sources of the visual impacts as described in *Section 8.4.1* above; the key VSR's are described in *Section 4.4.4* and illustrated by *Figure 4.4h*; the approximate distance between the VSR's and the sources of impact; the magnitude of the impact; the degree of sensitivity of the VSR's; and the predicted degree of visual impact on each of the VSR's before and after mitigation.

8.4.3 Mitigation Measures

8.4.3.1 Landscape Mitigation Measures

Generally, the landscape mitigation measures proposed below and illustrated *by Figures 8.4b* and 8.*4c* seek to minimise potential landscape and visual impacts of the roadworks, reinstate vegetation that would be lost, blend the new development into the landscape pattern of the surrounding area, and to provide compensation in the form of environmental improvements such as road side planting to off-set the adverse effects of the scheme. Landscape mitigation measures should include:

- storage and re-use of topsoil in areas impacted by the road improvements;
- dust control measures to prevent the deterioration of adjacent landscape elements;
- transplantation of existing trees impacted by the road improvements to compensatory planting sites or offsite to amenity sites identified by and agreed with Government Departments;
- stabilisation and planting of all disturbed areas where appropriate;
- compensatory new tree and shrub planting for lost vegetation; consideration should be given to advance planting works; and
- amenity tree and shrub planting to central carriageway medians and traffic islands.

It is assumed that the proposed mitigation measures would be funded by KCRC and carried out under the EPIW contracts. After an initial 12 month maintenance period of planting works by the implementing Contractor, the Highways Department would normally assume the long term maintenance responsibility of hard landscape elements such as planter walls and tree grilles, and the Regional Services Department would maintain the soft landscape.

8.4.3.2 Visual Mitigation Measures

Generally, the visual mitigation measures proposed below seek to minimise potential impacts of development and to blend the new development into the landscape pattern of the surrounding area. Visual mitigation measures should include:

- site hoardings to screen works areas during the construction period; consideration should be given to the design and surface treatment, particularly adjacent to pedestrian environments;

- sensitively designed noise barriers with careful choice of materials, colours and textures and associated planting;
- control of lighting during night construction activity; and
- amenity roadside tree and shrub planting to screen the road alignment and associated structures (advance planting works should be considered).

Figures 8.4d and *8.4e* show the landscape and visual mitigation measures at Tin Fuk Road both immediately, and 10 years after their implementation, whilst *Figures 8.4f* and *8.4g* show the landscape and visual mitigation measures at Ping Ha Road both immediately, and 10 years after their implementation.

8.4.4 Residual Landscape and Visual Impacts at Tin Shui Wai

8.4.4.1 Residual Landscape Impacts at Tin Shui Wai

Residual landscape impacts associated with the modifications to Tin Fuk Road and Ping Ha Road will include:

- 550 linear metres loss of central median palm trees (note: there is insufficient space to reinstate central median planting along Tin Fuk Road and Ping Ha Road).;
- 600 linear metres loss of mature embankment tree and shrub planting to boundary of future public transport interchange south of Ping Ha Road;
- 200 linear metres loss of mature embankment tree and shrub planting to south east boundary of HOS development in Tin Shui Wai Area 3;
- 400 linear metres loss of grass verge at Tin Fuk Road; and
- 450 linear metres loss of grass verge at Ping Ha Road.

8.4.4.2 Residual Visual Impacts at Tin Shui Wai

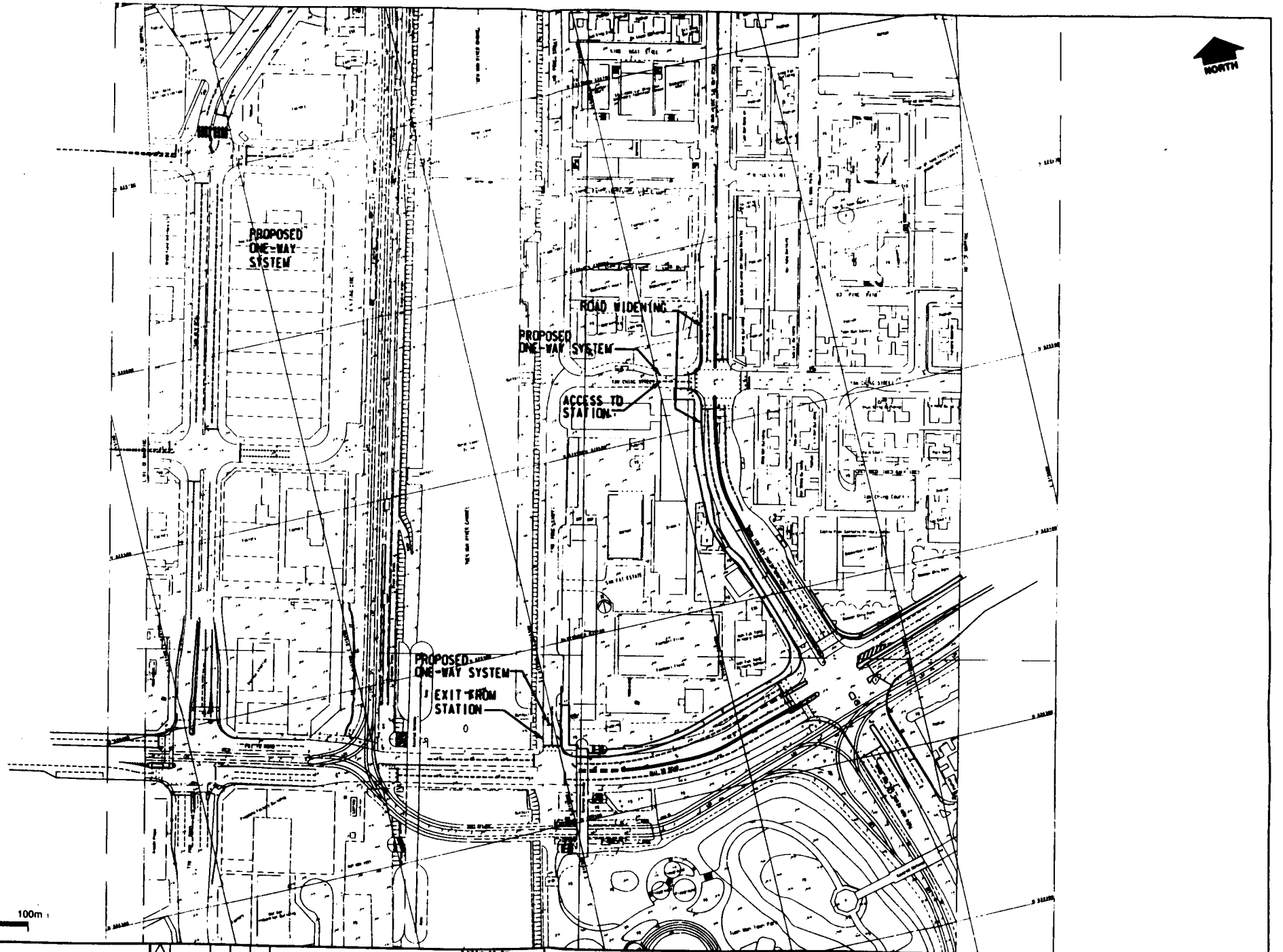
Tables 8.4a and *8.4b* below illustrates the predicted residual visual impacts on each of the VSR's after the mitigation measures have taken effect.

Significant visual impacts will remain during the construction phase even after the implementation of the mitigation measures outlined above. During the Operational Phase the most significant residual impacts will be the very substantial negative impacts felt by pedestrians and cyclists adjacent to the noise barriers on Tin Fuk Road, and the substantial impacts felt by the proposed school at Ping Ha Road. In addition the noise barriers will cause moderate negative impacts on the adjacent land uses at Tin Yiu Estate and Queen Elizabeth Primary School.

Table 8.4a VISUAL IMPACT DURING THE CONSTRUCTION PHASE

Sources of Impacts	Key Visually Sensitive Receivers (VSR's) :	Type and Identity No. of VSR*	Minimum Distance Between VSR and Sources	Magnitude of Impact	Receptor Sensitivity	Impact During Construction Phase before Mitigation Measures	Residual Impact During Construction Phase after Mitigation Measures take effect.
Modifications to Tin Fuk Road and associated Noise barriers NB1	Students and teachers at Queen Elizabeth Primary School	M1	30m	Medium	Medium	Moderate Negative	Moderate Negative
	Students and teachers at TWGH Kwok Yat Wai College	M2	20m	Medium	Medium	Moderate Negative	Moderate Negative
	Residents at south-east facing towers at Tin Yiu Estate	R1	40m	High	High	Very Substantial Negative	Very Substantial Negative
	Pedestrians and cyclists on footpaths adjacent to Tin Fuk Road	P1/P2	1.5m	High	High	Very Substantial Negative	Very Substantial Negative
	Pedestrians on proposed footbridge across Tin Fuk Road	P3	0m	High	High	Very Substantial Negative	Very Substantial Negative
	Pedestrians on proposed footbridge at Tin Fuk Road/Ping Ha Road junction	P4	0m	High	High	Very Substantial Negative	Very Substantial Negative
Modifications to Ping Ha Road and associated Noise Barriers NB2, NB3, and NB4	Students and teachers at Kwok Yat Wai College	M2	20m	Medium	Medium	Moderate Negative	Moderate Negative
	Students and teachers at proposed schools north of Ping Ha Road	M3	40m	High	High	Very Substantial Negative	Very Substantial Negative

Sources of Impacts	Key Visually Sensitive Receivers (VSR's) :	Type and Identity No. of VSR*	Minimum Distance Between VSR and Sources	Magnitude of Impact	Receptor Sensitivity	Impact During Construction Phase before Mitigation Measures	Residual Impact During Construction Phase after Mitigation Measures take effect.
	Residents at south and east facing blocks at proposed HOS development in Tin Shui Wai Area 3	R2	60m	Medium	High	Moderate Negative	Moderate Negative
	Pedestrians on proposed footbridges at Ping Ha Road, and at grade along Ping Ha Road south	P5/P7/P8/P9/ P10	0m	High	High	Very Substantial Negative	Very Substantial Negative
	Pedestrians and cyclists adjacent to Ping Ha Road north	P6	0m	High	High	Very Substantial Negative	Very Substantial Negative
	Passengers on LRT	T7/T8	0m	Medium	Low	Moderate Negative	Moderate Negative
	Motorists and passengers at car park south of TWGH Kwok Yat Wai College	T9	20m	Low	Low	Very Slight Negative	Very Slight Negative
	Motorists and passengers at car park adjacent to Ping Ha Road West	T10	10m	Low	Low	Very Slight Negative	Very Slight Negative



REV	DATE	BY	SUB	APP	DESCRIPTION

REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED BY -
DRAWN BY J.L.
CHECKED BY T.C. TC
IN CHARGE A.D. and
DATE 23/3/99

KOWLOON-CANTON RAILWAY CORPORATION

WEST RAIL

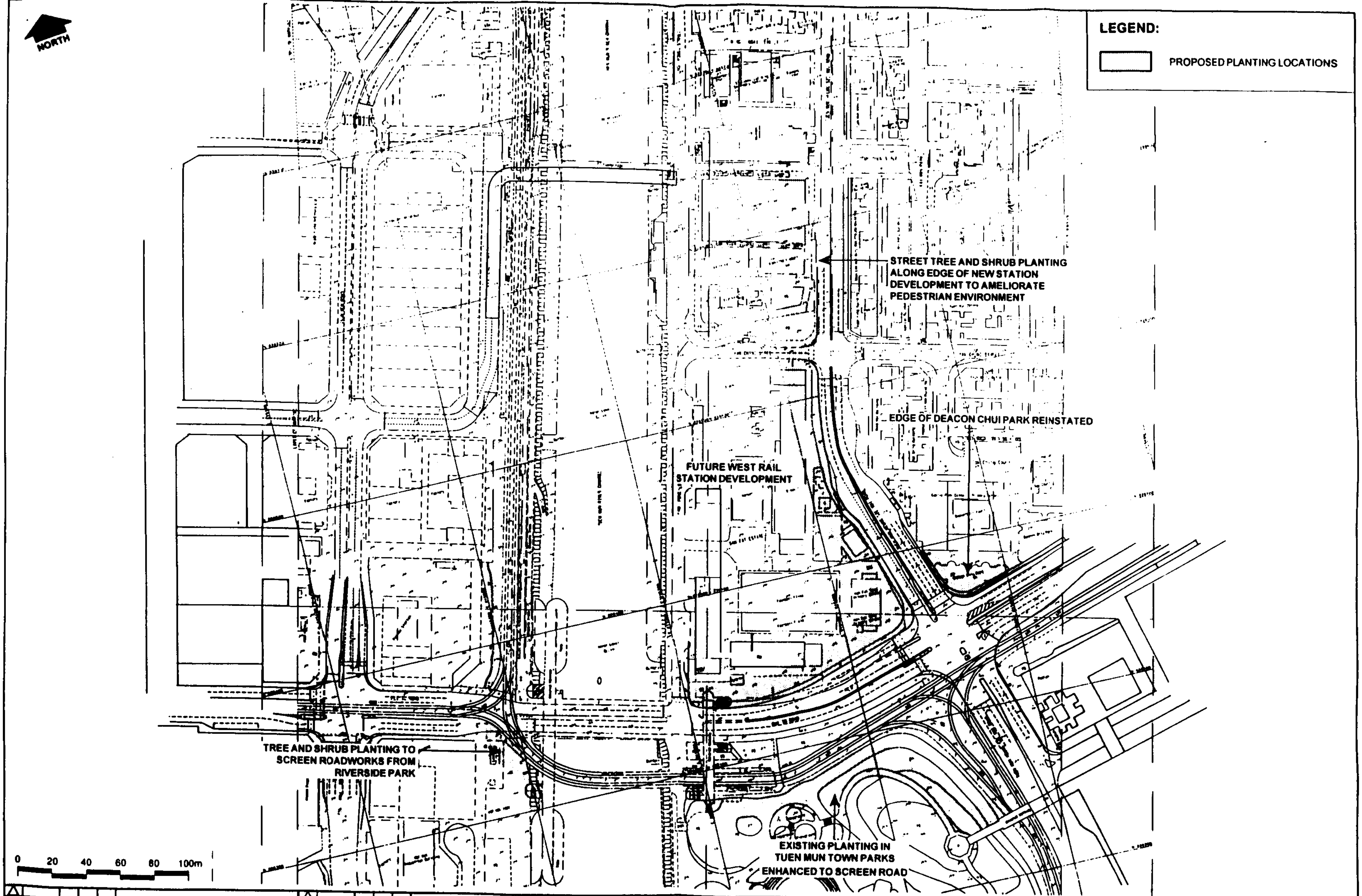
DESIGNER DATE

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS FOR YUEN LONG SECTION

IMPROVEMENTS TO TUEN MUN HEUNG SZE WUI ROAD YAN CHING STREET, PUI TO ROAD, HO PONG STREET AND KIN FUNG CIRCUIT SERVING TMC STATION

SOURCES OF LANDSCAPE AND VISUAL IMPACTS

CADD FILE NO. | CADD DATE
SCALE : 1: 2,000
DRAWING NUMBER
8.5a
CONTRACT NO. | REV | SHEET NO.



KOWLOON-CANTON RAILWAY CORPORATION

WEST RAIL

KCRC WEST RAIL (PHASE 1)
ESSENTIAL PUBLIC INFRASTRUCTURE WORKS
FOR YUEN LONG SECTION

IMPROVEMENTS TO TUEN MUN HEUNG SZE WUI ROAD, YAN CHING STREET, PUI TO ROAD, HO PONG STREET AND KIN FUNG CIRCUIT SERVING TMC STATION

LANDSCAPE MITIGATION MEASURES

SCALE: 1: 2,000

DRAWING NUMBER: 8.5b

REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED BY / DRAWN BY / CHECKED BY / IN CHARGE / DATE: March 22, 1999

APPROVED / DATE

Table 8.4b Visual Impact During the Operational Phase

Sources of Impacts	Key Visually Sensitive Receivers (VSR's) :	Type and Identity No. of VSR*	Minimum Distance Between VSR and Sources	Magnitude of Impact	Receptor Sensitivity	Impact During Operation Phase before Mitigation Measures	Residual Impact During Operational Phase after Mitigation Measures take effect.
Modifications to Tin Fuk Road and associated Noise barriers NB1	Students and teachers at Queen Elizabeth Primary School	M1	30m	Low	Medium	Substantial Negative	Moderate Negative
	Students and teachers at TWGH Kwok Yat Wai College	M2	20m	Medium/Low	Medium	Slight Negative	Very Slight Negative
	Residents at south-east facing towers at Tin Yiu Estate	R1	40m	Medium/High	High	Substantial Negative	Moderate Negative
	Pedestrians and cyclists on footpaths adjacent to Tin Fuk Road	P1/P2	1.5m	High/Low	High	Very Substantial Negative	Very Substantial Negative
	Pedestrians on proposed footbridge across Tin Fuk Road	P3	0m	High/Low	High	Substantial Negative	Slight Negative
	Pedestrians on proposed footbridge at Tin Fuk Road/Ping Ha Road junction	P4	0m	High/Low	High	Substantial Negative	Slight Negative
	Passengers on proposed LRT crossing Tin Fuk Road	T1	10m	Low	Low	Very Slight Negative	Negligible
	Passengers on proposed LRT/West Rail along southern side of Tin Fuk Road	T2	20m	Low	Low	Very Slight Negative	Negligible
	Passengers at proposed LRT/West Rail Station at Tin Fuk Road	T3	20m	Low	Low	Very Slight Negative	Negligible

Sources of Impacts	Key Visually Sensitive Receivers (VSR's) :	Type and Identity No. of VSR*	Minimum Distance Between VSR and Sources	Magnitude of Impact	Receptor Sensitivity	Impact During Operation Phase before Mitigation Measures	Residual Impact During Operational Phase after Mitigation Measures take effect.
Modifications to Ping Ha Road and associated Noise Barriers NB2, NB3 and NB4	Students and teachers at TWGH Kwok Yat Wai College	M2	20m	Medium/Low	Medium	Slight Negative	Very Slight Negative
	Students and teachers at proposed schools north of Ping Ha Road	M3	40m	High	High	Very Substantial Negative	Substantial Negative
	Residents of proposed West Rail development above PTI	R/C1	20m	Low	Medium	Slight Negative	Very Slight Negative
	Residents at south and east facing blocks at proposed HOS development in Tin Shui Wai Area 3	R2	60m	Low	High	Moderate Negative	Slight Negative
	Pedestrians on proposed footbridges at Ping Ha Road, and at grade along Ping Ha Road south	P5/P7/P8/P9/ P10	0m	Medium/Low	High	Moderate Negative	Very Slight Negative
	Pedestrians and cyclists adjacent to Ping Ha Road north	P6	0m	High	High	Very Substantial Negative	Very Substantial Negative
	Passengers at proposed West Rail along southern edge of Ping Ha Road	T6	20m	Medium/Low	Medium	Moderate Negative	Slight Negative
	Passengers on LRT	T7/T8	0m	Low	Low	Very Slight Negative	Negligible
	Motorists and passengers at car park south of TWGH Kwok Yat Wai College	T9	20m	Low	Low	Very Slight Negative	Negligible

Sources of Impacts	Key Visually Sensitive Receivers (VSR's) :	Type and Identity No. of VSR*	Minimum Distance Between VSR and Sources	Magnitude of Impact	Receptor Sensitivity	Impact During Operation Phase before Mitigation Measures	Residual Impact During Operational Phase after Mitigation Measures take effect.
	Motorists and passengers at car park adjacent to Ping Ha Road West	T10	10m	Low	Low	Very Slight Negative	Negligible

8.5 Construction and Operation Phase Impacts at Tuen Mun

8.5.1 Sources of Impacts at Tuen Mun

Potential sources of landscape and visual impacts during the operation phase are illustrated in *Figure 8.5a* and identified below:

- slightly increased road area;
- increased road traffic;
- highways structures (including safety barriers, signage); and
- vehicular and street lighting.

8.5.2 Prediction and Evaluation of Impacts at Tuen Mun

8.5.2.1 Landscape Impacts at Tuen Mun

8.5.2.1.1 Impact on Landscape Resources at Tuen Mun

Landscape impacts associated with roadworks at Tuen Mun will include:

- loss of 500 sq.m mature vegetation and seating areas on north side of Pui To road adjacent to public housing; and
- loss of 100 sq.m mature vegetation on north side of Pui To at Deacon Chiu Park.

8.5.2.1.2 Impact on Landscape Character at Tuen Mun

The impact of the proposed roadworks at Tuen Mun on the landscape character of the local environment will be relatively minor as they represent adjustments to an established road system. The greatest impact will be on the northern edge of Pui To road where existing mature vegetation is lost to road widening.

West of Tuen Mun Heung Sze Wui Road the loss of vegetation is less significant as the site context will change with the construction of the new West Rail Station integrated transport, commercial and residential development. It's current function as a screen for residents and a shady environment for seating and play areas will therefore be lost and it is likely that all tree planting will be removed in the re-development of the site. East of Tuen Mun Heung Sze Wui Road there is a minimal loss of vegetation from the edge of Deacon Chui Park.

8.5.2.2 Visual Impacts

Table 8.5a lists the sources of the visual impacts as described in *Section 8.5.1* above; the key VSR's are described in *Section 4.4.4* and illustrated by *Figure 4.4l*; the approximate distance between the VSR's and the sources of impact; the magnitude of the impact; the degree of sensitivity of the VSR's; and the predicted degree of visual impact on each of the VSR's before and after mitigation.

8.5.3 Mitigation Measures

8.5.3.1 Landscape Mitigation Measures at Tuen Mun

Generally, the landscape mitigation measures proposed below and illustrated by *Figure 8.5a* seek to minimise potential landscape and visual impacts of the roadworks, reinstate vegetation that would be lost, blend the new development into the landscape pattern of the surrounding area, and to provide compensation in the form of environmental improvements such as road side planting to off-set the adverse effects of the scheme. Landscape mitigation measures should include:

- dust control measures during the construction period to prevent the deterioration of adjacent landscape elements;
- storage and re-use of topsoil in areas impacted by the road improvements;
- transplantation of existing trees impacted by the road improvements to compensatory planting sites or offsite to amenity sites identified by and agreed with Government Departments;
- stabilisation and planting of all disturbed areas where appropriate;
- compensatory new tree and shrub planting; consideration should be given to the feasibility of advance planting works.

It is assumed that the proposed mitigation measures would be funded by KCRC and carried out under the EPIW contracts. After an initial 12 month maintenance period of planting works by the implementing Contractor, the Highways Department would normally assume the long term maintenance responsibility of hard landscape elements such as planter walls and tree grilles, and the Regional Services Department would maintain the soft landscape.

8.5.3.2 Visual Mitigation Measures

Generally, the visual mitigation measures proposed below seek to minimise potential impacts of development and to blend the new development into the landscape pattern of the surrounding area. Visual mitigation measures should include:

- amenity roadside tree and shrub planting to screen the road works.
- site hoardings to screen works areas during the construction period; consideration should be given to the design and surface treatment, particularly adjacent to pedestrian environments;
- control of lighting during night construction activity;

Suggested landscape and visual mitigation measures for the Tuen Mun Centre road improvements are illustrated *in Figure 8.5b*.

8.5.3.3 Residual Landscape Impacts at Tuen Mun

Residual landscape impacts associated with the modifications to roads at Tuen Mun are listed below:

- loss of mature vegetation and seating areas on north side of Pui To Road.

8.5.3.4 Residual Visual Impacts at Tuen Mun

Table 8.5a and *8.5b* illustrates the predicted residual visual impacts on each of the VSR's after the mitigation measures have taken effect.

Substantial visual impacts will remain after mitigation measures during the Construction Phase. However, the residual impacts after the implementation of mitigation measures during the Operational Phase will in all cases be negligible.

Table 8.5a VISUAL IMPACT DURING CONSTRUCTION PHASE

Sources of Impacts	Key Visually Sensitive Receivers (VSR's) :	Type and Identity No. of VSR*	Minimum Distance Between VSR and Sources	Magnitude of Impact	Receptor Sensitivity	Impact During Construction Phase before Mitigation Measures	Residual Impact During Construction Phase after Mitigation Measures take effect.
Road improvements at junction of Pui To Road and Tsun Wen Road	Workers at Tuen Mun District Police H.Q.	M2	5m	Low	Low	Slight Negative	Slight Negative
	Workers at Tuen Mun Ambulance and Fire Departments	M3	5m	Medium	Low	Slight Negative	Slight Negative
	Pedestrians along Pui To Road, Tin Hau Road and Tsun Wen Road	P1	1m	High	High	Very Substantial Negative	Very Substantial Negative
	LRT Passengers along Pui To Road	T1	1m	High	High	Very Substantial Negative	Very Substantial Negative
Road Improvements Along Tsun Wen Road	Pedestrians along Tsun Wen Road	P2	1m	High	High	Very Substantial Negative	Very Substantial Negative
	Workers and Drivers at Petrol Station	C1	5m	Medium	Medium	Slight Negative	Slight Negative
Road Improvements along Pui To Road	Students and Teachers in Castle Peak Catholic Primary School	M1	5m	High	Medium	Substantial Negative	Substantial Negative
	Residents and shoppers at commercial and residential blocks along east side of Tuen Mun Heung Sze Wui Road	R/C2	20m	Medium	Medium	Moderate Negative	Moderate Negative

	Users of riverside open space south of road bridge, West river bank	OS1	10m	Medium	High	Substantial Negative	Substantial Negative
	Users of Tuen Mun Town Park	OS2	10m	Low	High	Moderate	Moderate
	Users of Deacon Chiu Park	OS3	5m	Medium	High	Substantial Negative	Substantial Negative
	Pedestrians on footbridges	P3	5m	Medium	High	Substantial Negative	Substantial Negative
	Pedestrians along Tuen Mun River Promenade-east bank	P4	5m	Low	High	Moderate Negative	Moderate Negative
	Pedestrians South East of Pui To Road and Tuen Mun Heung Sze Wui Road	P5	1m	Medium	High	Substantial Negative	Substantial Negative
Roadworks at Tuen Mun Heung Sze Wui Road north of Pui To Road	Residents and shoppers at commercial and residential blocks along east side of Tuen Mun Heung Sze Wui Road	R/C2	5m	Medium	Medium	Moderate Negative	Moderate Negative
	Pedestrians along Tuen Mun Heung Sze Wui Road	P6	1m	High	High	Very Substantial Negative	Very Substantial Negative

Table 8.5b Visual Impact During the Operational Phase

Sources of Impacts	Key Visually Sensitive Receivers (VSR's) :	Type and Identity No. of VSR*	Minimum Distance Between VSR and Sources	Magnitude of Impact	Receptor Sensitivity	Impact During Operation Phase before Mitigation Measures	Residual Impact During Operational Phase after Mitigation Measures take effect.
Road improvements at junction of Pui To Road and Tsun Wen Road	Workers at Tuen Mun District Police H.Q.	M2	5m	Low	Low	Very Slight Negative	Negligible
	Workers at Tuen Mun Ambulance and Fire Departments	M3	5m	Low	Low	Very Slight Negative	Negligible
	Pedestrians along Pui To Road, Tin Hau Road and Tsun Wen Road	P1	1m	Low	High	Slight Negative	Negligible
	LRT Passengers along Pui To Road	T1	1m	Low	High	Very Slight Negative	Negligible
Road Improvements Along Tsun Wen Road	Pedestrians along Tsun Wen Road	P2	1m	Low	High	Slight Negative	Negligible
	Workers and Drivers at Petrol Station	C1	5m	Low	Medium	Very Slight Negative	Negligible
	Passengers on West Rail	T2	100m	Low	Low	Very slight negative	Negligible
Road Improvements along Pui To Road	Students and Teachers in Castle Peak Catholic Primary School	M1	5m	Low	Medium	Slight Negative	Negligible

	Residents and users of proposed Tuen Mun West Rail Station Development	R/C1	5m	Low	Medium	Slight Negative	Negligible
	Residents and shoppers at commercial and residential blocks along east side of Tuen Mun Heung Sze Wui Road	R/C2	20m	Low	Medium	Slight Negative	Very slight
	Users of riverside open area south of road bridge, West river bank	OS1	10m	Low	High	Negligible	Negligible
	Users of Tuen Mun Town Park	OS2	10m	Low	High	Negligible	Negligible
	Users of Deacon Chiu Park	OS3	5m	Low	High	Slight Negative	Negligible
	Pedestrians on footbridges	P3	5m	Low	High	Negligible	Negligible
	Pedestrians along Tuen Mun River Promenade-east bank	P4	5m	Low	High	Negligible	Negligible
	Pedestrians South East of Pui To Road and Tuen Mun Heung Sze Wui Road	P5	1m	Low	High	Slight Negative	Negligible
Roadworks at Tuen Mun Heung Sze Wui Road north of Pui To Road	Residents and users of proposed Tuen Mun West Rail Station Development	R/C1	5m	Low	Medium	Very Slight Negative	Negligible
	Residents and shoppers at commercial and residential blocks along east side of Tuen Mun Heung Sze Wui Road	R/C2	5m	Low	Medium	Very Slight Negative	Negligible
	Pedestrians along Tuen Mun Heung Sze Wui Road	P6	1m	Low	High	Slight Negative	Negligible

8.6 Conclusions

8.6.1 Yuen Long

The primary sources of impact will be Roads L1 and L2 to the north, and the junction of the access road with Castle Peak Road south east of the Sun Yuen Long Centre to the south. Secondary sources of landscape and visual impact will be the 3m high noise barrier, and the diverted drainage channel and new retaining wall located adjacent to the Yuen Long (LRT) floodwater pumping station south east of Shung Tak School at Nam Pin Wai.

The primary landscape impacts will be loss of open area (agricultural land no longer in active use) caused by the proposed alignments of Roads L1 and L2. The roads will physically impact upon a children's playground and mature trees at Tai Wai Tsuen, and upon a village pond and it's surrounding landscape at Ying Lung Wai. Impacts caused by the junction with Castle Peak Road will be associated with loss of mature trees located along embankments on the southern edge of the road. The trees provide visual and landscape amenity to pedestrians, cyclists and motorists whilst additionally providing screening to extensive areas of open storage to the immediate south.

Visual impacts will be highest among VSRs located along the edge of the villages to the north of the works and motorists, pedestrians and cyclists east of Sun Yuen Long Centre. There is little or no vegetative screening along the southern boundaries of Ying Lung Wai and Tai Wai Tsuen and VSRs located on the edges of these village would receive substantial negative visual impacts. The presence of mature trees and vegetation along the southern boundaries of Tsoi Uk Tsuen and Tung Tau Tsuen, and along the eastern boundary of Nam Pin Wai will protect these villages from visual impacts to a large extent. However, there will be a visual impact on VSRs located on the eastern edge of Nam Pin Wai due to a 3m high noise barrier adjacent to the proposed junction between Roads L1 and L2.

There will be no practical method of screening to VSRs on upper floors of the proposed new developments above YUL. However, the visual impact on these VSR's is considered to be only slight.

Secondary landscape and visual impacts will be caused by drainage channel diversion works and a new retaining wall south east of Nam Pin Wai. There may be loss of existing trees associated with the works and the new wall may cause slight negative visual impacts upon VSRs located at Shung Tak School and along the southern edge of Nam Pin Wai.

Visual impacts during the construction phase cannot be effectively mitigated due to the scale of the works and proximity to sensitive visual receivers. However, it is considered that operational phase visual impacts can be significantly reduced by appropriate mitigation measures. In additional to the sensitive design of noise barriers, the open nature of the site offers considerable opportunities for visual and landscape mitigation through screen planting. The open area between Roads L1 and L2 and the villages to the north and west is predominantly flat grassland no longer used for agriculture. Mitigation measures should concentrate on woodland planting

within these buffer zones and upon the reprovisioning of the children's playground at Tai Wai Tsuen.

With reference to the criteria in Annex 10 of the EIA TM, it is considered that the landscape and visual impacts are acceptable with mitigation.

8.6.2 Tin Shui Wai

Modifications to Tin Fuk Road and Ping Ha Road will result in substantial losses of mature embankment vegetation. Impacts will be highest on embankment planting around the boundary of the proposed public transport interchange south of Ping Ha Road and on the south-eastern corner of the proposed residential site to the north. The existing vegetation provides substantial visual and landscape amenity whilst screening both sites from road and footpath users. It is considered that these impacts are residual in nature as there is no practical method of replacing the mounding or replanting trees and shrubs in similar numbers within the immediate vicinity.

An additional source of landscape and visual impact will be the loss of central median palm trees at Tin Fuk Road and Ping Ha Road. The trees currently soften the visual impact of the roads and their loss will adversely affect motorists and pedestrians and residents in south facing blocks at Tin Yiu Estate.

The primary sources of visual impact will be 4.5m, 5m and 7 m high noise barriers recommended under this Study, (located respectively along the southern boundary of the proposed primary and secondary schools west of the road junction, and along the southern boundary of Tin Yin Estate), and the 4m high barrier proposed by TDD (also along the southern boundary of the proposed primary and secondary schools west of the road junction). It is considered that opportunities for screening these structures will be severely limited by lack of available space for planting and that the noise barriers will cause moderate to very substantial negative residual visual impacts.

Mitigation measures should concentrate upon reprovisioning of trees and shrubs to the road alignment boundaries where practicable. Opportunities exist to the southern boundaries of Tin Yiu Estate and the proposed residential development presently under construction to the west for substantial screen planting. Particular attention should be taken to screen noise barriers along the northern boundary of Tin Fuk Road/Ping Ha Road by the planting of fast growing tree and shrub species where space permits.

Visual impacts during the construction phase cannot be effectively mitigated due to the scale of the works and the proximity to sensitive visual receivers. However, with reference to the criteria in Annex 10 of the EIA TM, it is considered that the landscape and visual impacts during the operational phase are acceptable with mitigation.

8.6.3 Tuen Mun Centre

The proposed roadworks at Tuen Mun will have moderate to very slight negative visual impacts as they represent relatively minor modifications to an existing road and junction layout.

The primary landscape impacts will be the loss of mature planting and seating areas adjacent to Pui To Road and slight loss of peripheral vegetation at Deacon Chui Park.

The primary sensitive visual receivers will be pedestrians and cyclists adjacent to roads and on footbridges and users of the riverside open areas and Tuen Mun Town Park.

Mitigation measures should include additional screen planting at riverside open area's and at Tuen Mun Town Park, reinstatement of the edge of Deacon Chui Park and street tree and shrub planting adjacent to the proposed West Rail Station along Pui To and Tsun Wen Heung Sze Wui Road.

Visual impacts during the construction phase cannot be effectively mitigated due to the scale of the works and the proximity to sensitive visual receivers. However, with reference to the criteria in Annex 10 of the EIA TM, it is considered that the landscape and visual impacts are acceptable with mitigation.

