

EIA/002.1/94

**FINAL REPORT**

Mass Transit Railway Corporation

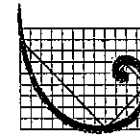
Lantau and Airport  
Railway: *Environmental  
Impact Study: Final Report*

*Volume 1: Executive Summary*

January 1994

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**ERM**

CONSULTING SERVICES BY ENVIRONMENTAL RESOURCES MANAGEMENT

EIA-023/BC

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Reference C1092

For and on behalf of ERM Hong Kong

Approved by: C. Man

Position: MANAGING DIRECTOR

Date: 6 JANUARY 1994

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## 1 INTRODUCTION

### 1.1 BACKGROUND TO THE ENVIRONMENTAL IMPACT STUDY

This summary was prepared by ERM Hong Kong on behalf of the Mass Transit Railway Corporation (MTRC). It presents the main findings of an Environmental Impact Study (EIS) which has been undertaken to examine the proposed design, construction and operation of the Lantau and Airport Railway (LAR) and to provide information on the nature, extent and magnitude of environmental impacts associated with this project. The study has also developed recommendations which may be used to help avoid any significant and unacceptable impacts, or reduce these to acceptable levels. Issues relating to the general alignment have already been discussed in the Airport Railway Feasibility Study (ARFS).

### 1.2 THE LANTAU AND AIRPORT RAILWAY

MTRC propose a new railway line, principally to serve the new Hong Kong International Airport at Chek Lap Kok, but also to improve public transport in the Territory, in particular by relieving the pressure in the Nathan Road Corridor. This will be known as the Lantau and Airport Railway (LAR), and will be approximately 34 km in length. It will run northwards from a new station on reclaimed land at Central, Hong Kong Island via West Kowloon and Kwai Chung, then west via Tsing Yi Island, the Lantau Fixed Crossing, Ma Wan and the north coast

of Lantau Island, terminating at the new airport on Chek Lap Kok.

Two services will be operated on the railway:

- *The Airport Express Line (AEL)* a dedicated high speed service from Hong Kong Central to Chek Lap Kok, stopping at Kowloon and Tsing Yi only.
- *The Lantau Line (LAL)* a public service linking Central to North Lantau, stopping at Kowloon, Tai Kok Tsui, Lai King (providing a connection with the existing Tsuen Wan Line and thereby relieving pressure on the Nathan Road corridor), Tsing Yi and Tung Chung.

### 1.3 OBJECTIVES OF THE STUDY

The objectives of the LAR EIS study were set out in the Consultancy Agreement developed by the Environmental Protection Department (EPD) and MTRC. These are, in summary:

- To identify, predict and evaluate the environmental impacts and the cumulative effects which may be expected to arise during the construction and operational phases of the LAR.
- To recommend appropriate works which are necessary to mitigate these impacts to environmentally acceptable levels in accordance with

Hong Kong Planning Standards and Guidelines (HKPSG) and relevant Government Ordinances.

- To minimise environmental impacts arising from the LAR in both construction and operation.
- To design and specify the particular environmental monitoring requirements for impact and compliance monitoring to ensure that the conditions referred to above are met.
- To design and specify the environmental monitoring requirements for compliance and the post-project audit.
- To produce construction and operational guidance notes as appropriate.

#### 1.4 *FORMAT OF THE REPORT*

The LAR EIS is presented in three volumes: *Volume 1*, the Executive Summary; *Volume 2*, the Main Report; and *Volume 3*, the Technical Annexes.

The findings of the Main Report are presented here in an Executive Summary in the following manner:

- *Section 2* provides a description of the project, related to the main civil contracts along the route and District Board boundaries.

- *Section 3* describes the unmitigated impacts that are predicted to occur during construction work. It also provides recommendation for mitigation measures, where necessary, to limit impacts to acceptable levels.

- *Section 4* identifies the unmitigated impacts and recommends mitigation measures for operational activities.

#### 1.5 *OTHER RELATED ENVIRONMENTAL STUDIES*

Prior to the commencement of the LAR EIS, a number of other studies had already been undertaken. ERM drew extensively on the material in these previous studies, which are described in more detail in *Volume 2*. This included information on the existing environment, preliminary predictions and evaluations of the likely impacts associated with the development of the LAR, and tentative proposals for mitigation measures. The findings of these documents were reviewed by ERM and updated or augmented as necessary.

