

# BINNIE BLACK & VEATCH

**East Rail Extensions -  
Tai Wai to Ma On Shan Rail  
Environmental Impact Assessment  
(Reference C1890)**

**Environmental Monitoring and Audit Manu**



**Binnie Black & Veatch Hong Kong Limited**

A Black & Veatch Company

VEP-031/2000/B  
EP-039

**KOWLOON-CANTON RAILWAY CORPORATION**


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**January 2001**

**[382141/BBV/03 Final]**

Report Authorized For  
Issue By:



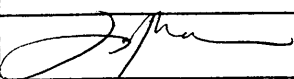
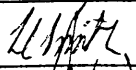

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## **1. INTRODUCTION**

### **1.1 Purpose of the Manual**

1.1.1 The purpose of this Environmental Monitoring and Audit (EM&A) Manual is to guide the setup of an EM&A programme to ensure compliance with the Environmental Impact Assessment (EIA) study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme to be undertaken for the construction of KCRC East Rail Extensions – Tai Wai to Ma On Shan (MOS Rail). It aims to provide systematic procedures for monitoring, auditing and minimising of the environmental impacts associated with the construction works.

1.1.2 Hong Kong environmental regulations for air and water quality, noise and waste, the Hong Kong Planning Standards and Guidelines, conditions of Environmental Permit No. VEP-031/2000/B/EP-039 and recommendations in the EIA study final report on the MOS Rail have served as environmental standards and guidelines in the preparation of this Manual. Nevertheless, this Manual shall not remove the responsibility of the Client, Contractor, Contractor's Environmental Team, Contractor's Environmental Team Leader and Independent Environmental Checker to comply with the above-mentioned regulations, standards, guidelines, Environmental Permit conditions and the recommendations in the approved EIA Final Report.

1.1.3 This Manual contains the following :

- (a) duties of the Client, Contractor, Engineer & Engineer's Representative, Contractor's Environmental Team (Contractor's ET), Contractor's Environmental Team Leader (Contractor's ET leader) and Independent Environmental Checker (IEC) with respect to the environmental monitoring and audit requirements during construction;
- (b) information on project organisation and programming of construction activities for the project;
- (c) requirements with respect to the construction schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
- (d) definition of Action and Limit levels;



- (e) establishment of event and action plans;
- (f) requirements of reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria;
- (g) requirements of presentation of environmental monitoring and audit data and appropriate reporting procedures.

*For the purpose of this manual, the "Engineer" shall refer to the Engineer as defined in the Contract and the Engineer's Representative (ER), in cases where the Engineer's powers have been delegated to the ER, in accordance with the Contract. The Contractor's ET leader, who shall be responsible for and in charge of the Contractor's ET, shall refer to the person delegated the role of executing the environmental monitoring and audit requirements.*

## **1.2 Background**

### ***Overview***

- 1.2.1 The project site is shown in Figure 1.1. The MOS Rail is proposed in order to improve transport communications for the population of the North East New Territories, and specifically to provide residents of the Ma On Shan and Lee On New Towns with a direct rail link to the KCRC and MTRC systems, thereby improving accessibility to the central business areas of Hong Kong.
- 1.2.2 The MOS Rail will involve the construction and operation of approximately 11.4 km of above ground railway track, nine stations, a depot at Tai Wai and two infed substations.

### ***Alignment***

- 1.2.3 The MOS Rail alignment runs from Tai Wai in the west, where it will interchange with the KCR East Rail Service, to Lee On in the east (see Figure 1.1). The alignment will be on viaduct through the predominantly urban areas of Sha Tin and Ma On Shan, with a section at ground level where it runs along the reserve of the Tate's Cairn Highway median.

*Hin Keng to Tai Wai*

- 1.2.4 The section from the depot at Hin Keng to Tai Wai Station is approximately 1100 m. The depot is planned for the area to the immediate south-west of Tai Wai Station, currently occupied by the Hong Kong School of Motoring and cycling area. A Public Transport Interchange (PTI) is proposed to the immediate south-east of the Tai Wai Station on the land currently occupied by the existing bus station and Happy Dragon Recreation Park.

*Tai Wai to Sha Tin Tau*

- 1.2.5 To the east of Tai Wai Station, the alignment will pass over the area currently occupied by the Happy Dragon Recreation Park, and continue through the bend of the Shing Mun River to an elevated station located opposite the Chun Shek Estate. The footpath and bicycle track to the south of the Shing Mun River promenade adjacent to Sha Tin Tau Station may require re-alignment to enable the construction of the proposed railway. The residential developments include Holford Gardens, Grandway Gardens and Man Lai Court to the north and Tim Sam Village, Carado Gardens, Sun Choi Estate, Lung Hang Estate and Hin Keng Estate to the south.

*Sha Tin Tau to Sha Kok Street*

- 1.2.6 The alignment between Sha Tin Tau Station and Sha Kok Street Station runs over Che Kung Miu Road and Lion Rock Tunnel Road which will require modification to allow the construction of the proposed railway viaduct. From the road junction, the alignment then passes over the Tsang Tai Uk Recreation Ground and Sha Kok Street on its way to Sha Kok Street Station. Several large housing estates and three schools are located on either side of Sha Kok Street including the Jat Min Chuen residential area, Pok Hong Estate and Sha Kok Estate. The construction of the proposed railway viaduct and Sha Kok Street Station will affect the ball courts and lorry parking spaces of Pok Hong Estate along Sha Kok Street.

*Sha Kok Street to City One*

- 1.2.7 From Sha Kok Street Station, the alignment passes over Shui Chuen Au Street towards Sha Tin Road, with Sha Tin Wai Village to the south. The alignment heads north-east over Sha Tin Road and Wong UK Village. The alignment then crosses Shatin Road to the north and west of the Prince of Wales Hospital, a bus terminus and a small open space located between the bus-terminus and Ngan

Shing Street. City One Station will be located to the east of the junction of Ngan Shing Street and Chap Wai Kong Street. The site is located immediately to the west of two schools (the Dr Catherine F. Woo Memorial School and the Lam Kau Mow Secondary School) and residential developments (Yue Tin Court and City One Plaza) and to the south and east by industrial buildings (mostly godowns). The Prince of Wales Hospital is also located to the south-west.

*City One to Shek Mun*

- 1.2.8 A large area of recreational open space, undeveloped land and a nullah is located between City One Station and the Shek Mun Station site. The alignment passes across this open space and over Siu Kek Yuen Road and the nullah before entering an industrial area, Tate's Cairn Highway and Tai Chung Kiu Road. The alignment then enters the proposed Shek Mun Station which is located parallel to, and immediately to the north-west of On Ming Street and above On Muk Street and On Lai Street, the latter of which is likely to be permanently closed. Shek Mun Station will be located on a site bounded by industrial buildings and land proposed for development.

*Shek Mun to Chevalier Garden*

- 1.2.9 From Shek Mun Station, the alignment swings north over the eastbound lane of the Tate's Cairn Highway. The alignment passes under Shek Mun Interchange roundabout, and along the central reserve of Ma On Shan Road until just before the Nullah, where it returns to viaduct for the remainder of the section to Chevalier Garden Station. Chevalier Garden Station will be located north-east of Hang Shun Street passing several residential areas including Garden Vista, Pictorial Gardens and Sha Tin Fishermen's New Village as well as Shatin Hospital. Near Chevalier Garden Station, residential developments (Tai Shui Hang Village and Chevalier Gardens) are located within side-valleys set amongst vegetated hill slopes.

*Chevalier Garden to Heng On*

- 1.2.10 After Chevalier Garden, the alignment crosses over the Ma On Shan highway. Heng On Station will be located north of the interchange with Hang Fai Street. The residential premises of Vista Paradise and Heng On Estate are located to the north-east and the east of the station respectively.

*Heng On to Ma On Shan*

- 1.2.11 The alignment crosses over a pedestrian footbridge located approximately 200 m south of the junction of Sai Sha Road and Hang Hong Street, and continues past a new stadium development before turning east as it approaches the Ma On Shan Town Centre and Ma On Shan Station. The proposed Ma On Shan Station will be located north-east of On Yuen Street. Residential developments are located to the north (Tolo Place, Bayshore Towers and Ma On Shin Centre) and south (Sunshine City and Fun Fai Garden) of the station. Thereafter, the track alignment continues along the MOS Rail reserve in an easterly direction towards Lee On Station.

*Ma On Shan to Lee On*

- 1.2.12 The alignment passes over the existing footbridge linking the Ma On Shan Centre and Fu Fai Garden residential complex and heads east over On Chiu Street. The alignment then passes through an area of residential properties, including Villa Athena to the north, and Saddle Ridge Gardens together with the Ma On Shan Health Centre to the south. The alignment then passes over the junction with Kam Ying Road and along the central reserve as it passes to the north of Lee On Estate and south of Wu Kwai Sha New Village. The alignment passes over the Lee On Estate access road into Lee On Station. Lee On Station is the terminal station, there will be over-run tracks that terminate beyond the station platform to the north-east of Sai Sha Road. Lee On Station will be situated in a series of flat platforms separated by rock outcrops with the Lee On Residential Development above. A PTI is proposed to be located to the south of Lee On Station.

***Construction***

- 1.2.13 One scenario that has been developed assumes that the MOS Rail will be constructed by means of four major construction contracts:
- (a) TCC200 – This contract would potentially comprise construction of all railway viaduct and stations from the north of Tai Wai Station to a point just south of the Tate's Cairn Highway Crossing. The contract would potentially include 3785 m of viaduct track, together with the construction of four above ground stations: Sha Tin Tau, Sha Kok Street, City One and Shek Mun.

- (b) TCC300 – This contract would potentially comprise all railway viaduct and at-grade construction, together with stations from a point just south of Tate’s Cairn Highway Crossing to the termination at Lee On Station. The contract would potentially include 2200 m of at-grade track and 4217 m of viaduct track, together with the construction of four above ground stations: Chevalier Garden, Heng On, Ma On Shan and Lee On.
- (c) TCC400 – This contract would potentially comprise construction of the new Tai Wai Station including viaduct, the adoption of the existing East Rail Station and the construction of a transfer corridor between the two.
- (d) TCC500 – This contract would potentially comprise construction of the MOS Rail Depot at Tai Wai.

1.2.14 According to the proposed construction methodology, both the southern and northern contracts (TCC200 and TCC300 respectively) would progress from both ends of the viaducts simultaneously, and the viaduct and the elevated station structures would be constructed using the same match cast segmental construction methodology. Each contract would require a match casting yard to be set up for the production of the viaduct segments. Additional pre-cast facilities would be likely to be required for the station pre-cast units and viaduct parapets.

1.2.15 The construction sequence would initially involve the construction of the vertical support elements and cross beams. The viaduct structures, which basically consist of 35-40 m span box girders, could be ‘delivered’ to the various work faces using a system that comprises a temporary rail track and special rolling stock mounted with cranes. (However, alternative methods of delivering the pre-cast units may be employed by the Contractor). Once delivered, the pre-cast units would be placed using an erection gantry. The viaducts would continue through the various stations, with the beams between each viaduct column supporting the platform slab and lightweight roof structure where applicable. Once a short section of viaduct is complete, subsequent viaduct girders would be erected on the previously completed vertical support column. As the viaduct erection moves beyond each Station, construction of the Station would commence. The use of pre-cast segments, beams and slabs would enable the majority of the viaduct sections to be constructed ‘in the air’ thereby minimising the amount of ground level construction works and consequently the likelihood of disruption to traffic and nuisance to residents.

### *Operation*

- 1.2.16 It is planned that trains will operate on the MOS Rail alignment from end to end throughout the planned operating hours of 0530 to 0100 hours. As most MOS Rail passengers will interchange with East Rail at Tai Wai, the first southbound train from Lee On and the last northbound train from Tai Wai are planned to connect with the first and last East Rail trains in both directions.
- 1.2.17 It is envisaged that initially, upon opening, the MOS Rail will operate 4 car trains with a peak service frequency slightly reduced from that proposed for full operation. Peak service frequencies will be achieved by the year 2011. Depending upon patronage, 8 car trains are likely to be used in later years.
- 1.2.18 The full operating train frequencies for MOS Rail are planned to be:-
- (a) Morning Peak on Weekdays – 2 minutes
  - (b) Evening Peak on Weekdays – 4 minutes
  - (c) Sundays and Public Holidays and off-peak on Weekdays – 6 minutes
- 1.2.19 However, upon opening in 2004, the peak service will be 2.5 minutes, although the off-peak frequencies will be as detailed above.
- 1.2.20 The MOS Rail Depot at Tai Wai will provide facilities for the maintenance of the MOS Rail and its associated rolling stock. The facilities at the depot will include two running maintenance berths, with one berth having a carriage lifting facility and a small heavy repair workshop. The Depot will, however, be used mainly for stabling and running maintenance due to the small MOS Rail train fleet size.

### *Summary of the Impacts and Mitigation Measures Specified in the EIA*

#### *Cumulative Impacts*

- 1.2.21 A number of situations that may give rise to cumulative impacts have been identified in the EIA. It is recognised that the potential for cumulative impacts is influenced not only by the coincidence in time and space of particular types of activities, but also by such factors as their relative intensity, nature of impact, diurnal variation, specific location and relative distance from sensitive receivers. In many cases this means that one particular activity or source is dominant in the assessment of cumulative impacts, especially in relation to noise.

1.2.22 For the MOS Rail, cumulative noise impacts from the various construction work sites along the full length of the MOS Rail have been carefully assessed and, where necessary, appropriate mitigation measures have been formulated.

1.2.23 The EIA has also examined a number of situations in which there are potential interactions or connections between different media of the environment including:

- (a) Potential air and water pollution impacts from the storage, handling and reuse of excavated materials; and
- (b) The visual impacts of noise mitigation measures.

*Construction Noise*

1.2.24 Unmitigated construction noise impacts from all sections of the alignment are predicted to exceed the daytime noise limits established under the EIAO TM at many identified sensitive receivers along the alignment. A package of mitigation measures has been designed to control construction noise impacts.

1.2.25 Whilst not sufficient to fully resolve the predicted noise impacts, general good site practices will help to control noise impacts. These include:

- (a) care in the placement and orientation of noisy plant away from sensitive receivers;
- (b) the use and correct fitting of silencers, mufflers and acoustic shields; and
- (c) regular maintenance of plant and equipment.

1.2.26 A series of further mitigation measures have been identified which will provide increasing levels of noise reduction which should normally be sufficient to control daytime noise impacts to within the established limit. These are:

- (a) Mitigation Stage 1 – the use of items of quieter construction equipment than those listed by EPD as standard;
- (b) Mitigation Stage 2 – in addition to the use of quiet plant, moveable noise barriers should be used to reduce operational plant noise at source; and

- (c) Mitigation Stage 3 – as well as a combination of quiet plant and moveable barriers, the number of plant operating simultaneously should be limited.

1.2.27 After the implementation of the above mitigation, residual impacts are likely at some schools, health centres and residential premises. It is recommended that the existing glazing systems at the schools and health centres are reviewed and upgraded if necessary.

1.2.28 In order to reduce the impacts at the residential premises, it is recommended that the contractors develop alternative construction methodologies. Should it be impracticable to achieve the required noise criteria through these practices, it is recommended that practical trigger levels are agreed with the EPD, and that strict monitoring is undertaken to identify any exceedances of the agreed criteria such that corrective action can be implemented. Through the adoption of this practice, it is considered that residual impacts can be either reduced to acceptable levels in accordance with the EIAO TM, or if unavoidable, kept to a minimum practicable duration.

#### *Operational Noise*

1.2.29 Noise impacts from the operational railway are a major concern, particularly at night (between 2300 and 0700 hours) when the statutory noise criteria are most stringent. In order to achieve the night-time criteria, a package of noise mitigation measures centred around the use of the Multi-plenum system has been proposed by KCRC.

1.2.30 The Multi-plenum noise attenuation system comprises three components:

- (a) a plenum beneath the train involving the use of vehicle skirts and under-car absorption;
- (b) a plenum located beneath a walkway on both sides of the track; and
- (c) edge walls with sound absorption.

1.2.31 In addition to the use of the Multi-plenum system, in order to meet the night-time noise criteria, the package of noise mitigation measures requires the use, in some areas, of floating slab track, and track side noise barriers. However, KCRC will provide floating slab track for the entire elevated alignment on viaduct. Within stations, the Multi-plenum System with the standard edge wall provision for walkway safety and a complementary noise specification for vehicle air-conditioning units will be required.



- 1.2.32 Full enclosures will be required to control airborne noise from crossovers. These shall be integrated with the Multi-plenum System.
- 1.2.33 The Multi-plenum is effective in controlling airborne noise at source and will therefore minimise noise barrier heights and enclosure requirements. Similarly the acoustically optimised structural design of the viaduct and track support system means that structure-borne noise levels will be reduced to a minimum.
- 1.2.34 With the implementation of the recommended mitigation measures, the proposed scheme will comply with the NCO and the EIAO TM.
- 1.2.35 Noise impacts from the Tai Wai Depot and associated plant will be controllable with mitigation measures including the proposed partial enclosure of the Depot. Noise from fixed plant will be limited by maximum sound power levels defined in the EIA and used as a target by the detailed designers to ensure the Noise Control Ordinance and EIAO TM criteria will be met.
- 1.2.36 Provided the above recommendations are taken during the detailed design phase no residual impacts are expected.

*Landscape and Visual*

- 1.2.37 Unmitigated adverse landscape and visual impacts are predicted from the construction of the MOS Rail. The proposed development would generate high impacts on the physical landscape due to the loss of amenity trees, particularly mature specimens. The proposed elevated stations, and viaducts would generate varying visual impacts on the surrounding areas and their populations depending on the horizontal and vertical proximity of the Visually Sensitive Receivers (VSRs) to the railway. A large proportion of the population live in flats that would be sufficiently elevated above the railway viaduct that they would not be able to see the railway unless they stood directly at their windows and looked straight down. Consequently they would suffer only low to negligible visual impacts. On the other hand, VSRs in low-rise developments and the lower floors of high-rise developments would potentially suffer greater impacts due to an increased potential to see the railway from their homes.
- 1.2.38 However, landscape impacts can be largely overcome by careful planning. There is a significant potential to mitigate the impacts on the lower floors of developments through the implementation of the proposed landscape and visual mitigation measures including:

- (a) Boundary fences should be erected around construction sites before the commencement of the works to reduce the potential visual impacts and to prevent tipping, vehicle movements and egress of personnel off site. All work sites, particularly those where vegetation has been removed, shall be reinstated to a standard as good as, or better than the original state, at the earliest opportunity.
- (b) The external appearance of all above-ground structures should be carefully detailed in terms of form, colour and finishes such that they are visually integrated as much as possible into the surrounding landscape. This applies, in particular to the stations, viaduct structures and the proposed noise mitigation structures as these elements would be the most visually dominant elements;
- (c) The use of high safety fences along the railway should be avoided wherever possible to minimise adverse visual intrusion on the landscaping;
- (d) Tree and shrub planting should be implemented within the railway reserve, below the viaduct so as to compensate for lost trees and to soften the visual impact of the viaduct. Climbing plants should be used to soften the appearance of viaduct columns.

1.2.39 With implementation of the proposed visual impact mitigation measures, predicted impacts would reduce to acceptable levels and the railway would become an accepted part of the urban scene.

#### *Air Quality*

1.2.40 Due to the close proximity of a number of ASRs to the worksites there are likely to be dust impacts associated with the construction of the railway. As the buffer distance requirements between some of the ASRs and the work site boundary will not satisfy those stipulated in the HKPSG, unmitigated cumulative dust impacts are predicted from the construction of the stations, alignment and depots.

1.2.41 A series of measures have been identified to control dust levels from general construction activities to within statutory limits. These include:

- (a) on site vehicle speed restrictions and vehicle washing before leaving the site;
- (b) careful handling and the containment or damping of dusty materials; and

- (c) frequent watering or covering of exposed areas of ground and prompt site restoration.
- 1.2.42 These measures should be used as general good practice on all construction sites to ensure that potential dust emissions are controlled and impacts upon sensitive receivers minimised.
- 1.2.43 Environmental Monitoring & Audit is required to ensure the efficacy of the proposed dust mitigation measures during the construction phase. Air quality impacts during the operational phase of the MOS Rail are not considered to be of concern as limited potential sources have been identified. The design of the ventilation systems for the stations and the bus termini should be carefully considered to ensure that the established criteria are met.

*Water Quality*

- 1.2.44 Potential problems could arise from the release of unmitigated construction site runoff. Sewage effluent arising from the construction workforce also has the potential to cause adverse impacts if dealt with in an inappropriate manner. Under the Water Pollution Control Ordinance, all sites will be required to obtain a discharge licence. The contractor should meet the discharge requirement to prevent adverse impacts upon receiving water bodies. With the implementation of the recommended mitigation measures, no adverse impacts are predicted during construction of the MOS Rail.
- 1.2.45 Stormwater runoff related impacts from stations and the depot should be effectively controlled through the design and implementation of appropriate drainage system(s) including silt traps and oil interceptors prior to discharge to stormwater drains. Wastewater generated by the detergent wash plant in the proposed depot will be collected and transferred to a dedicated on-site treatment plant. The treated effluents and any other wastewater generated from the depot and stations will have to meet the criteria specified in the TM on Standard for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters, prior to discharge to sewers. With the implementation of the proposed mitigation measures, no water quality impacts arising from the operation of the proposed rail development are predicted.

*Historic and Cultural Resources*

1.2.46 No direct impacts to the known archaeological sites of Wu Kwai Sha and Sai O are predicted during construction of the MOS Rail. However, as the assessment has identified the presence of some areas of archaeological potential, it is recommended that archaeological excavation is undertaken in advance of construction works for the areas affected by the viaduct footings east of the Sai Sha Road at Lee On, and at Sha Tin Wai Hill. With the implementation of the recommended mitigation measures, no residual impacts are predicted for the identified historic buildings, structures or landscape features identified along the MOS Rail alignment during the construction phase.

1.2.47 No cultural or heritage impacts are predicted in relation to the operation of the MOS Rail.

*Hazard Assessment*

1.2.48 The potential hazards identified during the construction phase of the MOS Rail have been identified to be accidental damage to the pipeline during excavation works, or damage to the pipeline caused by excessive loading or vibration associated with the use of heavy plant or piling activities. In case there is an unavoidable conflict between the current location of the pipeline and the proposed location of the viaduct foundations, the pipeline will need to be re-located with adequate safety measures.

1.2.49 The hazards posed by the construction of the railway could threaten the integrity of the pipeline. It is therefore recommended that suitable procedural and safety management measures are developed in accordance with the guidelines issued by EMSD and HKCG to minimise these hazards. KCRC should co-ordinate closely with HKCG during the detailed design and construction process. In addition, the construction safety plan to be developed by KCRC's contractor in accordance with KCRC's safety management system should include a detailed assessment of the construction hazards and specify appropriate controls to reduce the risks. The development and implementation of this plan and the associated measures will ensure that the construction risks conform to the acceptability criteria of the EIAO TM.

- 1.2.50 During the operational phase, approximately 2.3 km of the high pressure gas pipeline will lie within 100 m of the proposed MOS Rail alignment, with 15 m of the pipeline being within 5 m of the alignment where the pipeline crosses under a section of the railway viaduct. The risks associated with the operation of the MOS Rail have been evaluated for persons using the railway and associated stations in the vicinity of the high pressure gas pipeline, and also for the general population in the vicinity of the new railway. The hazards posed to the high pressure gas pipeline due to the presence of the operational railway are not expected to be significant and have been shown to meet the risk criteria of the EIAO TM. However, there exists the potential for damage to the pipeline due to stray current and vibration impacts. Consequently, appropriate engineering measures should be adopted to minimise stray current and vibration effects on the pipeline. The risks posed to the rail passengers due to the proximity of the pipeline was also found to be low and 'acceptable'. Nevertheless, it is recommended that procedures are developed to enable the immediate reporting of any gas leakages or fires to the train control centre to enable the driver to be notified as quickly as possible and therefore avoid approaching the scene of the incident.

*Environmental Monitoring & Auditing (EM&A)*

- 1.2.51 During the construction phase of the MOS Rail environmental monitoring is required in order to assess the effectiveness of measures implemented to mitigate potential air quality and noise impacts. Regular environmental auditing is also required to ensure that potential impacts from other sources are adequately addressed through the implementation of the mitigation measures defined in the EIA Report.
- 1.2.52 Noise monitoring at a permanent monitoring location situated close to the Depot is recommended during the operational phase in order to determine the maintenance requirements for rolling stock operating on the MOS Rail. If an exceedance of a reference noise level is detected, investigations will be undertaken to diagnose the fault and implement appropriate remedial action.

**1.3 Environmental Monitoring and Audit Requirements**

- 1.3.1 A summary of the EIA Report recommendations in EM&A as an implementation schedule against with programme milestones is presented in Appendix A.

***Enhanced Environmental Monitoring & Audit Programme***

- 1.3.2 According to the Environmental Permit No. VEP-031/2000/B/EP-039 for the MOS Rail, an enhanced EM&A programme shall be performed taking into account public comments forwarded to EPD during the period of public inspection.
- 1.3.3 The enhanced EM&A programme shall include construction noise monitoring at noise sensitive receivers predicted to have high construction noise levels, The monitoring frequency is double that of regular monitoring.. A list of these receivers is given in Table 3.2 of Section 3: Noise.
- 1.3.4 The enhanced EM&A programme shall also include operational and maintenance noise monitoring at Villa Athena (Block 5) and Sunshine City (Block G), where the noise levels are predicted in the EIA report to marginally comply with the noise standards.
- 1.3.5 The operational noise monitoring should be carried out for the first year of the MOS Rail operation and maintenance. Termination of the noise monitoring shall be subject to approval by EPD and details of the conditions for termination of the EM&A are presented in Section 3.1.2.
- 1.3.6 The reporting of operational and maintenance noise for the MOS Rail shall include adjusted operational and maintenance noise levels accounting for difference between the worst case used in the EIA report and the actual operation conditions e.g. 8-car trains and higher frequencies of MOS Rail operation etc., and normalised to the worst case locations stated above.
- 1.3.7 Details of the operational and maintenance noise monitoring are described in Section 3: Noise.

***Archaeological Excavations***

- 1.3.8 As stated in 1.2.46, the EIA Report has recommended archaeological excavations to be undertaken in advance of construction works for the areas affected by the viaduct footings, east of the Sai Sha Road at Lee On and Sha Tin Wai Hill.

- 1.3.9 The archaeological excavations shall be undertaken in accordance with the Archaeological Monitoring Manual for Engineering Works in Hong Kong: KCRC East Rail Extensions, which was written for use in a variety of engineering situations during excavations.
- 1.3.10 When the exact locations of the viaduct footings have been identified, the Contractor shall inform ARCHAEOLOGICAL ASSESSMENTS, who have been commissioned to perform MOS Rail archaeological excavation, to clearly identify the areas of archaeological excavations and to what depth the archaeological excavations will be carried out.
- 1.3.11 In order to expedite the archaeological excavation process it is recommended that the Contractor responsible for the construction of the viaduct footings identify a designated person to liaise with ARCHAEOLOGICAL ASSESSMENTS.
- 1.3.12 Time shall be allowed for the archaeologist to record and retrieve the archaeological material to confirm the presence of archaeological material in the archaeological excavation area. Site procedures and decision making are detailed in the Archaeological Monitoring Manual.
- 1.3.13 In the event of a major archaeological deposit being revealed during archaeological excavation, the archaeologist of ARCHAEOLOGICAL ASSESSMENTS shall seek advice from the Antiquities and Monuments Office.

#### **1.4 Project Organization**

- 1.4.1 The project organisation and lines of communication with respect to environmental protection works are shown in Figure 1.2a and b respectively.

##### ***The Client***

- 1.4.2 The Client who may be the Environmental Manager (EM) of KCRC shall be responsible for:
- (a) the broad supervision of the EM&A Study Programme, its members and the timely production and quality of the outputs;
  - (b) managing the Independent Environmental Checker and providing guidance to KCRC personnel in dealings with the Contractor's Environmental Team;
  - (c) meeting the agreed objectives and deadlines as set out in this Manual; and
  - (d) ensuring the quality of the deliverables.

1.4.3 The Client shall also provide appropriate information to the monthly EM&A reports such as:

- any design changes
- public consultation and liaison meetings involving the District Councils, area committee's, interest groups, etc.

*Contractor*

1.4.4 Each Contractor shall be responsible for the following:

- (a) employ an Environmental Team (ET) to undertake monitoring, laboratory analysis and reporting of environmental monitoring and audit;
- (b) implementing environmental controls and mitigation as set out in this manual as well as any additional measures necessary for compliance with the environmental control standards;
- (c) following any reasonable directions and corrective actions given by the Engineer or the ER(s) particularly as the result of the implementation of event/action plan and co-operate with the environmental performance review undertaken by the IEC;
- (d) each Contractor shall comply with and observe all Ordinances, bye-laws, regulations and rules for the time being in force in Hong Kong governing the control of any form of pollution, including air, noise, water and waste pollution, and shall implement environmental controls and mitigation as set out in this manual as well as any additional measures necessary for compliance with the environmental control standards;
- (e) each Contractor shall carry out all works in such a manner as to cause as little impact as possible to environs and the Contractor shall be held responsible for any claims which may arise from such impacts; and
- (f) operate and strictly adhere to the guidelines of the Environmental Management Plan (EMP) developed by the Contractor.



### *The Engineer*

1.4.5 The Engineer will be responsible for:

- (a) ensuring that the EM&A programme is fully implemented in accordance with the Environmental Permit No. VEP-031/2000/B/EP-039 and this EM&A Manual;
- (b) ensuring that the Contractor is implementing environmental controls and mitigation as set out in the contract specifications, Environmental Permit No. VEP-031/2000/B/EP-039 and this EM&A Manual as well as any additional measures necessary for compliance with the environmental control standards;
- (c) ensuring that the Contractor is implementing and enforcing event/action plans when exceedances of Action and Limit (AL) levels or complaints occur;
- (d) reviewing the monitoring and audit reports submitted by the Contractor's ET leader;
- (e) implementing a 'stop work' action if repeated exceedance of target levels justifies this action;
- (f) follow up and close out corrective actions in accordance with the event/action plans; and
- (g) investigating and auditing the Contractor's equipment and work methodologies with respect to pollution control and environmental mitigation, and to anticipate environmental issues that may require mitigation before the problem arises.

1.4.6 The division of the responsibilities under the Engineer are given in the following paragraphs.

### *The Engineer's Representative (ER(s))*

1.4.7 The ER(s) have a key role to play with the EM&A programme, undertaking:

- (a) an engineering audit of environmental reports;

- (b) site liaison;
- (c) implementing and enforcing event/action plans under the Contract when exceedances of AL levels or complaints occur; and
- (d) ensuring that measures to protect the environment are sufficient, properly and regularly maintained under the Contract.

***The Contractor's Environmental Team (Contractor's ET)***

1.4.8 The Contractor's ET led by Contractor's ET leader will hold a key position with the EM&A programme.

1.4.9 Appropriate staff shall be included in the Contractor's ET to fulfil the following EM&A duties:

- (a) environmental monitoring of various aspects such as noise, air quality and water quality as required by this EM&A Manual and using the procedures outlined in this EM&A Manual;
- (b) recording activities or operations taking place at the site before or during the monitoring period;
- (c) recording factors such as weather conditions at the time of sampling or data collection;
- (d) undertaking regular maintenance and calibration of equipment so that accurate data are collected with precision;
- (e) reporting to the Contractor's ET leader any abnormality in monitoring process and any difficulties encountered; and
- (f) ensuring that monitoring results are sent to both the ER and the ET leader within the time frame as agreed by the ER.

***Contractor's Environmental Team Leader (Contractor's ET Leader)***

1.4.10 The Contractor's ET leader shall have relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the Engineer. The Contractor's ET leader will be responsible for:

- (a) reviewing the EIA final report and the detailed designs to ensure that the EIA recommendations and any other measures identified during the reviews are incorporated into the designs;
- (b) ensuring that the contracts, licences and detailed designs of the MOS Rail incorporate the measures recommended in the EIA report;
- (c) checking that timely implementation of mitigation measures identified in the EIA final report occurs;
- (d) examining Contractors' rolling works programmes, method statements, licence application and other relevant documentation so as to ensure the best practice would be implemented to generate no unacceptable impacts to the established guidelines/standards;
- (e) identifying any potential unanticipated or greater than expected impacts;
- (f) formulating any necessary preventative or remedial measures to be actioned for these potential impacts;
- (g) liaising with the Engineer(s), and Contractors on environmental considerations both regularly and as necessary;
- (h) undertaking environmental site inspection and audit both regularly and on ad-hoc basis at a frequency appropriate to the intensity of the works;
- (i) approval of the appointment and the direction of the ET and supervising the ET;
- (j) reviewing the monitoring data produced taking into account any factors which may influence these data;
- (k) interpreting the reviewed data with reference to AL levels and baseline and control data;
- (l) ascertaining whether any extraneous activities, unrelated to the construction work on the site, may have influenced the data. Cumulative impacts from nearby construction works should be considered;
- (m) implementing event/action plans when exceedances of AL levels or complaints occur;

- (n) liaising and consulting with all relevant parties during the implementation of action plans;
- (o) establishing the A/L levels of water quality and Action Level of air quality;
- (p) reviewing the EM&A programme after the collection and analysis of the baseline data. Modifying the EM&A programme in terms of parameters, sites, sample sizes, frequency etc. if appropriate in consultation with the Independent Environmental Checker (IEC), Engineer, EPD and Client;
- (q) modifying the EM&A programme in consultation with the ER(s), EPD and AFD if necessary throughout the period of Works;
- (r) producing and circulating reports:
  - on a regular basis as required in Section 6 of this manual;
  - when action plans are implemented;
  - when responding to public complaints; and
- (s) implementing the complaints procedures.

***Independent Environmental Checker (IEC)***

- 1.4.11 The Client shall employ an IEC before the commencement of construction of the MOS Rail. The IEC shall have at least 7 years experience in EM&A or environmental management.
- 1.4.12 The IEC shall audit the overall EM&A programme including the implementation of all environmental mitigation measures, submissions relating to EM&A, and any other submission required under the Environmental Permit.
- 1.4.13 In addition, the IEC shall be responsible for verifying the environmental acceptability of permanent and temporary works, relevant design plans and submissions under the Environmental Permit.
- 1.4.14 Appropriate resources shall also be allocated under the ER to fulfil their duties specified in this manual.
- 1.4.15 Implement and maintain the Electronic Environmental Management System (EEMS) to all contract packages.

- 1.4.16 Arrange and conduct monthly general site inspections of the different works areas along the MOS alignment.
- 1.4.17 Ensure that impact monitoring is conducted at the correct locations at the correct frequency as identified in this Manual.
- 1.4.18 Report the findings of the site inspections and other environmental performance reviews to the Client and the EPD.
- 1.4.19 The IEC shall also prepare the following information for inclusion into the monthly EM&A reports:
  - (a) summary of site audit observations and results
  - (b) comments and/or recommendations
  - (c) areas of concern
  - (d) verification and certification of the report

## **1.5 Construction Programme**

- 1.5.1 Summary of the construction programme assumed in the EIA study final report is presented in Figure 1.3. This tentative programme is for information of the Contractor's ET leader to get an initial idea of the projection of the works. The Contractor's ET leader shall make reference to the actual works progress and programme during the construction stage to schedule the EM&A works, and the Contractor shall provide the respective information to the Contractor's ET leader for formulating the EM&A schedule.

## **2. AIR QUALITY**

### **2.1 Introduction**

- 2.1.1 Along the proposed alignment of the MOS Rail, the area is predominantly urban with the majority of land uses in the vicinity of the work sites being residential, recreational and institutional. The main sources of pollutants are the traffic on existing roads and highways.

### *Air Sensitive Receivers*

- 2.1.2 Within 500 m either side and along the full stretch of the proposed MOS Rail, domestic premises, hotels, hostels, hospitals, clinics, nurseries, temporary housing accommodation, schools, educational institutions, offices, factories, shops, shopping centres, place of public worship, libraries, courts of law, sports stadium or performing arts centres have been considered in the EIA as Air Sensitive Receivers (ASRs). Details of the ASRs can be found from Table 3.3a of Annex A1 and Figures 3.3a-r of Annex 2 of the EIA Volume 2 – Technical Annexes. These are reproduced in Figures 2.2a-g of this report.
- 2.1.3 Dust monitoring is required to be carried out during the construction period.
- 2.1.4 No operational air quality impacts have been predicted, therefore, no EM&A relating to air quality is required for the operational phase.