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9. WASTE MANAGEMENT

9.1 Potential Sources of Impacts

9.1.1 Construction Phase

9.1.1.1 General

Construction activities to be carried out for the EPIW's will result in the generation of a variety of wastes which include:

- Site clearance waste;
- Excess excavated material/spoil;
- General construction waste;
- Demolition waste;
- Chemical waste; and
- General refuse.

9.1.1.1.1 Site Clearance Waste

As the EPIW's are mostly within existing highway corridors, minimal clearance works will be required other than existing verge materials. The site clearance works in the vicinity of Yuen Long will mainly involve the clearance of vegetation in the work areas to the north of the station including the West Rail alignment.

9.1.1.1.2 Excess Excavated Material

The majority of the EPIW's will be at-grade through existing corridors and so limited excavation will be required. Excavation will be carried out only for the construction of piles and pile cap foundations for the footbridges, noise barriers and the reprovisioning of services. This will generate minimal quantities of spoil which will be reused as fill as necessary on-site.

9.1.1.1.3 General Construction Waste

General construction waste generated from these construction works will consist of wood waste from formwork and falsework, material and equipment wrappings and surplus or rejected construction material (mainly concrete). These are, however, expected to be minimal given the limited extent of elevated works.

If general construction wastes are not removed from site regularly, they may hinder construction and present a safety hazard, in addition to causing potential water quality impacts from runoff. The storage and disposal of construction wastes also have the potential to create visual and dust nuisances.

9.1.1.1.4 Demolition Waste

No significant demolition works will be carried out for the EPIW's. Detailed cut and fill rates for new alignment works to the north of Yuen Long station are not presently known but will be balanced as is practicable to avoid unnecessary disposal.

9.1.1.1.5 Chemical Waste

Substances likely to be generated by construction activities for the EPIW's will, for the most part, arise from the maintenance of equipment. These may include, but may not be limited to, the following:

- Scrap batteries or spent acid/alkali from their maintenance;
- Used engine oils, hydraulic fluids and waste fuel;
- Spent mineral oils and cleaning fluids from mechanical machinery; and
- Spent solvents/solutions, some of which may be halogenated, from equipment cleaning activities.

Chemical waste may pose serious environmental, health and safety hazards if it is not properly managed. These hazards include:

- Toxic effects to workers;
- Adverse effects on water quality from spills;
- Fire hazards; and
- Disruption of sewage treatment works if chemical waste enters the sewerage system.

9.1.1.1.6 General Refuse

General refuse will be generated from the works sites for the EPIW's. The storage of general refuse has the potential to give rise to adverse environmental impacts. These include odour if waste is not collected frequently, windblown litter, water quality impacts if waste enters water bodies, and visual impact. The site may also attract pests and vermin if the waste storage area is not well maintained and cleaned regularly. In addition, disposal of wastes at sites other than approved waste transfer or disposal facilities, can also lead to similar adverse impacts at those sites.

9.1.2 Operational Phase

Waste other than from pedestrian use of footways and occasional littering by passing vehicles is unlikely to arise directly from the operation of the EPIW's. Other than standard street-cleaning, litter bins should be provided for pedestrian use.

9.2 Evaluation of Impacts

9.2.1 Construction Phase

9.2.1.1 Site Clearance Waste

As little site clearance works will be required for the construction of the EPIW's, it is anticipated that there will be negligible environmental impacts due to the storage, handling, transport and disposal of site clearance waste.

9.2.1.2 Excess Excavated Material

Excavated material generated from the EPIW works is expected to be limited.

With respect to the small quantity of excess excavated soil requiring off-site disposal, it is not anticipated to have a significant impact on the demand for public filling capacity. The disposal of inert excavated material at public filling areas or land formation sites will not have any long term environmental impacts.

9.2.1.3 General Construction Waste

Although the storage, handling, transport and disposal of general construction wastes has the potential to create visual, water, dust and associated traffic impacts, due to the limited quantity of general construction wastes that are expected to be produced, it is not predicted that any impacts will occur.

9.2.1.4 Demolition Waste

As little demolition waste will be generated from the construction of the EPIW's, it is anticipated that the environmental impacts will be negligible.

9.2.1.5 Chemical Waste

It is difficult to quantify the amount of chemical waste which will arise from the construction activities as it will be highly dependent on the Contractor's on-site maintenance activities and the numbers of plant and vehicles utilised. However, it is anticipated that the quantity of chemical waste, such as lubricating oils and solvent, produced from plant maintenance will be small.

Storage, handling, transport and disposal should be undertaken in accordance with the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*. Provided that this occurs, and chemical wastes are disposed of at a licensed facility, the contractor should be in compliance with all relevant regulations and there will be little environmental impact.

9.2.1.6 General Refuse

The number of construction personnel who will work on site has not yet been determined by the engineering Design Consultants. However, provided that the recommended mitigation measures are adopted, the environmental impacts caused by the storage, handling, transport and disposal of general refuse is expected to be minimal.

9.2.2 Operational Phase

No impacts are expected during the operational phase.

9.2.3 Mitigation Measures

Construction Phase

The following mitigation measures are recommended in order to minimise the waste related impact of the EPIWs.

General

The Contractor should develop a site specific Waste Management Plan, for submission to the EPD, that clearly defines the arrangements for avoidance, reuse, recovery and recycling, storage, collection, treatment and disposal of different categories of waste to be generated from the construction activities

Various waste management options can be categorised in terms of preference from an environmental viewpoint. The options considered to be more preferable have the least impacts and are more sustainable in a long term context. The Contractor should ensure that, as far as practicable, the most preferred options are implemented. The hierarchy is as follows:

- Avoidance and minimisation (not generating waste through changing or improving practices and design);
- Reuse of materials, thus avoiding disposal (generally with only limited reprocessing);
- Recovery and recycling, thus avoiding disposal (although reprocessing may be required); and
- Treatment and disposal, according to relevant regulations, guidelines and good practice.

The contractor should consult the Waste Disposal Authority on the final disposal of wastes.

Storage, Collection and Transport of Waste

Permitted waste hauliers should be used to collect and transport wastes to the appropriate disposal points. The use of permitted waste carriers, and the implementation of a ticketing system, should also ensure the avoidance of fly-tipping.

The following should be instigated:

- Handle and store wastes in a manner which ensures that they are held securely without loss or leakage, thereby minimising the potential for pollution;
- Segregation and sort the waste into 3 categories (The sorting process shall be carefully monitored to avoid mixing of the 3 categories. Different types of materials/wastes shall be stockpiled and stored in different containers or skips to enhance re-use or recycling of the materials and proper disposal):
  - public fill (e.g. concrete and rubble) for re-use on-site or at public filling areas;
  - recyclable waste (e.g. steel and papers);
  - waste which cannot be re-used and/or recycled for landfill disposal.
- Remove wastes in a timely manner;
- Maintain and clean waste storage areas regularly;
- Minimise windblown litter and dust during transportation by either covering trucks or transporting wastes in enclosed containers;
- Obtain the necessary waste disposal permits from the appropriate authorities, if they are required, in accordance with the *Waste Disposal Ordinance)(Cap 354), Waste Disposal (Chemical Waste) (General) Regulation (Cap 354), the Crown Land Ordinance (Cap 28), Dumping At Sea Ordinance (Cap 466) and Works Branch Technical Circular No. 22/92, Marine Disposal of Dredged Mud;*
- Dispose of waste at licensed sites;
- Develop procedures such as a ticketing system to facilitate tracking of loads, particularly for chemical waste, and to ensure that illegal disposal of wastes does not occur; and
- Maintain records of the quantities of wastes generated, recycled and disposed.

Excess Excavated Material

If practicable, the EPIW contractors should liaise with other contractors of West Rail who require fill material, in order to minimise the amount of inert excavated material to be delivered to public filling areas.

General Construction Waste

General construction waste should be removed from site as soon as practicable in order to avoid adverse environmental impacts due to on-site storage of the material.

To conserve the capacities at landfill sites, general construction waste with more than 20% (by volume) inert material should not be disposed of at landfills. The contractor should recycle as much as possible of the construction waste, and subject to the availability of sufficient space on-site, the Contractor should segregate wastes before disposing of inert materials (concrete, soil, cement/bentonite, etc.) at public filling areas and the degradable wastes (wood, paper, plastic,

etc.) at landfills. The production of general construction wastes should be minimised by the careful control of ordering procedures which can result in surplus materials. The avoidance of over-ordering and the segregation of materials will minimise waste arisings requiring landfill disposal.

Chemical Wastes

Storage, handling, transport and disposal of chemical wastes should be undertaken in accordance with the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*.

General Refuse

General refuse generated on-site should be stored in enclosed bins or compaction units separate from construction and chemical wastes. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from construction and chemical wastes, on a daily basis to minimise odour, pest and litter impacts. The burning of refuse on construction sites is prohibited by law.

General refuse will be generated largely by food service activities on site, so reusable rather than disposable dishware should be used if feasible. Aluminium cans are often recovered from the waste stream by individual collectors if they are segregated or easily accessible, so separate labelled bins for their deposit should be provided wherever feasible.

Office wastes can be reduced through recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme should be considered if one is available.

9.3 Residual Impacts

With the implementation of the recommended mitigation measures, potential residual waste management related impacts will be avoided or reduced to acceptable levels such that they have no adverse health, or environmental resource related impacts.

9.4 Conclusion

The potential impacts of waste arising from the construction and operational phases of the EPIWs have been assessed. Key issues include the need for effective waste management planning during the construction phase, effective management of chemical/industrial and other potentially hazardous wastes, and the strong preference for reuse of clean surplus material rather than disposing of it at public filling areas. Waste management methods and practices and other mitigation measures have been recommended to ensure that potential impacts are avoided or controlled to acceptable levels.

A summary of the recommended mitigation measures is outlined in *Table 9.4a* below.

Table 9.4a - Summary of Recommended Mitigation Measures During Construction and Operation of the Project

Phase	Recommended Mitigation Measures
Construction Phase	• The Contractor should develop a site specific Waste Management Plan to define the Permitted waste hauliers should be used to collect and transport wastes to the appropriate disposal points. The use of permitted waste carriers, and the implementation of a ticketing system, should also ensure the avoidance of fly-tipping. • Permitted waste hauliers should be used to collect and transport wastes to the appropriate disposal points. The use of permitted waste carriers, and the implementation of a ticketing system, should also ensure the avoidance of fly-tipping. • If practicable, the EPIW contractors should liaise with other contractors of West Rail who require fill material, in order to minimise the amount of inert excavated material to be delivered to public filling areas. • General construction waste should be removed from site as soon as practicable in order to avoid adverse environmental impacts due to on-site storage of the material. • Storage, handling, transport and disposal of chemical wastes should be undertaken in accordance with the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*. • General refuse generated on-site should be stored in enclosed bins or compaction units separate from construction and chemical wastes. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from construction and chemical wastes, on a daily basis to minimise odour, pest and litter impacts.
Operation Phase	None required.

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10. CULTURAL AND HERITAGE

10.1 Potential Sources of Impact

The heritage resources within Tin Shui Wai area will potentially be impacted by activities associated with the construction, permanent landtake and operation of West Rail, whereas the EPIW construction works will be distant.

Both temporary and permanent landtake may result in damage to, or loss of, archaeological remains and deposits, the removal of historic buildings, standing archaeological monuments and to the physical coherence of historic landscapes. These potential impacts have been addressed by the West Rail Final Assessment Report. Of most significance to the Pagoda are severance and "islanding", visual and noise and vibration impacts.

Severance and "islanding" may result from permanent landtake required for the West Rail alignment and associated permanent features and from temporary landtake required during construction to accommodate haul roads and construction sites. Areas of historic and cultural interest may be severed, thereby altering or destroying their integrity.

Ground compaction due to construction activities or the weight of permanent embankments may cause damage or distortion to buried archaeological remains, especially in soft alluvial deposits.

Visual and noise intrusion on the setting and amenity of historic and cultural resources may occur where the route passes close to historic buildings, gravesites, archaeological sites and monuments and culturally or historically significant landscape features.

However, given that the West Rail alignment and station are closer to the Pagoda, the mitigation measures being implemented will be sufficient for the EPIW's construction works.

10.2 Prediction and Evaluation of Impacts

No buildings or structures of known historical interest are to be directly impacted by the EPIWs.

During the construction phase, the adjacent works will include site clearance, limited foundation construction using non-percussive piling techniques and superstructure construction but mostly at-grade highway preparation works. With limited scope for heavy vibratory plant in at-grade highway works, the distance separation between these works and the Pagoda, no impacts are likely during the construction phase. However, given the sensitivity and heritage importance of this structure, a condition survey is being undertaken as part of the West Rail works and sample vibration monitoring will be undertaken by the Contractor during site operations. A vibration limit of 2 mm/s peak particle velocity has been applied to all construction related activities and should be included in the Particular Specification for EPIWs.

Since the EPIW's construction activities are likely to be concurrent with West Rail works, the monitoring will ensure no continued exceedance of this threshold limit.

10.3 Recommended Mitigation

Vibration monitoring and adherence to a threshold limit of unacceptability is recommended to protect the structure during the construction phase for all works within 75 m of the Pagoda.

10.4 Residual Impacts

With the implementation of the recommended vibration monitoring to ensure that the levels of vibration associated with the construction phase do not exceed the threshold limit, it is not anticipated that there will be any adverse residual impacts to cultural or heritage resources from either the construction or operation of the EPIWs.

10.5 Conclusions

No temporary or permanent impacts will be likely to the Tsui Shing Lau Pagoda as a result of the Tin Shui Wai EPIW. No other archaeological or cultural resources are known or likely to be impacted by the EPIWs.

Table 10.4a Summary of Recommended Mitigation Measures During Construction and Operation of the Project

Phase	Recommended Mitigation Measures
Construction Phase	Precondition survey of the Pagoda structure. Vibration monitoring during construction works and no exceedance of a 2 mm/s peak particle velocity criteria within the Pagoda Structure.
Operational Phase	None required.

11. ENVIRONMENTAL MONITORING AND AUDIT

11.1 Introduction

This section defines the key areas of impact that have been identified within the preceding chapters, and outlines the proposed EM&A requirements that should be implemented to ensure the efficacy of the recommended mitigation measures.

EM&A is recommended during the construction phase in order to monitor the efficacy of the measures recommended to mitigate the noise and air quality impacts, and during the operational phase to monitor the efficacy of measures proposed to mitigate the traffic noise impact during peak periods. The precise requirements are discussed later within this chapter.

11.2 Objectives of the Environmental Monitoring and Audit Programme

The objectives of carrying out EM&A for the Project include the following:

- to ensure that the areas of environmental concern identified during the EIA process are carried through to, and appropriately considered and incorporated into the detailed design and tender stages of the Project;
- to provide a database against which any short or long term environmental impacts of the Project can be determined;
- to provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards;
- to monitor the performance of the Project and the effectiveness of mitigation measures;
- to verify the environmental impacts predicted in the EIA Study;
- to determine project compliance with regulatory requirements, standards and government policies;
- to take remedial action if unexpected problems or unacceptable impacts arise; and
- to provide data to enable an environmental audit to be performed.

The following sections summarise the recommended scope of the proposed EM&A requirements. The specific EM&A requirements that are to be implemented during the construction and operational phases of the EPIWs will be specified following the approval of the EIA Report as required by the Study Brief and the EIAO TM.

11.3 Scope of Environmental Management

In order to ensure the effective implementation of the recommended mitigation measures and to comply with the conditions of the Environmental Permit and the requirements of

all controlling legislation, it will be essential to develop robust environmental management mechanisms and procedures in the form of an Environmental Management System (EMS). This is in line with KCRC's corporate commitment to high standards of environmental performance and reflects formal systems already established within the operating East Rail Network.

The structure, focus and scope of the EMS is determined by the findings of the formal EIA process and by the Corporation's own environmental policy commitments. The EMS will seek to verify that the environmental performance commitments given in the EIA Report and in KCRC's corporate environmental policies are being upheld and that adverse environmental impacts are minimised.

11.4 Development of an Environmental Management System

An EMS can take many forms, however, they all basically involve the setting and agreement of performance targets and goals, the defining of mechanisms for achieving these targets, together with a means of reviewing and/or auditing the system to verify that the targets have been satisfactorily achieved, and also to identify any weaknesses in the overall EMS that can be improved.

To ensure compliance with the controlling principles defined in the Implementation Schedule, it is likely that these principles will be reproduced in contractual documentation and therefore become performance standards/targets for the consultants and contractors who undertake the detailed design or construction work for KCRC. In this way, the requirements of the Implementation Schedule will become formal requirements with which the various organisations involved in the construction and /or operation of the EPIWs must comply. If appropriate, it may also be necessary to set certain items from the Implementation Schedule as design standards that need to be met during the detailed design and operation of the railway.

To verify compliance with the Contractual requirements, it will be necessary to implement a system of compliance checking and auditing during both the detailed design and construction phases. This verification will be undertaken by either the Corporation, or by Independent Checkers employed by the Corporation who will undertake regular compliance audits, and, for the construction phase, environmental monitoring.

11.5 Environmental Management Plan

In addition to defining the environmental targets that must be achieved, it is envisaged that, for the construction phase, the contractual documentation will also require that the Contractors define mechanisms for achieving the environmental requirements in the form of an Environmental Management Plan (EMP).

The EMP should detail the means by which the Contractor (and all subcontractors working to the Contractor) will implement the recommended mitigation measures and achieve the environmental performance standards defined both in Hong Kong environmental legislation and in the Implementation Schedule. A primary reason for

adopting the EMP approach is to make sure that the Contractor is fully aware of his environmental responsibilities and to ensure his commitment to achieving the specified standards. The EMP approach is grounded on the principle that the Contractor shall define the means by which the environmental requirements of the EIA process, and the contractual documentation shall be met..

11.6 EM&A Manual

The Essential Public Infrastructure Works will be undertaken as part of the individual West Rail construction contracts for Tuen Mun, Tin Shui Wai, and Yuen Long. KCRC has stated its commitment to submit Contract specific EM&A Manuals for each contract and it is recommended that the EM&A provisions associated with the EPIWs be incorporated and integrated within these documents.

Each Contract specific EM&A Manual shall clearly demonstrate the effective integration of the EPIW EM&A requirements.

Once prepared, the EM&A Manual shall provide a description of the organisational arrangements and resources required for the EM&A programme based on the conclusions and recommendations of this EIA. The construction EM&A Manual shall stipulate details of the construction monitoring required, and actions that shall be taken in the event of exceedances of the environmental criteria. In effect, the EM&A Manuals will form handbooks for the on-going environmental management during the construction and, if required, operational phases.

The finalised EM&A Manual will need to comprise descriptions of the key elements of the EM&A programme including:

- appropriate background with references to relevant technical reports;
- organisational arrangements, hierarchy and responsibilities with regard to the management of environmental performance functions during the construction phase to include the EM&A team, the Contractor's team and the Corporation's representatives;
- a broad construction programme indicating those activities for which specific mitigation is required, as recommended in the EIA, and providing a schedule for their timely implementation;
- descriptions of the parameters to be monitored and criteria through which performance will be assessed including: monitoring frequency and methodology, monitoring locations (in the first instance, the location of sensitive receivers as listed in the EIA), monitoring equipment lists, event contingency plans for exceedances of established criteria and schedule of mitigation and best practice methods for minimising adverse environmental impacts;
- procedures for undertaking on-site environmental performance audits as a means of ensuring compliance with environmental criteria; and

- reporting procedures.

The EM&A manual will be a dynamic document which will undergo a series of revisions to accommodate the progression of the construction programme.

During the construction phase, it is envisaged that, in accordance with the mechanisms used for the West Rail Project, an Independent Environmental Checker (IEC) will be employed by KCRC to provide objective monitoring of the environmental management system. The Checker will typically have dual reporting responsibilities and will report directly to both the Engineer and to the EPD.

The IEC will be appointed by the Corporation as a competent independent organisation that can impartially assess the Contractor's environmental performance and ensure that they are implementing all the requirements of the EM&A Manual and the Contractor's own EMP. Compliance verification will be undertaken by means of independent environmental monitoring, and regular auditing of the Contractor's monitoring results, on-site practices and their EMS procedures. In the event of any problems or non-conformances being identified, the IEC will be empowered through the Contract, with powers to require the rectification of the problem.

11.7 Noise

11.7.1 Construction Phase

Noise produced during the construction phase would impact upon nearby NSRs as assessed in *Section 5.2*. The primary noise sources include the use of dump truck, asphalt paver, grader, excavator and breaker during various construction stages. The EIA TM daytime construction noise criteria would be exceeded at most of the representative NSRs if no mitigation measures are imposed.

A set of broad mitigation measures, including good site practice, the use of quiet plant, installing temporary noise barriers, controlled usage of plant on site and substitution of noisy construction equipment has been recommended to reduce the identified impacts. The effectiveness of recommended measures will be checked by the EM&A procedures. It is anticipated that if the mitigation measures described could be successfully applied, the noise levels experienced by the affected receivers will be reduced.

Noise monitoring should be undertaken, as part of the EM&A programme during the construction period of the Project in Yuen Long, Tin Shui Wai and Tuen Mun Centre. *Table 11.7a* below shows the NSR locations for noise monitoring. Additional monitoring locations may be considered necessary in agreement with the EPD.

Table 11.7a Noise Monitoring Location

Location	NSR	Description

Yuen Long	6	Nam Pin Wai (east)
	10	Tai Wai Tsuen (west)
	17	Residential Development in Area 15 (north-west)
Tin Shui Wai	29	Tin Shing Court (east)
	33	QE School Old Student's Association Primary School
Tuen Mun Centre	61	Koon Hing Building
	65	Castle Peak Catholic Primary School (south façade)

The construction noise level shall be measured in terms of A-weighted equivalent continuous sound pressure level (L_{Aeq}). $L_{Aeq(30min)}$ shall be used as the monitoring parameter for the time period between 0700-1900 hours on normal weekdays. For all other time periods, $L_{Aeq(5min)}$ shall be employed for comparison with the NCO noise criteria. As supplementary information for data auditing, statistical results such as L_{A10} and L_{A90} shall also be obtained for reference.

11.7.1.1 Baseline Monitoring

Baseline noise monitoring should be carried out prior to the commencement of the construction works. The baseline monitoring should be carried out daily for a period of at least two weeks to set up the baseline noise condition.

There shall not be any construction activities in the vicinity of the stations during the baseline monitoring. Baseline monitoring measurements shall be evenly spread throughout the assessment period to be conducted at the same frequency and duration throughout the periods of the day for which works are anticipated to be constructed (e.g. daytime, evening and night-time).

11.7.1.2 Impact Monitoring

Noise monitoring should be carried out at all designated monitoring stations. The monitoring frequency should depend on the scale of the construction activities. As a initial guide, the frequency of monitoring should be undertaken once every six days at each monitoring station during the normal working hours (0700-1900 from Monday to Saturday) when noise generating activities are underway.

The monitoring is required to ensure the compliance with the EIA TM noise standards in providing feedback to the contractor for the management of their operations. An EM&A programme should be established for impact monitoring during the construction phase.

In case of non-compliance with the construction noise criteria, more frequent monitoring shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

11.7.2 Operational Phase

In the operational phase of the Project, traffic noise would impact on the nearby NSRs as assessed in *Section 5.3*. The traffic noise criteria for residential uses and schools would be exceeded given the insufficient buffer distance and the increase of traffic volume in the future. Traffic noise mitigation measures such as roadside barriers and low noise road surfacing have been proposed to protect the affected NSRs. Noise monitoring should be conducted during the operational phase so as to ensure the noise levels are comparable to the predicted results of the EIA Study.

Traffic noise levels shall be measured at representative locations in Yuen Long, Tin Shui Wai and Tuen Mun Centre as agreed with the EPD, within the first year of the road opening. Recommended monitoring locations are given in *Table 11.7a* above. Additional monitoring locations may be necessary in agreement with the EPD.

Measurements shall be made in terms of the A-weighted L_{A10} over a 1.5 hour period which includes the peak traffic hour. A traffic survey shall also be conducted during the measurement period and the average speed of vehicles estimated.

Baseline monitoring during the operational phase of the project is not required. For operational phase impact monitoring, two sets of measurements at all designated locations within the first year of the road opening are required as an initial guidance. The recorded traffic and speed data shall be put back in the project prediction model to provide noise level predictions. The generated noise levels will then be compared with the measured level. In case of noise levels exceeding those predicted in the EIA Study, more frequent monitoring shall be carried out.

11.8 Air Quality

The construction work will inevitably lead to dust emissions, mainly from excavation and material handling. Mitigation measures are presented in *Section 6.2.2* and recommended to limit the dust emission and dispersion. With proper dust control measures in accordance with *Air Pollution Control (Construction Dust) Regulations*, the dust levels at the nearby air sensitive receivers will comply with the dust criteria.

Dust monitoring should be undertaken, as part of the EM&A programme during the construction period of the Project in Yuen Long, Tin Shui Wai and Tuen Mun Centre to ensure the efficacy of the control measures. *Table 11.8a* below shows the ASR locations for dust monitoring. Additional monitoring locations may be considered necessary in agreement with the EPD.

Table 11.8a Dust Monitoring Location

Location	ASR	Description
Yuen Long	17	Residential Development in Area 15 (north-west)
Tin Shui Wai	36	Yiu Foo House (south) - Tin Yiu Estate
Tuen Mun Centre	65	Castle Peak Catholic Primary School (south façade)

11.8.1 Baseline Monitoring

Baseline monitoring should be carried out at all of the designated monitoring locations for at least 14 consecutive days prior to the commissioning of the construction works to obtain daily 24-hr dust samples.

11.8.2 Impact Monitoring

Impact monitoring should be carried out during the course of the construction works. For regular impact monitoring, the sampling frequency of at least once in every six-days, should be strictly observed at all the monitoring stations for 24-hr dust monitoring. For hourly dust monitoring, the sampling frequency of at least three times in every six-days should be undertaken when the highest dust impact occurs.

The monitoring is required to ensure compliance with the EIAO in providing feedback to the contractor for the management of their operations. An EM&A programme should be established for impact monitoring during construction phase.

11.9 Water Quality

Environmental monitoring for water quality is not required during the construction phase of the EPIWs.

11.10 Landscape and Visual

No specific landscape and visual environmental monitoring/ auditing is required during the construction phase of the EPIWs.

11.11 Waste Management

The effective management of waste arisings during the construction phase of EPIWs could be monitored through a well planned site audit programme. However, in view of the potential waste generation rate associated with the works, environmental monitoring and audit is not required.

11.12 Cultural Heritage

Although the works are more distant than West Rail Phase I construction activity, vibration monitoring will be required at the Pagoda in Tin Shui Wai to ensure the vibration limits are not exceeded. Should the West Rail Phase I monitoring be undertaken at the same time, data sharing will avoid the need for duplication in measurement.

12. IMPLEMENTATION SCHEDULE OF RECOMMENDED MITIGATION MEASURES

12.1 Construction Phase

Impacts on the nearby sensitive receivers were identified during various construction stages. Appropriate mitigation measures such as good site practices, the use of quiet plant, temporary noise barriers, reducing the operation of construction plant and avoidance of simultaneous noisy activities have been recommended to reduce the construction noise impacts.

To reduce the dust nuisance associated with the works, the requirements stated in *Air Pollution (Construction Dust) Regulation* should be followed and incorporated into the contract specification for implementation.

A practicable environmental implementation schedule of the Project during the construction phase has been proposed and is shown by *Table 12.1a*. All the requirements stated in the implementation schedule should be included in the Contract of Works (Particular Specifications) for the Contractor to undertake in order to avoid adverse environmental impacts. The effectiveness of the recommended measures will be monitored through the EM&A exercise during the construction period. The engineer as well as the contractor is responsible to act accordingly once the defined action and limit levels have been reached where appropriate.

12.2 Operational Phase

Adverse noise impacts from road traffic were predicted at identified sensitive receivers. Direct technical remedies in the form of roadside barriers and low noise road surfacing have been recommended in order to reduce the noise impacts from traffic. Given that the use of direct measures were exhausted, together with the potential site constraints of the Projects and other engineering factors, the need to use indirect measures was considered.

A practicable environmental implementation schedule of the Project during the operational phase has been proposed and is shown by *Table 12.2a*. All the requirements stated in the implementation schedule should be considered in order to avoid adverse environmental impacts.

Table 12.1a Implementation Schedule for Construction Phase Environmental Mitigation Measures

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
Noise							
1	Good Site Practice	The following package of measures shall be implemented during each phase of construction: • only well-maintained plant shall be operated on-site and plant shall be serviced regularly during the construction phase; • machines and plant that may be in intermittent use shall be shut down between work periods or throttled down to a minimum; • plant known to emit noise strongly in one direction shall, where possible, be orientated to direct noise away from nearby NSRs; • silencers or mufflers on construction equipment shall be utilised and shall be maintained in accordance with the manufacturer's recommendations; • mobile plant shall be sited as far away from NSRs as possible; and • material stockpiles and other structures shall be effectively utilised, where practicable, to screen noise from on-site construction activities.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout construction period	NCO, ProPECC PN2/93, EIAO & EIAOTM (Annex 5)	Section 5.2.4.1

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
2	Specific Noise Control Measures	The following package of noise control measures (items 2A-2D) shall be implemented at the times and locations specified in order to achieve the required noise criteria:					
2A	Use of Quieter Plant	The Contractor may be able to obtain particular models of plant that are quieter than standard types given in the *Technical Memorandum on Noise from Construction Work other than Percussive Piling* (GW-TM). Quiet plant is defined as Power Mechanical Equipment (PME) whose actual Sound Power Level (SWL) is less than the value specified in GW-TM for the same piece of equipment. Examples of SWLs for specific silenced PME taken from the British Standard *Noise Control on Construction and Open Sites, BS5228: Part 1: 1997*, are listed below: • Bulldozer, Table C.3 Ref 65, SWL 111 dB(A) • Mobile Crane, Table C.7 Ref 110, SWL 106 dB(A) • Air Compressor, Table C.7 Ref 25, SWL 98 dB(A) • Concrete Pump, Table C.6 Ref 36, SWL 106 dB(A) • Dump Truck, Table C.9 Ref 29, SWL 109 dB(A) • Excavator - for trenching, Table C.3 Ref 97, SWL 105 dB(A)	Contractor	Yuen Long construction site (Castle Peak Road, Long Yat Road, Roads L1, L2, L3 and 6/L3) Tin Shui Wai construction site (Ping Ha Road, Tin Yiu Road and Tin Fuk Road) Tuen Mun Centre construction site (Pui To Road and Tuen Mun Heung Sze Wui Road)	During road construction stage (excavation, placement of road base, kerbing / concreting for concrete carriageway, levelling of new road and road paving), drainage works (excavation, preparation of formation, laying of pipes, construction of manhole, backfilling and reinstatement of pavement), and barrier construction in Yuen Long and Tin Shui Wai (excavation for foundation and erection of barrier)	NCO, ProPECC PN2/93, EIAO & EIAOTM (Annex 5)	Section 5.2.4.2

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
		- for ground excavation, Table C.3 Ref 35, SWL 106 dB(A) • Generator, Table C.7 Ref 62, SWL 100 dB(A)					
2A	Use of Quieter Plant (Cont.)	• Lorry, Table C.9 Ref 27, SWL 105 dB(A) • Loader, Table C.3 Ref 97, SWL 105 dB(A) • Concrete Lorry Mixer, Table C.6 Ref 35, SWL 100 dB(A) • Vibratory Roller, Table C.3 Ref 115, SWL 102 dB(A) • Grader, Table C.3 Ref 76, SWL 111 dB(A) • Breaker, Table C.2 Ref 10, SWL 110 dB(A) • Road Roller, Table C.8 Ref 27, SWL 104 dB(A) • Poker Vibrator, Table C.6 Ref 32, SWL 100 dB(A)					
2B	Use of Temporary and Movable Noise Barriers	It is anticipated that a movable noise barrier with a footing (which has been designed to appropriate engineering standards) and a small cantilevered upper portion can be located within a few metres of a static plant and within about 5 m of more mobile equipment such as excavator and mobile crane etc. such that the line of sight could be blocked by the barriers viewed from the NSRs. The estimated noise reduction by means of screening, provided that the barriers are carefully located, can provide at least 5 dB noise attenuation for mobile equipment and about 10 dB for relative stationary construction plant.	Contractor	Yuen Long construction site (Castle Peak Road, Long Yat Road and Roads L1, L3 and 6/L3) Tin Shui Wai construction site (Ping Ha Road, Tin Yiu Road and Tin Fuk Road) Tuen Mun Centre construction site (Pui To Road and Tuen Mun	During road construction stage (excavation, placement of road base, levelling of new road and road paving), drainage works (excavation, preparation of formation, laying of pipes and backfilling), and barrier construction in Yuen Long and Tin Shui Wai (excavation for foundation and erection of barrier)	NCO, ProPECC PN2/93, EIAO & EIAOTM (Annex 5)	Section 5.2.4.3 and Table 5.4a

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
				Heung Sze Wui Road)			
2C	Restriction of Plant Usage On-site During Critical Construction Stages	The percentage of time that the noisy equipment is in operation may need to be controlled so as to reduce the noise emissions during critical construction stages. Imposing restriction on PME usage by limiting the operating time of PMEs to 50% (i.e. PMEs in operation for 15 minutes within a 30 minutes time slot), could achieve a reduction in noise emission by 3 dB. The use of PMEs on site such as excavator, grader, concrete pump, dump truck, asphalt paver, loader and breaker shall follow this operational restriction. Simultaneous noisy activities should also be avoided to eliminate cumulative noise impact.	Contractor	Yuen Long construction site (Castle Peak Road and Road L1) Tin Shui Wai construction site (Ping Ha Road, Tin Yiu Road and Tin Fuk Road) Tuen Mun Centre construction site (Pui To Road and Tuen Mun Heung Sze Wui Road)	During road construction stage (excavation, placement of road base, levelling of new road and road paving), drainage works (excavation and preparation of formation) and barrier construction in Yuen Long and Tin Shui Wai (excavation for foundation)	NCO, ProPECC PN2/93, EIAO & EIAOTM (Annex 5)	Section 5.2.4.4 and Table 5.4a
2D	Substitution of Noisy Construction Equipment and Further Restriction on Plant Usage	Use lorry of 10t or other model with a SWL of 98 dB(A) or lower to substitute dump truck in order to reduce the noise emissions from construction works. Further restriction on plant usage during excavation works and road paving activities should be implemented by limiting the operating time to 30%.	Contractor	Tin Shui Wai construction site (Ping Ha Road, Tin Yiu Road and Tin Fuk Road) and Tuen Mun Centre construction site (Pui To Road and Tuen Mun Heung Sze Wui Road)	During all excavation works for drainage and road construction, foundation construction for noise barrier and road paving activities	NCO, EIAO & EIAOTM	Section 5.2.5 and Table 5.4a