A number of parallel environmental studies are being undertaken at the same time as the LAR EIS. These relate to particular sections of the alignment where the potential environmental problems require a more in-depth consideration and also to the proposed Comprehensive Development Areas (CDAs) planned for some of the proposed LAR stations. Reference is made in this report, where appropriate, to the most recent findings of these studies.

## 2 DESCRIPTION OF THE PROJECT

### 2.1 INTRODUCTION

The assessment of the LAR alignment covers a total of 19 civil construction contracts, these are shown in *Figure 2.1a*. For the purposes of this study, the route has been divided into four sections to correspond with District Board boundaries as follows:

- Central and Yau Tsim Districts (Contracts 501 to 504);
- Mong Kok and Sham Shui Po Districts (Contracts 505 to 507, and 520);
- Kwai Tsing District (Contracts 507 to 512); and
- Tsuen Wan and Islands Districts (Contracts 513 to 518).

### 2.2 CENTRAL AND YAU TSIM DISTRICTS

*Contract 501* includes the new Hong Kong Station and a tunnel to the seawall on the Central and Wanchai Reclamation. It will form the terminus of the AEL and the LAL, with provision for the future extension of the LAL eastwards. Extensive property development and podium structures will be constructed by others above and adjacent to the station. *Contract 501A* will comprise the construction of a pedestrian subway link between the new LAR station and the existing Central MTR station.

*Contract 502*, the Western Immersed Tube Tunnel will link Hong Kong Station with Kowloon Station. The tunnel will carry two tracks, separated by a continuous structural wall and will rest in a trench excavated in the bed of Victoria Harbour.

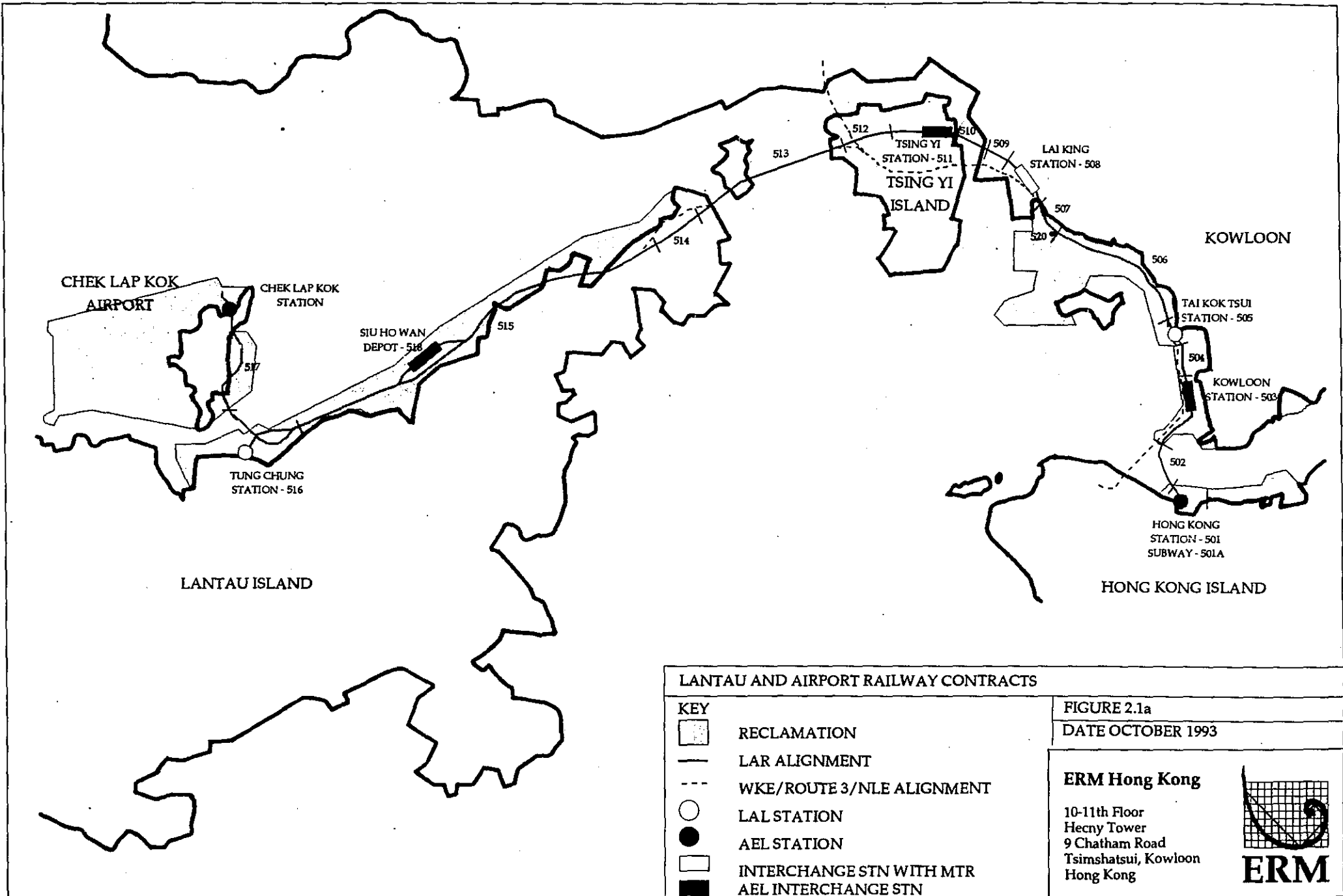
*Contracts 503, 503A & 503B* are for the connecting tunnel and Kowloon Station, on the West Kowloon Reclamation (WKR). Property development above the station will be built by others and does not form part of *Contract 503*.