## **2.2 Air Quality Parameters**

- 2.2.1 The impact of fugitive dust on ambient air pollution depends on the quantity and the drift potential of the dust particles injected into the atmosphere. Large dust particles will settle out near the source and particles that are 30-100 µm in diameter are likely to undergo impeded settling. These particles, depending on the extent of atmospheric turbulence, would settle within a distance of 100 m from the source. The main dust impact will arise from fine particles of a diameter less than 30 µm, measured as Total Suspended Particulates (TSP), dispersed over greater distances from the sources. Monitoring and audit of the TSP levels shall therefore be carried out by the ET to ensure that any deteriorating air quality could be readily detected and timely action taken to rectify the situation.
- 2.2.2 24-hour TSP levels shall be measured by following the standard high volume sampling (HVS) method as set out in the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B.
- 2.2.3 Due to the lengthy delay between sampling time and result availability for 24-hour sampling, 1-hour TSP sampling should also be conducted. 1-hour TSP levels, while assessed under different criteria, are considered to be indicative of forthcoming 24-hour results conducted on the same day. In this way expedient remedial actions, should they be required, may be undertaken based on the 1-hour data, before the 24-hour results become available.

- 2.2.4 1-hour sampling, providing real time airborne particulate measurement, can be undertaken using a direct reading dust meter. Despite the advantages of using a real time monitor to measure particulate concentrations such as in response to dust complaints, results are not comparable with 24-hour HVS data. Therefore, if the use of a direct reading monitor is agreed for 1-hour TSP sampling both baseline and impact monitoring must be carried out by the direct reading method.
- 2.2.5 No comparisons between direct reading and HVS data shall be attempted except that, where the direct reading method for 1-hour TSP sampling is used, the measured TSP concentrations shall be regarded as indicative of the 24-hour TSP results and the actions specified in the following section shall be implemented.
- 2.2.6 All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, and other special phenomena and work progress of the concerned site etc. shall be recorded down in details. A sample data sheet is shown in Figure 2.1.

### **2.3 Monitoring Equipment**

- 2.3.1 High volume sampler (HVS) in compliance with the following specifications shall be used for carrying out the 1-hr and 24-hr TSP monitoring:
- (a) 0.6-1.7 m<sup>3</sup>/min (20-60 SCFM) adjustable flow range;
  - (b) equipped with a timing/control device with +/- 5 minutes accuracy for 24 hours operation;
  - (c) installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
  - (d) capable of providing a minimum exposed area of 406 cm<sup>2</sup> (63 in<sup>2</sup>);
  - (e) flow control accuracy: +/- 2.5% deviation over 24-hr sampling period;
  - (f) equipped with a shelter to protect the filter and sampler;
  - (g) incorporated with an electronic mass flow rate controller or other equivalent devices;

- (h) equipped with a flow recorder for continuous monitoring;
- (i) provided with a peaked roof inlet;
- (j) incorporated with a manometer;
- (k) able to hold and seal the filter paper to the sampler housing at horizontal position;
- (l) easy to change the filter; and
- (m) capable of operating continuously for 24-hr period.

2.3.2 The Contractor's ET leader is responsible for provision of the monitoring equipment. He shall ensure that sufficient number of HVSs with an appropriate calibration kit are available for carrying out any baseline checks, regular impact monitoring and ad hoc monitoring. The HVSs shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals. All the equipment, calibration kit, filter papers, etc. shall be clearly labelled.

2.3.3 Initial calibration of dust monitoring equipment shall be conducted upon installation and thereafter at bi-monthly intervals. The transfer standard shall be traceable to the internationally recognised primary standard and be calibrated annually. The calibration data shall be properly documented for future reference. All the data should be converted into standard temperature and pressure condition.

2.3.4 The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded down in the data sheet as mentioned in Section 2.2.6.

2.3.5 If the Contractor's ET leader proposes to use a direct reading dust meter to measure 1-hr TSP levels, he shall submit sufficient information to the ER to prove that the instrument is capable of achieving a comparable result as that the HVS and may be used for the 1-hr sampling. The instrument should also be calibrated regularly, and the 1-hr sampling shall be determined periodically by HVS to check the validity and accuracy of the results measured by direct reading method.



- 2.3.6 Wind data monitoring equipment shall also be provided and set up at conspicuous locations for logging wind speed and wind direction near to the dust monitoring locations. The equipment installation location shall be proposed by the Contractor's ET leader and agreed with the ER. For installation and operation of wind data monitoring equipment, the following points shall be observed:
- (a) the wind sensors should be installed on masts at an elevated level 10m above ground so that they are clear of obstructions or turbulence caused by the buildings;
  - (b) the wind data should be captured by a data logger and to be downloaded for processing at least once a month;
  - (c) the wind data monitoring equipment should be re-calibrated at least once every six months; and
  - (d) wind direction should be divided into 16 sectors of 22.5 degrees each.
- 2.3.7 In exceptional situations, the Contractor's ET leader may propose alternative methods to obtain representative wind data upon approval from the ER and agreement from EPD.
- 2.3.8 Due to the lengthy delay between sampling time and result availability for 24-hour sampling, 1-hour TSP sampling should also be conducted. 1-hour TSP levels, while assessed under different criteria, are considered to be indicative of forthcoming 24-hour results conducted on the same day. In this way expedient remedial actions, should they be required, may be undertaken based on the 1-hour data, before the 24-hour results become available.
- 2.3.9 1-hour sampling, providing real time airborne particulate measurement, can be undertaken using a direct reading dust meter. Despite the advantages of using a real time monitor to measure particulate concentrations such as in response to dust complaints, results are not comparable with 24-hour HVS data. Therefore, if the use of a direct reading monitor is agreed for 1-hour TSP sampling both baseline and impact monitoring must be carried out by the direct reading method.
- 2.3.10 No comparisons between direct reading and physically measured (HVS) data will be attempted except that, where the direct reading method for 1-hour TSP sampling is used, the measured TSP concentrations shall be regarded as indicative of the 24-hour TSP results and the actions specified in the following section shall be implemented.
-

## **2.4 Laboratory Measurement/Analysis**

- 2.4.1 A clean laboratory with constant temperature and humidity control, and equipped with necessary measuring and conditioning instruments, to handle the dust samples collected, shall be available for sample analysis, and equipment calibration and maintenance. The laboratory should be HOKLAS accredited.
- 2.4.2 If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the ER and the measurement procedures shall be witnessed by the ER. The Contractor's ET leader shall provide the ER with one copy of the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his reference.
- 2.4.3 Filter paper of size 8"x10" shall be labelled before sampling. It shall be a clean filter paper with no pin holes, and shall be conditioned in a humidity controlled chamber for over 24-hr and be pre-weighed before use for the sampling.
- 2.4.4 After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper is then returned to the laboratory for reconditioning in the humidity controlled chamber followed by accurate weighing by an electronic balance with a readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.
- 2.4.5 All the collected samples shall be kept in a good condition for 6 months before disposal.

## **2.5 Monitoring Locations**

- 2.5.1 The dust monitoring locations are shown in Table 2.1 and Figure 2.2 a-g. The status and locations of dust sensitive receivers may change after issuing this manual. If such cases exist, the Contractor's ET leader shall propose updated monitoring locations and seek approval from ER and agreement from EPD on the proposal.

**Table 2.1  
Location of Air Quality Monitoring Stations**

<b>Air Monitoring Station</b>	<b>Description</b>	<b>Detail of Location</b>
AM1	Grandway Garden, Block 2	Podium of Grandway Garden, Block 2 facing Tsuen Nam Road
AM2	Shek Fai House, Chun Shek Estate	G/F (Plant House), Shek Fai House, Chun Shek Estate, facing Che Kung Mun Road
AM3	Pok Yat House, Pok Hong Estate	Podium of Pok Yat House, Pok Hong Estate, facing Sha Kok Street
AM4	Yau Kam Yuen Prevocational School	Roof of school (on the 6th floor) facing Chap Wai Kon Road
AM5	Siu Lek Yuen Road Playground	Roof of the Pump House
AM6	Kam Tai Court Block J (WIP)	No sensitive receiver has been resided at the monitoring station as construction works were in progress
AM7	Chinese YMCA College	Roof of school (on the 6th floor), facing Sai Sha Road
AM8	Ma On Shan Centre Block 1	Podium of Ma On Shan Centre, facing Sai Sha Road
AM9	Rest Garden at Lee On Estate	Rest Garden at Lee On Estate, facing Sai Sha Road

2.5.2 When alternative monitoring locations are proposed, the following criteria, as far as practicable, should be followed:

- (a) at the site boundary or such locations close to the major dust emission source;
- (b) close to the sensitive receptors; and
- (c) take into account the prevailing meteorological conditions.

2.5.3 The Contractor's ET leader shall agree with the ER on the position of the HVS for installation of the monitoring equipment. When positioning the samplers, the following points shall be noted:

- (a) a horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
- (b) no two samplers should be placed less than 2 metres apart;

- (c) the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
- (d) a minimum of 2 metres separation from walls, parapets and penthouses is required for rooftop samplers;
- (e) a minimum of 2 metres separation from any supporting structure, measured horizontally is required;
- (f) no furnace or incinerator flue is nearby;
- (g) airflow around the sampler is unrestricted;
- (h) the sampler is more than 20 metres from the dripline;
- (i) any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;
- (j) permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- (k) a secured supply of electricity is needed to operate the samplers.

## 2.6 **Baseline Monitoring**

- 2.6.1 Baseline monitoring shall 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 TSP samples. 1-hr sampling shall also be done at least 3 times per day while the highest dust impact is expected.
- 2.6.2 During the baseline monitoring, there should not be any construction or dust generation activities in the vicinity of the monitoring stations.
- 2.6.3 In case the baseline monitoring cannot be carried out at the designated monitoring locations during the baseline monitoring period, it should be carried out at alternative locations which can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations shall be approved with EPD.

2.6.4 In exceptional case, when insufficient baseline monitoring data or questionable results are obtained, agreement with EPD should be sought on an appropriate set of data to be used as a baseline reference.

2.6.5 Ambient conditions may vary seasonally and shall be reviewed at three monthly intervals. If the ER or Contractor's ET leader considers that the ambient conditions have been changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring should be at times when the contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, should be revised. The revised baseline levels and air quality criteria should be agreed with EPD.

## 2.7 **Impact Monitoring**

2.7.1 The Contractor's ET leader shall carry out impact monitoring during the course of the Works. For regular impact monitoring, the sampling frequency of once in every six-days shall be performed at all designated monitoring stations for 24-hr TSP monitoring. For 1-hr TSP monitoring, the sampling frequency of three times in every six-days should be undertaken when the highest dust impact occurs.

2.7.2 The specific time to start and stop the 24-hr TSP monitoring shall be clearly defined for each location and be strictly followed by the operator.

2.7.3 In case of non-compliance with the air quality criteria, more frequent monitoring exercise, as specified in the Action Plan in Section 2.8, shall be conducted within 24 hours after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified.

## 2.8 **Event and Action Plan for Air Quality**

2.8.1 The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The Contractor's ET leader shall compare the impact monitoring results with air quality criteria set up for 24-hour TSP and 1-hour TSP. Table 2.2 shows the air quality criteria and Action and Limit levels to be used. Should non-compliance of the air quality criteria occur, the Contractor's ET, the ER and the Contractor shall undertake the relevant action in accordance with the Action Plan in Table 2.3.

**Table 2.2 Action and Limit Levels for Air Quality**

Parameters	Action		Limit
	Criteria		
24-Hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level < 108 $\mu\text{g}/\text{m}^3$ , Action level = average of baseline level plus 30% and Limit level For baseline level > 108 $\mu\text{g}/\text{m}^3$ and baseline level < 154 $\mu\text{g}/\text{m}^3$ , Action level = 200 $\mu\text{g}/\text{m}^3$ For baseline level > 154 $\mu\text{g}/\text{m}^3$ , Action level = 130% of baseline level		260
1-Hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level < 154 $\mu\text{g}/\text{m}^3$ , Action level = average of baseline level plus 30% and Limit level For baseline level > 154 $\mu\text{g}/\text{m}^3$ and baseline level < 269 $\mu\text{g}/\text{m}^3$ , Action level = 350 $\mu\text{g}/\text{m}^3$ For baseline level > 269 $\mu\text{g}/\text{m}^3$ , Action level = 130% of baseline level		500

Table 2.3 Event/Action Plan for Air Quality

EVENT LEVEL	ACTION			Contractor
	Contractor's ET leader	IEC	ER	
<p>1. Exceedance for one sample</p> <p>2. Exceedance for two or more consecutive samples</p>	<p>1. Identify source</p> <p>2. Inform IEC, ER and Contractor</p> <p>3. Repeat measurement to confirm findings</p> <p>4. Increase monitoring frequency to daily</p> <p>1. Identify source</p> <p>2. Inform IEC, ER and Contractor</p> <p>3. Repeat measurement to confirm findings</p> <p>4. Increase monitoring frequency to daily</p> <p>5. Discuss with IEC, Contractor and ER on remedial actions required</p> <p>6. If exceedance continue, arrange meeting with IEC, ER and Contractor</p> <p>7. If exceedance stops, cease additional monitoring</p>	<p>1. Check monitoring data submitted by Contractor's ET leader</p> <p>2. Check Contractor's working method</p> <p>1. Checking monitoring data submitted by Contractor's ET leader.</p> <p>2. Check Contractor's working method</p> <p>3. Discuss with Contractor's ET leader and Contractor on possible remedial measures</p> <p>4. Advise the ER on the effectiveness of the proposed remedial measures</p> <p>5. Supervise implementation of remedial measures</p>	<p>1. Notify Contractor</p> <p>1. Confirm receipt of notification of failure in writing</p> <p>2. Notify Contractor</p> <p>3. Ensure remedial measures properly implemented</p>	<p>1. Rectify any unacceptable practice</p> <p>2. Amend working methods if appropriate</p> <p>1. Submit proposals for remedial actions to IEC and ER within 3 working days of notification</p> <p>2. Implement the agreed proposals</p> <p>3. Amend proposal if appropriate</p>
<p>1. Exceedance for one sample</p> <p>2. Exceedance for two or more consecutive samples</p>	<p>1. Identify source</p> <p>2. Inform IEC, ER, EPD and Contractor</p> <p>3. Repeat measurement to confirm findings</p> <p>4. Increase monitoring frequency to daily</p> <p>5. Assess effectiveness of Contractor's remedial actions and kept IEC, EPD and ER informed of the results</p> <p>1. Notify IEC, ER, Contractor and EPD</p> <p>2. Identify source</p> <p>3. Repeat measurement to confirm findings</p> <p>4. Increase monitoring frequency to daily</p> <p>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented</p> <p>6. Arrange meeting with IEC, Contractor and ER to discuss the remedial actions to be taken</p> <p>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results</p> <p>8. If exceedance stops, cease additional monitoring</p>	<p>1. Check monitoring data submitted by Contractor's ET leader</p> <p>2. Check Contractor's working method</p> <p>3. Discuss with Contractor's ET leader and Contractor on possible remedial measures</p> <p>4. Advise the ER on the effectiveness of the proposed remedial measures</p> <p>5. Audit implementation of remedial measures</p> <p>1. Discuss amongst ER, Contractor's ET leader and Contractor on the potential remedial actions</p> <p>2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly</p> <p>3. Audit the implementation of remedial measures</p>	<p>1. Confirm receipt of notification of failure in writing</p> <p>2. Notify Contractor</p> <p>3. Ensure remedial measures properly implemented</p> <p>1. Confirm receipt of notification of failure in writing</p> <p>2. Notify Contractor</p> <p>3. In consultation with IEC, agree with the Contractor on the remedial measures to be implemented</p> <p>4. Ensure remedial measures properly implemented</p> <p>5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</p>	<p>1. Take immediate action to avoid for the exceedance</p> <p>2. Submit proposals for remedial actions to IEC and ER within 3 working days of notification</p> <p>3. Amend proposal if appropriate</p> <p>1. Take immediate action to avoid for the exceedance</p> <p>2. Submit proposals for remedial actions to IEC and ER within 3 working days of notification</p> <p>3. Implement the agreed proposals</p> <p>4. Resubmit proposals if problem still not under control</p> <p>5. Stop the relevant portion of works as determined by the ER until the exceedance is abate.</p>
<p>1. Exceedance for one sample</p> <p>2. Exceedance for two or more consecutive samples</p>	<p>1. Identify source</p> <p>2. Inform IEC, ER, EPD and Contractor</p> <p>3. Repeat measurement to confirm findings</p> <p>4. Increase monitoring frequency to daily</p> <p>5. Assess effectiveness of Contractor's remedial actions and kept IEC, EPD and ER informed of the results</p> <p>1. Notify IEC, ER, Contractor and EPD</p> <p>2. Identify source</p> <p>3. Repeat measurement to confirm findings</p> <p>4. Increase monitoring frequency to daily</p> <p>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented</p> <p>6. Arrange meeting with IEC, Contractor and ER to discuss the remedial actions to be taken</p> <p>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results</p> <p>8. If exceedance stops, cease additional monitoring</p>	<p>1. Check monitoring data submitted by Contractor's ET leader</p> <p>2. Check Contractor's working method</p> <p>3. Discuss with Contractor's ET leader and Contractor on possible remedial measures</p> <p>4. Advise the ER on the effectiveness of the proposed remedial measures</p> <p>5. Audit implementation of remedial measures</p> <p>1. Discuss amongst ER, Contractor's ET leader and Contractor on the potential remedial actions</p> <p>2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly</p> <p>3. Audit the implementation of remedial measures</p>	<p>1. Confirm receipt of notification of failure in writing</p> <p>2. Notify Contractor</p> <p>3. Ensure remedial measures properly implemented</p> <p>1. Confirm receipt of notification of failure in writing</p> <p>2. Notify Contractor</p> <p>3. In consultation with IEC, agree with the Contractor on the remedial measures to be implemented</p> <p>4. Ensure remedial measures properly implemented</p> <p>5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</p>	<p>1. Take immediate action to avoid for the exceedance</p> <p>2. Submit proposals for remedial actions to IEC and ER within 3 working days of notification</p> <p>3. Amend proposal if appropriate</p> <p>1. Take immediate action to avoid for the exceedance</p> <p>2. Submit proposals for remedial actions to IEC and ER within 3 working days of notification</p> <p>3. Implement the agreed proposals</p> <p>4. Resubmit proposals if problem still not under control</p> <p>5. Stop the relevant portion of works as determined by the ER until the exceedance is abate.</p>

## 2.9 Dust Mitigation Measures

2.9.1 The EIA report has recommended dust control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures. The suggested dust control/mitigation measures are described below.

2.9.2 Standard dust suppression measures specified in the *Air Pollution Control (Construction Dust) Regulations* should be incorporated into contract documents and adopted as part of good site practices to minimise potential dust impacts on the ASRs. The following measures should be implemented in order to reduce dust generation:

- (a) the areas at which demolition works are to take place should be sprayed with water or dust suppressing chemicals immediately upon commencing the works and at regular intervals throughout the duration of the demolition works in order to ensure that the entire surface of the works is maintained in a damp condition;
- (b) all demolished items that have the potential to emit dust particles should be covered entirely with impervious sheeting or placed in an area sheltered on the top and the 3 sides within a day of demolition;
- (c) any excavated material which may potentially emit dust should be covered entirely by impervious sheeting or sprayed with water so as to maintain it in a damp condition;
- (d) vehicle washing facilities should be provided at every exit point, and mechanisms put in place to ensure that they are used effectively;
- (e) where a site boundary adjoins a road, street, service lane or other area accessible to the public, hoarding of not less than 2.4 m above ground level should be provided along the entire length of that portion of the site boundary except for any site entrances or exits;
- (f) every main haul road should be sprayed with water or a dust suppressing chemical so as to maintain the entire road surface in a damp condition; and
- (g) all dusty materials should be sprayed with water or a dust suppression chemical immediately prior to any loading, unloading or transfer operation so as to maintain the dust materials in a damp condition.



- 2.9.3 In addition to the above, the following control measures, recommended under the *Best Practicable Means Requirements for Cement Work (Concrete Batching Plant)* should also be incorporated into the contract documents to prevent fugitive dust emission:
- (a) every stockpile of cement or dry pulverised fuel ash shall be covered entirely by impervious sheeting;
  - (b) all receiving hoppers for unloading materials shall be enclosed on 3 sides up to 3 m above the unloading point;
  - (c) cement or dry pulverised fuel ash delivered in bulk shall be stored in a closed silo fitted with an audible high level alarm which is interlocked with the material filling line to warn of over-filling;
  - (d) silo used for the storage of cement or dry pulverised fuel ash shall not be overfilled;
  - (e) the loading, unloading, handling, transfer or storage of dusty materials should be carried out in such a manner to minimise dust emissions and in an enclosed system of facility;
  - (f) any vent or exhaust shall be fitted with an effective fabric filter;
  - (g) the belt conveyor should be enclosed on the top and on 2 sides with a metal board at the bottom to eliminate any dust emission due to wind-whipping effects;
  - (h) all conveyor transfer points should be totally enclosed;
  - (i) the filter bags in the cement silo dust collector must be thoroughly shaken after cement is blown into the silo to ensure adequate dust collection for subsequent loads;
  - (j) for dry mix batching, the truck batching aperture shall be shrouded and fitted with water suppression sprays; and
  - (k) vents of all silos and weighing scale shall be fitted with a fabric filtering system.

- 2.9.4 Should any dredged or excavated materials be odorous, the following mitigation measures are recommended to minimise odour nuisance at nearby ASRs:
- (a) the odorous material should be removed within one day to reduce the amount of time available for decomposition; and
  - (b) the odorous materials should be covered with plastic tarpaulin sheets in the stockpile area.
- 2.9.5 If the above measures are not sufficient to restore the air quality to acceptable levels upon the advice of Contractor's ET leader, the Contractor shall liaise with the Contractor's ET leader on some other mitigation measures, endorsed by IEC and propose to ER for approval, and implement the mitigation measures.

### **3. NOISE**

#### **3.1 Introduction**

- 3.1.1 The Environmental Impact Assessment had identified a number of Representative Noise Sensitive Receivers likely to be affected by either construction, operation or maintenance of this noise.
- 3.1.2 A noise monitoring and audit programme is specified in the following sections throughout the construction phase and the first year of operation phase. There is enhanced programme for certain noise sensitive receivers with high residual noise impact. Both the maintenance of rails and operational noise will be monitored. Termination of the maintenance and operational noise monitoring shall be determined on the following basis and subject to the approval by EPD:
- (a) insignificant environmental impacts of the MOS Rail operation and maintenance;
  - (b) trends analysis to demonstrate the narrow down of exceedance due to operation and maintenance of the MOS Rail and return of ambient environmental conditions in comparison with baseline data, EIA predicted noise levels or approved adjusted maintenance noise levels;
  - (c) no environmental complaint and prosecution involved.

- 3.1.3 Additional monitoring is stipulated at educational institutes predicted to have residual construction noise impact during examination period.
- 3.1.4 Alternative locations in case the monitoring location is already mitigated with indirect technical measures are also stipulated.
- 3.1.5 The Contractor is required to submit review document to propose ways to further minimize the construction noise impact at least six weeks before commencement of works at NSRs included in the Enhanced EM&A Programme.
- 3.1.6 Notwithstanding the monitoring and audit requirements in this EM&A Manual, the Contractor may be required to undertake additional noise monitoring by EPD in connection to CNP application.

### **3.2 Noise Parameters**

- 3.2.1 The construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level (Leq). Leq(30 min) as six consecutive Leq (5 min) shall be used as the monitoring parameter for the time period between 0700-1900 hours on normal weekdays. For all other time periods, Leq(15 min) as three consecutive Leq(5 min) results shall be employed for comparison with the NCO criteria.
- 3.2.2 As supplementary information for data auditing, statistical results such as  $L_{10}$ ,  $L_{90}$  and  $L_{max}$  shall also be obtained for reference.  $L_{max}$  levels are only measured during operation/maintenance monitoring. A sample data record sheet is shown in Figure 3.1 for reference.

### **3.3 Monitoring Equipment**

- 3.3.1 As referred to in the Technical Memorandum (TM) issued under the Noise Control Ordinance (NCO), sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration level from before and after the noise measurement agree to within 1.0 dB.

3.3.2 Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding  $5\text{ms}^{-1}$  or wind with gusts exceeding  $10\text{ms}^{-1}$ . The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

3.3.3 The Contractor's ET leader is responsible for the provision of the monitoring equipment. He shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

### 3.4 **Construction Noise**

The following sections describe the construction phase of the monitoring and audit programme for noise.

#### 3.4.1 Monitoring Stations

3.4.1.1 The locations of regular noise monitoring stations is shown in Table 3.1 and Figure 2.2a-g. In case works is required for restricted hours, monitoring locations may also include those relevant to the application of Construction Noise Permit (CNPs) as advised by EPD.

3.4.1.2 Monitoring programme for educational establishments listed in Tables 3.1 and 3.2 should be timed so that when examinations are held at these schools they are always monitored in accordance with the methodology, frequency and event/action plan described in paras. 3.4.1.9 and 3.4.3.3.

3.4.1.3 An additional list of schools which are potentially affected during construction works will require monitoring during examination period. These schools are marked on Figures 2.2a-g also.

3.4.1.4 Name of the schools requiring ad hoc monitoring are listed in Table 3.3.

3.4.1.5 The status and locations of noise sensitive receivers may change after issuing this manual. If such cases exist, the Contractor's ET leader shall propose updated monitoring stations and seek approval from ER and agreement from EPD of the proposal.

**Table 3.1**  
**Regular Construction Noise Monitoring Stations**

Noise Monitoring Station	Location
NM2 (OA)	Sha Tin Tsung Tsin Secondary School & Ng Yuk Sec. School
NM3	Lei Uk Tsuen No. 11-15
NM4	Shek Yuk House, Chun Shek Estate
NM5 (OA)	Tin Ka Ping Salvation Army Primary School
NM6	Pok Tai House, Pok Hong Estate
NM7 (OA)	Caritus H.W. Lee Care & Attention Centre
NM8	Yue Kwan House, Yue Tin Court
NM9 (OA)	Lam Kau Mow Secondary School
NM10 (OA)	Ma On Shan Tsung Tsin Secondary School
NM11a	Proposed Residential Development in Area 90B in Ma On Shan
NM13	St. Francis Church
NM14	Sunshine City Block M
NM15	Bayshore Towers Block 3
NM16 (OA)	Caritus Ma On Shan Practical School
NM17	Lee Wing House, Lee On Estate

OA With openable windows and air conditioning.

3.4.1.6 Table 3.2 gives a list of monitoring stations for the Enhanced EM&A Programme. They are predicted to have residual noise impact after implementation of mitigation measures:

**Table 3.2**  
**Enhanced Construction Noise Monitoring Stations**

Noise Monitoring Station	Location
NM1 (OA)	Christian Alliance School
NM11b	Proposed Health and Welfare Building in Area 90B in Ma On Shan
NM12	Chinese YMCA College
NM18	Monte Vista
NSR97	Pamela Youde Child Assessment Centre/Clinic
NSR102	Yau Kam Yuen Prevocational School
NSR140	Ngan On House, Kam On Court

(OA) with openable windows and air conditioning

**Table 3.3  
Additional Schools to be Monitored Ad Hoc during Examination Period**

<b>Educational Establishments</b>	<b>Name of Educational Establishment</b>
S1	NSR43 Immaculate Heart of Mary School
S2 (OA)	NSR53 Ecclesia Bible College
S3	NSR57 Lok Sin Tong Chan Cho Chak Memorial School
S4 (OA)	NSR146 Toi Shan Association Wong Tat To Memorial School

OA with openable windows and air conditioning

NSR numbers as in EIA

- 3.4.1.7 When alternative monitoring stations are proposed, the monitoring locations should be chosen based on the following criteria:
- (a) at locations close to the major site activities which are likely to have noise impacts;
  - (b) close to the noise sensitive receivers (N.B. For the purposes of this section, any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing art centre should be considered as noise sensitive receiver); and
  - (c) for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.
- 3.4.1.8 The monitoring station shall normally be at a point 1m from the exterior of the sensitive receivers building facade and be at a position 1.2m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3dB(A) shall be made to the free field measurements.
- 3.4.1.9 The Contractor's ET leader shall agree with the ER on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

3.4.1.10 In case the monitoring location's windows are normally closed and operate their air condition units, or has fixed windows and operate air conditioning units, alternative locations shall be sought, bearing in mind the criteria listed in Section 3.4.1.7.

3.4.1.11 Where examinations will take place in any school/college area not protected by conditions described above, monitoring shall take place at the school/college instead of alternative locations. This paragraph applies to Tables 3.1, 3.2 and 3.3.

#### 3.4.2 **Baseline Monitoring**

3.4.2.1 To obtain baseline results, a sound level meter and data logger should be used at each designated noise monitoring as stated in Tables 3.1 and 3.2.

3.4.2.2 At each location, baseline noise levels should be measured prior to construction of the project over one consecutive 7-day calendar week following the methodology stated in Sections 3.2 to 3.4, Leq(30 min) measurement for hours between 0700-1900, and Leq(5 min) measurement, between 1900 – 0700 shall be taken. The measurements should be computed from consecutive Leq(5 min) readings taken throughout each 24 hour period.

3.4.2.3 The survey period should be selected prior to the commencement of construction activities in order to avoid other atypical noise sources. The proper functioning of the logger shall be ensured during the monitoring period, and as a minimum, the equipment shall be inspected for a period of not less than one hour every two days to ensure its continued operation and to detail specific noise sources audible at the monitoring location. The calibration of the logger kit shall be as recommended by the manufacturer. Measurements shall be recorded to the nearest 0.1 dB.

3.4.2.4 There shall not be any construction activities in the vicinity of the stations during the baseline monitoring.

3.4.2.5 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, liaison with EPD should be sought to agree on an appropriate set of data to be used as a baseline reference.

### 3.4.3 *Impact Monitoring*

#### Regular Monitoring

3.4.3.1 Impact monitoring shall be carried out at all the designated monitoring station in Table 3.1 during construction phase of the project. The regular monitoring frequency for each station on a basis of once every six days when noise generating activities are underway is as follows:

- (a) one set of Leq (30 min) as six consecutive Leq (5 min) between 0700-1900 hours on normal weekdays.
- (b) one set of Leq (15 min) as three consecutive Leq (5 min) between 1900-2300 hours (only if construction works is carried out during these hours).
- (c) one set of Leq (15 min) as three consecutive Leq (5 min) between 2300-0700 hours of next day (only if construction works is carried out during these hours).
- (d) one set of Leq (15 min) as three consecutive Leq (5 min) between 0700-1900 hours on holidays (only when construction works of this project is going on).

The Action and Limit Levels for Regular Monitoring are given in Table 3.4 and the Event/Action Plan in Table 3.5.

#### Enhanced EM&A Monitoring

3.4.3.2 Enhanced noise monitoring, i.e. with frequency doubling those of the regular monitoring stations, at twice every six days. The locations requiring enhanced monitoring are listed in Table 3.2. The Action and Limit Levels for enhanced monitoring are also given in Table 3.4 and the relevant Event/Action Plan is Table 3.6.

#### Ad Hoc Monitoring during School Examination

3.4.3.3 For a selection of educational establishments potentially affected by the construction noise from the project, ad hoc monitoring during examination period will be provided. One set of Leq (30 min) as six consecutive Leq (5 min) shall be carried out twice a day between 0700-1900 for each day monitored. The Contractor's ET leader shall liaise with the school's personnel and the



Examination Authority to ascertain the exact dates, times and locations of all examination periods during the course of the contract. This list of schools/colleges in the ad hoc monitoring is given in Table 3.3. Again the Action/Limit Levels are given in Table 3.4, while the Event/Action Plan is also given on Table 3.6, following those actions required under Enhanced Monitoring in case of triggering Limit/Action Levels.

#### **3.4.4 *Event and Action Plan for Construction Noise Monitoring***

3.4.4.1 The Action and Limit levels for construction noise are defined in Table 3.4. During regular construction noise monitoring, if the triggering of these levels can be traced to the construction activities of this Project, actions in accordance with the Event/Action Plan in Table 3.5 for both restricted and unrestricted hours shall be carried out.

3.4.4.2 The Environmental Team (ET) is required to adjust the measured noise levels to edit out effects of background and extraneous noise levels based on the available baseline data before making comparisons with the Action and Limit levels. This will help to distinguish the background noise level (which may be different to the baseline) from the noise which could be contributed by the construction works.

3.4.4.3 To achieve this, the baseline time level at that specific time should be subtracted from measured noise level. If the result indicates that the added noise above baseline contributes more than the Limit level, then this triggers the Limit level of the Event/Action Plan. The ET is required to investigate whether this is caused by KCRC's site activities or other extraneous noise sources. If the baseline levels are higher than the Limit levels, then any exceedance of the Limit level triggers investigation of the same.

**Table 3.4  
Action and Limit Levels for Construction Noise**

	<b>Time Period</b>	<b>Action</b>	<b>Limit</b>
Normal hours	0700-1900 hrs on normal weekdays	When one documented complaint is received	75* dB(A)
Restricted hours	0700-2300 hrs on holidays; and 1900-2300 hrs on all other days		60/65/70** dB(A) or 45/50/55*** dB(A)
	2300-0700 hrs of next day		45/50/55** dB(A) or 30/35/40*** dB(A)

\* *Reduced to 70 dB(A) for schools and 65 dB(A) during school examination periods.*

\*\* *For works carried out within non Designated - Areas during restricted hours. Limit levels given here are suggestive only, given that Local Control Division of EPD will reserve the right to determine appropriate Areas Sensitively Ratings and Limit levels in the form of CNP conditoin on a case by case basis.*

\*\*\* *For works carried out within Designated Areas during restricted hours. Limit levels given here are suggestive only, given that Local Control Division of EPD will reserve the right to determine appropriate Areas Sensitively Ratings and Limit levels in the form of CNP conditions on a case by case basis. The Contractor shall obtain a copy of Technical Memorandum on Noise from Construction Work in Designated Areas for reference.*

3.4.4.4 For stations under the enhanced EM&A Programme a different approach in terms of actions after triggering the Action Level will be taken. These actions are summarized in Table 3.6.

Table 3.5 Event/Action Plan for Regular Construction Noise Monitoring

EVENT	ACTION				Contractor
	Contractor's ET Leader	IEC	ER	Contractor	
Action Level	<ol style="list-style-type: none"> <li>1. Notify IEC, Contractor and ER</li> <li>2. Carry out investigation</li> <li>3. Report the results of investigation to the IEC, Contractor and ER</li> <li>4. Discuss with the Contractor and formulate remedial measures</li> <li>5. Double monitoring frequency</li> <li>6. Check compliance to Action/Limit Levels after application of mitigation measures</li> </ol>	<ol style="list-style-type: none"> <li>1. Review the analysed results submitted by the Contractor's ET leader</li> <li>2. Review the proposed remedial measures by the Contractor and advise the ER accordingly</li> <li>3. Review the implementation of remedial measures</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of complaint in writing</li> <li>2. Notify Contractor</li> <li>3. Require Contractor to propose remedial measures for the analysed noise problem</li> <li>4. Ensure remedial measures are properly implemented</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit noise mitigation proposals to ER and IEC</li> <li>2. Implement noise mitigation proposals</li> </ol>	
Limit Level	<ol style="list-style-type: none"> <li>1. Notify IEC, ER, EPD and Contractor</li> <li>2. Identify Source</li> <li>3. Repeat measurement to confirm findings</li> <li>4. Increase monitoring frequency</li> <li>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented</li> <li>6. Inform IEC, ER and EPD the causes &amp; actions taken for the exceedances</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results</li> <li>8. If exceedance stops, cease additional monitoring</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, Contractor's ET leader and Contractor on the potential remedial actions</li> <li>2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly</li> <li>3. Audit the implementation of remedial measures</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing</li> <li>2. Notify Contractor</li> <li>3. Require Contractor to propose remedial measures for the analysed noise problem</li> <li>4. Ensure remedial measures are properly implemented</li> <li>5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance</li> <li>2. Submit proposals for remedial actions to within 3 working days of notification</li> <li>3. Implement the agreed proposals</li> <li>4. Resubmit proposals if problem still not under control</li> <li>5. Stop the relevant portion of works as determined by the ER until the exceedance is abated</li> </ol>	

**Table 3.6 Event/Action Plan for Enhanced Construction Noise Monitoring and Construction Noise Monitoring at Schools/Colleges During Examination Periods**

EVENT	ACTION			
	Contractor's ET Leader	IEC	ER	Contractor
Action Level	<ol style="list-style-type: none"> <li>1. Notify IEC, Contractor and ER within 24 hours.</li> <li>2. Investigate on site and at complainant's premise, interview complainant at time when suspected noise source is operating, taking ad hoc noise measurements at appropriate times to verify noise sources. Ad hoc monitoring to continue until noise problem is abated.</li> <li>3. Report the results of investigation to the IEC, Contractor and ER.</li> <li>4. Discuss with the Contractor and formulate remedial measures.</li> <li>5. Increase monitoring frequency to daily in order to check mitigation effectiveness, until complainant confirms at least verbally noise problem is abated.</li> <li>6. Keep record of interviews, monitoring, verbal and written correspondences with complainant.</li> </ol>	<ol style="list-style-type: none"> <li>1. Review correspondence and monitoring data to verify true causes of complainant had been identified.</li> <li>2. Review contractor's immediate actions to avoid continuing the impact and proposals for modification of working methods or equipment for effectiveness of in controlling noise problem. At source mitigations should be the preferred methods.</li> <li>3. Review the analysed results submitted by the Contractor's ET Leader.</li> <li>4. Review the proposed remedial measures by the Contractor and advise the ER accordingly.</li> <li>5. Review the implementation of remedial measures. Review records on the complaint and report actions and status in monthly EM&amp;A reports.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check adequacy of resources provide by Contractor for Environmental Team to undertake monitoring to deal with complaints.</li> <li>2. Review contractors immediate actions to discontinue impact/complaint and their alternative working methods for feasibility.</li> <li>3. Confirm receipt of notification of complaint in writing.</li> <li>4. Notify Contractor.</li> <li>5. Require Contractor to propose remedial measures for the noise problem.</li> <li>6. Ensure remedial measures are properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. To allow resources at own expenses for additional monitoring at complainant's premise and on request by ER.</li> <li>2. To propose immediate actions in reducing/modify the aspect of construction effected the complaint.</li> <li>3. Review alternative construction method to avoid causing complaints.</li> <li>4. Submit more thorough noise mitigation proposals to ER, IEC, such as alteration of construction methods abatement measures, site surveys etc.</li> <li>5. Implement noise mitigation proposals.</li> </ol>
Limit Level	<ol style="list-style-type: none"> <li>1. Notify IEC, ER, EPD and Contractor within 24 hours</li> <li>2. Identify Source</li> <li>3. Repeat measurement to confirm findings</li> <li>4. Increase monitoring frequency</li> <li>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented</li> <li>6. Inform IEC, ER and EPD the causes &amp; actions taken for the exceedances</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results</li> <li>8. If exceedance stops, cease additional monitoring</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, Contractor's ET leader and Contractor on the potential remedial actions</li> <li>2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly</li> <li>3. Audit the implementation of remedial measures</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing</li> <li>2. Notify Contractor</li> <li>3. Require Contractor to propose remedial measures for the analysed noise problem</li> <li>4. Ensure remedial measures are properly implemented</li> <li>5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance</li> <li>2. Submit proposals for remedial actions to within 3 working days of notification</li> <li>3. Implement the agreed proposals</li> <li>4. Resubmit proposals if problem still not under control</li> <li>5. Stop the relevant portion of works as determined by the ER until the exceedance is abated</li> </ol>

### 3.4.5 *Noise Mitigation Measures*

3.4.5.1 The EIA report has recommended construction noise control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures. The suggested noise control/mitigation measures are illustrated below.