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
	Air Quality						
3	Dust	In addition to compliance with the Air Pollution Control (Construction Dust) Regulations, the following mitigation measures will be implemented to limit the dust emissions: • the heights from which materials are dropped should be controlled to a minimum practical height to control fugitive dust arising from unloading; • materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport; and • water sprays should be applied to maintain the worksite wet.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout construction period	APCO, APC(CD)R, EIAO & EIAOTM (Annex 4 & 12)	Section 6.2.2
	Water Quality						
4	Construction Runoff	Exposed soil areas shall be minimised to reduce the potential for increased siltation, contamination of runoff, and erosion. Construction runoff related impacts associated the construction activities shall be controlled through the use of appropriate	Contractor	Yuen Long and Tin Shui Wai construction sites	During periods of excavation	WPCO, EIAO, EIAOTM (Annex 6 & 14) and ProPECC PN 1/94 (Appendix AI)	Section 7.2.2

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
		mitigation measures which include: • Use of sediment traps; and • Adequate maintenance of drainage systems to prevent flooding and overflow. The boundaries of critical areas of earthworks shall be marked and surrounded by dykes or embankments for flood protection. Temporary ditches shall be provided to facilitate runoff discharge into appropriate watercourses, via a silt retention pond. Permanent drainage channels shall incorporate sediment basins or traps and baffles to enhance deposition rates.					
5	Construction Runoff - Programming	Construction works shall be programmed to avoid or if this is not practicable, to minimise surface excavation works during the rainy season (April to September). All exposed earth areas shall be completed as soon as possible after earth works have been completed, or alternatively, where practicable, within 14 days of the cessation of earthworks. If excavation of soil cannot be avoided during the rainy season, or at any time of year when rainstorms are likely, exposed slope surfaces should be covered by tarpaulin or other means.	Contractor	Yuen Long and Tin Shui Wai construction sites	During periods of excavation	WPCO, EIAO, EIAOTM (Annex 6 & 14) and ProPECC PN 1/94 (Appendix A2)	Section 7.2.2
6	Sediment tanks	Sediment tanks of sufficient capacity shall be used for settling surface runoff prior to disposal. The system capacity shall be flexible and able to handle multiple inputs from a variety	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	During periods of excavation	WPCO, EIAO, EIAOTM (Annex 6 & 14) and ProPECC PN 1/94	Section 7.2.2

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
		of sources and particularly suited to applications where the influent is pumped.				(Appendix A2)	
7	Manholes	Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris being washed into the drainage system and storm runoff being directed into foul sewers.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout construction period	WPCO, EIAO, EIAOTM (Annex 6 & 14) and ProPECC PN 1/94 (Appendix A2)	Section 7.2.2
8	Drainage	All temporary and permanent drainage pipes and culverts provided to facilitate runoff discharge shall be designed for the controlled release of storm flows. All sediment traps shall be regularly cleaned and maintained. The temporarily diverted drainage shall be reinstated to its original condition when the construction work has finished or the temporary diversion is no longer required.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout construction period	WPCO, EIAO and TM (Annex 6 & 14)	Section 7.2.2
9	Wheel Washes	Sand and silt in the wash water from the wheel washing facilities shall be settled out and removed before discharging into storm drains. A section of the road between the wheel washing bay and the public road shall be paved with backfall to prevent wash water or other site runoff from entering public road	Contractor	Exit of Yuen Long construction site	Throughout construction period	WPCO, EIAO and TM (Annex 6 & 14)	Section 7.2.2

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
		drains.					
10	Oil interceptors	Oil interceptors shall be provided in the drainage system downstream of any oil/fuel pollution sources associated with construction, and regularly emptied to prevent the release of oils and grease into the storm water drainage system after accidental spillages. The interceptor should have a bypass to prevent flushing during periods of heavy rain.	Contractor	Yuen Long construction site	Throughout construction period	WPCO, EIAO and TM (Annex 6 & 14)	Section 7.2.2
11	General Construction Activities	Debris and rubbish on site shall be collected, handled and disposed of properly to prevent it from entering the water column and causing water quality impacts. All fuel tanks and storage areas shall be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank, to prevent spilled fuel oils from reaching the receiving water bodies.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout construction period	WPCO, EIAO & EIAOTM (Annex 6 &14)	Section 7.2.2
12	Sewage Effluent	Construction workforce sewage is expected to be connected to the existing trunk sewer or sewage treatment facilities, although precise information on the size of the on-site workforce is not available at this stage. Construction sewage may need to be handled by portable chemical toilets and sewage holding tanks if the construction workers are likely to be dispersed along the alignment. Appropriate and adequate portable toilets shall be provided by a licensed contractor who will be responsible for undertaking the related disposal and maintenance activities in accordance with all related legislation and guidelines.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout construction period	WPCO, EIAO & EIAOTM (Annex 6 & 14)	Section 7.2.2

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
Landscape and Visual							
13	General	The following mitigation measures shall be implemented to mitigate the landscape and visual impacts associated with the construction phase: • Control of night time lighting; • Where hoarding is erected, it shall be of an appropriate decorative type; • Advance planting for screening and mitigation during the construction phase (this will only be feasible on those parts of the site where the planting will not hinder the construction works or be damaged by the construction activities); • Dust control measures to prevent the deterioration of adjacent landscape elements; and • Careful positioning of construction plant.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout construction period	EIAO & EIAOTM (Annex 18)	Sections 8.3.3, 8.4.3 & 8.5.3
14	Specific Landscape and Visual Mitigation Measures - Yuen Long	The following site specific landscape and visual mitigation measures shall be incorporated at the Yuen Long Worksite:					
		Storage and re-use of topsoil in areas impacted by the road improvements;	Contractor	Yuen Long construction site	During periods of excavation period	EIAO & EIAOTM (Annex 18)	Section 8.3.3.1
		Dust control measures to prevent the deterioration of adjacent landscape elements;	Contractor	Yuen Long construction site	Throughout construction period	EIAO & EIAOTM (Annex 18) & APC (Const Dust) Regs	Section 8.3.3.1

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
		Transplantation of existing trees impacted by the road improvements to compensatory planting sites or offsite to amenity sites identified by Government Departments;	Contractor	Yuen Long construction site	At earliest opportunity on possession of site	EIAO & EIAOTM (Annex 18)	Section 8.3.3.1
		Stabilisation and planting of all disturbed areas without a permanent surface treatment	Contractor and Regional Services Department	Yuen Long construction site	Following completion of construction works	EIAO & EIAOTM (Annex 18)	Section 8.3.3.1
		Compensatory new tree and shrub planting; consideration should be given to the feasibility of advance planting works;	Contractor	Yuen Long construction site	Following completion of construction works	EIAO & EIAOTM (Annex 18)	Section 8.3.3.1
		Reprovisioning of a children's playground at Tai Wai Tsuen;	Contractor & Highways Department	Yuen Long construction site	At earliest opportunity	EIAO & EIAOTM (Annex 18)	Section 8.3.3.1
		Consideration should be given to the design and surface treatment of any hoardings used to screen works areas (especially those adjacent to pedestrian environments);	Contractor	Yuen Long construction site	Throughout construction period	EIAO & EIAOTM (Annex 18)	Section 8.3.3.2
		Consideration should be given to the sensitive design of the noise barrier at Road L1; careful choice of materials, colours and textures and associated planting;	Highways Department	Yuen Long construction site	Detailed Design Stage	EIAO & EIAOTM (Annex 18)	Section 8.3.3.2
		Control of lighting during night construction activity;	Contractor	Yuen Long construction site	Throughout construction period	EIAO & EIAOTM (Annex 18)	Section 8.3.3.2
		Amenity roadside tree and shrub planting to screen the road alignment and associated structures, particularly new Roads L1 and L2. Advance planting works should be considered.	Contractor	Yuen Long construction site	Following completion of construction works	EIAO & EIAOTM (Annex 18)	Section 8.3.3.2
15	Specific Landscape and Visual Mitigation Measures - Tin Shui Wai Worksite	The following site specific landscape and visual mitigation measures shall be incorporated at the Tin Shui Wai Worksite:					
		Storage and re-use of topsoil in areas impacted by the road improvements;	Contractor	Tin Shui Wai construction site	During periods of excavation	EIAO & EIAOTM (Annex 18)	Section 8.4.3.1

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
		Dust control measures to prevent the deterioration of adjacent landscape elements;	Contractor	Tin Shui Wai construction site	Throughout construction period	EIAO & EIAOTM (Annex 18 & APC (Const Dust) Regs.)	Section 8.4.3.1
		Transplantation of existing trees impacted by the road improvements to compensatory planting sites or offsite to amenity sites identified by and agreed with Government Departments;	Contractor	Tin Shui Wai construction site	At earliest opportunity on possession of site, and prior to any EPIW works that may impact upon the trees	EIAO & EIAOTM (Annex 18)	Section 8.4.3.1
		Stabilisation and planting of all disturbed areas without a permanent surface treatment	Contractor	Tin Shui Wai construction site	Following completion of construction works	EIAO & EIAOTM (Annex 18)	Section 8.4.3.1
		Compensatory new tree and shrub planting for lost vegetation; consideration should be given to advance planting works; and	Contractor	Tin Shui Wai construction site	Following completion of construction works	EIAO & EIAOTM (Annex 18)	Section 8.4.3.1
		Amenity tree and shrub planting to central carriageway medians and traffic islands.	Contractor	Tin Shui Wai construction site	Following completion of construction works	EIAO & EIAOTM (Annex 18)	Section 8.4.3.1
		Consideration should be given to the design and surface treatment of any hoardings used to screen works areas (especially those adjacent to pedestrian environments);	Contractor	Tin Shui Wai construction site	Throughout construction period	EIAO & EIAOTM (Annex 18)	Section 8.4.3.2
15	Specific Landscape and Visual Mitigation Measures -	Consideration should be given to the sensitive design of the noise barriers with careful choice of materials, colours and textures and associated planting;	Highways Department	Tin Shui Wai construction site	Detailed Design Stage	EIAO & EIAOTM (Annex 18)	Section 8.4.3.2

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
	Tin Shui Wai Worksite (Cont.)						
		Control of lighting during night construction activity;	Contractor	Tin Shui Wai construction site	Throughout construction period	EIAO & EIAOTM (Annex 18)	Section 8.4.3.2
		Amenity roadside tree and shrub planting to screen the road alignment and associated structures, advance planting works should be considered, particularly new Roads L1 and L2	Contractor	Tin Shui Wai construction site	Following completion of construction works	EIAO & EIAOTM (Annex 18)	Section 8.4.3.2
16	Specific Landscape and Visual Mitigation Measures - Tuen Mun Centre construction site	The following site specific landscape and visual mitigation measures shall be incorporated at the Tuen Mun Centre construction site:					
		Dust control measures during the construction period to prevent the deterioration of adjacent landscape elements;	Contractor	Tuen Mun Centre construction site	Throughout construction period	EIAO & EIAOTM (Annex 18 & APC (Const Dust) Regs.)	Section 8.5.3.1
		Storage and re-use of topsoil in areas impacted by the road improvements;	Contractor	Tuen Mun Centre construction site	During periods of excavation	EIAO & EIAOTM (Annex 18)	Section 8.5.3.1
		Transplantation of existing trees impacted by the road improvements or offsite to amenity sites identified by and agreed with Government Departments;	Contractor	Tuen Mun Centre construction site	At earliest opportunity on possession of site, and prior to any EPIW works that may impact upon the trees	EIAO & EIAOTM (Annex 18)	Section 8.5.3.1
16	Specific Landscape and Visual	Stabilisation and planting of all disturbed areas where appropriate;	Contractor	Tuen Mun Centre construction site	Following completion of construction works	EIAO & EIAOTM (Annex 18)	Section 8.5.3.1

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
	Mitigation Measures - Tuen Mun Centre construction site (Cont.)	Compensatory new tree and shrub planting; consideration should be given to the feasibility of advance planting works.	Contractor	Tuen Mun Centre construction site	Following completion of construction works	EIAO & EIAOTM (Annex 18)	Section 8.5.3.1
		Amenity roadside tree and shrub planting to screen the road works.	Contractor	Tuen Mun Centre construction site	Following completion of construction works	EIAO & EIAOTM (Annex 18)	Section 8.5.3.2
		Consideration should be given to the design and surface treatment of any hoardings used to screen works areas (especially those adjacent to pedestrian environments);	Contractor	Tuen Mun Centre construction site	Throughout construction period	EIAO & EIAOTM (Annex 18)	Section 8.5.3.2
		Control of lighting during night construction activity;	Contractor	Tuen Mun Centre construction site	Throughout construction period	EIAO & EIAOTM (Annex 18)	Section 8.5.3.2
Waste Management							
17	Waste - General	The Contractor shall submit a site specific Waste Management Plan for the construction phase to EPD. The Plan shall be verified by the Independent Environmental Consultant (IEC) and shall describe the arrangements for avoidance, reuse, recovery and recycling, storage, collection, treatment and disposal of different categories of waste to be generated from the construction activities and shall take into account the recommendations of the EIA report.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Prior to the commencement of construction works	EIAO & EIAOTM (Annex 15)	Section 9.2.3

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
18	Storage, Collection and Transport of Waste	The following site specific mitigation measures shall be implemented to minimise potential waste impacts:					
		• Minimise windblown litter and dust during transportation by either covering trucks or transporting wastes in enclosed containers.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout the construction phase	EIAO & EIAOTM (Annex 15)	Section 9.2.3
		• Obtain the necessary waste disposal permits from the appropriate authorities, if they are required, in accordance with the *Waste Disposal Ordinance)(Cap 354)*, *Waste Disposal (Chemical Waste) (General) Regulation (Cap 354)*, the *Crown Land Ordinance (Cap 28)*, *Dumping At Sea Ordinance (Cap 466)* and *Works Branch Technical Circular No.*	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout the construction phase	EIAO & EIAOTM (Annex 15)	Section 9.2.3
		• Develop procedures such as a ticketing system to facilitate tracking of loads, particularly for chemical waste, and to ensure that illegal disposal of wastes does not occur;	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout the construction phase	EIAO & EIAOTM (Annex 15)	Section 9.2.3
		• Maintain records of the quantities of wastes generated, recycled and disposed.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout the construction phase	EIAO & EIAOTM (Annex 15)	Section 9.2.3
		• Segregation and sort the waste into 3 categories: * public fill (e.g. concrete and rubble) for re-use on-site or at public filling areas; * recyclable waste (e.g. steel and papers); * waste which cannot be re-used and/or recycled for landfill disposal.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout the construction phase	EIAO & EIAOTM (Annex 15)	Section 9.2.3

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
18	Storage, Collection and Transport of Waste (Cont.)	The sorting process shall be carefully monitored to avoid mixing of the 3 categories. Different types of materials/wastes shall be stockpiled and stored in different containers or skips to enhance re-use or recycling of the materials and proper disposal.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout the construction phase	EIAO & EIAOTM (Annex 15)	Section 9.2.3
19	General construction waste	General construction waste shall be removed from site as soon as practicable in order to avoid adverse environmental impacts due to on-site storage of the material.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout the construction phase	Waste Disposal Ordinance and subsidiary legislation	Section 9.2.3
		General construction waste with more than 20% (by volume) inert material shall not be disposed of at landfills. The contractor shall recycle as much as possible of the construction waste, and subject to the availability of sufficient space on-site, the Contractor shall segregate wastes before disposing of inert materials (concrete, soil, cement/bentonite, etc.) at public filling areas and the degradable wastes (wood, paper, plastic, etc.) at landfills. The production of general construction wastes should be minimised by the careful control of ordering procedures which can result in surplus materials.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout the construction phase	Waste Disposal Ordinance and subsidiary legislation	Section 9.2.3
20	Chemical Wastes	Storage, handling, transport and disposal of chemical wastes should be undertaken in accordance with the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout the construction phase	Waste Disposal Ordinance and subsidiary legislation	Section 9.2.3
21	General Refuse	General refuse generated on-site should be stored in enclosed bins or compaction units separate from construction and	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre	Throughout the construction phase	Waste Disposal Ordinance and	Section 9.2.3

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
		chemical wastes. A reputable waste collector shall be employed by the contractor to remove general refuse from the site, separately from construction and chemical wastes, on a daily basis to minimise odour, pest and litter impacts.		construction sites		subsidiary legislation	
21	General Refuse (Cont.)	If a canteen is provided, reusable rather than disposable dishware shall be used if feasible to minimise waste.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout the construction phase	Waste Disposal Ordinance and subsidiary legislation	Section 9.2.3
		Separate labelled bins shall be provided for the collection of aluminium cans to facilitate recycling.	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout the construction phase	Waste Disposal Ordinance and subsidiary legislation	Section 9.2.3
		If the volume of office paper wastes is large enough to warrant collection, the Contractor shall participate in a local collection scheme (if available), to facilitate recycling	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre construction sites	Throughout the construction phase	Waste Disposal Ordinance and subsidiary legislation	Section 9.2.3
EM&A Requirements - Construction Phase							
22	Noise Monitoring	Noise monitoring should be undertaken at the following locations, as part of the EM&A programme during the construction period of the Project in Yuen Long, Tin Shui Wai and Tuen Mun Centre. (Additional monitoring locations may be considered necessary in agreement with the EPD).					
22A	Yuen Long	Yuen Long • NSR 6 - Nam Pin Wai (east) • NSR 10 - Tai Wai Tsuen (west)	Contractor	Yuen Long	Throughout construction phase	EIAO & EIAOTM (Annex 21)	Section 11.7

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
		• NSR 17 - Residential Development in Area 15 (north-west)					
22B	Tin Shui Wai	Tin Shui Wai • NSR 29 - Tin Shing Court (east) • NSR 33 - QE School Old Student's Association Primary School • NSR 36 - Yiu Foo House (south) - Tin Yiu Estate	Contractor	Tin Shui Wai	Throughout construction phase	EIAO & EIAOTM (Annex 21)	Section 11.7
22C	Tuen Mun Centre	Tuen Mun Centre • NSR 61 - Koon Hing Building • NSR 65 - Castle Peak Catholic Primary School (south façade)	Contractor	Tuen Mun Centre	Throughout construction phase	EIAO & EIAOTM (Annex 21)	Section 11.7
23	Air Quality Monitoring	Dust monitoring should be undertaken at the following locations, as part of the EM&A programme during the construction period of the Project in Yuen Long, Tin Shui Wai and Tuen Mun Centre to ensure the efficacy of the recommended mitigation measures. (Additional monitoring locations may be considered necessary in agreement with the EPD.)	Contractor	Yuen Long, Tin Shui Wai and Tuen Mun Centre	Throughout construction phase	EIAO & EIAOTM (Annex 21)	Section 11.8
23A	Yuen Long	Yuen Long				EIAO & EIAOTM	Section

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
		• ASR 17 - Residential Development in Area 15 (north-west)	Contractor	Yuen Long	Throughout construction phase	(Annex 21)	11.8
23B	Tin Shui Wai	Tin Shui Wai					
		• ASR 36 - Yiu Foo House (south) - Tin Yiu Estate	Contractor	Tin Shui Wai	Throughout construction phase	EIAO & EIAOTM (Annex 21)	Section 11.8
23C	Tuen Mun Centre	Tuen Mun Centre					
		• ASR 65 - Castle Peak Catholic Primary School (south façade)	Contractor	Tuen Mun Centre	Throughout construction phase	EIAO & EIAOTM (Annex 21)	Section 11.8
24	Vibration Monitoring - Tin Shui Wai	Vibration monitoring will be required at the Pagoda in Tin Shui Wai to ensure the vibration limits are not exceeded. Note: It is anticipated that the West Rail Phase I vibration monitoring will be undertaken at the same time as that required for the EPIW works. As the same Contractor is likely to undertake both items of construction work, vibration monitoring will be undertaken under the West Rail Phase I Contract and data sharing implemented to avoid the need for duplication in measurement.	Contractor	Tin Shui Wai	Throughout construction phase	EIAO & EIAOTM (Annex 21)	Section 11.12

Table 12.2a Implementation Schedule for Operational Phase Environmental Mitigation Measures

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
Noise							
1	Yuen Long	The following mitigation measures shall be provided at Yuen Long to mitigate the operational road noise:					
		• 3 m high vertical barrier of length 35 m at Road L1 (*Figure 5.3g refers*).	Contractor	Road L1	Before completion of road works	EIAO	Section 5.3.4.1
		• Define extent of indirect technical remedies (ITR) required at the Sun Yuen Long Centre.	KCRC	Sun Yuen Long Centre	Before completion of road works	EIAO	Section 5.3.5
		• Define extent of indirect technical remedies (ITR) required at the proposed residential development in CDA 12 and CDA15.	Highways Department	Residential developments in CDA 12 and CDA15	Upon completion of the detailed design of the residential developments in CDA 12 and CDA15	EIAO	Section 5.3.5
1	Yuen Long (Cont.)	• Install indirect technical remedies, in the form of suitable window glazing and air-conditioning to protect the affected NSRs at the Sun Yuen Long Centre.	KCRC	Sun Yuen Long Centre	Before completion of road works	EIAO	Section 5.3.5
		• Install indirect technical remedies, in the form of suitable window glazing and air-conditioning to protect the affected NSRs at the proposed residential development in CDA 12 and	KCRC	Residential developments in CDA 12 and CDA15	If practicable before completion of road works,	EIAO	Section 5.3.5

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
		CDA15.			alternatively during construction of residential developments		
2	Tin Shui Wai	The following mitigation measures shall be provided at Tin Shui Wai to mitigate the operational road noise:					
		• 5 m high absorptive noise barrier (135 m long) on the outside edge of drainage reserve and next to the eastbound carriageway of Ping Ha Road (*Figure 5.3h refers*).	Contractor	Ping Ha Road	Before completion of road works	EIAO	Section 5.3.4.2
		• 7m high barrier integrated with the proposed footbridge at Ping Ha Road (70 m long) (Figure 5.3h refers)	Contractor	Ping Ha Road	Before completion of road works	EIAO	Section 5.3.4.2
		• 4.5 m high barrier integrated with the proposed footbridge at Tin Fuk Road (35 m long) (Figure 5.3i refers).	Contractor	Tin Fuk Road	Before completion of road works	EIAO	Section 5.3.4.2
		• Application of low noise road surfacing on the east bound carriageway of Tin Fuk Road (approximately 290 m long), Tin Yiu Road (north and south bound carriageways, approximately 120 m long) and Ping Ha Road West (east and west bound carriageways, approximately 240 m long) (Figures 5.3h&I refer).	Contractor	Ping Ha Road, Tin Yiu Road and Tin Fuk Road	Before completion of road works	EIAO	Section 5.3.4.2
	Tin Shui Wai (Cont.)	• Define extent of indirect technical remedies (ITR) required at QE School Old Student's Association Primary School	KCRC	QE School Old Student's Association Primary School	Before completion of road works	EIAO	Section 5.3.5
		• Install indirect technical remedies, in the form of suitable window glazing and air-conditioning to protect the affected	KCRC	QE School Old Student's Association	Before completion of road works	EIAO	Section 5.3.5

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
		NSRs (QE School Old Student's Association Primary School).		Primary School			
3	Operational EM&A Requirements - Noise Monitoring	Noise monitoring should be conducted during the operational phase so as to ensure the noise levels are comparable to the predicted results of the EIA Study. Traffic noise levels shall be measured at representative locations in Yuen Long, Tin Shui Wai and Tuen Mun Centre as agreed with the EPD, within the first year of the road opening. The recommended monitoring locations are detailed below. Additional monitoring locations may be necessary in agreement with the EPD.	KCRC	Yuen Long, Tin Shui Wai and Tuen Mun Centre	During first year of operation	EIAO & EIAOTM (Annex 21)	Section 11.7.2
3A		Yuen Long • NSR 6 - Nam Pin Wai (east) • NSR 10 - Tai Wai Tsuen (west) • NSR 17 - Residential Development in Area 15 (north-west)	KCRC	Yuen Long	During first year of operation	EIAO & EIAOTM (Annex 21)	Section 11.7.2
3B		Tin Shui Wai • NSR 29 - Tin Shing Court (east) • NSR 33 - QE School Old Student's Association Primary School • NSR 36 - Yiu Foo House (south) - Tin Yiu Estate	KCRC	Tin Shui Wai	During first year of operation	EIAO & EIAOTM (Annex 21)	Section 11.7.2
3C		Tuen Mun Centre • NSR 61 - Koon Hing Building	KCRC	Tuen Mun Centre	During first year of operation	EIAO & EIAOTM (Annex 21)	Section 11.7.2

No.	Environmental Issue	Environmental Mitigation Measures	Implementation Agent	Location	Implementation Stages	Relevant Environmental Legislation and Guidelines	EIA Reference
		• NSR 65 - Castle Peak Catholic Primary School (south façade)					
4	Maintenance of Noise Mitigation Measures	Noise barriers, both reflective and absorptive should be maintained in order to ensure the acoustic performance of the proposed measures. Low noise road surfacing proposed in Tin Shui Wai should be inspected on a routine basis regarding any defects, cracks or other physical deterioration and provide re-surfacing as and when required.	Highways Department	Yuen Long and Tin Shui Wai	Operational Phase	EIAO	Section 5.3.4
Landscape and Visual							
5	Maintenance	After an initial 12 month maintenance period of planting works by the implementing Contractor, the Highways Department will assume the long term maintenance responsibility of hard landscape elements such as planter walls and tree grilles, and the Regional Services Department will maintain the soft landscaping.	Highways Department and Regional Services Department	Yuen Long, Tin Shui Wai and Tuen Mun Centre	Throughout operational stage		Sections 8.3.3.1, 8.4.3.1 and 8.5.3.1

13. CONCLUSION

13.1 Noise

Noise during construction phase of the Project would impact the surrounding environment. Unmitigated construction activities associated with the Project would cause exceedances of daytime construction noise standards stipulated in EIA TM at most of the nearby NSRs. Noise exceedances in the range of 1 to 12 dB(A) have been predicted at Yuen Long. NSRs at Tin Shui Wai and Tuen Mun Centre would also be adversely impacted by the works, with predicted exceedances of up to 18 dB(A) and 16 dB(A) respectively. The critical noisy construction activities identified were excavation works during various construction stages and road paving in road construction.

Adequate control measures would be required for construction works to meet the EIA TM daytime construction noise criteria. Mitigation measures including good site practices, use of quiet plant, installation of temporary noise barriers, reduce the percentage of time of noisy equipment in operation, avoidance of simultaneous construction activities on sites and substitution of particular noisy equipment were recommended. Regular monitoring of noise at NSRs would be required during the construction phase of the Project in order to ensure the environmental performance of the works.

With the adoption of appropriate measures as stated above and the implementation of an effective monitoring exercise which would draw the contractor's attention to any excessive impact and to trigger appropriate corrective actions, it is expected that the residual impacts can be reduced to acceptable levels in accordance with the EIA TM requirements.

Operational road traffic noise impact is a key issue raised by this EIA Study. Based upon the worst case traffic forecasts of year 2018, unmitigated noise impacts would be likely at most of the identified NSRs within the locality of the Project although the majority of these are already adversely affected prior to the opening of the EPIWs. The use of direct technical remedies including roadside barriers and low noise road surfacing for the proposed scheme has been considered in Yuen Long and Tin Shui Wai, taking account of existing and potential engineering constraints for each site, and other controlling factors including visibility splay at junctions, presence of drainage reserve and proposed footbridge.

With an exhaustive research of direct measures being completed, the residual noise impacts have been assessed against the noise insulation criteria. The Study finds that there will be three residential developments in Yuen Long (Sun Yuen Long Centre, residential development in CDA 12 and CDA15) and two schools in Tin Shui Wai (the proposed primary school in Area 3 and QE School Old Student’s Association Primary School) eligible to be considered for noise insulation. Type I and II noise insulation are required for the EPIWs and the existing/proposed noise insulation works under other projects will need to be reviewed in order to satisfy this requirement.

13.2 Air Quality

Dust would be the major air pollutants during the construction phase. The major dust generating activities have been identified to be materials handling, top soil removal and wind erosion. It is envisaged that as the volume of material to be handled on site and the excavation rate for road construction would be low, adverse dust impacts on the nearby Air Sensitive Receivers are not expected. However, mitigation measures have been recommended to ensure there is no exceedance of dust criteria.

There is the potential for cumulative construction dust impacts to occur especially as a result of the West Rail (Phase I) construction works taking place concurrently with the EPIW related works. However, this potential source of impact has been assessed and it is predicted that the cumulative impact will be within the required dust criteria at all the air sensitive receivers located in the vicinity of each of the EPIW worksites. As a consequence, no adverse cumulative air quality impacts are predicted to affect the local community.

The operational air quality impact assessment for the EPIWs concludes that the air quality levels at the identified ASRs would be within the AQO criteria.

13.3 Water Quality

No insurmountable water quality impacts are likely during the construction and operation of the EPIWs provided that the recommended mitigation measures are implemented.

13.4 Landscape and Visual Impact

13.4.1 Yuen Long Station

Primary sources of landscape and visual impacts will be the alignment of Roads L1 and L2 across open area north and east of the Sun Yuen Long Centre, and a new junction at Castle Peak Road and a 3m noise barrier east of Nam Pin Wai . Residual impacts will be the loss of open grassland, including an area of mature trees and a children's playground, and mature roadside tree planting. Opportunities are available for comprehensive landscape and visual mitigation through replanting schemes within both areas and the reprovisioning of the playground to an adjacent open area. The proposed noise barrier can be mitigated through sensitive design and planting.

It is considered that the landscape and visual impacts are acceptable with the recommended mitigation strategies.

13.4.2 Tin Shui Wai Station

Primary landscape impacts will be the loss of mature trees and shrubs to embankments west of the Tin Fuk Road/Ping Ha Road junction. The impacts are residual in nature though opportunities exist for replanting to the edges of the revised road and LRT/West Rail alignments. An additional source of residual landscape impact will be the loss of

palm trees from the central median areas at Tin Fuk Road and Ping Ha Road (there is insufficient space to reinstate the planting).

Visual impacts will be highest among sensitive receivers located along the northern edge of the Tin Fuk Road/Ping Ha Road corridor. The 4.5m and 5 m and 7m high noise barriers recommended under this Study, (located respectively along the southern boundary of the proposed primary and secondary schools west of the road junction, and along the southern boundary of Tin Yin Estate), and the 4m high barrier proposed by TDD (also along the southern boundary of the proposed primary and secondary schools west of the road junction) will be the primary sources of impact. These barriers will give rise to moderate to very substantial residual visual impacts.

It is considered that the landscape and visual impacts are acceptable with the recommended mitigation strategies.

13.4.3 Tuen Mun

Primary landscape impacts will be the loss of mature vegetation and seating areas adjacent to housing at Pui To Road and on the edge of Deacon Chui Park. The most sensitive visual receivers will be pedestrians and cyclists and users of a riverside park and Tuen Mun Town Park. Impacts are assessed as moderate to very slight. Opportunities exist for street and screen planting to mitigate impacts and if these are implemented the residual impacts will be negligible.

It is considered that the landscape and visual impacts are acceptable with the recommended mitigation strategies.

13.5 Waste Management

The potential impacts of waste arising from the construction and operational phases of the EPIWs have been assessed. Key issues include the need for effective waste management planning during the construction phase, effective management of chemical/industrial and other potentially hazardous wastes, and the strong preference for reuse of clean surplus material rather than disposing of it at public filling areas. Potential impacts can be avoided and controlled to acceptable levels provided that the recommended waste management methods and practices are implemented.

13.6 Cultural Heritage

Other than the Tsui Shing Lau Pagoda in Tin Shui Wai, no other archaeological or cultural resources are known or likely to be within the boundary or the immediate adjacent areas to the works. Provided that the recommended mitigation measures are adopted during the construction phase, no impacts to the Pagoda are likely.

ANNEX A TRAFFIC DATA

- Annex A1 - Agreement from Transport Department on Traffic Data for EIA Study
- Annex A2 - Traffic Data for Operational Noise Impact Assessment
- Annex A3 - Justification of Worst Prediction Year for Tin Shui Wai EPIW

ANNEX A1 - AGREEMENT FROM TRANSPORT DEPARTMENT ON TRAFFIC DATA FOR EIA STUDY

3 FEB 1999 19:07 KCRC WEST RAIL +852 2581 4012 NO. 1739 P. 1

FAXED
DATE: 3 Feb 99

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九廣鐵路
KCR

九廣鐵路公司
Kowloon-Canton Railway Corporation
西鐵部 West Rail Division

Comm Ref.: WR1CRN1999-0007124

3 February, 1999

ERM-Hong Kong, Ltd
6th Floor, Hecny Tower
9 Chatham Road
Tsimshatsui
Kowloon

(via fax 2367-6396)

Date Received by ERM:
-4 FEB 1999
Login Ref: 3-148

Attn: Mr Jon Pyke

Subject: KCRC West Rail
DD-901 Environmental Support Services
EPIWs EIA Traffic Forecast

Dear Jon,

In response to your enquiry and the EPD's comment on the draft EPIWs Operational Noise Report regarding the traffic data employed for the noise analysis, please be advised that the methodology for traffic forecast between years 2011 and 2018 has been submitted to the Transportation Department (see attached KCRC's letter) and they have expressed their view that no in principle objection to the projection approach (see Transportation Department's letter).

Yours sincerely,

Vic McNally
Environmental Manager

dl/vt/VM

Send to: JP	Flr: 3/F	Ref: C18oc/12
Received by: JP		Date: 4/2
Action taken: —		
Copy to: —	Date: —	Action req: Y
Verification req?	Y	N ✓
Specify verification:		
Result of verification:		
Verification:		

Response Required: No
Due Date: N/A
Attachments: Yes (DCC#CRN1999-0004781 & CPP/TP/13/13)
Project Code: WR1
Contract Code: DD0901
Subject Code: EN101

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KCR 九廣鐵路

KCRC WR PROJECT

九廣鐵路公司
Kowloon-Canton Railway Corporation
新鐵路工程部 Capital Works Group

Our File: CPP/TP/13/13

By Post and Fax (2827 9237)

22 January 1999

Commissioner for Transport
Transport Department
39th Floor, Immigration Tower
7, Gloucester Road
Wan Chai
Hong Kong

KCRC-WEST RAIL
OCC#: CAN1999-0004781
REF: ____________

WR1-0000022808

Attn.: Mr Stephen Chiu

KCRC West Rail
EIA Study for EPIW
Forecast of Traffic Data

Dear Sir,

As a requirement by EPD, the West Rail DD-901 Consultants have conducted an Environment Impact Assessment (EIA) study for the Essential Public Infrastructural Works (EPIW) associated with the West Rail stations in NWNT. We are writing to seek your comments/ endorsement on the methodology on the derivation of traffic forecasts, being adopted in the EIA study, as detailed below.

Background

West Rail DD-901 Consultants have recently conducted an EIA study for the proposed EPIW, which are classified as Designated Projects under the EIA Ordinance, associated with the West Rail Kam Tin (KAT), Yuen Long (YUL), Tin Shui Wai (TIS) and Tuen Mun Centre (TMC) stations. The study assess the environmental impact of the anticipated vehicular traffic generated from West Rail station on the local area in 2018, i.e. 15 years after the opening of West Rail.

