Appendix 15.1

Summary of key assessment assumptions and limitation of assessment methodologies

Appendix 15.1 Key Assessment Assumptions and Methodologies

Assessment Methodologies	Assessment Assumptions	Limitation of Assessment Methodologies / Assumptions	Prior Agreements with EPD / Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
Air Quality Impact (Construction Phase)				
The air quality impact assessment for the Project follows Annex 4 and Annex 12 of the TM-EIAO. Dust emission will be the major air quality impact. Quantitative assessment was carried out by applying FDM model. The 1-hour, 24-hour and annual average TSP concentrations at representative discrete ASRs were predicted either at 1.5m 5m and 10m, above ground. The emission rates for different construction activities considered in the model were based on the USEPA Compilation of Air Pollutant Emission Factors (AP-42), 5th edition. The concurrent works with SCL (TAW-HUH) and Kai Tak Development (KTD) were taken into account in assessing the cumulative dust impact. Dust sources from these concurrent projects were made referenced to the approved EIA studies for SCL (TAW-HUH) and KTD.	Dusty construction activities and programme were based on information provided by the Engineer. The major potential sources of construction dust impact associated with the Project would include excavation, spoil removal, wind erosion and materials handling. Construction dust assessment for short-term impact (i.e. 1-hour and 24-hour average) were undertaken by a 2-Tier approach. Tier 1 screening assessment is a theoretical worst case scenario evaluation to identify hot spot areas of construction air quality impact. The identified hot spot areas were further assessed by a more focused Tier 2 assessment to predict the realistic worst case impact by assuming 15% active construction area. Long-term impact (i.e. annual average) were assessed with realistic assumptions of the 6% active construction area for all work sites. Subject to the construction work at night-time and during weekend or holiday, construction working period of 24 days a month and 8 hours a day was assumed.	The construction programme is indicative and subject to contractors' actual operation. A conservative approach was adopted in the model run. The actual situation may be better than that of the model prediction. It is difficult to obtain the detailed information for estimation of emission rates for different dusty construction activities. Heavy construction emission rate which is the highest emission rate was therefore adopted in the model run as a conservative approach. The predicted dust concentrations at the ASRs may be higher than the actual situation. FDM does not allow emissions to be placed more than 20m above ground, but can output concentration accurately at all heights for emission placed within 20m above ground. Tier 1 screening test is a hypothetical one which is very conservative and does not occur in reality. Tier 2 assessment is also a very	3.4.6 - Detailed study requirements 3.4.6.3 (vi) (a) - quantitative modelling	Not applicable

<table>
<tr><th rowspan="2">Assessment Methodologies</th><th rowspan="2">Assessment Assumptions</th><th rowspan="2">Limitation of Assessment Methodologies / Assumptions</th><th colspan="2">Prior Agreements with EPD / Other Authorities</th></tr>
<tr><th>EIA Study Brief Clause Reference</th><th>Relevant Documentation</th></tr>
<tr><td></td><td>The prediction of dust emissions is based on the typical values and emission factors obtained from United States Environmental Protection Agency (USEPA) Compilation of Air Pollution Emission Factors, AP-42, 5th Edition.

<table>
<tr><td>Heavy construction activities including land clearance, site formation, ground excavation, construction of associated facilities etc.</td><td>E = 2.69 Mg/hectare/month of activities</td></tr>
<tr><td>Wind erosion</td><td>E = 0.85 Mg/hectare/year</td></tr>
<tr><td>Loading/Unloading at Barging facilities and any stockpile</td><td>$E = k(0.0016)\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}(kg/megagram)$
k is particle size multiplier
U is average wind speed
M is material moisture content</td></tr>
</table>

Watering once per hour on exposed worksites is proposed to achieve dust removal efficiency of 91.7% with an assumed application intensity of 1.3 L/m2, in accordance with the “Control of Open Fugitive Dust Sources” (USEPA AP-42) as given in Appendix 4.2.