3.4.5.2 The predicted noise levels in the preceding section show that construction activities are likely to give rise to adverse daytime noise impacts at most of the identified NSRs. Mitigation measures are therefore required and the following forms of mitigation have been considered:

- (a) use of good site practice to limit noise emissions at source;
- (b) use of quiet plant and working methods;
- (c) use of temporary and movable noise barriers; and
- (d) reduction in the number of plant operating in critical areas close to NSRs.

#### *Good Site Practices*

3.4.5.3 Whilst the effects are not easily quantifiable, good site practices and noise management can considerably reduce the impact of construction activities on nearby NSRs. The following measures should be followed during each phase of construction:

- (a) only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme.
- (b) Machines and plant (such as trucks) that may be intermittent use should be shut down between work periods or throttled down to a minimum;
- (c) Plant known to emit noise strongly in one direction, should, where possible, be orientated so that the noise is directed away from nearby NSRs;
- (d) Silencers or mufflers on construction equipment should be properly fitted and maintained; and
- (e) Mobile plant should be sited as far away from NSRs possible.

3.4.5.4 The noise benefits of these techniques can vary according to specific site conditions and operations, and while they would provide some attenuation, they cannot be assumed to guarantee a precise level of noise mitigation: these “good house keeping” measures will be implemented and enforced by contract administration.

*Use of Quiet Plant and Working Methods*

3.4.5.5 The use of quiet plant is identified to be a feasible solution to tackle the adverse impacts associated with the construction works. The Contractor would be able to obtain particular models of plant that are quieter than the noise levels stated in GW-TM. The benefits achievable in this way will depend on the Contractor’s chosen construction methods, and it is considered too restrictive to specify that the Contractor has to use specific models or 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 for all PME on site so that the Contractor is allowed some flexibility to select plant to suit his needs.

3.4.5.6 Quiet PME is defined as PME whose actual SWL is less than the value specified in GW-TM for the same item of plant. *Table 4.4r* provides examples of specific silenced PME which is known to be available, together with details of the corresponding SWLs of the plant as taken from the British Standard *Noise Control on Construction and Open Sites. BS 5228: Part 1:1997*. The information provided in this report regarding the SWLs of silenced equipment is for reference only. The total SWLs for each construction activity with the recommended silenced PMEs are detailed in *Annex D of Volume 2 – Technical Annexes*.

**Table 3.7**  
**Sound Power Levels for Specific Silenced PME**

PME	BS 5228	Ref. No.	SWL dB(A)	Relative Size of Power Rating (where applicable)
	Table No.			
Excavator	C3	79	101	52kW
Lorry	C7	121	98	10t
Concrete Lorry Mixer	C6	35	100	5 m <sup>3</sup>
Poker Vibrator, Hand-held	C6	32	100	-
Grader	C3	76	111	-
Roller Vibratory	C3	116	106	50kW
		115	102	9kW
Air Compressor	C7	25	98	7m <sup>3</sup> /min
Mobile Crane	C7	109	103	56kW
Loader	C3	97	105	52kW
Road Roller	C3	114	108	5kW
Concrete Pump	C6	36	106	100kW

\* Remark: BS 5228 Part 4: 1992 refers

3.4.5.7 Some of the noisiest construction activities include excavation works, placement of road base and road paving in which dump trucks have been proposed to be used. In order to reduce the level of noise emissions from these activities, lorries have been recommended, and agreed with KCRC, as a suitable replacement. In addition, mini-concrete cruncher was also recommended to substitute hand-held breaker for any concrete breaking activities in pile cap construction, excavation works for foundation and preparation of formation. It is believed that these plant substitutions can satisfy the functional and operational requirements of construction activities and at the same time, reduce the level of noise impact at nearby NSRs.

3.4.5.8 It should be noted that whilst various types of silenced equipment can be found in Hong Kong, the Noise Control Authority, when processing a CNP application, will apply the noise levels 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 on the Contractor to prove that his 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 2 to 16 dB(A) depending on the type of quiet plant selected.

*Temporary and Movable Noise Barriers*

3.4.5.9 The locations of noise barriers and enclosures are summarised in Appendix C. Movable barriers that can be located close to noisy plant can be very effective at screening NSRs from particular items of plant or noisy operations. Movable barriers of 3 to 5 m height, with a small cantilevered upper portion and skid footing can be located within a few metres of static plant and within about 5 m or more of mobile equipment such as excavator and mobile crane etc such that the line of sight is blocked by the barriers viewed from the NSRs. 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<sup>2</sup>) located close to operating PME, in order to reduce the noise impact to the surrounding sensitive uses. Certain types of PME, such as generators and compressors, can be completely screened by portable barriers giving a total noise reduction of 10 dB(A) or more.

3.4.5.10 Based on the NSR heights and site geometry, it is estimated that movable noise barriers of this type 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 the general plant types considered in this study is listed as follows:

- (a) stationary plant – 10 dB(A) screening for PME such as air compressor, water pump, generator, concrete pump, winch, bar bender, vibratory compactor and poker vibrator; and
- (b) mobile plant – 5 dB screening for PME such as excavator, loader, truck mixer, roller, mini-concrete cruncher, asphalt paver and mobile crane.

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



*Reducing the Numbers of Plant Operating in Critical Areas Close to NSRs*

3.4.5.12 In general the number of plant should be left to the choice of the Contractor so that in combination with the selection of quiet plant, any further reduction in the total plant noise level, or the site specific maximum sound power levels, as described above, can be achieved. It will be appropriate to restrict the number of operating PME within certain parts of the site that are very close to the NSRs in order to reduce the level of noise impacts. This method could be more effective for activities associated with foundation work, station box and excavation activities in which a large number of PME are anticipated, but not all of them would be utilised at the same time. A noise reduction of up to 6 dB(A) could be achieved if the number of PME used on site is reduced to one, as estimated from the predicted values.

*Assessment of Construction Noise with Mitigation Measures*

3.4.5.13 Without mitigation measures, construction activities associated with the MOS Rail are predicted to cause exceedances of the 75 dB(A) and 70dB(A) limits at most of the NSRs. In addition to the use of good site practice, three mitigation packages, as outlined below have been reviewed and considered in this EIA Study to develop the required control measures for tackling the predicted noise impacts:

- M1 – Use of Quiet/Silenced PMEs;
- M2 – M1 with the use of temporary noise barriers; and
- M3 – M2 with reduction in the number of operating PME.

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

3.4.5.15 The noise levels with the implementation of the proposed mitigation measures have been predicted and investigated. The predicted mitigated noise levels are described below and the results are shown in the EIA Report Volume II Annex E. Other NSRs within this section would be protected with Mitigation Package M1 (use of quiet plant) for viaduct construction, station construction, road improvement works and footbridge construction. To address the cumulative noise

impacts during the construction phase of the Project, avoidance of simultaneous construction activities near the schools are recommended together with the proposed control measures.

Hin Keng to Tai Wai

3.4.5.16 Potential adverse noise impacts associated with the at-grade alignment construction, viaduct construction, station construction, footbridge and subway construction and road improvement works in this section can, in most cases, be controlled with the use of quiet plant (Mitigation Package M1). For the works close to Christian Alliance School, such as at-grade alignment construction and construction of box culvert. Mitigation Package M2 is required in order to reduce the predicted noise impact.

3.4.5.17 Residual cumulative noise impacts of up to 3 dB(A) have been predicted at Christian Alliance School (NSR 21), even with the implementation of Mitigation Package M3. These impacts can be eliminated by avoiding simultaneous activities associated with the construction of the proposed box culvert, the proposed station and the road improvement works in the vicinity of this NSR.

3.4.5.18 Site inspection has revealed that this school has already been provided with steel-framed openable window glazing and air-conditioning units. It is considered that with this configuration and with the windows kept closed during the Project's construction phase, a noise reduction and with the windows kept closed during the Project's construction phase, a noise reduction of about 10 dB(A) can be achieved, insitu testing will be undertaken to ensure adequate glazing provision to the school. However, mitigation measures to control noise emission from construction activities should be considered at the first place and employed on-site in order to reduce the potential noise nuisance.

Tai Wai to Sha Tin Tau

3.4.5.19 With the implementation of Mitigation Package M1 (use of quiet plant), all the identified adverse noise impacts at nearby NSRs during viaduct construction, station construction, road improvement works, construction of box culvert and the proposed subway can be mitigated. Cumulative noise impacts previously identified can be mitigated with Mitigation Package M2 (use of quiet plant and noise barriers). Residual noise impacts at all the identified NSRs within this section are not expected with the implementation of the recommended mitigation measures.

Sha Tin Tau to Sha Kok Street

3.4.5.20 Noise impacts due to the construction of viaduct would be mitigated with the use of quiet construction equipment, noise barrier and by reducing the number of operating equipment on site (Mitigation Package M3). Mitigation Package M1 is also recommended to eliminate the noise impacts from road improvement works, construction of box culvert and subway. During the construction of station structure, Mitigation Package M2 is required, especially for the works close to Pok Hong Estate.

3.4.5.21 The predicted residual cumulative noise impacts can be mitigated by avoiding simultaneous construction activities being undertaken at work sites close to the affected NSRs through appropriate planning and scheduling of construction works. With the suggested mitigation measures in place, no residual noise impacts are likely.

Sha Kok Street to City One

3.4.5.22 Mitigation Package M2 (use of quiet plant and noise barrier) is recommended to reduce the noise arising from the construction of viaduct and station structure. Although residual noise impact was predicted at NSR 97 (Pamela Youde Child Assessment Centre/School Dental Clinic), the potential noise nuisance would be unlikely as this NSR has already been equipped with centralised air conditioning and fixed window glazing.

3.4.5.23 The use of quiet plant (Mitigation Package M1) is recommended to reduce the noise impacts from the construction of the special long span structures and the proposed footbridge. Cumulative noise impacts previously identified can be mitigated through the implementation of Mitigation Package M2. As an alternative to package M2, the cumulative noise impacts can also be eliminated by preventing simultaneous construction activities near the affected NSRs with specific mitigation measures taken in place at specific location.

City One Shatin to Shek Mun

3.4.5.24 After the implementation of Mitigation Package M3 (use of quiet plant, noise barrier and by reducing the number of operating construction equipment) for viaduct and station construction, all the predicted noise impacts at the nearby schools (NSRs 102 and 109) would be reduced to within the acceptable noise limit during daytime construction period.

3.4.5.25 Other NSRs within this section would be protected with Mitigation Package M1 (use of quiet plant) for viaduct construction, station construction, road improvement works and footbridge construction. To address the cumulative noise impacts during the construction phase of the Project, avoidance of simultaneous construction activities near the schools are recommended together with the proposed control measures.

Shek Mun to Chevalier Garden

3.4.5.26 Potential noise impacts in this section, which are predicted to result from the works associated with the alignment construction, the construction of Chevalier Garden station, the road improvement works and the subway construction works, can be controlled with the use of quiet plant and movable barriers (Mitigation Package M2). No residual noise impacts have been identified for this section.

Chevalier Garden to Heng On

3.4.5.27 For the alignment and station construction within this section of the proposed MOS Rail, the full Mitigation Package M3 (use of quiet plant, noise barrier and reducing the number of operating equipment) is required especially for the works close to NSR 142 (Chinese YMCA College). Mitigation Package M2 (use of quiet plant and noise barriers) is also required during subway construction in order to reduce the likely construction noise nuisance on the nearby sensitive uses.

3.4.5.28 After exhausting all the possible direct mitigation measures, residual noise impacts are predicted at NSR 142 and at the proposed development on Area 90B (NSR 139) during road improvement works. Due to the small buffer distances, the excavation works, levelling of road and road paving activities in road improvement works would lead to residual noise impacts at these NSRs. The expected time period of noise impacts at these NSRs would be about one to two months, dependent on the actual construction programme of the works.

3.4.5.29 Site inspection has revealed that NSR 142 is equipped with steel-framed openable window glazing only. It is therefore recommended to provide appropriate window glazing and air-conditioning units to this school, as a last resort to mitigate the noise impacts during the construction phase. For the predicted residual noise impacts at NSR 139 (1 dB(A) beyond the daytime noise standard), it is expected that the time period of the exceedance will be short, in comparison with the construction of the whole railway extension. It is believed that detailed information on construction sequence, construction method and programme will

be available after the detailed design stage and an effective Environmental Management Plan would be developed by the Contractor in order to ensure no adverse noise impacts from the works. It is the Contractor's responsibility to ensure his recommended measures are practical and at the same time can fulfill the requirement of the construction programme. The Contractor should seek to develop other alternatives or other quieter working method in order to reduce the predicted noise nuisance at this NSR.

- 3.4.5.30 The noise impacts caused by the works for the special long span viaduct would be well mitigated by using quiet/silenced equipment. To address the cumulative noise impacts during the construction phase of the Project, avoidance of simultaneously construction activities near NSRs 139, 140 and 142 are recommended.

Heng On to Ma On Shan

- 3.4.5.31 After the implementation of the Mitigated Package M2 (use of quiet plant and noise barriers) for viaduct and station construction, no residual noise impacts were predicted at the identified NSRs. Regarding the works for the road improvement and subway construction, the use of quiet plant is recommended. No residual noise impacts have been identified for this section.

Ma On Shan to Lee On

- 3.4.5.32 In order to reduce the noise impacts caused by the construction works, Mitigation Package M2 (use of quiet plant and noise barriers) is recommended for viaduct construction, station construction and the construction of footbridge. Residual noise exceedance of up to 11 dB(A) was predicted at NSR 179 (Residential Development to the East of Lee On Estate), as a result of the works associated with road improvement. Due to the small buffer distance, excavation works, levelling of road and road paving activities in the road improvement stage would lead to residual noise impact at this NSR. It is expected that the duration of the noise exceedances will be about one to two months, dependent on the actual construction programme of the works. It is believed that detailed information on construction sequence, construction method and programme will be available after the detailed design stage and an effective Environmental Management Plan would be developed by the Contractor in order to ensure no adverse noise impacts from the works. It is the Contractor's responsibility to ensure his recommended measures are practical and at the same time can fulfill the requirement of the construction programme. The Contractor should develop other alternatives or other quieter working method for these works in order to reduce the noise impact.

3.4.5.33 The Ma On Shan Health Care & Elderly Centre has already been provided with fixed window glazing and air-conditioning, noise impacts at this NSR are not expected. To address the cumulative noise impacts during the construction phase of the Project, avoidance of simultaneously construction activities near NSR 179 is recommended.

3.4.5.34 If the above measures are not sufficient to restore the construction noise quality to an acceptable levels upon the advice of Contractor's ET leader, the Contractor shall liaise with the Contractor's ET leader on some other mitigation measures, propose to ER for approval, and carry out the mitigation measures.

#### Additional Construction Noise Mitigation Measures

3.4.5.35 The Contractor is required, except for works at Lee On Station (east of Lee On Estate) of the Project, to submit to the Engineer review document to propose ways to further minimize the construction noise impact at least six weeks before commencement of works near Enhanced Monitoring locations listed in Table 3.2, due to the high residual noise impact predicted at those locations. The review document shall be submitted to EPD before commencement of works near the enhanced monitoring locations. All at-source mitigation measures shall be exhausted before considering the application of indirect enhanced measured such as fixed windows and air conditioning.

3.4.5.36 At least 4 weeks before commencement of any works at Lee On Station (east of Lee On Estate) of the Project, the Contractor shall submit 20 copies of a review document to the EPD for approval. The document shall include proposed measures to further minimize the construction noise impact, but in no circumstances construction noise impact be worse than the predictions made in Technical Annex E in the Volume II and Table 4.4bb in Volume I of the EIA Report. No such works shall commence before the approval of the document.

### **3.5 Operation and Maintenance Noise**

The following sections describe the maintenance and operation noise monitoring and audit programme.

### 3.5.1 *Operation Noise due to Train Operations*

3.5.1.1 At least four weeks before the commencement of construction of viaduct sections of the Project, the Contractor shall submit to the EPD for approval 3 copies of design drawings for the Multi-plenum System to be used on all viaduct sections of the Project, with explanatory statements. The drawings shall be verified by the IEC as conforming to the findings and recommendations of the EIA Report. The Multi-plenum System shall include the following principal mitigation measures:

- track mounted on a soft baseplate upon a floating mini slab, to reduce vibration transmission to the viaduct structure;
- a system of sound-absorptively lined cascading plena comprising an under vehicle plenum created with vehicle skirts and under walkway plena on either side of the viaduct – for twin viaducts, an additional central plenum is created with a capped central wall; and
- an edge wall provided for walkway safety which may be increased in height with additive noise barriers to further reduce airborne noise levels.

3.5.1.2 Prior to the operation of the Project, the Permit Holder shall submit to the Director for approval 3 copies of a performance test proposal to illustrate that the operation of the 8-car electric train of the Project would meet the specification of maximum levels ( $L_{max}$ ) not exceeding 82.1 dB(A) at maximum 100kph on ballasted track, and not exceeding 81.2 dB(A) at maximum 80kph on viaducts, both measured at 25m without the “Multi-plenum System” described in Section 3.5.1.1 above. The performance test proposal shall be verified by the IEC.

3.5.1.3 The following noise barriers and enclosures Table 3.8 shall be constructed and installed before the operation of the Project. Their locations are shown in Figures 3.2a-j.

**Table 3.8**  
**Noise Barriers and Enclosures**  
 (Extracted from Table 4.5h of the EIA Report and the Application VEP-031/2000)

Section between Stations	Chainage or Length	Noise Measures
Heng Keng to Tai Wai	200m	1.45m high absorptive barriers on both sides of each tail track
	250m down	4m high absorptive barrier
	160m up	2m high absorptive barrier
Tai Wai to Sha Kok Street	12,720,-,12,880 up	2m high barrier above 2.1m high parapet wall
City One to Shek Mun	14,587 – 14,717 down	Enclosure
Shek Mun to Chevalier Garden	15,860 – 16,120 down	3m high noise barrier above 2m high containment wall
Chevalier Garden to Heng On	18,565 – 18,693 down	Enclosure
Heng On to Ma On Shan	19,480 – 19,560 down	1.5m high noise barrier above 2.1m high parapet wall
Ma On Shan to Lee On	21,501 – 21,175 down	Enclosure

Notes:

- (i) barrier height is above standard viaduct parapet, or the ballast track bed, or otherwise specified in this table.
- (ii) absorptive material shall be based on Table 4.5n of the EIA Report.

*Train Operation Monitoring*

3.5.1.4 Noise monitoring is also required as part of the enhanced EM&A programme in response to public comments forwarded to EPD during public inspection of the EIA report.

Noise Parameters

3.5.1.5 During train operation hours, one set of Leq (30 min) as six consecutive Leq (5 min) shall be taken between 0700 to 2300 and the same during 2300 to 0700 respectively.  $L_{max}$  between 2300 to 0700 should also be measured. Monitoring periods should extend so far as to cover the train operation time within 2300 to 0700.

Monitoring Locations

3.5.1.6 The noise monitoring locations are shown in Table 3.9 and Figure 3.3. The land use and locations of noise sensitive receivers may change after issuing this manual. If such cases exist, the KCRC shall propose updated monitoring locations and seek approval of the proposal from EPD.



**Table 3.9  
Train Operation Noise Monitoring Stations**

Noise Monitoring Station	Location
NM19	Villa Athena Block 5, Ma On Shan
NM20	Sunshine City Block G, Ma On Shan

*Reporting of Train Operation Noise EM&A*

- 3.5.1.7 KCRC shall take over all responsibilities of the Contractor's ET leader set out in Section 8 for reporting of the Train Operation Noise EM&A.
- 3.5.1.8 KCRC shall prepare and submit the monthly, quarterly and final summary reports in accordance with the requirements set out in Section 8. KCRC shall translate, as appropriate, expressions of 'construction', 'works', 'project' or likewise implication appeared in all requirements in Section 8 for train operation carried out under the Project.
- 3.5.1.9 When alternative monitoring locations are proposed, the monitoring locations should be chosen based on the following criteria:
- (a) at locations close to the major site activities which are likely to have noise impacts;
  - (b) close to the noise sensitive receivers (N.B. For the purposes of this section, any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing art centre should be considered as noise sensitive receiver); and
  - (c) for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.
- 3.5.1.10 The monitoring station shall normally be at a point 1m from the exterior of the sensitive receivers building facade and be at a position 1.2m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3dB(A) shall be made to the free field measurements. KCRC shall agree with EPD on the monitoring position. Once the positions for the monitoring stations are chosen, the baseline monitoring and the operational monitoring shall be carried out at the same positions.

### Monitoring Equipment

3.5.1.11 The monitoring equipment requirement is given in Section 3.3.

### Baseline Monitoring

3.5.1.12 Baseline data shall be obtained prior to commencement of the MOS Rail operation, including continuous Leq (30 min) measurements between 24 hours, as Leq (5 min) readings for two 7-day weeks. The  $L_{max}$  between 2300 to 0700 shall also be measured. There should not be any operation, maintenance or construction activities within 300 m of the monitoring stations during the baseline monitoring. The construction phase shall be completed before undertaking baseline monitoring.

3.5.1.13 In exceptional cases, when alternative monitoring stations are proposed and insufficient or questionable baseline monitoring data are available, liaison with EPD should be sought to agree on an appropriate set of data to be used as a baseline reference.

### Impact Monitoring

3.5.1.14 The train operation noise monitoring should be carried out for the first year of the MOS Rail operation. Discontinuation of monitoring after first year is subject to fulfilment of conditions under Section 3.1.2.

3.5.1.15 Once every six days consecutive readings shall be taken as described in Section 3.5.1.5.

3.5.1.16 In case of non-compliance with the noise criteria, more frequent monitoring as specified in the Action Plan in Table 3.15 shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the MOS train operation.

3.5.1.17 The report of operation noise shall include adjusted noise levels accounting for difference between the worst case used as the EIA report and actual operation e.g. 8-car trains and higher frequencies of MOS Rail Operation etc. and normalised to the worst cases locations stated above.

3.5.1.18 The Action and Limit levels for train operation noise are illustrated in Table 3.10. Should non-compliance of the criteria occurs, actions in accordance with the Event/Action Plan in Table 3.15, shall be carried out.

**Table 3.10**  
**Action and Limit Levels for Train Operation Noise**

Time Period	Action Level	Limit Level*
Day (0700 to 2300 hours)	On receiving one documented complaint	(70 / 65 / 60) dB(A)
Night (2300 to 0700 hours)	On receiving one documented complaint	(60 / 55 / 50) dB(A) and $L_{max}$ (2300 - 0700) = 85 dB(A)

\* Rail Noise is under control of the Noise Control Ordinance and shall comply with Acceptable Noise Levels laid down in the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites. KCRC is required to refer to suggested Area Sensory Ratings in the EIA for train operation.

### 3.5.2 Operation Noise due to Fixed Plant

3.5.2.1 Maximum sound power levels were assigned to the various fixed operation plant during EIA as design limits. The Contractor should adhere to these design limits and KCRC's contractual requirements as design criteria for E&M equipment and rooms, in order to satisfy requirement under *Noise Control Ordinance*. Table 3.11 gives the maximum design total sound power levels for fixed equipment and plant rooms.

**Table 3.11**  
**Maximum Design Total Sound Power Levels**  
**for Fixed Equipment and Plant Room**

Fixed Plant Room Considered	Maximum Design Total Sound Power Levels (dB(A))
Feeder/Traction Station in Depot	93
Chillers within Depot	93
Wash Bay Facilities within Depot	102
Track Section Cabin	86
Station Plant, close to CHG Station	97
Station Plant, close to HEO Station	75
Feeder Substation at Li Po Chun United World College	97

### 3.5.3 *Maintenance Noise Monitoring*

#### *Vehicle Maintenance*

- 3.5.3.1 A permanent monitoring station for measuring rolling stock noise at depot shall be located inside or near the depot and shall be determined by KCRC during detailed design depending on how the maintenance and testing to be carried out within the depot for the rolling stocks.
- 3.5.3.2 Monitoring of rail maintenance is also required as part of the enhanced EM&A programme in response to public comments forwarded to EPD during public inspection of EIA report. The monitoring of rolling stock noise will be performed by KCRC as a means of establishing the noise characteristics and maintenance requirement of the rolling stocks. The purpose of this monitoring is for the study and abatement of railway operation noise rather than for compliance at potential receiver.
- 3.5.3.3 As soon as an exceedance of a reference noise level given in Table 3.12 below is detected, the fault will be diagnosed for remedial action. This may include routine wheel profiling and checking of mechanical sources and their silencing equipment.

**Table 3.12  
Maximum Permissible Free Field Rolling Stock Noise Levels**

Rolling Stock	Distance (m)	Speed (kph)	Noise Limit, $L_{max}$ , dB(A)
EMU on Ballasted Track	25	100	82.1 <sup>(1)</sup>
Locomotive on Ballasted Track	25	50	71 <sup>(1)</sup>
Flatbed Wagons on Ballasted Track	25	50	78.1 <sup>(1)</sup>
EMU Air-conditioning Unit	15	0	57 <sup>(2)</sup>

- (1) Noise levels measured in a free field condition on flat ground at a height of 1.2 m and in the absence of any screening objects and reflective surfaces. In the absence of a suitable monitoring location representative of the reference conditions, alternative procedures may be adopted to good acoustical principles.
- (2) Noise levels measured in a free field condition in the vertical axis above the train and in the absence of any screening objects and reflective surfaces. In the absence of a suitable permanent monitoring location, alternative procedures may be adopted to good acoustical principles.

*Rail Maintenance*

3.5.3.4 Periodic inspection of the track for wear and the presence of corrugation shall be undertaken by KCRC track maintenance personnel. In particular, where corrugation is detected, rail grinding will be carried out by the KCRC. Early removal of corrugation should be encouraged since long term build up will permanently alter the material structure of the rail head. The frequency for grinding will be dependent on the actual operational characteristic of the permanent way system and rolling stock. This will be determined together with the need to maintain rail head profiles for the minimisation of wear.

Noise Parameters

3.5.3.5 During rail maintenance works, a set of Leq (30 min) as six consecutive Leq (5 min) shall be taken between 0700~1900, and a set of Leq (15 min) as 3 consecutive Leq (5 min) shall be once taken between 1900~2300 and 2300~0700 respectively. Additional monitoring may be required by EPD in relation to Construction Noise Permits (CNPs) applications and during effective period of CNPs.

Monitoring Locations

3.5.3.6 The noise monitoring locations are shown in Table 3.13 and Figure 3.3. The land use and locations of noise sensitive receivers may change after issuing this manual. If such cases exist, the KCRC shall propose updated monitoring locations and seek approval of the proposal from EPD.

**Table 3.13  
Maintenance Noise Monitoring Stations**

Noise Monitoring Station	Location
NM19	Villa Athena Block 5, Ma On Shan
NM20	Sunshine City Block G, Ma On Shan

3.5.3.7 When alternative monitoring locations are proposed, the monitoring locations should be chosen based on the following criteria:

- (a) at locations close to the major site activities which are likely to have noise impacts;

- (b) close to the noise sensitive receivers (N.B. For the purposes of this section, any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing art centre should be considered as noise sensitive receiver); and
- (c) for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

3.5.3.8 The monitoring station shall normally be at a point 1m from the exterior of the sensitive receivers building facade and be at a position 1.2m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3dB(A) shall be made to the free field measurements. KCRC shall agree with EPD on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the operational monitoring shall be carried out at the same positions.

#### *Baseline Monitoring*

3.5.3.9 Baseline data shall be obtained prior to commencement of the MOS Rail operation, including continuous Leq (30 min) measurements between (0700~1900), and Leq (15 min) measurements between (1900~2300), as Leq (5 min) readings for two 7-day weeks. There should not be any operation, maintenance or construction activities within 300 m of the monitoring stations during the baseline monitoring. The construction phase shall be completed before undertaking baseline monitoring.

3.5.3.10 In exceptional cases, when alternative monitoring stations are proposed and insufficient or questionable baseline monitoring data are available, liaison with EPD should be sought to agree on an appropriate set of data to be used as a baseline reference.

#### *Impact Monitoring*

3.5.3.11 The maintenance noise monitoring should be carried out for the first year of the MOS Rail operation. Discontinuation of monitoring after first year is subject to fulfilment of conditions under Section 3.1.2.

3.5.3.12 During each rail maintenance event, if it is carried out during the day, one set of Leq (30 min) as six consecutive Leq (5 min) readings should be taken. If it is carried out during restricted hours, one set of Leq (15 min) as three consecutive Leq (5 min) readings shall be taken once between 1900~2300 and once between 2300~0700 respectively.

3.5.3.13 In case of non-compliance with the noise criteria, more frequent monitoring as specified in the Action Plan in Table 3.15 shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the MOS Rail maintenance. The reporting of noise levels shall include adjusted levels to account for difference between worst case used in EIA and actual operating conditions.

3.5.3.14 The Action and Limit levels for maintenance noise are illustrated in Table 3.14. If triggering of these levels can be traced to activities of this Project, actions in accordance with the Event/Action Plan in Table 3.15, shall be carried out.

**Table 3.14**  
**Action and Limit Levels for Rail Maintenance Noise**

Time Period	Action Level	Limit Level
Day (0700 to 1900 hours)	On receiving one documented complaint	75* dB(A)
Evening (1900 to 2300 hours)	On receiving one documented complaint	(60 / 65 / 70)** dB(A) or (45/50/55)*** dB(A)
Night (2300 to 0700 hours)	On receiving one documented complaint	(50 / 55 / 60)** dB(A) or (30/35/40)*** dB(A)

\* *Reduced to 70 dB(A) for schools and 65 dB(A) during school examination periods.*

\*\* *For works carried out within non Designated Areas during restricted hours. Limit levels given here are suggestive only, given that Local Control Division of EPD will reserve the right to determine appropriate Areas Sensitively Ratings and limit levels in the form of CNP conditions on a case by case basis.*

\*\*\* *For works carried out with Designated Areas during restricted hours. Limit levels given here are suggestive only, given that Local Control Division of EPD will reserve the right to determine appropriate Areas Sensitively Ratings and limit levels in the form of CNP conditions on a case by case basis. The Contractor should obtain a copy of Technical Memorandum on Noise from Construction Work in Designated Areas for reference.*

**Table 3.15**  
**Event/Action Plan for Train Operation and Rail Maintenance Noise**

Event	KCRC Agent
Action level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1) Identify source(s) of Impact;</li> <li>2) Inform KCRC;</li> <li>3) Repeat measurement to confirm findings;</li> <li>4) Check monitoring data, all plant, equipment and working methods;</li> <li>5) Implement mitigation measures and document the event/action and results.</li> </ol>
Action level being exceeded by more than one consecutive sampling days	<ol style="list-style-type: none"> <li>1) Identify source(s) of Impact;</li> <li>2) Inform KCRC ;</li> <li>3) Repeat measurement to confirm findings;</li> <li>4) Check monitoring data, all plant, equipment and working methods;</li> <li>5) Discuss mitigation measures with KCRC;</li> <li>6) Ensure mitigation measures are implemented and document the event/action and results;</li> <li>7) Prepare to increase the monitoring frequency to daily.</li> </ol>
Limit level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1) Identify source(s) of Impact;</li> <li>2) Inform KCRC and EPD;</li> <li>3) Repeat measurement to confirm findings;</li> <li>4) Check monitoring data, all plant, equipment and maintenance working methods;</li> <li>5) Discuss mitigation measures with KCRC;</li> <li>6) Ensure mitigation measures are implemented and document the event/action and results;</li> <li>7) Increase the monitoring frequency to daily until no exceedance of Limit Level.</li> </ol>
Limit level being exceeded by more than one consecutive sampling days	<ol style="list-style-type: none"> <li>1) Identify source(s) of Impact;</li> <li>2) Inform KCRC and EPD;</li> <li>3) Repeat in-situ measurement to confirm findings;</li> <li>4) Check monitoring data, all plant, equipment and maintenance working methods;</li> <li>5) Discuss mitigation measures with KCRC;</li> <li>6) Ensure mitigation measures are implemented and document the event/action and results;</li> <li>7) Increase the monitoring frequency to daily until no exceedance of Limit Level for two consecutive days.</li> <li>8) After implementation of steps 1)-7), if the exceedances of Limit level persist by 3 consecutive sampling days or more, KCRC should stop relevant portion of works if there is no other concern such as operations and/or safety. In which case KCRC should seek further discussions with relevant authorities.</li> <li>9) Repeat steps 1)-8) until the exceedances are abated, keeping EPD informed of the most updated situation. Only when exceedances are abated can the relevant suspended maintenance works be resumed.</li> </ol>



*Reporting of Maintenance Noise EM&A*

3.5.3.15 KCRC shall take over all responsibilities of the Contractor's ET leader set out in Section 8 for reporting of the Maintenance Noise EM&A.

3.5.3.16 KCRC shall prepare and submit the monthly, quarterly and final summary reports in accordance with the requirements set out in Section 8. KCRC shall translate, as appropriate, expressions of 'construction', 'works', 'project' or likewise implication appeared in all requirements in Section 8 for maintenance works carried out under the Project, either for the railway alignment or at depot.

#### **4. WATER QUALITY**

4.1 The alignment of the Project has changed during detailed design stage. As a result the construction of railway will no longer require dredging as all the channels traversed by the railway will be concrete box culverts.

4.2 Where piers are to be installed in the channels, cofferdam will be constructed by piling and the bore piles and piers formation will occur inside the cofferdam. Any surface or ingress water within the cofferdam will be pumped out and will be subject to the same mitigation measures for construction site runoff. The Contractor is required to avoid inadvertent release of site runoff into any water bodies at any time.

4.3 Given that the EIA has concluded that impacts of possible construction site runoff can be prevented, and the impacts of dredging will not occur, water quality monitoring programme is no longer required.

4.4 The EIA report has recommended water quality control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures. The suggested pollution control/mitigation measures are illustrated below.

4.5 Construction phase mitigation measures, in accordance with the *Practice Note for Professional Persons on Construction Site Drainage, EPD, 1994 (ProPECC PN 1/94)* include the use of sediment traps, wheel washing facilities for vehicles leaving the site, adequate maintenance of drainage systems to prevent flooding overflow, sewage collection and treatment, and comprehensive waste management (collection, handling, transportation, disposal) procedures.