2011 Traffic Forecasts

The West Rail TS-100 and TS-200 Technical Study Consultants (TSCs) have developed local area transport models to estimate the traffic flows on the road network in the vicinity of respective West Rail stations. Details of assumptions and methodology were reported in relevant Working Papers and milestone submissions and the final results of findings are concluded in the Final Traffic Impact Assessment (TIA) reports which form part of the TS-100 Milestone 7 submission for KAT and TS-200 Milestone 7 submission for YUL, TIS and TMC stations. The reports contain traffic forecasts in the respective study area for three design years, i.e. the West Rail opening year in 2003, an intermediate design year of 2006 and the ultimate design year of 2011.

Traffic Growth between 2011 and 2018

To satisfy the requirement by EPD, the ultimate traffic forecasts in 2011 developed by TSCs need to be projected further to obtain traffic flows in 2018. As planning assumptions are not available for the situation beyond 2011, direct use of the local transport models developed by

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House, No. 9 Lok King Street, Fo Tan, Sha Tin, N.T., Hong Kong. Telephone: (852) 2688 1333 Facsimile: (852) 2688 0460

TSCs is not applicable. Instead, the "growth factor" method was adopted in deriving the 2018 traffic forecasts.

The 2011 traffic data obtained from the transport model developed by TS Consultants was projected to 2018 by applying the following growth factors. These factors were derived by comparing the flows between 2011 and 2016 in the respective study area by running the MVCTS transport model. MVCTS model is a strategic level forecasting tool that has been developed to retain as much compatibility as possible with the government approach. Detailed description of the model is documented in "Planning Data and Additional Patronage Forecasts for System Design" which had been submitted to Transport Department in 1996.

Vehicle Type	Annual Growth Factors
Private Vehicles	2.47%
Goods Vehicles	3.05%
Total	2.77%

In the case that the total traffic growth between 2011 and 2018 is higher than 15%, which is the available reserve capacity of local junctions in 2011, the growth rate is assumed to be 15% as the road network may be overloaded beyond this point. It is assumed that no additional road capacity is available to support further traffic growth on the local roads. Rather, additional capacity are expected on the surrounding strategic road network to relieve the pressure on the local roads.

I would be grateful to have your views on the derivation of traffic data as discussed above. If you have any queries, please contact the undersigned or Ms Oliver Cheung (Direct Line 2688-1736).

Yours faithfully,
Kowloon-Canton Railway Corporation

Original Signed

(Herbert Ho)
Planning and Development Manager

vf/OC/HH

Response Required : Yes
Attachment: No

c.c.
CE/WR, RDO, HyD Attn: Mr. Duncan Siu (Fax : 2714 5297)
NMPG, EPD Attn: Mr. C P Wai (Fax : 2802 4511)

b.c.c.
GM-OM (Atg) (Wilfred Lau)
ACM-Area 4 (Derek Hill)
ACM-Area 5 (Roger Henes)
ACM-Area 6 (Stanley Keung)
EM (Vic McNally)
STP (Oliver Cheung)
TP (Alok Jain)

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運輸署
Transport Department

Our Ref.: PR 105/193-1
Your Ref.: CPP/TP/13/13
Tel.: 21867507
Fax.: 28279237

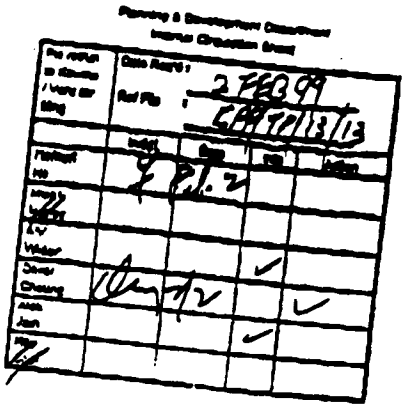
By Fax Only
(26904145)

1 February, 1999

Kowloon-Canton Railway Corporation
KCRC House, No. 9 Lok King Street
Fo Tan, Sha Tin
New Territories

(Attn.: Mr. Hebert Ho)

Dear Sirs,



KCRC West Rail
EIA Study for EPIW
Forecast of Traffic Data

I refer to your above referenced letter dated 22.1.1999 on the caption. Please be advised that I have the following comments:

1. As the 2016 road network and planning assumptions in the northwest New Territories area are not yet finalised by the Planning and Development Study on North West New Territories, we have no in principle objection to your approach to project the 2011 traffic forecasts to 2018.

Yours faithfully,

(M S Lam)
for Government Engineer/Strategic Infrastructure
Transport Department

c.c. CE/WR, RDO, HyD (Attn.: Mr. Duncan Siu) Fax. No.:27145297
NMPG, EPD (Attn.: Mr. C P Wai) 25024511
Plan D (Attn.: Ms. S C Lau) 28684497

基礎建設科
Strategic Infrastructure Branch
香港灣仔駱克道三十三號中央廣場告羅士打大廈二十五樓
25/F, Asia Orient Tower, Town Place, 33 Lockhart Road, Wanchai, Hong Kong
傳真 Fax (852) 2827 9237

ANNEX A2 - TRAFFIC DATA FOR OPERATIONAL NOISE IMPACT ASSESSMENT

Table A1 Yuen Long Station Traffic Forecasts for the Year 1999, AM Peak Hour

Road	From	To	Total Traffic Flow	Percentage of Heavy Vehicles(%)	Speed (kph)
Castle Peak Road	Castle Peak Road(NB)	Yuen Long On Lok Road	1733	30	50
	Yuen Long On Lok Road	Castle Peak Road(SB)	1221	30	50
	Castle Peak Road(EB)	Long Yat Road	926	30	50
	Long Yat Road	Castle Peak Road(WB)	1358	30	50
	Long Yat Road	Kam Tin Road	1964	30	50
	Kam Tin Road	Long Yat Road	1358	30	50
Castle Peak Road (Fly-over)	East Bound	-	910	30	50
	West Bound	-	694	30	50
Long Lok Road(PTI)	-	-	248	30	50
Long Yat Road	-	-	1400	30	50

Table A2 Yuen Long Station Traffic Forecasts for the Year 2018, AM Peak Hour

Road	From	To	Total Traffic Flow	Percentage of Heavy Vehicles(%)	Speed (kph)
Castle Peak Road	Castle Peak Road(NB)	Yuen Long On Lok Road	1451	29	50
	Yuen Long On Lok Road	Castle Peak Road(SB)	1671	32	50
	Castle Peak Road(EB)	Long Yat Road	1895	41	50
	Long Yat Road	Castle Peak Road(WB)	2904	40	50
	Long Yat Road	Kam Tin Road	3200	44	50
	Kam Tin Road	Long Yat Road	3094	35	50
Castle Peak Road (Fly-over)	East Bound	-	1727	37	50
	West Bound	-	1204	44	50
Long Lok Road(PTI)-With changed alignment	-	-	831	34	50
Long Yat Road	Road 6/ L3	Castle Peak Road	1498	37	50
Road L2	-	-	1615	37	50
Road L3	-	-	273	37	50
Road 6/ L3	Road L3	Long Yat Road	656	37	50

Table A3 Tin Shui Wai Traffic Forecasts for the Year 1999, AM Peak Hour

Road	From	To	Total Traffic Flow	Percentage of Heavy Vehicle(%)	Speed(kph)
Ping Ha Road	Hung Tin Road	Tin Yiu Road	1042	35	50
	Hang Mei Tsuen	Tin Fuk Road	652	35	50
Tin Yiu Road	Ping Ha Road	Tin Wu Road	923	35	50
Tin Fuk Road	Tin Yiu Road	Tin Shing Road	777	35	50

Table A4 Tin Shui Wai Traffic Forecasts for the Year 2018, AM Peak Hour

Road	From	To	Total Traffic Flow	Percentage of Heavy Vehicle(%)	Speed(kph)
Ping Ha Road(EB)	Hung Tin Road	Tin Yiu Road	1172	22	50
Ping Ha Road(WB)	Tin Yiu Road	Hung Tin Road	1316	27	50
Ping Ha Road(NB)	Hang Mei Tsuen	Tin Fuk Road	1109	27	50
Ping Ha Road(SB)	Tin Fuk Road	Hang Mei Tsuen	777	34	50
Tin Yiu Road(NB)	Ping Ha Road	Tin Wu Road	984	24	50
Tin Yiu Road(SB)	Tin Wu Road	Ping Ha Road	801	26	50
Tin Fuk Road(EB)	Tin Yiu Road	Tin Shing Road	491	26	50
Tin Fuk Road(WB)	Tin Shing Road	Tin Yiu Road	486	32	50

Table A5 Tuen Mun Centre Traffic Forecasts for the Year 1999, AM Peak Hour

Road	From	To	Total Traffic Flow	Percentage of Heavy Vehicle(%)	Speed(kph)
Tsun Wen Road	Pui To Road	Ho Tin Street	937	41	50
	Ho Tin Street	King Wing Street	827	33	50
Pui To Road	Tuen Mun Heung Sze Wui Road	Castle Peak Road	1260	33	50
	Ho Pong Street	Tuen Mun Heung Sze Wui Road	1101	39	50
	Tsun Wen Road	Ho Pong Street	1466	33	50
Kin Fung Circuit	South Access	-	51	32	50
	North Access	-	26		
Ho Pong Street	Pui To Road	Yan Ching Street	438	30	50
Tuen Mun Heung Sze Wui Road	Yan Ching Street	Ho Pong Street	707	37	50
	Pui To Road	Yan Ching Street	868	36	50
	Tuen Lung Street	Pui To Road	1641	34	50

Table A6 Tuen Mun Centre Traffic Forecasts for the Year 2018, AM Peak Hour

Road	From	To	Total Traffic Flow	Percentage of Heavy Vehicle(%)	Speed(kph)
Tsun Wen Road	Pui To Road	Kin Wing Street	1060	37	50
	Kin Wing Street	Ho Tin Street	1200	33	50
Pui To Road	Tuen Mun Heung Sze Wui Road	Castle Peak Road	2900	35	50
	Ho Pong Street	Tuen Mun Heung Sze Wui Road	2680	40	50
	Tsun Wen Road	Ho Pong Street	2500	35	50
Kin Fung Circuit	Kin Wing Street	Access Ramp	510	36	50
Ho Pong Street	Pui To Road	Access Ramp	250	33	50
Tuen Mun Heung Sze Wui Road	Pui To Road	Ho Pong Street	1030	37	50
	Tuen Lung Street	Rui To Road	3280	34	50
Access Ramp	Kin Fung Circuit	Ho Pong Street	460	36	50

ANNEX A3 - JUSTIFICATION OF WORST PREDICTION YEAR FOR TIN SHUI WAI EPIW

Tin Shui Wai EPIW

Year 2018 case	flow (veh/hour)	p%	speed (kph)	BNL (2018)
Ping Ha Road (NB)	1109	27	50	75.53
Ping Ha Road (SB)	777	34	50	74.74
Ping Ha Road (EB)	1172	22	50	75.14
Ping Ha Road (WB)	1316	27	50	76.27
Tin Yiu Road (NB)	984	24	50	74.64
Tin Yiu Road (SB)	801	26	50	74.00
Tin Fuk Road (EB)	491	26	50	71.87
Tin Fuk Road (WB)	486	32	50	72.50

Year 2011 case	flow (veh/hour)	p%	speed (kph)	BNL (2011)
Ping Ha Road (NB)	973	30	50	75.30
Ping Ha Road (SB)	682	37	50	74.46
Ping Ha Road (EB)	1028	24	50	74.84
Ping Ha Road (WB)	1154	30	50	76.04
Tin Yiu Road (NB)	863	26	50	74.32
Tin Yiu Road (SB)	703	27	50	73.55
Tin Fuk Road (EB)	431	27	50	71.42
Tin Fuk Road (WB)	426	35	50	72.23

diff. (BNL_{2018}-BNL_{2011})
0.23
0.28
0.31
0.23
0.32
0.45
0.45
0.27

ANNEX B CONSTRUCTION PLANT INVENTORY & SOUND POWER LEVELS EVALUATION

KCR 九廣鐵路

九廣鐵路公司
Kowloon-Canton Railway Corporation

西鐵部 West Rail Division

Comm Ref.: WR1CRN1999-0041105

17 June, 1999

(via fax 2367-6396)

ERM-Hong Kong, Ltd
6th Floor, Hecny Tower
9 Chatham Road
Tsimshatsui
Kowloon

Attn: Mr Peter Marsden

Subject: **KCRC West Rail**
DD-901 Environmental Support Services
Essential Public Infrastructure Works

Dear Peter,

Please kindly be informed that the plant list assumed for the construction noise analysis have been reviewed and is considered to be the worst scenario. Since construction contracts have not been awarded yet, the detailed construction programme is not available. An indicative programme matches with the West Rail construction works, i.e. from 1999 to 2003 can be assumed.

PXM 3/F C1800/12
LL 17/6

Y- include in Final EIA report

Yours sincerely,

Vic McNally
Environmental Manager

dl/vt/VM

Response Required: No
Due Date: N/A
Attachments: No
Project Code: WR1
Contract Code:DD0901
Subject Code: EN101

Date Received by ERM:
17 JUN 1999
Login Ref: 3-915

香港新界沙田連城廣場七樓
7/F., Citylink Plaza, Sha Tin, N.T., Hong Kong
Telephone: (852) 2684 8300 Facsimile: (852) 2601 5287
\\wr016\workin\Saa06712\wr1crn1999-0041105.doc

C1800/12 - EPIW EIA
SWL Evaluations - Unmitigated

A	Drainage Works	PME	TM Identification Code	Unit	SWL
A1.1	Excavation (Soft Ground)	Excavator	CNP 081	1	112
		Dump Truck	CNP 067	1	117
				Total	118
A1.2	Excavation (Hard Ground)	Breaker (mass > 35kg)	CNP 026	1	114
		Air Compressor (air flow ≤ 10m^3/min)	CNP 001	1	100
				Total	114
A2	Preparation of Formation	Breaker (mass > 35kg)	CNP 026	1	114
		Air Compressor (air flow ≤ 10m^3/min)	CNP 001	1	100
		Concrete Lorry Mixer	CNP 044	1	109
				Total	115
A3	Laying of Pipes	Mobile Crane	CNP 048	1	112
		Concrete Lorry Mixer	CNP 044	1	109
		Poker Vibrator	CNP 170	1	113
				Total	116
A4	Construction of Manhole	Concrete Lorry Mixer	CNP 044	1	109
		Poker Vibrator	CNP 170	1	113
				Total	114
A5	Backfilling	Excavator	CNP 081	1	112
		Roller, vibratory	CNP 186	1	108
				Total	113
A6	Reinstatement of Pavement	Concrete Lorry Mixer	CNP 044	1	109
		Poker Vibrator	CNP 170	1	113
				Total	114
B	**Road Construction**	**PME**	**TM Identification Code**	**Unit**	**SWL**
B1	Excavation	Excavator	CNP 081	1	112
		Dump Truck	CNP 067	1	117
		Breaker (mass > 35kg)	CNP 026	1	114
		Air Compressor (air flow ≤ 10m^3/min)	CNP 001	1	100
				Total	120
B2	Placement of Road Base	Dump Truck	CNP 067	1	117
		Roller, vibratory	CNP 186	1	108
		Loader	CNP 081	1	112
				Total	119
B3	Kerbing/Concreting for Concrete Carriageway	Concrete Lorry Mixer	CNP 044	1	109
		Poker Vibrator	CNP 170	1	113
				Total	114
B4	Leveling of New Road (Except Tuen Mun Centre)	Grader	CNP 104	1	113
		Roller, vibratory	CNP 186	1	108
				Total	114
B5	Road Paving	Asphalt Paver	CNP 004	1	109
		Roller, vibratory	CNP 186	1	108
		Dump Truck	CNP 067	1	117
		Road Roller	CNP 185	1	108
				Total	118

C	Barrier Construction	PME	TM Identification Code	Unit	SWL
C1	Excavation for Foundation	Excavator	CNP 081	1	112
		Dump Truck	CNP 067	1	117
		Breaker (mass > 35kg)	CNP 026	1	114
		Air Compressor (air flow ≤ $10m^3/min$)	CNP 001	1	100
				Total	120
C2	Bored Piling	Bored Piling Rig (reverse circulation drill)	CNP 166	1	100
				Total	100
C3	Erection of Barrier	Lorry	CNP 141	1	112
		Mobile Crane	CNP 048	1	112
				Total	115
C4	Concreting	Concrete Lorry Mixer	CNP 044	1	109
		Poker Vibrator	CNP 170	1	113
				Total	114

C1800/12 - EPIW EIA

SWL Evaluations - Use of Quiet Plant

A	Drainage Works	PME	BS 5228:Part 1:1997 Reference (Table No./ Ref No.)	Unit	SWL
A1.1	Excavation (Soft Ground)	Excavator	C3/ 97	1	105
		Dump Truck	C9/ 29	1	109
				Total	110
A1.2	Excavation (Hard Ground)	Breaker (mass > 35kg)	C2/ 10	1	110
		Air Compressor (air flow ≤ $10m^3$/min)	C7/ 25	1	98
				Total	110
A2	Preparation of Formation	Breaker (mass > 35kg)	C2/ 10	1	110
		Air Compressor (air flow ≤ $10m^3$/min)	C7/ 25	1	98
		Concrete Lorry Mixer	C6/ 35	1	100
				Total	111
A3	Laying of Pipes	Mobile Crane	C7/ 110	1	106
		Concrete Lorry Mixer	C6/ 35	1	100
		Poker Vibrator	C6/ 32	1	100
				Total	108
A4	Construction of Manhole	Concrete Lorry Mixer	C6/ 35	1	100
		Poker Vibrator	C6/ 32	1	100
				Total	103
A5	Backfilling	Excavator	C3/ 97	1	105
		Roller, vibratory	C3/ 115	1	102
				Total	107
A6	Reinstatement of Pavement	Concrete Lorry Mixer	C6/ 35	1	100
		Poker Vibrator	C6/ 32	1	100
				Total	103
B	**Road Construction**	**PME**	**BS 5228:Part 1:1997 Reference (Table No./ Ref No.)**	**Unit**	**SWL**
B1	Excavation	Excavator	C3/ 35	1	106
		Dump Truck	C9/ 29	1	109
		Breaker (mass > 35kg)	C2/ 10	1	110
		Air Compressor (air flow ≤ $10m^3$/min)	C7/ 25	1	98
				Total	114
B2	Placement of Road Base	Dump Truck	C9/ 29	1	109
		Roller, vibratory	C3/ 115	1	102
		Loader	C3/ 97	1	105
				Total	111
B3	Kerbing/Concreting for Concrete Carriageway	Concrete Lorry Mixer	C6/ 35	1	100
		Poker Vibrator	C6/ 32	1	100
				Total	103
B4	Leveling of New Road (Except Tuen Mun Centre)	Grader	C3/ 76	1	111
		Roller, vibratory	C3/ 115	1	102
				Total	112
B5	Road Paving	Asphalt Paver	CNP 004[(1)]	1	109
		Roller, vibratory	C3/ 115	1	102
		Dump Truck	C9/ 29	1	109
		Road Roller	C8/27	1	104
				Total	113

C	Barrier Construction	PME	BS 5228:Part 1:1997 Reference (Table No./ Ref No.)	Unit	SWL
C1	Excavation for Foundation	Excavator	C3/ 35	1	106
		Dump Truck	C9/ 29	1	109
		Breaker (mass > 35kg)	C2/ 10	1	110
		Air Compressor (air flow ≤ $10m^3$/min)	C7/ 25	1	98
				Total	114
C2	Bored Piling	Bored Piling Rig (reverse circulation drill)	CNP 166(1)	1	100
				Total	100
C3	Erection of Barrier	Lorry	C7/ 121	1	98
		Mobile Crane	C7/ 110	1	106
				Total	107
C4	Concreting	Concrete Lorry Mixer	C6/ 35	1	100
		Poker Vibrator	C6/ 32	1	100
				Total	103

Remark: (1) TM Identification Code

C1800/12 - EPIW EIA

SWL Evaluations - Use of Quiet Plant and Barriers

A	Drainage Works	PME	BS 5228:Part 1:1997 Reference (Table No./ Ref No.)	Unit	SWL	Reduction[2]	Sub-SWL
A1.1	Excavation (Soft Ground)	Excavator	C3/ 97	1	105	5	100
		Dump Truck	C9/ 29	1	109	0	109
						Total	110
A1.2	Excavation (Hard Ground)	Breaker (mass > 35kg)	C2/ 10	1	110	5	105
		Air Compressor (air flow ≤ 10m^3/min)	C7/ 25	1	98	10	88
						Total	105
A2	Preparation of Formation	Breaker (mass > 35kg)	C2/ 10	1	110	5	105
		Air Compressor (air flow ≤ 10m^3/min)	C7/ 25	1	98	10	88
		Concrete Lorry Mixer	C6/ 35	1	100	5	95
						Total	105
A3	Laying of Pipes	Mobile Crane	C7/ 110	1	106	5	101
		Concrete Lorry Mixer	C6/ 35	1	100	5	95
		Poker Vibrator	C6/ 32	1	100	5	95
						Total	103
A4	Construction of Manhole	Concrete Lorry Mixer	C6/ 35	1	100	5	95
		Poker Vibrator	C6/ 32	1	100	5	95
						Total	98
A5	Backfilling	Excavator	C3/ 97	1	105	5	100
		Roller, vibratory	C3/ 115	1	102	5	97
						Total	102
A6	Reinstatement of Pavement	Concrete Lorry Mixer	C6/ 35	1	100	5	95
		Poker Vibrator	C6/ 32	1	100	5	95
						Total	98
B	**Road Construction**	**PME**	**BS 5228:Part 1:1997 Reference (Table No./ Ref No.)**	**Unit**	**SWL**	**Reduction[2]**	**Sub-SWL**
B1	Excavation	Excavator	C3/ 35	1	106	5	101
		Dump Truck	C9/ 29	1	109	0	109
		Breaker (mass > 35kg)	C2/ 10	1	110	5	105
		Air Compressor (air flow ≤ 10m^3/min)	C7/ 25	1	98	10	88
						Total	111
B2	Placement of Road Base	Dump Truck	C9/ 29	1	109	0	109
		Roller, vibratory	C3/ 115	1	102	5	97
		Loader	C3/ 97	1	105	5	100
						Total	110
B3	Kerbing/Concreting for Concrete Carriageway	Concrete Lorry Mixer	C6/ 35	1	100	5	95
		Poker Vibrator	C6/ 32	1	100	5	95
						Total	98
B4	Leveling of New Road (Except Tuen Mun Centre)	Grader	C3/ 76	1	111	0	111
		Roller, vibratory	C3/ 115	1	102	5	97
						Total	111
B5	Road Paving	Asphalt Paver	CNP 004[1]	1	109	5	104
		Roller, vibratory	C3/ 115	1	102	5	97
		Dump Truck	C9/ 29	1	109	0	109
		Road Roller	C8/ 27	1	104	5	99
						Total	111

C	Barrier Construction	PME	BS 5228:Part 1:1997 Reference (Table No./ Ref No.)	Unit	SWL	Reduction[2]	Sub-SWL
C1	Excavation for Foundation	Excavator	C3/ 35	1	106	5	101
		Dump Truck	C9/ 29	1	109	0	109
		Breaker (mass > 35kg)	C2/ 10	1	110	5	105
		Air Compressor (air flow ≤ 10m^3/min)	C7/ 25	1	98	10	88
						Total	111
C2	Bored Piling	Bored Piling Rig (reverse circulation drill)	CNP 166[1]	1	100	0	100
						Total	100
C3	Erection of Barrier	Lorry	C7/ 121	1	98	0	98
		Mobile Crane	C7/ 110	1	106	5	101
						Total	103
C4	Concreting	Concrete Lorry Mixer	C6/ 35	1	100	5	95
		Poker Vibrator	C6/ 32	1	100	5	95
						Total	98

Remark: [1] TM Identification Code
[2] Reduction of Barrier

C1800/12 - EPIW EIA

SWL Evaluations - Use of Quiet Plant and Barriers with Limited Operation Time

	Drainage Works	PME	BS 5228:Part 1:1997 Reference (Table No./ Ref No.)	Unit	SWL	Reduction[2]	Reduction[3]	Sub-SWL
A1.1	Excavation (Soft Ground)	Excavator	C3/ 97	1	105	5	3	97
		Dump Truck	C9/ 29	1	109	0	3	106
							Total	107
A1.2	Excavation (Hard Ground)	Breaker (mass > 35kg)	C2/ 10	1	110	5	3	102
		Air Compressor (air flow ≤ 10m^3/min)	C7/ 25	1	98	10	3	85
							Total	102
A2	Preparation of Formation	Breaker (mass > 35kg)	C2/ 10	1	110	5	3	102
		Air Compressor (air flow ≤ 10m^3/min)	C7/ 25	1	98	10	3	85
		Concrete Lorry Mixer	C6/ 35	1	100	5	3	92
							Total	102
A3	Laying of Pipes	Mobile Crane	C7/ 110	1	106	5	3	98
		Concrete Lorry Mixer	C6/ 35	1	100	5	3	92
		Poker Vibrator	C6/ 32	1	100	5	3	92
							Total	100
A4	Construction of Manhole	Concrete Lorry Mixer	C6/ 35	1	100	5	3	92
		Poker Vibrator	C6/ 32	1	100	5	3	92
							Total	95
A5	Backfilling	Excavator	C3/ 97	1	105	5	3	97
		Roller, vibratory	C3/ 115	1	102	5	3	94
							Total	99
A6	Reinstatement of Pavement	Concrete Lorry Mixer	C6/ 35	1	100	5	3	92
		Poker Vibrator	C6/ 32	1	100	5	3	92
							Total	95
B	**Road Construction**	**PME**	**BS 5228:Part 1:1997 Reference (Table No./ Ref No.)**	**Unit**	**SWL**	**Reduction[2]**	**Reduction[3]**	**Sub-SWL**
B1	Excavation	Excavator	C3/ 35	1	106	5	3	98
		Dump Truck	C9/ 29	1	109	0	3	106
		Breaker (mass > 35kg)	C2/ 10	1	110	5	3	102
		Air Compressor (air flow ≤ 10m^3/min)	C7/ 25	1	98	10	3	85
							Total	108
B2	Placement of Road Base	Dump Truck	C9/ 29	1	109	0	3	106
		Roller, vibratory	C3/ 115	1	102	5	3	94
		Loader	C3/ 97	1	105	5	3	97
							Total	107
B3	Kerbing/Concreting for Concrete Carriageway	Concrete Lorry Mixer	C6/ 35	1	100	5	3	92
		Poker Vibrator	C6/ 32	1	100	5	3	92
							Total	95
B4	Leveling of New Road (Except Tuen Mun Centre)	Grader	C3/ 76	1	111	0	3	108
		Roller, vibratory	C3/ 115	1	102	5	3	94
							Total	108
B5	Road Paving	Asphalt Paver	CNP 004[1]	1	109	5	3	101
		Roller, vibratory	C3/ 115	1	102	5	3	94
		Dump Truck	C9/ 29	1	109	0	3	106
		Road Roller	C8/ 27	1	104	5	3	96
							Total	108

C	Barrier Construction	PME	BS 5228:Part 1:1997 Reference (Table No./ Ref No.)	Unit	SWL	Reduction[2]	Reduction[3]	Sub-SWL
C1	Excavation for Foundation	Excavator	C3/ 35	1	106	5	3	98
		Dump Truck	C9/ 29	1	109	0	3	106
		Breaker (mass > 35kg)	C2/ 10	1	110	5	3	102
		Air Compressor (air flow ≤ $10m^3$/min)	C7/ 25	1	98	10	3	85
							Total	108
C2	Bored Piling	Bored Piling Rig (reverse circulation drill)	CNP 166[1]	1	100	0	3	97
							Total	97
C3	Erection of Barrier	Lorry	C7/ 121	1	98	0	3	95
		Mobile Crane	C7/ 110	1	106	5	3	98
							Total	100
C4	Concreting	Concrete Lorry Mixer	C6/ 35	1	100	5	3	92
		Poker Vibrator	C6/ 32	1	100	5	3	92
							Total	95

Remark:
[1] TM Identification Code
[2] Reduction of Barrier
[3] Reduction of 50% Operation Time

ANNEX C CONSTRUCTION NOISE CALCULATIONS

Yuen Long EPIW Construction Noise Calculations

Unmitigated

Activity ID	Description	NSR	1	2	5	6	7	8	9	10	12	15	17	19	20a	21	22	23
A	*Drainage Works*	*SWL*	*Predicted Noise Level (dB)*															
A1.1	Excavation (soft ground)	118	69	69	76	78	75	75	78	81	75	76	82	81	84	71	69	70
A1.2	Excavation (hard ground)	114	65	65	72	74	71	71	74	77	71	72	78	77	80	67	65	66
A2	Preparation of formation	115	67	66	73	76	72	72	76	78	72	73	79	78	81	68	66	67
A3	Laying of pipes	116	68	67	74	77	73	73	77	79	73	74	80	79	82	69	67	68
A4	Construction of manhole	114	66	65	73	75	71	71	75	77	71	72	78	77	80	67	65	66
A5	Backfilling	113	65	64	72	74	70	70	74	76	70	71	77	76	79	66	64	65
A6	Reinstatement of pavement	114	66	65	73	75	71	71	75	77	71	72	78	77	80	67	65	66
Max. Predicted Level (dB)			69	69	76	78	75	75	78	81	75	76	82	81	84	71	69	70
Max. Predicted Exceedance (dB)			0	0	6	3	0	0	3	6	0	1	7	6	9	0	0	0
B	*Road Construction*	*SWL*	*Predicted Noise Level (dB)*															
B1	Excavation	120	71	71	78	80	76	76	80	83	76	77	84	83	85	72	70	71
B2	Placement of Road Base	119	70	70	77	79	75	75	79	82	75	76	82	81	84	71	69	70
B3	Kerbing/ concreting for concrete carriageway	114	66	65	73	75	71	71	75	77	71	72	78	77	80	67	65	66
B4	Leveling of new road	114	65	65	72	74	71	71	74	77	71	72	78	77	80	67	65	66
B5	Road paving	118	70	69	77	79	75	75	79	81	75	76	82	81	84	71	69	70
Max. Predicted Level (dB)			71	71	78	80	76	76	80	83	76	77	84	83	85	72	70	71
Max. Predicted Exceedance (dB)			0	1	8	5	1	1	5	8	1	2	9	8	10	0	0	0
C	*Barrier Construction*	*SWL*	*Predicted Noise Level (dB)*															
C1	Excavation for foundation	120	-	-	82	83	70	67	-	-	74	-	-	-	-	-	-	-
C2	Bored piling	100	-	-	62	64	50	48	-	-	54	-	-	-	-	-	-	-
C3	Erection of barrier	115	-	-	77	79	65	63	-	-	69	-	-	-	-	-	-	-
C4	Concreting	114	-	-	77	79	65	63	-	-	69	-	-	-	-	-	-	-
Max. Predicted Level (dB)			-	-	82	83	70	67	-	-	74	-	-	-	-	-	-	-
Max. Predicted Exceedance (dB)			-	-	12	8	0	0	-	-	0	-	-	-	-	-	-	-
Max. Cum. Noise Level (dB)			74	74	85	86	79	79	83	86	79	80	87	86	88	75	73	74
Max. Cum. Noise Exceedance (dB)			0	4	15	11	4	4	8	11	4	5	12	11	13	0	0	0

Activity ID	Description	1	2	5	6	7	8	9	10	12	15	17	19	20a	21	22	23
A	*Drainage Works*	*Slant Distance (m)*															
A1.1	Excavation (soft ground)	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A1.2	Excavation (hard ground)	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A2	Preparation of formation	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A3	Laying of pipes	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A4	Construction of manhole	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A5	Backfilling	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A6	Reinstatement of pavement	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
Max. Predicted Level (dB)		155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
Max. Predicted Exceedance (dB)																	
B	*Road Construction*																
B1	Excavation	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B2	Placement of Road Base	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B3	Kerbing/ concreting for concrete carriageway	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B4	Leveling of new road	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B5	Road paving	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
Max. Predicted Level (dB)		155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
Max. Predicted Exceedance (dB)																	
C	*Barrier Construction*	*Distance to Barrier (m)*															
C1	Excavation for foundation	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
C2	Bored piling	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
C3	Erection of barrier	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
C4	Concreting	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
Max. Predicted Level (dB)		-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
Max. Predicted Exceedance (dB)																	
Max. Cum. Noise Level (dB)																	
Max. Cum. Noise Exceedance (dB)																	

Yuen Long EPIW Construction Noise Calculations

Use of Quiet Plant																															
Activity ID	Description	NSR	1	2	5	6	7	8	9	10	12	15	17	19	20a	21	22	23	1	2	5	6	7	8	9	10	12	15	17	19	20a	21	22	23
A	*Drainage Works*	*SWL*	*Predicted Noise Level (dB)*																*Slant Distance (m)*															
A1.1	Excavation (soft ground)	110	62	61	69	71	67	67	71	73	67	68	74	73	76	63	61	62	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A1.2	Excavation (hard ground)	110	61	61	68	70	67	67	70	73	67	68	74	73	76	63	61	62	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A2	Preparation of formation	111	62	62	69	71	67	67	71	74	67	68	75	74	76	63	61	62	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A3	Laying of pipes	108	59	59	66	68	64	64	68	71	64	66	72	71	73	60	58	59	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A4	Construction of manhole	103	54	54	61	63	59	59	63	66	60	61	67	66	69	56	53	54	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A5	Backfilling	107	58	58	65	67	63	63	67	70	63	65	71	70	72	59	57	58	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A6	Reinstatement of Pavement	103	54	54	61	63	59	59	63	66	60	61	67	66	69	56	53	54	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
Max. Predicted Level (dB)			62	62	69	71	67	67	71	74	67	68	75	74	76	63	61	62																
Max. Predicted Exceedance (dB)			0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0																
B	*Road Construction*	*SWL*	*Predicted Noise Level (dB)*																															
B1	Excavation	114	65	64	72	74	70	70	74	76	70	71	77	76	79	66	64	65	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B2	Placement of Road Base	111	62	62	69	71	67	67	71	74	68	69	75	74	77	64	61	63	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B3	Kerbing/ concreting for concrete carriageway	103	54	54	61	63	59	59	63	66	60	61	67	66	69	56	53	54	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B4	Leveling of new road	112	63	62	70	72	68	68	72	74	68	69	75	74	77	64	62	63	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B5	Road paving	113	64	64	71	73	69	69	73	76	70	71	77	76	79	66	63	64	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
Max. Predicted Level (dB)			65	64	72	74	70	70	74	76	70	71	77	76	79	66	64	65																
Max. Predicted Exceedance (dB)			0	0	2	0	0	0	0	1	0	0	2	1	4	0	0	0																
C	*Barrier Construction*	*SWL*	*Predicted Noise Level (dB)*																*Distance to Barrier (m)*															
C1	Excavation for foundation	114	-	-	76	77	64	61	-	-	68	-	-	-	-	-	-	-	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
C2	Bored piling	100	-	-	62	64	50	48	-	-	54	-	-	-	-	-	-	-	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
C3	Erection of barrier	107	-	-	69	70	57	54	-	-	61	-	-	-	-	-	-	-	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
C4	Concreting	103	-	-	69	70	57	54	-	-	61	-	-	-	-	-	-	-	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
Max. Predicted Level (dB)			-	-	76	77	64	61	-	-	68	-	-	-	-	-	-	-																
Max. Predicted Exceedance (dB)			-	-	6	2	0	0	-	-	0	-	-	-	-	-	-	-																
Max. Cum. Noise Level (dB)			68	67	79	80	73	73	77	79	73	74	80	79	82	69	67	68																
Max. Cum. Noise Exceedance (dB)			0	0	9	5	0	0	2	4	0	0	5	4	7	0	0	0																

