Appendix 15.1
Key Assessment Assumptions and Methodologies

Appendix 15.1 Key Assessment Assumptions and Methodologies

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
Air Quality Impact				
Construction Phase Dusty construction activities of the Project including seawall and filling works during reclamation, material handling and tunnel works of CWB Tunnel would pose potential dust impacts. Quantitative assessment was conducted for determination of construction dust impact due to the Project. Fugitive Dust Model (FDM) (1993 version) was adopted to assess potential dust impact from the construction works. The 1-hour and 24-hour average TSP concentrations at representative discrete ASRs in the vicinity of the construction sites were predicted. The assessment levels for ASRs were at 1.5m and 5m 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.	**Construction Phase** Dusty construction activities and programme were based on information provided by the Engineer. Six scenarios which represent the worst case scenarios over the whole construction period of WDII Project were identified for assessment. As a conservative assessment approach, heavy construction emission rate was adopted for all types of construction activities in the assessment. Confirmed with the Project Proponent, 50% of work area would be active during construction and the working period at the construction site would be 10 hours (08:00-18:00). Theses two assumptions have been considered in the assessment. Wind erosion of open sites (i.e. 50% of work area) was assumed to take place over the whole day in the model. The requirement of the Air Pollution Control (Construction Dust) Regulation such as watering with complete coverage of active construction area four times a day was considered in the assessment and 75% reduction of dust emission was assumed in the model with the implementation of this dust suppression measure in accordance with USEPA guideline.	**Construction Phase** It is difficult to obtain the detail information for estimation of emission rates of different dusty construction activities, heavy construction emission rate which is higher emission rate was therefore adopted in the model run. The predicted dust concentrations at the ASRs may be higher than the actual situation. **Operation Phase** *Open Road Vehicle Emission Impact* The highest traffic forecast year and the highest vehicle emission factor year were adopted in the model run. A very worst case scenario was considered in the assessment and may overestimate the vehicle emission impact (open road). *Air Quality inside CWB Tunnel / deckover* *There is no any structure wall between the* Convention Avenue and Expo Drive Central. The air quality under the planned deckover would be mixed but not fully mixed due to large separate distance between the roads. As a worst case scenario, three separate tunnels were assumed in the model run. However, the predicted air quality under the proposed deckover may be overestimated.	3.4.5.3 (iii) (b) 3.4.5.3 (v) (b) 3.4.5.3 (v) (c) 3.4.5.3 (v) (d)	Paper for odour assessment methodology and EMFAC-HK model for determining the fleet average emission factors have been submitted to EPD for agreement. Acceptance memo was obtained from EPD (See Annex 15.1) Assumptions for air emissions from *CWB Tunnel / deckover* were provided by the tunnel ventilation design engineer. (See Annex 15.1) Acceptance on the traffic forecast (including traffic mix and volume) was obtained from Transport

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
Operation Phase *Open Road Vehicle Emission Impact* Vehicular Emission Impact (open road sections) from the Project including open road emission and portal emissions from existing CHT, planned deckovers along Road P2, existing deckover over Expo Drive, proposed deckover for New Atrium Link was assessed. HK-EMFAC Model was adopted to calculate the fleet average emission factors. Portal emissions were modelled in accordance with "Permanent International Association of Road Congress Report (PIAR, 1991). The cumulative air pollutant concentrations at ASRs were predicted using CALINE4 model and ISCST3 model. The cumulative pollutant concentrations at the ASRs at each specific wind direction were calculated by summing the results from the two models. The highest pollutant concentrations at the ASRs amongst the 360 wind directions were identified as the	Worst case meteorological data was adopted in the model run: • Wind speed: 1 m/s • Wind direction: 360 wind direction • Stability class: D (daytime) & F (night time) • Surface roughness: 1m • Mixing height: 500 m Background TSP concentration, based on latest five years average monitoring data from EPD Central/Western monitoring station, was adopted as an indication of the future TSP background concentration. As the monitoring data in year 2001 and 2002 were below their respective minimum data requirement of 66% for number of data within the period, therefore, the annual average concentration of TSP was calculated based on the data in Year 2000 and 2003 - 2006. **Operation Phase** *Open Road Vehicle Emission Impact* Traffic forecast Year 2031, the peak hour traffic flow within 15 years after operation of the Project, was adopted for assessment; the highest vehicle emission factors for different vehicle classes, Year 2016, were used in the model run. Meteorological conditions assumed in the CALINE4 model: • Wind speed : 1 m s^{-1} • Wind direction: 360 wind directions	*Odour Impact* It is difficult to obtain a quantitative value of odour reduction efficiency in future scenario for modelling run as it cannot ensure that no expedient connection to CBTS after rectification. A conservative assumption for odour removal efficiency was therefore used in the assessment for future scenario.		Department (See Annex 15.6)

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
worst predicted cumulative pollutant concentrations. The conversion factor from NO_x to NO_2 for all roads and portal emissions of tunnels and ventilation building was based on the Ambient Ratio Method (assuming 20% of NO_x to be NO_2) which is one acceptable approach as stipulated in EPD "Guidelines on Choice of Models and Model Parameters". Secondary air quality impacts arising from implementation of roadside noise barriers/semi-enclosures were also incorporated in the air quality model. *Air Quality inside CWB Tunnel / deckover* The ventilation system for CWB Tunnel would fulfil EPD "*Practice Note on Control of Air Pollution in Vehicle Tunnels*" and the air quality inside the tunnel should achieve the EPD recommended standard of 1ppm NO_2 concentration. The air quality under the deckover for planned HKCEC Atrium Link was calculated based on the empirical formulas of fluid	• Resolution: 1° • Wind variability : 24° • Stability class: D • Surface roughness : 1 m • Mixing height : 500 m A conversion factor of 0.4 was used to convert the 1-hour average concentrations to 24-hour average concentrations with reference to the "Screening Procedures for Estimating the Air Quality Impact of Stationary Source (EPA-454/R-92-019)." Meteorological conditions assumed in the ISCST3 model: • Wind speed : 1 m s^{-1} • Wind direction : 360 wind directions • Resolution : 1° • Stability class: D • Mixing height: 500 m • Emission temperature : 7° above ambient Background NO_2 and RSP concentration, based on latest five years average monitoring data from EPD Central/Western monitoring station, was adopted as an indication of the future NO_2 and RSP background concentration. As the monitoring data in year 2001 and 2002 were below their respective minimum data requirement of 66% for number of data within the period, therefore, the annual average concentration of NO_2 and TSP was calculated based on the data in Year 2000 and 2003 - 2006. *Air Quality inside CWB Tunnel / deckover* A conversion factor of 12.5% including tailpipe NO_2			

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
dynamics. Two scenarios were considered for the deckover, i.e. normal traffic flow condition and congested traffic flow condition. *Odour Impact* The potential odour emission source locations at CBTS and odour emission strength were determined based on the findings of Year 2006 and 2007 odour surveys including odour patrol, air sampling & olfactometry analysis. Odour impact from CBTS under existing scenario and future scenario were assessed using ISCST3 model. The predicted 1-hour average concentrations of odour at the receivers were converted to 5-second averaging time in accordance with Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales" published by the Department of Environment and Conservation, New South Wales, Australia (NSW Approved Method).	emission (taken as 7.5% of NO_x) plus 5% of NO_2/NOx for tunnel air recommended in PIARC for air expelled from the tunnel was taken in this assessment as the inside tunnel conversion factor. It was assumed that under normal traffic flow condition, the vehicles are at a speed of 50 kph, whereas under congested mode, the separation between vehicles is assumed to be 1 m. Under the proposed deckover for planned HKCEC Atrium Link, Convention Avenue and Expo Drive Central are located far away from the other four road sections (Road P2 Eastbound & Westbound and CWB Eastbound & Westbound). Good mixing of air pollutants from Road P2 and CWB under the deckover was assumed. No mixing of vehicular emissions from Convention Avenue and Expo Drive Central was assumed and these two road sections were considered as separate tunnel sections in the assessment. In total, three separated tunnel sections under the deckover were assumed for the in-tunnel air quality model run. *Odour Impact* The future odour emission strength from CBTS was assumed to be 30% of existing odour emission strength. Hourly meteorological data for the year 2005 (including wind speed, wind direction, air temperature, Pasquill stability class and mixing height) of the Hong Kong Observatory Weather Station were employed for the model run. The study area is in an urban area, "Urban" model was adopted in the model.			