*Contract 504* links Kowloon Station to Tai Kok Tsui Station. The Contract has been entrusted to the Highways Department as the line will run under the extensive works associated with the West Kowloon Expressway (WKE).

### 2.3 MONG KOK AND SHAM SHUI PO DISTRICTS

*Contract 505* is for the construction of Tai Kok Tsui Station on the south-west corner of the Tai Kok Tsui peninsula, only LAL services will stop at the station. The station forms the centre of a development with Comprehensive Development Areas (CDAs) planned to the north-east, north-west and south-east of the station. A 24-hour thoroughfare through the station will provide pedestrian access between the new CDAs and across Trunk Road P1 and the WKE.

*Contract 506* between Tai Kok Tsui Station and Lai Chi Kok will be entrusted works, constructed as part of the WKE. The LAR will follow the WKE alignment, running




LANTAU AND AIRPORT RAILWAY CONTRACTS

KEY	
	RECLAMATION
	LAR ALIGNMENT
	WKE/ROUTE 3/NLE ALIGNMENT
	LAL STATION
	AEL STATION
	INTERCHANGE STN WITH MTR
	AEL INTERCHANGE STN

FIGURE 2.1a  
DATE OCTOBER 1993

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 Tsimshatsui, Kowloon  
 Hong Kong





under the viaduct just north of Tai Kok Tsui station. At the northern end of this section, a temporary depot will be constructed nearby for use as part of *Contract 520*, comprising two sections connected by tunnel and covering a total area of approximately 9 ha.

The construction of *Contract 507* will also be part of the entrusted works for the construction of Route 3 and will rise from grade onto an embankment and then a viaduct below Route 3. The track follows the alignment of Route 3 for most of the section and separates just before crossing Kwai Chung Road to enter the Lai King Tunnel. The Contract also includes the viaducts north of Lai King Station which are described below.

#### 2.4 KWAI TSING DISTRICT

*Contract 508* will comprise bored tunnels through Lai King Hill and a new station at Lai King. The new station will be situated alongside, and to the south of, the existing MTR station, comprising a concrete box with platform extensions in tunnel under Lai King Road. A number of modifications will be made to the existing station such as the provision of new escalators and stairs and the opening up of sections of the side wall.

*Contract 507* also includes a viaduct between Lai King Station and Kwai Chung Park, which will be built by the Government as part of the entrusted works for Route 3. The viaduct will leave the station at high level, passing over Kwai Chung Road and joining the Route 3 structure

close to Container Port Road with the LAR located within the structure and beneath the highway.

Under *Contract 509*, the viaduct continues and enters Kwai Chung Park, this section will be built by excavating an open cut through the former Gin Drinkers Bay Landfill. On the south-west side of the park the tracks emerge onto an elevated structure.