Hourly meteorological data from Hong Kong Observatory for year 2010 were adopted to predict the hourly, daily and annual TSP concentration.

Background TSP concentration is based</td><td>conservative approach as it assumed that 15% daily maximum active works areas of the Project would be located closest to the potentially worst affected ASRs at any one time throughout the construction period which is unlikely to occur in reality. The predicted TSP levels may be higher than the actual situation.</td><td></td><td></td></tr>
</table>

Assessment Methodologies	Assessment Assumptions	Limitation of Assessment Methodologies / Assumptions	Prior Agreements with EPD / Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
	on recent 5-year average monitoring data of 3 monitoring stations (Sham Shui Po, Kwun Tong and Tsuen Wan) for urban development was adopted as an indication of the future TSP background concentration.			
Air Quality Impact (Operational Phase)				
The air quality impact assessment for the Project follows Annex 4 and Annex 12 of the TM-EIAO. **Emission Sources** - Vehicular emission from open road sections including all project-related elevated and at-grade slip roads, concurrent projects such as Road Works at West Kowloon, planned road networks associated with Kai Tak Development, Trunk Road T2 etc.; - Emissions from 3 proposed ventilation buildings – 2 on either ends and one at the Central Portion at Ho Man Tin; - Associated full enclosure for CKR, which emissions at portals may cause local air pollution concern; - Other non-CKR related enclosures, landscape deck, and underpasses that can contribute	Vehicular emission factor was based on modeling results of EmFAC. The cumulative air quality impact due to vehicular emission from open road was predicted by CALINE4 model while vehicular emission from tunnel portals and ventilation buildings and emissions from industrial chimneys, marine vessels and helicopter were predicted by ISCST3. PATH is used to quantify the future background air quality from various sources including those in Pearl River Delta Economic Zone (PRDEZ), the Hong Kong International Airport, power plants in HKSAR, marine vessels and road transports over the whole territory etc. Grid-specific composite meteorological data extracted from EPD's PATH model have been adopted in the models. Ozone Limiting Method (OLM) was adopted for conversion of NO_x to NO_2. According to	Worst case traffic impact assessment conditions were adopted in the model. Thus, the assessment may overestimate the vehicular emission impact. CALINE4 model has the limitation of only allowing input of the maximum height to 10m above ground.	3.4.6 - Detailed study requirements 3.4.6.3 (vi) (a) - quantitative modelling	

Assessment Methodologies	Assessment Assumptions	Limitation of Assessment Methodologies / Assumptions	Prior Agreements with EPD / Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
to cumulative impact; - Other non-CKR related emissions from chimneys, marine vessels and helicopter in the assessment area that will contribute to cumulative air quality impact. **<u>Quantitative Modelling</u>** - Use of EPD accepted dispersion model – ISCST3 for point sources (ventilation buildings, chimneys, planned cruise terminal), area sources (typhoon shelter) and volume sources (portal emission, helicopter) - Use of EPD accepted dispersion model – CALINE4 for line sources (open roads) - Used to predict the maximum cumulative 1-hr & 24-hr average and annual concentrations - Cumulative impacts compared against AQO - The cumulative impact is a combination of the results from CALINE4, ISCST3 and PATH on an hour-by-hour basis.	EPD's Guidelines on Choice of Models and Model Parameters, the vehicular tailpipe NO_2 emission is assumed to be 7.5% of NOx. Other NO_2 emissions from chimney, typhoon shelter etc. are assumed to be 10% of NOx.			
<u>Airborne Noise Impact (Construction Phase)</u>				
The noise impact assessment for the Project follows Annex 5 and Annex 13 of the EIAO-TM.	Construction noise impact assessment was carried out on a monthly basis and assessed on existing NSRs from the	The prediction of construction noise impact was based on the methodology described in the GW-TM under the NCO.	3.4.7.2 – (i) Determination of Assessment Area	Not applicable