- 4.6 The following sections provide details of the preventive and mitigation measures for maintaining good water quality should be observed by the Contractor during all stages of construction works of this Project.

***Construction Runoff and Drainage (Erosion Control Plan)***

- 4.7 As the start of site establishment, perimeter cut-off drains to direct off-site water around the site should be constructed and internal drainage works and erosion and sedimentation control facilities implemented. Channels, earth bunds or sand bag barriers should be provided on site to direct stormwater to silt removal facilities. The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 1/94. All the surface runoff or extracted ground water contaminated by silt and suspended solids should be collected by the on-site drainage system and diverted through the silt traps prior to discharge into foul sewer.
- 4.8 Ideally, construction works should be programmed to minimise surface excavation works during the rainy season (April to September). All exposed earth areas should be completed as soon as possible after earthworks have been completed, or alternatively, within 14 days of the cessation of earthworks where applicable. If excavation of soil cannot be avoided during the rainy season, or at any time of year when stormwaters are likely, exposed slope surfaces should be covered by tarpaulin or other means.
- 4.9 The overall slope of the site should be kept to a minimum to reduce the erosive potential of surface water flows, and all trafficked areas and access roads protected by coarse stone ballast. An additional advantage accruing from the use of crushed stone is the positive traction gained during prolonged periods of inclement weather and the reduction of surface sheet flows.
- 4.10 Sediment tanks of sufficient capacity, constructed from pre-formed individual cells in approximately 6 to 8 m<sup>3</sup> capacity, are recommended as a general mitigation measure which can be used for settling waste water prior to disposal. The system capacity is flexible and able to handle multiple inputs from a variety of sources and particularly suited to applications where the influent is pumped.
- 4.11 All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly following rainstorms. Deposited silt and grit should be removed regularly and disposed of by spreading evenly over stable, vegetated areas.

- 4.12 Measures should be taken to minimise the ingress of site drainage into excavations. If the excavation of trenches in wet periods is necessary, they should be dug and backfilled in short sections wherever practicable. Water pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.
- 4.13 Open stockpiles of construction materials (for example, aggregates, sand and fill material) of more than 50 m<sup>3</sup> should be discharged into storm drains via silt removal facilities.
- 4.14 Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris washed into the drainage system and storm runoff being directed into foul sewers.
- 4.15 Precautions to be taken at any time of year when rainstorms are likely, actions to be taken when a rainstorm is imminent or forecasted, and actions to be taken during or after rainstorms are summarised in Appendix A2 of ProPECC PN 1/94. Particular attention should be paid to the control of silty surface runoff during storm events, especially for areas located near steep slopes.
- 4.16 All vehicles and plant should be cleared before leaving a construction site to ensure no earth, mud, debris and the like is deposited by them on roads. An adequately designed and sited wheel washing bay should be provided at every site exit and wash-water should have sand and silt settled out and removed at least on a weekly basis to ensure the continued efficiency of the process. The section of access road leading to and exiting from, the wheel-wash bay to the public road should be paved with sufficient backfall toward the wheel-wash bay to prevent vehicle tracking soil and silty water to public roads and drains.
- 4.17 Oil interceptors should be provided in the drainage system and regularly emptied to prevent the release of oil 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.
- 4.18 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 temporary diverted drainage should be reinstated to the original condition when

the construction work has finished or the temporary diversion is no longer required.

#### *Drainage*

- 4.19 Although it is considered that MOS Rail works will not have a significant impact on drainage, all of the contractors employed will be required to ensure that the existing drainage arrangements will not be adversely affected during construction and that any flow from the construction site must pass through settling traps/ponds before discharge into public drains.

#### *Sewage Effluent*

- 4.20 Since there are predicted to be about 1600 construction workers working along the railway alignment simultaneously, appropriate disposal facilities in the form of chemical toilets and septic tanks will be required. Appropriate numbers of portable toilets should be provided by a licensed contractor to serve the construction workers. The contractor should also be responsible for maintenance practices and sewage disposal at an appropriate sewage disposal at an appropriate sewage treatment works.

#### *General Construction Activities*

- 4.21 Debris and rubbish on site should be collected, handled and disposed of properly to avoid entering the water column and causing water quality impacts. The waste management requirement on site to prevent such impact is detailed in *Section 6*.
- 4.22 Temporary on-site storage of excavated materials from station and depot construction works should be covered with tarpaulin or similar fabric during rainstorms. Any washout of construction or excavated materials should be diverted to the drainage system via appropriate sediment traps. Stockpiling of the excavated material can be minimised by scheduling the construction programme in a way that one section of the alignment can be constructed and completed before the excavated works of the next section commence.

#### *Residual Impact*

- 4.23 The construction activities associated with the proposed MOS Rail could lead to site runoff containing elevated concentration of SS and associated contaminants that may enter into the drains, and impact the downstream water quality and aquatic ecology along the coast of Tolo Harbour and Channel. However, with

proper implementation of the mitigation measures, all construction site discharges should comply with the TM standards of the WPCO and no residual water quality impact will result from the construction phase of the proposed development. These mitigation measures include:

- (a) implementation of an on-site drainage system, silty runoff collection facilities, and local flood prevention measures during heavy rainfall;
- (b) diversion of drainage pipes or channels is constructed to allow flow to the discharge point without overflow or washout;
- (c) reinstatement of all temporary drainage diversions to their original condition after the construction works are completed (any practical options for the diversion and re-alignment of drainage should comply with both engineering and environmental requirements); and
- (d) adequate temporary sewage collection, disposal facilities, and temporary treatment facilities to handle sewage from the construction site.

4.24 If the above measures are not sufficient to restore the water quality to an acceptable levels upon the advice of the Contractor's ET leader, the Contractor shall liaise with the Contractor's ET leader on some other mitigation measures, endorsed by IEC and propose to ER for approval, and carry out the mitigation measures.

## **5. WASTE MANAGEMENT**

- 5.1 The Contractor is responsible for waste control within the construction site, removal of the waste material produced from the site and to implement any mitigation measures to minimise waste or redress problems arising from the waste from the site. The waste material may include any sewage, waste water or effluent containing sand, cement, silt or any other suspended or dissolved material to flow from the site onto any adjoining land, storm sewer, sanitary sewer, or any waste matter or refuse to be deposited anywhere within the site or onto any adjoining land.
- 5.2 For each construction contract of TCC200, TCC300, TCC400, and TCC500 as described in Section 2.5 of the EIA Report, the Permit Holder shall submit 3 sets of Waste Management Plan (WMP) to EPD for approval at least 4 weeks before the commencement of any construction works within the respective construction contract. The Plan 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 recommended mitigation measures in Section 6.5 of the EIA Report. Such a management plan shall incorporate site specific factors, such as the designation of areas for segregation and temporary storage of reusable and recyclable materials. All measures in the approved Waste Management Plan shall be fully implemented throughout the construction period.
- 5.3 Notwithstanding requirements under Section 5.2, the Contractor is also required to observe all the recommended mitigation measures concerning waste management laid down in this Manual.
- 5.3 For the operational phase, KCRC should develop a waste management scheme for the operation of the MOS Rail which should incorporate the recommended mitigation measures of the EIA report.

### **Waste Management Hierarchy**

- 5.4 The various waste management options can be categorised in terms of preferred from an environmental viewpoint. The options considered to be preferable have the least impacts and are more sustainable in the long term, hence, the hierarchy is as follows:
- (a) avoidance and minimisation;
  - (b) reuse of materials;

- (c) recovery and recycling; and
- (d) treatment and disposal, as the last option to be considered.

5.5 The contractors should consult the Waste Disposal Authority, which is the Environmental Protection Department, for the final disposal of wastes.

5.6 The above hierarchy should be used to evaluate and select waste management options. The aim should be to minimise the amount of waste to be generated and hence reduce the waste handling and disposal costs. For example, by reducing or eliminating over-ordering of construction materials, waste is avoided and costs are reduced both in terms of purchasing materials and in disposing of wastes.

#### ***Excavated Material***

5.7 Excavated materials should be segregated from other wastes to avoid contamination thereby ensuring acceptability at public filling areas or reclamation sites and avoiding the need for disposal at landfill. The priority for off-site disposal of surplus excavated material should be as follows:

- (a) transport to other reclamation sites at Shatin and MOS areas; and
- (b) transport to public filling areas.

5.8 The locations of construction sites in the Shatin and MOS areas that are likely to require fill material between 2000-2003 are shown in Figure 5.

#### ***Construction and Demolition Wastes***

5.9 Careful planning and good site management can minimise over ordering and waste of materials such as ready mixed concrete and cement grouts. The design of formwork should maximise the use of standard wooden panels so that high reuse levels can be achieved. More durable alternatives such as steel formwork or plastic facing should be considered in order to increase the potential for reuse.

5.10 The requirements for the handling and disposal of bentonite slurries should follow the Practice Note For Professional Persons. Construction Site Drainage Professional Persons Consultative Committee. 1994 (ProPECC PN 1/94).

- 5.11 The contractors should recycle as much as possible of the C&D material on-site. Proper segregation of wastes and materials into different transit skips/containers on-site will increase the feasibility of recycling certain components of the waste stream by recycling contractors. Concrete and masonry, for example, can be crushed and used as fill and steel reinforcing bar can be used by scrap steel mills. Different areas of the worksites can be designated for segregation and storage of the various materials.
- 5.12 Wherever possible, the inert C&D material should be reused or recycled with the remaining inert materials before being delivered to other reclamation sites or public filling areas. Waste containing putrescible materials should be disposed of at landfills. At present, Government is developing a charging policy for the disposal of waste to landfill. When it is implemented, this will provide additional incentive to reduce the volume of waste generated and to encourage proper segregation to allow free disposal of inert C&D material to public filling areas.
- 5.13 In order to minimise the potential dust and water quality impacts of demolition works, C&D material should be cleared as quickly as possible after demolition. The demolition and clearance works should therefore be undertaken simultaneously.

#### *Chemical Waste*

- 5.14 For those processes which generate chemical waste, it may be possible to find alternatives which generate reduced quantities or even no chemical waste, or less dangerous types of chemical waste.
- 5.15 Chemical waste that is produced, as defined by Schedule 1 of the *Waste Disposal (Chemical Waste) (General) Regulation*, should be handled in accordance with the *Code of Practice on the Packaging, Handling and Storage of Chemical Wastes*. Containers used for the storage of chemical wastes should:
- (a) be suitable for the substance they are holding, resistant to corrosion maintained in a good condition, and securely closed;
  - (b) have a capacity of less than 450 l unless the specifications have been approved by EPD; and
  - (c) display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the Regulations.



- 5.16 The storage area for chemical wastes should:
- (a) be clearly labelled and used solely for the storage of chemical waste;
  - (b) be enclosed on at least 3 sides;
  - (c) have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest;
  - (d) have adequate ventilation;
  - (e) be covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste if necessary); and
  - (f) be arranged so that incompatible materials are adequately separated.
- 5.17 Disposal of chemical waste should:
- (a) be via a licensed waste collector; and
  - (b) be to a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Facility which also offers a chemical waste collection service and can supply the necessary storage containers; or
  - (c) be to a reuser of the waste, under approval from the EPD.
- 5.18 The Centre for Environmental Technology operates a Waste Exchange Scheme which can assist in finding receivers or buyers.

***General Refuse***

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

5.20 General refuse is generated largely by food service activities on site, so reusable rather than disposable dish ware 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 if feasible.

5.21 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.

### *Summary*

5.22 This section describes waste management requirements and provides practical recommendations which should be implemented to minimise the potential environmental impacts due to storage, handling, transport and disposal of wastes.

5.23 Waste reduction is best achieved at the planning and design stages, as well as by ensuring that processes are developed and operated efficiently. Good management and control can prevent the generation of significant amounts of waste. For unavoidable wastes, reuse and optimal disposal are recommended as follows:

- (a) use of excavated material (inert) suitable for reclamation or fill;
- (b) disposal of inert C&D material (public fill) for on-site reclamation or reuse at public filling areas;
- (c) disposal of C&D waste at landfills;
- (d) consignment of chemical waste to the CWTC or other approved facilities for treatment and disposal; and
- (e) disposal of general refuse at landfills.

5.24 The criteria for sorting solid waste is described in *New Disposal Arrangements for Construction Waste*. Waste containing in excess of 20% by volume of inert material should be segregated from waste with a larger proportion of putrescible material.

5.25 Proper storage and site practices will minimise the damage or contamination of construction materials. On-site measures may be implemented which promote the proper disposal of wastes once it is moved off site. For example having separate skips for inert (rubble, sand, stone, etc) and non-inert (wood, organics, etc) wastes would help to ensure that the former are taken to public filling areas, while the latter are properly disposed of at controlled landfills. Since waste brought to public filling areas will not attract a charge, while that taken to landfill may attract some future charge, separating waste may also help to reduce waste disposal costs, should landfill charging be introduced.

5.26 Specifically, it is recommended that:

- (a) wastes should be handled and stored in a manner which ensures that they are held securely without loss or leakage thereby minimising the potential for pollution;
- (b) only reputable waste collectors authorised to collect the specific category of waste concerned should be employed;
- (c) procedures, such as a ticketing system, are developed to facilitate the tracking of loads and to ensure that illegal disposal of wastes does not occur;
- (d) removal of C&D material should be arranged to coincide with the demolition work;
- (e) appropriate measures should be employed to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers;
- (f) the necessary waste disposal permits should be obtained 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) and *Dumping at Sea Ordinance* (1995);
- (g) collection of general refuse should be carried out on a daily basis;
- (h) waste should only be disposed of at licensed sites and site staff and the contractors should develop procedures to ensure that illegal disposal of wastes does not occur;

- (i) waste storage areas should be well maintained and cleaned regularly;
  - (j) records should be maintained of the quantities of wastes generated, recycled and disposed (determined by weighting each load or by another method); and
  - (k) during demolition, the contractor should adopt selective demolition measures so that reusable material, like wood and metal, can be disposed of at landfills, and inert demolition materials can be reused on site or delivered to public filling areas, public filling points or land formation sites.
- 5.27 Training and instruction of construction staff should be given at the site to increase awareness and draw attention to waste management issues and the need to minimise waste generation. The training requirements should be included in the site waste management plan.
- 5.28 The Contractor shall also pay attention to the *Waste Disposal Ordinance*, the *Dumping at Sea Ordinance*, the *Public Health and Municipal Services Ordinance* and the *Water Pollution Control Ordinance*, and carry out the appropriate waste management work. The relevant licence/permit, such as the effluent discharge licence, the chemical waste producer registration, etc. shall be obtained. The Contractor shall refer to the relevant booklets issued by EPD when applying for the licence/permit.
- 5.29 During the site inspections and the document review procedures as mentioned in Sections 7.1 and 7.2 of this Manual, the Contractor's ET leader shall pay special attention to the issues relating to waste management, and check whether the Contractor has followed the relevant contract specifications and the procedures specified under the laws of Hong Kong.

## **6. VISUAL AND LANDSCAPE**

### **6.1 Introduction**

- 6.1.1 The proposed development would, in general, generate high impacts on the physical landscape due to the loss of amenity trees, particularly mature specimens. However, the Compensatory Planting Proposal prepared by the Corporations consultants would involve planting 3,600 trees which will largely compensate for this loss in the long term.

6.1.2 The proposed elevated stations, and viaducts would generate varying visual impacts on the surrounding areas and their populations depending on the horizontal and vertical proximity of the VSRs to the railway. A large proportion of the population live in flats that would be sufficiently elevated above the railway viaduct that they would not be able to see the railway unless they stood directly at their windows and looked straight down. Consequently they would suffer only low to negligible visual impact. On the other hand, VSRs in low-rise developments and the lower floors of high-rise developments would potentially suffer greater impacts due to an increased potential to see the railway from their homes.

6.1.3 However, there is significantly potential to mitigate the impacts on the lower floors of developments through the implementation of landscape and visual mitigation measures such as sensitive viaduct design, tree planting and climber planting against columns. It is considered that implementation of the proposed visual impact mitigation measures would reduce predicted impacts to acceptable levels and the railway would become an accepted part of the urban scene.

## **6.2 Visual and Landscape Mitigation Measures**

6.2.1 No more than 6 months after commencement of construction of the Project, the Contractor shall submit the EPD for approval 3 sets of landscape plan(s), of scale 1 to 1000 or other appropriate scale as agreed by the EPD. The drawings shall show the detailed landscape proposals during the construction and operation stages of the Project, and shall include an implementation programme of landscape works. The submission shall be verified by the IEC as conforming to the information and recommendations contained in the EIA Report. Additional copies may be required by the EPD. All measures recommended in the approved landscape plan(s) shall be fully implemented in accordance with the details and time schedule set out in the submission.

6.2.2 Further recommended mitigation measures for impacts caused during the construction process are as follows:

- (a) Control of night time lighting;
- (b) Erection of decorative screen hoarding;
- (c) Advance planting for screening;

- (d) Minimising the height of temporary buildings;
- (e) Careful positioning of construction plant;
- (f) Regular checks should be carried out to ensure that the work site boundaries are not exceeded and that no damage is being caused to the surrounding areas;
- (g) Temporary construction sites should be restored to standards as good as, or better than, the original condition;
- (h) Replanting of disturbed vegetation should be undertaken and this should use predominantly native plant species;
- (i) Topsoil should be stripped and stored for re-use in the construction of the soft landscape works;
- (j) The locations of work sites associated with the proposed development should be carefully selected to minimise the potential landscape and visual impacts of the proposed construction works; and
- (k) The potential for soil erosion should be reduced at the construction stage by minimising the extent of vegetation disturbance on site and by providing a protective cover (e.g. plastic sheeting or a grass cover established by hydroseeding) over any exposed ground.
- (l) There are plans, currently under discussion with RSD, for the following temporary reprovision of open space that will be affected during the construction period:
  - (i) 2 basketball courts and 1 tennis court to be located on Sha Tin Tau Road, opposite Chun Shek Estate as mitigation for the temporary impacts on Tsang Tai Uk Recreation Ground.
  - (ii) 1 basketball court to be located within Pok Hong Estate as mitigation for the temporary impacts on the Estate recreation facilities along Sha Kok Street.

### **6.3 Mitigation Measures During the Operational Phase**

6.3.1 Landscape and visual impact mitigation measures arising during the operational phase and to be incorporated within the permanent landscape design proposals should include the following:

- (a) The size and extent of noise barriers should be reduced as much as possible. Where noise barriers/enclosures are unavoidable, they should be integrated with the viaduct design to create a harmonious whole, or if they are at grade, they should be designed to blend into the surrounding environment as far as possible;
- (b) Footpath and cycle track diversions should be provided to minimise impact on pedestrian and vehicular movements;
- (c) The external appearance of all above-ground structures should be carefully detailed in the terms of form, colour and finishes such that they are visually integrated as much as possible into the surrounding landscape. This applies, in particular to the stations, viaduct structures and the proposed noise mitigation structures as these elements would be the most visually dominant elements. The width of the viaduct sides and supporting columns should be minimised as far as possible to provide a 'lightness' of appearance. The form and surface detailing of these structures should be carefully considered to reduce their apparent mass;
- (d) The use of high safety fences along the railway should be avoided wherever possible to minimise adverse visual intrusion on the landscape. This applies particularly along the central reserve within Ma On Shan Road as this is an area of attractive open landscape;
- (e) Tree and shrub planting should be implemented within the railway reserve, below the viaduct, as so to compensate for lost trees and to soften the visual impact of the viaduct. Tree species should be selected on the basis of their ultimate height, so that they do not physically interfere with the viaduct. The KCRC has commissioned a separate consultancy to prepare a Compensatory Planting Proposal to compensate for felled trees. This consultancy has identified that 3,600 trees of "standard" to "heavy standard" size can be planted along the alignment; and
- (f) Climbing plants should be used to soften the appearance of viaduct columns.

## **7. SITE ENVIRONMENTAL AUDIT**

### **7.1 Site Inspections**

7.1.1 Site Inspections provide a direct means to trigger and enforce the specified environmental protection and pollution control measures. They shall be undertaken routinely to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. With well defined pollution control and mitigation specifications and a well established site inspection, deficiency and action reporting system, the site inspection is one of the most effective tools to enforce the environmental protection requirements on the construction site.

7.1.2 The Contractor's ET leader is responsible for formulation of the environmental site inspection, deficiency and action reporting system, and for carrying out the site inspection works. He shall submit a proposal endorsed by IEC on the site inspection, deficiency and action reporting procedures within 21 days of the construction contract commencement to the Contractor for agreement and to the ER for approval.

7.1.3 Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the environmental situation, pollution control and mitigation measures within the site; it should also review the environmental situation outside the site area which is likely to be affected, directly or indirectly, by the site activities. The Contractor's ET leader shall make reference to the following information in conducting the inspection:

- (a) the EIA recommendations on environmental protection and pollution control mitigation measures;
- (b) works progress and programme;
- (c) individual works methodology proposals (which shall include proposal on associated pollution control measures);
- (d) the contract specifications on environmental protection;
- (e) the relevant environmental protection and pollution control laws; and
- (f) previous site inspection results.



7.1.4 The Contractor shall update the Contractor's ET leader with all relevant information of the construction contract for him to carry out the site inspections. The inspection results and its associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the ER and the Contractor within 24 hours, for reference and for taking immediate action. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated by the Contractor's ET leader to report on any remedial measures subsequent to the site inspections.

7.1.5 Ad hoc site inspections shall also be carried out if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation work, as specified in the Action Plan for environmental monitoring and audit.

## **7.2 Compliance with Legal and Contractual Requirements**

7.2.1 There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong which the construction activities shall comply with.

7.2.2 In order that the works are in compliance with the contractual requirements, all the works method statements submitted by the Contractor to the ER for approval shall be sent to the Contractor's ET leader for vetting to see whether sufficient environmental protection and pollution control measures have been included.

7.2.3 The Contractor's ET leader shall also review the progress and programme of the works to check that relevant environmental laws have not been violated, and that the any foreseeable potential for violating the laws can be prevented.

7.2.4 The Contractor shall regularly copy relevant documents to the Contractor's ET leader so that the checking work can be carried out. The document shall at least include the updated Work Progress Reports, the updated Works Programme, the application letters for different licence/permits under the environmental protection laws, and all the valid licence/permit. The site diary shall also be available for the Contractor's ET leader's inspection upon his request.

7.2.5 After reviewing the document, the Contractor's ET leader shall advise the ER and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET leader's review concludes that the current status on

licence/permit application and any environmental protection and pollution control preparation works may not cope with the works programme or may result in potential violation of environmental protection and pollution control requirements by the works in due course, he shall also advise the Contractor and the ER accordingly.

- 7.2.6 Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The ER shall follow up to ensure that appropriate action has been taken by the Contractor in order that the environmental protection and pollution control requirements are fulfilled.

### **7.3 Environmental Complaints**

- 7.3.1 Complaints shall be referred to the Contractor's ET leader for carrying out complaint investigation procedures. The Contractor's ET leader shall undertake the following procedures upon receipt of the complaints:
- (a) log complaint and date of receipt onto the complaint database and inform the IEC immediately via the ER;
  - (b) investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities;
  - (c) if a complaint is valid and due to works, identify mitigation measures;
  - (d) if mitigation measures are required, advise the Contractor accordingly;
  - (e) review the Contractor's response on the identified mitigation measures, and the updated situation;
  - (f) if the complaint is transferred from EPD, submit interim report to EPD after endorsement by IEC on status of the complaint investigation and follow-up action within the time frame assigned by EPD;
  - (g) undertake additional monitoring and audit to verify the situation if necessary, and review that any valid reason for complaint does not recur;
  - (h) report the investigation results and the subsequent actions to the source of complaint for responding to complainant (If the source of complaint is EPD, the results should be reported within the time frame assigned by EPD); and

- (i) record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

7.3.2 During the complaint investigation work, the Contractor and ER shall cooperate with the Contractor's ET leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor shall promptly carry out the mitigation. The ER shall ensure that the measures have been carried out by the Contractor.

7.3.3 A flow chart of the complaint response procedures is shown in Figure 7.

## **8. REPORTING**

### **8.1 General**

8.1.1 The following reporting requirements are based upon a paper documented approach. However, the same information can be provided in an electronic medium upon agreeing the format with the ER and EPD. All the monitoring data (baseline and impact) shall also be submitted in diskettes in an agreed format. This would enable a transition from a paper/historic and reactive approach to an electronic proactive approach.

### **8.2 Baseline Monitoring Report**

8.2.1 One hard copy of the Baseline Monitoring Report shall be verified and certified by the IEC and shall be submitted to EPD 4 weeks before the commencement of any major construction works that would affect the monitoring results. Additional copies of the Baseline Monitoring Report may be required by EPD. The Baseline Environmental Monitoring Report shall also be submitted to each of the Contractor and the ER. The relevant parties shall be liaised on the exact number of copies they want. The form and content of the report, and the representation of baseline monitoring data shall be in a format to the satisfaction of EPD and include, but not be limited to the following:

- (a) up to half a page executive summary;
- (b) brief project background information;
- (c) drawings showing locations of the baseline monitoring stations;

- (d) an updated construction programme with milestones of environmental protection/mitigation activities annotated;
- (e) monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;
  - parameters monitored;
  - monitoring locations (and depth);
  - monitoring date, time, frequency and duration;
  - QA/QC results and detection limits;
- (f) details on influencing factors, including:
  - major activities, if any, being carried out on the site during the period;
  - weather conditions during the period;
  - other factors which might affect the results;
- (g) determination of the Action and Limit Levels (AL levels) for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored;
- (h) revisions for inclusion in the EM&A Manual; and
- (i) comments and conclusions.

### **8.3 Monthly EM&A Reports**

- 8.3.1 The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the Contractor's ET leader, collated by the IEC and submitted to EPD within 10 working days of the end of each reporting month, with the first report due in the month after construction commences. The time frame for the Contractor's ET leader's submission to the Engineer shall be agreed with the Engineer.

- 8.3.2 The Contractor's ET leader shall review the number and location of monitoring stations and parameters to monitor every 6 months or on as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.
- 8.3.3 The Contractor's ET leader shall rectify any comments on the monthly EM&A reports made by EPD within one month of the receipt of the comments, unless otherwise specified by EPD. The Contractor's ET leader shall also rectify comments on the EM&A reports by the IEC and ER in the time frame agreed with the ER and IEC.

#### **First Monthly EM&A Report**

- 8.3.4 The first monthly EM&A report shall include at least but not limited to the following :
- (a) 1-2 pages Executive Summary
    - Breaches of AL levels;
    - Complaint Log;
    - Notifications of any summons and successful prosecutions;
    - Reporting Changes;
    - Future key issues.
  - (b) Basic Project Information
    - Project organisation including key personnel contact names and telephone numbers;
    - Construction Programme with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month;
    - Management structure; and
    - Works undertaken during the month.
  - (c) Environmental Status
    - Works undertaken during the month with illustrations (such as location of works, percentage fines in the fill material used); and
    - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
  - (d) Summary of EM&A requirements
    - All monitoring parameters;

- Environmental quality performance limits (Action and Limit Levels);
- Event-Action Plans;
- Environmental mitigation measures, as recommended in the project EIA study final report;
- Environmental requirements in contract documents.

(e) Implementation Status

Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for ecological and visual impacts, as recommended in the project EIA study report, summarised in the updated implementation schedule.

(f) Monitoring Results

To provide monitoring results (in both hard and diskettes copies) together with the following information:

- monitoring methodology;
- name of laboratory and types of equipment used and calibration details;
- parameters monitored;
- monitoring locations;
- monitoring date, time, frequency, and duration;
- weather conditions during the period;
- graphical plots of the monitored parameters in the month annotated against;
- the major activities being carried out on site during the period;
- weather conditions that may affect the results;
- any other factors which might affect the monitoring results; and
- QA/QC results and detection limits.

(g) Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions

- Record of all noncompliance (exceedances) of the environmental quality performance limits (Action and Limit Levels);
- Record of all complaints received (written or verbal) for each media, including locations and nature for complaints investigation,

- liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
  - Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
  - Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
  - Description of the actions taken in the event of noncompliance and deficiency reporting and any follow-up procedures relating to earlier noncompliance.
- (h) Others
- An account of the future key issues as reviewed from the works programme and work method statements;
  - Advice on the solid and liquid waste management status; and
  - Submission of implementation status proforma, proactive environmental protection proforma, regulatory compliance proforma, site inspection proforma, data recovery schedule and complaint log summarizing the EM&A of the period.

### **Subsequent EM&A Reports**

8.3.5 The subsequent monthly EM&A reports shall include the following :

- (a) Executive Summary (1-2 pages)
- Breaches of AL levels
  - Complaint Log
  - Notifications of any summons and successful prosecutions
  - Reporting Changes
  - Future key issues
- (b) Environmental Status
- Construction programme with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month;
  - Works undertaken during the month with illustrations including key personnel contact names and telephone numbers; and
  - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.

(c) Implementation Status

Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for ecological and visual impacts, as recommended in the project EIA study report, summarised in the updated implementation schedule.

(d) Monitoring Results

To provide monitoring results (in both hard and diskette copies) together with the following information:

- monitoring methodology;
- name of laboratory and types of equipment used and calibration details;
- parameters monitored;
- monitoring locations;
- monitoring date, time, frequency, and duration;
- weather conditions during the period;
- graphical plots of the monitored parameters in the month annotated against;
- the major activities being carried out on site during the period;
- weather conditions that may affect the results;
- any other factors which might affect the monitoring results; and
- QA/QC results and detection limits.

(e) Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions

- Record of all noncompliance (exceedances) of the environmental quality performance limits (Action and Limit Levels);
- Record of all complaints received (written or verbal) for each media, including locations and nature for complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
- Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;



- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
  - a description of the actions taken in the event of noncompliance and deficiency reporting and any follow-up procedures relating to earlier noncompliance.
- (f) Others
- An account of the future key issues as reviewed from the works programme and work method statements; and
  - Advice on the solid and liquid waste management status.
- (g) Appendix
- AL levels
  - Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
    - i) major activities being carried out on site during the period;
    - ii) weather conditions during the period; and
    - iii) any other factors which might affect the monitoring result
  - Monitoring schedule for the present and next reporting period
  - Cumulative statistics on complaints, notifications of summons and successful prosecutions
  - Outstanding issues and deficiencies
  - Details of complaints, outstanding issues and deficiencies

### **Quarterly EM&A Summary Reports**

8.3.6 The quarterly EM&A summary report which should generally be around 5 pages (including about 3 of text and tables and 2 of figures) should contain at least the following listed information. Apart from these, the first quarterly summary report should also confirm that the monitoring work is proving effective and that it is generating data with the necessary statistical power to categorically identify or confirm the absence of impact attributable to the works.

- (a) up to half a page executive summary;
- (b) basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;

- (c) a brief summary of EM&A requirements including:
  - monitoring parameters;
  - environmental quality performance limits (Action and Limit Levels); and
  - environmental mitigation measures, as recommended in the project EIA study final report;
- (d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;
- (e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (f) graphical plots of the trends of monitored parameters over the past 2 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
  - the major activities being carried out on Site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results;
- (g) advice on the solid and liquid waste management status;
- (h) a summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (i) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- (j) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- (k) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (l) a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results;

- (m) comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and
- (n) proponents contacts and any hotline telephone number for the public to make enquiries.

#### **Final EM&A Summary Report**

8.3.7 The termination of EM&A programme shall be determined on the following basis:

- (a) completion of construction activities and insignificant environmental impacts of the remaining outstanding construction works;
- (b) trends analysis to demonstrate the narrow down of monitoring exceedances due to construction activities and the return of ambient environmental conditions in comparison with baseline data;
- (c) operation and maintenance of the MOS Rail and acceptable operational and maintenance noise level as demonstrated by the operational noise monitoring results; and
- (d) no environmental complaint and prosecution involved.

8.3.8 The proposed termination may be required to consult related local community such as village representative/committee and/or District Board and the proposal should be endorsed by the IC(E), A/ER and the project proponent prior to final approval from the Director of Environmental Protection.

8.3.9 The final EM&A summary report shall include, inter alia, the following:

- (a) an executive summary;
- (b) basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the entire construction period;
- (c) a brief summary of EM&A requirements including:
  - monitoring parameters;

- environmental quality performance limits (Action and Limit Levels); and
  - environmental mitigation measures, as recommended in the project EIA study final report;
- (d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation status proformas;
- (e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (f) graphical plots of the trends of monitored parameters over the construction period for representative monitoring stations annotated against;
- the major activities being carried out on Site during the period;
  - weather conditions during the period;
  - any other factors which might affect the monitoring results; and
  - the return of ambient environmental conditions in comparison with baseline data;
- (g) compare and contrast the EM&A data with the EIA predictions and annotate with expansions for any discrepancies;
- (h) provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;
- (i) advice on the solid and liquid waste management status;
- (j) a summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit Levels);
- (k) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- (l) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- (m) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

- (n) review the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness);
- (o) a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution legislations, locations and nature of the breaches, investigation, follow-up actions taken and results;
- (p) review the practicality and effectiveness of the EIA process and EM&A programme (e.g. effectiveness and efficiency of the mitigation measures), recommended any improvement in the EM&A programme; and
- (q) a conclusion to state the return of ambient and/or the predicted scenario as per EIA findings.

#### **8.4 Data Keeping**

- 8.4.1 The site document such as the monitoring field records, laboratory analysis records, site inspection forms, etc. are not required to be included in the monthly EM&A reports for submission. However, the document shall be well kept by the Contractor's ET Leader and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. The monitoring data shall also be recorded in magnetic media form, and the software copy can be available upon request. All the documents and data shall be kept for at least one year after completion of the construction contract.
- 8.4.2 The Contractor's ET Leader shall input the impact monitoring data into the East Rail Extensions (ERE) Electronic Environmental Management System which will be set up on site for the tracking and management of data.

#### **8.5 Electronic Reporting of EM&A Information**

- 8.5.1 To enable public inspection of the Baseline Monitoring Report and monthly EM&A Reports via the EIAO Internet Website and at the EIAO Register Office, electronic copies of monthly EM&A Reports, prepared in Hyper Text Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 4.0 or later), unless otherwise agreed by EPD, shall be submitted at the same time as the hard copies as described in 8.2 and 8.3 above. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of the EM&A Reports shall be included in the beginning of the document. Hyperlinks to all figures, drawings and tables in the EM&A Reports shall be

provided in the main text from where the respective references are made. All graphics in the report shall be in interlaced GIF format unless otherwise agreed by EPD. The content of the electronic copies of the monthly EM&A Reports must be the same as the hard copies.

8.5.2 All environmental monitoring data described in 8.2 and 8.3 above shall be made available to the public via internet access in the form of a website, in the shortest possible time and in no event later than 2 weeks after the relevant environmental monitoring data are collected. KCRC shall notify EPD in writing within 2 weeks after the commencement of works the internet address where the environmental monitoring data are to be placed. The internet address and the environmental monitoring data shall be made available to the public via the EIAO Internet Website and the EIAO Register Office.