*Contract 510* comprises an elevated structure spanning the Public Cargo Working Area (PCWA) and a bridge over the Rambler Channel and typhoon shelter, linking Kwai Chung Park and Tsing Yi Station. The probable form will be a two-tier, double track, concrete bridge. The parapet will act as a noise barrier for both the upper and lower tracks with the last 50 m covered to mitigate impact on the planned residential development above Tsing Yi Station.

*Contract 511* will comprise a new station, sited to the south of Tsing Tsuen Road, serving both the LAL and AEL with associated commercial and residential development above provided by others. The station development will form the podium for a residential development comprising 12 cruciform towers and associated facilities. The development will also contain the Operational Control Centre for all MTRC train operations throughout the Territory.

The *Contract 512* viaduct extends westwards from Tsing Yi station passing through the Green Belt area immediately to the south of Tsing Tsuen Road over Fung Shue Wo Road to the Tsing Yi Tunnel portals. The tunnels will link

the viaduct to the Route 3 toll plaza adjacent to the Lantau Fixed Crossing (LFC).

## 2.5 TSUEN WAN AND ISLANDS DISTRICTS

The entrusted works for *Contract 513* are being designed and constructed by the Government on behalf of the MTRC as part of the LFC Project linking Tsing Yi and North Lantau.

*Contract 514* will comprise the Lantau Tunnels, linking the LFC to the Lantau Viaducts. Twin tunnels will run from the LFC toll plaza to the western portal at Tsing Chau Tsai.

*Contract 515* is being designed and constructed by the Government as part of the North Lantau Expressway (NLE) along the northern shoreline of Lantau Island and will be built either on reclamation below, or cuttings into, the hillside. From the tunnel portal at Tsing Chau Tsai, the alignment of the NLE and LAR will run via Ngong Shuen Au, Yam O, Sam Shui Kok, Tai Ho Wan and Tai Po. Just before reaching Tung Chung the LAL and the AEL separate, the LAL will run in tunnel to terminate at Tung Chung Station whilst the AEL will continue along the alignment of the NLE to the new bridge north of Tung Chung and on to the airport. The works will include a bridge across the airport island channel for the AEL and the NLE.

*Contract 518* comprises MTRC Depot at Siu Ho Wan which will provide stabling and maintenance facilities for the

entire LAR. The site will also be used as a base for permanent way operations. Concrete box structure grade separations will be built at the Depot entry and exit where the LAL crosses the AEL.

*Contract 516* comprises Tung Chung Station and tunnels, the station will be the western terminus of the LAL, and will be located next to the NLE, to the south-west of Tung Chung Town Centre. The station will be built as a cut and cover box with additional levels within the commercial bridge link across the NLE to be provided by others.

The works for *Contract 517* of the LAR will be entrusted to the Provisional Airport Authority with track and fittings supplied by MTRC. The AEL will run north along the eastern side of the new airport island to serve the airport terminal.

### 3 IMPACTS DURING CONSTRUCTION

#### 3.1 INTRODUCTION

The construction of the LAR is scheduled to commence in late 1993 and continue until mid-1997. At the same time as the LAR is under construction other major infrastructure and development projects will also be being built in the vicinity. Environmental impacts associated with these projects have been taken into account in this study so that the cumulative effects arising from the construction of the LAR and other projects can be considered.

The construction of several sections of the LAR route have been entrusted to Government and are outside the control of the MTRC. These sections are only considered in this report where they contribute to cumulative impacts with sections built by MTRC.

In the following sections, impacts are predicted for uncontrolled activities and, where required, mitigation measures are recommended to achieve the appropriate environmental criteria.

#### 3.2 NOISE AND VIBRATION

##### 3.2.1 *Predicted Unmitigated Impacts*

Construction noise levels from the Hong Kong Station worksite are predicted to exceed the requirements of the

Noise Control Ordinance (NCO) for evening and night-time work, and the voluntary daytime limit at the United Building if no mitigation measures are employed. The proximity of Exchange Square to the site means that vibration from piling, if used, may lead to nuisance effects.

Noise from excavation works for the Western Immersed Tube Tunnel are only expected to be significant on the Hong Kong side of the Harbour.

It is likely that the construction of Kowloon Station and the adjacent tunnels will only lead to significant noise impacts if evening or night-time working is required. Planned daytime work and the mainly bored piling activities are not expected to cause disturbance.