Assessment Methodologies	Assessment Assumptions	Limitation of Assessment Methodologies / Assumptions	Prior Agreements with EPD / Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
To assess the potential noise impacts due to the Project, the noise sources were identified and the impacts were quantified. The assessment methodology follows Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW-TM).	commencement of the Project. Cumulative noise impact was considered within 300m of the NSRs from the construction tasks of the Project taking place concurrently. Noise sources from the areas greater than this 300m distance were excluded from this assessment for West Portion and Central Portion; and 500m distance were excluded from this assessment for East Portion and Barging Point. In accordance with the EIAO, the methodology outlined in the GW-TM has been used for this construction noise assessment (excluding percussive piling). Sound power level (SWL) of the equipment was taken from Table 3 of GW-TM, EPD's Quality Powered Mechanical Equipment (QPME) and additional reference is made to typical SWLs for international manufacturer's reference. It was assumed that all PME items required for a particular construction activity would be located at the notional source position of the worksites where such activity is to be performed. The assessment was based on the cumulative SWL of PME likely to be used for each location, taking into account the	There are limitations of the methodology such as the accuracy of the predictive base data for future (e.g. plant inventory for proposed construction works). Quantitative uncertainties in this assessment of impacts should be considered when drawing conclusions from the assessment. In carrying out the assessment, realistic worst case assumptions have been made in order to provide a conservative assessment of noise impacts. The construction noise impact was assessed based on conservative estimates for the types and quantities of plant and construction methods. The predicted noise levels may be higher than the actual situation.	3.4.7.2 – (iii) Noise Sensitive Receivers	

Assessment Methodologies	Assessment Assumptions	Limitation of Assessment Methodologies / Assumptions	Prior Agreements with EPD / Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
	construction period in the vicinity of the receiver location. To predict the noise level, PME was divided into groups required for each discrete construction task. The objective was to identify the worst case scenario representing those items of PME that would be in use concurrently at any given time. The sound pressure level of each construction task was calculated, depending on the number of plant and distance from receivers. The noise levels at NSRs were then predicted by adding up the SWLs of all concurrent construction tasks. A positive 3 dB(A) façade correction was added to the predicted noise levels in order to account for the façade effect at each NSR.			
Airborne Noise Impact (Operational Phase)				
The noise impact assessment for the Project follows Annex 5 and Annex 13 of the EIAO-TM. The method used to predict operational airborne road traffic noise is based on the U.K. Department of Transport "Calculation of Road Traffic Noise (CRTN)".	Fixed Noise The fixed plant noise assessment has been carried out by determining the maximum permissible sound power levels for future detailed design of the fixed plant in the absence of any detailed information and noise specification of the proposed fixed plant at the time of this	Fixed Noise For determining the distance correction factors, the horizontal distances between the noise source positions and the NSRs were used for representing the worst level of the representative NSRs. The distance between NSRs and the noise sources (slant distance) could be larger and the maximum permissible noise	3.4.7.2 – (i) Determination of Assessment Area 3.4.7.2 – (iii) Noise Sensitive Receivers	Not applicable

Assessment Methodologies	Assessment Assumptions	Limitation of Assessment Methodologies / Assumptions	Prior Agreements with EPD / Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
	EIA study. <u>Road Traffic Noise</u> A road traffic noise model has been used to predict and assess the propagation of road traffic noise. The modelling methodology for propagation is based on the prediction procedures in Calculation of Road Traffic Noise (CRTN).	emission levels could be higher than the predicted levels. <u>Road Traffic Noise</u> The following parameters have been taken into account as limitation depends on site specific condition: • Barrier correction; and • Road surface type correction; These conservative approaches have applied for the above parameters may lead the predicted noise levels differs from the actual situation.		
<u>Groundborne Noise Impact (Construction Phase)</u>				
The noise impact assessment for the Project follows Annex 5 and Annex 13 of the EIAO-TM. The method used to predict construction groundborne noise is based on the U.S. Department of Transportation "High-Speed Ground Transportation Noise and Vibration Impact Assessment". The methodology which had previously been applied in other EIA	In carrying out the assessment, realistic worst case assumptions have been made in order to provide a conservative assessment of noise impacts. The construction ground-borne noise impact was assessed based on conservative estimates for the types of plant and methods of working.	There would be some limitations such as the accuracy of the predictive base data for future conditions e.g. limitation of reference in vibration source, soil damping loss, coupling loss. Uncertainties in the assessment of impacts have been considered when drawing conclusions from the assessment.	3.4.7.2 – (i) Determination of Assessment Area 3.4.7.2 – (v) Construction Noise Assessment	Not applicable

