

**Environmental Impact Assessment Ordinance (Cap. 499), Section 5(7)**  
**Environmental Impact Assessment Study Brief No. ESB-188/2008**

**Project Title : Kwun Tong Line Extension**  
**(hereinafter known as the "Project")**

**Name of Applicant : MTR Corporation Limited (MTRCL)**  
**(hereinafter known as the "Applicant")**

**1. BACKGROUND**

1.1 An application (No. ESB-188/2008) for an Environmental Impact Assessment (EIA) study brief under section 5(1) of the Environmental Impact Assessment Ordinance (EIAO) was submitted by the Applicant on 24 April 2008 with a Project Profile (No. PP-352/2008) (the Project Profile).

1.2 The proposed Project is to construct and operate a new railway line to serve Ho Man Tin and Whampoa in Kowloon. The indicative route of the system is shown in the Project Profile and is reproduced in Figure 1 in this study brief. Preliminary plans of Project boundary and indicative works areas/works sites, based on the best available information at the time of study brief application, are reproduced in Figure 2 to Figure 5 of this study brief. The development and operation of the Project will comprise the following:

- (i) Running line from Yau Ma Tei Station (YMT) to the Ho Man Tin Station (HMT);
- (ii) Running line between HMT to Whampoa Station (WHA);
- (iii) Ho Man Tin Station with associated structures;
- (iv) Whampoa Station with associated structures.

1.3 Pursuant to section 5(7)(a) of the Environmental Impact Assessment Ordinance, the Director of Environmental Protection (the Director) issues this Environmental Impact Assessment (EIA) study brief to the Applicant to carry out an EIA study.

1.4 The purpose of this EIA study is to provide information on the nature and extent of

environmental impacts arising from the construction and operation of the Project and related activities that take place concurrently. This information will contribute to decisions by the Director on:

- (i) the overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project;
- (ii) the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; and
- (iii) the acceptability of residual impacts after the proposed mitigation measures are implemented.

## **2. OBJECTIVES OF THE EIA STUDY**

2.1 The objectives of the EIA study are as follows:

- (i) to describe the Project, associated works, and any option(s) of alignment together with the requirements and environmental benefits for carrying out the Project;
- (ii) to identify any individual Designated Project under Part I, Schedule 2 of the EIAO to be covered in the Project to ascertain whether the findings of this EIA Study have adequately addressed the environmental impacts of these projects;
- (iii) to identify and describe the elements of the community and environment likely to be affected by the Project and/or likely to cause adverse impacts to the Project, including both the natural and man made environment and the associated environmental constraints;
- (iv) to present the considerations of alternative(s) with regard to avoiding and minimizing the potential environmental impacts on the sensitive receivers; to compare the environmental benefits and dis-benefits of the option(s) (including Project alignment, station location(s), train system, locations and size of works areas/works sites and construction method(s)); to provide reasons for selecting the preferred option(s) and to describe the part that environmental factors played in the selection;

- (v) to identify and assess noise impacts, water quality impacts, landscape and visual impacts, hazard to life, waste management implications, potential land contamination issue, air quality impacts and impacts on cultural heritage, and determine the significance of impacts on sensitive receivers and potential affected uses;
- (vi) to investigate the feasibility, practicability, effectiveness and implications of the proposed avoidance or mitigation measures;
- (vii) to identify, predict and evaluate the environmental impacts expected to arise from existing railway connection and modification works to the Yau Ma Tei Station during the construction and operational phases in relation to the sensitive receivers and potential affected uses;
- (viii) to identify, predict and evaluate the residual environmental impacts (i.e. after practicable mitigation) and the cumulative effects expected to arise during the construction and operational phases in relation to the sensitive receivers and potential affected uses;
- (ix) to identify, assess and specify methods, measures and standards, to be included in the detailed design, construction and operational stages of the Project which are necessary to avoid or mitigate these environmental impacts and cumulative effects and reduce them to acceptable levels;
- (x) to investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures and to identify constraints associated with the mitigation measures recommended in the EIA study, as well as the provision of any necessary modification; and
- (xi) to design and specify the environmental monitoring and audit requirements to ensure the effective implementation of the recommended environmental protection and pollution control measures.

### **3. DETAILED REQUIREMENTS OF THE EIA STUDY**

#### **3.1 The Purpose**

- 3.1.1 The purpose of this study brief is to scope the key issues of the EIA study and to specify the environmental issues that are required to be reviewed and assessed in

the EIA report. The Applicant has to demonstrate in the EIA report that the criteria in the relevant sections of the Technical Memorandum on the Environmental Impact Assessment Process of the Environmental Impact Assessment Ordinance (hereinafter referred to as “the TM”) are fully complied with.

## **3.2 The Scope**

3.2.1 The scope of this EIA study shall cover the Project proposed in the Project Profile and shall include the major elements mentioned in Section 1.2 above. The EIA study shall address the key issues and provide information as described below, together with any other key issues identified during the course of the EIA study and the cumulative environmental impacts of the Project through interaction or in combination with the Essential Public Infrastructure Works (EPIW) supporting the Project, any related Project subway work(s), the reprovisioning of Gascoigne Road substation and the associated cable diversion works, and other existing, committed, planned and known potential development in the vicinity of the Project, including at least the Central Kowloon Route, Widening of Gascoigne Road Flyover and Shatin to Central Link:

- (i) the potential noise impacts on the existing and planned sensitive receivers, including at least schools, hospital, nursing homes and hotels along Gascoigne Road; residential buildings along Chung Hau Street; residential buildings along Valley Road, Yan Fung Street and Chung Hau Street; future property development at the HMT Station; residential buildings, school and institutions along Station Lane and the west side of Hung Hom Road; Whampoa Estate, Whampoa Garden and schools along Tak On Street/Tak Fung Street during the construction and operation of the Project;
- (ii) the potential water quality impacts arising from the construction and operation of the Project, including the impact to the underground water table due to the construction and operation of the Project, discharge during the construction stage, sewage treatment and disposal at facilities and discharge from any water-cooled air conditioning system during the operation stage;
- (iii) the potential landscape and visual impacts on existing and planned sensitive receivers, including at least the Gascoigne Road Rest Garden, Fat Kwong Street Playground, Yan Fung Street Rest Garden, and including old and mature tree(s) within the assessment area during the construction and operation of the Project;

- (iv) the potential hazard to life during the construction of the Project;
- (v) the potential impacts of various types of waste arising, including at least excavated materials from constructing tunnels, stations of the railway and any other construction waste to be generated from the construction and operation of the Project;
- (vi) the potential land contamination issue, taking into account relevant land use history and/or present land use;
- (vii) the potential air quality impacts on sensitive receivers, including at least schools, hospital, nursing homes and hotels along Gascoigne Road; residential buildings along Chung Hau Street; residential buildings along Valley Road, Yan Fung Street and Chung Hau Street; future property development at the HMT Station; residential buildings, school and institutions along Station Lane and the west side of Hung Hom Road; Whampoa Estate, Whampoa Garden and schools along Tak On Street/Tak Fung Street during the construction stage of the Project, taking into account the cumulative impact from the construction and operation of existing and planned/committed project in the vicinity of the Project; and
- (viii) the potential impacts on heritage items, including at least the Tin Hau Temple at Temple Street, the Old South Kowloon District Court at Gascoigne Road, the Kwun Yum Temple at Station Lane, and the “disused air raid precaution tunnels and portals” located off Nathan Road, between Gascoigne Road and Cliff Street at Yau Ma Tei and in Valley Road at Ho Man Tin likely to be affected by the construction works of the Project.

### **3.3 Consideration of Alternative Alignment Option(s) and Construction Method(s)**

#### **3.3.1 The Background Information of the Project**

The Applicant shall provide information on the background for the construction and operation of this Project. The Applicant shall explain clearly the purpose and objectives of the Project, and shall include a description of the potential environmental benefits of the Project.

### 3.3.2 Consideration of Alternative Alignment(s), Station(s) and Train System

In addition to the proposed alignment and stations option mentioned in the Project Profile and Section 1.2 above, the Applicant shall describe the considerations given, when exploring various feasible alternative option(s) for alignment, station(s) and train system, to avoid adverse environmental impacts to the maximum practicable extent, taking into account previous studies and any lessons learned from other similar projects. A comparison of the environmental benefits and dis-benefits of feasible alternative option(s) shall be presented to support the selection of the preferred option.

Operational consideration(s) or other constraint(s) affecting the selection of the preferred option shall also be stated. The consideration(s) given in the design and location of the station entrance(s) and ventilation shaft(s) shall also be provided to justify the selection of the preferred option.

### 3.3.3 Consideration of Alternative Construction Method(s), Sequences of Work(s), Works Areas/Works Sites Requirements and Locations

Taking into consideration the potential cumulative effects during the construction period and the degree of the construction impacts on affected sensitive receivers, the EIA study shall describe the consideration(s) given, when exploring various feasible alternative construction method(s) including at least Tunnel Boring Machine, drill-and-blast, cut and cover, minor bored tunnelling and sequence of work(s), works areas/works sites size requirements (including Tunnel Boring Machine launching and retrieval site(s)) and works areas/works sites locations for the Project, to avoid exposing sensitive receivers to adverse environmental impacts.

A comparison of the environmental benefits and dis-benefits of applying different construction method(s), sequences of work(s), works areas/works sites locations and size shall be made.

### 3.3.4 Selection of Preferred Option

Taking into consideration of the findings resulting from Sections 3.3.2 and 3.3.3 above, the Applicant shall provide the recommendation(s) and justification(s) for the preferred option that avoids or minimizes adverse environmental effect(s) arising from the construction and operation of the Project to the maximum practicable extent, and shall adequately describe the part that environmental factor(s)

played in arriving at the final selection.

### 3.3.5 Description of the Project

The Applicant shall describe the Project in details, including at least the alignment and train system to be adopted, the stations locations, the construction programme, the works areas/works sites size requirements and their locations, the explosives magazine location (if overnight storage of explosives cannot be avoided), the form of construction and construction method(s) for various above ground and underground structure(s) of the railway system.

## 3.4 Technical Requirements

The Applicant shall conduct the EIA study to address the environmental aspects as described in Section 3.2 above. The assessment shall be based on the best and latest information available during the course of the EIA study.

### 3.4.1 Construction Air Quality Impact

3.4.1.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing air quality impact as stated in Section 1 of Annex 4 and Annex 12 of the TM, respectively.

3.4.1.2 The study area for air quality impact assessment shall generally be defined by a distance of 500 meters from the boundary of the Project site, with consideration be given to extend the area to include major emission sources that may have a bearing on the environmental acceptability of the Project. The emissions from associated works of the Project shall also be included in determining the cumulative impacts. Besides, if any other concurrent projects are identified relevant during the course of the EIA study, their possible emissions shall also be taken into account in the air quality assessment. The assessment shall include at least the existing, planned and committed sensitive receivers within the study area. Such assessment shall be based on the based available information at the time of the assessment.

3.4.1.3 The air quality impact assessment shall include the following:

(i) Background and Analysis of Activities

(a) Provide background information relating to air quality issues relevant to the

Project, e.g. description of the types of activities of the Project that may affect air quality during the construction stage.

- (b) Give an account, where appropriate, of the consideration/measures that had been taken into consideration in the planning of the Project to abate the air pollution impact. That is, the Applicant shall consider alternative construction methods/phasing programmes to minimize the constructional air quality impact.
  - (c) Present background air quality levels in the assessment area for the purpose of evaluating cumulative constructional air quality impacts.
- (ii) Identification of Air Sensitive Receivers (ASRs) and Examination of Emission/Dispersion Characteristics
- (a) Identify and describe existing and planned/committed ASRs that would likely be affected by the Project, including those earmarked on the relevant Outline Zoning Plans, Outline Development Plans and Layout Plans and other relevant published land use plans, including plans and drawings published by the Lands Department and any land use and development application approved by the Town Planning Board. The Applicant shall select the assessment points of the identified ASRs that represent the worst impact point of these ASRs. A map clearly showing the location and description such as name of buildings, uses and height of the selected assessment points shall be given. The separation distances of these ASRs from the nearest emission sources shall also be given.
  - (b) Provide a list of air pollution emission sources, including any nearby emission sources which are likely to have impact related to the Project based on the analysis of the constructional activities in Sub-section 3.4.1.3(i)(a) above. Examples of construction stage emission sources include stock piling, blasting (if cannot be avoided), construction plant, concrete batching plant and vehicular movements on unpaved haul roads on site, etc. Confirmation of the validity of the assumptions and the magnitude of the activities (e.g. volume of construction materials handled and traffic volume on a haul road etc.) shall be obtained from the relevant government department/authorities and documented.
- (iii) Construction Phase Air Quality Impact



- (a) The Applicant shall follow the requirements stipulated under the Air Pollution Control (Construction Dust) Regulation to ensure that construction dust impacts are controlled within the relevant standards as stipulated in Section 1 of Annex 4 of the TM. A monitoring and audit programme for the construction phase shall be devised to verify the effectiveness of the control measures proposed so as to ensure proper construction dust control.
  