During the construction of Tai Kok Tsui Station unmitigated cumulative noise impacts in excess of the voluntary daytime limit have been predicted to occur in the nearby Cherry Street/Hoi King Street Intersection neighbourhood. The development at CDA Site B will be constructed simultaneously with the station. In its early stages it will add to noise levels at the Hoi King Street residential units, while in its later stages it may act as a screen to station construction noise.

No significant construction noise impacts are anticipated as a result of the construction of the temporary depot at Mei Foo.

In the absence of mitigation, significant noise levels are expected at the Winifred Mary Cheung Morninghope School during construction of the Lai King Tunnel portal,

however, no significant noise or vibration impacts are likely from blasting operations associated with tunnelling.

If no noise control measures are employed in the vicinity of Lai King Station, significant impacts have been predicted for a large number of residents. The worst case will be during the hillside excavation works and the demolition of the Lai King Community Hall, although these works will be of limited duration.

Noise in excess of acceptable levels is also predicted at the crematorium in Tsuen Wan Cemetery due to works at both Kwai Chung Park and the Rambler Channel Bridge. Residents at Riviera Gardens are likely to experience noise levels in excess of the NCO requirements if unmitigated work takes place in the evenings and at night. With the exception of the Marine Department Offices in the Public Cargo Works Area, noise levels from piling works required for the bridge piers are not expected to exceed the levels specified in the NCO.

On Tsing Yi, without mitigation measures, noise from works for the bridge will exceed the NCO levels at St Paul's Village and Greenfield Garden if carried out at night. The construction of Tsing Yi Station and viaducts will require mitigation to alleviate predicted significant noise impacts at St Paul's Village and Cheung On Estate.

Unmitigated work at the eastern portal of the Tsing Yi Tunnels will probably lead to excessive noise levels at Cheung On Estate and other NSRs in the area. There are also likely to be widespread impacts in excess of the NCO limits (including effects as far away as Ting Kau) if work continues through the night without mitigation. However,

no significant noise or vibration impacts are anticipated from blasting operations associated with tunnelling. The tunnel alignment will pass close to the Water Services Department (WSD) reservoir, however, statutory controls on permitted vibration from blasting will ensure that there are no adverse effects on the water-retaining structure

On North Lantau, the noise levels at Tai Po Youth Camp from both Tung Chung tunnel and station construction are anticipated to exceed the NCO requirements for evening working if no mitigation measures are employed.

### 3.2.2 *Measures for mitigation*

The following mitigation measures are recommended in order that all construction works for the LAR will comply with both the voluntary daytime noise limit and the requirements of the NCO. Contractors are responsible for the implementation of measures to mitigate construction noise to acceptable levels, such as:

- Care in the location and operation of plant and equipment;
- use of silencers, mufflers, acoustic shields, sheds and screens;
- regular maintenance of plant and equipment;
- specification and use of "quiet" plant and equipment;
- the erection, where necessary, of acoustic screens to protect NSRs exposed to unacceptable noise levels; and

the strict control of evening and night-time activities to prevent the disturbance of residents.

Additional screening and insulation will be provided at WMC Morninghope School.

At Lai King Station MTRC will construct an enclosure to cover the hillside excavation and construction work to reduce noise levels at the nearest multi-storey residences.

To minimise the nuisance effects of blasting, local residents will be given as much notice as possible of the proposed timetables for these activities.

Contractors will be required to obtain a Construction Noise Permit (CNP) for percussive piling and if evening, night-time or general holiday working is necessary.

### 3.3 AIR QUALITY

#### 3.3.1 *Predicted Unmitigated Impacts*

In Central, if no mitigation is used, the high levels of dust from the station construction works alone are expected to exceed acceptable hourly limits and impacts will arise from the reclamation works as well. However, most of the existing buildings in the vicinity are centrally ventilated and the dust impacts will be less significant although mitigation measures will still be required.

No significant dust impacts will occur from construction works associated with the Immersed Tube Tunnel.

In Kowloon, dust impacts from the construction of the WKE are predicted to be much more significant than those from Kowloon Station which are expected to be within Air Quality Objective (AQO) limits.

It is unlikely that dust from the construction of the Kowloon tunnels alone will exceed acceptable limits. However, cumulative impacts from sources including the WKE construction probably will.