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
Noise Impact				
Construction Noise				
To assess the potential noise impacts due to the Project, the noise sources are identified and the impacts have been quantified. The assessment methodology follows Technical Memorandum on Noise From Construction Work other than Percussive Piling.	Construction noise impact assessment has been carried out on a monthly basis and assessed on existing NSRs from the 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 have been excluded from this assessment. In accordance with the EIAO, the methodology outlined in the GW-TM has been used for this assessment of construction noise (excluding percussive piling). Sound power level (SWL) of the equipment was taken from Table 3 of TM and BS5228 was referenced for those without information provided. It was assumed that all PME items required for a particular construction activity would be located at the notional or probable source position of the segment where such activity is to be performed. The assessment is based on the cumulative SWL of PME likely to be used for each location, taking into account the 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	The prediction of construction noise impact was based on the methodology described in the GW-TM under the NCO. There would be 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.	3.4.6.2 (i) 3.4.6.2 (iii) (b) 3.4.6.2 (iv) (a) 3.3.6.2 (v) (d) (Not applicable)	Acceptance memo was obtained from EPD (see Annex 15.2) It was stated in EIA Report that the construction plant inventory has been vetted and confirmed by the Engineer as being practicable in completing the works within scheduled timeframe. No tunnel boring machine is proposed, agreement on the criteria and methodology is not required.

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
	tasks. A positive 3 dB(A) façade correction was added to the predicted noise levels in order to account for the facade effect at each NSR. The boundary walls around HKAPA Open Arena are assumed as noise barriers and a 5 dB(A) reduction of the predicted noise levels at the NSR is expected due to the shielding effect Appropriate on-time percentage for PMEs were reasonably assumed, such as poker vibrator, crane and excavator. The CRIII project has already commenced and is scheduled to be completed in September 2012. Besides, the Hong Kong Convention and Exhibition Centre, Atrium Link Extension (HKCEC ALE) project is scheduled to commence in May 2006 and to be completed in March 2009, according to the *EIA Report for HKCEC ALE* (March 2006). Therefore, some construction tasks of the CRIII and HKCEC ALE projects will be carried out within the same construction period of the Project. The construction programme for the Project takes into account the likelihood that the contractor will, if permitted, undertake dredging and seawall construction works over a 16-hour working day (0700 to 2300 hours) at the area of PCWA, Wan Chai Reclamation and HKCEC Reclamation. This is in order to maintain his required work rates to meet the tight programme with some allowance for plant downtime, variability in fill supply rates, etc. The longer working hours will also ensure that allowance can be made to cater for possible changes in dredging and filling rates due to deterioration			

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
	of water quality. Land-based construction activities, on the other hand, will generally be carried out over a 10-hour working day (0800 to 1800 hours). However, where necessary, for example to minimise traffic impacts due to road diversion works, diversion of salt water intake back to existing system in WSD's salt water pumping station and construction of drainage culverts in the existing built up hinterland, construction works during restricted hours may be required.			
Road Traffic Noise				
The noise impact assessment for the Project follows Annex 5 and Annex 13 of the EIAO-TM. Traffic noise was predicted using the methodology provided in the UK Department of Transport Calculation of Road Traffic Noise (CRTN) 1988. The assessment was based on projected peak hour flows for the worst year within 15 years after opening of the road.	The roads proposed under the Project are scheduled to open in 2016. Therefore, the traffic data for year 2031, which was agreed by Transport Department, was adopted for the assessment. Traffic speeds for the proposed Trunk Road system adopted in the noise model are as follows: • Trunk Road (Open Section and Underneath Landscape Deck) – 70 km/hour • Trunk Road in Tunnel – 80 km/hour • Road P2 – 50 km/hour • Slip Roads – 50 km/hour • Operation Raods – 50 km/hour For the proposed project, low noise road surface has been assumed for the Trunk Road (except tunnel section and beneath the landscaped deck at the eastern portal area) with speed limit of 70 km/hour. In view of the visual quality, south-facing panel of the landscaped deck at the eastern portal area would be installed with transparent material.	There would be some limitations of methodology such as the accuracy of the predictive base data for future (e.g. traffic flow forecast). Besides, traffic noise levels are predicted based on free flow condition. Traffic congestion and hence reduced traffic speed are not taken into account in the noise model. Quantitative uncertainties in the 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. For the assessment of road traffic noise impact, peak hourly traffic flows representing the worst case scenario were adopted.	3.4.6.2 (i) 3.4.6.2 (iii) (b) 3.4.6.2 (iv) (a) 3.4.6.2 (vi) (a1)	Acceptance memo was obtained from EPD (see Annex 15.2) Transport Department's agreement on use of 2031 traffic data for this EIA is presented in Annex 15.6 Sample calculation and input parameters for 10 representative assessment points have been included in EIA report for EPD agreement.

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
	Based on the best available information from Planning Department, a notional point representing a 53-storey residential building at CDA(1) site has been assumed on the demarcation line as indicated on the relevant OZP, while another notional point representing a 34-storey residential building at CDA site has been assumed at 50m setback from the IEC for traffic noise impact assessment.			A CD-ROM containing information on road segment, noise sensitive receiver and recommended noise mitigation measures has been submitted together with EIA Report for EPD agreement.
Ventilation Noise				
The noise impact assessment for the Project follows Annex 5 and Annex 13 of the EIAO-TM.	As the worst case scenario, the assessment has been carried out for the congestion mode when the maximum number of ventilation fans would be in operation. According to information provided by the Ventilation Engineer, 7 duty plus 2 standby ventilation fans are proposed for EVB, while 11 duty plus 2 standby ventilation fans are proposed for CVB. All the ventilation fans installed in each ventilation building will be provided with silencers, and sea-facing louvers will be provided for EVB. A positive 3 dB(A) tonality correction was considered in the calculation.	Fans and damper arrangement at each ventilation building may be refined in detailed design. The worst case condition that all duty exhaust fans are operated at each ventilation building was adopted for assessment. Screening corrections from other buildings / structures and directivity were excluded in the assessment.	3.4.6.2 (vi) (b2)	All noise matters addressed in EIA report are included in Table 1A of Annex 5 of the TM.
PTI Noise				
The noise impact assessment for the Project follows Annex 5 and Annex 13 of the EIAO-TM.	As the layout and operational details of the re-provisioned PTI is not available at the time of carrying out this EIA, a qualitative approach has been adopted to	The noise impact was qualitatively addressed based on the condition that the operational scale of the re-provisioned PTI would be similar to that of the existing	3.4.6.2 (vi) (b2)	All noise matters addressed in EIA report are

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
	address the noise nuisance arising from the operation of the PTI. Screening effect of other buildings/structures was not considered in qualitative assessment.	Wan Chai North PTI. The re-provisioned PTI will be subject to the detailed design and it will be implemented with the construction of the Exhibition Station for Northern Island Line/Shatin Central Link. The noise impact arising from the PTI will be further assessed in the relevant EIA study for NIL/SCL.		included in Table 1A of Annex 5 of the TM.
Helicopter Noise				
The noise impact assessment for the Project follows Annex 5 and Annex 13 of the EIAO-TM.	The operation parameters for the proposed helipad, which was adopted in the previously approved *EIA Report on Wan Chai Development Phase II*, were adopted. It will be used to serve VIPs as well as for emergency services and, therefore, will be used infrequently. Routine tasking or regular flights are not expected. Only the new types of helicopter, Eurocopter AS-332 L2 (Super Puma) and Eurocopter EC 155B, will operate at the proposed helipad. There will be no designated approach route and take-off route for the proposed helipad. The helicopters will generally fly along the coastline to approach the landing pad. A possible commercial helicopter service has been addressed. CEDD has separately commissioned a detailed helipad assessment to conduct noise impact assessment.	The noise assessment was carried out based on the best available information. With reference to the *Final EIA Study for Helipad at Yung Shue Wan, Lamma Island* (approved in January 2006), the measured Lmax for Eurocopter AS-332 L2 (Super Puma) and Eurocopter EC 155B was adopted for assessment. The assessment was undertaken based on the noise level associated with an AS 332 L2 helicopter as a conservative approach. At this stage, it would be hard to make the assumptions (e.g. frequency of flights, type of helicopters, etc.) of commercial helicopter services for noise assessment. However, in view of the considerable buffer distance between the NSRs and the helipad (i.e. about 500m), adverse helicopter noise impact would not be anticipated.	3.4.6.2 (vi) (c1) 3.4.6.2 (vi) (c2)	GFS's letter regarding the latest operation parameters is presented in Annex 15.2 Noise matters addressed in EIA report are included in Table 1A of Annex 5 of the TM.