Assessment Methodologies	Assessment Assumptions	Limitation of Assessment Methodologies / Assumptions	Prior Agreements with EPD / Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
studies is generally accepted for use in assessing groundborne noise impacts against TM-EIAO and TM-IND noise criteria.				
Water Quality Impact				
The assessment of potential water quality impacts for the Project follows those presented in Annex 6 and Annex 14 of the EIAO-TM. To assess the potential water quality impacts due to the Project, the sources and natures of water pollution to be generated have been identified and their impacts have been assessed. The method to predict water quality impact due to marine works is based on a 3 dimensional mathematical model. In considering the anticipated small scale water quality impact, a qualitative assessment approach was adopted to all land-based works. Mitigation measures have been recommended to minimize any adverse water quality impacts. **Hydrodynamic Model**: Delft3D-	**Parameters for Sediment Plume Model**: Horizontal Dispersion Coefficient D_H (m^2/s) a = 0.003 b = 0.4 Reference: $DH = at^b$, Where t is the age of particle from the instant of discharge in seconds Vertical Dispersion Coefficient D_V (m^2/s) $5x10^{-3}$ Dry Season $1x10^{-5}$ Wet Season Particle Settling Velocity 0.0005m/s (Constant) Grain size diameter of 10 μm Critical Shear Stress 0.2 Pa Sedimentation 0.3 Pa Erosion	Key model uncertainties and limitations are: • All the predictions made in this EIA were based on the latest available design and construction information and assumptions. Any key assumptions during the actual implementation of the Project in the future would affect the prediction and assessment findings presented in this EIA report. To enhance the model performance, following approaches were adopted during the assessment: The SEK model in the approved EIA-Kai Tak Development was adopted in the study and further refined to a finer resolution lower than 75m in the proximity of CKR. The refined SEK model was validated with the overall SEK model to ensure the reliable predictions of hydrodynamics and	3.4.8-Water Quality Impact Appendix B-Hydrodynamic and Water Quality Modelling Requirements	Not applicable

Assessment Methodologies	Assessment Assumptions	Limitation of Assessment Methodologies / Assumptions	Prior Agreements with EPD / Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
FLOW model **Sediment Plume Model**: Delft3D-PART model **Dilution Tracer for Computation of Contaminant Release:** Delft3D-PART model	<u>Water depth which deposition take place</u> 0.2 m **Simulation Periods:** 15 days spring-neap tidal cycle • Dry Season: 9 Jan 2006 02:00 to 24 Jan 2006 02:00 • Wet Season: 1 Oct 2005 12:00 to 16 Oct 2005 12:00 **Bathymetry:** Based on the Marine Chart WGS 84 HK0801 and 0802 **Coastaline Configuration:** Included the following key planned reclamation projects WDII & CWB Relamation; Further Development of Tseung Kwan O Providing Sufficient Water Depth for Kawi Tsing Container Basin and Its Approach Channel Kai Tak Runway Opening **Concurrent Marine Works:** Scenario H1b -Stage 1 reclamation and H2b - Stage 2 reclamation took account of Kai Tak Runway Opening for the	water quality. Sufficient spin-up time of 39 days for wet seasons and 17 days for dry seasons was adopted in the model simulations to ensure that the initial conditions do not affect the results. The sediment loss rate for dredging activities was calculated by the multiplication of volumetric dredging rate. The sediment loss per volumetric dredging rates closed grab dredgers was 25 kg/m^3. The sediment removal efficiency (75%) of silt curtain for mitigation is based on the approved EIA-Cruise Terminal for conservative assessment. The daily oxygen uptake factor for the calculation of oxygen depletion was set at 1.0 for worse case estimate. The highest concentrations from the elutriate test was adopted to assess the potential contaminant release due to dredging for worse case assessment. The radius of initial release was assumed to be 10m and an average water depth was 7m.		