Near Tai Kok Tsui Station, the construction of the WKE will be the dominant source of dust impacts. Impacts from the CDAs are likely to be more significant than those from the adjacent station and tunnel works, neither of which is likely to exceed the daily AQO. Cumulative effects from all these activities are predicted to cause significant impacts and will, therefore, require mitigation.

Activities at the temporary depot may make a small contribution to the increase in Total Suspended Particulates (TSP) levels in the area during construction but alone will not be significant.

Uncontrolled dust impacts are expected to be significant at WMC Morninghope and Chan Nam Cheong Schools. This will only occur during initial blasting as later blasts will be contained within the tunnel. Dust impacts at Lai King Station will be reduced due to the presence of the acoustic cover.

Odours arising from the construction activities at the former Gin Drinker's Bay Landfill are not predicted to be significant.

No significant dust impacts are expected during the construction of the Rambler Channel Bridge alone. However, on Tsing Yi Island, cumulative unmitigated dust impacts from Contracts 510, 511 and 512 are anticipated to exceed the daily TSP limit at Cheung On Estate, the school at Cheung On Estate and St Paul's Village by a considerable margin.

At the East Lantau Tunnels, the dust impacts from general construction are predicted to be within acceptable levels.

Dust impacts from the construction of the Depot at Siu Ho Wan alone are not likely to be significant, however cumulative impacts from all construction activities will probably exceed the AQO at Tai Ho Wan Temple.

Construction of Tung Chung Station and Tunnels alone is unlikely to cause significant dust impacts. Once again it is the cumulative impacts of other construction activities associated with the NLD and the new airport which will lead to exceedance of the AQOs.

### 3.3.2 *Measures for Mitigation*

A series of measures have been recommended to help ensure that dust levels from general construction activities are kept to within acceptable limits during construction of the LAR and to comply with the provisions of the Air Pollution Control Ordinance. These include:

- Containment or damping of dusty materials;
- no burning of debris;
- site vehicle control and cleaning; and
- prompt site restoration.

Additionally, the Contractor for Contract 509 will be required to implement specific mitigation measures to control odours from the excavation and handling of material from the former landfill.

## 3.4 *WATER QUALITY*

### 3.4.1 *Predicted Unmitigated Impacts*

Unmitigated construction site runoff from Hong Kong Station may elevate suspended solids (SS) levels in Victoria Harbour causing adverse impacts on the performance of seawater intakes. A discharge consent will be required and waste water controlled and treated if necessary prior to disposal. In the Harbour, SS loadings from dredging, or backfilling with fine grained material, are likely to be high and mitigation measures will be required. The disposal of contaminated material may also affect water quality. However, it is extremely unlikely that the WQO for SS will be breached due to LAR construction work.

Contaminated water arising at the former Gin Drinker's Bay Landfill will be disposed of to foul sewer.

Dredging and construction activities in the Rambler Channel will be of relatively short duration and any physical impacts of the disturbed sediment are unlikely to be significant.

The NLD construction works will lead to the removal of many of the sensitive receptors in the area and no

significant impacts are predicted from the construction of the LAR.

#### 3.4.2 Measures for Mitigation

The mitigation measures used to control impacts on water quality should include:

- Proper site management to prevent debris and harmful materials from reaching water bodies;
- proper drainage facilities to control contaminated runoff; and
- either sewage discharges are connected to the local public sewer or chemical toilets should be provided.

All discharges will meet EPD's requirements with reference to the *Technical Memorandum on Standards of Effluents Discharged into Drainage and Sewage Systems, Inland and Coastal Waters* and the *Water Pollution Control Ordinance*.

Dredging impacts will be controlled by measures such as:

- The use of sealed grabs;
- sealed bottom openings of barges;
- silt curtains; and
- the control of barge and hopper loading.

Marine muds will be disposed of in an approved manner and only at appropriate dumping grounds so as to minimise the impact on the surrounding waters. The

Rambler Channel bridge piers within the channel will be constructed within cofferdams, or similar, minimising losses of excavated material.

#### 3.5 LAND USE AND VISUAL IMPACTS

The LAR from Central to Sham Shui Po will be built on reclaimed land and the land uses in these areas have been planned taking the railway into account, therefore, there will be no significant land use impacts. Similarly, the construction works for the LAR will be undertaken against a backdrop of other construction works and no additional visual impacts are likely.