- (b) If the Project will give rise to significant construction dust impacts likely to exceed recommended limits in the TM at the ASRs despite the incorporation of the dust control measures proposed in accordance with Sub-section 3.4.1.3(iii)(a) above, a quantitative assessment should be carried out to evaluate the construction dust impact at the identified ASRs. The Applicant shall follow the methodology set out in Sub-section 3.4.1.3(iv) below when carrying out the quantitative assessment.
  
- (iv) Quantitative Assessment Methodology
  - (a) If quantitative assessment is to be carried out following Section 3.4.1.3 (iii)(b), the Applicant shall apply the relevant general principles enunciated in the modelling guidelines in Appendices A1 to A3 while making allowance for the specific characteristic of the Project. This specific methodology must be documented in such level of details, preferably assisted with tables and diagrams, to allow the readers of the EIA report to grasp how the model has been set up to simulate the situation under study without referring to the model input files. Detailed calculations of air pollutants emission rates for input to the modelling and a map showing the emission sources shall be presented in the EIA report. The Applicant must ensure consistency between the text description and the model files at every stage of submissions for review. In case of doubt, prior agreement between the Applicant and the Director on the specific modelling details should be sought.
  
  - (b) The Applicant shall identify the key/representative air pollution parameters (types of pollutants and averaging time concentrations) to be evaluated and provide explanation for selecting such parameters for assessing the impact from the Project.
  
  - (c) The Applicant shall calculate the cumulative air quality impact at the ASRs identified under Sub-section 3.4.1.3 (ii)(a) above and compare these results against the criteria set out in section 1 of Annex 4 in the TM. The predicted air

quality impacts (both unmitigated and mitigated) shall be presented in the form of summary table(s) and pollution contours, to be evaluated against the relevant air quality standards and on any effect they may have on the land use implications. Plans of a suitable scale should be used to present pollution contours to allow buffer distance requirements to be determined properly.

(v) Mitigation Measures for Non-compliance

The Applicant shall propose remedies and mitigating measures where the predicted air quality impact exceeds the criteria set in Section 1 of Annex 4 in the TM. These measures and any constraints on future land use planning shall be agreed with the relevant government departments/authorities and documented. The Applicant shall demonstrate quantitatively that the residual impacts after incorporation of the proposed mitigating measures will comply with the criteria stipulated in Section 1 of Annex 4 in the TM.

(vi) Submission of Model Files

All input and output file(s) of the model run(s) shall be submitted to EPD in electronic format.

### 3.4.2 **Noise Impact**

3.4.2.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing both the construction and operation noise impacts arising from the Project as stated in Annexes 5 and 13 of the TM respectively. In response to Section 4.4.2(h) of the TM, the Applicant shall review and consider any lessons learnt from other similar projects for incorporation in the current proposal to avoid in the first instance or minimize potential noise impacts.

3.4.2.2 The Applicant shall address the potential noise impacts, including at least (1) the potential air-borne and ground-borne construction noise impacts; (2) the potential operational rail noise impacts; and (3) the potential fixed noise impacts during the operation stage, such as ventilation system(s)/fan(s) and fixed plant(s) at stations.

3.4.2.3 The noise impact assessment shall include the following:

(i) Determination of Assessment Area

The assessment area shall include all areas within a distance of 300m from the Project boundary and of all work sites, including work areas away from the railway alignment, proposed under the Project. The assessment area may be reduced accordingly if the first layer of noise sensitive receivers (NSRs), closer than 300m from the outer project limit, provides acoustic shielding to those receivers located further away. In this case, the assessment area shall be agreed with the Director. Subject to the agreement of the Director, the assessment area shall be expanded to include NSRs at greater distance which would be affected by the construction and operation of the project.

(ii) Provision of Background Information and Existing Noise Levels

The Applicant shall provide background information relevant to the Project, e.g. relevant previous or current studies. Unless required for determining the planning standards, such as those for planning of fixed noise sources, no existing noise levels are particularly required.

(iii) Identification of Noise Sensitive Receivers

- (a) The Applicant shall refer to Annex 13 of the TM when identifying the NSRs. The NSRs shall include all existing NSRs and all planned/committed noise sensitive developments and uses earmarked on the relevant Outline Zoning Plans, Outline Development Plans and Layout Plans, and other relevant published land use plans.
- (b) The Applicant shall select assessment points to represent all identified NSRs for carrying out quantitative noise assessment as described below. The assessment points shall be agreed with the Director prior to the quantitative noise assessment and may be varied subject to the best and latest information available during the course of the EIA study. A map shall be given showing the location and description such as name of building, use, and floors of each and every selected assessment points. For planned noise sensitive land uses without committed site layouts, the Applicant should use the relevant planning parameters to work out representative site layouts for operational noise assessment purpose.

(iv) Provision of an Emission Inventory of the Noise Sources

The Applicant shall provide inventory of noise sources including

representative construction equipment assumed for assessing construction noise associated with, for example tunnelling and other construction works, and plant/equipment/railway/rolling stock for operation noise assessment. The inventory shall assume appropriate railway traffic data for the purpose of assessment.

- (v) Construction Noise Assessment
- (a) The assessment shall cover the cumulative noise impacts due to the construction works of the Project and other likely concurrent projects identified during the course of the EIA study.
- (b) The Applicant shall carry out assessment of noise impact from construction (excluding percussive piling) of the Project during day time, i.e. 7 a.m. to 7 p.m., on weekdays other than general holidays in accordance with the methodology stipulated in paragraphs 5.3 and 5.4 of Annex 13 of the TM. The criteria in Table 1B of Annex 5 of the TM shall be adopted in the assessment.
- (c) For ground-borne noise impacts, the criteria and assessment methodology shall be agreed with the Director (with reference to Section 4.4.2(c) of the TM). Site measurements at appropriate locations may be required in order to obtain the empirical input parameters required in the ground-borne noise model.
- (d) To minimize the construction noise impact, alternative construction methods to replace percussive piling and blasting shall be proposed as far as practicable. In case blasting cannot be avoided, it should be carried out, as far as practicable, outside the sensitive hours (7pm to 7am on Monday to Saturday and any time on a general holiday, including Sunday). For blasting that must be carried out during the above-mentioned sensitive hours, the noise impact associated with the removal of debris and rocks should be fully assessed and mitigation measures should be recommended to reduce the construction noise impact. Also, a mechanism should be recommended in the EIA Report such that the blasting schedule should be submitted to the concerned authority for approval prior to its implementation.
- (e) For tunnelling, noise impact (including air-borne noise and ground-borne noise) associated with the operation of powered mechanical equipment, in particular, tunnel boring machines or equivalent, shall be assessed. If the equipment, such as a tunnel boring machine and associated facilities, is used, the

methodology/model for assessing ground-borne noise impact from these equipments/facilities shall be agreed with the Director prior to obtaining the empirical parameters required in the ground-borne noise model. Cumulative impacts with other projects shall be covered if appropriate.

- (f) If the unmitigated construction noise levels are found to exceed the relevant criteria, the Applicant shall propose practicable direct mitigation measures (including at least movable barriers, enclosures, quieter alternative methods, re-scheduling and restricting hours of operation of noisy tasks), particularly at open-cut area(s), tunnel boring machine launching and retrieval shaft(s) and tunnel portal(s), to minimize the impact. If the mitigated noise levels still exceed the relevant criteria, the duration of the noise exceedance and population being affected shall be given.
  
  - (g) The Applicant shall formulate a construction programme as far as practicable such that no work will be required in the restricted hours as defined under the Noise Control Ordinance (NCO). In case the Applicant needs to evaluate whether construction works during restricted hours as defined under the NCO are feasible or not in the context of programming construction works, reference should be made to the relevant technical memoranda issued under the NCO. Regardless of the results of construction noise impact assessment for restricted hours, the Noise Control Authority will process Construction Noise Permit (CNP) application, if necessary, based on the NCO, the relevant technical memoranda issued under the NCO, and the contemporary condition/situations of adjoining land uses and any previous complaints against construction activities at the site before making his decision in granting a CNP. This should be explicitly stated in the noise chapter and the conclusions and recommendations chapter in the EIA report.
- (vi) Operational Rail Noise Assessment
- (a) The Applicant shall assess the noise impacts during the operational phase of the proposed railway, including worst case scenario, normal, abnormal, transient and emergency operations, if applicable, with respect to the acceptable levels contained in Table 1A in Annex 5 in the TM. The assessment methodology including the railway/train design noise level shall be agreed with the Director prior to the commencement of the assessment.
  
  - (b) For operation ground-borne noise impact, the criteria and assessment

methodology shall be agreed with the Director with special reference to Section 4.4.2(c) of the TM. The assessment shall also cover the cumulative ground-borne noise impact due to the Project and the railways in the vicinity (such as the existing Mass Transit Railway and Shatin to Central Link, if appropriate). Site measurements at appropriate locations on a “like-to-like” basis (e.g. under similar situations) may be required in order to obtain the empirical input parameters required in the ground-borne noise model.

- (c) In assessing the noise level, the Applicant shall allow for a deterioration in rail and rolling stock condition from brand new to an operating level and shall address the reasonable and worst case scenarios, taking into account any other planned noise sources. The Applicant shall present the noise levels in  $Leq(30min)$ ,  $Leq(24 hr)$  and  $Lmax$  during the day and at night at the NSRs at various representative floor levels (in mPD) on tables and plans of suitable scale. Quantitative assessment at the identified NSRs for different alignment of the rail shall be compared against the relevant criteria or limits. The potential noise impact of each proposed alignment on the existing and planned NSRs shall be quantified by estimating the total number of dwellings and/or classrooms and other sensitive elements that will be exposed to levels above the relevant planning criteria and statutory limits.
- (d) The Applicant shall make recommendations for noise amelioration/direct technical remedies for any existing or planned NSR which would be subject to predicted cumulative noise level in excess of the relevant planning criteria or statutory limits in the appropriate design year. A manual detailing the schedule of maintaining/capping the wheel/rail noise to suit the design specification shall be provided, if relevant.
- (e) In case where a number of the NSRs cannot be protected by the recommended noise amelioration/direction technical remedies, the Applicant shall consider alternatives to reduce the impact.

(vii) Fixed Noise Source Assessment

For fixed noise sources, such as ventilation systems and fixed plants at stations, the following assessment shall be followed:

- (a) Assessment of Fixed Source Noise Levels – The Applicant shall calculate the expected noise using standard acoustic principles. Calculations for the

expected noise shall be based on the assumed plant inventories and utilization schedule for the reasonable and worst case scenarios. The Applicant shall calculate the noise levels taking into account the correction of tonality, impulsiveness and intermittency in accordance with the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites. The cumulative impacts due to the fixed noise sources proposed for the Project (such as the ventilation shaft(s)) and other existing and planned noise sources shall also be assessed.

- (b) Presentation of Noise Levels – The Applicant shall present the existing and future noise levels in Leq(30min) at the NSRs at various representative floor levels (mPD) on tables and plans of suitable scale. A quantitative assessment at the NSRs for the proposed fixed noise sources shall be carried out and compared against the criteria set out in Table 1A of Annex 5 of the TM.
- (c) Proposal for Noise Mitigation Measures – To protect the affected NSRs, the Applicant shall propose direct technical remedies within the project limits in all situations where the predicted noise levels exceed the criteria set out in Table 1A of Annex 5 of the TM.