Assessment Methodologies	Assessment Assumptions	Limitation of Assessment Methodologies / Assumptions	Prior Agreements with EPD / Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
	cumulative hydrodynamic impacts. Scenario 4 -dredging of marine channel for CKR took account of the following concurrent projects for water quality impacts: • Kai Tak Runway Opening Trunk Road T2 (T2)			
Waste Management Implications				
The method for assessing potential waste management impacts for the Project follow those presented in Annex 7 and Annex 15 of the EIAO-TM. Appropriate mitigation measures have been recommended to minimize any adverse waste impacts.	The waste quantities to be generated from the Project were estimated based on the engineering assessment and the information provided in the Construction and Demolition Material Management Plan (C&DMMP) prepared for the Project. Quality of the sediment to be dredged was characterised in accordance to the methodologies stipulated in the endorsed Marine Sediment Sampling Plan (MSSP) and the endorsed Supplementary Sediment Sampling and Testing Plan (SSTP).	The waste quantities estimated under this EIA are subject to further detailed site survey. However, further refinement of the estimated waste quantities would not affect the assessment conclusion provided that all the recommended mitigation measures are implemented properly.	Clause 3.4.9.2 (iii) (for dredged sediment)	Appendix 7.3 and 7.5

Assessment Methodologies	Assessment Assumptions	Limitation of Assessment Methodologies / Assumptions	Prior Agreements with EPD / Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
Land Contamination				
The approach for land contamination assessment for the Project follows those presented in Practice Guide for Investigation and Remediation of Contaminated Land and Annex 19 of the EIAO-TM	The strategy for sampling and laboratory testing, selection of the contaminants of concern (COCs) would be representative to the site specific characteristics for the past, present and future land uses.	Localised contamination hotspots may not have been identified and investigated due to site constraints.	Clause 3.4.10.3 – Contamination Assessment Plan	See Appendix 8.1 and 8.3
Hazard				
Evaluation and assessment of potential risk impact was conducted in accordance with the criteria and guidelines specified in Annex 4 and Annex 22 of the EIAO-TM. The Methodology Statement of Hazard Assessment submitted in April 2009 was approved in May 2009 by EPD. The current study approach follows the agreed assessment methodology (dated 5 May 2009) to conduct the hazard assessment.	List of Assumptions have been agreed upon by relevant parties and government departments for the transport and use of explosives for blasting operations. The hazard assessment was carried out based on current best available information obtained from relevant parties and government authorities. Population estimation using Territorial Population and Employment Data Matrix (TPEDM) was adopted for the assessment based on prior agreement with Planning Department.	The hazard assessment was conducted based on site survey data and current best available information provided by the relevant parties and government departments. Based on the assumptions made for this study, the individual and societal risk levels associated with the transport and use of explosives for blasting operations were found to be “Acceptable” in accordance with the criteria stipulated in Annex 4 of the EIAO-TM.	Clause 3.4.11.2, Clause 3.4.11.3	Acceptance memo for the Method Statement of Hazard Assessment from EPD was obtained on 5 May 2009. Confirmation on the applicability of the agreed method statement for the current D&C EIA study from EPD was received dated 13 Dec 2011.