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
Water Quality				
The water quality impact assessment for the Project follows 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 quantified using mathematical model. Appropriate mitigation measures have been recommended to minimize any adverse water quality impacts.	The extent of the reclamation as presented in the EIA has already been minimized to satisfy the Government's requirement and the community's aspiration. The maximum dredging rates and the reclamation phasing assumed in the EIA were developed based on both engineering and environmental considerations.	Quantitative uncertainties in the modelling need to be considered when making an evaluation of the modelling predictions. The worst case conditions were adopted as model input to indicate the maximum extent of the potential environmental impacts. The input data tended to be conservative to provide a margin of tolerance. The maximum dredging rates were applied to the model continuously during the entire dredging period. In reality, the peak rates would not occur continuously and the average rates should be smaller. The following approach has been adopted to enhance the model performance: • The computational grid of the detailed Victoria Harbour (VH) Model was refined along the coastline of Wan Chai, Causeway Bay and North Point to represent the coastal features under different interim construction and operational scenarios; • Use of a fully calibrated and validated regional Update Model to provide boundary and initial conditions to the detailed VH Model; • The performance of the detailed VH Model was extensively calibrated and validated with reference to the field data to ensure that reliable predictions of hydrodynamics are provided for the Study area. • The simulation comprises a sufficient spin up period so that the initial conditions do not affect the results. • The level of uncertainties on the water quality predictions inside the temporary embayment areas would also depend on the accuracy of the pollution loading input into the embayment areas. The storm pollution loading discharged into the embayment areas along the coastline of Wan Chai and Causeway Bay including the Causeway Bay typhoon shelter was derived from detailed field investigation to provide	3.4.7.6 (g) 3.4.7.6 (h) 3.4.7.7 (f) Appendix C	Acceptance memo was obtained from EPD (see Annex 15.3)

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
		accurate information for model input. The loading input to the water quality model under various future assessment scenarios has also taken into account the future development and population growth in order to provide conservative predictions.		
Waste Management				
The method for assessing potential waste management impacts for the Project follow those presented in Annex 7 and Annex 15 of the EIAO-TM. A marine site investigation was completed to determine the level of contamination in the sediments within the proposed dredging area. The chemical and biological laboratory test methods were carried out in accordance with ETWB TCW No. 34/2002 Management of Dredge/ Excavated Sediment. 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 contained in the Construction and Demolition Material Management Plan (C&DMMP) prepared for the Project.	The waste quantities estimated under this EIA are subject to further detailed site survey and detailed design as part of and at the time of the detailed design and construction stage. However, further refinement of the estimated waste quantities would not affect the assessment conclusion provided that all the recommended mitigation measures are implemented properly.	3.4.9.2 (iii)	Acceptance memo was obtained from EPD (see Annex 15.4)

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
Land Contamination				
The method for assessing potential land contamination impacts for the Project follow the following: 1. EIA Study Brief No. ESB - 153/2006 2. Section 3.1 and 3.2 in Annex 19 of the EIAO-TM. 3. ProPECC PN3/94 "*Contaminated Land Assessment and Remediation*" 4. Guidance Notes for Investigation and Remediation of Contaminated Sites of: Petrol Filling Stations, Boatyards, and Car Repair / Dismantling Workshops.	The findings of the assessment were evaluated based on previous EIA Study for the Wan Chai Development Phase II Comprehensive Feasibility Study in 2001, site reconnaissance on 8 August and 13 December 2006 and site investigation works within A King Marine in February 2007.	The contaminated soil extent and quantity at A King Marine were estimated based on the results of the site investigation carried out in February 2007. Limitation to the estimation would exist due to unknown contamination levels between sampling locations and the actual contamination may deviate from the estimated volume. The actual extent of soil contamination would be subject to the confirmation testing and site specific conditions (eg encountering of boulders).	3.4.10.4	Agreement from EPD on Contamination Assessment Plan (CAP) (see Annex 15.5)
Marine Ecology				
Evaluation and assessment of potential impact on ecological resources was conducted in accordance with the criteria and guidelines specified in Annex 8 and Annex 16, respectively, of the EIAO-TM.	The assessment and evaluation of ecological impact on marine habitats was undertaken based on the results of literature review, ecological field survey and water quality impact assessment results.	Limitations and uncertainties of the water quality impact assessment have been stated under the Water Quality Impact. Results of ecological surveys (e.g. benthos sampling, intertidal survey, spot-check dive and REA) conducted for previous relevant studies and for this Project are based on sampling / survey at several representative locations / transects in and within the vicinity of the assessment area. The exact number of coral colonies to be directly affected by proposed reclamation works is subjected to further detailed pre-translocation coral survey at the time of the detailed design phase of this Project. However, further refinement of the exact number of coral colonies to be	Not required	Not Applicable

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
		directly impacted would not affect the assessment conclusion in this EIA, provided that all the recommended mitigation measures are implemented properly.		
Landscape and Visual Impact Assessment				
The assessment of landscape impacts has involved the following procedures: • Identification of the baseline landscape resources found within the study area. • Assessment of the degree of sensitivity to change of the landscape resources. • Identification of potential sources of landscape impacts. • Identification of the magnitude of landscape impacts. • Identification of potential landscape mitigation measures. • Predicted significance of landscape impacts before and after the implementation of the mitigation measures. The assessment of visual impacts has involved the followings: • Identification of Zones of Visual Influence (ZVIs) during the construction and operational phase of the project. • Identification of Visual sensitive receivers (VSRs) within the	N/A	N/A	Not required	Not Applicable

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD/Other Authorities	
			EIA Study Brief Clause Reference	Relevant Documentation
Zone of Visual Influence (ZVIs) at construction and operational stages. • Assessment of the degree of sensitivity to change of the VSRs. • Identification of relative numbers of VSRs. • Identification of potential sources of visual impacts. • Assessment of the potential magnitude of visual impacts. • Identification of potential visual mitigation measures. • Prediction of the significance of visual impacts before and after the implementation of the mitigation measures. • Prediction of Acceptability of Impacts.				
Cultural Heritage Impact				
Evaluation and assessment of potential impact on cultural heritage was conducted in accordance with the requirements in Section 3.4.13 of the EIA Study Brief No. ESB-153/2006, relevant criteria and guidelines specified in Annex 10 and Annex 19, respectively, of the EIAO-TM, and Marine Archaeological Investigation Guideline issued by AMO.	The assessment and evaluation of cultural heritage impact was undertaken based on the results of literature review and the marine archaeological investigation results.	The survey area in the North Point end was under the Island Eastern Corridor Bridge and the surveying vessel was unable to get in safely. In addition, the reception of the positioning data was restricted under the bridge and so no survey lines was under the bridge. It is assumed that the seabed in the immediate vicinity of the bridge would have been extensively disturbed during construction of the bridge.	Not required	Not Applicable

Annex 15.1

Prior Agreement on Air Impact Assessment From EPD

②

土木工程拓展署
CEDD Civil Engineering and Development Department

港島及離島拓展處
Hong Kong Island and Islands Development Office

Web site 網址 : http://www.cedd.gov.hk
E-mail 電子郵件 : cklam@cedd.gov.hk
Telephone 電話 : (852) 2231 4415
Facsimile 傳真 : (852) 2577 5040
Our ref 本署檔號 : HKI 2/4/50EI
Your ref 來函檔號 : PMC:CAKM:ccht:97103/10.6-0777

香港北角渣華道333號
北角政府合署13樓

13/F, North Point Government Offices,
333 Java Road,
North Point, Hong Kong

Urgent by fax (Fax No. 2691 2649)

2 August 2007

Maunsell Consultants Asia Ltd
8/F Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road
Shatin, NT
(Attn: Mr Peter Cheek)

Dear Sirs,

SA1 to Agreement No. CE 54/2001 (CE)
WDII – Planning and Engineering Review

Wan Chai Development Phase II and Central – Wan Chai Bypass – EIA Study
Pollutants emitted from Tunnels

I refer to your letter dated 26.7.2007 and have no comment on the assumptions on the amount and the types/kinds of pollutants emitted from the CWB tunnel except the following:

(a) The figures in Tables 1 and 2 (for EVB) should represent those emissions at the vent shaft at the breakwater and originated from the EVB location but not at the location of the building itself. As such, a note should be added in the tables to make it clearly.

Yours faithfully,

(signed)

(C K LAM)
for Project Manager (Hong Kong Island and Islands)
Civil Engineering and Development Department

c.c. CHE/MW2-1, HyD (Attn: Mr CY WONG) Fax No. 2714 5289

HKI&I Dev. O
- 3 AUG 2007
DESPATCHED

Portal and Ventilation Building Emissions

1. The fresh air requirements for the CWB tunnel are based on year 2031 traffic data by adopting the methodology as recommended in the "Technical Committee Report, by the Permanent International Association of Road Congress" (PIARC - 1991, 1995). The predicted total pollutant emission rates are then calculated based on a NO_2/NO_x ratio of 20% for inside tunnel vitiated air. These figures are used for assessing the environmental impacts.

2. Three ventilation buildings have been proposed for Trunk Road to discharge the polluted tunnel air:

   - West Ventilation Building (WVB): for extracting polluted tunnel air from the Trunk Road mainline
   - Central Ventilation Building (CVB): for extracting polluted tunnel air from the Trunk Road mainline, Slip Road 1 and Slip Road 3
   - East Ventilation Building (EVB): for extracting polluted tunnel air from the Trunk Road mainline.

3. The location of the WVB is outside of the study area, therefore, only emissions from the CVB and EVB were considered in the assessment. The portal and ventilation building emissions are summarised in **Table 1**.