(viii) Assessment of Side Effects and Constraints

The Applicant shall identify, assess and propose means to avoid or minimize any consequential adverse impacts from the construction of noise impact mitigation measures and to resolve any potential constraints due to the inclusion of the recommended direct technical remedies.

(ix) Evaluation of Constraints on Planned Noise Sensitive Developments/Land Uses

- (a) For planned noise sensitive uses which will still be affected even with all practicable direct technical remedies in place, the Applicant shall propose, evaluate and confirm the practicality of additional measures within the planned noise sensitive uses boundary and shall make recommendations on how these noise sensitive uses should be designed for the information of relevant parties.
- (b) The Applicant shall take into account the agreed environmental requirements/ constraints identified by the study to assess the development potential of the concerned sites, and shall make such information known to the relevant

parties.

### **3.4.3 Water Quality Impacts**

- 3.4.3.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing water pollution as stated in Annexes 6 and 14 of the TM respectively.
- 3.4.3.2 The Study Area shall include areas within 300m from the Project alignment and boundary as described above, and shall cover relevant existing and potential sensitive receivers that have a bearing on the environmental acceptability of the Project.
- 3.4.3.3 Physical, chemical and biological disruptions of the water systems that include at least the fresh/storm water system, groundwater system, drainage system and catchment area within the study area arising during the construction and operation of the Project shall be identified, in particular from any historical contaminated land use as stated in Section 3.1 of Annex 19 of the TM.
- 3.4.3.4 The Applicant shall address water quality impacts due to the construction and operational stages of the Project. Essentially, the assessment shall address the following :

#### General

- (i) Collection and review of background information on the existing and planned water system(s), and their respective catchments and sensitive receivers which might be affected by the Project and associated works during construction and operation.
- (ii) Characterization of water quality of the water systems and respective catchments and sensitive receivers which might be affected by the Project and associated works during construction and operation based on existing best available information or through site surveys and tests as appropriate.
- (iii) Identification and analysis of relevant existing and planned activities, beneficial uses and water sensitive receivers related to the affected water system(s).
- (iv) Identification of pertinent water quality objectives and establishment of other



appropriate water quality criteria or standards for the water system(s) and the sensitive receivers as mentioned in (i), (ii) and (iii) above.

- (v) Review the specific construction method(s) and configuration(s), and operation of the Project. Identification of any alteration of water course, drainage system, groundwater hydrology and catchment types or areas.
- (vi) Identification, analysis and quantification of existing and likely future water pollution sources, including point discharges and non-point sources to surface water runoff, sewage and polluted discharge generated from the Project, and spent cooling water discharge.
- (vii) Establishment and provision of a pollution load inventory on the quantities and characteristics of existing and likely future water pollution sources identified in (vi) above. Field investigation and laboratory test(s) shall be conducted as appropriate to fill in any major information gaps.

#### Impact Prediction

- (viii) Prediction and quantification of the impacts on the water system(s) and the sensitive receivers due to those alterations and changes identified in (v) and the pollution sources identified in (vi). Possible impacts include changes in hydrology, groundwater level, water quality due to such changes shall be assessed. The prediction shall take into account and include likely different construction stages or sequences, and different operation stages.
- (ix) If contaminated groundwater is identified in the land contamination assessment, the potential impacts during construction stage shall be evaluated and properly addressed.
- (x) If seawater will be used in cooling systems and spent coolant effluent shall be discharged into marine water, prediction and quantification by mathematical modelling shall be required to assess the impacts on the water system and sensitive receivers, in respect of thermal and chemical discharge. If the spent cooling water discharge will not be significant in terms of discharge rate and impact on sensitive waters or sensitive receivers, the Applicant may propose alternative assessment methodology.
- (xi) Cumulative impacts due to other related concurrent and planned projects,

activities or pollution sources within a boundary around the Study Area to be agreed by the Director shall also be predicted and quantified.

- (xii) Assessment and evaluation of any potential impacts on the identified water system(s), respective catchments and sensitive receivers due to sewage, wastewater and pumped groundwater arising from the Project. Any effluent generated will require appropriate collection, treatment and disposal to within standards and objectives and criteria established in (iv) above.
- (xiii) Assessment and evaluation of any potential impacts arising from tunnel/seepage drainage and track runoff. Appropriate measures shall be recommended to reduce the identified impacts arising during operation. The assessment should include the volume of anticipated wastewater/water seepage to be discharged from the stations/tunnel so as to facilitate assessment in accordance with Section 6.5 in Annex 14 of the TM.
- (xiv) Assessment and evaluation of any potential stormwater and surface runoff impacts on the water systems(s), respective catchments and sensitive receivers during both construction and operation stages so as to reduce the water quality impacts to within standards, objectives and criteria established in (iv) above. Best management practices shall be recommended to reduce any potential impacts arising from stormwater drainage system and surface runoff.

### Mitigation

- (xv) Proposal of effective and practicable infrastructure upgrading or provision, water pollution prevention and mitigation measures including those for contaminated groundwater to be implemented during the construction and operation stages so as to reduce the water quality impacts to within acceptable levels of standards. Requirements to be incorporated in the Project contract document shall also be proposed.
- (xvi) The residual impacts on the water system(s) and the sensitive receivers with regard to the appropriate water quality criteria, standards or guidelines shall be assessed and quantified.
- (xvii) Best management practices to reduce storm water and non-point source pollution shall be investigated and proposed as appropriate. Attention shall

be made to the water pollution control and mitigation measures recommended in ProPECC Note 1/94 on construction site drainage.

#### 3.4.4 **Waste Management Implications**

3.4.4.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing waste management implications as stated in Annexes 7 and 15 of the TM respectively.

3.4.4.2 The Applicant shall address the potential waste management implications due to the construction and operation phases of the Project, including at least railway tunnel excavation and other construction activities for the stations and ventilation shafts. The assessment of waste management implications shall cover the following:

(i) **Analysis of Activities and Waste Generation**

The Applicant shall identify the quantity, quality and timing of the waste arising as a result of the construction and operation activities of the Project, based on the sequence and duration of these activities including any dredged/excavated sediment/mud which would be generated during construction stage. The Applicant shall adopt design, general layout, construction methods and programme to minimize the generation of public fill/inert construction and demolition material (C&DM) and maximise the use of public fill/inert C&DM for other construction works.

(ii) **Proposal for Waste Management**

(a) Prior to considering the disposal options for various types of wastes, opportunities for reducing waste generation, on-site or off-site re-use and recycling shall be fully evaluated. Measures that can be taken in the planning and design stages e.g. by modifying the design approach and in the construction stage for maximizing waste reduction shall be separately considered;

(b) After considering the opportunities for reducing waste generation and maximizing re-use, the types and quantities of the wastes required to be disposed of as a consequence shall be estimated and the disposal methods/options for each type of the wastes shall be described in detail. The disposal methods/options recommended for each type of wastes shall take into

account the result of the assessment in item (c) below; and

- (c) The impact caused by handling (including stockpiling, labelling, packaging & storage), collection, transportation and re-use/disposal of wastes shall be addressed in detail and appropriate mitigation measures shall be proposed.

This assessment shall cover the following areas:

- potential hazard;
- air and odour emissions;
- noise;
- wastewater discharge; and
- public transport.

(iii) Management of Dredged/Excavated Sediment/Mud

- (a) Identification and quantification as far as practicable of relevant dredging/excavation, sediment/mud transportation and disposal activities and requirements shall be conducted. Potential dumping ground to be involved shall also be identified. Field investigation, sampling and chemical and biological laboratory tests to characterize the sediment/mud concerned shall be conducted as appropriate. The ranges of parameters to be analyzed; the number, type and methods of sampling; sample preservation; chemical and biological laboratory test methods to be used shall be agreed with the Director (with reference to Section 4.4.2(c) of the TM) prior to the commencement of the tests. The categories of sediment/mud which are to be disposed of in accordance with a permit granted under the Dumping at Sea Ordinance (DASO) shall be identified by both chemical and biological tests and their quantities shall be estimated. If the presence of any serious contamination of sediment/mud which requires special treatment/disposal is confirmed, the Applicant shall identify the most appropriate treatment and/or disposal arrangement and demonstrate its feasibility; and

- (b) Identification and evaluation of the best practical dredging/excavation methods to minimize dredging/excavation and dumping requirements based on the criterion that existing sediment/mud shall be left in place and not to be disturbed as far as possible.

### 3.4.5 **Land Contamination Assessment**

- 3.4.5.1 The Applicant shall follow the guidelines for evaluating and assessing potential land contamination issues as stated in Sections 3.1 and 3.2 of Annex 19 of the TM.
- 3.4.5.2 The “Assessment Area” for the land contamination shall include any potential land contamination site(s) within the Project area and any other potential contaminated site(s) identified in this EIA study.
- 3.4.5.3 The Applicant shall provide a clear and detailed account of the present land use (including description of the activities, chemicals and hazardous substances handled, with clear indication of their storage and location, by reference to a site map) and the relevant land use history in relation to possible land contamination (including accident records and change of land use(s) and the like).
- 3.4.5.4 During the course of the EIA study, the Applicant shall submit a Contamination Assessment Plan (CAP) to the Director for endorsement prior to conducting the contamination impact assessment of the relevant land or site(s). The CAP shall include proposal with details on representative sampling and analysis required to determine the nature and the extent of the contamination of the relevant land or site(s).
- 3.4.5.5 Based on the endorsed CAP, the Applicant shall conduct a land contamination impact assessment and submit a Contamination Assessment Report (CAR) to the Director for endorsement. If land contamination is confirmed, a Remedial Action Plan (RAP) shall also be submitted to the Director for endorsement to formulate necessary remedial measures.
- 3.4.5.6 If there is/are potential contaminated site(s) that is/are inaccessible for preparing sampling and analysis during the course of the EIA study, e.g. due to site access problem, the Applicant’s CAP shall include :
- (i) A review of the available information;
  - (ii) An initial contamination evaluation of this/these site(s) and possible remediation methods;
  - (iii) A confirmation of whether the contamination problem at this/these site(s) would be surmountable;

- (iv) A sampling and analysis proposal which shall aim at determining the nature and the extent of the contamination of this/these site(s); and
- (v) A schedule of submission of revised CAP (if necessary), CAR and RAP upon this/these site(s) is/are accessible.

3.4.5.7 The Applicant shall complete land contamination assessment and remediation (if necessary) at the potential contaminated site(s) prior to the commencement of the construction works at the respective site(s).

### **3.4.6 Hazard to Life**

3.4.6.1 If the Project will use explosives, the Applicant shall describe the statutory/licensing requirements with respect to explosives under the Dangerous Goods Ordinance (Cap. 295). The Applicant shall also document any guidelines and/or advice obtained from relevant departments/authorities on the proposed transport and storage of explosives for the blasting activities.

3.4.6.2 If the proposed use of explosives for rock blasting is required and the location of overnight storage of explosives magazine is in close vicinity to populated areas and/or Potentially Hazardous Installation site, the Applicant shall carry out hazard assessment as follows:

- (i) Identify hazardous scenarios associated with the storage and transport of explosives and then determine a set of relevant scenarios to be included in a Quantitative Risk Assessment (QRA);
- (ii) Execute a QRA of the set of hazardous scenarios determined in (i), expressing population risks in both individual and societal terms;
- (iii) Compare individual and societal risks with the criteria for evaluating hazard to life stipulated in Annex 4 of the TM; and
- (iv) Identify and assess practicable and cost-effective risk mitigation measures. (e.g. selection of the shortest practicable road transport routes to and from the magazine)

The methodology to be used in the hazard assessment should be consistent with previous studies having similar issues.