Yuen Long EPIW Construction Noise Calculations

Use of Quiet Plant and Barrier																																
Activity ID	Description	NSR	1	2	5	6	7	8	9	10	12	15	17	19	20a	21	22	23	1	2	5	6	7	8	9	10	12	15	17	19	20a	21	22	23
A	*Drainage Works*	*SWL*	*Predicted Noise Level (dB)*																*Slant Distance (m)*															
A1.1	Excavation (soft ground)	110	61	60	68	70	66	66	70	72	66	67	73	72	75	62	60	61	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A1.2	Excavation (hard ground)	105	56	56	63	65	61	61	65	68	62	63	69	68	71	58	55	57	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A2	Preparation of formation	105	57	56	64	66	62	62	66	68	62	63	69	68	71	58	56	57	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A3	Laying of pipes	103	54	54	61	63	59	59	63	66	59	61	67	66	68	55	53	54	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A4	Construction of manhole	98	49	49	56	58	54	54	58	61	55	56	62	61	64	51	48	49	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A5	Backfilling	102	53	53	60	62	58	58	62	65	58	60	66	65	67	54	52	53	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A6	Reinstatement of Pavement	98	49	49	56	58	54	54	58	61	55	56	62	61	64	51	48	49	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
Max. Predicted Level (dB)			61	60	68	70	66	66	70	72	66	67	73	72	75	62	60	61																
Max. Predicted Exceedance (dB)			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																
B	*Road Construction*	*SWL*	*Predicted Noise Level (dB)*																															
B1	Excavation	111	62	62	69	71	67	67	71	74	68	69	75	74	76	64	61	62	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B2	Placement of Road Base	110	61	61	68	70	66	66	70	73	66	68	74	73	75	62	60	61	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B3	Kerbing/ concreting for concrete carriageway	98	49	49	56	58	54	54	58	61	55	56	62	61	64	51	48	49	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B4	Leveling of new road	111	62	62	69	71	68	68	71	74	68	69	75	74	77	64	62	63	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B5	Road paving	111	62	62	69	71	67	67	71	74	67	68	75	74	76	63	61	62	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
Max. Predicted Level (dB)			62	62	69	71	68	68	71	74	68	69	75	74	77	64	62	63																
Max. Predicted Exceedance (dB)			0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0																
C	*Barrier Construction*	*SWL*	*Predicted Noise Level (dB)*																*Distance to Barrier (m)*															
C1	Excavation for foundation	111	-	-	73	74	61	59	-	-	65	-	-	-	-	-	-	-	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
C2	Bored piling	100	-	-	62	64	50	48	-	-	54	-	-	-	-	-	-	-	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
C3	Erection of barrier	103	-	-	65	66	53	50	-	-	57	-	-	-	-	-	-	-	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
C4	Concreting	98	-	-	65	66	53	50	-	-	57	-	-	-	-	-	-	-	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
Max. Predicted Level (dB)			-	-	73	74	61	59	-	-	65	-	-	-	-	-	-	-																
Max. Predicted Exceedance (dB)			-	-	3	0	0	0	-	-	0	-	-	-	-	-	-	-																
Max. Cum. Noise Level (dB)			65	65	76	77	71	71	74	77	71	72	78	77	80	67	65	66																
Max. Cum. Noise Exceedance (dB)			0	0	6	2	0	0	0	2	0	0	3	2	5	0	0	0																

Yuen Long EPIW Construction Noise Calculations

Use of Quiet Plant and Barrier with Limited Operation Time

Activity ID	Description	NSR	1	2	5	6	7	8	9	10	12	15	17	19	20a	21	22	23	1	2	5	6	7	8	9	10	12	15	17	19	20a	21	22	23
A	*Drainage Works*	*SWL*	*Predicted Noise Level (dB)*																*Slant Distance (m)*															
A1.1	Excavation (soft ground)	107	58	57	65	67	63	63	67	69	63	64	70	69	72	59	57	58	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A1.2	Excavation (hard ground)	102	53	53	60	62	58	58	62	65	59	60	66	65	68	55	52	54	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A2	Preparation of formation	102	54	53	61	63	59	59	63	65	59	60	66	65	68	55	53	54	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A3	Laying of pipes	100	51	51	58	60	56	56	60	63	56	58	64	63	65	52	50	51	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A4	Construction of manhole	95	46	46	53	55	51	51	55	58	52	53	59	58	61	48	45	46	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A5	Backfilling	99	50	50	57	59	55	55	59	62	55	57	63	62	64	51	49	50	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
A6	Reinstatement of Pavement	95	46	46	53	55	51	51	55	58	52	53	59	58	61	48	45	46	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
Max. Predicted Level (dB)			58	57	65	67	63	63	67	69	63	64	70	69	72	59	57	58																
Max. Predicted Exceedance (dB)			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																
B	*Road Construction*	*SWL*	*Predicted Noise Level (dB)*																															
B1	Excavation	108	59	59	66	68	64	64	68	71	65	66	72	71	73	61	58	59	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B2	Placement of Road Base	107	58	58	65	67	63	63	67	70	63	65	71	70	72	59	57	58	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B3	Kerbing/ concreting for concrete carriageway	95	46	46	53	55	51	51	55	58	52	53	59	58	61	48	45	46	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B4	Leveling of new road	108	59	59	66	68	65	65	68	71	65	66	72	71	74	61	59	60	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
B5	Road paving	108	59	59	66	68	64	64	68	71	64	65	72	71	73	60	58	59	155	160	70	55	85	85	55	40	82	73	36	40	30	130	170	150
Max. Predicted Level (dB)			59	59	66	68	65	65	68	71	65	66	72	71	74	61	59	60																
Max. Predicted Exceedance (dB)			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																
C	*Barrier Construction*	*SWL*	*Predicted Noise Level (dB)*																*Distance to Barrier (m)*															
C1	Excavation for foundation	108	-	-	70	71	58	56	-	-	62	-	-	-	-	-	-	-	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
C2	Bored piling	97	-	-	59	61	47	45	-	-	51	-	-	-	-	-	-	-	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
C3	Erection of barrier	100	-	-	62	63	50	47	-	-	54	-	-	-	-	-	-	-	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
C4	Concreting	95	-	-	62	63	50	47	-	-	54	-	-	-	-	-	-	-	-	-	44	38	170	231	-	-	107	-	-	-	-	-	-	-
Max. Predicted Level (dB)			-	-	70	71	58	56	-	-	62	-	-	-	-	-	-	-																
Max. Predicted Exceedance (dB)			-	-	0	0	0	0	-	-	0	-	-	-	-	-	-	-																
Max. Cum. Noise Level (dB)			62	62	73	74	68	68	71	74	68	69	75	74	77	64	62	63																
Max. Cum. Noise Exceedance (dB)			0	0	3	0	0	0	0	0	0	0	0	0	2	0	0	0																

Tin Shui Wai EPIW Construction Noise Calculations

Unmitigated

Activity ID	Description	NSR	25	26	28	29	31	33	35	36	38	39	40	42	45	46	49
A	*Drainage Works*	*SWL*	*Predicted Noise Level (dB)*														
A1.1	Excavation (soft ground)	118	78	73	80	75	74	74	77	80	78	82	70	69	79	80	70
A1.2	Excavation (hard ground)	114	74	69	76	71	70	70	73	76	74	78	66	65	75	76	66
A2	Preparation of formation	115	75	70	77	72	71	71	74	77	75	79	67	66	76	77	67
A3	Laying of pipes	116	76	71	78	73	72	72	75	78	77	80	68	67	77	78	68
A4	Construction of manhole	114	74	69	76	71	70	70	73	76	75	79	67	65	75	76	67
A5	Backfilling	113	73	68	75	70	69	69	72	75	74	78	66	64	74	75	66
A6	Reinstatement of pavement	114	74	69	76	71	70	70	73	76	75	79	67	65	75	76	67
Max. Predicted Level (dB)			78	73	80	75	74	74	77	80	78	82	70	69	79	80	70
Max. Predicted Exceedance (dB)			8	0	10	0	0	4	2	5	3	7	0	0	9	5	0
B	*Road Construction*	*SWL*	*Predicted Noise Level (dB)*														
B1	Excavation	120	79	74	82	76	75	76	78	82	80	84	72	70	81	82	72
B2	Placement of Road Base	119	78	73	80	75	74	74	77	80	79	83	71	69	80	81	71
	Kerbing/ concreting for																
B3	concrete carriageway	114	74	69	76	71	70	70	73	76	75	79	67	65	75	76	67
B4	Leveling of new road	114	74	69	76	71	70	70	73	76	74	78	66	65	75	76	66
B5	Road paving	118	78	73	80	75	74	74	77	80	79	83	71	69	79	80	71
Max. Predicted Level (dB)			79	74	82	76	75	76	78	82	80	84	72	70	81	82	72
Max. Predicted Exceedance (dB)			9	0	12	1	0	6	3	7	5	9	0	0	11	7	0
C	*Barrier Construction*	*SWL*	*Predicted Noise Level (dB)*														
C1	Excavation for foundation	120	85	76	88	80	77	82	78	92	86	76	-	-	75	82	-
C2	Bored piling	100	65	56	68	60	58	62	58	73	66	57	-	-	56	62	-
C3	Erection of barrier	115	80	71	83	75	73	77	73	88	81	72	-	-	71	77	-
C4	Concreting	114	80	71	83	75	73	77	73	88	81	72	-	-	71	77	-
Max. Predicted Level (dB)			85	76	88	80	77	82	78	92	86	76	-	-	75	82	-
Max. Predicted Exceedance (dB)			15	1	18	5	2	12	3	17	11	1	-	-	5	7	-
Max. Cum. Noise Level (dB)			88	79	91	83	80	85	81	95	89	87	75	73	84	85	75
Max. Cum. Noise Exceedance (dB)			18	4	21	8	5	15	6	20	14	12	0	0	14	10	0

Activity ID	25	26	28	29	31	33	35	36	38	39	40	42	45	46	49
A	*Slant Distance (m)*														
A1.1	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A1.2	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A2	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A3	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A4	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A5	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A6	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B1	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B2	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B3	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B4	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B5	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
C	*Distance to Barrier (m)*														
C1	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
C2	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
C3	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
C4	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-

Tin Shui Wai EPIW Construction Noise Calculations

Use of Quiet Plant																															
Activity ID	Description	NSR	25	26	28	29	31	33	35	36	38	39	40	42	45	46	49	25	26	28	29	31	33	35	36	38	39	40	42	45	46	49
A	*Drainage Works*	*SWL*	*Predicted Noise Level (dB)*															*Slant Distance (m)*														
A1.1	Excavation (soft ground)	110	70	65	72	67	66	66	69	72	71	75	63	61	71	72	63	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A1.2	Excavation (hard ground)	110	70	65	72	67	66	66	69	72	70	74	62	61	71	72	62	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A2	Preparation of formation	111	70	65	73	67	66	67	69	73	71	75	63	61	72	73	63	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A3	Laying of pipes	108	67	62	70	64	63	64	66	70	68	72	60	58	69	70	60	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A4	Construction of manhole	103	62	58	65	59	58	59	62	65	63	67	55	54	64	65	55	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A5	Backfilling	107	66	61	69	63	62	63	65	69	67	71	59	57	68	69	59	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A6	Reinstatement of pavement	103	62	58	65	59	58	59	62	65	63	67	55	54	64	65	55	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
Max. Predicted Level (dB)			70	65	73	67	66	67	69	73	71	75	63	61	72	73	63															
Max. Predicted Exceedance (dB)			0	0	3	0	0	0	0	0	0	0	0	0	2	0	0														
B	*Road Construction*	*SWL*	*Predicted Noise Level (dB)*																													
B1	Excavation	114	73	68	75	70	69	69	72	75	74	78	66	64	75	75	66	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B2	Placement of Road Base	111	70	66	73	67	66	67	70	73	71	75	63	62	72	73	63	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B3	Kerbing/ concreting for concrete carriageway	103	62	58	65	59	58	59	62	65	63	67	55	54	64	65	55	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B4	Leveling of new road	112	71	66	73	68	67	67	70	73	72	76	64	62	72	73	64	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B5	Road paving	113	72	68	75	69	68	69	72	75	73	77	65	64	74	75	65	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
Max. Predicted Level (dB)			73	68	75	70	69	69	72	75	74	78	66	64	75	75	66															
Max. Predicted Exceedance (dB)			3	0	5	0	0	0	0	0	0	3	0	0	5	0	0														
C	*Barrier Construction*	*SWL*	*Predicted Noise Level (dB)*															*Distance to Barrier (m)*														
C1	Excavation for foundation	114	79	70	82	74	71	76	72	86	80	70	-	-	69	76	-	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
C2	Bored piling	100	65	56	68	60	58	62	58	73	66	57	-	-	56	62	-	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
C3	Erection of barrier	107	72	63	75	67	64	69	65	79	73	63	-	-	62	69	-	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
C4	Concreting	103	72	63	75	67	64	69	65	79	73	63	-	-	62	69	-	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
Max. Predicted Level (dB)			79	70	82	74	71	76	72	86	80	70	-	-	69	76	-															
Max. Predicted Exceedance (dB)			9	0	12	0	0	6	0	11	5	0	-	-	0	1	-															
Max. Cum. Noise Level (dB)			82	73	85	77	74	79	75	89	83	81	69	67	78	79	69															
Max. Cum. Noise Exceedance (dB)			12	0	15	2	0	9	0	14	8	6	0	0	8	4	0															

Tin Shui Wai EPIW Construction Noise Calculations

Use of Quiet Plant and Barrier																															
Activity ID	Description	NSR	25	26	28	29	31	33	35	36	38	39	40	42	45	46	49	25	26	28	29	31	33	35	36	38	39	40	42	45	46	49
A	*Drainage Works*	*SWL*	*Predicted Noise Level (dB)*															Slant Distance (m)														
A1.1	Excavation (soft ground)	110	69	64	71	66	65	65	68	71	70	74	62	60	70	71	62	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A1.2	Excavation (hard ground)	105	64	60	67	61	61	61	64	67	65	69	57	56	66	67	57	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A2	Preparation of formation	105	65	60	67	62	61	61	64	67	66	70	58	56	66	67	58	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A3	Laying of pipes	103	62	57	65	59	58	59	61	65	63	67	55	53	64	65	55	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A4	Construction of manhole	98	57	53	60	54	53	54	57	60	58	62	50	49	59	60	50	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A5	Backfilling	102	61	56	64	58	57	58	60	64	62	66	54	52	63	64	54	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A6	Reinstatement of pavement	98	57	53	60	54	53	54	57	60	58	62	50	49	59	60	50	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
Max. Predicted Level (dB)			69	64	71	66	65	65	68	71	70	74	62	60	70	71	62															
Max. Predicted Exceedance (dB)			0	0	1	0	0	0	0	0	0	0	0	0	0	0	0															
B	*Road Construction*	*SWL*	*Predicted Noise Level (dB)*																													
B1	Excavation	111	70	66	73	67	66	67	70	73	71	75	63	62	72	73	63	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B2	Placement of Road Base	110	69	64	72	66	65	66	68	72	70	74	62	60	71	72	62	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B3	Kerbing/ concreting for concrete carriageway	98	57	53	60	54	53	54	57	60	58	62	50	49	59	60	50	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B4	Leveling of new road	111	71	66	73	68	67	67	70	73	71	75	63	62	72	73	63	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B5	Road paving	111	70	65	73	67	66	67	69	73	71	75	63	61	72	73	63	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
Max. Predicted Level (dB)			71	66	73	68	67	67	70	73	71	75	63	62	72	73	63															
Max. Predicted Exceedance (dB)			1	0	3	0	0	0	0	0	0	0	0	0	2	0	0															
C	*Barrier Construction*	*SWL*	*Predicted Noise Level (dB)*																													
C1	Excavation for foundation	111	76	67	79	71	69	73	69	84	77	68	-	-	67	73	-	*Distance to Barrier (m)*														
C2	Bored piling	100	65	56	68	60	58	62	58	73	66	57	-	-	56	62	-	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
C3	Erection of barrier	103	68	59	71	63	60	65	61	75	69	59	-	-	58	65	-	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
C4	Concreting	98	68	59	71	63	60	65	61	75	69	59	-	-	58	65	-	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
Max. Predicted Level (dB)			76	67	79	71	69	73	69	84	77	68	-	-	67	73	-	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
Max. Predicted Exceedance (dB)			6	0	9	0	0	3	0	9	2	0	-	-	0	0	-															
Max. Cum. Noise Level (dB)			79	70	82	74	72	76	73	87	80	78	66	65	75	76	66															
Max. Cum. Noise Exceedance (dB)			9	0	12	0	0	6	0	12	5	3	0	0	5	1	0															

Tin Shui Wai EPIW Construction Noise Calculations

Use of Quiet Plant and Barrier with Limited Operation Time																															
Activity ID	Description	NSR	25	26	28	29	31	33	35	36	38	39	40	42	45	46	49	25	26	28	29	31	33	35	36	38	39	40	42	45	46	49
A	*Drainage Works*	*SWL*	*Predicted Noise Level (dB)*															*Slant Distance (m)*														
A1.1	Excavation (soft ground)	107	66	61	68	63	62	62	65	68	67	71	59	57	67	68	59	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A1.2	Excavation (hard ground)	102	61	57	64	58	58	58	61	64	62	66	54	53	63	64	54	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A2	Preparation of formation	102	62	57	64	59	58	58	61	64	63	67	55	53	63	64	55	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A3	Laying of pipes	100	59	54	62	56	55	56	58	62	60	64	52	50	61	62	52	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A4	Construction of manhole	95	54	50	57	51	50	51	54	57	55	59	47	46	56	57	47	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A5	Backfilling	99	58	53	61	55	54	55	57	61	59	63	51	49	60	61	51	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
A6	Reinstatement of pavement	95	54	50	57	51	50	51	54	57	55	59	47	46	56	57	47	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
Max. Predicted Level (dB)			66	61	68	63	62	62	65	68	67	71	59	57	67	68	59															
Max. Predicted Exceedance (dB)			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0															
B	*Road Construction*	*SWL*	*Predicted Noise Level (dB)*																													
B1	Excavation	108	67	63	70	64	63	64	67	70	68	72	60	59	69	70	60	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B2	Placement of Road Base	107	66	61	69	63	62	63	65	69	67	71	59	57	68	69	59	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B3	Kerbing/ concreting for concrete carriageway	95	54	50	57	51	50	51	54	57	55	59	47	46	56	57	47	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B4	Leveling of new road	108	68	63	70	65	64	64	67	70	68	72	60	59	69	70	60	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
B5	Road paving	108	67	62	70	64	63	64	66	70	68	72	60	58	69	70	60	60	105	45	85	95	90	65	45	55	35	140	165	50	45	140
Max. Predicted Level (dB)			68	63	70	65	64	64	67	70	68	72	60	59	69	70	60															
Max. Predicted Exceedance (dB)			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0															
C	*Barrier Construction*	*SWL*	*Predicted Noise Level (dB)*															*Distance to Barrier (m)*														
C1	Excavation for foundation	108	73	64	76	68	66	70	66	81	74	65	-	-	64	70	-	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
C2	Bored piling	97	62	53	65	57	55	59	55	70	63	54	-	-	53	59	-	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
C3	Erection of barrier	100	65	56	68	60	57	62	58	72	66	56	-	-	55	62	-	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
C4	Concreting	95	65	56	68	60	57	62	58	72	66	56	-	-	55	62	-	31	86	22	55	73	44	71	13	27	82	-	-	92	44	-
Max. Predicted Level (dB)			73	64	76	68	66	70	66	81	74	65	-	-	64	70	-															
Max. Predicted Exceedance (dB)			3	0	6	0	0	0	0	6	0	0	-	-	0	0	-															
Max. Cum. Noise Level (dB)			76	67	79	71	69	73	70	84	77	75	63	62	72	73	63															
Max. Cum. Noise Exceedance (dB)			6	0	9	0	0	3	0	9	2	0	0	0	2	0	0															

Tuen Mun Centre EPIW Construction Noise Calculations

Unmitigated																								
Activity ID	Description	NSR	50	52	53	54	57	59	61	63	64	66	68	50	52	53	54	57	59	61	63	64	66	68
A	*Drainage Works*	*SWL*	*Predicted Noise Level (dB)*											*Slant Distance (m)*										
A1.1	Excavation (soft ground)	118	68	71	73	72	75	80	86	88	82	85	76	175	125	104	118	83	45	22	19	38	25	74
A1.2	Excavation (hard ground)	114	64	67	69	68	71	76	82	84	77	81	72	175	125	104	118	83	45	22	19	38	25	74
A2	Preparation of formation	115	65	68	70	69	72	77	83	85	79	82	73	175	125	104	118	83	45	22	19	38	25	74
A3	Laying of pipes	116	67	70	71	70	73	78	84	86	80	84	74	175	125	104	118	83	45	22	19	38	25	74
A4	Construction of manhole	114	65	68	69	68	71	76	83	84	78	82	72	175	125	104	118	83	45	22	19	38	25	74
A5	Backfilling	113	64	67	68	67	70	75	82	83	77	81	71	175	125	104	118	83	45	22	19	38	25	74
A6	Reinstatement of pavement	114	65	68	69	68	71	76	83	84	78	82	72	175	125	104	118	83	45	22	19	38	25	74
Max. Predicted Level (dB)			68	71	73	72	75	80	86	88	82	85	76											
Max. Predicted Exceedance (dB)			0	0	0	0	5	5	11	13	12	10	1											
B	*Road Construction*	*SWL*	*Predicted Noise Level (dB)*																					
B1	Excavation	120	70	73	74	73	76	82	88	89	83	87	77	175	125	104	118	83	45	22	19	38	25	74
B2	Placement of Road Base	119	69	72	73	72	75	81	87	88	82	86	76	175	125	104	118	83	45	22	19	38	25	74
B3	Kerbing/ concreting for concrete carriageway	114	65	68	69	68	71	76	83	84	78	82	72	175	125	104	118	83	45	22	19	38	25	74
B5	Road paving	118	69	72	73	72	75	81	87	88	82	86	76	175	125	104	118	83	45	22	19	38	25	74
Max. Predicted Level (dB)			70	73	74	73	76	82	88	89	83	87	77											
Max. Predicted Exceedance (dB)			0	0	0	0	6	7	13	14	13	12	2											
Max. Cum. Noise Level (dB)			73	76	77	76	79	85	91	92	86	90	80											
Max. Cum. Noise Exceedance (dB)			0	1	2	1	9	10	16	17	16	15	5											

Tuen Mun Centre EPIW Construction Noise Calculations

Use of Quiet Plant																								
Activity ID	Description	NSR	50	52	53	54	57	59	61	63	64	66	68	50	52	53	54	57	59	61	63	64	66	68
A	*Drainage Works*	*SWL*	*Predicted Noise Level (dB)*											*Slant Distance (m)*										
A1.1	Excavation (soft ground)	110	61	64	65	64	67	72	79	80	74	78	68	175	125	104	118	83	45	22	19	38	25	74
A1.2	Excavation (hard ground)	110	60	63	65	64	67	72	78	80	74	77	68	175	125	104	118	83	45	22	19	38	25	74
A2	Preparation of formation	111	61	64	65	64	67	73	79	80	74	78	68	175	125	104	118	83	45	22	19	38	25	74
A3	Laying of pipes	108	58	61	62	61	64	70	76	77	71	75	65	175	125	104	118	83	45	22	19	38	25	74
A4	Construction of manhole	103	53	56	58	57	60	65	71	72	66	70	61	175	125	104	118	83	45	22	19	38	25	74
A5	Backfilling	107	57	60	61	60	63	69	75	76	70	74	64	175	125	104	118	83	45	22	19	38	25	74
A6	Reinstatement of Pavement	103	53	56	58	57	60	65	71	72	66	70	61	175	125	104	118	83	45	22	19	38	25	74
Max. Predicted Level (dB)			61	64	65	64	67	73	79	80	74	78	68											
Max. Predicted Exceedance (dB)			0	0	0	0	0	0	4	5	4	3	0											
B	*Road Construction*	*SWL*	*Predicted Noise Level (dB)*																					
B1	Excavation	114	64	67	68	67	70	76	82	83	77	81	71	175	125	104	118	83	45	22	19	38	25	74
B2	Placement of Road Base	111	61	64	66	65	68	73	79	81	74	78	69	175	125	104	118	83	45	22	19	38	25	74
B3	Kerbing/ concreting for concrete carriageway	103	53	56	58	57	60	65	71	72	66	70	61	175	125	104	118	83	45	22	19	38	25	74
B5	Road paving	113	63	66	68	67	70	75	81	82	76	80	71	175	125	104	118	83	45	22	19	38	25	74
Max. Predicted Level (dB)			64	67	68	67	70	76	82	83	77	81	71											
Max. Predicted Exceedance (dB)			0	0	0	0	0	1	7	8	7	6	0											
Max. Cum. Noise Level (dB)			67	70	71	70	73	79	85	86	80	84	74											
Max. Cum. Noise Exceedance (dB)			0	0	0	0	3	4	10	11	10	9	0											

Tuen Mun Centre EPIW Construction Noise Calculations

Use of Quiet Plant and Barrier																								
Activity ID	Description	NSR	50	52	53	54	57	59	61	63	64	66	68	50	52	53	54	57	59	61	63	64	66	68
A	*Drainage Works*	*SWL*	*Predicted Noise Level (dB)*											*Slant Distance (m)*										
A1.1	Excavation (soft ground)	110	60	63	64	63	66	72	78	79	73	77	67	175	125	104	118	83	45	22	19	38	25	74
A1.2	Excavation (hard ground)	105	55	58	60	59	62	67	73	75	68	72	63	175	125	104	118	83	45	22	19	38	25	74
A2	Preparation of formation	105	56	59	60	59	62	68	74	75	69	73	63	175	125	104	118	83	45	22	19	38	25	74
A3	Laying of pipes	103	53	56	57	56	59	65	71	72	66	70	60	175	125	104	118	83	45	22	19	38	25	74
A4	Construction of manhole	98	48	51	53	52	55	60	66	67	61	65	56	175	125	104	118	83	45	22	19	38	25	74
A5	Backfilling	102	52	55	56	55	58	64	70	71	65	69	59	175	125	104	118	83	45	22	19	38	25	74
A6	Reinstatement of Pavement	98	48	51	53	52	55	60	66	67	61	65	56	175	125	104	118	83	45	22	19	38	25	74
Max. Predicted Level (dB)			60	63	64	63	66	72	78	79	73	77	67											
Max. Predicted Exceedance (dB)			0	0	0	0	0	0	3	4	3	2	0											
B	*Road Construction*	*SWL*	*Predicted Noise Level (dB)*																					
B1	Excavation	111	61	64	66	65	68	73	79	80	74	78	69	175	125	104	118	83	45	22	19	38	25	74
B2	Placement of Road Base	110	60	63	64	63	66	72	78	79	73	77	67	175	125	104	118	83	45	22	19	38	25	74
B3	Kerbing/ concreting for concrete carriageway	98	48	51	53	52	55	60	66	67	61	65	56	175	125	104	118	83	45	22	19	38	25	74
B5	Road paving	111	61	64	65	64	67	73	79	80	74	78	68	175	125	104	118	83	45	22	19	38	25	74
Max. Predicted Level (dB)			61	64	66	65	68	73	79	80	74	78	69											
Max. Predicted Exceedance (dB)			0	0	0	0	0	0	4	5	4	3	0											
Max. Cum. Noise Level (dB)			64	67	69	68	71	76	82	83	77	81	72											
Max. Cum. Noise Exceedance (dB)			0	0	0	0	1	1	7	8	7	6	0											

Tuen Mun Centre EPIW Construction Noise Calculations

Use of Quiet Plant and Barrier with Limited Operation Time																								
Activity ID	Description	NSR	50	52	53	54	57	59	61	63	64	66	68	50	52	53	54	57	59	61	63	64	66	68
A	*Drainage Works*	*SWL*	*Predicted Noise Level (dB)*											*Slant Distance (m)*										
A1.1	Excavation (soft ground)	107	57	60	61	60	63	69	75	76	70	74	64	175	125	104	118	83	45	22	19	38	25	74
A1.2	Excavation (hard ground)	102	52	55	57	56	59	64	70	72	65	69	60	175	125	104	118	83	45	22	19	38	25	74
A2	Preparation of formation	102	53	56	57	56	59	65	71	72	66	70	60	175	125	104	118	83	45	22	19	38	25	74
A3	Laying of pipes	100	50	53	54	53	56	62	68	69	63	67	57	175	125	104	118	83	45	22	19	38	25	74
A4	Construction of manhole	95	45	48	50	49	52	57	63	64	58	62	53	175	125	104	118	83	45	22	19	38	25	74
A5	Backfilling	99	49	52	53	52	55	61	67	68	62	66	56	175	125	104	118	83	45	22	19	38	25	74
A6	Reinstatement of Pavement	95	45	48	50	49	52	57	63	64	58	62	53	175	125	104	118	83	45	22	19	38	25	74
Max. Predicted Level (dB)			57	60	61	60	63	69	75	76	70	74	64											
Max. Predicted Exceedance (dB)			0	0	0	0	0	0	0	1	0	0	0											
B	*Road Construction*	*SWL*	*Predicted Noise Level (dB)*																					
B1	Excavation	108	58	61	63	62	65	70	76	77	71	75	66	175	125	104	118	83	45	22	19	38	25	74
B2	Placement of Road Base	107	57	60	61	60	63	69	75	76	70	74	64	175	125	104	118	83	45	22	19	38	25	74
B3	Kerbing/ concreting for concrete carriageway	95	45	48	50	49	52	57	63	64	58	62	53	175	125	104	118	83	45	22	19	38	25	74
B5	Road paving	108	58	61	62	61	64	70	76	77	71	75	65	175	125	104	118	83	45	22	19	38	25	74
Max. Predicted Level (dB)			58	61	63	62	65	70	76	77	71	75	66											
Max. Predicted Exceedance (dB)			0	0	0	0	0	0	1	2	1	0	0											
Max. Cum. Noise Level (dB)			61	64	66	65	68	73	79	80	74	78	69											
Max. Cum. Noise Exceedance (dB)			0	0	0	0	0	0	4	5	4	3	0											