8.5.3 The internet website described above shall enable user-friendly public access to the monitoring data with features capable of:

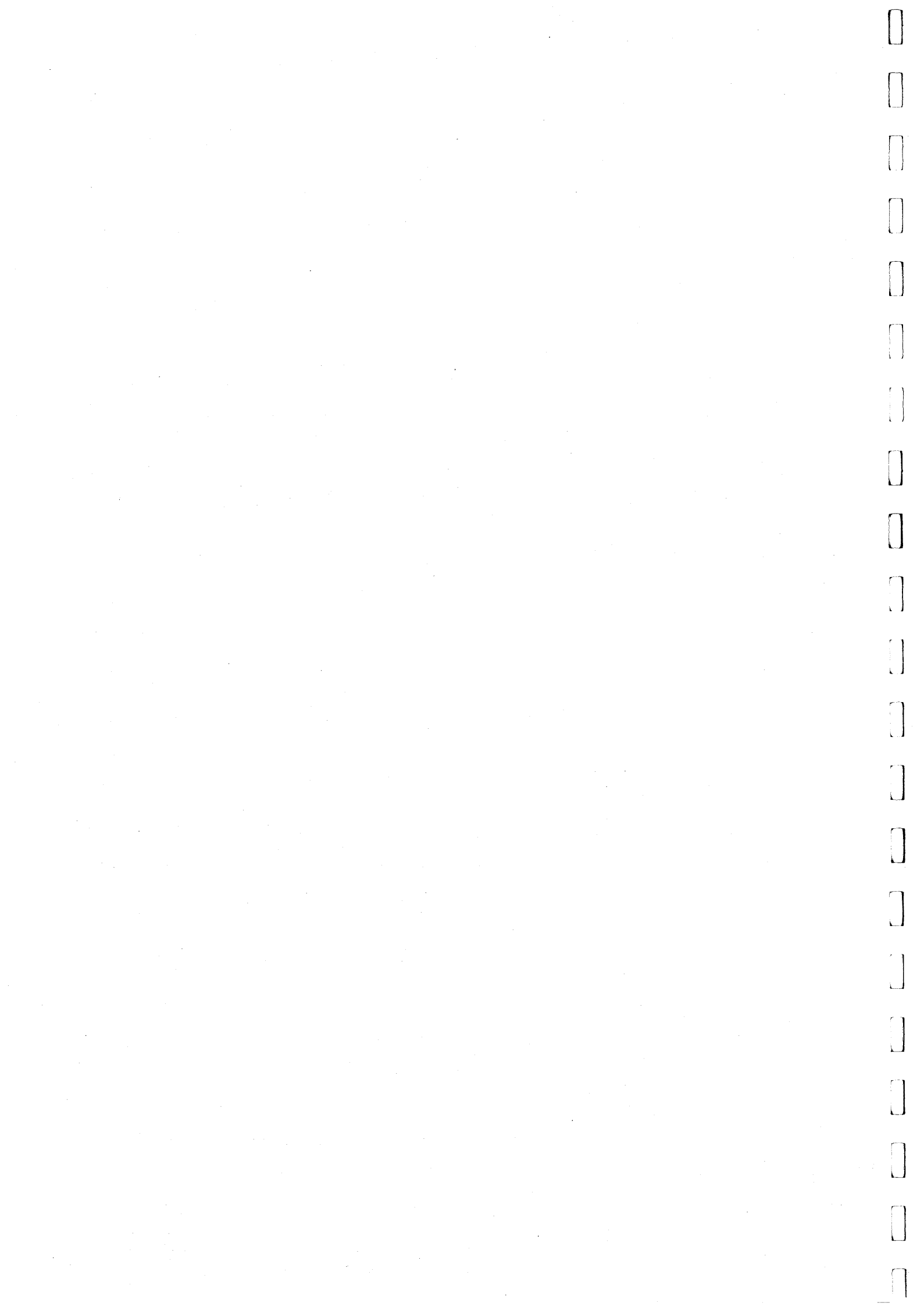
- (a) providing access to all environmental monitoring data collected since the commencement of works;
- (b) searching by date;
- (c) searching by types of monitoring data (air quality and noise); and
- (d) hyperlinks to relevant monitoring data after searching;

or otherwise as agreed by EPD.

## **8.6 Interim Notifications of Environmental Quality Limit Exceedances**

8.6.1 With reference to Event/Action Plans in Tables 2.3, 3.5 and 3.6, when the environmental quality limits are exceeded, the Contractor's ET leader shall immediately notify the ER, IEC & EPD, as appropriate. The notification shall be followed up with advice to EPD after endorsement of IEC, on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in Fig. 8.

**END OF TEXT**



## **FIGURES**



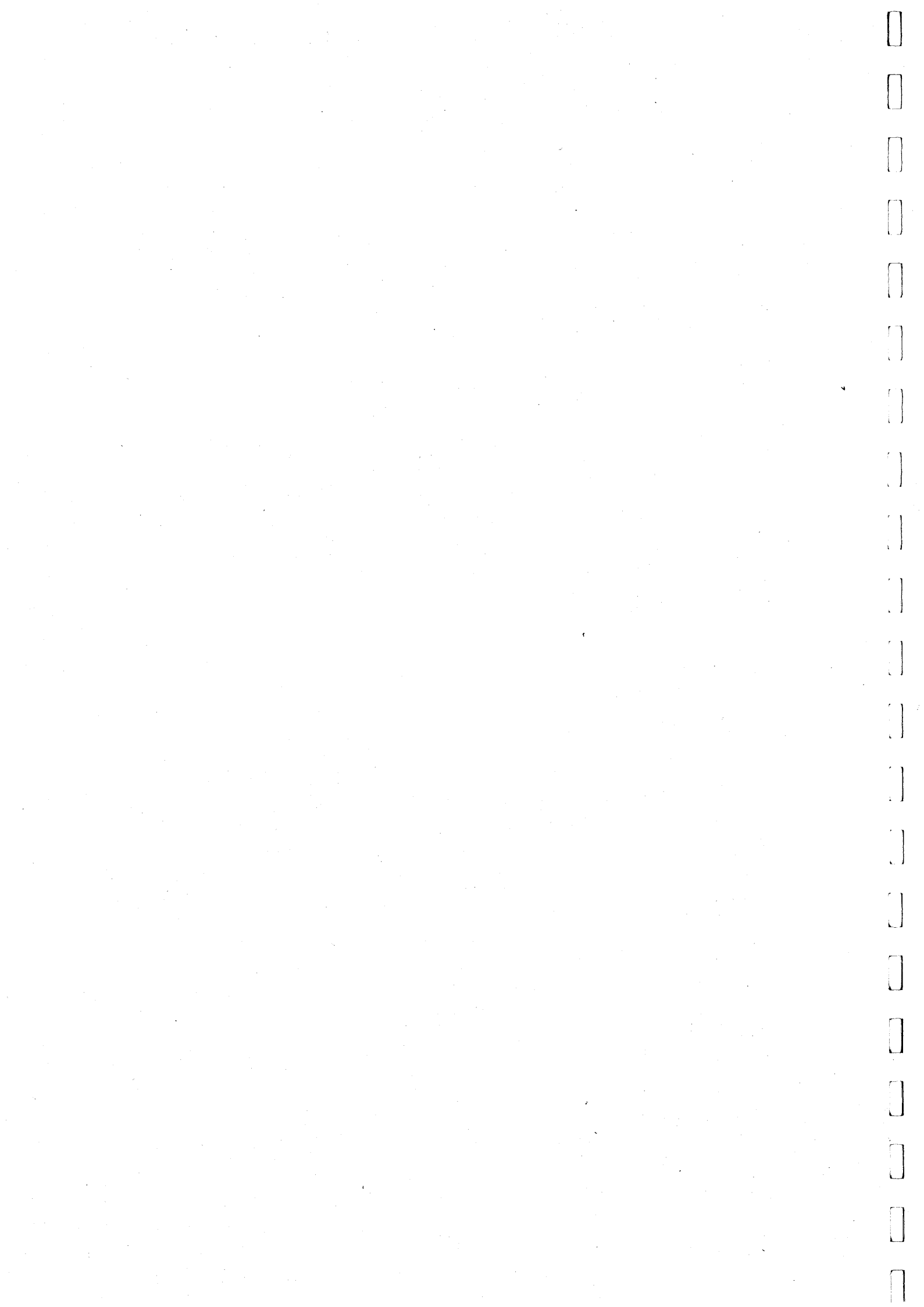




Figure 1.2 a Project Organisation and Lines of Authority for EM&A

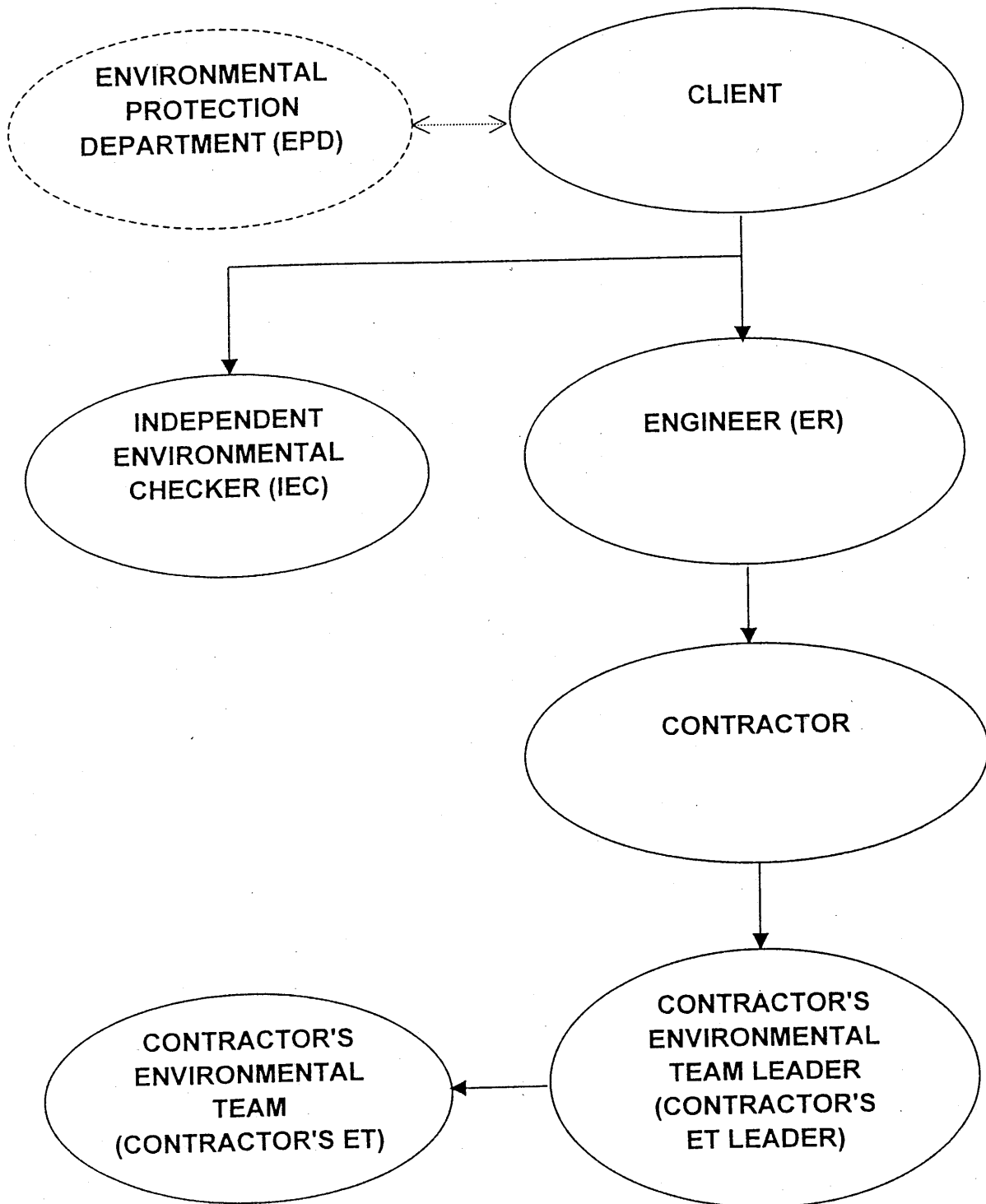


Figure 1.2 b Lines of Communication for Reporting Function for the EM&A

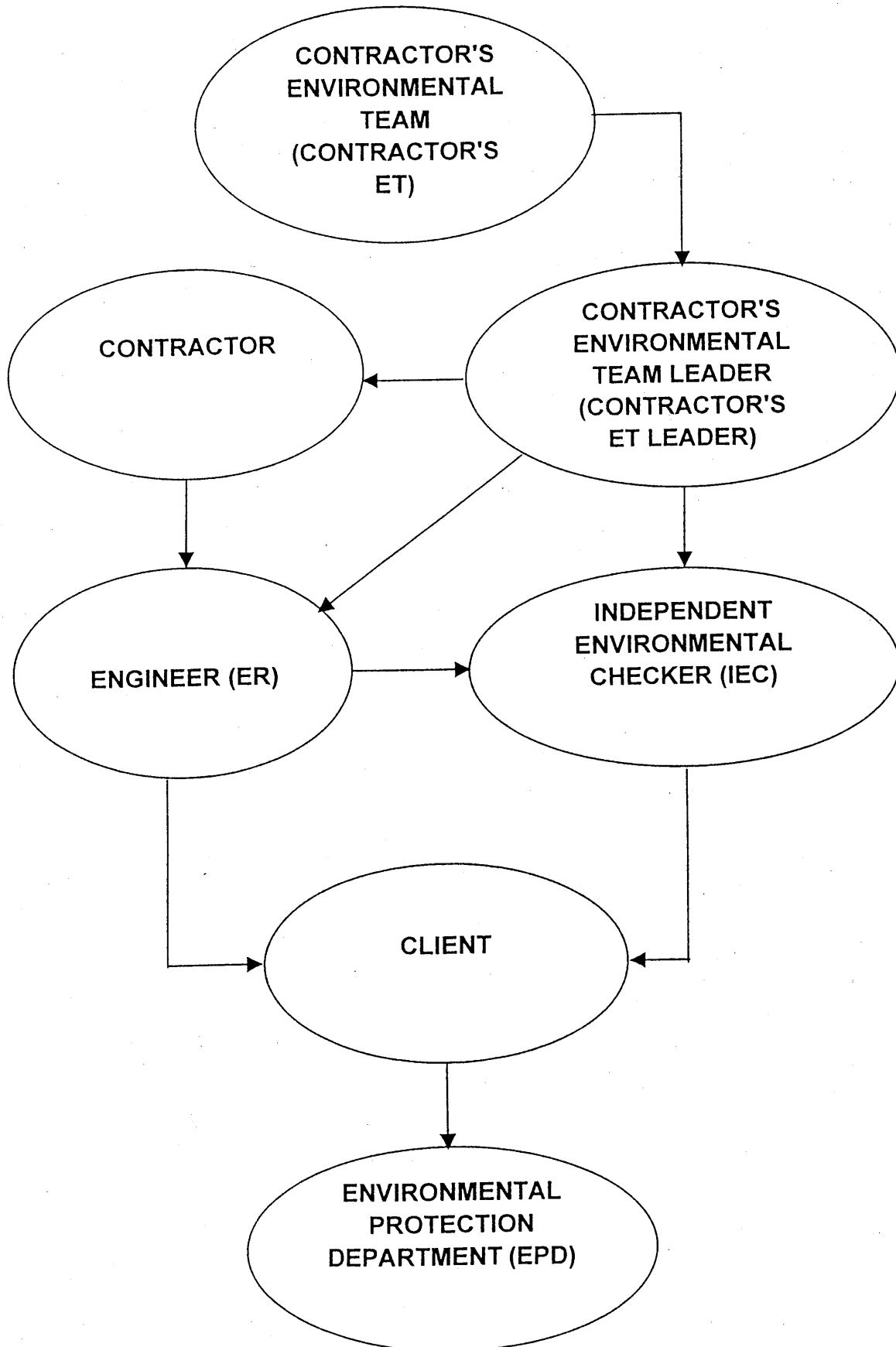




Figure 2.1 Data Sheet for TSP Monitoring

Monitoring Location		
Details of Location		
Sampler Identification		
Date & Time of Sampling		
Elapsed-time	Start (min.)	
Meter Reading		
	Stop (min.)	
Total Sampling Time (min.)		
Weather Conditions		
Site Conditions		
Initial Flow Rate, Qsi	Pi (mmHg)	
	Ti (°C)	
	Hi (in.)	
	Qsi (Std. M <sup>3</sup> )	
Final Flow Rate, Qsf	Pf (mmHg)	
	Tf (°C)	
	Hf (in.)	
	Qsf (Std. M <sup>3</sup> )	
Average Flow Rate (Std. m <sup>3</sup> )		
Total Volume (Std. m <sup>3</sup> )		
Filter Identification No.		
Initial Wt. of Filter (g)		
Final Wt. of Filter (g)		
Measured TSP Level (µg/m <sup>3</sup> )		

	<u>Name &amp; Designation</u>	<u>Signature</u>	<u>Date</u>
Field Operator:	_____	_____	_____
Laboratory Staff:	_____	_____	_____
Checked by:	_____	_____	_____



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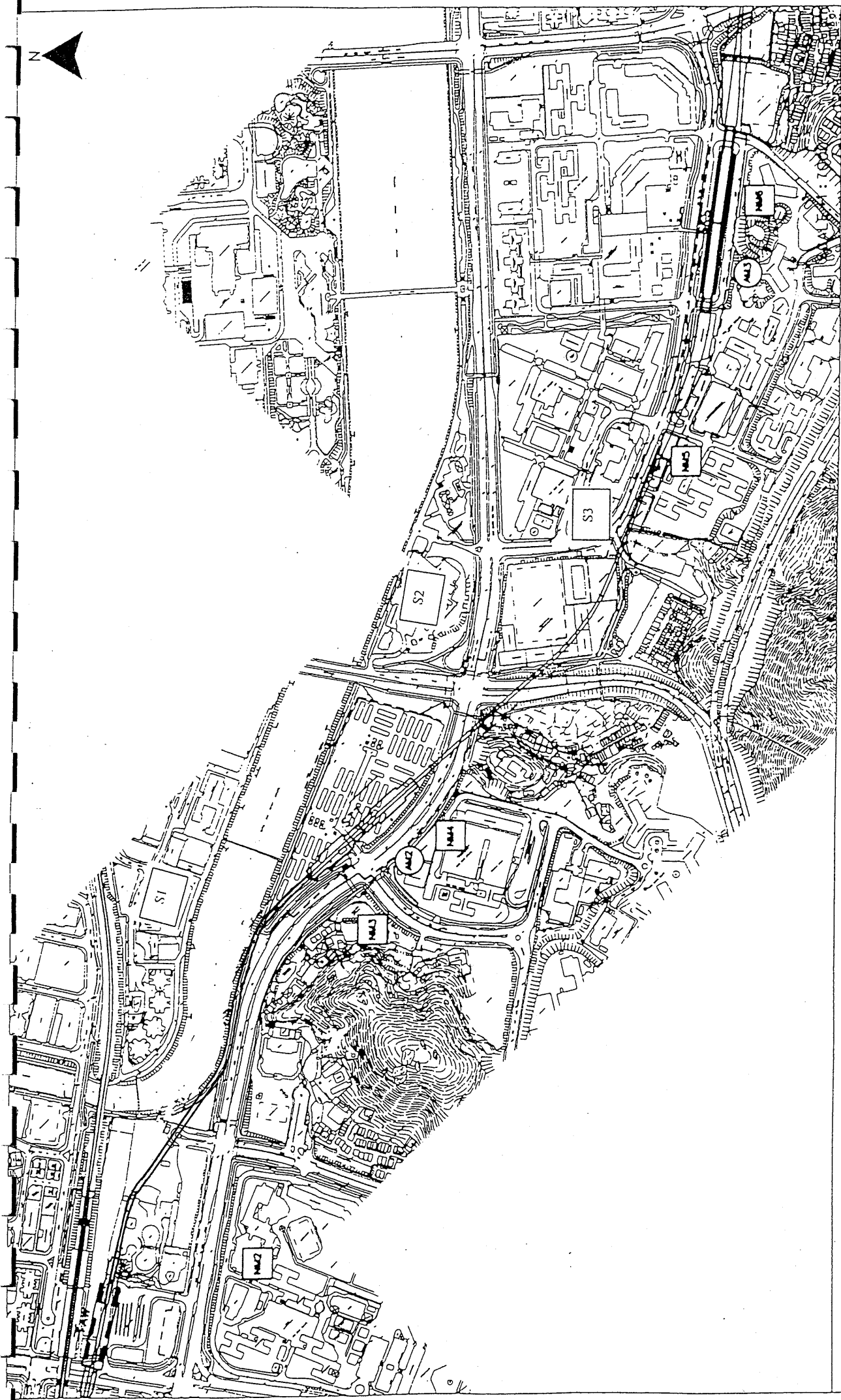
LOCATION OF RECOMMENDED AIR AND NOISE MONITORING STATION

- KEY
- ⊖ RECOMMENDED AIR MONITORING LOCATION
  - ▭ RECOMMENDED NOISE MONITORING LOCATION





Figure 2.2a

USIN FILE: C1890.79  
DATE: 07/04/99



KEY

 RECOMMENDED AIR MONITORING LOCATION  
 RECOMMENDED NOISE MONITORING LOCATION

LOCATION OF RECOMMENDED AIR AND NOISE MONITORING STATIONS

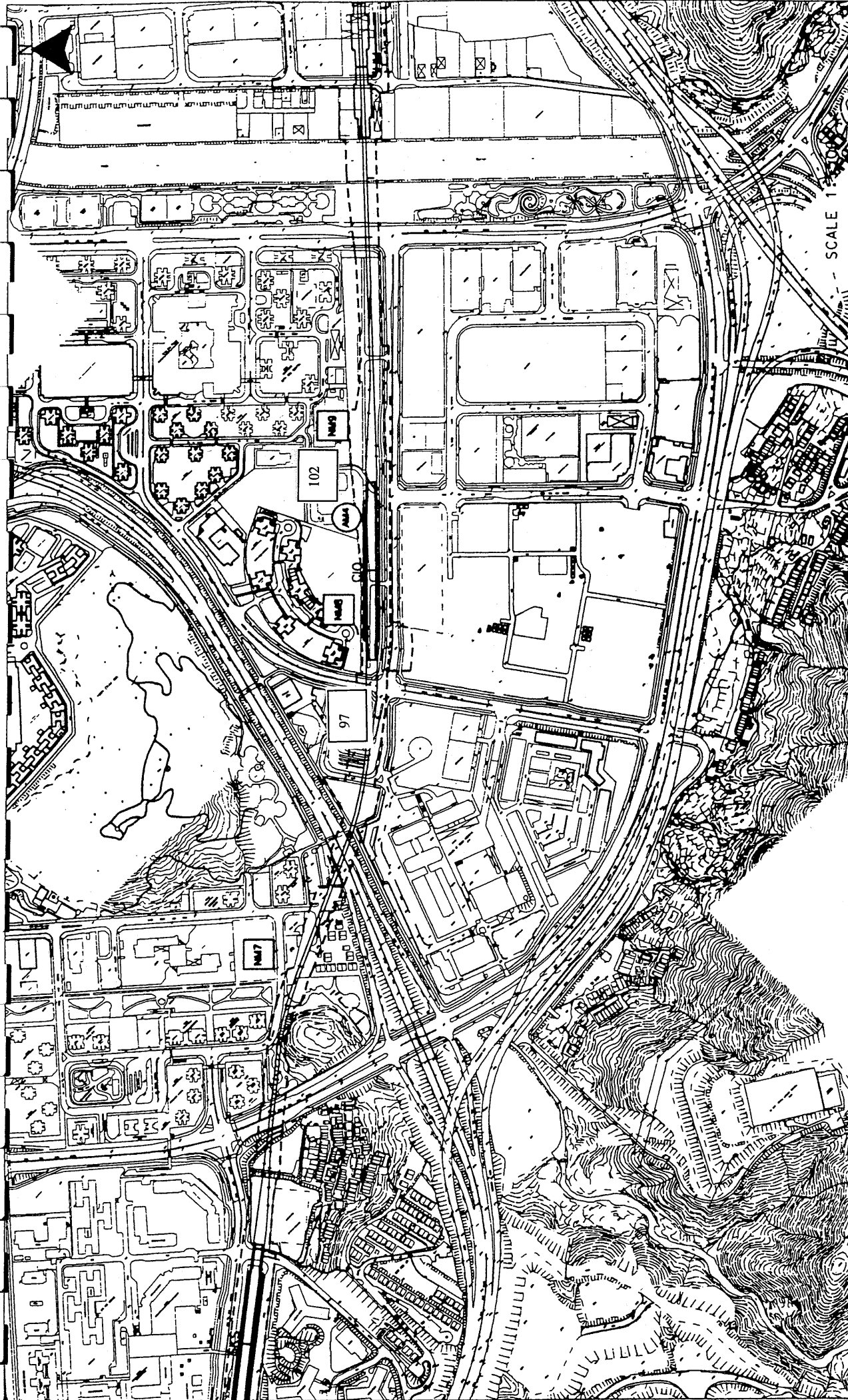
Recommended Schools for Ad Hoc Monitoring during Examinations

S5



Figure 2.2b





KEY  
 ○ RECOMMENDED AIR MONITORING LOCATION  
 □ RECOMMENDED NOISE MONITORING LOCATION

LOCATION OF RECOMMENDED AIR AND NOISE MONITORING STATIONS

102

Additional NSRs that require enhanced EM&A.

Figure 2.2c



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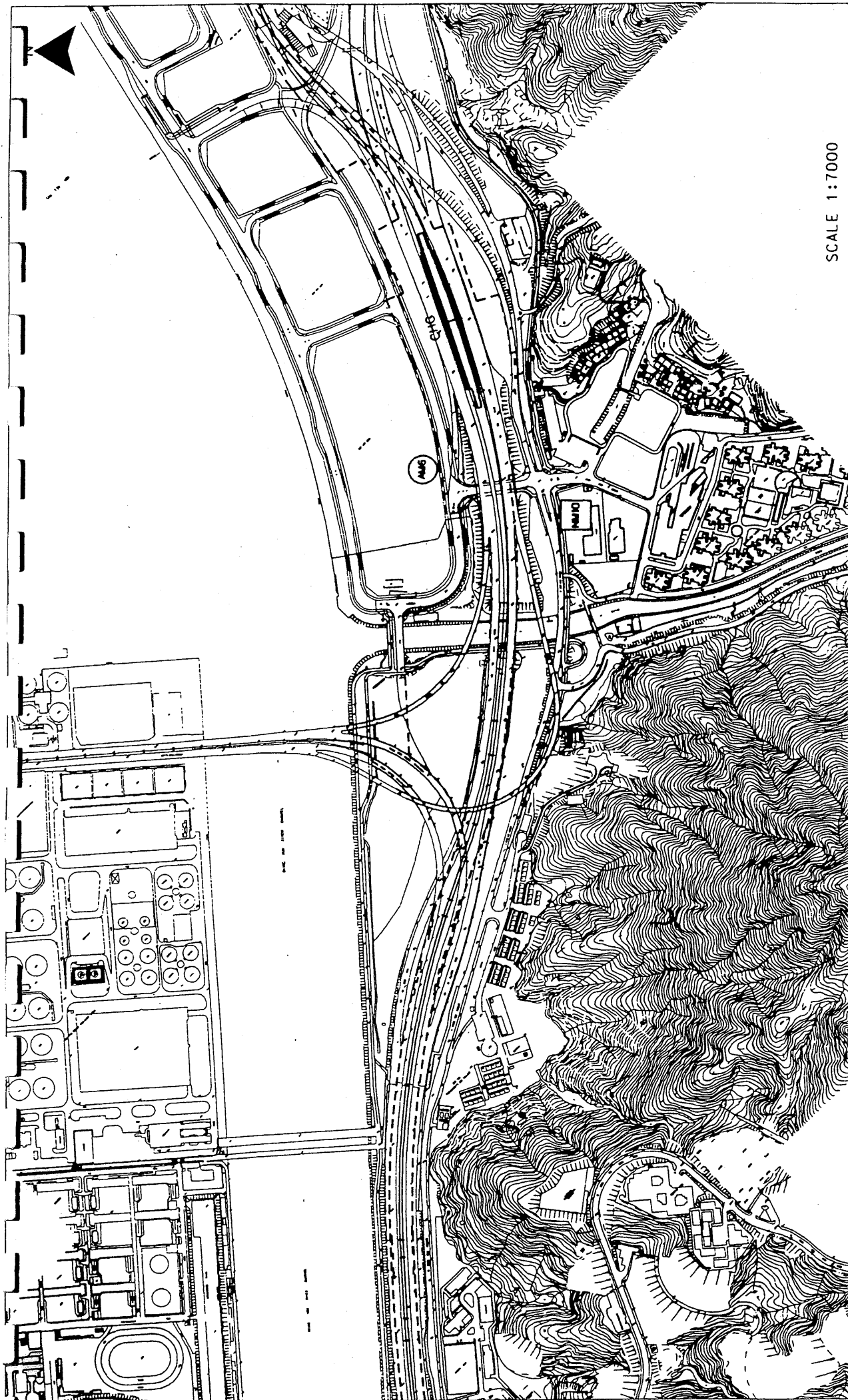
KEY  
 RECOMMENDED AIR  
 MONITORING LOCATION



LOCATION OF RECOMMENDED AIR AND NOISE MONITORING STATION

Figure 2.2d

USIN FILE: C1890.82  
 DATE: 07/04/99



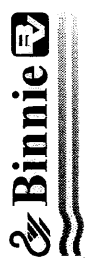
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KEY  
 ○ RECOMMENDED AIR MONITORING LOCATION  
 □ RECOMMENDED NOISE MONITORING LOCATION

LOCATION OF RECOMMENDED AIR AND NOISE MONITORING STATIONS

Figure 2.2e

USIN FILE: C1690.83  
 DATE: 07/04/99





SCALE 1:7000

Figure 2.2f

LOCATION OF RECOMMENDED AIR AND NOISE MONITORING STATIONS

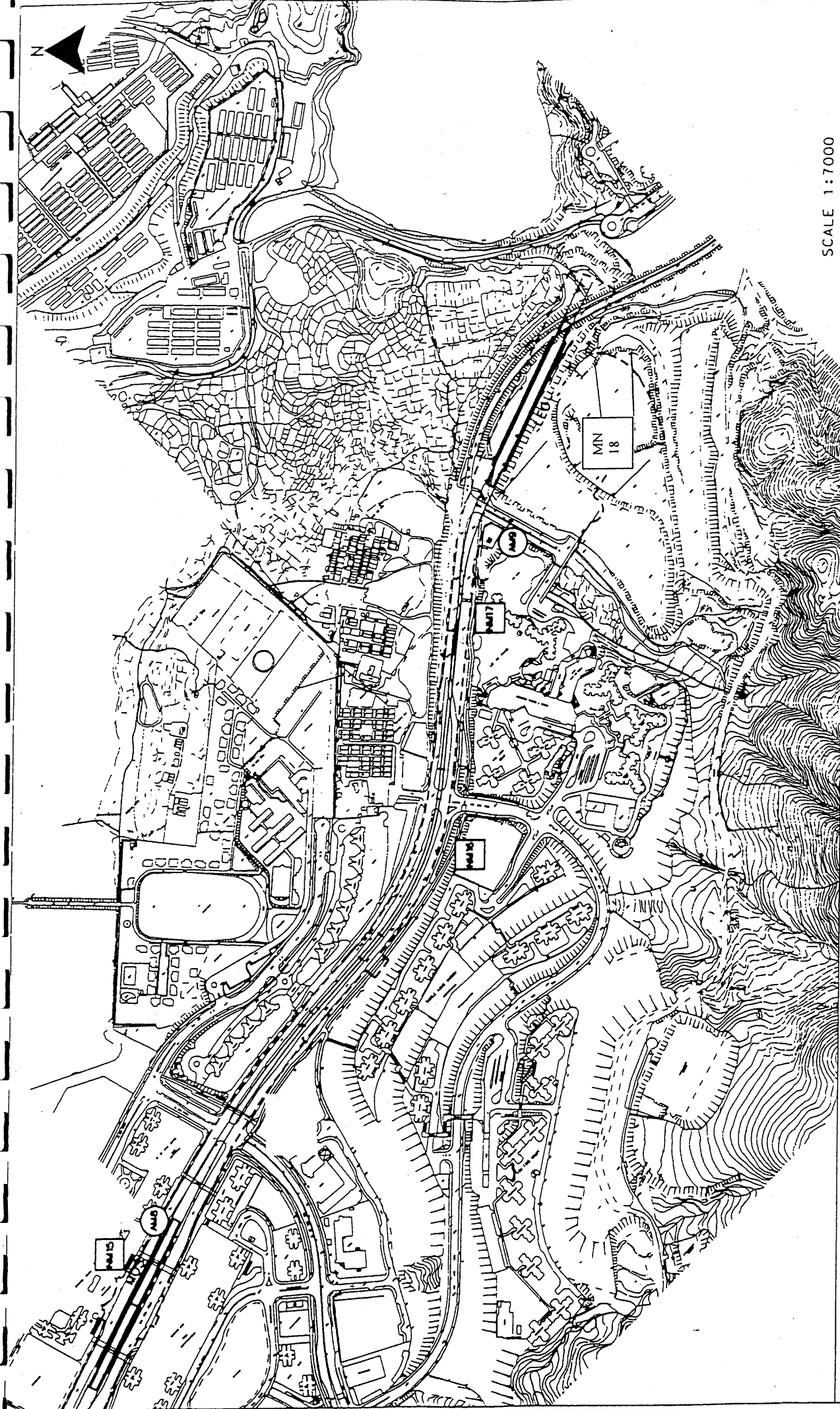
KEY  
 ○ RECOMMENDED AIR MONITORING LOCATION  
 □ RECOMMENDED NOISE MONITORING LOCATION

Additional NSRs that require enhanced EM&A.

S5  
 Recommended Schools for Ad Hoc Monitoring during Examinations

102





SCALE 1:7000



KEY  
 ○ RECOMMENDED AIR MONITORING LOCATION  
 □ RECOMMENDED NOISE MONITORING LOCATION

LOCATION OF RECOMMENDED AIR AND NOISE MONITORING STATIONS

Additional NSRs that require enhanced EM&A.