### **3.4.7 Landscape and Visual Impacts**

- 3.4.7.1 The Applicant shall follow the criteria and guidelines as stated in Annexes 10 and 18 of the TM and the EIAO Guidance Note No.8/2002 on “Preparation of Landscape and Visual Impact Assessment under the Environmental Impact Assessment Ordinance”.
- 3.4.7.2 The Applicant shall address the potential landscape and visual impacts due to the above-ground structure, including at least stations and design, station entrance(s) and ventilation shaft(s) during the construction and operation stages.
- 3.4.7.3 The assessment area for landscape impact assessment shall include all areas within a 100m distance from the works limit of the Project. The assessment area for the visual impact assessment shall be defined by the visual envelope of the Project.
- 3.4.7.4 The Applicant shall review relevant outline development plan(s), outline zoning plan(s), layout plan(s) or planning briefs and studies which may identify areas of high landscape value and visually sensitive areas. The aim is to gain an insight to the future outlook of the area affected so as to assess whether the Project can fit into the surrounding setting. Any conflict with statutory town plan(s) shall be highlighted and appropriate follow-up action shall be recommended.
- 3.4.7.5 The Applicant shall describe, appraise, analyze and evaluate the existing landscape resources and character of the assessment area, including at least the Gascoigne Road Rest Garden, Fat Kwong Street Playground, Yan Fung Street Rest Garden, and including old and mature tree(s) within the assessment area. A system shall be derived for judging landscape and visual impact significance as required under the TM. The sensitivity of the landscape framework and its ability to accommodate change shall be particularly focused on. The Applicant shall identify the degree of compatibility of the Project with the existing and planned landscape setting. The landscape impact assessment shall evaluate the potential landscape impact as far as possible so as to illustrate the significance of such impacts arising from the proposed Project. Clear mapping of the baseline landscape resources, landscape character areas and the landscape impact is required.
- 3.4.7.6 The Applicant shall assess the visual impacts of the proposed Project. Clear illustration including mapping of visual impact is required. The assessment shall adopt a systematic methodology and include the following:

- (i) Identification and plotting of visual envelope of the proposed Project within the study area;
- (ii) Identification of the key groups of sensitive receivers within the visibility envelope and their views at both ground level and elevated vantage points;
- (iii) Description of the visual compatibility of the Project with the surrounding and the planned setting, and its obstruction and interference with the key views of the adjacent areas. Among other receivers, sensitive receivers shall include nearby residents;
- (iv) Description of the severity of visual impacts in terms of distance, nature and number of sensitive receivers. The visual impacts of the Project with and without mitigation measures shall also be included so as to demonstrate the effectiveness of the proposed mitigation measures; and
- (v) Clear evaluations and explanation with supportive arguments of all relevant factors considered in arriving the significance thresholds of visual impact.

3.4.7.7 The Applicant shall evaluate the merit of preservation in totality, in parts or total destruction of existing landscape and the establishment of a new landscape character area. Alternative rail alignment, station design, station entrance(s) and ventilation shaft(s) and construction methods that would avoid or reduce the identified landscape and visual impacts shall first be considered and be evaluated for comparison before adopting other mitigation or compensatory measures to alleviate the impacts. The mitigation measures proposed shall not only be concerned with damage reduction but shall also include consideration of potential enhancement of the existing landscape and visual quality. The Applicant shall recommend mitigation measures to minimize the adverse effects identified above, including provision of a landscape design.

3.4.7.8 The mitigation measures shall also include the preservation of vegetation, transplanting of trees of good amenity value, provision of screen planting, re-vegetation of disturbed lands, compensatory planting, re-provisioning of amenity areas and open spaces, sensitive landscape treatment on slope works, design of structure, provision of finishes to structure, colour scheme and texture of material used and any measures to mitigate the disturbance of the existing land use. Parties shall be identified for the on-going management and maintenance of the proposed mitigation works to ensure their effectiveness throughout the operation phase of the



Project. A practical programme and funding proposal for the implementation of the recommended measures shall be provided.

- 3.4.7.9 Annotated illustration such as coloured perspective drawings, plans and section/elevation diagrams, oblique aerial photographs, photographs taken at vantage points and computer-generated photomontage shall be adopted to illustrate the significance of the landscape and visual impacts of the Project.

### **3.4.8 Impact on Cultural Heritage**

- 3.4.8.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing the cultural heritage impacts as stated in Annex 10 and 19, respectively and make reference to the Guidelines for Built Heritage Impact Assessment at Appendix B.
- 3.4.8.2 The Applicant shall conduct a built heritage impact assessment (BHIA), taking the results of previous BHIA and other background of the site into account, to identify known and unknown heritage items within the assessment area (which shall be within 300m from either side along the full length of the Project boundary) that may be affected by the Project and its associated works to assess the direct and indirect impacts on the identified heritage items. Appropriate mitigation measures should be recommended in the BHIA.

Particular attention shall be paid to the following heritage items:

- (i) Tin Hau Temple at Temple Street (Grade II)
  - (ii) Old South Kowloon District Court (Grade II)
  - (iii) Kwun Yum Temple at Station Lane (Grade II)
- 3.4.8.3 Any potential physical disturbance caused by works during construction and operation of the Project to the heritage items, including at least the Tin Hau Temple at Temple Street, the Old South Kowloon District Court at Gascoigne Road, the Kwun Yum Temple at Station Lane and the “disused air raid precaution tunnels and portals” located off Nathan Road, between Gascoigne Road and Cliff Street at Yau Ma Tei and in Valley Road at Ho Man Tin shall be identified and avoided.
- 3.4.8.4 The Applicant shall also identify all other cultural heritage sites that may be adversely affected by the Project. The inventory shall include known and potential archaeological sites.

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3.4.8.5 The Applicant shall assess the extent that the heritage items might be affected and recommend possible alternative(s) (at least other feasible alternative option(s) and/or construction method(s)). Practicable mitigation measure(s) including identification of implementation agent(s) and period(s) to avoid or minimize the impact(s) on the affected heritage items shall be recommended, if applicable.

### **3.4.9 Documentation of Key Assessment Assumptions, Limitation of Assessment Methodologies and related Prior Agreement(s) with the Director**

To facilitate efficient retrieval, a summary to include the assessment methodologies and key assessment assumptions adopted in this EIA study, the limitations of these assessment(s) methodologies/assumptions, if any, plus all relevant prior agreement(s) with the Director or other Authorities on individual environmental media assessment components. The proposed use of any alternative assessment tool(s) or assumption(s) have to be justified by the Applicant, with supporting documents based on cogent, scientific and objectively derived reason(s) before seeking the Director's agreement. This summary and all related supporting documents shall be provided in the form of an Appendix to the EIA study report.

### **3.4.10 Impacts Summary**

3.4.10.1 To facilitate effective retrieval of pertinent key information, a summary of environmental impacts in the form of a table (or in any other form approved by the Director) showing the assessment points (such as ASRs, NSRs), results of impact predictions, relevant standards or criteria, extents of exceedances predicted, impact avoidance measures considered, mitigation measures proposed and residual impacts (after mitigation) shall be provided to cover each individual impact in the EIA report. This impact summary shall form an essential part of the Executive Summary.

### **3.4.11 Summary of Environmental Outcomes**

3.4.11.1 The EIA report shall contain a summary of the key environmental outcomes arising from the EIA study, including the population and environmentally sensitive areas protected, environmentally friendly designs recommended, key environmental problems avoided, compensation areas included and the environmental benefits of environmental protection measures recommended.

### **3.4.12 Environmental Monitoring and Audit (EM&A) Requirements**

- 3.4.12.1 The Applicant shall identify and justify in the EIA study whether there is any need for EM&A activities during construction and operation phases of the Project and, if affirmative, to define the scope of EM&A requirements for the Project.
- 3.4.12.2 Subject to confirmation of EIA findings, the Applicant shall comply with requirements as stipulated in Annex 21 of the TM. The Applicant shall also propose real-time reporting of monitoring data for the Project through a dedicated internet website.
- 3.4.12.3 The Applicant shall prepare a project implementation schedule (in the form of a checklist as shown in Appendix C to this EIA study brief) containing the EIA study recommendations and mitigation measures with reference to the implementation programme.

## **4. DURATION OF VALIDITY**

- 4.1 The Applicant shall notify the Director of the commencement of the EIA study. If the EIA study does not commence within 36 months after the date of issue of this EIA study brief, the Applicant shall apply to the Director for a fresh EIA study brief before commencement of the EIA study.

## **5. REPORT REQUIREMENTS**

- 5.1 In preparing the EIA report, the Applicant shall refer to Annex 11 of the TM for the contents of an EIA report. The Applicant shall also refer to Annex 20 of the TM, which stipulates the guidelines for the review of an EIA report.
- 5.2 The Applicant shall supply the Director with the following number of copies of the EIA report and the executive summary:
- (i) 40 copies of the EIA report in English and 40 copies of the executive summary (each bilingual in both English and Chinese) as required under section 6(2) of the EIAO to be supplied at the time of application for approval of the EIA report. Additional copies of the EIA report and the executive summary shall be supplied upon advice by the Director.
  - (ii) when necessary, addendum to the EIA report and the executive summary

submitted in 5.2 (i) above as required under section 7(1) of the EIAO, to be supplied upon advice by the Director for public inspection.

(iii) 20 copies of the EIA report in English and 20 copies of the executive summary (each bilingual in both English and Chinese) with or without Addendum as required under section 7(5) of the EIAO, to be supplied upon advice by the Director for consultation with the Advisory Council on the Environment.

5.3 The Applicant shall, upon request, make additional copies of above documents available to the public, subject to payment by the interested parties of full costs of printing.

5.4 In addition, to facilitate public inspection of the EIA report via the EIAO Internet Website, the Applicant shall provide electronic copies of both the EIA report and the executive summary prepared in HyperText Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 1.3 or later), unless otherwise agreed by the Director. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of the EIA report and the executive summary shall be included in the beginning of the document. Hyperlinks to all figures, drawings and tables in the EIA report and executive summary 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 the Director.

5.5 The electronic copies of the EIA report and the executive summary shall be submitted to the Director at the time of application for approval of the EIA report.

5.6 When the EIA report and the executive summary are made available for public inspection under section 7(1) of the EIAO, the content of the electronic copies of the EIA report and the executive summary must be the same as the hard copies and the Director shall be provided with the most updated electronic copies.

5.7 To promote environmentally friendly and efficient dissemination of information, both hardcopies and electronic copies of future EM&A reports recommended by the EIA study shall be required and their format shall be agreed by the Director.

## **6. OTHER PROCEDURAL REQUIREMENTS**

6.1 If there is any change in the name of Applicant for this EIA study brief during the

course of the EIA study, the Applicant must notify the Director immediately.

- 6.2 If there is any key change in the scope of the Project mentioned in Section 1.2 of this EIA study brief and in Project Profile (No. PP-352/2008), the Applicant must seek confirmation from the Director in writing on whether or not the scope of issues covered by this EIA study brief can still cover the key changes, and the additional issues, if any, that the EIA study must also address. If the changes to the Project fundamentally alter the key scope of the EIA study brief, the Applicant shall apply to the Director for a fresh EIA study brief.

--- END OF EIA STUDY BRIEF ---

June 2008

Environmental Assessment Division,  
Environmental Protection Department

## **Guidelines on Choice of Models and Model Parameters**

*[The information contained in this Appendix is only meant to assist the Applicant in performing the air quality assessment. The Applicant must exercise professional judgment in applying this general information for the Project.]*

### **1. Introduction**

- 1.1 To expedite the review process by the Authority and to assist project proponents or environmental consultants with the conduct of air quality modelling exercise which are frequently called for as part of environmental impact assessment studies, this paper describes the usage and requirements of a few commonly used air quality models.

### **2. Choice of Models**

- 2.1 The models which have been most commonly used in air quality impact assessments, due partly to their ease of use and partly to the quick turn-around time for results, are of Gaussian type and designed for use in simple terrain under uniform wind flow. There are circumstances when these models are not suitable for ambient concentration estimates and other types of models such as physical, numerical or mesoscale models will have to be used. In situations where topographic, terrain or obstruction effects are minimal between source and receptor, the following Gaussian models can be used to estimate the near-field impacts of a number of source types including dust, traffic and industrial emissions.

<u>Models</u>	<u>Applications</u>
FDM	for evaluating fugitive and open dust source impacts (point, line and area sources)
CALINE4	for evaluating mobile traffic emission impacts (line sources)
ISCST3	for evaluating industrial chimney releases as well as area and volumetric sources (point, area and volume sources); line sources can be approximated by a number of volume sources.

These frequently used models are also referred to as Schedule 1 models (see attached list).