ANNEX D SAMPLE HFA NOISE MODEL OUTPUT

FANOISE v1.10 RESULTS FILE : FULL OUTPUT

File : F27.DAT
Time : 10:04:16
Date : Thursday, 13 May 1999

Receiver no 15:
X=818294.1 Y=834395.5 Z= 10.3 Height= 1.5

Road Segment	Sub Segment	Flow	Speed	%Heavy	Gradient	Basic Noise Level	Corrections: Speed	Gradient	Surface	Distance	Angle of View	Barrier	Ground Cover	Facade	Reflection	Total
1018 1019	1	1785.0	50.0	24.90	0.3	74.70	2.6	0.1	-1.0	-8.5	-7.3	0.0	0.0	2.5	0.0	63.1
1018 1019	Category: U	Noise Level:	63.1													
1017 1018	1	1785.0	50.0	24.90	0.3	74.70	2.6	0.1	-1.0	-8.5	-9.2	0.0	0.0	2.5	0.0	61.2
1 7 1018	Category: U	Noise Level:	61.2													
3 8 3019	1	984.0	50.0	24.00	0.1	72.10	2.5	0.0	-3.5	-8.6	-10.4	0.0	0.0	2.5	0.0	54.6
3018 3019	Category: U	Noise Level:	54.6													
3024 3025	1	1109.0	50.0	27.00	1.1	72.60	2.9	0.0	-1.0	-8.1	-16.9	-3.2	0.0	2.5	0.0	48.8
3 4 3025	2	1109.0	50.0	27.00	1.1	72.60	2.9	0.0	-1.0	-8.1	-17.9	-2.5	0.0	2.5	0.0	48.5
3 4 3025	Category: N	Noise Level:	51.7													
3030 3031	1	777.0	50.0	34.00	0.1	71.10	3.6	0.0	-1.0	-8.9	-18.8	-2.8	0.0	2.5	0.0	45.7
3030 3031	2	777.0	50.0	34.00	0.1	71.10	3.6	0.0	-1.0	-8.9	-18.5	-2.7	0.0	2.5	0.0	46.1
3030 3031	3	777.0	50.0	34.00	0.1	71.10	3.6	0.0	-1.0	-8.9	-18.3	-2.5	0.0	2.5	0.0	46.5
3 0 3031	Category: N	Noise Level:	50.9													
3 6 3017	1	984.0	50.0	24.00	0.1	72.10	2.5	0.0	-3.5	-8.9	-13.8	0.0	0.0	2.5	0.0	50.9
3016 3017	2	984.0	50.0	24.00	0.1	72.10	2.5	0.0	-3.5	-8.9	-17.8	0.0	0.0	2.5	0.0	46.9
3016 3017	3	984.0	50.0	24.00	0.1	72.10	2.5	0.0	-3.5	-8.9	-18.9	0.0	0.0	2.5	0.0	45.8
3 6 3017	Category: U	Noise Level:	53.2													
3 2 3023	1	801.0	50.0	26.00	0.1	71.20	2.8	0.0	-3.5	-9.1	-18.7	0.0	0.0	2.5	0.0	45.2
3022 3023	2	801.0	50.0	26.00	0.1	71.20	2.8	0.0	-3.5	-9.1	-12.7	-1.8	0.0	2.5	1.5	50.9
3022 3023	Category: U	Noise Level:	51.9													
3015 3048	1	1316.0	50.0	27.00	0.4	73.40	2.9	0.0	-1.0	-12.1	-17.9	-3.2	0.0	2.5	0.0	44.6
3 5 3048	2	1316.0	50.0	27.00	0.4	73.40	2.9	0.0	-1.0	-12.1	-18.9	-2.2	0.0	2.5	0.0	44.6
3 5 3048	3	1316.0	50.0	27.00	0.4	73.40	2.9	0.0	-1.0	-12.1	-18.5	-2.6	0.0	2.5	0.0	44.6
3015 3048	Category: N	Noise Level:	49.4													
3048 3049	1	486.0	50.0	32.00	0.9	69.10	3.4	0.3	-1.0	-12.0	-15.6	-5.2	0.0	2.5	0.0	41.5
3 8 3049	2	486.0	50.0	32.00	0.9	69.10	3.4	0.3	-1.0	-12.0	-17.7	-4.3	0.0	2.5	0.0	40.3
3 8 3049	3	486.0	50.0	32.00	0.9	69.10	3.4	0.3	-1.0	-12.0	-13.1	-3.6	0.0	2.5	0.0	45.6
3 8 3049	Category: N	Noise Level:	47.9													
3021 3022	1	801.0	50.0	26.00	0.1	71.20	2.8	0.0	-3.5	-9.2	-14.9	-1.8	0.0	2.5	0.0	47.1
3021 3022	2	801.0	50.0	26.00	0.1	71.20	2.8	0.0	-3.5	-9.2	-14.8	-1.8	0.0	2.5	0.0	47.2
3 1 3022	Category: U	Noise Level:	50.2													
3 0 3021	1	801.0	50.0	26.00	1.8	71.20	2.8	0.0	-3.5	-9.3	-19.2	-3.1	0.0	2.5	0.0	41.4
3020 3021	2	801.0	50.0	26.00	1.8	71.20	2.8	0.0	-3.5	-9.3	-13.8	-3.0	0.0	2.5	0.0	46.9
3020 3021	3	801.0	50.0	26.00	1.8	71.20	2.8	0.0	-3.5	-9.3	-18.9	-2.9	0.0	2.5	0.0	41.9
3020 3021	Category: U	Noise Level:	48.9													
3 4 3015	1	1316.0	50.0	27.00	0.0	73.40	2.9	0.0	-3.5	-12.0	-18.7	-2.8	0.0	2.5	0.0	41.8
3 4 3015	2	1316.0	50.0	27.00	0.0	73.40	2.9	0.0	-3.5	-12.0	-19.0	-2.8	0.0	2.5	0.0	41.5
3014 3015	3	1316.0	50.0	27.00	0.0	73.40	2.9	0.0	-3.5	-12.0	-18.8	-2.7	0.0	2.5	0.0	41.8
3014 3015	4	1316.0	50.0	27.00	0.0	73.40	2.9	0.0	-3.5	-12.0	-16.0	-2.7	0.0	2.5	0.0	44.6
3 4 3015	Category: N	Noise Level:	48.6													
3 3 3014	1	1316.0	50.0	27.00	0.0	73.40	2.9	0.0	-3.5	-12.0	-17.2	-2.7	0.0	2.5	0.0	43.4
3013 3014	2	1316.0	50.0	27.00	0.0	73.40	2.9	0.0	-3.5	-12.0	-15.5	-30.2	0.0	2.5	0.0	17.6
3013 3014	3	1316.0	50.0	27.00	0.0	73.40	2.9	0.0	-3.5	-12.0	-17.7	-9.4	0.0	2.5	0.0	36.2
3013 3014	Category: N	Noise Level:	44.2													
3 7 3043	1	1172.0	50.0	22.00	1.7	72.90	2.3	0.0	-1.0	-11.8	-18.0	-3.1	0.0	2.5	0.0	43.8
3 7 3043	2	1172.0	50.0	22.00	1.7	72.90	2.3	0.0	-1.0	-11.8	-18.9	-3.2	0.0	2.5	0.0	42.8
3007 3043	3	1172.0	50.0	22.00	1.7	72.90	2.3	0.0	-1.0	-11.8	-18.2	0.0	0.0	2.5	0.0	46.7
3007 3043	Category: N	Noise Level:	49.5													
3 7 3018	1	984.0	50.0	24.00	0.1	72.10	2.5	0.0	-3.5	-8.9	-13.4	0.0	0.0	2.5	0.0	51.3
3 7 3018	Category: U	Noise Level:	51.3													
3006 3007	1	1172.0	50.0	22.00	0.0	72.90	2.3	0.0	-3.5	-11.8	-16.6	0.0	0.0	2.5	0.0	45.8
3006 3007	2	1172.0	50.0	22.00	0.0	72.90	2.3	0.0	-3.5	-11.8	-19.0	0.0	0.0	2.5	0.0	43.4
3006 3007	3	1172.0	50.0	22.00	0.0	72.90	2.3	0.0	-3.5	-11.8	-18.8	0.0	0.0	2.5	0.0	43.6
3 5 3007	4	1172.0	50.0	22.00	0.0	72.90	2.3	0.0	-3.5	-11.8	-15.3	0.0	0.0	2.5	0.0	47.1
3 5 3007	Category: N	Noise Level:	51.3													
3051 3052	1	486.0	50.0	32.00	0.2	69.10	3.4	0.1	-1.0	-12.2	-18.9	-30.7	0.0	2.5	0.0	12.3
3051 3052	2	486.0	50.0	32.00	0.2	69.10	3.4	0.1	-1.0	-12.2	-19.3	-30.4	0.0	2.5	0.0	12.2
3 3052	3	486.0	50.0	32.00	0.2	69.10	3.4	0.1	-1.0	-12.2	-17.4	-30.7	0.0	2.5	0.0	13.8
3 3052	4	486.0	50.0	32.00	0.2	69.10	3.4	0.1	-1.0	-12.2	-18.8	-30.1	0.0	2.5	0.0	13.0
3051 3052	5	486.0	50.0	32.00	0.2	69.10	3.4	0.1	-1.0	-12.2	-19.4	-12.9	0.0	2.5	0.0	29.6
3051 3052	6	486.0	50.0	32.00	0.2	69.10	3.4	0.1	-1.0	-12.2	-18.0	-22.0	0.0	2.5	0.0	21.9
3052 3052	Category: N	Noise Level:	30.6													
1 1058	1	2968.0	50.0	26.00	1.5	76.90	2.8	0.4	-1.0	-16.4	-16.7	-10.8	0.0	2.5	0.0	37.7
1 1058	2	2968.0	50.0	26.00	1.5	76.90	2.8	0.4	-1.0	-16.4	-18.3	-10.5	0.0	2.5	0.0	36.4
1057 1058	Category: U	Noise Level:	40.1													
1047 1048	1	2234.0	50.0	16.00	0.4	75.70	1.3	0.1	-1.0	-17.3	-19.4	-30.3	0.0	2.5	0.0	11.6
1 1048	2	2234.0	50.0	16.00	0.4	75.70	1.3	0.1	-1.0	-17.3	-18.9	-30.5	0.0	2.5	0.0	11.9
1 1048	3	2234.0	50.0	16.00	0.4	75.70	1.3	0.1	-1.0	-17.3	-18.6	-30.4	0.0	2.5	0.0	12.3
1047 1048	4	2234.0	50.0	16.00	0.4	75.70	1.3	0.1	-1.0	-17.3	-19.0	-30.0	0.0	2.5	0.0	12.3
1047 1048	5	2234.0	50.0	16.00	0.4	75.70	1.3	0.1	-1.0	-17.3	-19.1	-30.0	0.0	2.5	0.0	12.2
1047 1048	6	2234.0	50.0	16.00	0.4	75.70	1.3	0.1	-1.0	-17.3	-17.1	-30.1	0.0	2.5	0.0	14.1
1 1048	Category: U	Noise Level:	20.3													
3 3006	1	1172.0	50.0	22.00	0.0	72.90	2.3	0.0	-3.5	-11.8	-18.3	-30.0	0.0	2.5	0.0	14.1
3005 3006	2	1172.0	50.0	22.00	0.0	72.90	2.3	0.0	-3.5	-11.8	-15.5	-30.2	0.0	2.5	0.0	16.7
3005 3006	3	1172.0	50.0	22.00	0.0	72.90	2.3	0.0	-3.5	-11.8	-16.9	-30.0	0.0	2.5	0.0	15.5

3005 3006		Category: N	Noise Level:	20.3												
1037 1038	1	1801.0	50.0	26.00	0.0	74.80	2.8	0.0	-1.0	-16.1	-14.2	-1.7	0.0	2.5	0.0	47.1
1037 1038	2	1801.0	50.0	26.00	0.0	74.80	2.8	0.0	-1.0	-16.1	-19.1	-30.0	0.0	2.5	0.0	13.9
1037 1038		Category: U	Noise Level:	47.1												
3025 3026	1	1109.0	50.0	27.00	0.2	72.60	2.9	0.1	-1.0	-8.1	-18.9	-1.7	0.0	2.5	0.0	48.4
3025 3026		Category: N	Noise Level:	48.4												
3011 3012	1	1316.0	50.0	27.00	0.0	73.40	2.9	0.0	-3.5	-12.2	-18.9	-30.3	0.0	2.5	0.0	13.9
3011 3012	2	1316.0	50.0	27.00	0.0	73.40	2.9	0.0	-3.5	-12.2	-18.5	-30.3	0.0	2.5	0.0	14.3
3011 3012	3	1316.0	50.0	27.00	0.0	73.40	2.9	0.0	-3.5	-12.2	-16.9	-30.3	0.0	2.5	0.0	15.9
3011 3012		Category: N	Noise Level:	19.6												
1050 1051	1	2968.0	50.0	26.00	0.5	76.90	2.8	0.1	-1.0	-17.5	-17.2	-30.4	0.0	2.5	0.0	16.2
1050 1051	2	2968.0	50.0	26.00	0.5	76.90	2.8	0.1	-1.0	-17.5	-17.7	-30.3	0.0	2.5	0.0	15.8
1050 1051		Category: U	Noise Level:	19.0												
3043 3044	1	491.0	50.0	26.00	1.4	69.10	2.8	0.4	-3.5	-11.7	-14.7	-3.2	0.0	2.5	0.0	41.7
3043 3044	2	491.0	50.0	26.00	1.4	69.10	2.8	0.4	-3.5	-11.7	-17.6	-3.3	0.0	2.5	0.0	38.7
3043 3044	3	491.0	50.0	26.00	1.4	69.10	2.8	0.4	-3.5	-11.7	-13.8	-3.2	0.0	2.5	0.0	42.6
3043 3044		Category: N	Noise Level:	46.1												
3003 3004	1	1172.0	50.0	22.00	0.2	72.90	2.3	0.1	-3.5	-12.0	-18.9	-30.4	0.0	2.5	0.0	13.0
3003 3004	2	1172.0	50.0	22.00	0.2	72.90	2.3	0.1	-3.5	-12.0	-17.3	-30.3	0.0	2.5	0.0	14.7
3003 3004	3	1172.0	50.0	22.00	0.2	72.90	2.3	0.1	-3.5	-12.0	-18.0	-30.3	0.0	2.5	0.0	14.0
3003 3004		Category: N	Noise Level:	18.7												
3045 3046	1	491.0	50.0	26.00	0.5	69.10	2.8	0.0	-3.5	-11.9	-19.2	-30.6	0.0	2.5	0.0	9.2
3045 3046	2	491.0	50.0	26.00	0.5	69.10	2.8	0.0	-3.5	-11.9	-19.5	-30.7	0.0	2.5	0.0	8.8
3045 3046	3	491.0	50.0	26.00	0.5	69.10	2.8	0.0	-3.5	-11.9	-19.4	-1.4	0.0	2.5	0.0	38.2
3045 3046	4	491.0	50.0	26.00	0.5	69.10	2.8	0.0	-3.5	-11.9	-18.0	-30.7	0.0	2.5	0.0	10.3
3045 3046	5	491.0	50.0	26.00	0.5	69.10	2.8	0.0	-3.5	-11.9	-18.8	-30.1	0.0	2.5	0.0	10.1
3045 3046	6	491.0	50.0	26.00	0.5	69.10	2.8	0.0	-3.5	-11.9	-19.4	-16.9	0.0	2.5	0.0	22.7
3045 3046	7	491.0	50.0	26.00	0.5	69.10	2.8	0.0	-3.5	-11.9	-15.6	-27.0	0.0	2.5	0.0	16.4
3045 3046		Category: N	Noise Level:	38.4												
3031 3032	1	777.0	50.0	34.00	0.4	71.10	3.6	0.1	-1.0	-8.7	-18.6	-2.5	0.0	2.5	0.0	46.5
3031 3032		Category: N	Noise Level:	46.5												
3050 3051	1	486.0	50.0	32.00	0.2	69.10	3.4	0.0	-1.0	-12.2	-19.3	-25.5	0.0	2.5	0.0	17.0
3050 3051	2	486.0	50.0	32.00	0.2	69.10	3.4	0.0	-1.0	-12.2	-17.9	-16.5	0.0	2.5	0.0	27.4
3050 3051	3	486.0	50.0	32.00	0.2	69.10	3.4	0.0	-1.0	-12.2	-16.1	-14.4	0.0	2.5	0.0	31.3
3050 3051		Category: N	Noise Level:	32.9												
1034 1035	1	1801.0	50.0	26.00	1.5	74.80	2.8	0.4	-1.0	-16.1	-14.6	-30.0	0.0	2.5	0.0	18.8
1034 1035		Category: U	Noise Level:	18.8												
3012 3013	1	1316.0	50.0	27.00	0.0	73.40	2.9	0.0	-3.5	-12.0	-15.0	-30.5	0.0	2.5	0.0	17.8
3012 3013		Category: N	Noise Level:	17.8												
1051 1052	1	2968.0	50.0	26.00	2.8	76.90	2.8	0.9	-1.0	-17.5	-16.6	-30.3	0.0	2.5	0.0	17.7
1051 1052		Category: U	Noise Level:	17.7												
3004 3005	1	1172.0	50.0	22.00	0.0	72.90	2.3	0.0	-3.5	-11.7	-17.0	-30.5	0.0	2.5	0.0	15.0
3004 3005	2	1172.0	50.0	22.00	0.0	72.90	2.3	0.0	-3.5	-11.7	-18.2	-30.5	0.0	2.5	0.0	13.8
3004 3005		Category: N	Noise Level:	17.5												
3049 3050	1	486.0	50.0	32.00	0.0	69.10	3.4	0.0	-1.0	-11.9	-19.4	-13.9	0.0	2.5	0.0	28.8
3049 3050	2	486.0	50.0	32.00	0.0	69.10	3.4	0.0	-1.0	-11.9	-16.2	-6.1	0.0	2.5	0.0	39.8
3049 3050		Category: N	Noise Level:	40.1												
3044 3045	1	491.0	50.0	26.00	0.7	69.10	2.8	0.0	-3.5	-11.8	-18.2	-17.7	0.0	2.5	0.0	23.2
3044 3045	2	491.0	50.0	26.00	0.7	69.10	2.8	0.0	-3.5	-11.8	-16.7	-14.7	0.0	2.5	0.0	27.7
3044 3045	3	491.0	50.0	26.00	0.7	69.10	2.8	0.0	-3.5	-11.8	-19.1	-13.7	0.0	2.5	0.0	26.3
3044 3045	4	491.0	50.0	26.00	0.7	69.10	2.8	0.0	-3.5	-11.8	-16.8	-2.8	0.0	2.5	0.0	39.5
3044 3045		Category: N	Noise Level:	40.1												
1032 1033	1	977.0	50.0	29.00	0.3	72.10	3.1	0.1	-1.0	-10.7	-18.5	-0.7	0.0	2.5	0.0	46.9
1032 1033		Category: U	Noise Level:	46.9												
3052 3053	1	486.0	50.0	32.00	1.0	69.10	3.4	0.3	-1.0	-12.0	-19.2	-30.7	0.0	2.5	0.0	12.4
3052 3053	2	486.0	50.0	32.00	1.0	69.10	3.4	0.3	-1.0	-12.0	-17.1	-30.6	0.0	2.5	0.0	14.6
3052 3053		Category: U	Noise Level:	16.6												
1036 1037	1	1801.0	50.0	26.00	0.0	74.80	2.8	0.0	-1.0	-16.1	-15.8	-30.2	0.0	2.5	0.0	17.0
1036 1037		Category: U	Noise Level:	17.0												
1035 1036	1	1801.0	50.0	26.00	2.3	74.80	2.8	0.7	-1.0	-16.1	-17.2	-1.8	0.0	2.5	0.0	44.7
1035 1036		Category: U	Noise Level:	44.7												
3046 3047	1	491.0	50.0	26.00	0.3	69.10	2.8	0.0	-1.0	-11.9	-19.2	-30.8	0.0	2.5	0.0	11.5
3046 3047	2	491.0	50.0	26.00	0.3	69.10	2.8	0.0	-1.0	-11.9	-17.0	-30.1	0.0	2.5	0.0	14.4
3046 3047		Category: U	Noise Level:	16.2												
1054 1055	1	2968.0	50.0	26.00	3.1	76.90	2.8	0.9	-1.0	-17.1	-18.6	-7.0	0.0	2.5	0.0	39.4
1054 1055		Category: U	Noise Level:	39.4												
1044 1045	1	965.0	50.0	13.00	0.5	72.00	0.8	0.0	-1.0	-17.2	-18.7	-30.3	0.0	2.5	0.0	8.1
1044 1045	2	965.0	50.0	13.00	0.5	72.00	0.8	0.0	-1.0	-17.2	-18.4	-30.5	0.0	2.5	0.0	8.2
1044 1045	3	965.0	50.0	13.00	0.5	72.00	0.8	0.0	-1.0	-17.2	-18.6	-30.5	0.0	2.5	0.0	8.0
1044 1045	4	965.0	50.0	13.00	0.5	72.00	0.8	0.0	-1.0	-17.2	-19.0	-30.0	0.0	2.5	0.0	8.1
1044 1045	5	965.0	50.0	13.00	0.5	72.00	0.8	0.0	-1.0	-17.2	-19.1	-30.0	0.0	2.5	0.0	8.0
1044 1045	6	965.0	50.0	13.00	0.5	72.00	0.8	0.0	-1.0	-17.2	-17.6	-30.1	0.0	2.5	0.0	9.4
1044 1045		Category: U	Noise Level:	16.1												
1052 1053	1	2968.0	50.0	26.00	1.0	76.90	2.8	0.3	-1.0	-17.4	-17.8	-30.3	0.0	2.5	0.0	16.0
1052 1053		Category: U	Noise Level:	16.0												
1053 1054	1	2968.0	50.0	26.00	1.5	76.90	2.8	0.4	-1.0	-17.3	-18.1	-30.1	0.0	2.5	0.0	16.1
1053 1054		Category: U	Noise Level:	16.1												
1055 1056	1	2968.0	50.0	26.00	0.9	76.90	2.8	0.3	-1.0	-17.0	-19.5	-18.1	0.0	2.5	0.0	26.9
1055 1056		Category: U	Noise Level:	26.9												
1048 1049	1	2234.0	50.0	16.00	0.6	75.70	1.3	0.0	-1.0	-17.4	-17.3	-30.0	0.0	2.5	0.0	13.8
1048 1049		Category: U	Noise Level:	13.8												
1045 1046	1	965.0	50.0	13.00	1.6	72.00	0.8	0.5	-1.0	-17.3	-17.1	-30.0	0.0	2.5	0.0	10.4
1045 1046		Category: U	Noise Level:	10.4												
8026 8027		Category: N	Warning: Flow too low for CRTN - segment ignored.													
8025 8026		Category: N	Warning: Flow too low for CRTN - segment ignored.													
3027 3028	1	1109.0	50.0	27.00	0.2	72.60	2.9	0.1	-1.0	-8.0	-20.1	-1.3	0.0	2.5	0.0	47.7
3027 3028		Category: N	Noise Level:	47.7	Warning: Segment angle less than 2°.											
3028 3029	1	1109.0	50.0	27.00	0.1	72.60	2.9	0.0	-1.0	-7.5	-20.6	-1.0	0.0	2.5	0.0	47.9
3028 3029		Category: N	Noise Level:	47.9	Warning: Segment angle less than 2°.											
8031 8032		Category: N	Warning: Flow too low for CRTN - segment ignored.													

30 8031	Category: N	Warning: Flow too low for CRTN - segment ignored.														
33 3034	1	777.0	50.0	34.00	0.0	71.10	3.6	0.0	-1.0	-8.7	-19.6	-2.9	0.0	2.5	0.0	45.0
3033 3034	Category: N	Noise Level: 45.0	Warning: Segment angle less than 2°.													
8029 8030	Category: N	Warning: Flow too low for CRTN - segment ignored.														
34 3035	1	777.0	50.0	34.00	0.1	71.10	3.6	0.0	-1.0	-8.7	-19.6	-2.6	0.0	2.5	0.0	45.3
34 3035	Category: N	Noise Level: 45.3	Warning: Segment angle less than 2°.													
27 8028	Category: N	Warning: Flow too low for CRTN - segment ignored.														
8028 8029	Category: N	Warning: Flow too low for CRTN - segment ignored.														
1034 1039	1	2252.0	50.0	31.40	1.9	75.70	3.4	0.6	-1.0	-5.7	-26.5	-30.0	0.0	2.5	0.0	19.0
34 1039	Category: U	Noise Level: 19.0	Warning: Segment angle less than 2°.													
26 3027	1	1109.0	50.0	27.00	0.0	72.60	2.9	0.0	-1.0	-6.9	-24.2	-1.2	0.0	2.5	0.0	44.7
3026 3027	Category: N	Noise Level: 44.7	Warning: Segment angle less than 2°.													
3029 3041	1	1109.0	50.0	27.00	0.0	72.60	2.9	0.0	-1.0	-7.4	-22.3	-30.1	0.0	2.5	0.0	17.2
3029 3041	Category: N	Noise Level: 17.2	Warning: Segment angle less than 2°.													
40 1041	1	2252.0	50.0	31.40	3.1	75.70	3.4	0.9	-1.0	-7.6	-25.8	-1.8	0.0	2.5	0.0	46.3
40 1041	Category: U	Noise Level: 46.3	Warning: Segment angle less than 2°.													
3032 3033	1	777.0	50.0	34.00	0.9	71.10	3.6	0.0	-1.0	-8.7	-22.4	-2.9	0.0	2.5	0.0	42.2
3032 3033	Category: N	Noise Level: 42.2	Warning: Segment angle less than 2°.													
35 3042	1	777.0	50.0	34.00	0.3	71.10	3.6	0.0	-1.0	-9.0	-20.9	-2.5	0.0	2.5	0.0	43.8
35 3042	Category: N	Noise Level: 43.8	Warning: Segment angle less than 2°.													
1042 1043	1	2252.0	50.0	31.40	0.2	75.70	3.4	0.0	-1.0	-11.5	-21.5	-30.5	0.0	2.5	0.0	17.1
1042 1043	Category: U	Noise Level: 17.1	Warning: Segment angle less than 2°.													
1025 1026	1	1886.0	50.0	29.90	0.2	75.00	3.2	0.1	-1.0	-7.0	-26.4	-30.1	0.0	2.5	0.0	16.3
25 1026	Category: U	Noise Level: 16.3	Warning: Segment angle less than 2°.													
39 1040	1	2252.0	50.0	31.40	0.7	75.70	3.4	0.2	-1.0	1.5	-34.6	-2.3	0.0	2.5	0.0	45.4
1039 1040	Category: U	Noise Level: 45.4	Warning: Segment angle less than 2°.													
1041 1042	1	2252.0	50.0	31.40	0.5	75.70	3.4	0.2	-1.0	-10.6	-24.0	-1.8	0.0	2.5	0.0	44.4
41 1042	Category: U	Noise Level: 44.4	Warning: Segment angle less than 2°.													
33 1034	1	977.0	50.0	29.00	1.5	72.10	3.1	0.5	-1.0	-9.6	-24.4	-30.0	0.0	2.5	0.0	13.2
1033 1034	Category: U	Noise Level: 13.2	Warning: Segment angle less than 2°.													
3010 3011	1	1316.0	50.0	27.00	0.0	73.40	2.9	0.0	-3.5	-12.4	-20.2	-30.2	0.0	2.5	0.0	12.5
3010 3011	Category: N	Noise Level: 12.5	Warning: Segment angle less than 2°.													
56 1057	1	2968.0	50.0	26.00	0.9	76.90	2.8	0.3	-1.0	-16.9	-20.0	-18.5	0.0	2.5	0.0	26.1
56 1057	Category: U	Noise Level: 26.1	Warning: Segment angle less than 2°.													
8033 8034	Category: N	Free-field level too low														
3002 3003	Category: N	Free-field level too low														
52 8033	Category: N	Free-field level too low														
54 8035	Category: N	Free-field level too low														
1007 1008	Category: U	Not in view of receiver														
1008 1009	Category: U	Not in view of receiver														
1009 1010	Category: U	Not in view of receiver														
16 1017	Category: U	Not in view of receiver														
59 1060	Category: U	Not in view of receiver														
1060 1061	Category: U	Not in view of receiver														
1061 1062	Category: U	Not in view of receiver														
62 1063	Category: U	Not in view of receiver														
63 1064	Category: U	Not in view of receiver														
1064 1065	Category: U	Not in view of receiver														
1065 1066	Category: U	Not in view of receiver														
1000 1001	Category: U	Not in view of receiver														
3000 3001	Category: U	Not in view of receiver														
3001 3002	Category: N	Not in view of receiver														
1001 1002	Category: U	Not in view of receiver														
1002 1003	Category: U	Not in view of receiver														
1003 1004	Category: U	Not in view of receiver														
1004 1005	Category: U	Not in view of receiver														
1005 1006	Category: U	Not in view of receiver														
3009 3010	Category: N	Not in view of receiver														
3008 3009	Category: N	Not in view of receiver														
1006 1007	Category: U	Not in view of receiver														

Total contribution from :

Unaltered	66.6
Altered	0.0
New	60.7
OVERALL	67.6

ANNEX E AGREEMENT ON THE USE OF LOW NOISE ROAD SURFACING

KCR 九廣鐵路

九廣鐵路公司
Kowloon-Canton Railway Corporation
西鐵部 West Rail Division

Comm Ref.: WR1CRN1999-0030434

ERM-Hong Kong, Ltd
6th Floor, Hecny Tower
9 Chatham Road
Tsimshatsui
Kowloon

10 May, 1999
(via fax 2367-6396)

Attn: Mr Jon Pyke

Date Received by ERM:
11 MAY 1999
Login Ref: 3-703

Subject: **KCRC West Rail**
DD-901 Environmental Support Services
EPIWs - Yuen Long, Tin Shui Wai and Tuen Mun EIA

Dear Jon,

Attached please find a copy of the correspondences between HyD, EPD and KCRC on the use of low noise road surfacing for your reference in undertaking the captioned EIA Study.

Yours sincerely,

Vic McNally
Environmental Manager

dl/vt/VM

Response Required: No
Due Date: N/A
Attachments: Yes (WR1CRN1999-0027823 & 0027386)
Project Code: WR1
Contract Code: DD0901
Subject Code: EN101

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香港新界沙田運城廣場七座
7/F., Citylink Plaza, Sha Tin, N.T., Hong Kong. Telephone: (852) 2684 8300 Facsimile: (852) 2601 5287

FACSIMILE

Original copy NOT sent/to separately
Total no. of pages including this page: ONE

Environmental Protection Department
環境保護署

FROM: Director of Environmental Protection

OUR REF.: ( ) in EP 1/G/72 Ax (20)

TEL NO.: 2594 6554

DATE: 30 April 1999

OUR FAX NO.: 2802 4511

TO: Kowloon-Canton Railway Corporation
(Attn.: Mr. Vic McNally)

YOUR REF.: ( ) in WR1CRN1999-0027386

YOUR FAX NO.: 2681 4012

Dear Vic,

KCRC West Rail Phase 1
Essential Public Infrastructure Works EIA Study
Use of Low Noise Road Surfacing

I refer to your facsimile dated 28.4.99 and letter from the RDO, HyD dated 29.4.99 regarding the captioned.

You may like to note that, if low noise road surfacing is to be used as a direct mitigation measure at source, the agents for implementation and maintenance would be specified in the "Implementation Schedule" of the EIA Report. Once committed, the agents would be responsible for providing and maintaining the effectiveness of the measure.

Having considered the context of HyD's letter, I would agree that their approach to replace the low noise road surfacing as and when necessary is appropriate, reasonable and pragmatic.

For the assessment of road traffic noise, please advise your consultants to make reference to the "Calculation of Road Traffic Noise" published by the U.K.'s Department of Transport on the correction factor for the road surfaces.

Yours sincerely,

(C. P. Wai)
for Director of Environmental Protection

cc: RDO, HyD [Attention: Mr. Stephen T.M. KONG via fax 2714 5297]
Internal: P(TA)/S(TA)4/E(TA)4

[A:\WR_LNRS.WPD/01]

(Fax: 2601 5287)

WR1-0000058990

路政署
HIGHWAYS DEPARTMENT

鐵路拓展處
RAILWAY DEVELOPMENT OFFICE
1ST FLOOR, HO MAN TIN GOVERNMENT OFFICES,
88 CHUNG HAU STREET, HOMANTIN, KOWLOON, HONG KONG.
香港九龍何文田忠孝街八十八號何文田政府合署一樓

29 APR 1999

KCRC
WR PROJECT

本處檔案 Our Ref : ( ) in RD 6/1/6
來函檔案 Your Ref :
電話 Tel : 2762 3515
圖文傳真 Fax : 2714 5297

KCRC
DCC#: WR/CAN/PP/50278/23
REF:

Date: 29 April 1999

KCRC, West Rail Division
9/F, Citylink Plaza,
Shatin, NT
Hong Kong

(Attn. Mr. Vic McNalley)

Dear Sir,

KCRC West Rail (Phase I)
DD200 Yuen Long Section,
Essential Public Infrastructure Works, EIA Study
<u>Use of Low Noise Road Surfacing</u>

I refer to your letter on 28.04.99 regarding the captioned subject and would like to comment that the Technical Report No. RD/TR/022 does not stipulate the frequency of resurfacing required. Paragraph 4.13 of the report does say that resurfacing may be required after three years. In order that to cause any necessary inconvenience to the public, the maintenance of the low noise road surfacing will be carried out in accordance with HyD current practice, i.e. half-yearly inspection and resurfacing as and when required.

Yours faithfully,

(Stephen T M Kong)
for Chief Engineer/ West Rail
Railway Development Office
Highway Department

C.C. BY fax

EPD	Attn: Mr. H M Wong	fax: 2591 0588
EPD	Attn: Mr. C P Wai	fax: 2802 4511

KCR 九廣鐵路 FAX 28-4-99

九廣鐵路公司
Kowloon-Canton Railway Corporation

西鐵部 West Rail Division

Comm Ref.: WR1CRN1999-0027386

Highways Department, 1st Floor
Ho Man Tin Government Offices
88 Chung Hau Street, Ho Man Tin
Kowloon

28 April, 1999
(via fax 2714-5297)

Attn: Mr Eric Fung

Subject: **KCRC West Rail**
Essential Public Infrastructure Works EIA Study
Use of Low Noise Road Surfacing

Dear Eric,

According to the Technical Report No. RD/TR/022, the noise reduction of low noise road surfacing material D is in the range of 3.0 dB(A) to 1.3 dB(A) for initial stage and after two years. As discussed with EPD in order to utilise the noise attenuation value attributable to low noise road surfacing, we are required to provide a commitment to replacing the surfacing material every two years to maintain the noise attenuation capacity of 1.3 dB(A). Please confirm HyD's agreement to commit to this maintenance requirement so that we can instruct our environmental consultant to add such a commitment into the EIA report.