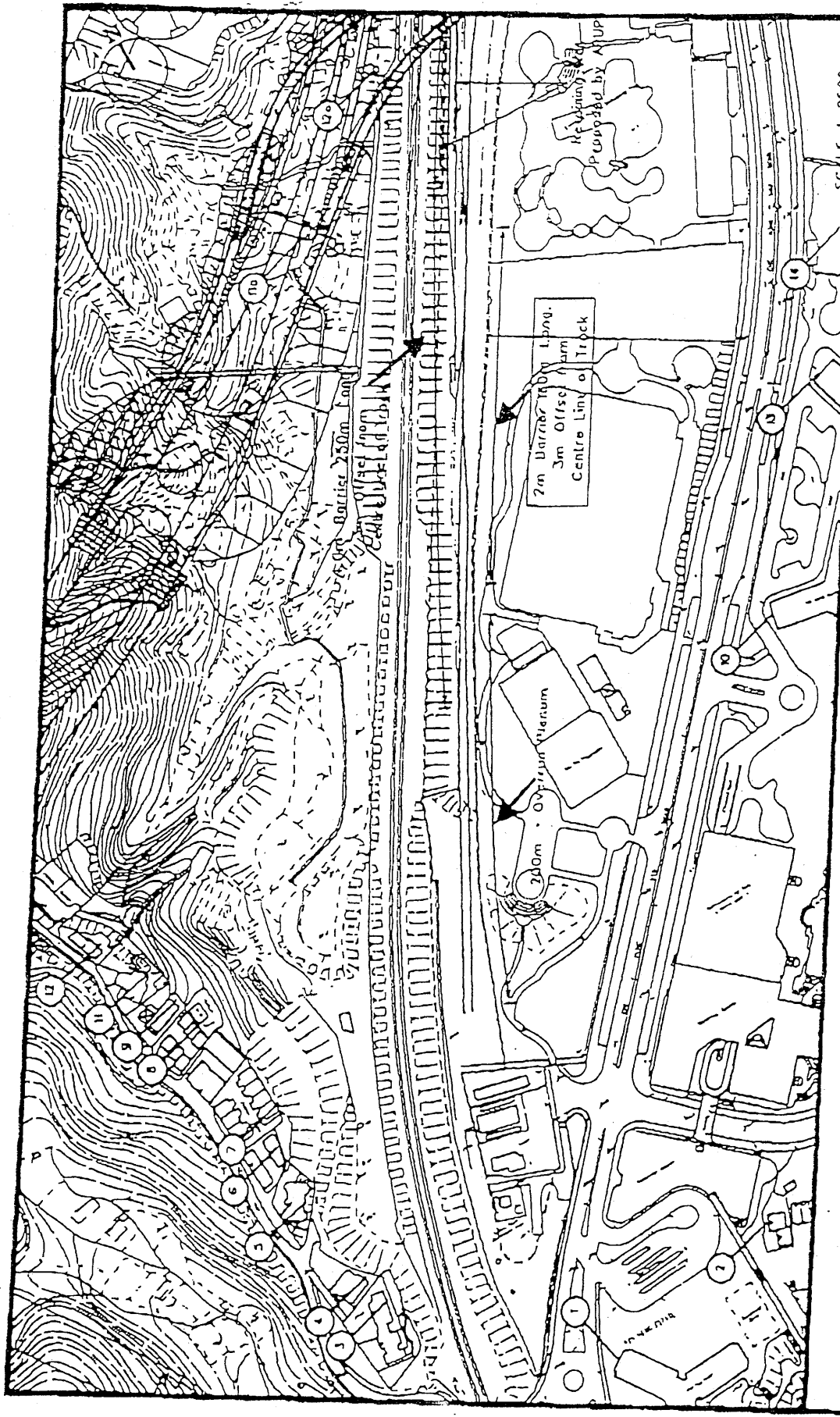
102

Figure 2.2g

**Figure 3.1**  
**Noise Monitoring Field Record Sheet**

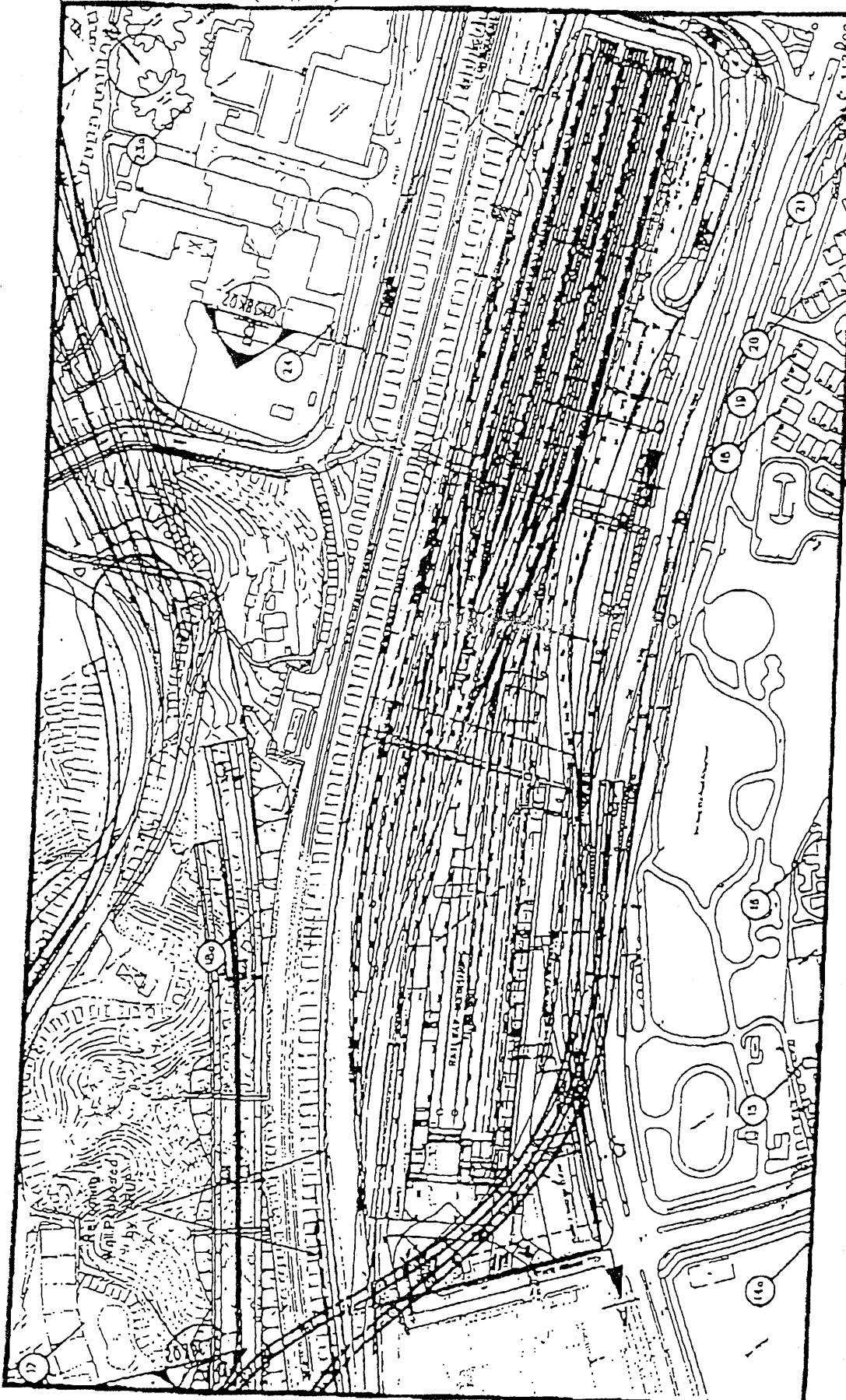
Monitoring Location		
Description of Location		
Date of Monitoring		
Measurement Start Time (hh:mm)		
Measurement Time Length (min.)		
Noise Meter Model/Identification		
Calibrator Model/Identification		
Measurement Results	L <sub>90</sub> (dB(A))	
	L <sub>10</sub> (dB(A))	
	Leq (dB(A))	
Major Construction Noise Source(s) During Monitoring		
Other Noise Source(s) During Monitoring		
Remarks		

	<u>Name &amp; Designation</u>	<u>Signature</u>	<u>Date</u>
Recorded by:	_____	_____	_____
Checked by:	_____	_____	_____



**Figure 3.2a Noise Barriers and Enclosures**  
 (Extracted from the Application VEP-012/2000)

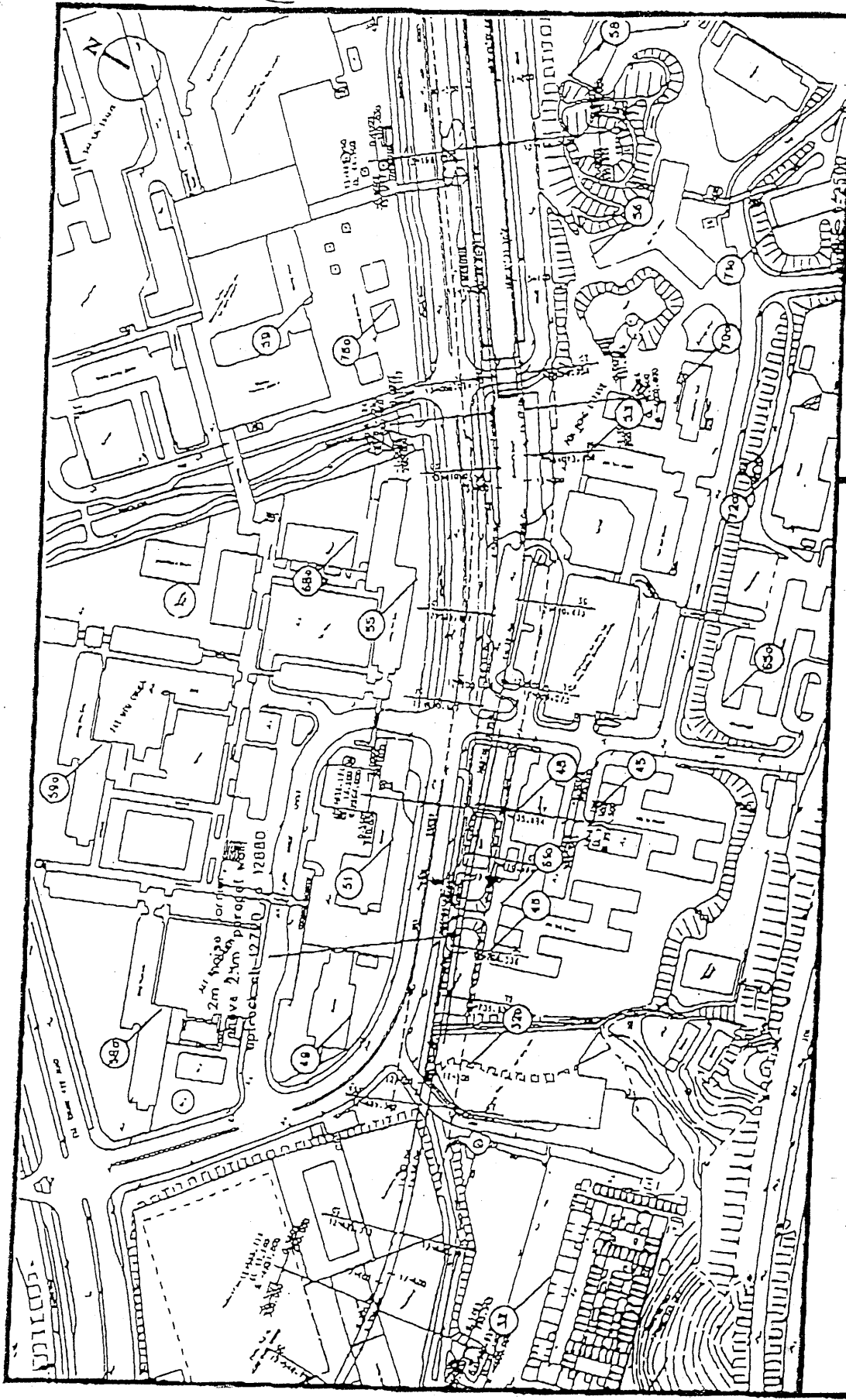
**Environmental Permit No:**  
**VEP-031/2000/B/EP-039**



**Figure 3.2b Noise Barriers and Enclosures**  
(Extracted from the Application VEP-012/2000)

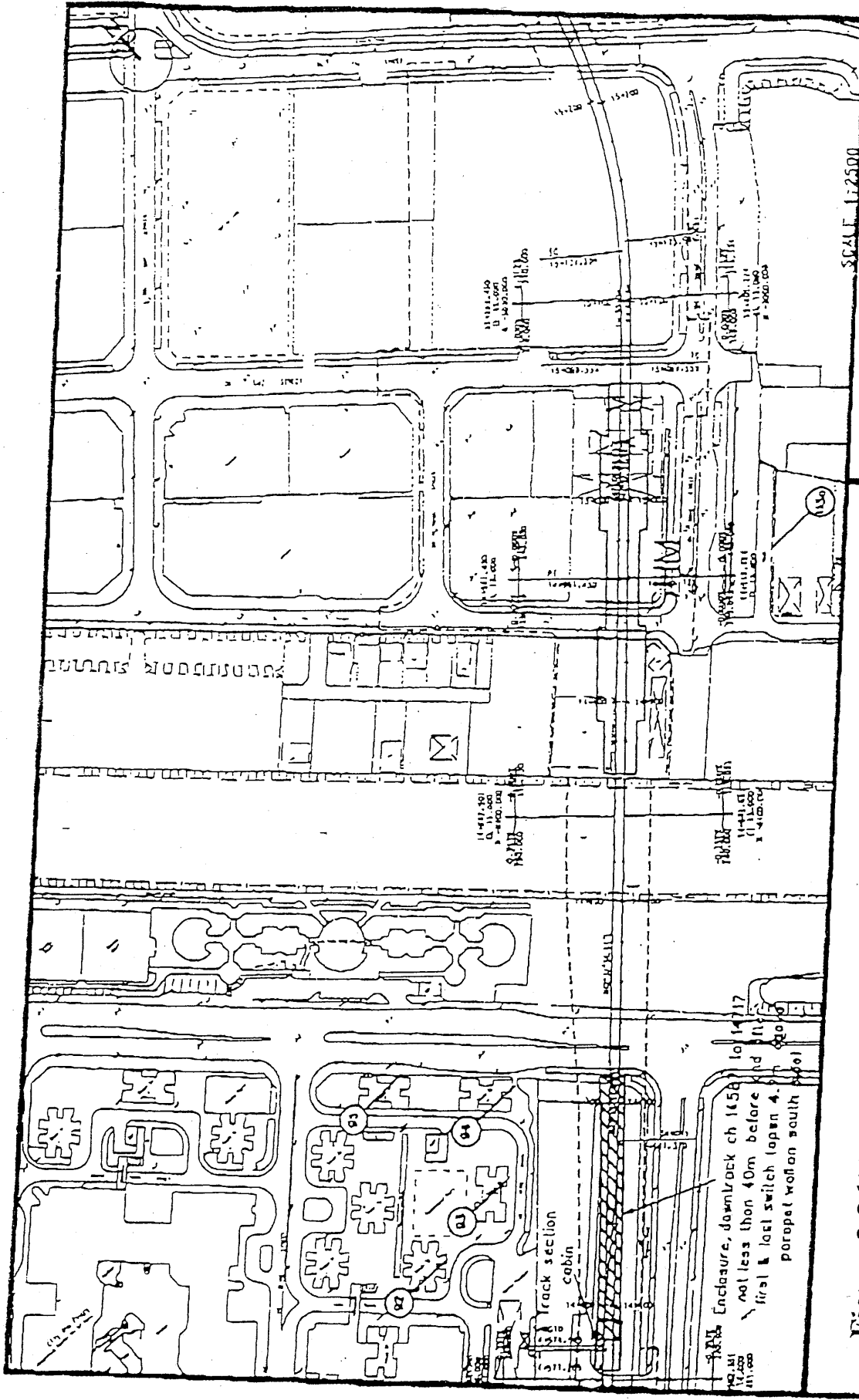
**Environmental Permit No:**  
**VEP-031/2000/B/EP-039**





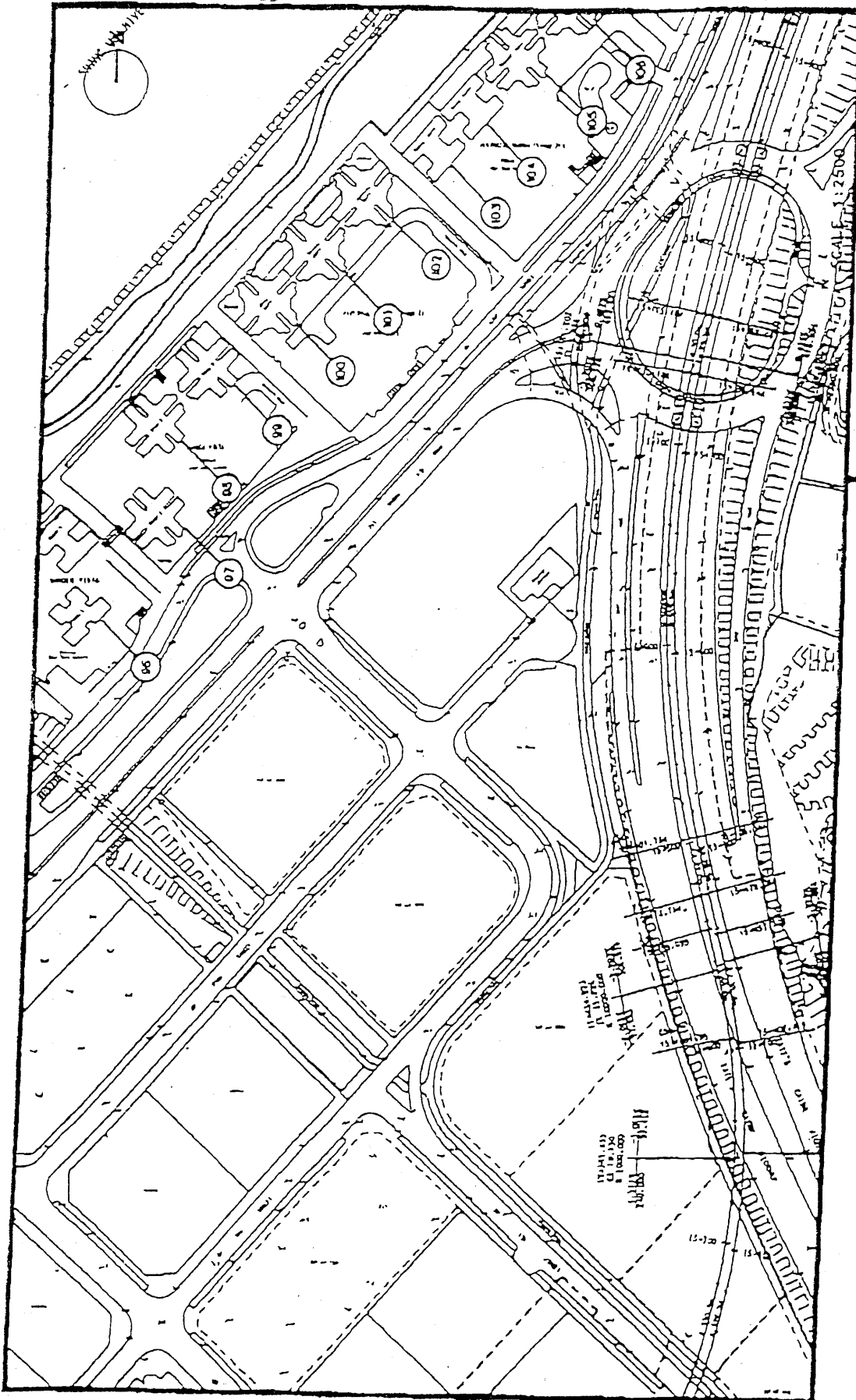
**Figure 3.2c Noise Barriers and Enclosures**  
 (Extracted from Technical Annex F1 of the EIA Report)

Environmental Permit No:  
 VEP-031/2000/B/EP-039



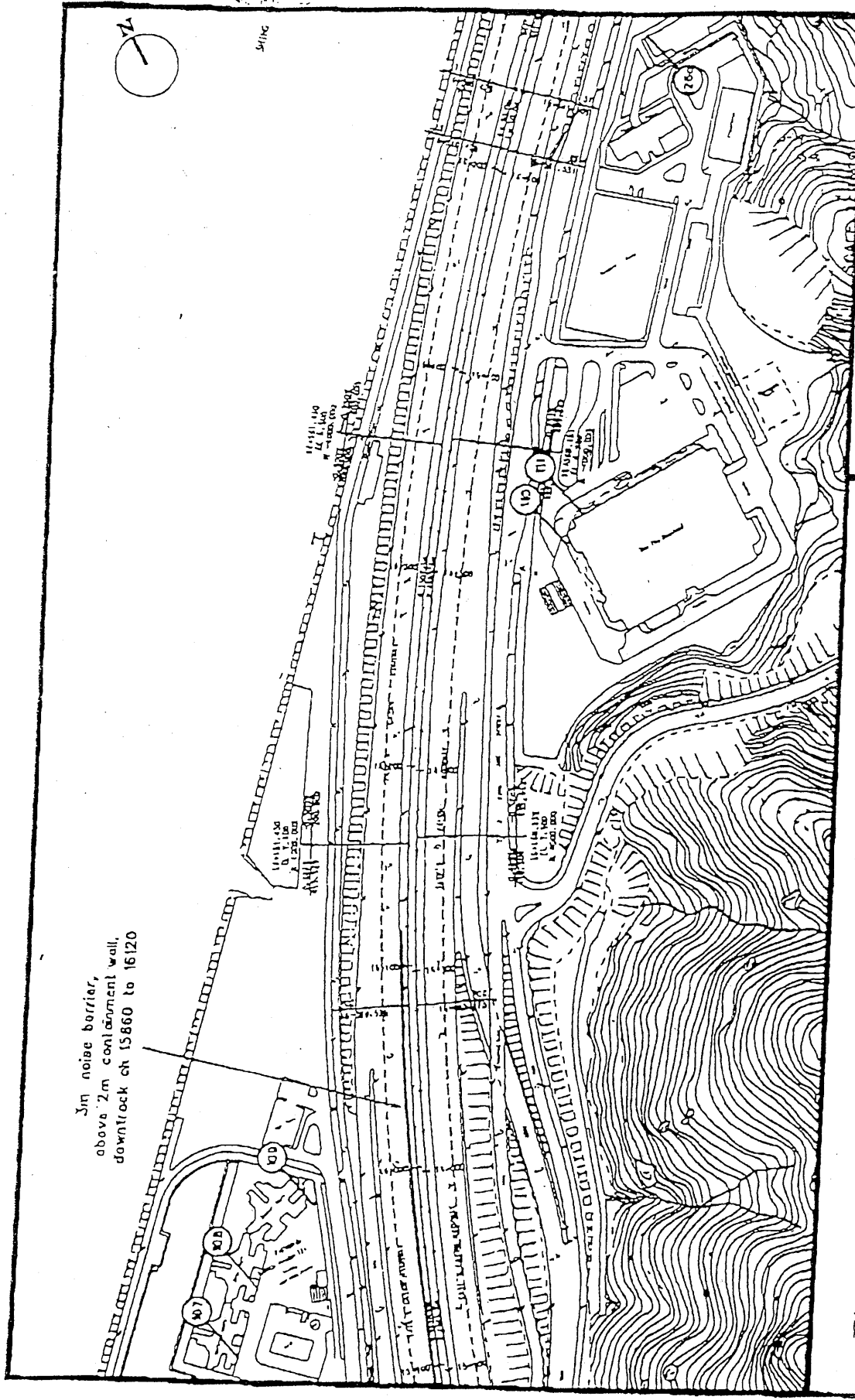
**Figure 3.2d Noise Barriers and Enclosures**  
 (Extracted from Technical Annex F1 of the ELA Report)

Environmental Permit No:  
 VEP-031/2000/B/EP-039



**Figure 3.2e Noise Barriers and Enclosures**  
(Extracted from Technical Annex F1 of the EIA Report)

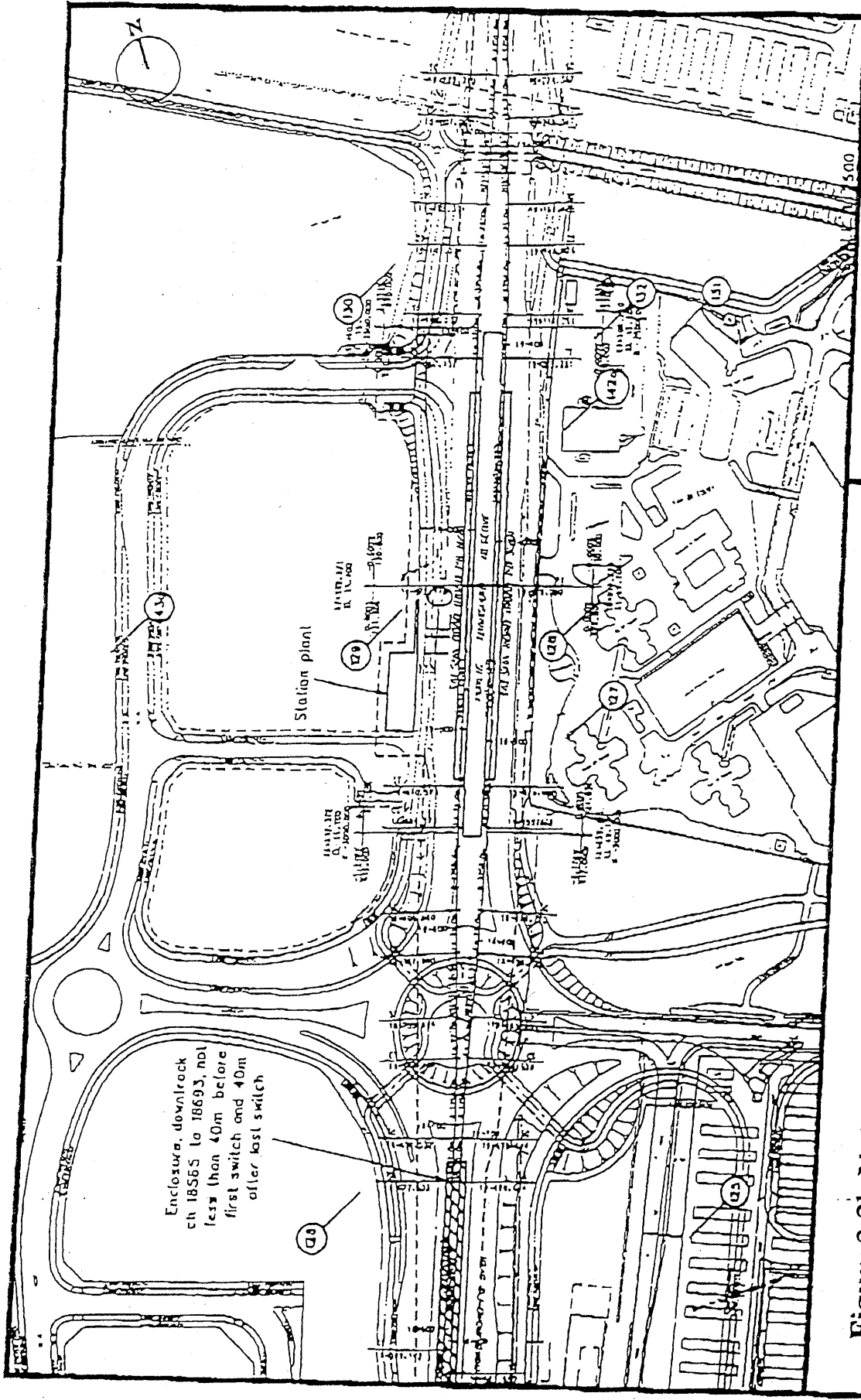
**Environmental Permit No:**  
**VEP-031/2000/B/EP-039**



**Figure 3.2f Noise Barriers and Enclosures**  
 (Extracted from Technical Annex F1 of the EIA Report)

**Environmental Permit No:**  
**VEP-031/2000/B/EP-039**

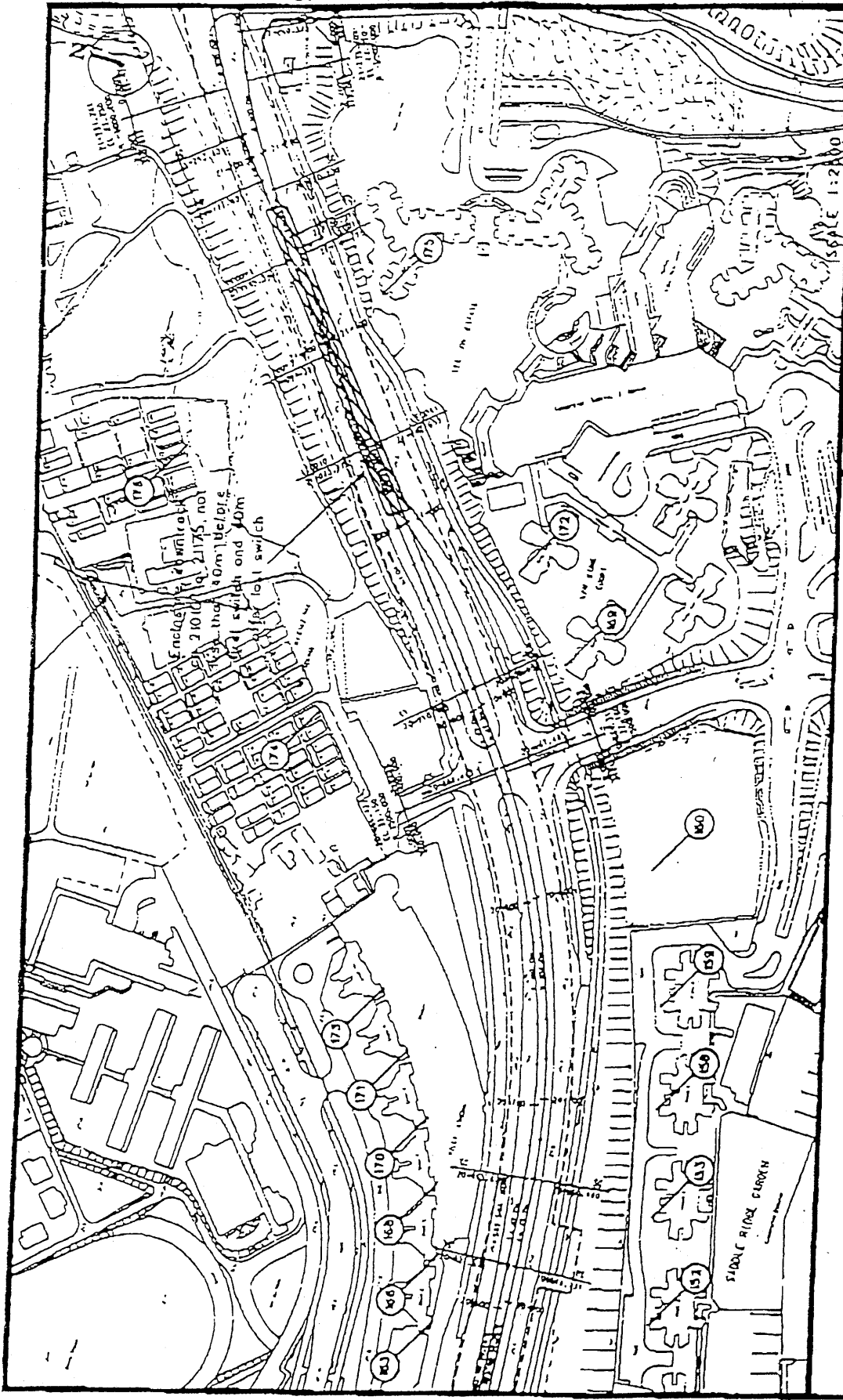




Environmental Permit No:  
VEP-031/2000/B/EP-039

Figure 3.2h Noise Barriers and Enclosures  
(Extracted from Technical Annex F1 of the EIA Report)



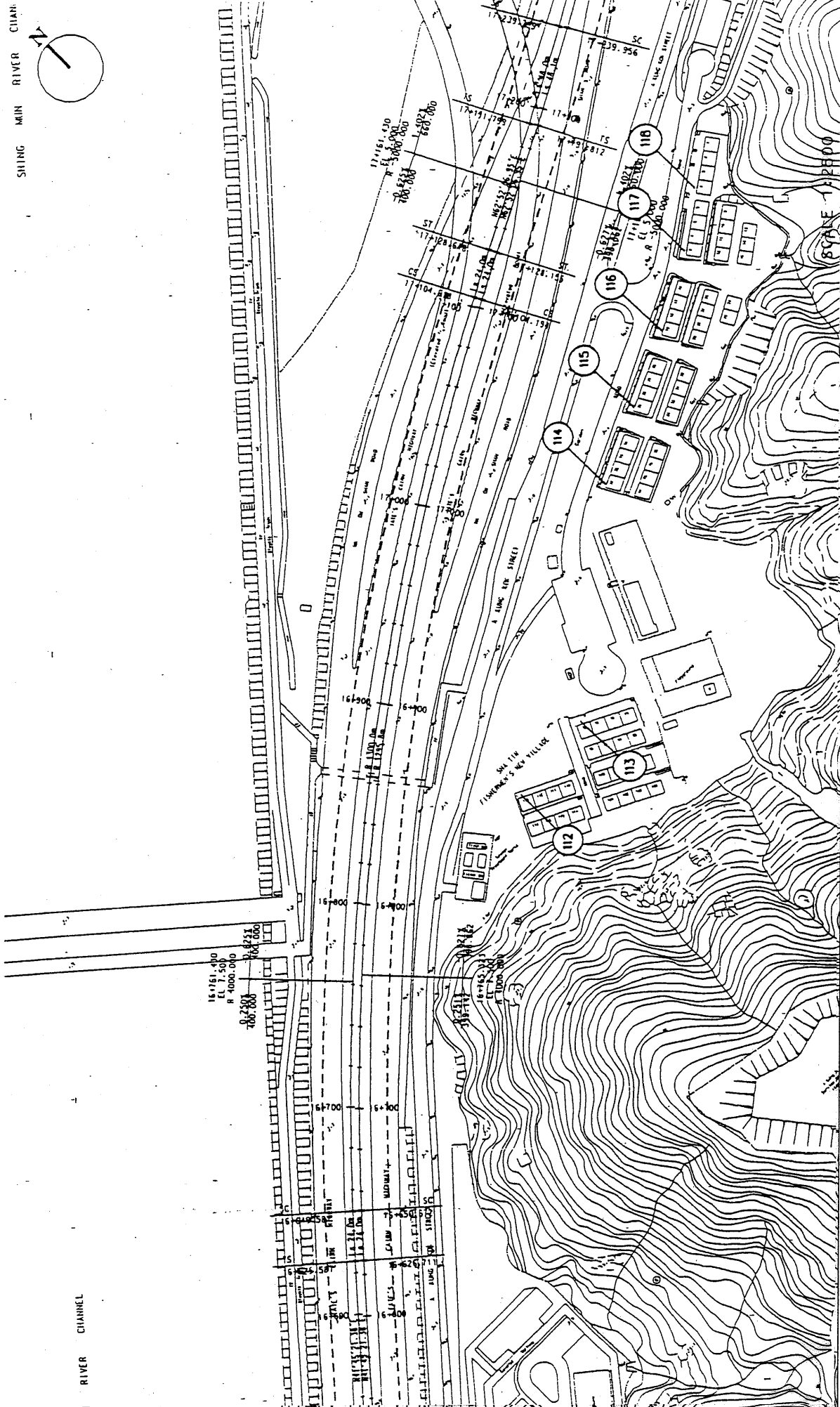


**Figure 3.2j Noise Barriers and Enclosures**  
(Extracted from Technical Annex FJ of the EIA Report)

**Environmental Permit No:**  
**VEP-031/2000/B/EP-039**



SHING MIN RIVER CHANNEL

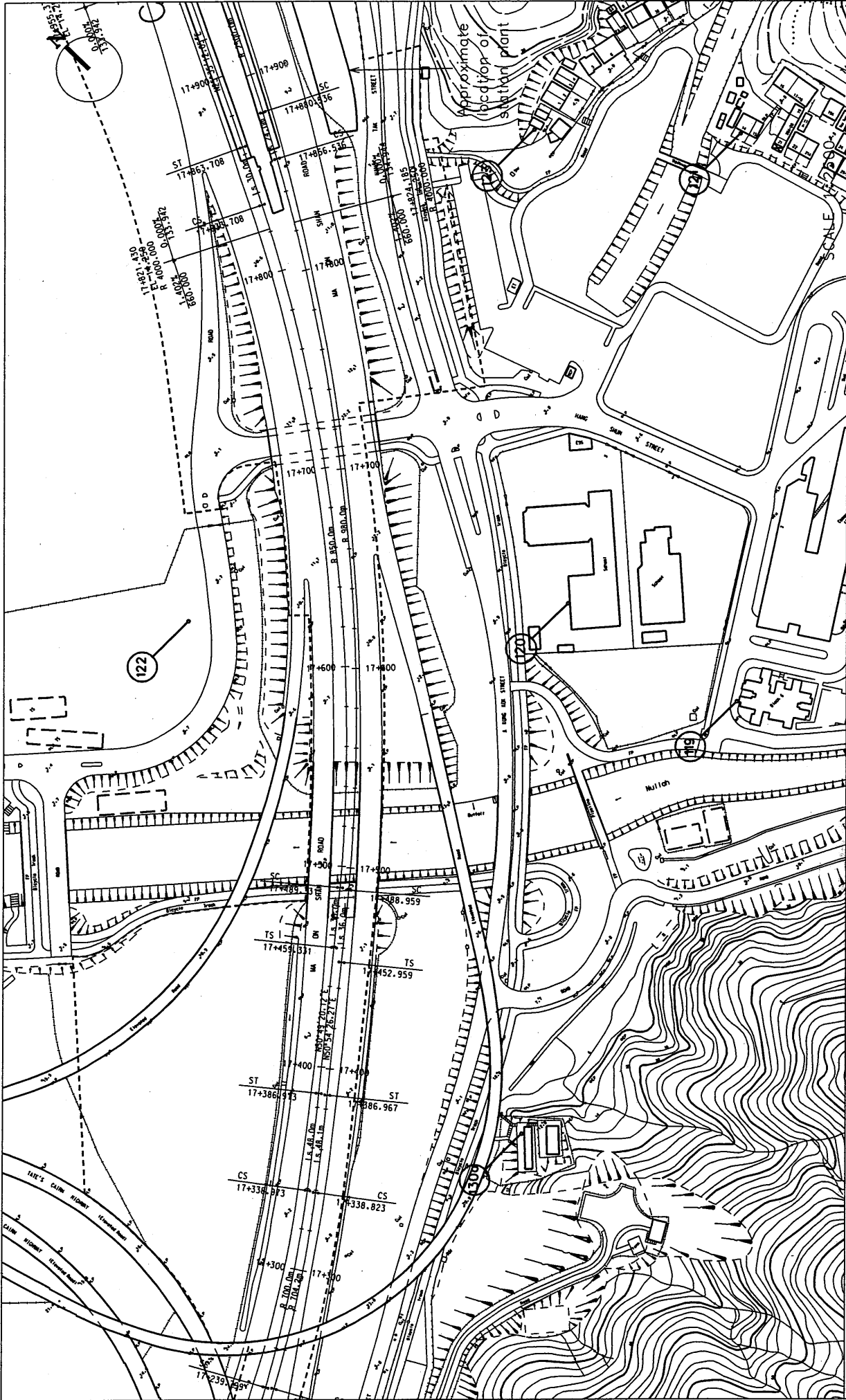


Noise Barriers and Enclosures (Extracted from Technical Annex F1 of the EIA Report)

FIGURE 3.2k

LEGEND  
 Noise Sensitive Receivers  
 Station Site  
 Worksite Area  
 Alignment