- 2.2 Note that both FDM and CALINE4 have a height limit on elevated sources (20m and 10m, respectively). Source of elevation above these limits will have to be modelled using the ISCST3 model or suitable alternative models. In using the latter, reference should be made to the 'Guidelines on the Use of Alternative Computer Models in Air Quality Assessment' in Appendix A-3.
- 2.3 The models can be used to estimate both short-term (hourly and daily average) and long-term (annual average) ambient concentrations of air pollutants. The model results, obtained using appropriate model parameters (refer to Section 3) and

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assumptions, allow direct comparison with the relevant air quality standards such as the Air Quality Objectives (AQOs) for the relevant pollutant and time averaging period.

### **3. Model Input Requirements**

#### **3.1 Meteorological Data**

3.1.1 At least 1 year of recent meteorological data (including wind speed, wind direction, stability class, ambient temperature and mixing height) from a weather station either closest to or having similar characteristics as the study site should be used to determine the highest short-term (hourly, daily) and long-term (annual) impacts at identified air sensitive receivers in that period. The amount of valid data for the period should be no less than 90 percent.

3.1.2 Alternatively, the meteorological conditions as listed below can be used to examine the worst case short-term impacts:

- Day time: stability class D; wind speed 1 m/s (at 10m height); worst-case wind angle; mixing height 500 m
- Night time: stability class F; wind speed 1 m/s (at 10m height); worst case wind angle; mixing height 500 m
- This is a common practice with using the CALINE4 model due to its inability to handle lengthy data set.

3.1.3 For situations where, for example, (i) the model (such as CALINE4) does not allow easy handling of one full year of meteorological data; or (ii) model run time is a concern, the followings can be adopted in order to determine the daily and annual average impacts:

- (i) perform a frequency occurrence analysis of one year of meteorological data to determine the actual wind speed (to the nearest unit of m/s), wind direction (to the nearest 10°) and stability (classes A to F) combinations and their frequency of occurrence;
- (ii) determine the short term hourly impact under all of the identified wind speed, wind direction and stability combinations; and
- (iii) apply the frequency data with the short term results to determine the long term (daily / annual) impacts.

Apart from the above, any alternative approach that will capture the worst possible impact values (both short term and long term) may also be considered.

3.1.4 Note that the anemometer height (relative to a datum same for the sources and receptors) at which wind speed measurements were taken at a selected station should be correctly entered in the model. These measuring positions can vary greatly from station to station and the vertical wind profile employed in the model can be grossly distorted from the real case if incorrect anemometer height is used. This will lead to unreliable concentration estimates.

- 3.1.5 An additional parameter, namely, the standard deviation of wind direction,  $\sigma_\theta$ , needs to be provided as input to the CALINE4 model. Typical values of  $\sigma_\theta$  range from 12° for rural areas to 24° for highly urbanised areas under 'D' class stability. For semi-rural such as new development areas, 18° is more appropriate under the same stability condition. The following reference can be consulted for typical ranges of standard deviation of wind direction under different stability categories and surface roughness conditions.

*Ref.(1): Guideline On Air Quality Models (Revised), EPA-450/2-78-027R, United States Environmental Protection Agency, July 1986.*

### **3.2 Emission Sources**

All the identified sources relevant to a process plant or a study site should be entered in the model and the emission estimated based on emission factors compiled in the AP-42 (Ref. 2) or other suitable references. The relevant sections of AP-42 and any parameters or assumptions used in deriving the emission rates (in units g/s, g/s/m or g/s/m<sup>2</sup>) as required by the model should be clearly stated for verification. The physical dimensions, location, release height and any other emission characteristics such as efflux conditions and emission pattern of the sources input to the model should also correspond to site data.

If the emission of a source varies with wind speed, the wind speed-dependent factor should be entered.

*Ref.(2): Compilation of Air Pollutant Emission Factors, AP-42, 5th Edition, United States Environmental Protection Agency, January 1995.*

### **3.3 Urban/Rural Classification**

Emission sources may be located in a variety of settings. For modelling purposes these are classed as either rural or urban so as to reflect the enhanced mixing that occurs over urban areas due to the presence of buildings and urban heat effects. The selection of either rural or urban dispersion coefficients in a specific application should follow a land use classification procedure. If the land use types including industrial, commercial and residential uses account for 50% or more of an area within 3 km radius from the source, the site is classified as urban; otherwise, it is classed as rural.

### **3.4 Surface Roughness Height**

This parameter is closely related to the land use characteristics of a study area and associated with the roughness element height. As a first approximation, the surface roughness can be estimated as 3 to 10 percent of the average height of physical structures. Typical values used for urban and new development areas are 370 cm and 100 cm, respectively.

### **3.5 Receptors**

These include discrete receptors representing all the identified air sensitive receivers at their appropriate locations and elevations and any other discrete or grid receptors



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for supplementary information. A receptor grid, whether Cartesian or Polar, may be used to generate results for contour outputs.

### 3.6 Particle Size Classes

In evaluating the impacts of dust-emitting activities, suitable dust size categories relevant to the dust sources concerned with reasonable breakdown in TSP (< 30 µm) and RSP (< 10 µm) compositions should be used.

### 3.7 NO<sub>2</sub> to NO<sub>x</sub> Ratio

The conversion of NO<sub>x</sub> to NO<sub>2</sub> is a result of a series of complex photochemical reactions and has implications on the prediction of near field impacts of traffic emissions. Until further data are available, three approaches are currently acceptable in the determination of NO<sub>2</sub>:

- (a) Ambient Ratio Method (ARM) - assuming 20% of NO<sub>x</sub> to be NO<sub>2</sub>; or
- (b) Discrete Parcel Method (DPM, available in the CALINE4 model); or
- (c) Ozone Limiting Method (OLM) - assuming the tailpipe NO<sub>2</sub> emission to be 7.5% of NO<sub>x</sub> and the background ozone concentration to be in the range of 57 to 68 µg/m<sup>3</sup> depending on the land use type (see also the EPD reference paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts').

### 3.8 Odour Impact

In assessing odour impacts, a much shorter time-averaging period of 5 seconds is required due to the shorter exposure period tolerable by human receptors. Conversion of model computed hourly average results to 5-second values is therefore necessary to enable comparison against recommended standard. The hourly concentration is first converted to 3-minute average value according to a power law relationship which is stability dependent (Ref. 3) and a result of the statistical nature of atmospheric turbulence. Another conversion factor (10 for unstable conditions and 5 for neutral to stable conditions) is then applied to convert the 3-minute average to 5-second average (Ref. 4). In summary, to convert the hourly results to 5-second averages, the following factors can be applied:

Stability Category	1-hour to 5-sec Conversion Factor
A & B	45
C	27
D	9

Under 'D' class stability, the 5-second concentration is approximately 10 times the hourly average result. Note, however, that the combined use of such conversion factors together with the ISCST results may not be suitable for assessing the extreme close-up impacts of odour sources.

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*Ref.(3): Richard A. Duffee, Martha A. O'Brien and Ned Ostojic, 'Odor Modeling – Why and How', Recent Developments and Current Practices in Odor Regulations, Controls and Technology, Air & Waste Management Association, 1991.*

*Ref.(4): A.W.C. Keddie, 'Dispersion of Odours', Odour Control – A Concise Guide, Warren Spring Laboratory, 1980.*

### **3.9 Plume Rise Options**

The ISCST3 model provides by default a list of the U.S. regulatory options for concentration calculations. These are all applicable to the Hong Kong situations except for the 'Final Plume Rise' option. As the distance between sources and receptors are generally fairly close, the non-regulatory option of 'Gradual Plume Rise' should be used instead to give more accurate estimate of near-field impacts due to plume emission. However, the 'Final Plume Rise' option may still be used for assessing the impacts of distant sources.

### **3.10 Portal Emissions**

These include traffic emissions from tunnel portals and any other similar openings and are generally modelled as volume sources according to the PIARC 91 (or more up-to-date version) recommendations (Ref. 5, section III.2). For emissions arising from underpasses or any horizontal openings of the like, these are treated as area or point sources depending on the source physical dimensions. In all these situations, the ISCST3 model or more sophisticated models will have to be used instead of the CALINE4 model. In the case of portal emissions with significant horizontal exit velocity which cannot be handled by the ISCST3 model, the impacts may be estimated by the TOP model (Ref. 6) or any other suitable models subject to prior agreement with EPD. The EPD's 'Guidelines on the Use of Alternative Computer Models in Air Quality Assessment' should also be referred to in Appendix A-3.

*Ref.(5): XIXth World Road Congress Report, Permanent International Association of Road Congresses (PIARC), 1991.*

*Ref.(6): N. Ukegunchi, H. Okamoto and Y. Ide "Prediction of vehicular emission pollution around a tunnel mouth", Proceedings 4th International Clean Air Congress, pp. 205-207, Tokyo, 1977.*

### **3.11 Background Concentrations**

Background concentrations are required to account for far-field sources which cannot be estimated by the model. These values, to be used in conjunction with model results for assessing the total impacts, should be based on long term average of monitoring data at location representative of the study site. Please make reference to the paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts' in Appendix A-2 for further information.

### **3.12 Output**

The highest short-term and long-term averages of pollutant concentrations at prescribed receptor locations are output by the model and to be compared against

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the relevant air quality standards specified for the relevant pollutant. Contours of pollutant concentration are also required for indicating the general impacts of emissions over a study area.

Copies of model files in electronic format should also be provided for EPD's reference.

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### **Schedule 1**

#### **Air Quality Models Generally Accepted by Hong Kong Environmental Protection Department for Regulatory Applications as at 1 July 1998\***

**Industrial Source Complex Dispersion Model - Short Term Version 3 (ISCST3)** or the latest version developed by U.S. Environmental Protection Agency

**California Line Source Dispersion Model Version 4 (CALINE4)** or the latest version developed by Department of Transportation, State of California, U.S.A.

**Fugitive Dust Model (FDM)** or the latest version developed by U.S. Environmental Protection Agency

\* EPD is continually reviewing the latest development in air quality models and will update this Schedule accordingly.

**Guidelines on Assessing the 'TOTAL' Air Quality Impacts**

*[The information contained in this Appendix is only meant to assist the Applicant in performing the air quality assessment. The Applicant must exercise professional judgment in applying this general information for the Project.]*

**1. Total Impacts - 3 Major Contributions**

1.1 In evaluating the air quality impacts of a proposed project upon air sensitive receivers, contributions from three classes of emission sources depending on their distance from the site should be considered. These are:

Primary contributions: project induced

Secondary contributions: pollutant-emitting activities in the immediate neighbourhood

Other contributions: pollution not accounted for by the previous two (Background contributions)

**2. Nature of Emissions**

**2.1 Primary contributions**

In most cases, the project-induced emissions are fairly well defined and quite often (but not necessarily) the major contributor to local air quality impacts. Examples include those due to traffic network, building or road construction projects.

**2.2 Secondary contributions**

Within the immediate neighbourhood of the project site, there are usually pollutant emitting activities contributing further to local air quality impacts. For most local scale projects, any emission sources in an area within 500m radius of the project site with notable impacts should be identified and included in an air quality assessment to cover the short-range contributions. In the exceptional cases where there is one or more significant sources nearby, the study area may have to be extended or alternative estimation approach employed to ensure these impacts are reasonably accounted for.

**2.3 Background contributions**

The above two types of emission contributions should account for, to a great extent, the air quality impacts upon local air sensitive receivers, which are often amenable to estimation by the 'Gaussian Dispersion' type of models. However, a background air quality level should be prescribed to indicate the baseline air quality in the region of the project site, which would account for any pollution not covered by the two preceding contributions. The emission sources contributing to the background air quality would be located further afield and not easy to identify. In addition, the transport mechanism by which pollutants are carried over long distances (ranging

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from 1km up to tens or hundreds of kms) is rather complex and cannot be adequately estimated by the 'Gaussian' type of models.