Works for the new Lai King Station will require substantial excavation and demolition of existing structures to accommodate both the platform tunnels and concrete structures.

The construction of Contract 509 of the LAR requires landtake within Kwai Chung Park, however, it is not open to the public and will be restored after the construction works are completed. The entrusted works for the construction of the viaduct over Kwai Tsing and Kwai Tai Roads, which is entrusted to Route 3, is anticipated to disrupt traffic movement in the area.

During the construction of Tsing Yi Station and Viaducts there will be disruption to traffic along Tsing Tsuen Road, Tsing King Road and at Tam Kon Shan Interchange. Access will be reduced, thereby causing a severance effect between the areas north and south of Tsing Tsuen Road

and may result in the loss of amenity land and vegetation around the interchange.

In the west of Tsing Yi, the LAR tunnels will pass through the ridgeline underground and direct land use impacts are unlikely. The tunnel alignment will pass close to the WSD reservoir, however, it is not expected to affect the water-retaining structure (see *Section 3.2.1*). Permanent land take will be necessary at the portal areas and will result in loss of some open area in the Green Belt. In addition, land take by construction Works Areas will lead to temporary loss of amenity.

Disruption and severance impacts are likely to occur as there are a number of construction projects being carried out at the same time, especially at the western end of the Tsing Yi tunnels. There are no recognised sensitive land uses in this area although the graves and pavilion in the area of the Eastern Portal may be affected by construction activities.

On North Lantau the scale of developments associated with the NLD and the new airport at Chek Lap Kok will reduce any impacts associated with the LAR to an insignificant level.

### 3.6 WASTE MANAGEMENT

Excavated material will either be reused on site, sold for use on other reclamation or construction projects, or as a last resort sent for disposal at a public dump or landfill. The material may be removed from the sites by truck, or

preferably by barge and impacts will be limited to the effects associated with increases in vehicle movements.

Old landfill material from Kwai Chung Park will be transported in sealed containers to Pillar Point Landfill for disposal. Chemical wastes will be taken to the Chemical Waste Treatment Facility on Tsing Yi for safe disposal. Other construction waste, including general refuse, will also be disposed of in a responsible manner and will not give rise to significant impacts.

Mitigation measures will include:

- segregation of wastes for disposal;
- observing the requirements of the dumping licence; and
- meeting the requirements of the Waste Disposal Ordinance.

### 3.7 *ENVIRONMENTAL MONITORING AND AUDIT*

As a means of ensuring compliance with regulatory and other environmental protection requirements and to ensure the effectiveness of mitigation measures, MTRC will employ an independent consultant to undertake environmental monitoring and will employ appropriate audit practices. The data collected in this manner will be used in association with Event Contingency Plans to ensure that any accidental or other exceedance of the statutory requirements are promptly remedied.



## 4 IMPACTS DURING OPERATION

### 4.1 NOISE AND VIBRATION

#### 4.1.1 Predicted Unmitigated Impacts

In Central and Kowloon, there will be no operational noise impacts from trains in stations or tunnels as far as Tai Kok Tsui Station.

In relation to Contracts 506 and 507, train noise in excess of the NCO requirements is likely to be experienced by residents at Ching Lai Court, Mei Foo Sun Chuen, Nam Cheong Estate and Block 19 of Chi Yui Estate, as well as at Princess Margaret Hospital and WMC Morninghope School if no mitigation measures are taken.

It is also predicted that the top floor of the school will be affected by train noise from the Lai King Tunnel southern portal and whilst it is soon to benefit from an insulation scheme to mitigate traffic noise this will not include all the classrooms that may be affected by train noise.

West of Lai King Station train noise levels at Ming King House (Block 1 of Lai King Estate) are expected to be in excess of the NCO requirements, requiring mitigation.

In the vicinity of the Rambler Channel Bridge, unmitigated train noise levels are only predicted to exceed the NCO requirements at the developments above Tsing Yi Station. In relation to the station and the viaducts to the west, the

NCO limits are likely to be exceeded at St Paul's Village and Cheung On Estate.

On North Lantau, train noise impacts in excess of the NCO requirements are only predicted at Luk Keng Tsuen Village and Tung Chung. There is also potential for impacts at proposed developments in Tai Ho Wan.