**Binnie**  
 Binnie Black & Veatch Hong Kong Limited  
 博勵工程顧問有限公司  
 Engineers and Scientists



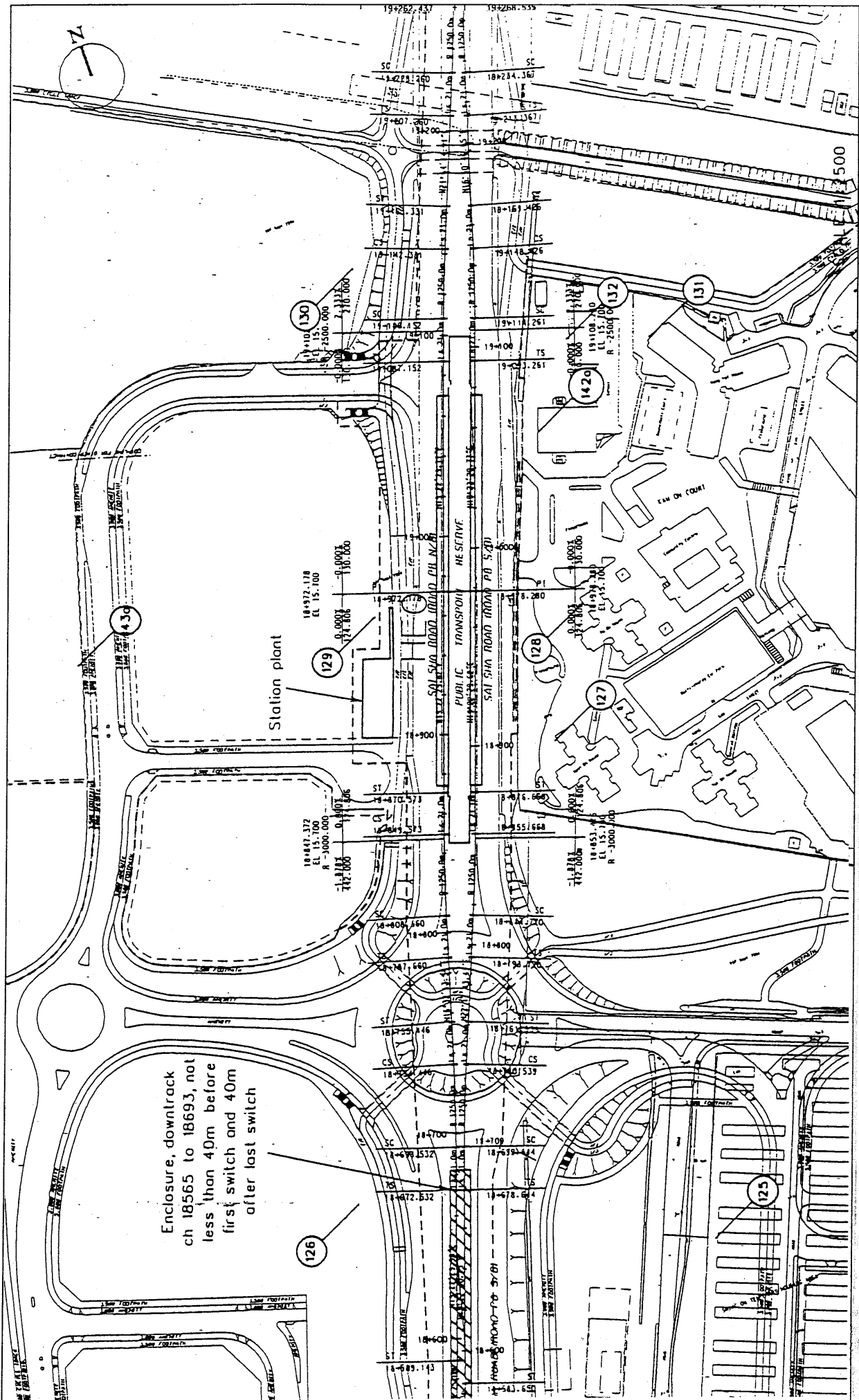
Noise Barriers and Enclosures (Extracted from Technical Annex F1 of the EIA Report)

**Binnie**  
**Black & Veatch**  
**博威工程顧問有限公司**  
 Engineers and Architects

LEGEND  
 Noise Sensitive Receivers  
 Station Site  
 Worksite Area  
 Alignment

FIGURE 3.21



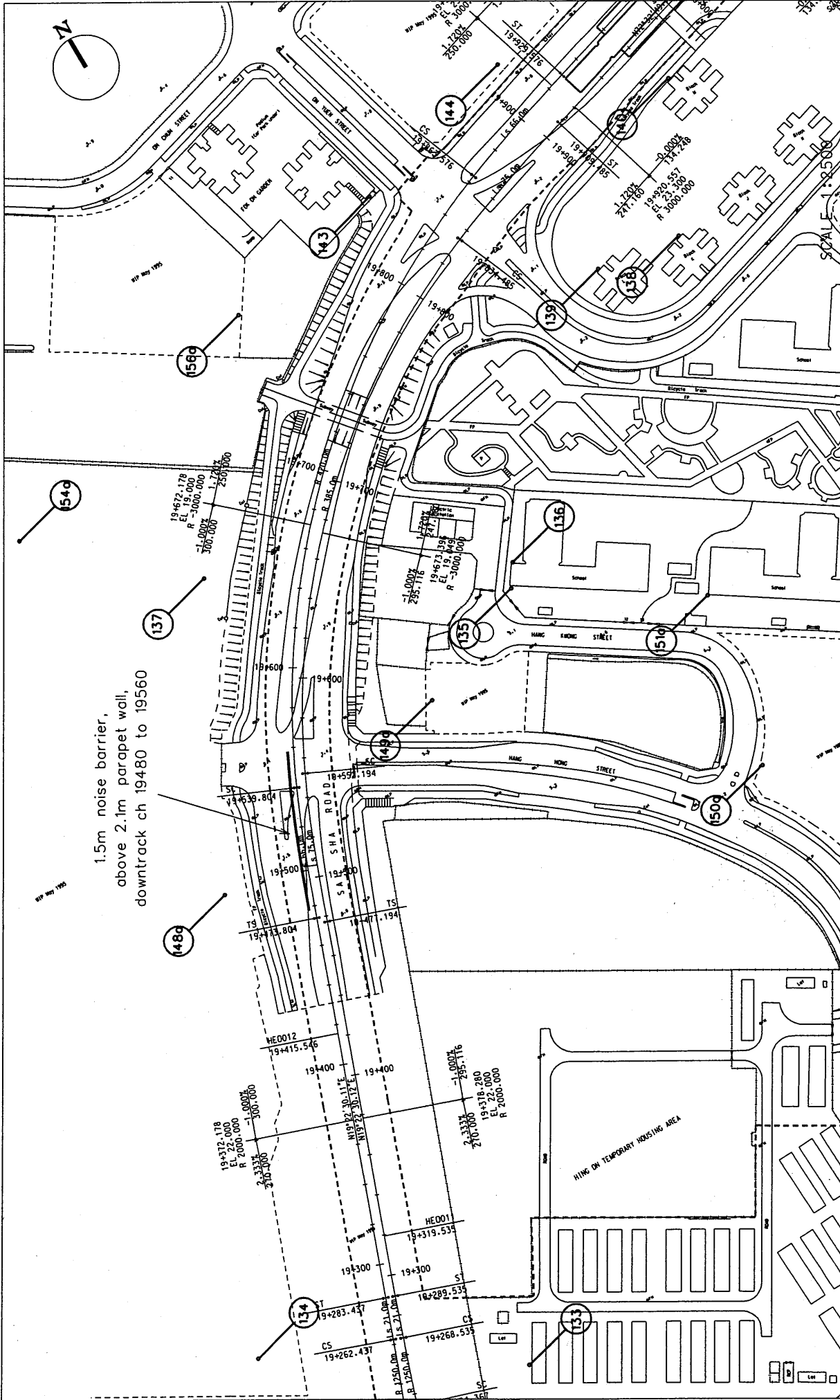


Noise Barriers and Enclosures (Extracted from Technical Annex F1 of the EIA Report)

LEGEND  
 Noise Sensitive Receivers  
 Station Site  
 Worksite Area  
 Alignment

**Binnie & Binnie**  
 Binnie Black & Veatch Hong Kong Limited  
 博威工程顧問有限公司  
 Engineers and Scientists

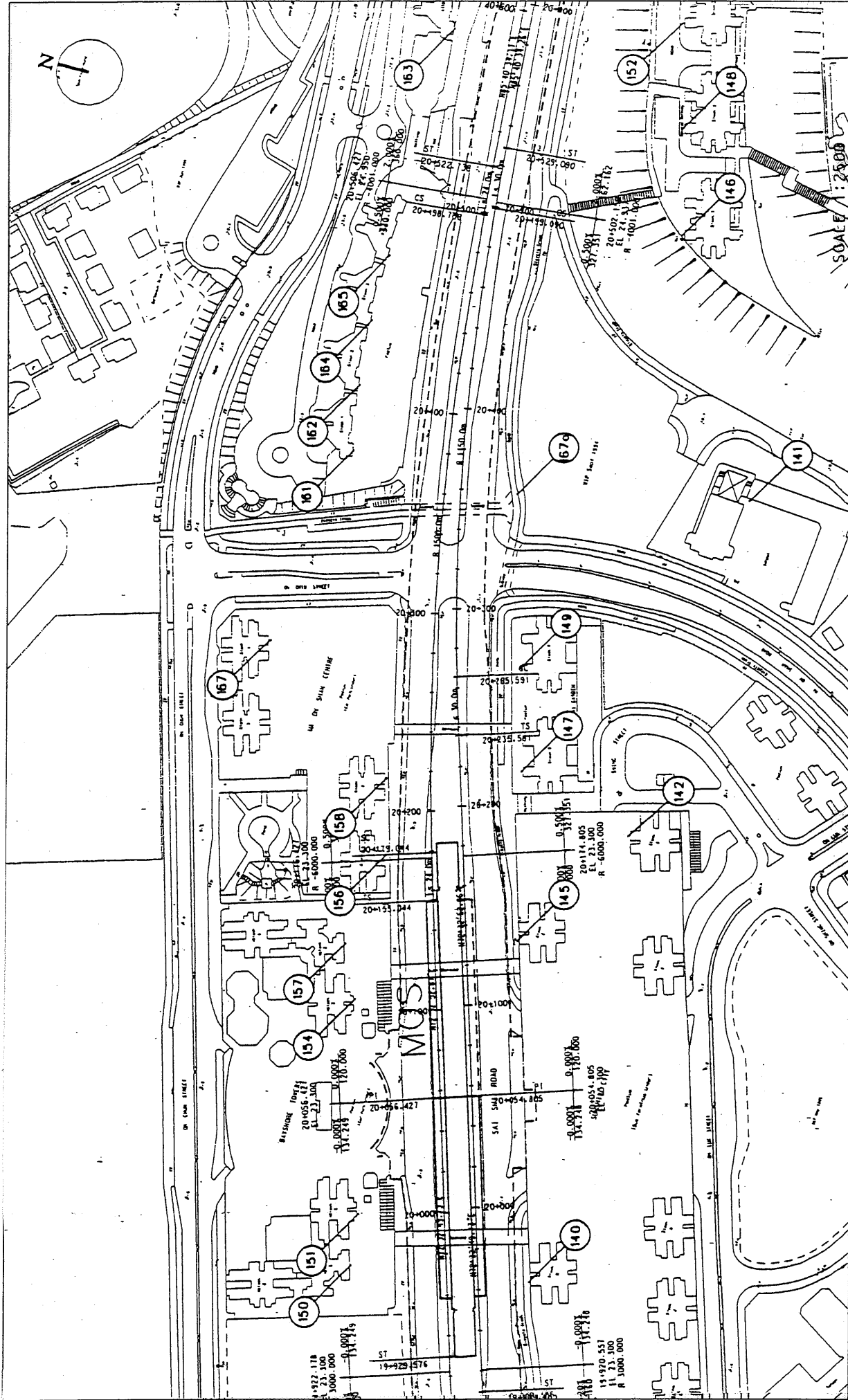
FIGURE 3.2n



1.5m noise barrier,  
above 2.1m parapet wall,  
downtrack ch 19480 to 19560

Noise Barriers and Enclosures (Extracted from Technical Annex F1 of the EIA  
Report)

LEGEND  
 Noise Sensitive Receivers  
 Station Site  
 Worksite Area  
 Alignment

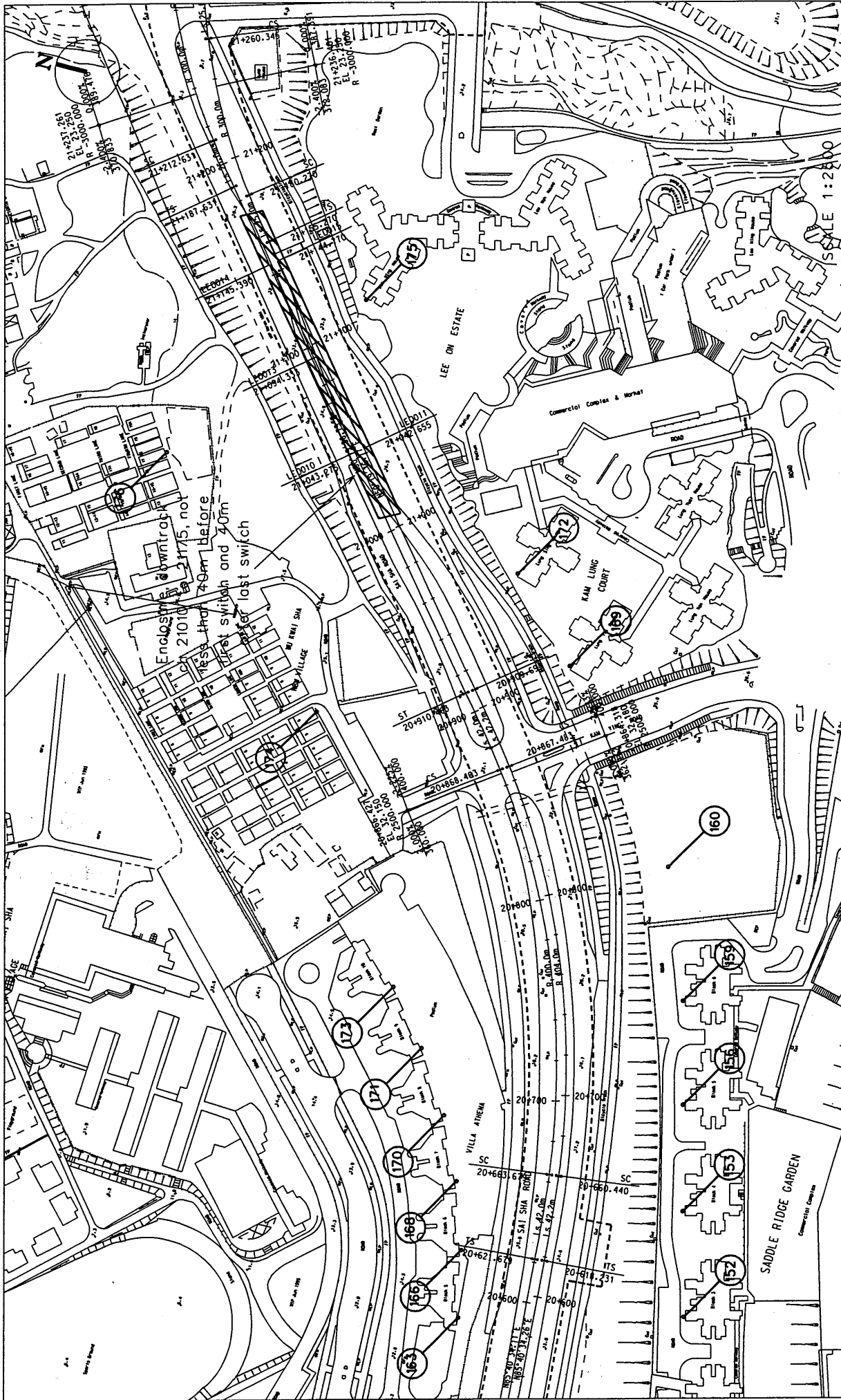


**Binnie**  
 Binnie Black & Veatch Hong Kong Limited  
 博威工程顧問有限公司  
 Engineers and Architects

LEGEND  
 Noise Sensitive Receivers  
 Station Site  
 Worksite Area  
 Alignment

Noise Barriers and Enclosures (Extracted from Technical Annex F1 of the EIA Report)

FIGURE 3.2p

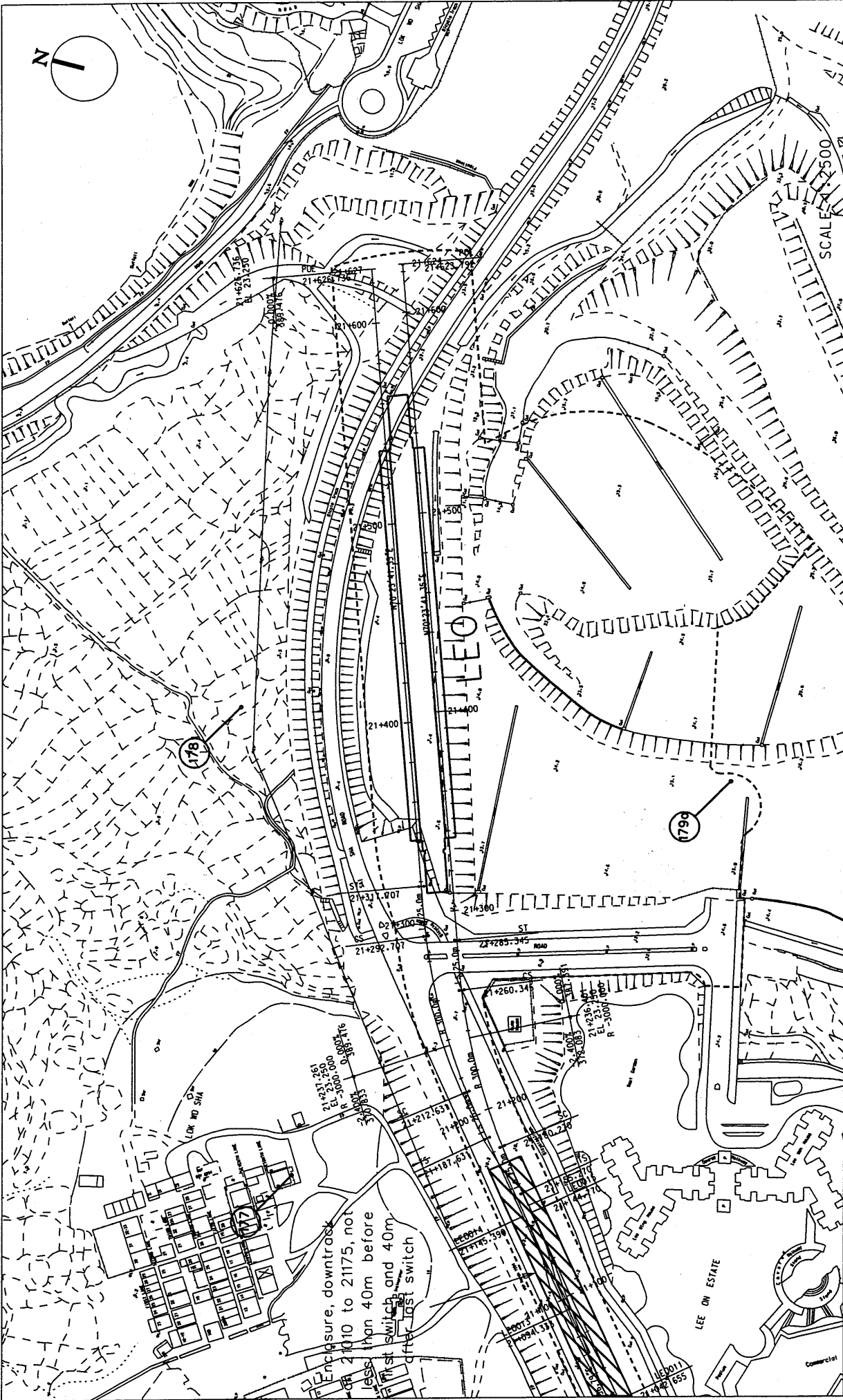


Noise Barriers and Enclosures (Extracted from Technical Annex F1 of the EIA Report)

FIGURE 3.2q

LEGEND  
 ○ Noise Sensitive Receivers  
 □ Station Site  
 ▭ Worksite Area  
 --- Alignment

**Binnie & Binnie**  
**Binnie Black & Veatch Hong Kong Limited**  
 博威工程顧問有限公司  
 Engineers and Architects



Enclosure, downtrack  
 CA 21010 to 21175, not  
 less than 40m before  
 1st switch and 40m  
 after last switch

Noise Barriers and Enclosures (Extracted from Technical Annex F1 of the EIA Report)

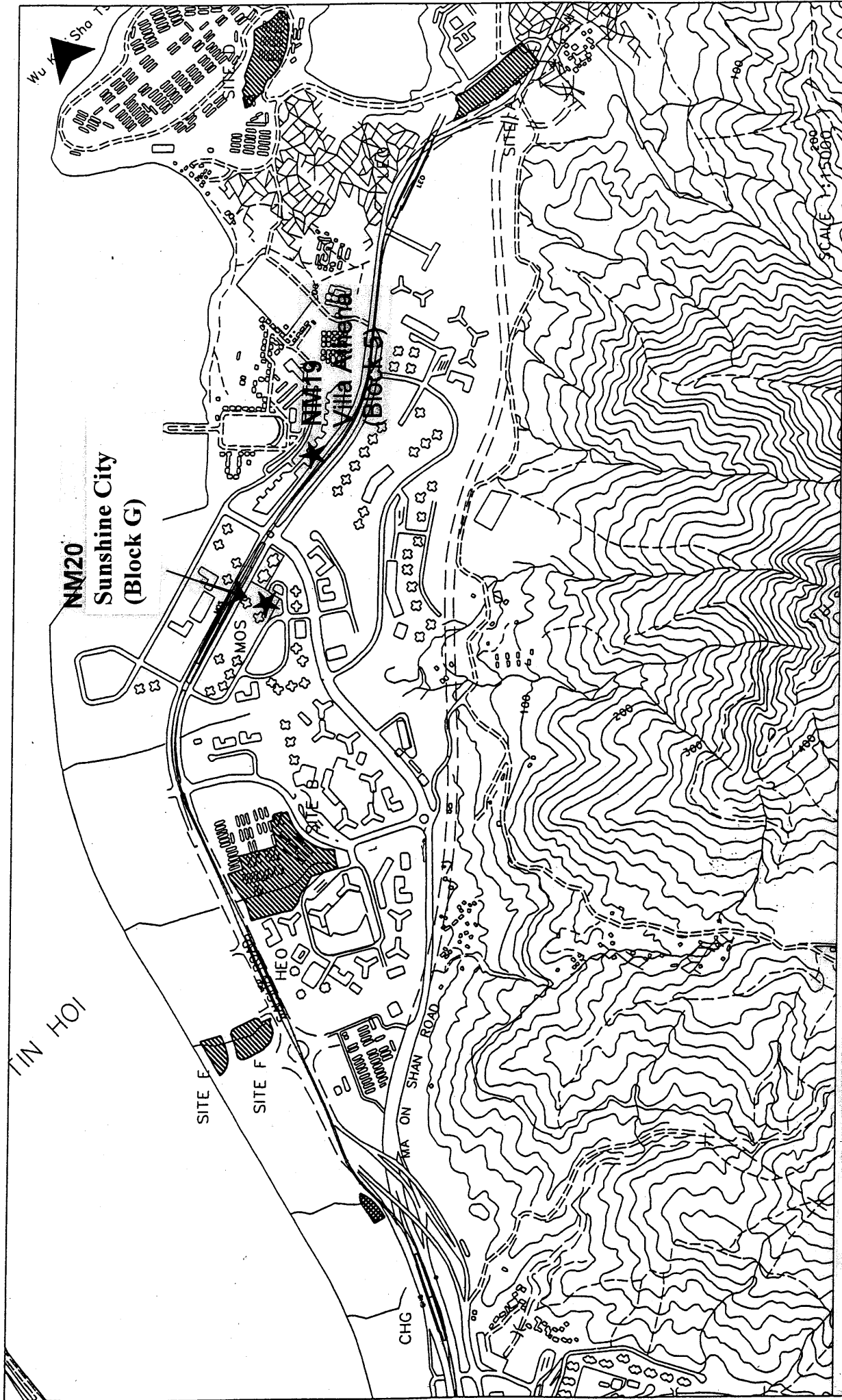


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 Engineers and Scientists

LEGEND  
 Noise Sensitive Receivers  
 Station Site  
 Worksite Area  
 Alignment

FIGURE 3.2r





KEY

- At grade section of railway
- - - Viaduct section of railway
- Station
- ▨ Systems Related Worksites
- ▩ Construction worksites

Figure 3.3 Train Operation and Maintenance Noise Monitoring Locations

**& Binnie**

Binnie Black & Veatch Hong Kong Limited  
 博威工程顧問有限公司  
 Engineers and Architects

Figure 4.1  
 Water Quality Monitoring Data Record Sheet

Location				
Date				
Start Time (hh:mm)				
Weather				
Sea Conditions				
Tidal Mode				
Water Depth (m)				
Monitoring Depth		Surface	Middle	Bottom
Salinity				
Temperature (°C)				
DO Saturation(%)				
DO (mg/l)				
Turbidity (NTU)				
SS Sample Identification				
SS (mg/l)				
Observed Construction Activities	<100m from location			
	>100m from location			
Other Observations				

Name & Designation

Signature

Date

Recorded by:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Checked by:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Note: The SS results are to be filled up once they are available from the laboratory.

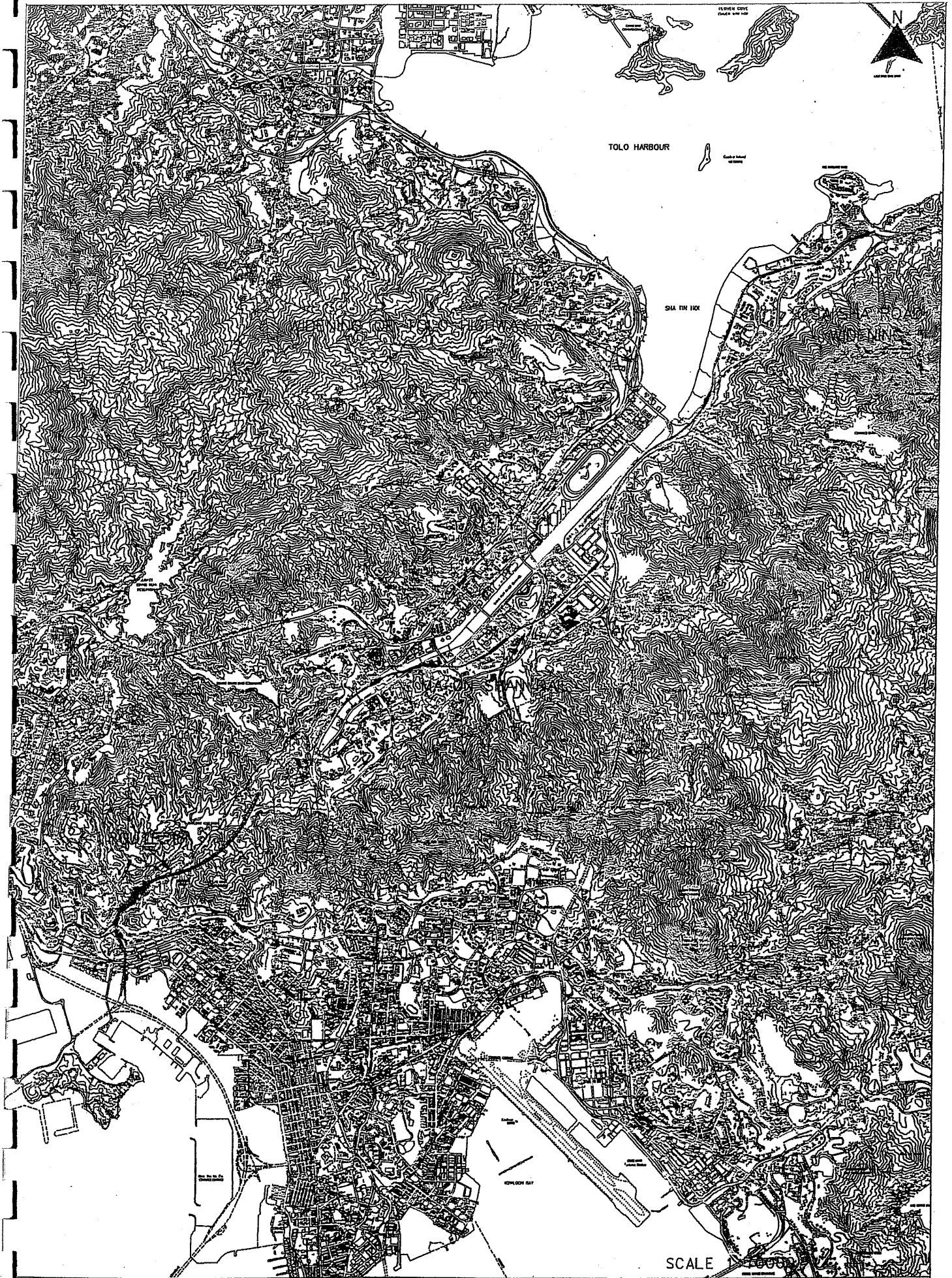
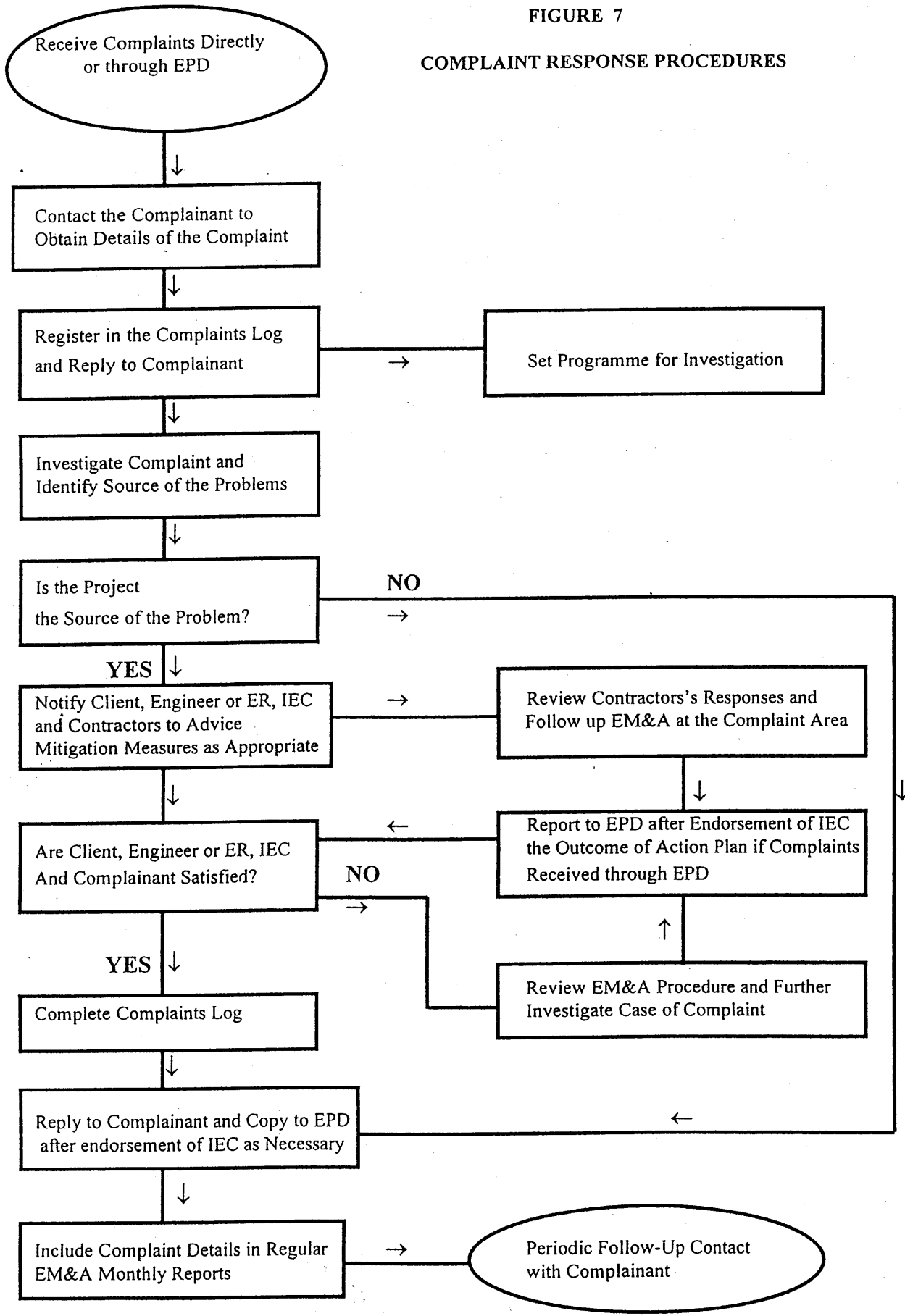


FIGURE 5

LOCATIONS OF CONSTRUCTION SITES IN MOS AND SHATIN AREAS WHICH REQUIRE FILL MATERIAL BETWEEN 2000 AND 2003



FIGURE 7  
COMPLAINT RESPONSE PROCEDURES



**Figure 8**  
**Sample Template for Interim Notifications of**  
**Environmental Quality Limits Exceedances**

Incident Report on Action Level or Limit Level Non-compliance

Project	
Date	
Time	
Monitoring Location	
Parameter	
Action & Limit Levels	
Measured Level	
Possible reason for Action or Limit Level Non-compliance	
Actions taken / to be taken	
Remarks	

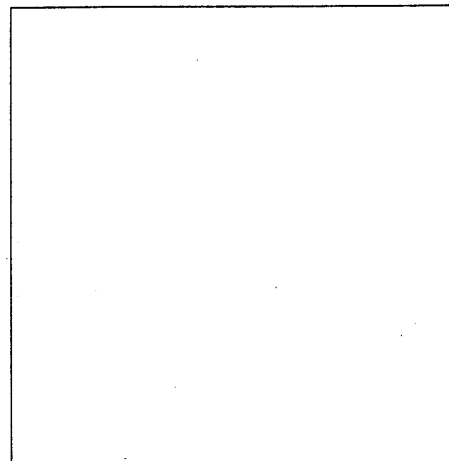
**Location Plan**

Prepared by: \_\_\_\_\_

Designation: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_



**APPENDIX A**

**MITIGATION MEASURES –  
IMPLEMENTATION SCHEDULE**

## 1. INTRODUCTION

This Part of the EIA Report provides a consolidation of the mitigation measures recommended by the EIA Study for the MOS Extension.

The consolidation is presented in the form of an Implementation Schedule in accordance with the format specified in Section 4.1.3 of the *EIA Study Brief No. ESB-015/1998 - East Rail Extensions - Tai Wai to Ma On Shan*.

The Implementation Schedule presents the recommended mitigation measures for both the construction and operation of the MOS Extension.

The Implementation Schedule has the following column headings:

**EIA Ref :**

This denoted the section number or reference from the EIA Report Main text.

**EM&A LOG REF:**

This denoted the sequential number of each of the recommended mitigation measures specified in the Implementation Schedule.

**Environmental Protection Measures:**

This denotes the recommended mitigation measures, courses of action or subsequent deliverables that are to be adopted, undertaken or delivered to avoid, minimise or ameliorate predicted environmental impacts.

**Location/Duration of Measures/Timing of Completion of Measures:**

This indicates the spatial area in which the recommended mitigation measures are to be implemented together with details of the programming or timing of their implementation.

**Implementation Agent:**

This denotes where the responsibility lies for the implementation of the recommended mitigation measures.

**Implementation Stage:**

This denotes the stage at which the recommended mitigation measures are to be implemented: either during the Design, Construction, Operation or Decommissioning.

**Relevant Legislation & Guidelines:**

This section defines the controlling legislation or guidelines that are either required to be complied with, or should be complied with as good practice.