Table 1 Portal and Ventilation Building Emissions

Type	**Emission Rate (g/s)**		
	NO_2 *	**CO**	**RSP**
Portal Emission			
Trunk Road Eastbound	0	0	0
Slip Road 1	0	0	0
Slip Road 3	0	0	0
Slip Road 2	N/A (merged with Trunk Road eastbound)		
Slip Road 8	N/A (merged with Trunk Road westbound		

Type	Emission Rate (g/s)		
	NO_2 *	CO	RSP
Ventilation Building			
East Ventilation Building** - Trunk Road Eastbound	0.4000	5.6124	1.129 E-01#
Central Ventilation Building			
- Trunk Road Westbound	0.3861	4.9734	1.189 E-01
- Trunk Road Eastbound	0.3540	4.9678	1.222 E-01
- Slip Road 1	0.0216	0.1075	2.444 E-02
- Slip Road 3	0.0314	0.2543	3.471 E-02

Note: * Based on 20% NO_2/NO_x conversion in ambient condition.

Electrostatic precipitator will be installed, dust removal efficiency is 80%. After reduction, the RSP emission from EVB will be 2.258 E-02 g/s.

**Emission from the East Ventilation Building will be discharged from a vent shaft extended from the East Ventilation Building to the breakwater of Causeway Bay Typhoon Shelter

4. The preliminary design of the ventilation buildings (including minimum mid-discharge heights, exhaust directions, exhaust area of ventilation buildings and exit velocity) is summarised in **Table 2**. For a worst case scenario in the air quality assessment, the minimum height of stack was used in modelling.

Table 2 Design of Ventilation Buildings

	Cross-sectional area of stack (m^2)	Exit velocity ($m\ s^{-1}$)	Minimum mid-discharge height (meter above ground)	Exhaust direction
East Ventilation Building (EVB) - Vent shaft at the breakwater	94	8	16.25	Inclined 45 degree upward
Central Ventilation Building (CVB)	219	8	17.5	vertical

MAUNSELL | AECOM

Maunsell Consultants Asia Ltd
8/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong
茂盛(亞洲)工程顧問有限公司
香港新界沙田鄉事會路 138 號新城市中央廣場第 2 座 8 樓
T +852 2605 6262 F +852 2691 2649 www.maunsell.aecom.com

Your Ref :
Our Ref : PMC:CAKM:ccht:97103/10.6-0777

By Fax (No. 2577 5040) and Post

PM/HKI&I
Civil Engineering and Development Department
13/F North Point Government Offices
333 Java Road
North Point
Hong Kong

Attn: Mr. S.K. Lam

26 July 2007

Dear Sir,

SA1 to Agreement No. CE54/2001(CE)
Wan Chai Development Phase II - Planning and Engineering Review

Wan Chai Development Phase II and Central-Wan Chai Bypass – EIA Study

With reference to Clause 3.4.5.3(v)(c) of the Environmental Impact Assessment Study Brief (No ESB-153/2006) for the Wan Chai Development Phase II and Central-Wan Chai Bypass (WDII & CWB) projects, which says that "*... When assessing air quality impact due to emissions from tunnels/full enclosures, the Applicant shall ensure prior agreement with relevant tunnel ventilation design engineer over the amount and the types/kinds of pollutants emitted from these tunnel/full enclosures; and such assumptions shall be clearly and properly documented in the EIA report...*", we enclose herewith the assumptions on the amount and the types/kinds of pollutants emitted from the CWB tunnel for the captioned EIA study for your agreement.

Your response to this submission by 1 August 2007 would be most appreciated. Should you have any queries in this regard, please contact our Ms. Carmen Au or the undersigned.

Yours faithfully,

Peter Cheek
Technical Director

cc MW/HyD – Attn: Mr. Raymond S.K. Yip – w/e (By Fax: 2714 5289)
ENSR – Attn: Mr. Freeman Cheung – w/e (By Fax: 2691 2649)

Portal and Ventilation Building Emissions

1. The fresh air requirements for the CWB tunnel are based on year 2031 traffic data by adopting the methodology as recommended in the "Technical Committee Report, by the Permanent International Association of Road Congress" (PIARC - 1991, 1995). The predicted total pollutant emission rates are then calculated based on a NO_2/NO_x ratio of 20% for inside tunnel vitiated air. These figures are used for assessing the environmental impacts.

2. Three ventilation buildings have been proposed for Trunk Road to discharge the polluted tunnel air:
   - West Ventilation Building (WVB): for extracting polluted tunnel air from the Trunk Road mainline
   - Central Ventilation Building (CVB): for extracting polluted tunnel air from the Trunk Road mainline, Slip Road 1 and Slip Road 3
   - East Ventilation Building (EVB): for extracting polluted tunnel air from the Trunk Road mainline.

3. The location of the WVB is outside of the study area, therefore, only emissions from the CVB and EVB were considered in the assessment. The portal and ventilation building emissions are summarised in **Table 1**.

Table 1 Portal and Ventilation Building Emissions

Type	Emission Rate (g/s)		
	NO_2 *	CO	RSP
Portal Emission			
Trunk Road Eastbound	0	0	0
Slip Road 1	0	0	0
Slip Road 3	0	0	0
Slip Road 2	N/A (merged with Trunk Road eastbound)		
Slip Road 8	N/A (merged with Trunk Road westbound		

Type	Emission Rate (g/s)		
	NO_2 *	CO	RSP
Ventilation Building			
East Ventilation Building - Trunk Road Eastbound	0.4000	5.6124	1.129 E-01#
Central Ventilation Building			
- Trunk Road Westbound	0.3861	4.9734	1.189 E-01
- Trunk Road Eastbound	0.3540	4.9678	1.222 E-01
- Slip Road 1	0.0216	0.1075	2.444 E-02
- Slip Road 3	0.0314	0.2543	3.471 E-02

Note: * Based on 20% NO_2/NO_x conversion in ambient condition.

Electrostatic precipitator will be installed, dust removal efficiency is 80%. After reduction, the RSP emission from EVB will be 2.258 E-02 g/s.

4. The preliminary design of the ventilation buildings (including minimum mid-discharge heights, exhaust directions, exhaust area of ventilation buildings and exit velocity) is summarised in **Table 2**. For a worst case scenario in the air quality assessment, the minimum height of stack was used in modelling.

Table 2 Design of Ventilation Buildings

	Cross-sectional area of stack (m^2)	Exit velocity ($m\ s^{-1}$)	Minimum mid-discharge height (meter above ground)	Exhaust direction
East Ventilation Building (EVB)	94	8	16.25	Inclined 45 degree upward
Central Ventilation Building (CVB)	219	8	17.5	vertical

+ 852 2572 4490

Urgent by Fax

MEMO

From	Director of Environmental Protection	To	Project Manager/HKI&I, CEDD
Ref.	in EP2/H4/S3/15 Pt.2	(Attn.:	Mr. C. K. Lam)
Tel. No.	2835 1155	Your Ref.	in HKI 2/4/50 EI
Fax. No.	2591 0558	dated	29.10.07 Fax. No. 25775040
Date	29 October 2007	Total Pages	2

Environmental Impact Assessment Ordinance (EIAO)
Project Title: Wan Chai Development Phase II and Central-Wan Chai Bypass
EIA Study Brief No. 153/2006
Methodology of Odour Assessment

I refer to your memo under reference on the above subject and a letter from your consultant, Maunsell (ref: PMC:CAKM:ccht:97103/10.6-0830) dated 26 October 2007 submitting the revised odour assessment methodology paper for our agreement under Section 3.4.5.3(v)(d) of the EIA Study Brief No. ESB-153/2006.

2. Please be informed that after taking into the advice from our air assessment section, the submission is considered as basically acceptable for the Project subject to some minor textual amendments are stated in Annex 1.

3. Given the above, agreements are hereby given under the following requirement of the captioned EIA Study Brief for you to carry out the odour assessment as proposed and explained in the submission subject to some minor textual amendments in Annex 1:

Reference in the Study Brief Stipulating the Requirement	Description
Section 3.4.5.3(v)(d)	Methodology of Odour Assessment

4. Nevertheless, CEDD and the consultant should note that according to Section 3.4 of the EIAO-Technical Memorandum, the assessment shall be based on the best available information at the time of the assessment. Above agreement is only for the concerned requirement under the EIA Study Brief and shall not prejudice the EPD's final decision on approval of the EIA report to be submitted under the EIAO. If there is any significant change in circumstances, project design/details or assessment methodology/assumptions, etc. CEDD and the consultant should review the situations; carry out necessary updating/revisions; and seek our advice whether further agreements under the EIA Study Brief are necessary.

5. You are also reminded that the requirements on documentations of key assessment assumptions, limitations of assessment methodologies and related prior agreement(s) with the DEP as stipulated under Section 3.4.14 of the EIA Study Brief shall be followed.