### **3. Background Air Quality - Estimation Approach**

#### **3.1 The approach**

In view of the difficulties in estimating background air quality using the air quality models currently available, an alternative approach based on monitored data is suggested. The essence of this approach is to adopt the long-term (5-year) averages of the most recent monitored air quality data obtained by EPD. These background data would be reviewed yearly or biennially depending on the availability of the monitored data. The approach is a first attempt to provide a reasonable estimate of the background air quality level for use in conjunction with EIA air quality assessment to address the cumulative impacts upon a locality. This approach may be replaced or supplemented by superior modelling efforts such as that entailed in PATH (Pollutants in the Atmosphere and their Transport over Hong Kong), a comprehensive territory-wide air quality modelling system currently being developed for Hong Kong. Notwithstanding this, the present approach is based on measured data and their long term regional averages; the background values so derived should therefore be indicative of the present background air quality. In the absence of any other meaningful way to estimate a background air quality for the future, this present background estimate should also be applied to future projects as a first attempt at a comprehensive estimate until a better approach is formulated.

#### **3.2 Categorisation**

The monitored air quality data, by 'district-averaging' are further divided into three categories, viz, Urban, Industrial and Rural/New Development. The background pollutant concentrations to be adopted for a project site would depend on the geographical constituency to which the site belongs.

The categorisation of these constituencies is given in Section 3.4. The monitoring stations suggested for the 'district-averaging' (arithmetic means) to derive averages for the three background air quality categories are listed as follows:

Urban: Kwun Tong, Sham Shui Po, Tsim Sha Tsui and Central/Western

Industrial: Kwun Tong, Tsuen Wan and Kwai Chung

Rural/New Development: Sha Tin, Tai Po, Junk Bay, Hong Kong South and Yuen Long.

The averaging would make use of data from the above stations wherever available. The majority of the monitoring stations are located some 20m above ground.

#### **3.3 Background pollutant values**

Based on the above approach, background values for the 3 categories have been obtained for a few major air pollutants as follows:

POLLUTANT	URBAN	INDUSTRIAL	RURAL/NEW DEVELOPMENT
NO2	59	57	39
SO2	21	26	13
O3	62	68	57
TSP	98	96	87
RSP	60	58	51

All units are in micrograms per cubic metre. The above values are derived from 1992 to 1996 annual averages with the exception of ozone which represent annual average of daily hourly maximum values for year 1996.

In cases where suitable air quality monitoring data representative of the study site such as those obtained from a nearby monitoring station or on-site sampling are not available for the prescription of background air pollution levels, the above tabulated values can be adopted instead. Strictly speaking, the suggested values are only appropriate for long term assessment. However, as an interim measure and until a better approach is formulated, the same values can also be used for short term assessment. This implies that the short term background values will be somewhat under-estimated, which compensates for the fact that some of the monitoring data are inherently influenced by secondary sources because of the monitoring station location.

Indeed, if good quality on-site sampling data which cover at least one year period are available, these can be used to derive both the long term (annual) and short term (daily/hourly) background values, the latter are usually applied on an hour to hour, day to day basis.

### 3.4 Site categories

The categories to which the 19 geographical constituencies belong are listed as follows:

DISTRICT	AIR QUALITY CATEGORY
Islands	Rural / New Development
Southern	Rural / New Development
Eastern	Urban
Wan Chai	Urban
Central & Western	Urban
Sai Kung	Rural / New Development
Kwun Tong	Industrial
Wong Tai Sin	Urban
Kowloon City	Urban
Yau Tsim	Urban
Mong Kok	Urban
Sham Shui Po	Urban

Kwai Tsing	Industrial
Sha Tin	Rural / New Development
Tsuen Wan	Industrial
Tuen Mun	Rural / New Development
Tai Po	Rural / New Development
Yuen Long	Rural / New Development
Northern	Rural / New Development

### 3.5 Provisions for ‘double-counting’

The current approach is, by no means, a rigorous treatment of background air quality but aims to provide an as-realistic-as-possible approximation based on limited field data. ‘Double-counting’ of ‘secondary contributions’ may be apparent through the use of such ‘monitoring-based’ background data as some of the monitoring stations are of close proximity to existing emission sources. ‘Primary contributions’ due to a proposed project (which is yet to be realized) will not be double-counted by such an approach. In order to avoid over-estimation of background pollutant concentrations, an adjustment to the values given in Section 3.3 is possible and optional by multiplying the following factor:

$$(1.0 - E_{\text{Secondary contributions}}/E_{\text{Territory}})$$

where E stands for emission.

The significance of this factor is to eliminate the fractional contribution to background pollutant level of emissions due to ‘secondary contributions’ out of those from the entire territory. In most cases, this fractional contribution to background pollutant levels by the secondary contributions is minimal.

## 4. Conclusions

- 4.1 The above described approach to estimating the total air quality impacts of a proposed project, in particular the background pollutant concentrations for air quality assessment, should be adopted with immediate effect. Use of short term monitoring data to prescribe the background concentrations is no longer acceptable.

## **Guidelines on the Use of Alternative Computer Models in Air Quality Assessment**

*[The information contained in this Appendix is only meant to assist the Applicant in performing the air quality assessment. The Applicant must exercise professional judgment in applying this general information for the Project.]*

### **1. Background**

1.1 In Hong Kong, a number of Gaussian plume models are commonly employed in regulatory applications such as application for specified process licences and environmental impact assessments (EIAs). These frequently used models (as listed in Schedule 1 attached; hereafter referred to as Schedule 1 models) have no regulatory status but form the basic set of tools for local-scale air quality assessment in Hong Kong.

1.2 However, no single model is sufficient to cover all situations encountered in regulatory applications. In order to ensure that the best model available is used for each regulatory application and that a model is not arbitrarily applied, the project proponent (and/or its environmental consultants) should assess the capabilities of various models available and adopt one that is most suitable for the project concerned.

1.3 Examples of situations where the use of an alternative model is warranted include:

- (i) the complexity of the situation to be modeled far exceeds the capability of the Schedule 1 models; and
- (ii) the performance of an alternative model is comparable or better than the Schedule 1 models.

1.4 This paper outlines the demonstration/submission required in order to support the use of an alternative air quality model for regulatory applications for Hong Kong.

### **2. Required Demonstration/Submission**

2.1 Any model that is proposed for air quality applications and not listed amongst the Schedule 1 models will be considered by EPD on a case-by-case basis. In such cases, the proponent will have to provide the followings for EPD's review:

- (i) Technical details of the proposed model; and
- (ii) Performance evaluation of the proposed model

Based on the above information, EPD will determine the acceptability of the proposed model for a specific or general applications. The onus of providing adequate supporting materials rests entirely with the proponent.

2.2 To provide technical details of the proposed model, the proponent should submit documents containing at least the following information:



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- (i) mathematical formulation and data requirements of the model;
  - (ii) any previous performance evaluation of the model; and
  - (iii) a complete set of model input and output file(s) in commonly used electronic format.
- 2.3 On performance evaluation, the required approach and extent of demonstration varies depending on whether a Schedule 1 model is already available and suitable in simulating the situation under consideration. In cases where no Schedule 1 model is found applicable, the proponent must demonstrate that the proposed model passes the screening test as set out in USEPA Document “Protocol for Determining the Best Performing Model” (Ref. 1).
- 2.4 For cases where a Schedule 1 model is applicable to the project under consideration but an alternative model is proposed for use instead, the proponent must demonstrate either that
- (i) the highest and second highest concentrations predicted by the proposed model are within 2 percent of the estimates obtained from an applicable Schedule 1 model (with appropriate options chosen) for all receptors for the project under consideration; or
  - (ii) the proposed model has superior performance against an applicable Schedule 1 model based on the evaluation procedure set out in USEPA Document “Protocol for Determining the Best Performing Model” (Ref. 1).
- 2.5 Should EPD find the information on technical details alone sufficient to indicate the acceptability of the proposed model, information on further performance evaluation as specified in Sections 2.3 and 2.4 above would not be necessary.
- 2.6 If the proposed model is an older version of one of the Schedule 1 models or was previously included in Schedule 1, the technical documents mentioned in Section 2.2 are normally not required. However, a performance demonstration of equivalence as stated in Section 2.4 (i) would become necessary.
- 2.7 If EPD is already in possession of some of the documents that describe the technical details of the proposed model, submission of the same by the proponent is not necessary. The proponent may check with EPD to avoid sending in duplicate information.

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## **Schedule 1**

### **Air Quality Models Generally Accepted by Hong Kong Environmental Protection Department for Regulatory Applications as at 1 July 1998\***

**Industrial Source Complex Dispersion Model - Short Term Version 3 (ISCST3)** or the latest version developed by U.S. Environmental Protection Agency

**California Line Source Dispersion Model Version 4 (CALINE4)** or the latest version

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developed by Department of Transportation, State of California, U.S.A.

**Fugitive Dust Model (FDM)** or the latest version developed by U.S. Environmental Protection Agency

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*Ref. (1): William M. Cox, "Protocol for Determining the Best Performing Model" Publication No.EPA-454/R-92-025; U.S. Environmental Protection Agency, Research Triangle Park, NC.*

\* EPD is continually reviewing the latest development in air quality models and will update this Schedule accordingly

## **Guidelines for Built Heritage Impact Assessment (BHIA)**

### **Introduction**

The purpose of the guidelines is to assist the understanding of the requirements in assessing impact on built heritage.

A comprehensive Built Heritage Impact Assessment (BHIA) includes a baseline study, an impact assessment study associated with the appropriate mitigation measures.

### **(1) Baseline Study**

1.1 A baseline study shall be conducted:

- a. to compile a comprehensive inventory of heritage sites within the proposed project area, which include:
  - (i) all pre-1950 buildings and structures;
  - (ii) selected post-1950 buildings and structures of high architectural and historical significance and interest; and
  - (iii) cultural landscapes include places associated with historic event, activity, or person or exhibiting other cultural or aesthetic values, such as sacred religious sites, battlefields, a setting for buildings or structures of architectural importance, historic field patterns, clan graves, old tracks, *fung shui* woodlands and ponds, and etc.
- b. to identify the direct and indirect impacts on the heritage sites at the planning stage in order to avoid causing any negative effects. The impacts include the direct loss, destruction or disturbance of an element of cultural heritage, impact on its settings or impinging on its character through inappropriate siting or design, potential damage to the physical fabric of historic buildings or historic landscapes through air pollution, change of ground water level, vibration, ecological damage, new recreation or other daily needs to be caused by the new development. The impacts listed are merely to illustrate the range of potential impacts and not intended to be exhaustive.

1.2 The baseline study shall also include a desk-top research and a field evaluation,

1.3 Desk-top Research

- 1.3.1 Desk-top research should be conducted to analyse, collect and collate extant information. It shall include at least:
  - a. List of declared monuments protected by the Antiquities and Monuments Ordinance (Chapter 53).
  - b. Graded historic buildings and sites.

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- c. Government historic sites identified by the Antiquities and Monuments Office (AMO).
  - d. Proposed monument and deemed monuments.
  - e. Lists and archives kept in the Reference Library of the Antiquities and Monuments Office of the Leisure and Cultural Services Department including declared monuments and recorded historical building & structures identified by the AMO.
  - f. Publications on local historical, architectural, anthropological and other cultural studies, such as, Journals of the Royal Asiatic Society (Hong Kong Branch), Antiquities and Monuments Office Monograph Series and so forth.
  - g. Other unpublished papers, records, archival and historical documents through public libraries, archives, and the tertiary institutions, such as the Hong Kong Collection and libraries of the Department of Architecture of the University of Hong Kong and the Chinese University of Hong Kong, Public Records Office, photographic library of the Information Services Department and so forth.
  - h. Historical documents in the Public Records Office, the Land Registry, District Lands Office, District Office and the Hong Kong Museum of History and so forth.
  - i. Cartographic and pictorial documents. Old and recent maps and aerial photos searched in the Maps and Aerial Photo Library of the Lands Department.
  - j. Discussion with local informants.

#### 1.4 Field Evaluation

##### 1.4.1 General

The potential value of the project area with regard the cultural heritage could be established easily where the area is well-documented. However, it does not mean that the area is devoid of interest if it lacks information. In these instances, a site visit and consultations with appropriate individuals or organisations should be conducted by those with expertise in local heritage to clarify the situation.

##### 1.4.2 Field survey on historic buildings and structures

- a. Field scan of all the historic buildings and structures within the project area.
- b. Photographic recording of each historic building or structure including the exterior (the elevations of all faces of the building premises, the roof, close up for the special architectural details) and the interior (special

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architectural details), if possible, as well as the surroundings, the associated cultural landscape features and the associated intangible cultural heritage (if any) of each historic building or structure.