Assessment Methodologies	Assessment Assumptions	Limitation of Assessment Methodologies / Assumptions	Prior Agreements with EPD / Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
Landscape and Visual Impact				
The landscape and visual assessment for the Project was conducted in accordance with the Study Brief No. ESB-156/2006. The study adhered to the requirements as listed in Annexes 10 and 18 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) and also the relevant guidelines for Landscape and Visual Impact Assessment (EIAO Guidance Note No.8/2010).	The predicted landscape and visual conditions for Ya Ma Tei (West), Ho Man Tin (Middle), Kai Tak (East) and Kwai Chung (Proposed barging point) Study Areas, apart from the Project itself, are based on the latest relevant OZPs and the best available information.	Assessment of sensitivity of receivers and the magnitude of change due to the Project are inherently subjective, more so for visual than for landscape. No detailed data exists for future planned projects or for the concurrent projects other than described in the Report. Changes to these may affect the evaluated impacts of the Project. It has been agreed to defer the tender to around 2013, and deferral dates for the Tree Survey Report is under discussion with HyD. Submission dates are to be revised in due course. A Detailed Tree Survey was undertaken for the whole development site at the inception and planning stage, in accordance with ETWB 3/2006 and completed in October 2010. These data are used to support the LVIA. A further Detailed Tree Survey will be carried out at a later stage of the Project (likely 2013) when trees within the final agreed works areas will be surveyed individually as the existing site conditions allow. The assessment in based on the latest	Environmental Impact Assessment Study Brief No. ESB-156/2006 Clause 3.4.12 Landscape & Visual.	VSRs and 12 viewpoints (VPs) for the purpose of photomontages, were agreed with PlanD on 06 March 2012. Following comments, one further VP for the purpose of photomontage was added for the Central Portion.

Assessment Methodologies	Assessment Assumptions	Limitation of Assessment Methodologies / Assumptions	Prior Agreements with EPD / Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
		CKR layout,. design of associated structures and location of noise barriers information. Changes to any of these may also affect the evaluated impacts of the Project.		
Cultural Heritage Impact (Terrestrial & Marine Archaeology)				
Evaluation and assessment of potential impacts to cultural heritage resources was conducted in accordance with the Study Brief No. ESB-156/2006. The study adhered to the requirements as listed in Annexes 10 and 19 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) and also the relevant guidelines for Cultural Heritage Impact Assessment issued by the AMO for Terrestrial Archaeological Impact Assessment and Marine Archaeological Investigation.	The assessment for terrestrial archaeology was based on the existing information available from previous investigations in the study area. For the Marine Archaeological Investigation additional data was acquired through marine geophysical survey and diver underwater survey.	The terrestrial archaeological potential of the study area was determined based on the findings of previous studies and have been adequately examined in previous investigations. For the marine archaeological investigation the methodology provided sufficient data to make an accurate assessment.	Not applicable	Not applicable
Cultural Heritage Impact (Built Heritage)				
Evaluation and assessment of potential impacts to cultural heritage resources was conducted in accordance with the Study Brief No. ESB-156/2006. The study adhered to	The assessment was based on the existing information available from previous investigations in the study area and supplemented through a built heritage survey.	The underpinning scheme for the new wing of the Yau Ma Tei Police Station has not been finalised and the proposal will be submitted as part of the detailed design.	Not applicable	Not applicable

Assessment Methodologies	Assessment Assumptions	Limitation of Assessment Methodologies / Assumptions	Prior Agreements with EPD / Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
the requirements as listed in Annexes 10 and 19 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) and also the relevant guidelines for Cultural Heritage Impact Assessment issued by the AMO for Built Heritage Impact Assessment.		The acceptable vibration limits for the Air Raid Precaution Tunnel K1 has not been determined, a condition survey will be conducted to determine appropriate vibration limits. If any of the following; the Ma Tau Kok Public Pier, the Kowloon City Ferry Pier, the Kowloon City Vehicular Ferry Pier and the Kowloon Permanent Pier No. 70 are granted Grade 1, Grade 2 or Grade 3 status, the mitigation will be revised to adhere to the requirements for protective measures for Graded Historic Buildings.		