(Victor YEUNG)
Senior Environmental Protection Officer
for Director of Environmental Protection

c.c.:
Maunsell (Attn: Mr. Peter Cheek Fax: 26912649
and Mr. Freeman Cheung) Fax: 28910305

c.c. internal: S(SA)5, E(MA)31

D:\EIAO_WDII CWB\CEDD 3.4.5.3vd Odour Methodology agree.doc

Annex 1

Odour Assessment Methodology Paper (October 2007)
Minor Textual Amendments

i) Section 4.4 - As P11 is not considered as an odour source, it should be deleted from the 2nd sentence.

ii) Section 5.26 - The last two sentence should read "*In other words, there would be a 0.1% probability that the actual peak concentration would be higher than those derived with the peak-to-mean ratios stated in the NSW Approved Method, which would be addressed under the Evaluation of the Residual Odour Impacts section.*"

- END -

MAUNSELL | AECOM

Maunsell Consultants Asia Ltd
8/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong
茂盛(亞洲)工程顧問有限公司
香港新界沙田鄉事會路 138 號新城市中央廣場第 2 座 8 樓
T +852 2605 6262 F +852 2691 2649 www.maunsell.aecom.com

Your Ref:
Our Ref: PMC:CAKM:ccht:97103/10.6-0830

FAXED 29/10/07 10:00am

Urgent by Fax & Hand (F: 2591 0558)

Environmental Protection Department
Metro Assessment Group
27/F, Southern Centre
130 Hennessy Road
Wan Chai, Hong Kong

Attn: Mr Raymond Lai

26 October 2007

Dear Sir,

SA1 to Agreement No. CE54/2001(CE)
Wan Chai Development Phase II – Planning and Engineering Review

Wan Chai Development Phase II and Central-Wan Chai Bypass – EIA Study

In accordance with Clause 3.4.5.3 (v) (d) of the EIA Study Brief No. ESB-153/2006 and your comments on the air quality assessment for the captioned EIA Study dated 26 October 2007, the odour assessment methodology have been revised. We are pleased to enclose herewith the revised odour assessment methodology for your agreement.

Should you need any further clarification or information, please feel free to contact Mr. Peter Lee at 3105 8297. Thank you for your kind attention.

Yours faithfully,

PP

Peter Cheek
Technical Director

Encl.

cc	PM/HKI&I, CEDD	Attn: Mr C K Lam	(F: 2577 5040)
	ENSR	Attn: Mr Freeman Cheung	(F: 2891 0305)

土木工程拓展署
Civil Engineering and
Development Department

Supplemental Agreement No. 1
to
Agreement No. CE 54/2001 (CE)

Wan Chai Development Phase II
Planning and Engineering Review

ODOUR ASSESSMENT METHODOLOGY PAPER

October 2007
Document Ref. 97103_EIA OMP1 (26Oct07)

MAUNSELL CONSULTANTS ASIA LTD

SA1 to Agreement No. CE54/2001 (CE)
WAN CHAI DEVELOPMENT PHASE II
PLANNING AND ENGINEERING REVIEW

Wan Chai Development Phase II and Central-Wan Chai Bypass – Environmental Impact Assessment

Odour Assessment Methodology Paper

CONTENTS

PAGE

List of Table

List of Figure

Annex

1. OBJECTIVE OF THE PAPER

1.1 In accordance with Section 3.4.5.3 (iii)(b) of EIA Study Brief ESB-153/2006 for the Project "Wan Chai Development Phase II and Central-Wan Bypass", the potential operational stage emission sources shall take into account the potential odour sources identified within the Project area and in the vicinity of and traversing the Project in particular for air sensitive uses which are proposed close to these sources.

1.2 Referring to Section 3.4.5.3 (v)(d) of the EIA Study Brief, the assumptions used for determining the reasonable worst case scenario in the odour impact assessment shall be clearly specified and justified. Assessment on the odour generation mechanism with a view to reasonably determine the existing and future emission strength of the odour sources shall also be included in the EIA report. The assessment methodology of the odour assessment in the EIA study should be agreed with the Environmental Protection Department (EPD).

1.3 During operational phase, this Project will not create any new odour source. However, odour nuisance associated with the Causeway Bay Typhoon Shelter is an existing environmental problem. In order to improve the environment, this Project will take the opportunities to mitigate the potential sources of odour nuisance within the Project area so as to alleviate this existing environmental problem as well as to provide an acceptable environment for the future land uses within the project area (including the open space with air sensitive use at the northern breakwater). Therefore, the assessment would be focused on the existing odour emission sources in the study area. In order to identify any existing potential odour impact, odour surveys including odour patrol and air sampling on potential odour source area for olfactometry analysis would be carried out.

1.4 This working paper is to present the details of the odour surveys and the assessment methodology/approach for any potential odour impacts identified within the project area on the future land use. The details of the surveys are described in Sections 2, 3 and 4. Section 5 presents the odour assessment methodology adopted in the EIA study.

2. ODOUR PATROL

Odour Patrol Procedure

2.1 Odour patrol means a simple judgment by observers patrolling and sniffing around to detect any odour at different hours. It is a screening process to identify the odour problems and the locations of odour sources in vicinity of the ex-PCWA and CBTS.

2.2 A two-day odour patrol exercise for the area in the vicinity of the CBTS and ex-PCWA was carried out by two observers who are qualified odour panel members from the Odour Laboratory of the Hong Kong Polytechnic University (HKPU). These observers were free from any respiratory diseases and do not normally work at or live in the area in the vicinity of CBTS and any typhoon shelter.

2.3 Each patrol day consisted of two patrol exercises in two different time periods (morning and afternoon/evening). At least one of the patrol exercises was conducted during the low tide period of the day so as to capture the worst conditions of any odour emissions from the ex-PCWA and CBTS.

2.4 The two observers patrolled slowly along the route and used their olfactory senses to detect any odour. The odour patrol route was along the coastline of CBTS and ex-PCWA as shown in **Figure 1**.

2.5 During the odour patrol, the observers recorded the following findings.

- the prevailing weather condition
- the wind direction & temperature
- location where odour is spotted
- possible source of odour
- perceived intensity of the odour
- duration of odour
- characteristics of the odour detected (e.g. unpleasant smell such as sewage or rotten-egg smell, etc).

2.6 The relevant meteorological data (e.g. ambient temperature, wind speed and direction, etc.) from the Hong Kong Observatory Meteorological Station during the survey period were also recorded for reference.

2.7 The perceived intensity was divided into 5 levels which are ranked in order as follows:

0	Not detected	No odour perceived or an odour so weak that it cannot be easily characterised or described
1	Slight	Identifiable odour, slight
2	Moderate	Identifiable odour, moderate
3	Strong	Identifiable odour, strong
4	Extreme	Severe odour

2.8 In conjunction with the odour patrol, on-site H_2S measurement was conducted at the locations where odour was detected during the odour patrol. The purpose of the measurement was to provide initial idea about the strength of odour emission in terms of H_2S concentration.

2.9 The H_2S concentration was measured by a portable H_2S analyzer (Jerome 631-X H_2S analyzer) at the odorous locations identified by the odour patrol members. The analyser is able to measure H_2S concentration in the range of 1 ppb to 50 ppm, and the sensitivity of the analyzer is 0.003 ppm H_2S. The analyzer operates within a temperature range of 0 to 40°C, at an air flow rate of 0.15 L/min. Grab air sample is drawn by built-in suction pump of the analyzer and passed across a gold film sensor. The electrical resistance of the gold film changes according to the change in mass of hydrogen sulphide in the gas sample.

2.10 In order to ensure that the analyzer is functioning properly, manual sensor regeneration and zero adjustment was performed before each set of the measurement. Verification of the H_2S analyzer was conducted prior to each set of measurement, with a known concentration of gaseous H_2S of 0.25 ppm, generated by the functional test module. The analyzer would be used for measurement if the verified data exhibited error of not more than 20% (i.e. fall outside the calibration range between 0.2 and 0.3 ppm H_2S). Calibration of the analyzer and functional test module was checked against with a sophisticated NIST traceable calibration system every year at the laboratory of the manufacturer.

Patrol Result (Year 2006)

2.11 Odour patrol was conducted on 11 and 14 September 2006. The two patrol exercises (morning and afternoon) on 11 September 2006 and morning patrol exercise on 14 September 2006 were conducted during the low tide of the day (less than 1m) to capture potential worst odour level of the day. Along the patrol route, seven representative locations were identified for detection of odour intensity. The identified locations are indicated in **Figure 1**. The mean odour intensities of these locations and the associated odour characteristics are summarized in **Table 2.1**.