- c. Interview with local elders and other informants on local historical, architectural, anthropological and other cultural information related to the historic buildings and structures.
- d. Historical and architectural appraisal of the historic buildings and structures, their associated cultural landscape and intangible cultural elements.

1.4.3 If the field evaluation identifies any additional heritage sites within the study area which are of potential historic importance and not recorded by AMO, the findings should be reported to the AMO as soon as possible.

## 1.5 The Report of Baseline Study

1.5.1 The study report should have concrete evidence to show that the process of the above desk-top and field survey has been satisfactorily completed. This should take the form of a detailed inventory of the heritage sites supported by full description of their significance. The description should contain detailed geographical, historical, architectural, anthropological, ethnographic and other relevant data supplemented with illustrations below and photographic and cartographic records, if required.

1.5.2 A master layout plan showing all the identified built heritage within the study area should be provided in the report. All the identified heritage sites should be properly numbered with their locations indicated on the master layout plan.

### 1.5.3 Historic Buildings/Structures/Sites

- a. A map in 1:1000 scale showing the boundary of each historic item.
- b. Photographic records of each historic item.
- c. Detailed recording form of each historic item including its construction year, previous and present uses, architectural characteristics, as well as legends, historic persons and events, cultural landscape features and cultural activities associated with the structure.
- d. A cross-referenced checklist including the reference number of each historical item, their photo and drawing reference, as well as the page number of the detailed recording form of each identified historical item for easy cross-checking of individual records.

1.5.4 A full bibliography and the source of information consulted should be provided to assist the evaluation of the quality of the evidence. To facilitate verification of the accuracy, the AMO will reserve the right to examine the full details of the research materials collected under the baseline study.

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## (2) Impact Assessment Study

### 2.1 Identification of impact on heritage

- 2.1.1 The impact assessment study must be undertaken to identify the impacts on the heritage sites which will be affected by the proposed development subject to the result of desktop research and field evaluation. The prediction of impacts and an evaluation of their significance must be undertaken by expert(s) in local heritage.
- 2.1.2 During the assessment, both the direct impacts such as loss or damage of important features as well as indirect impacts should be clearly stated, such as adverse visual impact on built heritage, landscape change to the associated cultural landscape features of the built heritage, temporary change of access to the heritage sites during the work period, change of ground level or water level which may affect the preservation of the built heritage *in situ* during the implementation stage of the project.
- 2.1.3 The evaluation of heritage impact assessment may be classified into five levels of significance based on type and extent of the effects concluded in the BHIA study:
- a. Beneficial impact: the impact is beneficial if the project will enhance the preservation of the heritage site(s) such as improving the flooding problem of the historic building after the sewerage project of the area;
  - b. Acceptable impact: if the assessment indicates that there will be no significant effects on the heritage site(s);
  - c. Acceptable impact with mitigation measures: if there will be some adverse effects, but these can be eliminated, reduced or offset to a large extent by specific measures, such as conduct a follow-up Conservation Proposal or Conservation Management Plan for the affected heritage site(s) before commencement of work in order to avoid any inappropriate and unnecessary interventions to the building;
  - d. Unacceptable impact: if the adverse effects are considered to be too excessive and are unable to mitigate practically;
  - e. Undetermined impact: if the significant adverse effects are likely, but the extent to which they may occur or may be mitigated cannot be determined from the study. Further detailed study will be required for the specific effects in question.
- 2.1.4 Preservation in totality must be taken as the first priority as it will be a beneficial impact and will enhance the cultural and socio-economical environment if suitable measures to integrate the heritage site into the proposed project are carried out.
- 2.1.5 If, due to site constraints and other factors, only preservation in part is possible, this must be fully justified with alternative proposals or layout

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designs which confirm the impracticability of total preservation.

- 2.1.6 Total destruction must be taken as the very last resort in all cases and shall only be recommended with a meticulous and careful analysis balancing the interest of preserving local heritage as against that of the community as a whole. Assessment of impacts on heritage sites shall also take full account of, and follow where appropriate, paragraph 4.3.1(c), item 2 of Annex 10, items 2.6 to 2.9 of Annex 19 and other relevant parts of the Technical Memorandum on Environmental Impact Assessment Process.

## 2.2 Mitigation Measures

- 2.2.1 It is always a good practice to recognize the heritage site early in the planning stage and site selection process, and to avoid it, i.e. preserve it in-situ, or leaving a buffer zone around the site.
- 2.2.2 Mitigation is not only concerned with minimizing adverse impact on the heritage site but also should give consideration of potential enhancement if possible (such as to improve the access to the built heritage or enhance the landscape and visual quality of built heritage).
- 2.2.3 Mitigation measures shall not be recommended or taken as *de facto* means to avoid preservation of heritage sites. They must be proved beyond all possibilities to be the only practical course of action. Heritage sites are to be in favour of preservation unless it can be demonstrated that there is a need for a particular development which is of paramount importance and outweighs the significance of a heritage site.
- 2.2.4 If avoidance of the heritage site is not possible, amelioration can be achieved by minimizing the potential impacts and the preservation of the heritage site, such as physically relocating it. Measures like amendments of the sitting, screening and revision of the detailed design of the development are required to lessen its degree of exposure if it causes visual intrusion to the heritage site and affects the character and integrity of the heritage site.
- 2.2.5 A rescue programme, when required, may involve preservation of the historic building or structure together with the relics inside, and its historic environment through relocation and detailed cartographic and photographic survey as the very last resort.
- 2.2.6 For major renovation or adaptive reuse projects for built heritage, conservation management plan and/or conservation maintenance manual may be required as mitigation measures for the construction and operation phase of the project subject to the nature and scope of the project.

## 2.3 The Impact Assessment Report

- 2.3.1 A detailed description and plans should be provided to elaborate on the heritage site(s) to be affected. Besides, please also refer to paragraph 4.3.1(d), items 2.10 to 2.14 of Annex 19 and other relevant parts of the Technical Memorandum, other appropriate presentation methods for mitigation

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proposals like elevations, landscape plan and photomontage shall be used in the report extensively for illustrating the effectiveness of the measures.

- 2.3.2 To illustrate the landscape and visual impacts on built heritage, as well as effects of the mitigation measures, choice of appropriate presentation methods is important. These methods include perspective drawings, plans and section/elevation diagrams, photographs on scaled physical models, photo-retouching and photomontage. These methods shall be used extensively to facilitate communication among the concerned parties.
- 2.3.3 The implementation programme for the agreed mitigation measures should be able to be executed and should be clearly set out in the report together with the funding proposal. These shall form an integral part of the overall redevelopment project programme and financing of the proposed redevelopment project. Competent professionals must be engaged to design and carry out the mitigation measures.
- 2.3.4 For contents of the implementation programme, reference can be made to Annex 20 of the Technical Memorandum on Environmental Impact Assessment Process. In particular, item 6.7 of Annex 20 requires to define and list out clearly the proposed mitigation measures to be implemented, by whom, when, where, to what requirements and the various implementation responsibilities. A comprehensive plan and programme for the protection and conservation of the partially preserved heritage site, if any, during the planning and design stage of the proposed project must be addressed in details.
- 2.3.5 Supplementary information to facilitate the verification of the findings shall be provided in the report including at least:
- a. layout plan(s) in a proper scale illustrating the location of all heritage sites within the study area, the extent of the work area together with brief description of the proposed works;
  - b. all the heritage sites within the study area should be properly numbered, cross-reference to the relevant drawings and plans;
  - c. an impact assessment cross-referenced checklist of all the heritage sites within the study area including heritage site reference, distance between the heritage site and work area, summary of the possible impact(s), impact level, summary of the proposed mitigation measure(s), as well as references of the relevant plans, drawings and photos; and
  - d. a full implementation programme of the mitigation measures for all affected heritage sites to be implemented with details, such as by whom, when, where, to what requirements and the various implementation responsibilities of individual parties.



**Appendix C**

**Implementation Schedule**

<b>EIA Ref.</b>	<b>EM&amp;A Ref.</b>	<b>Recommended Mitigation Measures</b>	<b>Objectives of the Recommended Measure &amp; Main Concerns to Address</b>	<b>Who to implement the measures?</b>	<b>Location of the measure</b>	<b>When to implement the measure?</b>	<b>What requirements or standards for the measure to achieve</b>

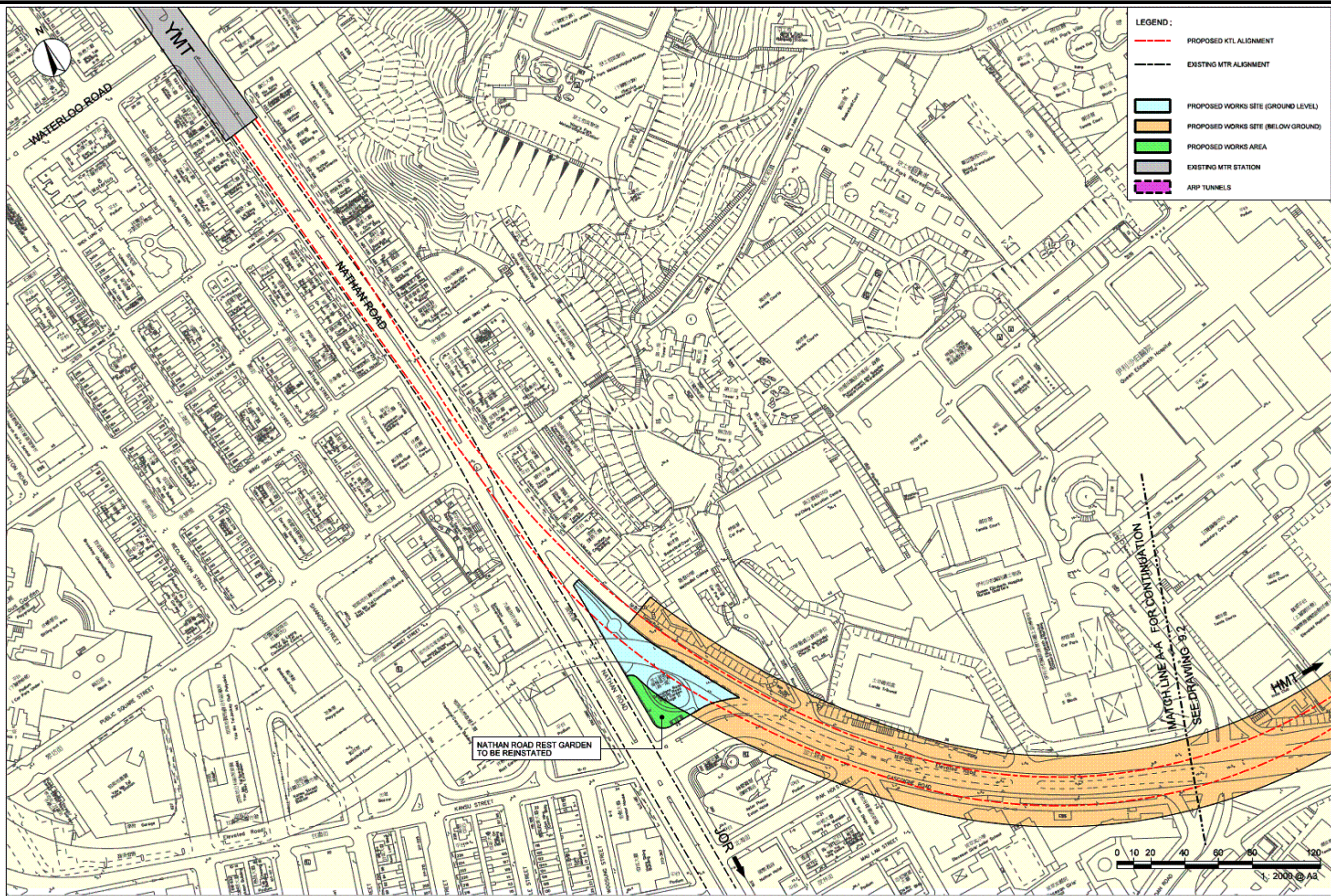


Project Title - Kwun Tong Line Extension (KTE)