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
<b>AIR QUALITY -Construction Phase</b>						
3 4 3	A1	<p>Standard Dust Suppression Measures</p> <p>The following measures shall be incorporated into the contract documents and adopted as part of good site practice.</p> <ul style="list-style-type: none"> <li>the areas at which demolition work are to take place should be sprayed with water or dust suppressing chemicals immediately upon commencing the works and at regular intervals throughout the duration of the demolition works in order to ensure that the entire surface of the works is maintained in a damp condition;</li> <li>all demolished items that have the potential to emit dust particles should be covered entirely with impervious sheeting or placed in an area sheltered on the top and the 3 sides within a day of demolition;</li> <li>all stockpiles of excavated material shall be either covered entirely by impervious sheeting or sprayed with water so as to maintain it in a damp condition;</li> <li>vehicle washing facilities shall be provided at every exit point, and mechanisms put in place to ensure that they are used effectively.</li> </ul>	<p>All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)</p> <p>All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)</p> <p>All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)</p> <p>All vehicle exits points, for the duration of their use</p>	<p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p> <p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p> <p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p> <p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>Air Pollution Control (Construction Dust) Regulations, LS2, Part I, 3</p> <p>Air Pollution Control (Construction Dust) Regulations, LS2, Part IV, 18</p> <p>Air Pollution Control (Construction Dust) Regulations, LS2, Part IV, 18</p> <p>Air Pollution Control (Construction Dust) Regulations, LS2, Part III, 13</p>
Des C O Dec						



Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
		<ul style="list-style-type: none"> <li>where a site boundary adjoins a road, street, service lane or other area accessible to the public, hoarding of not less than 2.4 m above ground level shall be provided along the entire length of that portion of the site boundary except for any site entrances or exits;</li> <li>every main haul road shall be sprayed with water or a dust suppressing chemical so as to maintain the entire road surface in a damp condition;</li> <li>all dusty materials shall be sprayed with water or a dust suppression chemical immediately prior to any loading, unloading or transfer operation so as to maintain the dust materials in a damp condition.</li> </ul>	<p>All parts of all works areas adjoining a road, street, service lane or other area accessible to the public, and throughout the full duration of the construction contract(s)</p> <p>All haul roads within the works areas and construction sites, and throughout the full duration of the construction contract(s) subject to weather conditions</p> <p>All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)</p>	<p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p> <p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p> <p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p>	✓				<p>Air Pollution Control (Construction Dust) Regulations, LS2, Part III, 13</p> <p>Air Pollution Control (Construction Dust) Regulations, LS2, Part III, 14</p> <p>Air Pollution Control (Construction Dust) Regulations, LS2, Part III, 14</p>
A2		<p>The following specific control measures shall also be incorporated into the contract documents to prevent fugitive dust emission:</p> <ul style="list-style-type: none"> <li>every stockpile of cement or dry pulverised fuel ash shall be covered entirely by impervious sheeting;</li> <li>all receiving hoppers for unloading materials shall be enclosed on 3 sides up to 3 m above the unloading point;</li> <li>cement or dry pulverised fuel ash delivered in bulk shall be stored in a closed silo fitted with an audible high level alarm which is interlocked with</li> </ul>	<p>All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)</p> <p>All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)</p> <p>All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)</p>	<p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p> <p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p> <p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p>	✓				<p>Best Practicable Means Requirements for Cement Work (Concrete Batching Plant)</p> <p>Best Practicable Means Requirements for Cement Work (Concrete Batching Plant)</p> <p>Best Practicable Means Requirements for Cement Work (Concrete Batching Plant)</p>

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
Des C O Dec						
		<ul style="list-style-type: none"> <li>the material filling line to warn of over-filling;</li> <li>silos used for the storage of cement or dry pulverised fuel ash shall not be overfilled;</li> <li>the loading, unloading, handling, transfer or storage of dusty materials shall be carried out in such a manner to minimise dust emissions and in an enclosed system or facility;</li> <li>any vent or exhaust to a silo or other part of the concrete batching facility shall be fitted with an effective fabric filter;</li> <li>any belt conveyor shall be enclosed on the top and on 2 sides with a metal board at the bottom to eliminate any dust emission due to wind-whipping effects;</li> <li>all conveyor transfer points should be totally enclosed;</li> <li>the filler bags in the cement silo dust collector must be thoroughly shaken after cement is blown into the silo to ensure adequate dust collection for subsequent loads;</li> <li>for dry mix batching, the truck batching aperture shall be shrouded and fitted with water</li> </ul>	<p>Construction Manager</p> <p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p> <p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p> <p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p> <p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p> <p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p> <p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p> <p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>Best Practicable Means Requirements for Cement Work (Concrete Batching Plant)</p> <p>Best Practicable Means Requirements for Cement Work (Concrete Batching Plant)</p> <p>Best Practicable Means Requirements for Cement Work (Concrete Batching Plant)</p> <p>Best Practicable Means Requirements for Cement Work (Concrete Batching Plant)</p> <p>Best Practicable Means Requirements for Cement Work (Concrete Batching Plant)</p> <p>Best Practicable Means Requirements for Cement Work (Concrete Batching Plant)</p> <p>Best Practicable Means Requirements for Cement Work (Concrete Batching Plant)</p>	

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
					Des C O Dec	Plant)
		suppression sprays;	duration of the construction contract(s)	enforced by KCRC's Construction Manager		
		<ul style="list-style-type: none"> <li>vents of all silos and weighing scale shall be fitted with a fabric filtering system</li> </ul>	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Best Practicable Means Requirements for Cement Work (Concrete Batching Plant)
A3		Control of Odour				
#		Should any excavated materials be odorous, the following mitigation measures shall be implemented to minimise odour nuisance at nearby ASRs:				
		<ul style="list-style-type: none"> <li>the odorous material shall be removed from site within one day to reduce the amount of time available for decomposition;</li> </ul>	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Annex 4 of EIAO TM
		<ul style="list-style-type: none"> <li>the odorous materials shall be immediately covered with plastic tarpaulin sheets prior to its removal from site.</li> </ul>	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Annex 4 of EIAO TM
B1		CONSTRUCTION NOISE				
		Good Site Practices				
		The following measures should be implemented during each phase of construction				

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
		<ul style="list-style-type: none"> <li>only well-maintained plant (ie that which does not emit excessive noise due to squeaking or rattling etc) shall be operated on-site and plant shall be serviced regularly during the construction programme.</li> <li>machines and plant (such as trucks) that are in intermittent use shall be shut down between work periods or throttled down to a minimum.</li> <li>plant known to emit noise strongly in one direction, shall, where possible, be orientated so that the noise is directed away from nearby NSRs;</li> <li>silencers or mufflers on construction equipment shall be properly fitted and maintained; and</li> <li>mobile plant shall be sited as far away from NSRs as possible (subject to working constraints such as power supply, safety and obstructing the proposed works).</li> </ul>	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓				Noise Control Ordinance (NCO) and Annex 5 of the EIAO TM
B2		Use of Quiet Plant and Working Methods  Where available, the Contractor shall use models of plant that are quieter than those specified in the EPD's technical memorandum (GW-TM)	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓				Noise Control Ordinance (NCO) and Annex 5 of the EIAO TM
B3		Temporary and Movable Noise Barriers  Movable barriers of 3 to 5 m height with a small cantilevered upper portion and skid footing shall be located within a few metres of static plant and within about 5 m of mobile equipment such as excavators	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓				Noise Control Ordinance (NCO) and Annex 5 of the EIAO TM

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
Des C O Dec						
		and mobile cranes etc such that the line of sight is blocked by the barriers viewed from the NSRs. If practicable, the Contractor should provide purpose-built noise barriers or screens constructed of appropriate material (minimum superficial density of 15 kg/m <sup>2</sup> ) located close to operating PME, in order to reduce the noise impact to the surrounding sensitive uses. (Note: The provision of temporary noise barriers may be restricted due to constraints relating to safety and engineering practicality)		Construction Manager		
	B4	Reducing the Numbers of Plant Operating in Critical Areas Close to NSRs				
		Wherever practicable, the Contractor shall reduce the number of items of plant operating at the same time at the specified locations. (Note: The implementation of this mitigation measure may be restricted due to constraints relating to safety and engineering practicality)	At worksites during for viaduct and station construction (ie sections between Tai Wai and Shek Mun, and Chevalier Gardens to Lee On)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Noise Control Ordinance (NCO) and Annex 5 of the EIAO TM
5.6.3	C1	WATER QUALITY - Construction Phase				
	#	General Construction Phase Mitigation Measures				
		The following measures shall be implemented. <ul style="list-style-type: none"> <li>wheel washing facilities and sediment traps shall be provided at each site exit,</li> <li>a maintenance regime shall be devised and implemented for the drainage systems to prevent flooding and overflow,</li> <li>procedures shall be developed and implemented</li> </ul>	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Practice Note for Professional Persons on Construction Site Drainage, EPD, 1994 (ProPECC PN 1/94)  Water Pollution Control Ordinance (WPCO)

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
Des C O Dec						
		for the collection and treatment of sewage, and				
		<ul style="list-style-type: none"> <li>comprehensive waste management (collection, handling, transportation, disposal) procedures shall be devised and implemented</li> </ul>				
C2	#	Construction Runoff and Drainage (Erosion Control Plan)	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Practice Note for Professional Persons on Construction Site Drainage, EPD, 1994 (ProPECC PN 1/94)  Water Pollution Control Ordinance (WPCCO)
C3	#	The overall slope of the site shall be kept to a minimum to reduce the erosive potential of surface water flows, and all trafficked areas and access roads shall be protected by coarse stone ballast	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Water Pollution Control Ordinance (WPCCO)
C4	#	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 earthworks have been completed, or alternatively, within 14 days of the cessation of earthworks where practicable. If	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Water Pollution Control Ordinance (WPCCO)

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
					Des C O Dec	
		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.				
C5	#	Sediment tanks of sufficient capacity to handle the predicted water flows shall be provided for settling out waste water prior to its disposal. The sediment tanks shall be constructed from pre-formed individual cells of approximately 6 to 8 m <sup>3</sup> capacity. The system capacity shall be flexible and able to handle multiple inputs from a variety of sources including influent that is pumped.	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Water Pollution Control Ordinance (WPCO)
C6		All drainage facilities and erosion and sediment control structures shall be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly following rainstorms. Deposited silt and grit shall be removed regularly and disposed of by spreading evenly over stable, vegetated areas.	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Water Pollution Control Ordinance (WPCO)
C7	#	Measures shall be taken to minimise the ingress of site drainage into excavations. If the excavation of trenches in wet periods is necessary, they shall be dug and backfilled in short sections wherever practicable. Water pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Water Pollution Control Ordinance (WPCO)
C8	#	Open stockpiles of construction materials (for example, aggregates, sand and fill material) of more than 50 m <sup>3</sup> shall be covered with tarpaulin or similar fabric during rainstorms. Measures shall be taken to prevent the washing away of construction materials.	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Water Pollution Control Ordinance (WPCO)

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
Des C O Dec						
		soil, silt or debris into any drainage system.				
C9	#	Manholes (including newly constructed ones) shall 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.	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Water Pollution Control Ordinance (WPCO)
C10		The recommendations in Appendix A2 of ProPECC PN 1/94 (ie the measures to be taken at any time of year when rainstorms are likely, when a rainstorm is imminent or forecasted, and during or after rainstorms) shall be implemented. Particular attention shall be paid to the control of silty surface runoff during storm events, especially for areas located near steep slopes.	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Water Pollution Control Ordinance (WPCO)
C11	#	All vehicles and plant shall be cleaned before leaving the construction site to ensure no earth, mud or debris is deposited by them on roads. A wheel washing bay shall be provided at every site exit. The wheel washing bay shall be designed and sited to accommodate the predicted through-put of vehicles and shall have an associated sedimentation facility that is capable of removing the sand and silt from the wash-water. The settled out sand and silt shall be removed at least on a weekly basis to ensure the continued efficiency of the process. The section of access road leading to, and exiting from, the wheel-wash bay to the public road shall be paved with sufficient backfall toward the wheel-wash bay to prevent vehicle tracking soil and silty water to public roads and drains	All construction site exits for the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Water Pollution Control Ordinance (WPCO)





Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
Des C O Dec						
C15	#	<p>Dredging and Marine Disposal of Dredged Sediment</p> <p>The following mitigation measures should be implemented to minimise the potential water quality impact during dredging:</p> <ul style="list-style-type: none"> <li>contaminated sediments shall be dredged using grabs of no more than 8 m<sup>3</sup>;</li> <li>disturbance to the sediments shall be minimised by ensuring care when manoeuvring the grab;</li> <li>all vessels used shall be sized to allow adequate clearance of the river/seabed;</li> <li>barges shall be fitted with tight fitting seals to their bottom openings to prevent leakage of material;</li> <li>barge loading shall be accurate to avoid splashing dredged material into the surrounding water;</li> <li>specialised water light grabs shall be used to control sediment loss and hoist speeds shall be suitably low during operation;</li> <li>overflow of materials or polluted water shall be prevented during loading or transportation</li> </ul> <p>Adequate freeboard shall be maintained to ensure that the decks are not washed by wave action;</p> <ul style="list-style-type: none"> <li>large objects and debris shall be manually removed prior to mechanical dredging to minimise losses from partially closed grabs.</li> </ul>	<p>During dredging works associated with the construction of foundations for viaducts over the Shing Mun River, and Siu Lek Yuen and Tai Shui Hang Nullahs</p>	<p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p>	✓	<p>Practice Note for Professional Persons on Construction Site Drainage, EPD, 1994 (ProPECC PN 1/94)</p> <p>Water Pollution Control Ordinance (WPCO)</p>

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
Des C O Dec						
		<ul style="list-style-type: none"> <li>• construction works shall cause no visible foam, oil, grease, scum, litter or other objectionable matter to be present in the water within the site or dumping grounds;</li> <li>• appropriate water quality monitoring shall be implemented during dredging works;</li> <li>• transport of contaminated mud to marine disposal sites should, wherever possible, be by split barges of not less than 750 m3 capacity, well maintained and capable of rapid opening and discharge at the disposal site;</li> <li>• monitoring of the barge loading shall be carried out to ensure that loss of material does not take place during transportation;</li> <li>• stockpiling of any moderately or seriously contaminated (Class B and Class C) marine sediment at the site shall be prohibited, and there shall be careful control in relation to the stockpiling of any uncontaminated (Class A) sediment to prevent runoff, resuspension and odour nuisances; and</li> <li>• on-site auditing of the equipment and plant is essential to ensure that it is used in the appropriate manner</li> </ul>	<p>During dredging works associated with the construction of foundations for viaducts over the Shing Mun River, and Siu Lek Yuen and Tai Shui Hang Nullahs</p>	<p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p>	✓	<p>Practice Note for Professional Persons on Construction Site Drainage, EPD, 1994 (ProPECC PN 194)</p> <p>Water Pollution Control Ordinance (WPCO)</p>

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
Des C O Dec						
1.6.2		For the marine disposal of mud, a sediment quality report (SQR) shall be prepared as part of the application for a dumping permit under the Dumping at Sea Ordinance. The SQR for marine mud disposal should be prepared and submitted to EPD for approval after a comprehensive site investigation.	Prior to dredging works that may give rise to mud that will require marine disposal (eg the works associated with the construction of foundations for viaducts over the Shing Mun River, and Siu Lek Yuen and Tai Shui Hang Nullahs)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Dumping at Sea Ordinance
C.16	#	Sewage Effluent  Sewage effluent disposal facilities in the form of chemical toilets and septic tanks shall be provided. Appropriate numbers of portable toilets shall be provided by a licensed contractor to serve the construction workers. The Contractor shall also be responsible for maintenance practices and sewage disposal at an appropriate sewage treatment works	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Practice Note for Professional Persons on Construction Site Drainage, EPD, 1994 (ProPECC PN 1/94)
C.17	#	General Construction Activities  Debris and rubbish on site shall be collected, handled and disposed of properly to avoid entering the water column and causing water quality impacts  Temporary on-site storage of excavated materials from station and depot construction works shall be covered with tarpaulin or similar fabric during rainstorms. Any washout of construction or excavated materials should be diverted to the drainage system via sediment traps. Stockpiling of the excavated material can be minimised by scheduling the construction programme in a way that one section of the alignment can be constructed and completed before the excavation works of the next	All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓	Practice Note for Professional Persons on Construction Site Drainage, EPD, 1994 (ProPECC PN 1/94)

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
section commence.						
Des C O Dec						
6.5.1	D1	<p><b>WASTE - Construction Phase</b></p> <p>Upon appointment, the main contractor of each construction contract should submit a Waste Management Plan which 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 recommended mitigation measures in the EIA report. Such a management plan shall incorporate site specific factors, such as the designation of areas for segregation and temporary storage of reusable and recyclable materials.</p> <ul style="list-style-type: none"> <li>• Develop procedures such as a ticketing system to facilitate tracking of marine mud and chemical waste, and to ensure that illegal disposal does not occur;</li> <li>• Segregate and sort the waste materials into 3 categories:                             <ul style="list-style-type: none"> <li>* public fill (eg concrete and rubble) for re-use on-site or disposal at a public filling area;</li> <li>* re-use and/or recycling waste (eg steel and other metals);</li> <li>* waste which cannot be re-used and/or recycled (eg wood, glass and plastic) for landfill disposal</li> </ul> </li> </ul>	<p>All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)</p>	<p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p>	<p>✓</p>	<p>Waste Disposal Ordinance and subsidiary legislation</p>

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
					Des C O Dec	

The sorting process shall be carefully monitored to avoid missing any of the 3 categories. Different types of wastes shall be stockpiled and stored in different containers / skips to enhance re-use or recycling of materials and their proper disposal

- Maintain records of the quantities of wastes generated and disposed off-site for each category of waste

Chemical waste that is produced, as defined by Schedule 1 of the Waste Disposal (Chemical Waste) (General) Regulation, shall be handled in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes.

8 52 E1 LANDSCAPE & VISUAL IMPACTS - Construction Phase

The following mitigation measures shall be implemented to minimise the landscape and visual impact of the construction works.

- Control of night time lighting.
- Erection of decorative screen hoarding.
- Advance planting for screening.
- Minimising the height of temporary buildings.
- Careful positioning of construction plant
- Regular checks shall be carried out to ensure that the work site boundaries are not exceeded and that no damage is being caused to the surrounding

All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)

To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager

EIAO TM ✓

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
					Des C O Dec	
		<p>areas:</p> <ul style="list-style-type: none"> <li>• Temporary construction sites shall be restored to standards as good as, or better than, the original condition;</li> <li>• Replanting of disturbed vegetation shall be undertaken and this shall use predominantly native plant species;</li> <li>• Topsoil shall be stripped and stored for re-use in the construction of the soft landscape works;</li> <li>• The locations of work sites associated with the proposed development shall be carefully selected to minimise the potential landscape and visual impacts of the proposed construction works, and</li> <li>• The potential for soil erosion shall be reduced at construction stage by minimising the extent of vegetation disturbance on site and by providing a protective cover (e.g. plastic sheeting or a grass cover established by hydroseeding) over any exposed ground.</li> </ul>	<p>All parts of all works areas and construction sites, and throughout the full duration of the construction contract(s)</p>	<p>To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager</p>	<p>✓</p>	<p>EIAO TM</p>
		<p>Plans shall be finalised and agreed with the appropriate authorities (eg RSD), for the provisioning of the following temporary open space to compensate for that affected during the construction period:</p> <ul style="list-style-type: none"> <li>• 2 basketball courts and 1 tennis court to be located on Sha Tin Tau Road, opposite Chun Shek Estate as mitigation for the temporary impacts on Tsang Tai Uk Recreation Ground</li> <li>• basketball court to be located within Pok Hong Estate as mitigation for the temporary impacts on</li> </ul>	<p>Prior to commencement of the construction phase</p>	<p>KCRC</p>	<p>✓</p>	<p>EIAO TM</p>

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
					Des C O Dec	
		the Estate recreation facilities along Sha Kok Street				
	F1	CULTURAL AND HERITAGE RESOURCES - Construction Phase				
961		If the detailed design indicates that pier footings are to be located within the areas of archaeological potential at Sha Tin Wai Hill and east of Sai Sha Road at Lee On, archaeological excavation of the areas affected by the footings shall be undertaken during the detailed design phase and prior to the onset of construction.	During the detailed design phase and prior to construction, within areas of archaeological potential at Sha Tin Wai Hill and east of Sai Sha Road at Lee On.	KCRC	✓	EIAO TM & Antiquities and Monuments Ordinance
96.1		The proposed location of the feeder station in the Ma On Shan - Lee On area will be determined during the detailed design stage and following consultation with CLP. The proposed location of the feeder station shall be critically evaluated in terms of the potential impacts to heritage resources and, if appropriate, the intended location will be subject to archaeological field evaluation prior to a final decision being taken as to its location.	During the detailed design stage and prior to construction	KCRC	✓	EIAO TM & Antiquities and Monuments Ordinance
10.7.2	G1	CONTAMINATED LAND  General Mitigation Measures				
		Potential exposure to contaminated materials shall be minimised by implementing the following generic mitigation measures				



Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
		<ul style="list-style-type: none"> <li>Use bulk earth-moving excavator equipment to minimise the potential interface of contaminated materials with site construction workers.</li> </ul>	When working in areas of high contamination potential or concern (eg areas of earthworks along the MOS alignment which are in the vicinity of the identified petrol stations).	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓				Professional Persons Environmental Consultative Committee Practice Note 3/94 - Contaminated Land Assessment and Remediation (ProPECC PN 3/94)
		<ul style="list-style-type: none"> <li>When interacting directly with contaminated material, site personnel shall wear appropriate clothing, ie personal protective equipment such as gloves, in order to minimise their exposure to any contaminated materials. Adequate hygiene and washing facilities shall be provided and smoking and eating shall be prohibited during such activities;</li> </ul>	When working in areas of high contamination potential or concern (eg areas of earthworks along the MOS alignment which are in the vicinity of the identified petrol stations).	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓				Professional Persons Environmental Consultative Committee Practice Note 3/94 - Contaminated Land Assessment and Remediation (ProPECC PN 3/94)
		<ul style="list-style-type: none"> <li>Vehicles containing contaminated materials shall be suitably covered to limit potential dust emissions or contaminated wastewater run-off, and truck bodies and tailgates sealed to prevent any discharge during transport or during wet conditions;</li> </ul>	When working in areas of high contamination potential or concern (eg areas of earthworks along the MOS alignment which are in the vicinity of the identified petrol stations).	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓				Professional Persons Environmental Consultative Committee Practice Note 3/94 - Contaminated Land Assessment and Remediation (ProPECC PN 3/94)
		<ul style="list-style-type: none"> <li>Only licensed waste hauliers shall be used to collect and transport any contaminated sediments to an appropriate disposal site and procedures shall be developed to ensure that illegal disposal of wastes does not occur.</li> </ul>	When working in areas of high contamination potential or concern (eg areas of earthworks along the MOS alignment which are in the vicinity of the identified petrol stations).	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓				Waste Disposal Ordinance (Cap 354); Waste Disposal (Chemical Waste) (General) Regulation (Cap 354)
		<ul style="list-style-type: none"> <li>Prior agreement shall be sought with the Facilities Management Group of the EPD regarding the acceptability of disposal of any contaminated sediments to landfill or other suitable disposal locations</li> </ul>	Prior to undertaking works in areas of high contamination potential or concern	To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓				Waste Disposal Ordinance (Cap 354); Waste Disposal (Chemical Waste) (General) Regulation (Cap 354)



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EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
Des C O Dec						
11 14	H1	HAZARD ASSESSMENT  Identify hazards due to intermediate, medium and low pressure pipelines  In order to prevent accidental damage to the gas pipelines during the construction works associated with the construction of the MOS Extension, there shall be close liaison with HKCG during the detailed design and construction development processes. In addition, the construction safety plan to be developed by KCRC's contractor, in accordance with KCRC's safety management system, should include a detailed assessment of the construction hazards and specify appropriate controls to reduce the risks	During and following the detailed design phase  During and following the detailed design phase, and throughout the construction period	KCRC's detailed design engineers  KCRC's detailed design engineers and KCRC's Contractors	✓  ✓	EIAO TM  EIAO TM
12 3	11	EM&A REQUIREMENTS - Construction Phase  Air Quality  Subject to the Environmental Protection Department's (EPD's) agreement, construction phase dust monitoring shall be carried out at the following locations in accordance with the	Prior to the construction Phase  During and following the detailed design phase, and throughout the construction period  At specified dust monitoring locations throughout the duration of the construction works	KCRC's Contractors  KCRC's detailed design engineers and KCRC's Contractors  To be implemented by KCRC's Contractor(s) and enforced by KCRC's Construction Manager	✓  ✓  ✓	EIAO TM, Safety Management Plan  EIAO TM  Air Pollution Control (Construction Dust) Regulations



EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines	
				Des	C	O	Dec
		NM3 - Lei Uk Tsuen No. 11-15					
		NM4 - Shek Yuk House, Chun Shek Estate					
		NM5 - Tin Ka Ping Salvation Army Primary School					
		NM6 - Pok Tai House, Pok Hong Estate					
		NM7 - Caritas H.W.Lee Care & Attention Centre					
		NM8 - Yue Kwan House, Yue Tin Court					
		NM9 - Lam Kau Mow Secondary School					
		NM10 - Ma On Shan Tsung Tsin Secondary School					
		NM11a Proposed Residential Development in Area 90B in Ma On Shan					
		NM11b Proposed Health and Welfare Building in Area 90B in Ma On Shan					
		NM12 Chinese YMCA College					
		NM13 St. Francis Church					
		NM14 Sunshine City Block M					
		NM15 Bay Shore Towers Block 3					
		NM16 Caritas Ma On Shan Practical School					
		NM17 Lee Wing House, Lee On Estate					
		NM18 Monte Vista					

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
						Des C O Dec

NM19 Villa Athena (Block 5)  
 NM20 Sunshine City (Block G)

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
					Des C O Dec	
12.6	I3	Water Quality				
		N.A.				
3.5	J1	AIR QUALITY - Operational Phase				
		Station Ventilation System				
		Ventilation fans and louvres, or air ventilation systems shall be provided to ensure sufficient local air movement within the station concourse. Smoke extraction vents shall also be provided in the event of fire. The vents for all ventilation systems shall be directed away from nearby sensitive receivers.	All stations, the depot and any associated developments	KCRC's Detailed Design Engineers	✓	
	J2	Bus Terminus				
		The bus terminus ventilation systems shall be designed to achieve the 1-hour and the 5-minute criteria as stated in ProPECC Note (PN 1/98). In addition, the air inlet and exhaust of the ventilation system shall be directed away from the nearby sensitive uses to avoid nuisance	All stations, the depot and any associated developments	KCRC's Detailed Design Engineers	✓	ProPECC Note (PN 1/98)

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
NOISE - OPERATIONAL PHASE						
Des C O Dec						
4.5.6	K1 #	Viaduct Structure The Multi-plenum System together with Floating Slab Track will be used on all elevated sections of the alignment on viaduct.	All elevated sections of the alignment on viaduct	KCRC's Detailed Design Engineers (Viaduct Design)	✓	Noise Control Ordinance and EIAOTM
	K2 #	Structure Radiated Noise During the detailed design phase, the viaduct design contractor shall achieve a performance specification of Lmax 56 dB(A) at a distance of 25 m for a MOS EMU train travelling at 80 kph on viaduct.	All elevated sections of the alignment on viaduct.	KCRC's Detailed Design Engineers (Viaduct Design)	✓	Noise Control Ordinance and EIAOTM
	K3 #	Track Form Design Viaduct of a design commensurate with KCRC's West Rail viaduct which includes a floating mini-slab track (FST) at a resonant frequency of 16 Hz and low stiffness shear type baseplates (Cologne Eggs) of 13 kN/mm shall be used in the track form design.	All elevated sections of the alignment on viaduct.	KCRC's Detailed Design Engineers (Viaduct Design)	✓	Noise Control Ordinance and EIAOTM
	K4 #	Revenue Rolling Stock The source level of rolling stock for revenue trains shall not be higher than Lmax 82.1 dB(A) when running on ballasted track at a speed of 100 kph at a distance of 25 m. The source level shall also not exceed a Lmax level of 81.2 dB(A) when running on viaducts with a maximum speed of 80 kph and at a distance of 25 m.	All revenue trains to be used on the railway extension between Tai Wai and Lee On at all time periods during the operational phase.	KCRC's Detailed Design Engineers (Rolling Stock)	✓	Noise Control Ordinance and EIAOTM



Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
K5 #		Non-revenue Rolling Stock			Des C O Dec	
		The noise source term of operational non-revenue locomotives shall be limited to L <sub>max</sub> 71 dB(A) on viaduct at 25 m for a maximum speed of 50 kph. For trailing flat bed wagons and other operational equipment, the source term shall not exceed L <sub>max</sub> 73.1 dB(A) on viaduct at 25 m for a maximum speed of 50 kph.	All non-revenue trains to be used on the railway extension between Tai Wai and Lee On at all time periods during the operational phase.	KCRC's Detailed Design Engineers (Rolling Stock)	✓	Noise Control Ordinance and EIAOTM
K6 #		Air-conditioning Units				
		The noise specification of air-conditioning units mounted on the roof of revenue trains shall not exceed a noise level of 57 dB(A) at a distance of 15 m from the train.	All revenue trains to be used on the railway extension between Tai Wai and Lee On at all time periods during the operational phase.	KCRC's Detailed Design Engineers (Rolling Stock)	✓	Noise Control Ordinance and EIAOTM
K7 #		Additional Mitigation Measures (to Standard Parapet & Retaining Walls) for Railway Noise				
		7.4 m Cantilever barrier (to be reviewed in detailed design stage - see K9#)	Hin Keng to Tai Wai Section, approx. chainage 10,000-10,400, down track, installed before the operation of railway	KCRC's Detailed Design Engineers and Construction Contractor(s)	✓	Noise Control Ordinance and EIAOTM
		2 m Noise barrier (to be reviewed in detailed design stage - see K9#)	Hin Keng to Tai Wai Section, approx. chainage 10,400-10,900, down track, installed before the operation of railway	KCRC's Detailed Design Engineers and Construction Contractor(s)	✓	Noise Control Ordinance and EIAOTM
		Enclosure	City One Shatin to Shek Mun, approx. chainage 14,587-14,717, down track, installed before the operation of railway	KCRC's Detailed Design Engineers and Construction Contractor(s)	✓	Noise Control Ordinance and EIAOTM
		3 m Noise barrier above 2 m containment wall	Shek Mun to Chevalier Garden, approx. chainage 15,860-16,120, down track,	KCRC's Detailed Design Engineers and	✓	Noise Control Ordinance and EIAOTM

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines	
				Des	C	O	Dec
		Enclosure	installed before the operation of railway	Construction Contractor(s)			
		Enclosure	Chevalier Garden to Heng On, approx. chainage 18,565-18,693, down track, installed before the operation of railway	KCRC's Detailed Design Engineers and Construction Contractor(s)	✓		Noise Control Ordinance and EIAOTM
		1.5 m Noise barrier above 2.1 m parapet wall	Heng On to Ma On Shan, approx. chainage 19,480-19,560, down track, installed before the operation of railway	KCRC's Detailed Design Engineers and Construction Contractor(s)	✓		Noise Control Ordinance and EIAOTM
		Enclosure	Ma On Shan to Lee On, approx. chainage 21,010-21,175, down track, installed before the operation of railway	KCRC's Detailed Design Engineers and Construction Contractor(s)	✓		Noise Control Ordinance and EIAOTM
K7a#		Additional Barriers to meet ANL-10dB(A)					
		Full enclosure (to be reviewed in detailed design stage - see K9#)	Hin Keng to Tai Wai Section, approx. chainage 10,000-10,400, down track, installed before operation of the railway	KCRC's Detailed Design Engineers and Construction Contractor(s)	✓		Noise Control Ordinance and EIAOTM
		3m Noise barrier between tracks (to be reviewed in detailed design stage - see K9#)	Hin Keng to Tai Wai Section, approx. chainage 10,000-10,400, down track, installed before operation of the railway	KCRC's Detailed Design Engineers and Construction Contractor(s)	✓		Noise Control Ordinance and EIAOTM
		2m Noise barrier above 2.1 parapet wall (to be reviewed in detailed design stage - see K9#)	Tai Wai to Sha Kok Street Section, approx. chainage 11,400-11,600, down track, installed before operation of the railway	KCRC's Detailed Design Engineers and Construction Contractor(s)	✓		Noise Control Ordinance and EIAOTM
K8 #		Performance Specification of Mitigation Measures					
		Acoustic performance of noise barriers, enclosures and multi-plenum systems shall be designed in accordance with the performance specification given	All the recommended noise barriers, noise enclosures and the multi-plenum system	KCRC's Detailed Design Engineers	✓		Noise Control Ordinance and EIAOTM







Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines		
					Des	C	O	Dec
		All plant maintenance areas shall be bunded and constructed on a hard standing, and provided with sediment traps and petrol interceptors. Traps and interceptors shall be regularly cleaned and maintained, especially after any accidental spillages. Each petrol interceptor shall have a bypass to prevent flushing during periods of heavy rains. Layers of sawdust, sand or equivalent material shall be laid underneath and around any plant and equipment that may possibly leak oil.	Tai Wai Depot throughout its entire operational period.	KCRC's Detailed Design Engineers, contractors, and operational managers	✓	✓	✓	Drainage Plans subject to Comment by the EPD, Professional Persons Environmental Consultative Committee, Practice Note for Professional Persons (ProPECC PN 5/93)
		An emergency spillage action plan shall be developed for the Depot to ensure that any accidental spillage event is treated immediately and does not impact on any water bodies.	Tai Wai Depot throughout its entire operational period.	KCRC's Depot operational managers			✓	
		All fuel tanks and storage areas within the Depot shall be provided with locks and be located on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank, to prevent the escape of spilled fuel oils.	Tai Wai Depot throughout its entire operational period.	KCRC's Detailed Design Engineers, contractors, and Depot operational managers	✓	✓	✓	
		Waste oil and other chemicals must be disposed of at the Government Chemical Waste Treatment Facility at Tsing Yi	Tai Wai Depot throughout its entire operational period.	KCRC's Depot operational managers			✓	Waste Disposal (Chemical Waste) (General) Regulation (Cap 354).
		Drainage and effluent collection and treatment systems shall be specified at the detailed design stage in order to meet the discharge limits stipulated in the TM	Tai Wai Depot throughout its entire operational period.	KCRC's Detailed Design Engineers, Contractors, and Depot operational managers	✓	✓	✓	EIAO TM
	L5	Drainage						

Implementation Schedule

EIA* Ref	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
					Des C O Dec	
		Drainage mitigation measures shall include:				
		<ul style="list-style-type: none"> <li>locating the columns of bridge crossings of the Siu Lek Yuen and Tai Shui Hang Nullahs in line with the existing columns of the bridge crossings at Ma On Shan Road for the Tai Shui Hang Nullah and Road D9 Extension for the Siu Lek Yuan nullah, and</li> <li>storm water drainage, sewer and U-channel diversions to allow for the proposed columns supporting the elevated track, at grade section of track, depot and station development.</li> </ul>	Siu Lek Yuen and Tai Shui Hang Nullahs	KCRC's Detailed Design Engineers and contractors	✓	✓
		Along the elevated sections of track, the foundations and columns will be strategically located to avoid disturbance to the existing main drainage pipes, culverts and nullahs. A minimum 3 m reserve area to either side of the drains shall be provided to comply with the Drainage Services Department's drainage reserve requirement. If disturbance is unavoidable, any diversion or relocation of local drainage or existing sewers shall comply with both engineering and environmental requirements.	Along all elevated sections of track	KCRC's Detailed Design Engineers and contractors	✓	✓
	M1	WASTE - Operational Phase	Project wide	KCRC		✓
		For the operational phase, KCRC shall submit a Waste Management Plan for the operation of the MOS Extension to EPD. The Plan shall describe the arrangements for avoidance, reuse, recovery and recycling, storage, collection, treatment and disposal of different categories of waste to be generated from				





Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**				Relevant Legislation & Guidelines
					Des	C	O	Dec	
		<p>apparent mass:</p> <ul style="list-style-type: none"> <li>The use of high safety fences along the railway should be avoided wherever possible to minimise adverse visual intrusion on the landscape. This applies particularly along the central reserve within Ma On Shan Road as this is an area of attractive open landscape.</li> <li>Tree and shrub planting should be implemented within the railway reserve, below the viaduct, in order to compensate for lost trees and to soften the visual impact of the viaduct. Tree species should be selected on the basis of their ultimate height, so that they do not physically interfere with the viaduct, and</li> <li>Climbing plants should be used to soften the appearance of viaduct columns.</li> </ul>	<p>Project-wide (although, particularly along the central reserve within Ma On Shan Road)</p> <p>Project-wide</p> <p>Project-wide</p>	<p>KCRC's Detailed Design Engineers</p> <p>KCRC's Detailed Design Engineers</p> <p>KCRC's Detailed Design Engineers</p>	<p>✓</p> <p>✓</p> <p>✓</p>				<p>EIAO TM</p> <p>EIAO TM</p> <p>EIAO TM</p>
11.14	O1	HAZARD ASSESSMENT Adopt necessary engineering measures to reduce the effect of stray current corrosion	Prior to the commencement of the operating railway	KCRC	✓	✓	✓		EIAO TM
12.5	P1	EM&A REQUIREMENTS - Operational Phase Devise procedure for communication of a gas leak/fire to train control centre	Prior to the commencement of the operating railway	KCRC	✓	✓	✓		EIAO TM

Implementation Schedule

EIA* Ref.	EM&A Log Ref	Environmental Protection Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent	Implementation Stage**	Relevant Legislation & Guidelines
Des C O Dec						
#		Noise Monitoring and Maintenance Requirements				
		Monitoring of rolling stock emissions will be required to determine maintenance requirements for vehicles. This will comprise a permanent monitoring location close to the Depot so that noise levels can be attributed to specific rolling stock. As soon as an exceedance of a reference noise level is detected, the fault will be diagnosed for remedial action	Permanent monitoring location close to the Tai Wai Depot	KCRC	✓	EIAO TM
		Periodic inspection of the track for wear and the presence of corrugation will be undertaken by KCRC track maintenance personnel. Where corrugation is detected, rail grinding will be carried out by the KCRC.	Route-wide	KCRC	✓	EIAO TM

\* Des=Design, C=Construction, O=Operation, Dec=Decommissioning

# Proposed mitigation measures that should be included as conditions on the Environmental Permit

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