Table 2.1 Summary of Odour Patrol Result (Year 2006)

Site ID	Location	Odour Intensity Level			Odour Character	Duration	On-site H_2S Conc. (ppb)	Possible Sources
		Min	Max	Mean				
1	CBTS near Victoria Park	0	0	0	n.d.	n.d.	3-5	n.d.
1a	CBTS near Fire Station	0-1	0-1	0.5	Rotten organics + sea wind blow	Intermittent	5	Sea water and refuse near the bank
2	CBTS near Victoria Park Road	0	0-1	0.06	Rotten organics + sea wind blow*	Intermittent	3-10	Sea water and refuse near the bank
2a	CBTS near Noonday Gun	0	1	0.25	Rotten organics + sea wind blow*	Intermittent	7-10	Sea water and refuse near the bank
3	CBTS near Police Officers' Club	0-1	2-3	1.44	Rotten organics/ decayed sediment + diesel smell	Persistent	7-15	Sea water and boats at CBTS
4	CBTS near carpark of Police Officers Club	0-1	1	0.75	Rotten organics/ decayed sediment + diesel smell	Persistent/ intermittent	4-7	Sea water and boats at CBTS
5	Ex-PCWA , GFS Temporary Helipad	0	0	0	n.d.	n.d.	3-6	n.d.

Note: n.d.: Not detected; * only detected on 11 September 2006.

2.12 The results indicated that negligible odour was detected at the shoreline of the ex-PCWA area and the CBTS except the area near Police Officers' Club (POC), CBTS near Noonday Gun (Site 2a) and CBTS near Victoria Park Road (Site 2). As identified by odour patrol members, the smell detected at the identified odour locations was dominantly from rotten organics/decay sediment at CBTS. The maximum measured H_2S concentration was found at Location 3, around 7 – 15 ppb on site, while a range of 3 – 10 ppb was measured at other locations during the odour patrol.

3. AIR SAMPLING AND OLFACTOMETRY ANALYSIS

Air Sampling Procedure

3.1 Based on the findings of the odour patrols, potential odour sources locations were identified. In order to determine the odour concentration of the emission sources and the ambient air in the vicinity of emission sources, air samples were collected for olfactometry analysis.

3.2 A follow-up air sampling exercise for potential odour source locations identified in the odour patrol and representative locations along the CBTS and the ex-PCWA was conducted on 15 September 2006. The sampling period was at the low tide period of the day. The sampling exercise was carried out in sunny day and the recorded ambient air temperature on the sampling day was 25 -29 °C.

3.3 For each sampling location, one air sample was collected above the water surface in the vicinity of shoreline to estimate the odour source emission rate and one ambient air sample was collected at the adjacent land to capture the ambient odour level near the odour source.. The locations of the sampling locations are shown in **Figure 1**.

3.4 The requirements and procedures of the sampling are described below:

(a) All air sampling for odour source emission rate estimation should be based on "hood" methods [(1)], whereby a flux hood type apparatus is placed on the emission surface of selected locations, and air is blown through it. The emission rate is then given by airflow through the hood and the odour concentration of the exit air.

(b) Flux hood systems, Tedlar bags and airtight plastic containers should be used for surface sampling of odorous gas. The plastic container should be pre-treated and then evacuated before sampling.

(c) During collection of the samples of odorous gas, the wind speed, temperature and humidity should be recorded during measurement.

(d) For the sources which are not area sources or "hood" method cannot be applied, the air samples should be collected via a sampling tube in connection with an odour sampling system (i.e. air pumps and Tedlar bags). The empty sample bag should be placed in a rigid plastic container and the container is then evacuated at a controlled rate and the bag is filled.

(e) The odour sample should not be contaminated, lost or altered during storage. The odour bags should be:

- Odour-free, i.e. they should not add odours to the sample;
- Of a material which does not absorb or react with odorous samples;
- Sufficiently impervious to prevent any significant loss of odour components;
- Reasonably robust;
- Leak-free;
- Equipped with leak-free fittings, compatible with olfactometer and other sampling equipment; and
- Of sufficient capacity to enable a full test series to be completed.

(f) The temperature should be kept above dew point of the samples to avoid condensation. Exposure of samples to direct sunlight should be avoided to minimize photochemical reactions.

(1) Sampling for Measurement of Odours, P.Gostelow, P. Longhurst, S.A. Parsons and R.Mstuetz, 2003.

(g) At least 60L of foul gas should be collected for each sample. The collected air samples should be delivered to a qualified laboratory for olfactometry analysis within 24 hours.

3.5 The collected samples were sent to the Odour Laboratory of the Hong Kong Polytechnic University for olfactometry analysis within 24 hours.

Olfactometry Analysis Procedure

3.6 The odour concentrations of the samples were determined by a forced-choice dynamic olfactometer with a panel of human assessors being the sensor in accordance with the European Standard Method (EN13725).

3.7 The odour laboratory should be ventilated to maintain an odour-free environment and to provide fresh air to the panel members. Each odour testing session comprises at least six qualified panellists. All the panellists should be screened beforehand by using a 50 ppm solution/mixture of certified n-butanol standard gas. The most sensitive and least sensitive individuals would be eliminated.

Olfactometry Analysis Results

3.8 The odour concentration (in terms of ou/m^3) of the collected air samples were determined by olfactometry analysis. The specific odour emission rate (SOER) of each area source was calculated by the following equation:

$$\text{SOER (ou/m}^2\text{.s)} = \frac{\text{Odour concentration(ou/m}^3\text{) x Air flow rate inside hood (m}^3\text{/s)}}{\text{Covered water surface area (m}^2\text{)}}$$

$$= \text{OC x } (0.02/60) / (0.2 \text{ x } 0.2 \text{ x } 3.14) = \text{OC x } 0.00265$$

3.9 Analytical results of odour concentrations are summarized in **Table 3.1**. Results showed that the odour concentrations of the ambient air samples collected near the five locations were in the range of 19 – 42 ou/m^3. Odour was detected at Locations 2, 3 and 4 from weak to moderate levels.

3.10 According to odour patrol result, the possible sources at Location 3 (area in the vicinity of POC) were possibly due to the decayed sediment. There is no doubt that the water circulation is poor at these locations as the tidal flows are inhibited by the typhoon shelter breakwater and limited flushing effect would be expected at the corner of CBTS. As a result, sediment has accumulated and rotten egg smell was detected from the breakdown of organic matter in the sediment. The other possible odour source was discharge from outfall. There are two outfalls, Outfall P and Q, located at and near the corner of CBTS.

Table 3.1 Results of Olfactometry Analysis (Year 2006)

Sample ID	Ambient Air or Source Sample	Odour Concentration (ou/m^3)	Odour Emission Rate (ou/m^2/s)
1-A	Ambient air sample	19	-
1-E	Source sample above water surface	61	0.16
2-A	Ambient air sample	32	-
2-E	Source sample above water surface	82	0.22
3-A	Ambient air sample	42	-
3-E	Source sample above water surface	143	0.38
4-A	Ambient air sample	37	-
4-E	Source sample above water surface	134	0.36
5-A	Ambient air sample	20	-
5-E	Source sample above water surface	75	0.20

4. ADDITIONAL ODOUR SURVEY

4.1 Additional odour survey is required as (i) the results of odour survey in September 2006 have indicated the potential odour source locations at the shoreline of CBTS but could not demonstrate whether there are any odour problems at the centre of CBTS and breakwater locations; and (ii) it is prudent to minimise the uncertainties in the spatial distribution of emission by repeating the odour survey.

Additional Odour Patrol

4.2 Further to the odour patrol that had been carried out along the CBTS and ex-PCWA, a one-day odour patrol exercise was carried out for the whole area of CBTS (water surface), ex-PCWA (along coastline and water surface), Northern Breakwater and Eastern Breakwater as indicated in **Figure 1a**. The patrol day consists of two patrol exercises in two different time periods (i.e. daytime and evening time/night time). One of the patrol exercises should be undertaken during low tide condition with reference to the tidal chart of the Hong Kong Observatory. The weather of the odour patrol day was sunny. Carbon filter masks were used by the observers to refresh their noses during the odour patrol. The observers followed the odour patrol procedures mentioned in Sections 2.5 – 2.10 above.

Additional Odour Patrol Result

4.3 The odour patrol including two patrol exercises (morning/noon and afternoon/evening) was conducted on 10 July 2007. The patrol exercise in the morning session was conducted during the low tide of the day (less than 1m) to capture potential worst odour level of the day. Along the patrol route, several locations were identified for detection of odour intensity. The identified locations are indicated in **Figure 1b**. The mean odour intensities recorded at these locations and the associated odour characteristics are summarized in **Table 4.1** and **Table 4.2**.