No significant impacts have been identified arising from ground-borne noise and vibration or from fixed plant sources or station activities with appropriate acoustic design.

#### 4.1.2 Measures for Mitigation

Where train noise has been predicted to cause significant impacts at NSRs it will be controlled to within the NCO limits by trackside noise barriers or enclosures and in the case of WMC Morninghope school, by the fitting of further secondary glazing and associated ventilation plant. The measures outlined in *Volume 2* will be sufficient to enable the LAR to meet the requirements of the NCO from the commencement of services in mid-1997 to full operational capacity which will be reached in 2011.

## 4.2 AIR QUALITY

During the operation of the LAR, the identified sources of air pollutants will only give rise to very low levels of emissions. Therefore, no significant air quality impacts are predicted to arise from the operation of the LAR.

At Kwai Chung Park, measures for landfill gas control will prevent any possible odour migration from the waste mass to the operational areas of the railway.

#### 4.3 WATER QUALITY

##### 4.3.1 *Predicted Unmitigated Impacts*

The potential exists for water quality impacts to result from unmitigated discharges of contaminated runoff and drainage from stations, tunnels and depots.

The temperature of cooling water discharges from stations will be less than 10°C above the intake temperature. Discharges of cooling water may therefore cause slight, localised, temperature increases in coastal waters but as there are no biologically sensitive receivers such as mariculture zones or bathing beaches within the area, the effects will not be significant.

Sewerage networks in the vicinity of the stations will be commissioned in time to serve the MTRC developments. As the sewerage system will be in phase with the LAR, no significant impacts on water quality are anticipated.

##### 4.3.2 *Measures for Mitigation*

Contaminated runoff will be controlled by:

- Regular inspection and maintenance procedures; and
- the use of traps and interceptors to collect suspended solids, oils and grease at stations.

Siu Ho Wan Depot will be built with an effective drainage system to prevent spillages or contaminated water entering the environment.

#### 4.4 LAND USE AND VISUAL IMPACTS

Much of the LAR alignment and associated structures will be located on reclaimed areas which have been the subject of detailed planning exercises and no significant impacts will occur. As most of the structures are below ground, or incorporated into larger developments, there will be no adverse visual impacts.

#### 4.5 WASTE MANAGEMENT

Waste will be collected and stored temporarily before being transported by private contractor or the Urban Services Department and taken to an appropriate disposal facility. No adverse environmental impacts are predicted to arise from these arrangements.

#### 4.6 ENVIRONMENTAL MONITORING AND AUDIT

To help ensure that noise levels from trains during operation of the LAR remain within the requirements of the NCO and the HKPSG, monitoring of noise levels will be carried out, the exact location of the monitoring stations will be determined by MTRC in discussion with EPD.

Monitoring and audit programmes will also be operated to protect air and water quality.

## CONCLUSIONS

No significant environmental impacts are predicted to arise as a result of the construction or operation of the LAR which cannot be avoided or reduced to acceptable levels by the implementation of appropriate mitigation measures.

However, it must be noted that the EIA process inherently includes elements of uncertainty, such as:

- The precise final form of the proposals will not be known until detailed design is completed;
- until the chosen contractors have finalised their preferred methods of working, the precise construction programme, working arrangements and plant to be used on site will not be known;
- the nature of the computer models used for the prediction of the extent and magnitude of impacts are subject to margins of error.

The measures for mitigation recommended by ERM generally indicate the type of measures which may be employed to ensure compliance with the statutory requirements, Government guidelines and other environmental standards agreed with EPD. Also, the environmental monitoring and audit programme which will be adopted during construction and operation of the LAR will help ensure compliance whatever means of mitigation are used.

The Environmental Monitoring and Audit (EM&A) procedure will control potential impacts from the effects of noise, air and water emissions during construction and noise and air emissions during the operation of the LAR. The EM&A requirements for the construction stage will be stated in the relevant engineering contract.

During implementation and operation of the project, the recommended EM&A programme should be launched to confirm the validity of the EIA study and therefore, ensure compliance with regulatory environmental requirements, related guidelines and/or recommended control levels. EM&A reports will be submitted to the relevant government authorities for information and, in the event of an exceedance of the Action/Target Limit, for advice.