Yours sincerely,

Vic McNally
Environmental Manager

dl/vt/VM

c. c. C P Wai, EPD Fax No. 2802-4511

Response Required: Yes
Due Date: ASAP
Attachments: No
Project Code: WR1
Contract Code: DD0901
Subject Code: EN101

香港新界沙田運城廣場七樓
7/F., Citylink Plaza, Sha Tin, N.T., Hong Kong. Telephone: (852) 2684 8300 Facsimile: (852) 2601 5287

ANNEX F NOISE INSULATION ELIGIBILITY ASSESSMENT

West Rail DD901
Yuen Long EPIW - Road Traffic Noise Impact Assessment
Low-level NSRs

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Noise Sensitive Receiver				Prevailing	Future			ExCo Criteria			
NSR	Name/Location	NSR ID in HFA	Noise Criterion dB(A)	1999 Total L_{A10} Noise dB(A)	2018 Total L_{A10} Noise dB(A)	2018 "Existing Roads" L_{A10} Noise dB(A)	2018 "New Roads" L_{A10} Noise dB(A)	1st Criterion Col (F) > Col (D)? Yes/No	2nd Criterion Col (F) - Col (E) >= 1.0? Yes/No	3rd Criterion Col (F) - Col (G) >= 1.0? Yes/No	Eligible for Noise Insulation? Yes/No
1	Nam Pin Wai (west)	3	70	69.4	71.2	71.1	53.4	yes	yes	no	no
2	Tai Wong Temple - Nam Pin Wai	4	65	61.4	64.6	64.5	48.0	no	yes	no	no
3	Nam Pin Wai (south-west)	5	70	70.2	72.0	71.9	51.0	yes	yes	no	no
4	Nam Pin Wai (south)	6	70	70.1	71.5	71.4	53.9	yes	yes	no	no
5	Shung Tak School	7	65	72.7	73.2	70.9	69.4	yes	no	yes	no
6	Nam Pin Wai (east)	8	70	68.7	68.0	60.6	67.1	no	no	yes	no
7	Tung Tau Tsuen	10	70	66.9	70.2	55.5	70.1	no	yes	yes	no
8	Tsoi Uk Tsuen	36	70	65.6	68.7	51.4	68.7	no	yes	yes	no
9	Ying Lung Wai	12	70	65.6	68.9	45.2	68.9	no	yes	yes	no
10	Tai Wai Tsuen (west)	13	70	64.9	68.4	56.7	68.1	no	yes	yes	no
11	Tai Wai Tsuen (east)	38	70	64.1	68.6	58.3	68.2	no	yes	yes	no
12	Sun Yuen Long Centre (north-west)	25	70	73.9	56.3	56.1	41.5	no	no	no	no
13	Sun Yuen Long Centre (north-east)	27	70	73.7	46.4	43.4	43.3	no	no	yes	no
14	Sun Yuen Long Centre (west)	28	70	73.4	68.6	68.6	18.1	no	no	no	no
15	Sun Yuen Long Centre (south)	812	70	58.8	62.7	59.1	60.1	no	yes	yes	no
16	Sun Yuen Long Centre (south)	814	70	63.6	60.4	57.5	57.3	no	no	yes	no
17	CDA Development in Area 15 (north-west)	802	70	72.2	68.2	54.2	68.0	no	no	yes	no
18	CDA Development in Area 15 (north-east)	33	70	53.0	61.6	53.0	61.0	no	yes	yes	no
19	CDA Development in Area 15 (south-west)	809	70	75.8	78.6	76.6	74.3	yes	yes	yes	yes
20	CDA Development in Area 15 (south)	816	70	75.3	78.6	78.6	51.6	yes	yes	no	no
20a	CDA Development in Area 12 (north)	97	70	76.8	81.0	77.9	78.0	yes	yes	yes	yes
21	Shap Pat Heung Rural Committee Building	24	70	79.3	84.2	84.0	71.2	yes	yes	no	no
22	Cheong Wai	23	70	79.7	82.6	82.6	64.5	yes	yes	no	no
23	Far East Consortium Yuen Long Building	16	70	78.2	80.3	80.3	56.0	yes	yes	no	no

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Yuen Long EPIW - Road Traffic Noise Impact Assessment
Mid-level NSRs

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Noise Sensitive Receiver				Prevailing	Future			ExCo Criteria			
NSR	Name/Location	NSR ID in HFA	Noise Criterion dB(A)	1999 Total L_{A10} Noise dB(A)	2018 Total L_{A10} Noise dB(A)	2018 "Existing Roads" L_{A10} Noise dB(A)	2018 "New Roads" L_{A10} Noise dB(A)	1st Criterion Col (F) > Col (D)? Yes/No	2nd Criterion Col (F) - Col (E) >= 1.0? Yes/No	3rd Criterion Col (F) - Col (G) >= 1.0? Yes/No	Eligible for Noise Insulation? Yes/No
1	Nam Pin Wai (west)	3	70	69.8	71.6	71.5	53.6	yes	yes	no	no
3	Nam Pin Wai (south-west)	5	70	70.7	72.4	72.4	51.4	yes	yes	no	no
4	Nam Pin Wai (south)	6	70	70.8	72.0	72.0	54.7	yes	yes	no	no
6	Nam Pin Wai (east)	8	70	69.5	68.5	62.2	67.3	no	no	yes	no
7	Tung Tau Tsuen	10	70	67.2	70.3	56.1	70.1	no	yes	yes	no
8	Tsoi Uk Tsuen	36	70	65.9	68.8	52.7	68.7	no	yes	yes	no
9	Ying Lung Wai	12	70	65.7	69.0	45.7	69.0	no	yes	yes	no
10	Tai Wai Tsuen (west)	13	70	65.0	68.8	59.0	68.3	no	yes	yes	no
11	Tai Wai Tsuen (east)	38	70	64.1	69.4	60.8	68.7	no	yes	yes	no
12	Sun Yuen Long Centre (north-west)	25	70	71.6	66.9	66.6	55.7	no	no	no	no
13	Sun Yuen Long Centre (north-east)	27	70	70.6	58.1	54.8	55.4	no	no	yes	no
14	Sun Yuen Long Centre (west)	28	70	72.7	70.7	70.7	30.2	yes	no	no	no
15	Sun Yuen Long Centre (south)	812	70	71.4	75.5	71.2	73.4	yes	yes	yes	yes
16	Sun Yuen Long Centre (south)	814	70	71.3	73.7	71.7	69.5	yes	yes	yes	yes
17	CDA Development in Area 15 (north-west)	802	70	70.2	71.6	60.1	71.3	yes	yes	yes	yes
18	CDA Development in Area 15 (north-east)	33	70	53.0	68.7	53.0	68.6	no	yes	yes	no
19	CDA Development in Area 15 (south-west)	809	70	74.1	77.0	74.9	72.8	yes	yes	yes	yes
20	CDA Development in Area 15 (south)	816	70	72.7	75.5	75.4	55.2	yes	yes	no	no
20a	CDA Development in Area 12 (north)	97	70	73.9	77.9	75.0	74.8	yes	yes	yes	yes
22	Cheong Wai	23	70	77.2	80.2	80.2	61.1	yes	yes	no	no
23	Far East Consortium Yuen Long Building	16	70	76.5	78.8	78.7	54.9	yes	yes	no	no

West Rail DD901
Yuen Long EPIW - Road Traffic Noise Impact Assessment
High-level NSRs

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Noise Sensitive Receiver				Prevailing	Future			ExCo Criteria			
NSR	Name/Location	NSR ID in HFA	Noise Criterion dB(A)	1999 Total L_{A10} Noise dB(A)	2018 Total L_{A10} Noise dB(A)	2018 "Existing Roads" L_{A10} Noise dB(A)	2018 "New Roads" L_{A10} Noise dB(A)	1st Criterion Col (F) > Col (D)? Yes/No	2nd Criterion Col (F) - Col (E) >= 1.0? Yes/No	3rd Criterion Col (F) - Col (G) >= 1.0? Yes/No	Eligible for Noise Insulation? Yes/No
1	Nam Pin Wai (west)	3	70	70.3	72.1	72.0	54.0	yes	yes	no	no
2	Tai Wong Temple - Nam Pin Wai	4	65	62.2	65.2	65.0	49.4	no	yes	no	no
3	Nam Pin Wai (south-west)	5	70	71.2	72.8	72.7	52.4	yes	yes	no	no
4	Nam Pin Wai (south)	6	70	71.2	72.4	72.3	56.6	yes	yes	no	no
5	Shung Tak School	7	65	73.4	73.7	71.6	69.6	yes	no	yes	no
6	Nam Pin Wai (east)	8	70	70.1	70.1	63.9	69.0	no	no	yes	no
7	Tung Tau Tsuen	10	70	67.5	70.3	56.6	70.2	no	yes	yes	no
8	Tsoi Uk Tsuen	36	70	66.0	68.9	53.6	68.7	no	yes	yes	no
9	Ying Lung Wai	12	70	65.8	69.0	46.2	69.0	no	yes	yes	no
10	Tai Wai Tsuen (west)	13	70	65.1	69.2	60.8	68.5	no	yes	yes	no
11	Tai Wai Tsuen (east)	38	70	64.2	70.0	62.7	69.1	no	yes	yes	no
12	Sun Yuen Long Centre (north-west)	25	70	70.4	67.1	66.7	57.0	no	no	no	no
13	Sun Yuen Long Centre (north-east)	27	70	69.0	59.1	54.7	57.1	no	no	yes	no
14	Sun Yuen Long Centre (west)	28	70	71.8	71.0	71.0	38.7	yes	no	no	no
15	Sun Yuen Long Centre (south)	812	70	70.4	74.2	70.2	72.0	yes	yes	yes	yes
16	Sun Yuen Long Centre (south)	814	70	70.3	73.1	71.4	68.3	yes	yes	yes	yes
17	CDA Development in Area 15 (north-west)	802	70	68.7	70.0	61.1	69.4	no	yes	yes	no
18	CDA Development in Area 15 (north-east)	33	70	53.0	66.3	53.0	66.1	no	yes	yes	no
19	CDA Development in Area 15 (south-west)	809	70	72.5	75.2	73.2	70.8	yes	yes	yes	yes
20	CDA Development in Area 15 (south)	816	70	70.8	74.4	74.1	63.0	yes	yes	no	no
20a	CDA Development in Area 12 (north)	97	70	72.0	75.8	73.0	72.7	yes	yes	yes	yes
21	Shap Pat Heung Rural Committee Building	24	70	79.5	84.3	84.1	71.6	yes	yes	no	no
22	Cheong Wai	23	70	75.3	78.2	78.1	59.6	yes	yes	no	no
23	Far East Consortium Yuen Long Building	16	70	74.8	77.1	77.0	54.4	yes	yes	no	no

West Rail DD901
Tin Shui Wai EPIW - Road Traffic Noise Impact Assessment
Low-level NSRs

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Noise Sensitive Receiver				Prevailing	Future			ExCo Criteria			
NSR	Name/Location	NSR ID in HFA	Noise Criterion dB(A)	1999 Total L_{A10} Noise dB(A)	2018 Total L_{A10} Noise dB(A)	2018 "Existing Roads" L_{A10} Noise dB(A)	2018 "New Roads" L_{A10} Noise dB(A)	1st Criterion Col (F) > Col (D)? Yes/No	2nd Criterion Col (F) - Col (E) >= 1.0? Yes/No	3rd Criterion Col (F) - Col (G) >= 1.0? Yes/No	Eligible for Noise Insulation? Yes/No
24	Proposed Secondary School (west)	35	65	65.4	67.7	67.7	42.5	yes	yes	no	no
25	Proposed Secondary School (south)	10	65	67.3	56.5	52.2	54.4	no	no	yes	no
26	Tin Shing Court (west)	12	70	63.6	63.8	63.5	51.4	no	no	no	no
27	Proposed Primary School	311	65	56.9	55.3	42.6	55.1	no	no	yes	no
28	Proposed Primary School (east)	341	65	62.5	57.4	45.6	57.1	no	no	yes	no
29	Tin Shing Court (east)	102	70	65.3	67.9	62.9	66.2	no	yes	yes	no
30	Tin Shing Court (south)	100	70	51.3	56.1	52.7	53.5	no	yes	yes	no
31	Tin Shing Court (east)	37	70	67.0	66.9	66.6	55.2	no	no	no	no
32	Tin Shing Court (north)	15	70	66.3	67.6	66.6	60.7	no	yes	yes	no
33	Q.E. School Old Student's Association Primary School	17	65	65.0	63.7	46.5	63.7	no	no	yes	no
34	Yiu Hong House (west)	266	70	71.4	71.3	71.3	0.0	yes	no	no	no
35	Yiu Hong House (east)	217	70	61.0	58.2	55.2	55.2	no	no	yes	no
36	Yiu Foo House (south) - Tin Yiu Estate	250	70	71.7	67.0	63.0	64.8	no	no	yes	no
36a	Yiu Foo House (west) - Tin Yiu Estate	256	70	68.2	67.3	52.1	67.1	no	no	yes	no
37	Yiu Foo House (north) - Tin Yiu Estate	255	70	69.3	67.3	62.2	65.6	no	no	yes	no
38	Yiu Yat House - Tin Yiu Estate	253	70	70.3	69.8	60.8	69.3	no	no	yes	no
39	Yau Hong House	20	70	70.2	69.3	68.3	62.1	no	no	yes	no
40	Yau Ning House	21	70	69.4	70.9	70.9	29.3	yes	yes	no	no
41	Tin Tsz Estate (west)	24	70	71.5	73.0	72.9	55.3	yes	yes	no	no
42	Tin Tsz Estate (south)	25	70	74.5	76.0	75.9	58.1	yes	yes	no	no
43	Tin Tsz Estate (south)	26	70	73.5	74.9	74.8	57.4	yes	yes	no	no
44	Tin Tsz Estate (east)	27	70	73.4	74.7	74.6	57.4	yes	yes	no	no
45	T.W.G.H.'s Kwok Yat Wai Prevocational Primary School	32	65	71.6	71.2	61.8	70.6	yes	no	yes	no
47	Residence in Ping Shan (north)	30	70	68.8	68.0	65.8	63.9	no	no	yes	no
48	Residence in Ping Shan (east)	40	70	66.1	66.0	64.7	59.9	no	no	yes	no
49	Sheung Cheung Wai	34	70	62.1	64.6	56.3	63.9	no	yes	yes	no

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Tin Shui Wai EPIW - Road Traffic Noise Impact Assessment
Mid-level NSRs

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Noise Sensitive Receiver				Prevailing	Future			ExCo Criteria			
NSR	Name/Location	NSR ID in HFA	Noise Criterion dB(A)	1999 Total L_{A10} Noise dB(A)	2018 Total L_{A10} Noise dB(A)	2018 "Existing Roads" L_{A10} Noise dB(A)	2018 "New Roads" L_{A10} Noise dB(A)	1st Criterion Col (F) > Col (D)? Yes/No	2nd Criterion Col (F) - Col (E) >= 1.0? Yes/No	3rd Criterion Col (F) - Col (G) >= 1.0? Yes/No	Eligible for Noise Insulation? Yes/No
24	Proposed Secondary School (west)	35	65	65.4	67.9	67.9	45.4	yes	yes	no	no
25	Proposed Secondary School (south)	10	65	67.0	60.1	56.7	57.4	no	no	yes	no
26	Tin Shing Court (west)	12	70	66.0	68.1	65.5	64.5	no	yes	yes	no
27	Proposed Primary School	311	65	64.6	65.0	55.6	64.5	no	no	yes	no
28	Proposed Primary School (east)	341	65	63.7	64.5	54.5	64.0	no	no	yes	no
29	Tin Shing Court (east)	102	70	69.7	70.2	64.2	69.0	no	no	yes	no
30	Tin Shing Court (south)	100	70	67.5	68.7	57.2	68.4	no	yes	yes	no
31	Tin Shing Court (east)	37	70	67.2	67.3	66.7	58.5	no	no	no	no
32	Tin Shing Court (north)	15	70	67.0	68.1	66.5	62.9	no	yes	yes	no
33	Q.E. School Old Student's Association Primary School	17	65	66.0	66.7	54.3	66.5	yes	no	yes	no
34	Yiu Hong House (west)	266	70	69.4	69.6	69.6	0.0	no	no	no	no
35	Yiu Hong House (east)	217	70	67.3	67.5	61.6	66.2	no	no	yes	no
36	Yiu Foo House (south) - Tin Yiu Estate	250	70	69.0	68.7	63.8	67.0	no	no	yes	no
36a	Yiu Foo House (west) - Tin Yiu Estate	256	70	67.7	68.4	62.2	67.1	no	no	yes	no
37	Yiu Foo House (north) - Tin Yiu Estate	255	70	68.1	67.8	62.9	66.2	no	no	yes	no
38	Yiu Yat House - Tin Yiu Estate	253	70	68.4	68.4	60.4	67.6	no	no	yes	no
39	Yau Hong House	20	70	67.4	67.8	66.6	61.6	no	no	yes	no
40	Yau Ning House	21	70	68.6	70.2	70.2	29.1	no	yes	no	no
41	Tin Tsz Estate (west)	24	70	70.1	71.6	71.5	56.8	yes	yes	no	no
42	Tin Tsz Estate (south)	25	70	74.0	75.5	75.4	58.8	yes	yes	no	no
43	Tin Tsz Estate (south)	26	70	73.1	74.5	74.4	57.0	yes	yes	no	no
44	Tin Tsz Estate (east)	27	70	71.7	73.1	73.0	56.6	yes	yes	no	no
45	T.W.G.H.'s Kwok Yat Wai Prevocational Primary School	32	65	71.9	71.8	63.2	71.2	yes	no	yes	no
48	Residence in Ping Shan (east)	40	70	66.4	66.3	65.0	60.4	no	no	yes	no
49	Sheung Cheung Wai	34	70	63.3	65.5	57.2	64.8	no	yes	yes	no

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Tin Shui Wai EPIW - Road Traffic Noise Impact Assessment
High-level NSRs

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Noise Sensitive Receiver				Prevailing	Future			ExCo Criteria			
NSR	Name/Location	NSR ID in HFA	Noise Criterion dB(A)	1999 Total L_{A10} Noise dB(A)	2018 Total L_{A10} Noise dB(A)	2018 "Existing Roads" L_{A10} Noise dB(A)	2018 "New Roads" L_{A10} Noise dB(A)	1st Criterion Col (F) > Col (D)? Yes/No	2nd Criterion Col (F) - Col (E) >= 1.0? Yes/No	3rd Criterion Col (F) - Col (G) >= 1.0? Yes/No	Eligible for Noise Insulation? Yes/No
24	Proposed Secondary School (west)	35	65	65.4	68.3	68.3	47.3	yes	yes	no	no
25	Proposed Secondary School (south)	10	65	69.0	65.3	62.8	61.7	no	no	yes	no
26	Tin Shing Court (west)	12	70	66.0	68.5	66.7	63.9	no	yes	yes	no
27	Proposed Primary School	311	65	69.8	70.1	58.7	69.8	yes	no	yes	no
28	Proposed Primary School (east)	341	65	70.2	70.9	58.3	70.7	yes	no	yes	no
29	Tin Shing Court (east)	102	70	68.7	69.1	63.3	67.7	no	no	yes	no
30	Tin Shing Court (south)	100	70	66.8	67.9	57.3	67.5	no	yes	yes	no
31	Tin Shing Court (east)	37	70	66.2	66.4	65.7	58.1	no	no	no	no
32	Tin Shing Court (north)	15	70	66.2	67.3	65.6	62.4	no	yes	yes	no
33	Q.E. School Old Student's Association Primary School	17	65	68.4	70.4	65.0	69.0	yes	yes	yes	yes
34	Yiu Hong House (west)	266	70	67.5	67.8	67.8	0.0	no	no	no	no
35	Yiu Hong House (east)	217	70	66.7	66.9	60.6	65.8	no	no	yes	no
36	Yiu Foo House (south) - Tin Yiu Estate	250	70	66.8	66.9	63.3	64.4	no	no	yes	no
36a	Yiu Foo House (west) - Tin Yiu Estate	256	70	66.6	67.2	62.5	65.4	no	no	yes	no
37	Yiu Foo House (north) - Tin Yiu Estate	255	70	66.5	66.6	62.2	64.6	no	no	yes	no
38	Yiu Yat House - Tin Yiu Estate	253	70	66.5	66.8	59.7	65.9	no	no	yes	no
39	Yau Hong House	20	70	65.3	66.1	64.6	60.7	no	no	yes	no
40	Yau Ning House	21	70	67.3	68.9	68.9	35.8	no	yes	no	no
41	Tin Tsz Estate (west)	24	70	69.7	71.2	71.1	56.2	yes	yes	no	no
42	Tin Tsz Estate (south)	25	70	73.1	74.6	74.5	58.1	yes	yes	no	no
43	Tin Tsz Estate (south)	26	70	72.2	73.7	73.7	56.5	yes	yes	no	no
44	Tin Tsz Estate (east)	27	70	69.9	71.3	71.2	55.9	yes	yes	no	no
45	T.W.G.H.'s Kwok Yat Wai Prevocational Primary School	32	65	71.8	72.1	64.1	71.3	yes	no	yes	no
48	Residence in Ping Shan (east)	40	70	66.6	66.7	65.4	61.0	no	no	yes	no
49	Sheung Cheung Wai	34	70	64.3	66.2	58.5	65.4	no	yes	yes	no

West Rail DD901
Tuen Mun Centre EPIW - Road Traffic Noise Impact Assessment
Low-level NSRs

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Noise Sensitive Receiver				Prevailing	Future			ExCo Criteria			
NSR	Name/Location	NSR ID in HFA	Noise Criterion dB(A)	1999 Total L_{A10} Noise dB(A)	2018 Total L_{A10} Noise dB(A)	2018 "Existing Roads" L_{A10} Noise dB(A)	2018 "New Roads" L_{A10} Noise dB(A)	1st Criterion Col (F) > Col (D)? Yes/No	2nd Criterion Col (F) - Col (E) >= 1.0? Yes/No	3rd Criterion Col (F) - Col (G) >= 1.0? Yes/No	Eligible for Noise Insulation? Yes/No
50	Hong Lai Garden (west)	19	70	60.2	61.2	60.2	54.3	no	yes	yes	no
51	Hong Lai Garden (east)	14	70	70.1	57.7	56.5	51.6	no	no	yes	no
52	Hong King Building	18	70	62.2	71.4	70.8	62.8	yes	yes	no	no
53	Bit Hing Building	13	70	63.9	55.1	52.7	51.3	no	no	yes	no
54	Honeley Court	16	70	73.5	63.1	62.6	53.9	no	no	no	no
55	Lui Ming Choi Technical School (south-west)	21	65	64.1	72.6	71.0	67.5	yes	yes	yes	yes*
56	Lui Ming Choi Technical School (south-east)	12	65	69.3	62.3	60.8	57.0	no	no	yes	no
57	Lui Ming Choi Technical School (south-west)	17	65	68.1	72.5	70.2	68.7	yes	yes	yes	yes*
58	Lui Ming Choi Technical School (south-east)	11	65	75.2	65.8	64.0	61.1	yes	no	yes	no
59	Tuen Mun Mansion	15	70	65.0	64.8	64.2	55.4	no	no	no	no
60	Tai Hing Building	10	70	65.1	66.0	65.2	58.6	no	no	no	no
61	Koon Hing Building	9	70	75.3	75.4	75.2	62.7	yes	no	no	no
62	Ming Wai Building (north)	8	70	76.3	76.9	76.7	62.0	yes	no	no	no
63	Ming Wai Building (south)	7	70	78.7	79.6	79.4	66.4	yes	no	no	no
64	Castle Peak Catholic Primary School (west)	6	65	78.2	79.4	78.8	70.5	yes	yes	no	no
65	Castle Peak Catholic Primary School (south)	5	65	76.8	79.7	79.1	70.8	yes	yes	no	no
66	Top Court	4	70	75.5	79.1	79.1	36.9	yes	yes	no	no
67	Man Shing Building	3	70	78.2	82.0	81.9	66.1	yes	yes	no	no
68	Kam Wah Garden (west)	1	70	73.1	76.2	75.5	67.9	yes	yes	no	no
69	Kam Wah Garden (north)	2	70	66.4	69.5	69.2	58.9	no	yes	no	no
70	The Trend Plaza	20	70	74.5	77.5	77.4	62.2	yes	yes	no	no

Remark: * to be provided by Education Department and subject to further investigation by Highways Department on acoustic performance of the glazing system.

West Rail DD901
Tuen Mun Centre EPIW - Road Traffic Noise Impact Assessment
Mid-level NSRs

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Noise Sensitive Receiver				Prevailing	Future			ExCo Criteria			
NSR	Name/Location	NSR ID in HFA	Noise Criterion dB(A)	1999 Total L_{A10} Noise dB(A)	2018 Total L_{A10} Noise dB(A)	2018 "Existing Roads" L_{A10} Noise dB(A)	2018 "New Roads" L_{A10} Noise dB(A)	1st Criterion Col (F) > Col (D)? Yes/No	2nd Criterion Col (F) - Col (E) >= 1.0? Yes/No	3rd Criterion Col (F) - Col (G) >= 1.0? Yes/No	Eligible for Noise Insulation? Yes/No
50	Hong Lai Garden (west)	19	70	65.3	65.9	64.5	60.2	no	no	yes	no
51	Hong Lai Garden (east)	14	70	69.5	61.8	60.9	54.6	no	no	no	no
52	Hong King Building	18	70	62.4	69.7	68.6	63.2	no	yes	yes	no
53	Bit Hing Building	13	70	63.9	57.1	54.6	53.5	no	no	yes	no
54	Honeley Court	16	70	70.8	66.2	65.2	59.0	no	no	yes	no
55	Lui Ming Choi Technical School (south-west)	21	65	67.8	72.5	70.8	67.7	yes	yes	yes	yes*
56	Lui Ming Choi Technical School (south-east)	12	65	69.1	65.7	64.3	60.0	yes	no	yes	no
59	Tuen Mun Mansion	15	70	64.6	66.3	64.9	60.5	no	yes	yes	no
60	Tai Hing Building	10	70	64.8	66.6	65.5	60.0	no	yes	yes	no
61	Koon Hing Building	9	70	74.3	74.5	74.1	63.8	yes	no	no	no
62	Ming Wai Building (north)	8	70	75.1	75.7	75.5	63.0	yes	no	no	no
63	Ming Wai Building (south)	7	70	76.6	77.6	77.2	66.7	yes	yes	no	no
64	Castle Peak Catholic Primary School (west)	6	65	76.4	77.8	76.9	70.3	yes	yes	no	no
65	Castle Peak Catholic Primary School (south)	5	65	76.4	79.3	78.7	70.4	yes	yes	no	no
66	Top Court	4	70	74.2	77.8	77.6	64.0	yes	yes	no	no
67	Man Shing Building	3	70	75.4	79.0	78.9	62.6	yes	yes	no	no
68	Kam Wah Garden (west)	1	70	73.2	76.4	75.8	67.0	yes	yes	no	no
69	Kam Wah Garden (north)	2	70	71.4	74.8	74.4	64.6	yes	yes	no	no
70	The Trend Plaza	20	70	71.0	74.1	73.8	62.1	yes	yes	no	no

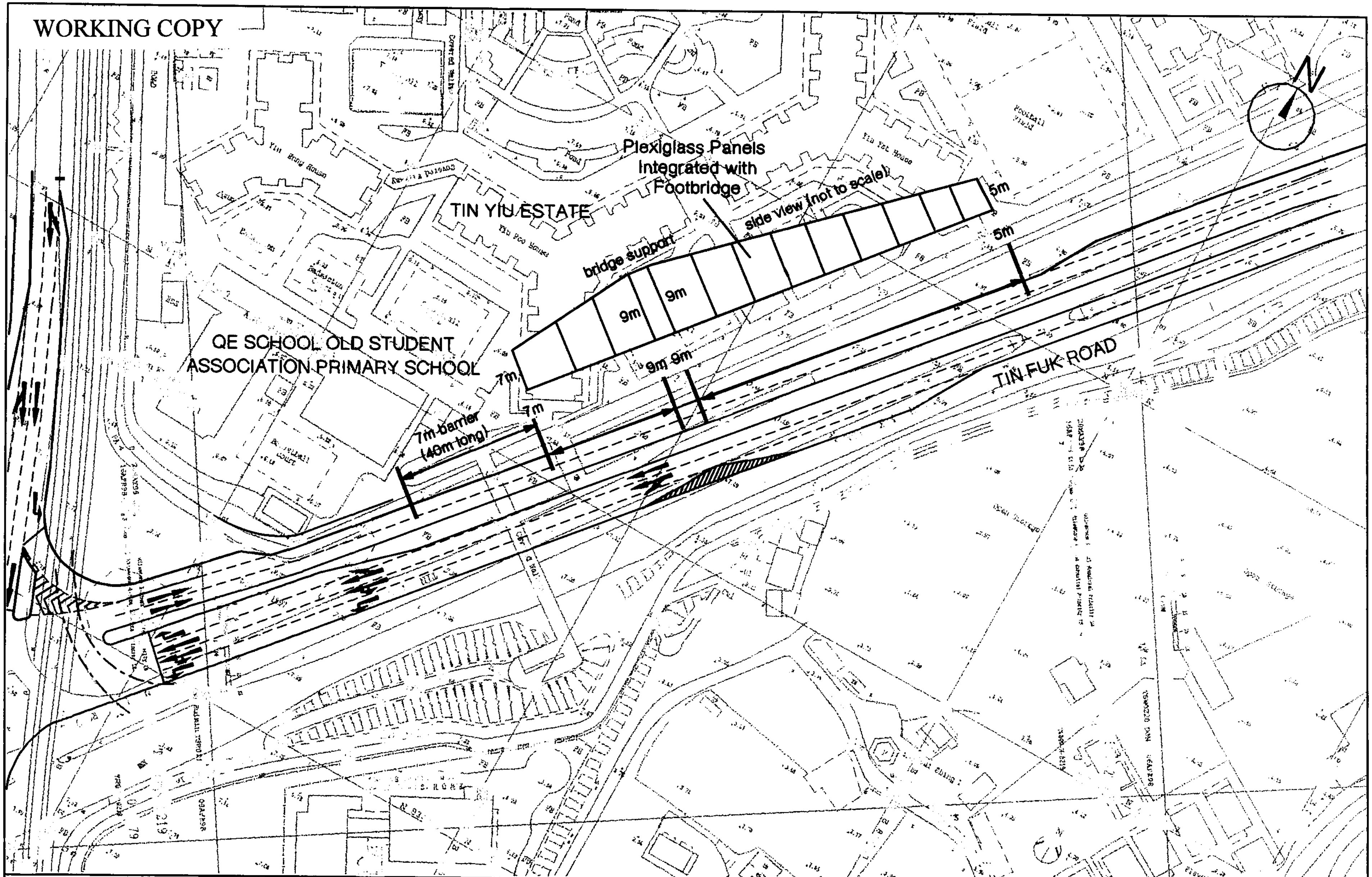
Remark: * to be provided by Education Department and subject to further investigation by Highways Department on acoustic performance of the glazing system.

West Rail DD901
Tuen Mun Centre EPIW - Road Traffic Noise Impact Assessment
High-level NSRs

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Noise Sensitive Receiver				Prevailing	Future			ExCo Criteria			
NSR	Name/Location	NSR ID in HFA	Noise Criterion dB(A)	1999 Total L_{A10} Noise dB(A)	2018 Total L_{A10} Noise dB(A)	2018 "Existing Roads" L_{A10} Noise dB(A)	2018 "New Roads" L_{A10} Noise dB(A)	1st Criterion Col (F) > Col (D)? Yes/No	2nd Criterion Col (F) - Col (E) >= 1.0? Yes/No	3rd Criterion Col (F) - Col (G) >= 1.0? Yes/No	Eligible for Noise Insulation? Yes/No
50	Hong Lai Garden (west)	19	70	65.3	65.9	64.7	59.7	no	no	yes	no
51	Hong Lai Garden (east)	14	70	67.7	63.0	62.2	55.1	no	no	no	no
52	Hong King Building	18	70	62.6	69.1	67.8	63.2	no	yes	yes	no
53	Bit Hing Building	13	70	63.8	57.5	55.1	53.9	no	no	yes	no
54	Honeley Court	16	70	69.2	66.7	65.7	60.0	no	no	yes	no
55	Lui Ming Choi Technical School (south-west)	21	65	67.9	71.6	69.7	67.2	yes	yes	yes	yes*
56	Lui Ming Choi Technical School (south-east)	12	65	68.2	66.3	64.6	61.5	yes	no	yes	no
57	Lui Ming Choi Technical School (south-west)	17	65	68.4	73.0	70.7	69.1	yes	yes	yes	yes*
58	Lui Ming Choi Technical School (south-east)	11	65	74.9	66.6	64.6	62.4	yes	no	yes	no
59	Tuen Mun Mansion	15	70	64.3	66.6	64.9	61.6	no	yes	yes	no
60	Tai Hing Building	10	70	64.6	66.5	65.4	60.1	no	yes	yes	no
61	Koon Hing Building	9	70	73.6	73.9	73.4	63.8	yes	no	no	no
62	Ming Wai Building (north)	8	70	74.4	75.0	74.8	63.1	yes	no	no	no
63	Ming Wai Building (south)	7	70	75.6	76.7	76.2	66.7	yes	yes	no	no
64	Castle Peak Catholic Primary School (west)	6	65	75.1	76.6	75.7	69.3	yes	yes	no	no
65	Castle Peak Catholic Primary School (south)	5	65	75.9	78.7	78.1	70.0	yes	yes	no	no
66	Top Court	4	70	72.7	76.2	76.0	62.6	yes	yes	no	no
67	Man Shing Building	3	70	73.3	76.8	76.7	60.7	yes	yes	no	no
68	Kam Wah Garden (west)	1	70	71.2	74.4	73.8	65.3	yes	yes	no	no
69	Kam Wah Garden (north)	2	70	69.9	73.2	72.8	62.9	yes	yes	no	no
70	The Trend Plaza	20	70	69.3	72.4	72.0	61.7	yes	yes	no	no

Remark: * to be provided by Education Department and subject to further investigation by Highways Department on acoustic performance of the glazing system.