Table 4.1 Summary of Odour Patrol Result in Morning/Noon Session (Year 2007)

Location	Time	Odour Intensity Level			Odour Nature	On-site H_2S Conc. (ppb)	Possible Sources	Duration	WS (m/s)	WD
		Oi-1	Oi-2	Mean						
P1	10:36	2	2	2	Oily & decayed waste	5 – 9	Floating debris, sediment	Persistent	0.7	SW
P2	10:40	2	2	2	Oily & decayed waste	5 – 11	Floating debris, sediment	Persistent	0.1	SW
P3	10:45	1	1	1	Oily & decayed waste	4 – 6	Floating debris, sediment	Persistent	2.0	SW
P4	10:47	1	1	1	Oily & decayed waste	2 – 4	Floating debris, sediment	Intermittent	1.2	SW
P5	10:51	0	0	0	-	0 – 1	-	-	1.7	SW
P6	10:55	0	0	0	-	1	-	-	1.1	SW
P7	11:02	0	0	0	-	1	-	-	2.6	SW
P8	11:06	0	0	0	-	1 – 2	-	-	2.7	SW
P9	11:08	0	0	0	-	1	-	-	3.7	SW
P10	11:10	0	0	0	-	1	-	-	0.4	SW
P11	11:13	0	0	0	-	0 - 2	-	-	0.5	SW
P12	11:15	1	1	1	Sewage + rotten-egg	2 - 27	Outfall + air bubbles from sediment	Persistent	2.7	SW
P13	11:19	2	3	2.5	Sewage + rotten-egg	14 – 37	Outfall + air bubbles from sediment	Persistent	1.6	SW
P14	11:22	3	3	3	Rotten-egg	10 - 57	Air bubbles from sediment	Persistent	2.0	SW
P15	11:25	1	1	1	Oily and decayed wastes	4 – 12	Floating debris	Intermittent	0.6	SW
P16	11:29	0	0	0	-	2 – 3	-	-	1.0	SW
P17	11:32	0	0	0	-	2 – 3	-	-	1.2	SW
P18	11:37	0	0	0	-	1 – 2	-	-	5.0	SW
P19	11:40	0	0	0	-	0 – 1	-	-	3.0	SW
P20	11:43	0	0	0	-	0 – 1	-	-	4.5	SW
P21	11:46	0	0	0	-	1 – 2	-	-	3.9	SW
P22	11:49	0	0	0	-	1 – 3	-	-	4.0	SW
P23	11:56	0	0	0	-	2 – 7	-	-	0.0	SW
P24	11:56	0	0	0	-	2 – 5	-	-	0.5	SW
P25	12:03	2	1	1.5	Rotten-egg	5 – 27	Air bubbles from nearby area.	Intermittent	0.4	SW
P26	12:19	0	0	0	-	0 – 2	-	-	1.5	SW
P27	12:22	0	0	0	-	1	-	-	0.6	SW
P28	12:24	0	0	0	-	1 – 2	-	-	0.9	SW
P29	12:29	0	0	0	-	0 – 1	-	-	0.3	SW
P30	12:31	1	1	1	Rotten-egg	0 – 1	Air bubbles from nearby area	Intermittent	1.1	SW
P31	12:35	2	2	2	Sewage + rotten-egg	2 – 13	Outfall + air bubbles from sediment	Persistent	3.0	SW
P32	12:38	0	0	0	-	1 – 2	-	-	2.5	SW
P33	12:45	0	0	0	-	2 – 3	-	-	0.0	SW
P34	12:47	0	0	0	-	1 – 6	-	-	0.7	SW
P35	12:52	1	1	1	Decayed wastes	9 – 10	Floating debris	Intermittent	0.5	SW
P36	12:55	0	0	0	-	2	-	-	2.8	SW

Note: - Not detected.

Table 4.2 Summary of Odour Patrol Result in Afternoon/Evening Session (Year 2007)

Location	Time	Odour Intensity Level			Odour Nature	On-site H_2S Conc. (ppb)	Possible Sources	Duration	WS (m/s)	WD
		Oi-1	Oi-2	Mean						
P1	17:11	2	2	2	Oily & decayed waste	3 – 4	Floating debris, sediment	Persistent	0.1	SW
P2	17:14	2	2	2	Oily & decayed waste	4 - 6	Floating debris, sediment	Persistent	2.3	SW
P3	17:17	1	1	1	Oily & decayed waste	2 – 3	Floating debris, sediment	Persistent	0.7	SW
P4	17:20	1	1	1	Oily & decayed waste	2 – 3	Floating debris, sediment	Intermittent	1.0	SW
P5	17:24	0	0	0	-	2 – 3		-	0.2	SW
P6	17:27	0	0	0	-	2	-	-	0.5	SW
P7	17:30	0	0	0	-	2	-	-	2.3	SW
P8	17:33	0	0	0	-	2	-	-	0.7	SW
P9	17:36	0	0	0	-	2	-	-	1.9	SW
P10	17:39	1	1	1	Rotten-egg	0 – 1	Air bubbles were noted from nearby area	Intermittent	2.2	SW
P11	17:42	3	2	2.5	Rotten-egg	7 - 11	Floating debris	Intermittent	1.1	SW
P12	17:45	3	3	3	Sewage + rotten-egg	11 – 44	Outfall + air bubbles from sediment	Persistent	0.8	SW
P13	17:48	2	2	2	Sewage + rotten-egg	42 – 70	Outfall + air bubbles from sediment	Persistent	3.0	SW
P14	17:52	2	2	2	Oily and decayed wastes	41 – 81	Air bubbles from sediment	Persistent	0.2	SW
P15	17:55	0	0	0	-	2 – 3	-	-	2.1	SW
P16	17:58	0	0	0	-	2	-	-	3.2	SW
P17	18:01	0	0	0	-	1 – 2	-	-	1.5	SW
P18	18:05	0	0	0	-	0 – 1	-	-	3.1	SW
P19	18:09	0	0	0	-	0 – 1	-	-	0.0	SW
P20	18:13	0	0	0	-	1 – 2	-	-	1.4	SW
P21	18:17	0	0	0	-	1 – 2	-	-	1.2	SW
P22	18:22	0	0	0	-	1 – 3	-	-	0.0	SW
P23	18:28	1	1	1	Oily and decayed wastes	2 – 4	Floating debris	Intermittent	0.2	SW
P24	18:33	0	0	0	-	1 – 2	-	-	0.2	SW
P25	18:39	0	0	0	-	2 – 5	-	-	0.0	SW
P26	18:54	0	0	0	-	1 - 2	-	-	1.6	SW
P27	18:58	0	0	0	-	2 – 5	-	-	0.1	SW
P28	19:02	0	0	0	-	2 – 4	-	-	2.0	SW
P29	19:08	0	0	0	-	1	-	-	0.7	SW
P30	19:11	0	0	0	-	0 – 1	-	-	1.1	SW
P31	19:16	1	1	1	Sewage + rotten-egg	5 – 13	Outfall + air bubbles from nearby area	Intermittent	0.1	SW
P32	19:28	0	0	0	-	3 – 4	-	-	0.2	SW
P33	19:36	0	0	0	-	2 – 4	-	-	1.3	SW
P34	19:42	0	0	0	-	1 – 4	-	-	1.4	SW
P35	19:36	0	0	0		1 – 2	-	-	1.2	SW
P36	19:42	0	0	0	-	2 – 6	-	-	0.5	SW

Note: - Not detected.

4.4 The results indicated that no odour was detected at the Eastern and Northern Breakwater and its nearby area, water surface of the ex-PCWA area and the CBTS except the area near Police Officers' Club (POC), and the area in the vicinity of Outfall Q. Moderate odour intensity level (2 – 3) was detected at a few locations including P1 (corner of CBTS, similar location of Site ID3 in Year 2006 odour patrol), P2, P3, P11, P12, P13, P14 and P31. As identified by the odour patrol members, the smell detected at the identified odour locations were dominantly from rotten organics/decay sediment at CBTS, outfall discharge and floating debris.

Additional Air Sampling & Olfactometry Analysis

4.5 Based on the findings of the odour patrols, the odour intensity level recorded at some locations within CBTS was equal to or higher than 1, which is classified as identifiable odour. However, the site observation indicated that the odour detected at these locations was intermittent with duration less than 1 minute. These locations are unlikely to be odour sources as the duration of odour detected at source location should be persistent (at least 2 – 3 minutes). The intermittent odour was most likely due to wind dispersion from nearby odour source areas. Hence, the potential odour sources locations should fulfil the following two criteria:

(i) Mean odour intensity level equal to or higher than 1 during patrol exercise; and

(ii) The duration of odour detected was persistent during patrol.

4.6 Odour sampling exercise was conducted at the proposed locations as shown in **Figure 2** and the odour hotspots identified in the additional odour patrol. For each sampling location, one air sample above water surface was collected. Headspaces sampling at Outfall P and Q were also conducted and one air sample was collected for each outfall. The locations of the outfall and the sampling locations are shown in **Figures 2** and **3**. The sampling locations were subject to the results of additional odour patrol. The sampling exercise was conducted on 28 July 2007. The recorded ambient air temperature on the sampling day was 31 -33 °C. The sampling and olfactometry analysis procedures followed those described in Sections 3.4 – 3.7 above.