EIA Study Brief No. :  
ESB-188/2008

Figure 1 - Location of Kwun Tong Line Extension



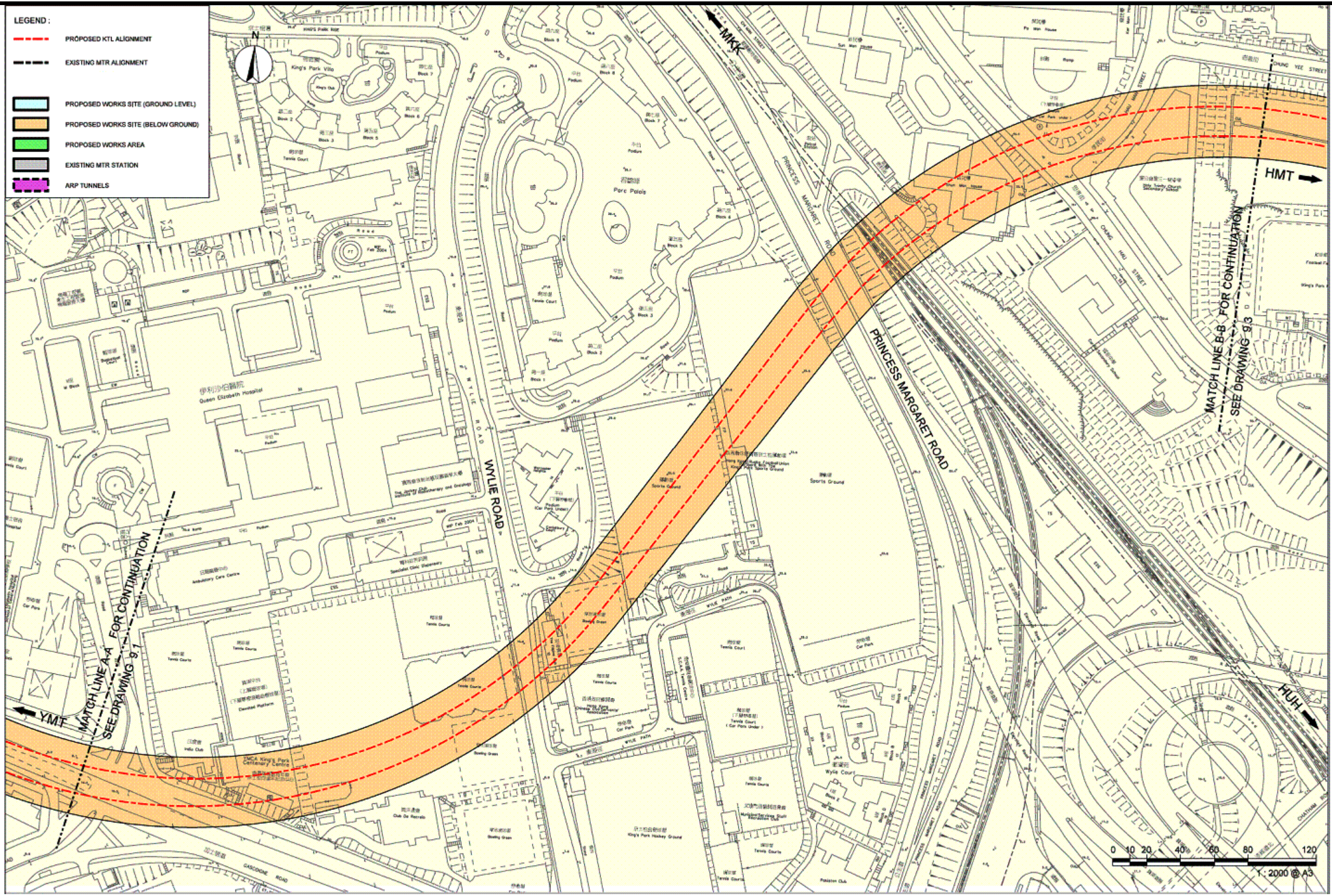


Project Title - Kwun Tong Line Extension (KTE)

EIA Study Brief No. : ESB-188/2008

Figure 2 - Preliminary Plan of Project Boundary and Indicative Works Area/Works Site



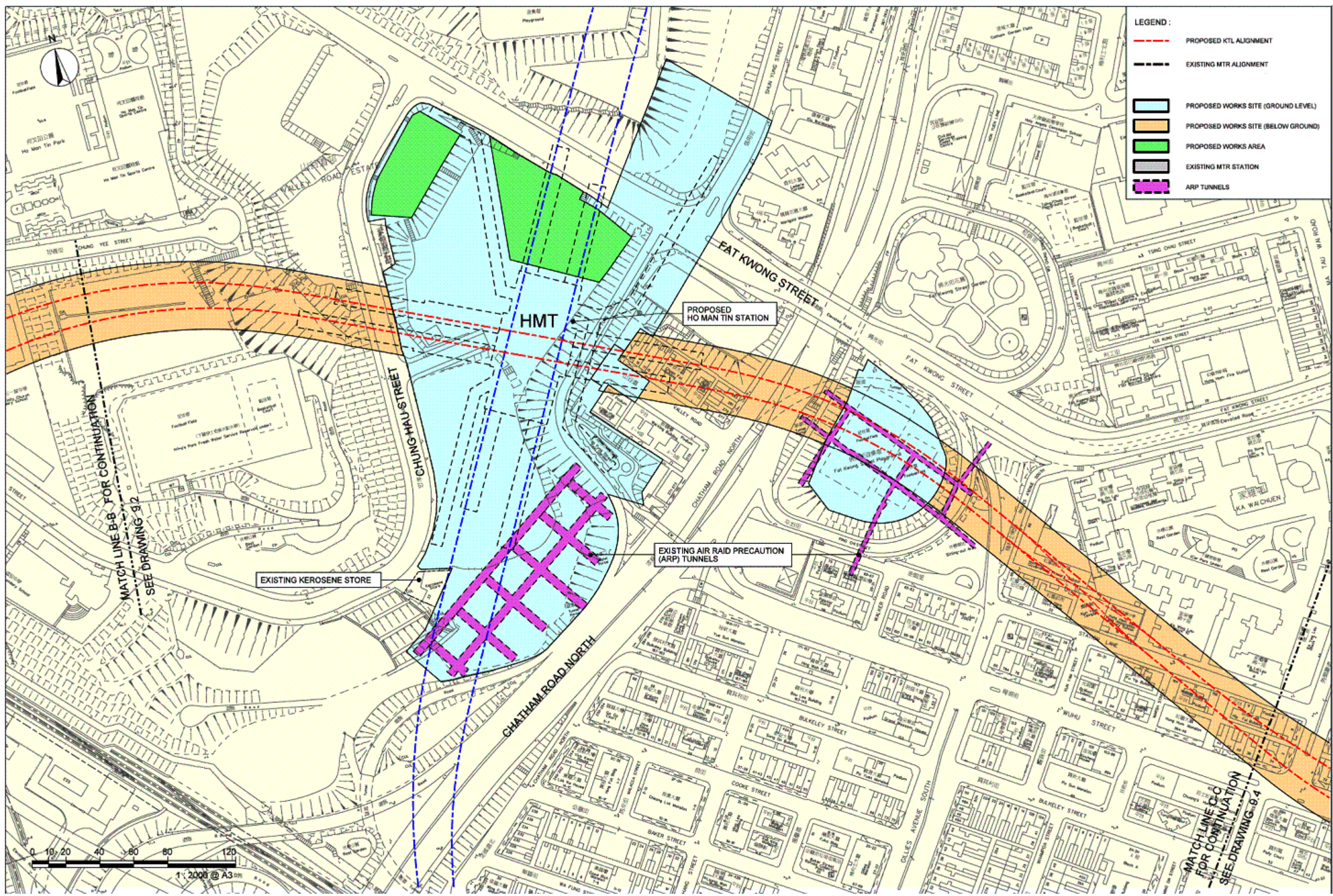


Project Title - Kwun Tong Line Extension (KTE)

EIA Study Brief No. : ESB-188/2008

Figure 3 - Preliminary Plan of Project Boundary and Indicative Works Area/Works Site



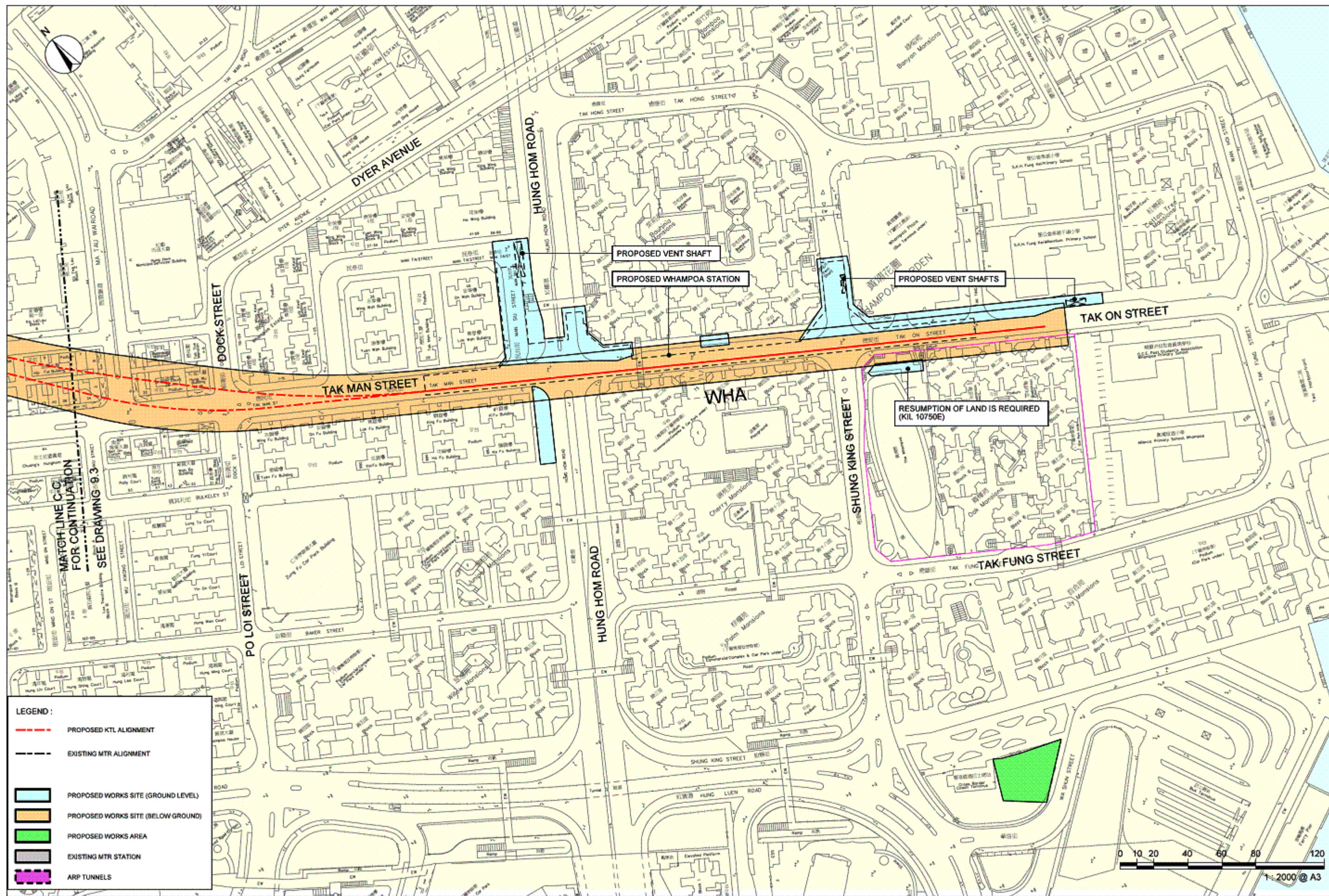


Project Title - Kwun Tong Line Extension (KTE)

EIA Study Brief No. : ESB-188/2008

Figure 4 - Preliminary Plan of Project Boundary and Indicative Works Area/Works Site





Project Title - Kwun Tong Line Extension (KTE)

EIA Study Brief No. : ESB-188/2008

Figure 5 - Preliminary Plan of Project Boundary and Indicative Works Area/Works Site