ANNEX G PREVIOUSLY CONSIDERED NOISE MITIGATION OPTIONS

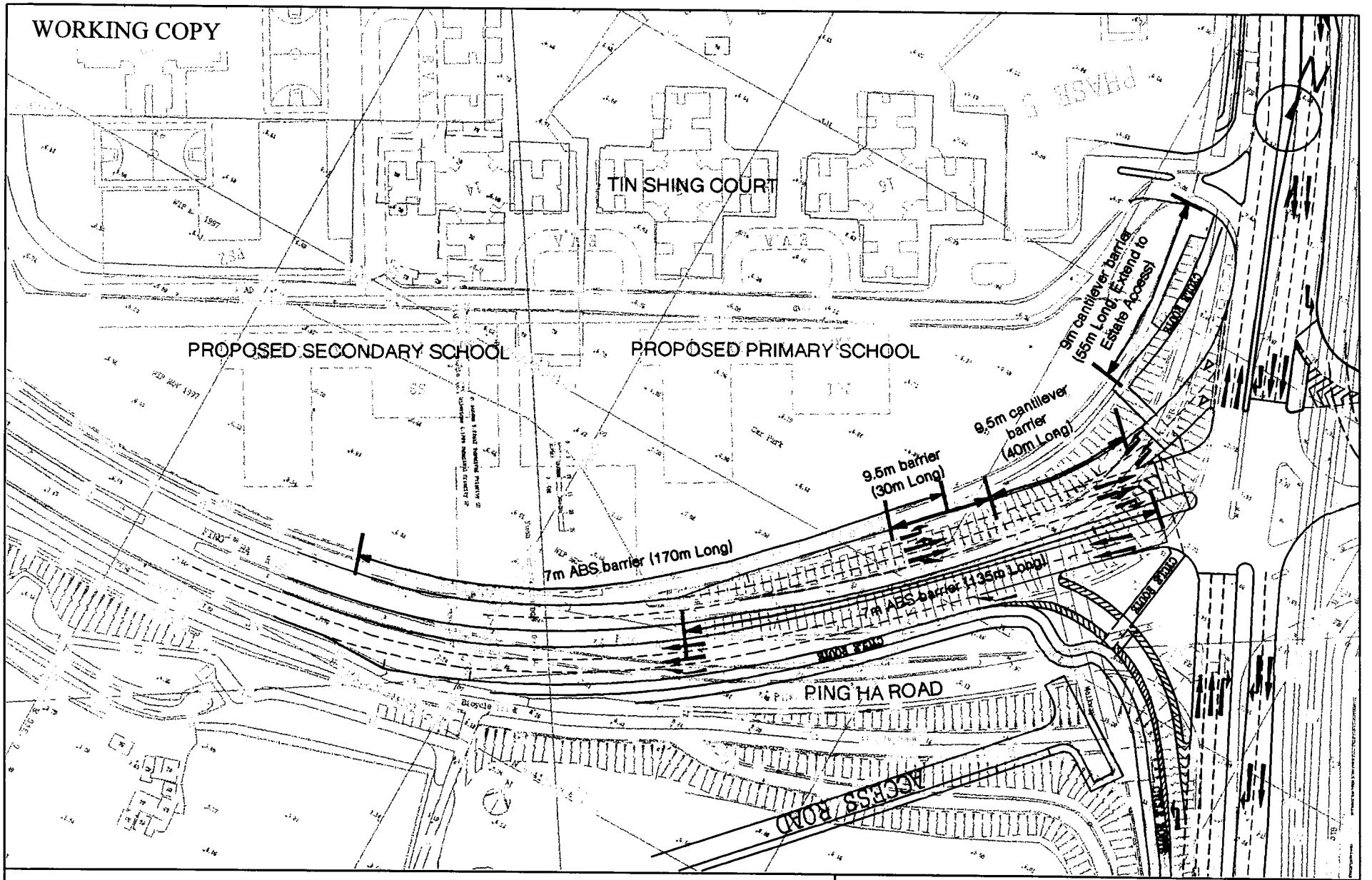


PROPOSED DIRECT ROAD TRAFFIC NOISE MITIGATION MEASURES ON TIN FUK ROAD, TIN SHUI WAI

SCALE: 1/1500

KOWLOON - CANTON RAILWAY CORPORATION

ERM WEST RAIL: DD901 ENVIRONMENTAL SUPPORT SERVICES

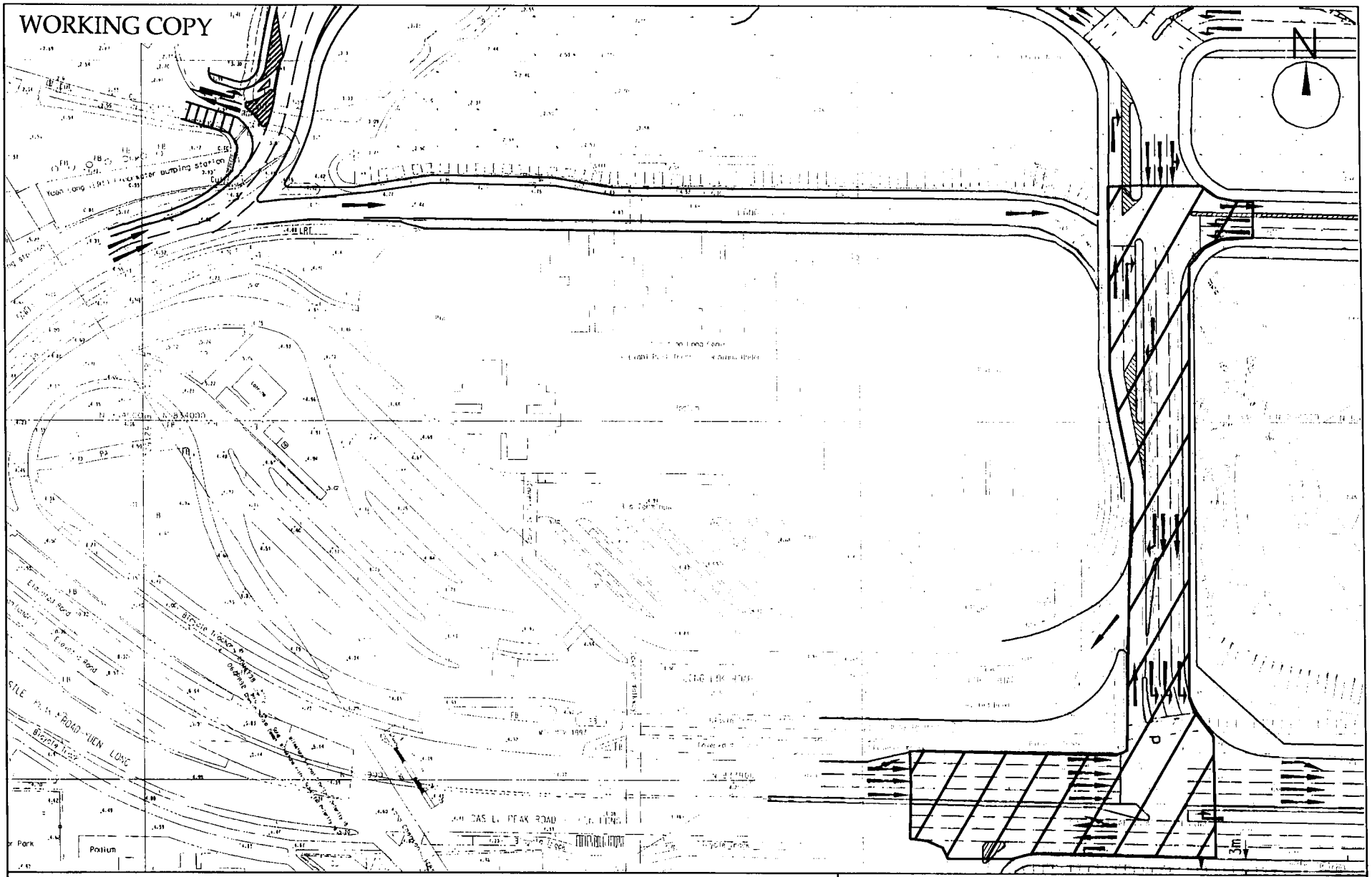


PROPOSED DIRECT ROAD TRAFFIC NOISE MITIGATION MEASURES ON PING HA ROAD, TIN SHUI WAI

SCALE: 1/1500

KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD901 ENVIRONMENTAL SUPPORT SERVICES



PROPOSED NOISE COVERS ON LONG YAT ROAD

AND CASTLE PEAK ROAD, YUEN LONG

SCALE: 1/1500

ermhk/a1888/yulber2.dgn

ERM

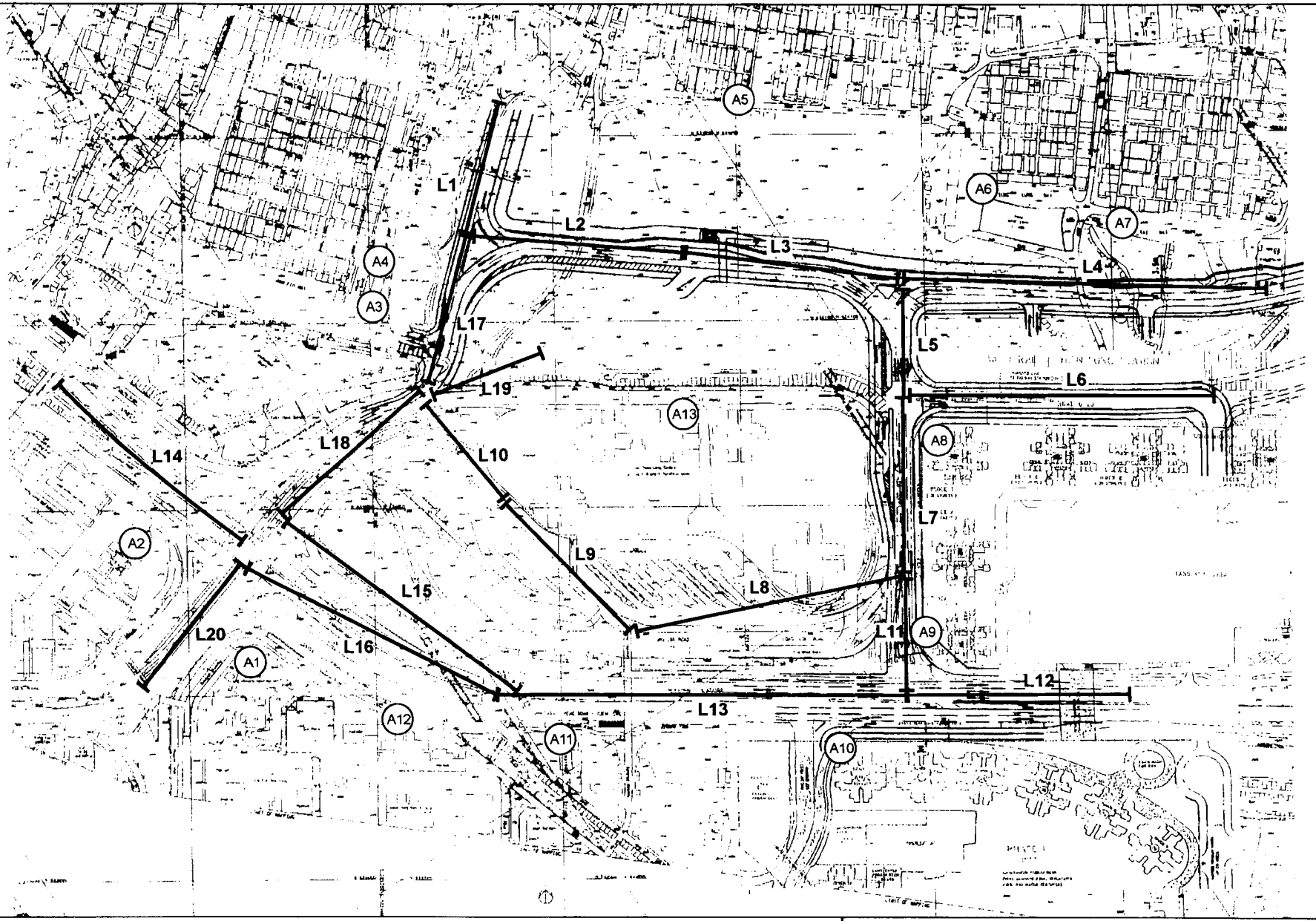
KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD901 ENVIRONMENTAL SUPPORT SERVICES

ANNEX H AIR QUALITY INPUT DATA

- Annex H1 - Yuen Long Year 2003 Emission
- Annex H2 - Tin Shui Wai Year 2011 Emission
- Annex H3 - Tuen Mun Centre Year 2018 Emission

ANNEX H1 - YUEN LONG YEAR 2003 EMISSION



ROAD LINK AT YUEN LONG

ANNEX H1

C1800r31

ERM

KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES

Annex H1 ---- Yuen Long at Year 2003

Traffic Breakdown

Link	P/C-p (Car)	Taxi	PuLB	LGV-DII	HGV	PuBus	Total
1	103	81	35	55	54	51	379
2	359	225	120	133	129	232	1198
3	359	225	120	133	129	232	1198
4	42	33	15	22	21	21	154
5	340	268	126	180	173	168	1255
6	152	120	56	80	78	76	562
7	470	369	174	248	240	232	1733
8	143	112	8	50	34	120	467
9	143	112	8	50	34	65	412
10	143	112	8	50	34	120	467
11	374	294	138	198	190	185	1379
12	1155	906	578	776	569	527	4511
13	879	691	402	620	525	375	3492
14	454	357	368	402	376	200	2157
15	223	175	32	131	187	53	801
16	424	333.5	196	155.5	145	113.5	1367.5
17	257	202	95	136	131	127	948
18	590	464	126	257	184	213	1834
19	590	464	126	257	184	213	1834
20	753	595	272	313	230	247	2410

Fleet Emission of Pollutant (EURO III)

	P/C-p (Car)	Taxi	PuLB	LGV-DII	HGV	PuBus
NOx	**0.9000**	**1.2700**	**1.9100**	**1.5300**	**6.2100**	**10.5300**
CO	**2.3400**	**1.4000**	**1.2100**	**2.5800**	**8.5300**	**9.2200**
PM	**0.0300**	**0.1000**	**0.3100**	**0.2700**	**1.0500**	**1.1700**

Emission Rates for NOx

NOx	P/C-p (Car)	Taxi	PrBus	LGV-DII	HGV	PuBus	Total	Emission	E (g/ml)
1	92.70	102.87	66.85	84.15	335.34	537.03	1218.94	3.216201	5.176
2	323.10	285.75	229.20	203.49	801.09	2442.96	4285.59	3.577287	5.757
3	323.10	285.75	229.20	203.49	801.09	2442.96	4285.59	3.577287	5.757
4	37.80	41.91	28.65	33.66	130.41	221.13	493.56	3.204935	5.158
5	306.00	340.36	240.66	275.40	1074.33	1769.04	4005.79	3.191865	5.137
6	136.80	152.40	106.96	122.40	484.38	800.28	1803.22	3.208577	5.164
7	423.00	468.63	332.34	379.44	1490.40	2442.96	5536.77	3.194905	5.142
8	128.70	142.24	15.28	76.50	211.14	1263.60	1837.46	3.934604	6.332
9	128.70	142.24	15.28	76.50	211.14	684.45	1258.31	3.054150	4.915
10	128.70	142.24	15.28	76.50	211.14	1263.60	1837.46	3.934604	6.332
11	336.60	373.38	263.58	302.94	1179.90	1948.05	4404.45	3.193945	5.140
12	1039.50	1150.62	1103.98	1187.28	3533.49	5549.31	13564.18	3.006912	4.839
13	791.10	877.57	767.82	948.60	3260.25	3948.75	10594.09	3.033817	4.882
14	408.60	453.39	702.88	615.06	2334.96	2106.00	6620.89	3.069490	4.940
15	200.70	222.25	61.12	200.43	1161.27	558.09	2403.86	3.001074	4.830
16	381.60	423.55	374.36	237.92	900.45	1195.16	3513.03	2.568940	4.134
17	231.30	256.54	181.45	208.08	813.51	1337.31	3028.19	3.194293	5.141
18	531.00	589.28	240.66	393.21	1142.64	2242.89	5139.68	2.802443	4.510
19	531.00	589.28	240.66	393.21	1142.64	2242.89	5139.68	2.802443	4.510
20	677.70	755.65	519.52	478.89	1428.30	2600.91	6460.97	2.680900	4.314

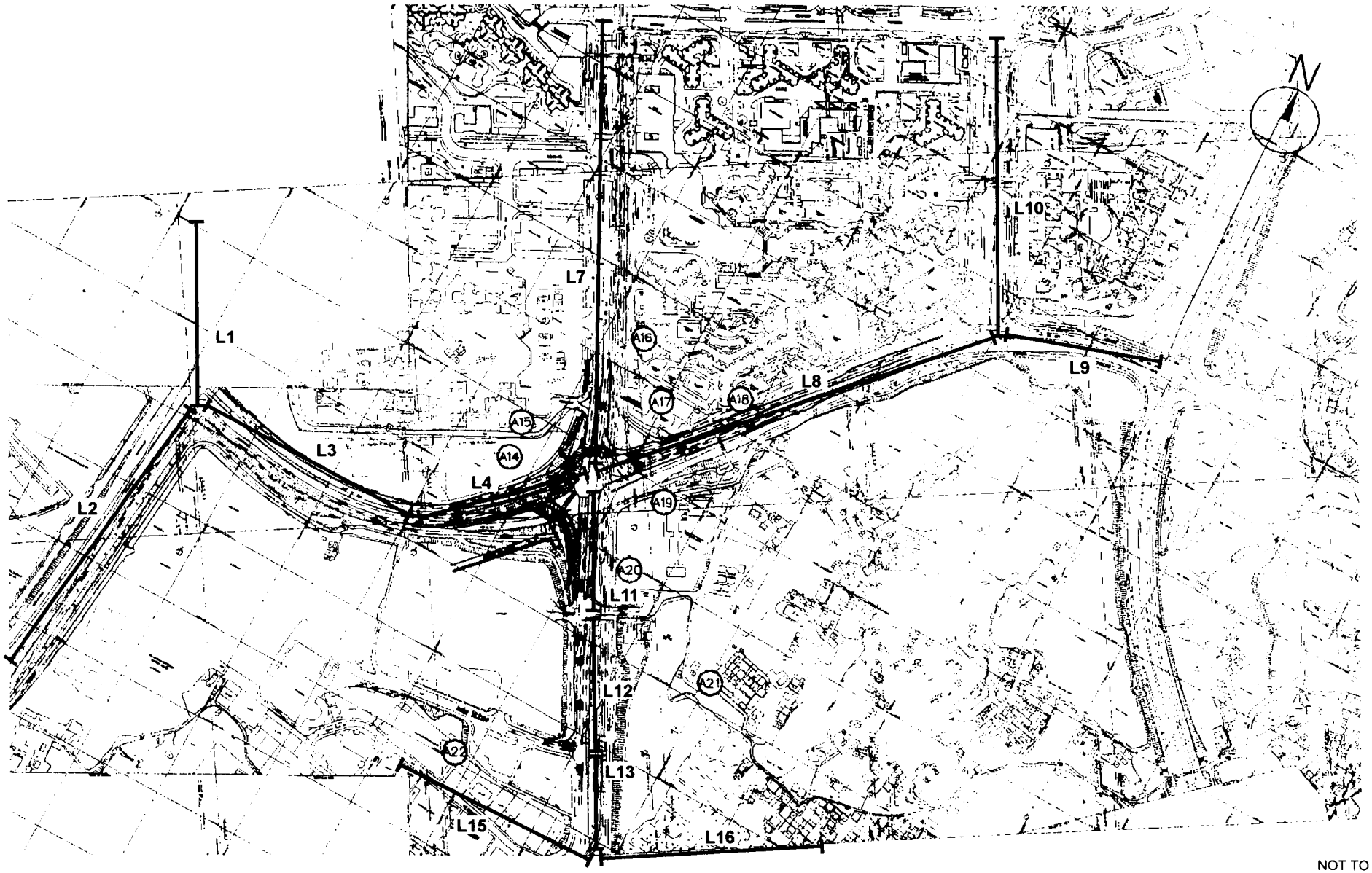
Emission Rates for CO

CO	P/C-p (Car)	Taxi	PrBus	LGV-DII	HGV	PuBus	Total	Emission	E (g/ml)
1	241.02	113.40	42.35	141.90	460.62	470.22	1469.51	3.8773	6.240
2	840.06	315.00	145.20	343.14	1100.37	2139.04	4882.81	4.0758	6.559
3	840.06	315.00	145.20	343.14	1100.37	2139.04	4882.81	4.0758	6.559
4	98.28	46.20	18.15	56.76	179.13	193.62	592.14	3.8451	6.188
5	795.60	375.20	152.46	464.40	1475.69	1548.96	4812.31	3.8345	6.171
6	355.68	168.00	67.76	206.40	665.34	700.72	2163.90	3.8504	6.196
7	1099.80	516.60	210.54	639.84	2047.20	2139.04	6653.02	3.8390	6.178
8	334.62	156.80	9.68	129.00	290.02	1106.40	2026.52	4.3394	6.983
9	334.62	156.80	9.68	129.00	290.02	599.30	1519.42	3.6879	5.935
10	334.62	156.80	9.68	129.00	290.02	1106.40	2026.52	4.3394	6.983
11	875.16	411.60	166.98	510.84	1620.70	1705.70	5290.98	3.8368	6.175
12	2702.70	1268.40	699.38	2002.08	4853.57	4858.94	16385.07	3.6322	5.845
13	2056.86	967.40	486.42	1599.60	4478.25	3457.50	13046.03	3.7360	6.012
14	1062.36	499.80	445.28	1037.16	3207.28	1844.00	8095.88	3.7533	6.040
15	521.82	245.00	38.72	337.98	1595.11	488.66	3227.29	4.0291	6.484
16	992.16	466.90	237.16	401.19	1236.85	1046.47	4380.73	3.2035	5.155
17	601.38	282.80	114.95	350.88	1117.43	1170.94	3638.38	3.8380	6.176
18	1380.60	649.60	152.46	663.06	1569.52	1963.86	6379.10	3.4782	5.598
19	1380.60	649.60	152.46	663.06	1569.52	1963.86	6379.10	3.4782	5.598
20	1762.02	833.00	329.12	807.54	1961.90	2277.34	7970.92	3.3074	5.323

Emission Rates for RSP

PM	P/C-p (Car)	Taxi	PrBus	LGV-DII	HGV	PuBus	Total	Emission	E (g/ml)
1	3.09	8.1	10.85	14.85	56.7	59.67	153.2600	0.4044	0.651
2	10.77	22.5	37.2	35.91	135.45	271.44	513.2700	0.4284	0.689
3	10.77	22.5	37.2	35.91	135.45	271.44	513.2700	0.4284	0.689
4	1.26	3.3	4.65	5.94	22.05	24.57	61.7700	0.4011	0.645
5	10.2	26.8	39.06	48.6	181.65	196.56	502.8700	0.4007	0.645
6	4.56	12	17.36	21.6	81.9	88.92	226.3400	0.4027	0.648
7	14.1	36.9	53.94	66.96	252	271.44	695.3400	0.4012	0.646
8	4.29	11.2	2.48	13.5	35.7	140.4	207.5700	0.4445	0.715
9	4.29	11.2	2.48	13.5	35.7	76.05	143.2200	0.3476	0.559
10	4.29	11.2	2.48	13.5	35.7	140.4	207.5700	0.4445	0.715
11	11.22	29.4	42.78	53.46	199.5	216.45	552.8100	0.4009	0.645
12	34.65	90.6	179.18	209.52	597.45	616.59	1727.9900	0.3831	0.616
13	26.37	69.1	124.62	167.4	551.25	438.75	1377.4900	0.3945	0.635
14	13.62	35.7	114.08	108.54	394.8	234	900.7400	0.4176	0.672
15	6.69	17.5	9.92	35.37	196.35	62.01	327.8400	0.4093	0.659
16	12.72	33.35	60.76	41.985	152.25	132.795	433.8600	0.3173	0.511
17	7.71	20.2	29.45	36.72	137.55	148.59	380.2200	0.4011	0.645
18	17.7	46.4	39.06	69.39	193.2	249.21	614.9600	0.3353	0.540
19	17.7	46.4	39.06	69.39	193.2	249.21	614.9600	0.3353	0.540
20	22.59	59.5	84.32	84.51	241.5	288.99	781.4100	0.3242	0.522

ANNEX H2 - TIN SHUI WAI YEAR 2011 EMISSION



NOT TO SCALE

ROAD LINK AT TIN SHUI WAI

ANNEX H2

C1800r32

ERM

KOWLOON - CANTON RAILWAY CORPORATION

WEST RAIL: DD-901 ENVIRONMENTAL SUPPORT SERVICES

Annex H2 ---- Tin Shui Wai at Year 2011

Traffic Breakdown

Link	P/C-p (Car)	Taxi	PrBus	LGV-DII	HGV	PuBus	Total
1	142	112	5	94	54	57	464
2	486	383	18	315	186	196	1584
3	713	560	91	284	452	136	2236
4	713	560	91	284	452	136	2236
7	544	428	32	146	127	262	1539
8	210	165	22	101	183	101	782
9	614	483	72	247	431	111	1958
10	525	412	83	204	226	117	1567
11	397	312	123	251	393	112	1588
12	397	312	123	251	393	112	1588
13	397	312	123	251	393	112	1588
15	397	312	123	251	393	112	1588
16	397	312	123	251	393	112	1588

Fleet Emission of Pollutant (EURO III)

NOx	**0.7100**	**0.7300**	**5.5400**	**1.2300**	**3.8400**	**6.8000**
CO	**1.8700**	**1.4700**	**6.2700**	**2.2500**	**6.4500**	**7.3800**
PM	**0.0300**	**0.0100**	**0.5000**	**0.1200**	**0.5300**	**0.6900**

Emission Rates for NOx

NOx	P/C-p (Car)	Taxi	PrBus	LGV-DII	MGV	PuBus	Total	Emission	E (g/ml)
1	100.82	81.76	27.70	115.62	207.36	387.60	920.86	1.984612	3.1938
2	345.06	279.59	99.72	387.45	714.24	1332.80	3158.86	1.994230	3.2093
3	506.23	408.80	504.14	349.32	1735.68	924.80	4428.97	1.980756	3.1876
4	506.23	408.80	504.14	349.32	1735.68	924.80	4428.97	1.980756	3.1876
7	386.24	312.44	177.28	179.58	487.68	1781.60	3324.82	2.160377	3.4767
8	149.10	120.45	121.88	124.23	702.72	686.80	1905.18	2.436292	3.9207
9	435.94	352.59	398.88	303.81	1655.04	754.80	3901.06	1.992370	3.2063
10	372.75	300.76	459.82	250.92	867.84	795.60	3047.69	1.944920	3.1300
11	281.87	227.76	681.42	308.73	1509.12	761.60	3770.50	2.374370	3.8211
12	281.87	227.76	681.42	308.73	1509.12	761.60	3770.50	2.374370	3.8211
13	281.87	227.76	681.42	308.73	1509.12	761.60	3770.50	2.374370	3.8211
15	281.87	227.76	681.42	308.73	1509.12	761.60	3770.50	2.374370	3.8211
16	281.87	227.76	681.42	308.73	1509.12	761.60	3770.50	2.374370	3.8211

Emission Rates for CO

CO	P/C-p (Car)	Taxi	PrBus	LGV-DII	MGV	PuBus	Total	Emission	E (g/ml)
1	265.54	164.64	31.35	211.50	348.30	420.66	1441.99	3.1077	5.0013
2	908.82	563.01	112.86	708.75	1199.70	1446.48	4939.62	3.1184	5.0185
3	1333.31	823.20	570.57	639.00	2915.40	1003.68	7285.16	3.2581	5.2433
4	1333.31	823.20	570.57	639.00	2915.40	1003.68	7285.16	3.2581	5.2433
7	1017.28	629.16	200.64	328.50	819.15	1933.56	4928.29	3.2023	5.1534
8	392.70	242.55	137.94	227.25	1180.35	745.38	2926.17	3.7419	6.0218
9	1148.18	710.01	451.44	555.75	2779.95	819.18	6464.51	3.3016	5.3132
10	981.75	605.64	520.41	459.00	1457.70	863.46	4887.96	3.1193	5.0199
11	742.39	458.64	771.21	564.75	2534.85	826.56	5898.40	3.7144	5.9775
12	742.39	458.64	771.21	564.75	2534.85	826.56	5898.40	3.7144	5.9775
13	742.39	458.64	771.21	564.75	2534.85	826.56	5898.40	3.7144	5.9775
15	742.39	458.64	771.21	564.75	2534.85	826.56	5898.40	3.7144	5.9775
16	742.39	458.64	771.21	564.75	2534.85	826.56	5898.40	3.7144	5.9775

Emission Rates for RSP

PM	P/C-p (Car)	Taxi	PrBus	LGV-DII	MGV	PuBus	Total	Emission	E (g/ml)
1	4.26	1.12	2.5	11.28	28.62	39.33	87.1100	0.1877	0.3021
2	14.58	3.83	9	37.8	98.58	135.24	299.0300	0.1888	0.3038
3	21.39	5.6	45.5	34.08	239.56	93.84	439.9700	0.1968	0.3167
4	21.39	5.6	45.5	34.08	239.56	93.84	439.9700	0.1968	0.3167
7	16.32	4.28	16	17.52	67.31	180.78	302.2100	0.1964	0.3160
8	6.3	1.65	11	12.12	96.99	69.69	197.7500	0.2529	0.4070
9	18.42	4.83	36	29.64	228.43	76.59	393.9100	0.2012	0.3238
10	15.75	4.12	41.5	24.48	119.78	80.73	286.3600	0.1827	0.2941
11	11.91	3.12	61.5	30.12	208.29	77.28	392.2200	0.2470	0.3975
12	11.91	3.12	61.5	30.12	208.29	77.28	392.2200	0.2470	0.3975
13	11.91	3.12	61.5	30.12	208.29	77.28	392.2200	0.2470	0.3975
15	11.91	3.12	61.5	30.12	208.29	77.28	392.2200	0.2470	0.3975
16	11.91	3.12	61.5	30.12	208.29	77.28	392.2200	0.2470	0.3975

ANNEX H3 - TUEN MUN CENTRE YEAR 2018 EMISSION

Annex H3 ----Tuen Mun Centre

Link	Road Segment in Model	From	To
1	Tsun Wen Rd	Ho Kwong Street	Ho Tin Street
2	Tsun Wen Rd	Ho Tin Street	Kin Wing Street
3	Tsun Wen Rd	Kin Wing Street	Pui To Road
4	Tin Hau Road	Pui To Road	San Hop Lane
5	Kin Fung Circuit	Light Rail Transit	Tsun Wen Road
6	Ho Tin St	Tsun Wen Road	Kin On Street
7	Kin Wing St	Kin Fung Circuit	Tsun Wen Road
8	Kin Wing St	Tsun Wen Road	Kin Tai Street
9	Pui To Rd	Castle Peak Road	Tuen Mun Heung Sze Wui Road
10	Pui To Rd	Tuen Mun Heung Sze Wui Road	Ho Pong Street
11	Pui To Rd	Ho Pong Street	Tin Hau Road
12	Pui To Rd	Tin Hau Road	Kin Tai Street
13	Tuen Mun Heung Sze Wui Rd	Ho Pong Street	Yan Ching Street
14	Tuen Mun Heung Sze Wui Rd	Yan Ching Street	Pui To Road
15	Tuen Mun Heung Sze Wui Rd	Pui To Road	Tuen Hop Street
16	Tuen Mun Heung Sze Wui Rd	Tuen Hop Street	Footbridge to Tuen Mun Park
17	Yan Ching St	Tuen Mun Road	Tuen Mun Heung Sze Wui Road
18	Yan Ching St	Tuen Mun Heung Sze Wui Road	Ho Pong Street

Annex H3 ---- Tuen Mun Centre at Year 2018

Traffic Breakdown in Percentage

Links	P/C-p (Car)	Taxi	PrBus	HGV	PuBus	Total %	Total Traffic Volume
1	21	45	9	24.5	0.5	100	760
2	29.5	37.5	6	24	3	100	1200
3	26	35.5	6	31.5	1	100	1060
4	34.5	30.5	3	32	0	100	1420
5	0	11	0	78	11	100	50
6	22	19.5	2	55.5	1	100	420
7	25.5	37.5	8.5	23.5	5	100	510
8	28.5	44	4.5	20	3	100	150
9	36.5	29.5	7	26.5	1	100	2900
10	27.5	32.5	4	34.5	1.5	100	2680
11	26	39	6	27.5	2.5	100	2500
12	19.5	38.5	2.5	35	4.5	100	1110
13	32	25	11	30	2	100	30
14	32	30.5	13	18.5	5	100	1030
15	32	34	10.5	19.5	4	100	3280
16	32	34	10.5	19.5	4	100	3280
17	25	48.5	2.5	24	0	100	700
18	19	47	9	18	7	100	380

Segment	P/C-p (Car)	Taxi	PrBus	HGV	PuBus	Total
1	160	342	68	186	4	760
2	354	450	72	288	36	1200
3	276	376	64	334	11	1060
4	490	433	43	454	0	1420
5	0	6	0	39	6	50
6	92	82	8	233	4	420
7	130	191	43	120	26	510
8	43	66	7	30	5	150
9	1059	856	203	769	29	2915
10	737	871	107	925	40	2680
11	650	975	150	688	63	2525
12	216	427	28	389	50	1110
13	10	8	3	9	1	30
14	330	314	134	191	52	1020
15	1050	1115	344	640	131	3280
16	1050	1115	344	640	131	3280
17	175	340	18	168	0	700
18	72	179	34	68	27	380

Fleet Emission of Pollutant (EURO III)

	P/C-p (Car)	Taxi	PrBus	HGV	PuBus
NOx	**0.7100**	**0.7300**	**5.5400**	**3.8400**	**6.8000**
CO	**1.8700**	**1.4700**	**6.2700**	**6.4500**	**6.9800**
PM	**0.0300**	**0.0100**	**0.5000**	**0.5300**	**0.6500**

Emission Rates for NOx

NOx	P/C-p (Car)	Taxi	PrBus	HGV	PuBus	Total	Emission	E (g/ml)
1	113.32	249.66	378.94	715.01	25.8400	1482.76	1.951000	3.1397
2	251.34	328.50	398.88	1105.92	244.8000	2329.44	1.941200	3.1240
3	195.68	274.70	352.34	1282.18	72.0800	2176.98	2.053750	3.3051
4	347.83	316.16	236.00	1744.90	0.0000	2644.89	1.862600	2.9975
5	0.00	4.02	0.00	149.76	37.4000	191.18	3.823500	6.1532
6	65.60	59.79	46.54	895.10	28.5600	1095.59	2.608550	4.1979
7	92.34	139.61	240.16	460.22	173.4000	1105.73	2.168100	3.4891
8	30.35	48.18	37.40	115.20	30.6000	261.73	1.744850	2.8080
9	751.54	624.52	1124.62	2951.04	197.2000	5648.91	1.938209	3.1192
10	523.27	635.83	593.89	3550.46	273.3600	5576.81	2.080900	3.3488
11	461.50	711.75	831.00	2640.00	425.0000	5069.25	2.007624	3.2309
12	153.68	311.97	153.74	1491.84	339.6600	2450.88	2.208000	3.5533
13	6.82	5.48	18.28	34.56	4.0800	69.21	2.307100	3.7128
14	234.02	229.33	741.81	731.71	350.2000	2287.06	2.242879	3.6095
15	745.22	814.10	1907.98	2456.06	892.1600	6815.51	2.077900	3.3440
16	745.22	814.10	1907.98	2456.06	892.1600	6815.51	2.077900	3.3440
17	124.25	247.84	96.95	645.12	0.0000	1114.16	1.591650	2.5614
18	51.26	130.38	189.47	262.66	180.8800	814.64	2.143800	3.4500

Emission Rates for CO

CO	P/C-p (Car)	Taxi	PrBus	HGV	PuBus	Total	Emission	E (g/ml)
1	298.45	502.74	428.87	1200.99	26.52	2457.57	3.2337	5.2039
2	661.98	661.50	451.44	1857.60	251.28	3883.80	3.2365	5.2085
3	515.37	553.16	398.77	2153.66	73.99	3694.95	3.4858	5.6097
4	916.11	636.66	267.10	2930.88	0.00	4750.75	3.3456	5.3841
5	0.00	8.09	0.00	251.55	38.39	298.03	5.9605	9.5922
6	172.79	120.39	52.67	1503.50	29.32	1878.66	4.4730	7.1984
7	243.19	281.14	271.80	773.03	177.99	1747.16	3.4258	5.5131
8	79.94	97.02	42.32	193.50	31.41	444.20	2.9613	4.7656
9	1979.40	1257.59	1272.81	4956.83	202.42	9669.04	3.3176	5.3390
10	1378.19	1280.37	672.14	5963.67	280.60	9574.97	3.5728	5.7496
11	1215.50	1433.25	940.50	4434.38	436.25	8459.88	3.3504	5.3919
12	404.76	628.20	173.99	2505.83	348.65	4061.43	3.6590	5.8883
13	17.95	11.03	20.69	58.05	4.19	111.91	3.7302	6.0030
14	616.35	461.80	839.55	1229.05	359.47	3506.22	3.4385	5.5336
15	1962.75	1639.34	2159.39	4125.42	915.78	10802.68	3.2935	5.3002
16	1962.75	1639.34	2159.39	4125.42	915.78	10802.68	3.2935	5.3002
17	327.25	499.07	109.73	1083.60	0.00	2019.64	2.8852	4.6432
18	135.01	262.54	214.43	441.18	185.67	1238.84	3.2601	5.2465

Emission Rates for RSP

RSP	P/C-p (Car)	Taxi	PrBus	HGV	PuBus	Total	Emission	E (g/ml)
1	4.788	3.42	34.2	98.686	2.47	143.5640	0.1889	0.3040
2	10.62	4.5	36	152.64	23.4	227.1600	0.1893	0.3046
3	8.268	3.763	31.8	176.967	6.89	227.6880	0.2148	0.3457
4	14.697	4.331	21.3	240.832	0	281.1600	0.1980	0.3186
5	0	0.055	0	20.67	3.575	24.3000	0.4860	0.7821
6	2.772	0.819	4.2	123.543	2.73	134.0640	0.3192	0.5137
7	3.9015	1.9125	21.675	63.5205	16.575	107.5845	0.2110	0.3395
8	1.2825	0.66	3.375	15.9	2.925	24.1425	0.1610	0.2590
9	31.755	8.555	101.5	407.305	18.85	567.9650	0.1949	0.3136
10	22.11	8.71	53.6	490.038	26.13	600.5880	0.2241	0.3606
11	19.5	9.75	75	364.375	40.625	509.2500	0.2017	0.3246
12	6.4935	4.2735	13.875	205.905	32.4675	263.0145	0.2370	0.3813
13	0.288	0.075	1.65	4.77	0.39	7.1730	0.2391	0.3848
14	9.888	3.1415	66.95	100.9915	33.475	214.4460	0.2103	0.3384
15	31.488	11.152	172.2	338.988	85.28	639.1080	0.1949	0.3136
16	31.488	11.152	172.2	338.988	85.28	639.1080	0.1949	0.3136
17	5.25	3.395	8.75	89.04	0	106.4350	0.1521	0.2447
18	2.166	1.786	17.1	36.252	17.29	74.5940	0.1963	0.3159