Additional Olfactometry Analysis Results

4.7 Analytical results of odour concentrations are summarized in **Table 4.3**. According to the olfactometry results, very high concentrations were detected at the area in the vicinity of outfall Q (Sample ID 8 – 11). Referring to site observation record, high odour intensity was detected near outfall Q and sewage discharge from the outfall was noted. The other possible source contributing to high odour concentrations at these areas would be the decayed sediment as gas bubble was observed at these areas during sampling. Very high odour concentration was also recorded at the corner of CBTS (Sample ID 1) due to sediment and sewage.

Table 4.3 Results of Olfactometry Analysis (Year 2007)

Sample ID	Odour Nature	Possible Source	In-situ H_2S (ppb)	Odour Concentrations (ou/m^3)	Odour Emission Rate ($ou/m^2/s$)
1	Oily & decayed wastes + rotten-egg	Floating debris + sediment + sewage	120 – 130	5792	15.32
2	Oily & decayed wastes + rotten-egg	Floating debris + sediment + sewage	5 – 6	164	0.43
3	Oily & decayed wastes + rotten-egg	Floating debris + sediment + sewage	11 – 12	889	2.35
4	Oily & decayed wastes + rotten-egg	Floating debris + sediment + sewage	3 – 4	484	1.28
5	Oily & decayed wastes + rotten-egg	Floating debris + sediment + sewage	3 – 4	469	1.24
6 (Outfall P)	Septic sewage + rotten-egg	Outfall + sediment with gas bubbling	24 – 25	884	-
7 (Outfall Q)	Septic sewage + rotten-egg	Outfall + sediment with gas bubbling	5300 – 5600	71,320	-
8	Septic sewage + rotten-egg	Outfall + sediment with gas bubbling	2400	30,530	80.77
9	Septic sewage + rotten-egg	Outfall + sediment with gas bubbling	15	670	1.77
10	Septic sewage + rotten-egg	Outfall + sediment with gas bubbling	370 – 380	6208	16.42
11	Septic sewage + rotten-egg	Outfall + sediment with gas bubbling	12 - 13	433	1.15

5. ODOUR IMPACT ASSESSMENT APPROACH IN EIA STUDY

5.1 In accordance with EIAO-TM, the odour criterion is 5 odour units (ou) averaged over 5 seconds for odour prediction assessment. In the EIA study, odour modelling would be conducted. The existing and future odour emission inventories are established based on the findings of the odour surveys described above. Air dispersion model would be conducted to predict the odour concentrations at the study area under existing scenario and future scenario. The predicted concentrations at ASRs would be compared with the odour criterion given in the EIAO-TM. Details of the assessment are presented as follows.

Existing Odour Emission Sources

5.2 According to the results of the odour surveys, the water area at the corner of CBTS and the area in the vicinity of the POC were identified as potential odour source emission area and the odour emissions were possibly due to the rotten organics/decayed sediment and polluted sewage from drainage outfall. The floating refuses at CBTS were also identified as one of the causes of the odour problem in the odour patrol. Another potential location was the area in the vicinity of Outfall Q and the dominant odour sources were the discharges from Outfall Q and air bubbles from seabed sediments. The slime attached on the seawall at the corner of

CBTS was also considered to have contributed to the odour problems at the affected area of CBTS.

5.3 Based on the findings of the odour surveys, the following four existing odour sources found at CBTS are identified and the possible causes of odour are summarized below.

(a) Sediment at the corner of CBTS and areas in the vicinity of Storm Drain Outfall Q

5.4 CBTS receives discharges from several drainage systems from Causeway Bay and Happy Valley. There are four outfalls including outfall P, Q, R and S discharging into CBTS. Currently these systems primarily receive stormwater and street runoffs. Odour patrol results indicated that odour nuisance was detected at the corner of CBTS (near Police Officers' Club) and areas in the vicinity of storm drain outfall Q. It is likely that polluted sewage/wastewater has been discharged to this storm drain through some expedient connections made in the past. The sewage/wastewater discharged from these expedient connections contained high levels of pollutants, together with the stagnant water system at the corner of CBTS, resulted in the deposition of a contaminated sediment layer today.

5.5 Under normal condition, the organic matter is decomposed by micro-organisms aerobically using the oxygen in the water and also diffused to the sediment. The resultant products are carbon dioxide and water:

Organic matter + oxygen → energy + carbon dioxide + water

5.6 When the organic load exceeds the carrying capacity, oxygen is not available for aerobic respiration and sulphate in seawater is used as the agent for anaerobic respiration by micro-organisms.

5.7 Hydrogen sulphide is formed when the organic rich sediments act as a substrate for the action of sulphate-reducing bacteria (SRBs) which reduce the sulphate in the absence of oxygen. Organic sulphur compounds, such as mercaptans, also contribute partly to the odour with process similar to hydrogen sulphide:

Organic matter + sulphate → energy + hydrogen sulphide + water

Organic matter with sulphide → energy + mercaptans + water (minor pathway)

5.8 This is also reflected by the observations made during the odour patrols that high concentration of hydrogen sulphide was detected in the air samples collected above the water surface at the corner of CBTS and the area in the vicinity of Outfall Q by the handheld H_2S detector.

(b) Polluted discharges from drainage outfall P and Q

5.9 In accordance with the site observation during odour patrol, polluted discharge from storm drain outfall P and sewage-like discharge from storm drain outfall Q into CBTS were noted in the odour patrols and causing odour nuisance. During odour sampling exercise in the 2007 odour survey, very high odour concentration and hydrogen sulphide concentrations were detected at the area in the vicinity of Outfall Q and its headspace. This supports the observation that the polluted discharge from outfall Q consisted of sewage which likely came from expedient connections.

(c) Slime attached on the shoreline seawall

5.10 Oil and greases discharged from the storm drain outfall P and Q were accumulated at the south-western corner of CBTS due to stagnant water flow and poor water circulation and some of the oil and greases were attached on the shoreline seawall. As there is no cleaning of the shoreline seawall before, the slime attached on the seawall caused odour nuisance in particular during low tide periods.

(d) Floating debris

5.11 Floating debris at CBTS was observed during odour survey. The debris might be disposed from the boats at CBTS or in the discharges from outfalls. The quantity of floating refuse collected was higher in the summer months which may be attributed to the heavy rains and typhoons bringing more refuse into the harbour. In the summer, the wind direction is from the south-west which also brings more refuse into the harbour.

5.12 Comparing the results of the two odour surveys, higher odour emission rates were obtained in the 2007 odour survey. This might be due to the fact that the sampling day in 2007 was very hot and the sampling exercise was conducted at the lowest tide (<0.5m) and during period with very high temperature (31 – 33 degrees Celsius). Discharges from Outfall Q with sewage-like smell were noted during the entire odour sampling period. The odour emission rates derived from the 2007 odour survey were considered as reasonable worst case emission rates and were therefore adopted in the assessment for the prediction of the worst odour concentrations at the representative ASRs. However, the odour emission rate derived from Sample ID 8 (Year 2007) was unreasonable high (80.77 ou/m^2/s). The emission rates derived from other air samples collected in the vicinity of outfall Q such as Sample ID 9 (the closest point to the outfall Q) and Sample ID10 were significantly lower. These two air sample locations were also close to Sample ID8. In accordance with the past experience in other odour projects, the odour emission rates for sewage and sludge related sources were not higher than 40 ou/m^2/s. It was therefore suspected that the air sample of Sample ID8 might be contaminated in the laboratory analysis. The result for this sample was therefore discarded and the emission rate to be used in the modelling was based on the second highest odour emission rate (i.e. 16.42 ou/m^2/s) derived from Sample ID10 which was also close to Sample ID8.

5.13 The odour concentrations of air samples collected inside the headspaces of outfall P and Q were 884 ou/m^3 and 71320 ou/m^3, respectively. The results indicated that high odour concentrations were detected in the headspace of outfall Q. Under the worst case condition as identified by the odour surveys during low tide, the rate of change in tide level is very slow and hence the rate of displacement of the headspace air volume from the outfalls to the atmosphere, if any, would also be very low. Therefore, no air displacement from the headspace of the outfalls was considered in the odour modelling. During other tidal conditions, the rate of displacement of the headspace air volume from the outfalls to the atmosphere might be higher, yet the odour emissions from other potential odour source locations would be significantly less and are therefore not considered as worst case conditions.

5.14 Based on the findings of the odour surveys, the locations of potential odour source areas considered in the odour modelling for the worst case scenario are shown in **Figure 3a.** Besides, with reference to the results of the odour surveys carried out in 2006 and 2007, it is noted that the odour emission rates of the identified odour source areas would be lower under lower ambient temperature. The recorded ambient temperature during the sampling period in 2006 and 2007 was in the range of 25-29 °C and 31-33 °C respectively. The estimated odour emission rates based on the 2006 odour survey results are significantly lower than those derived based on the 2007 odour survey results. The highest odour emission rate derived from the 2006 odour survey results is 0.38 ou/m^2/s whereas the highest odour emission rate derived from the 2007 odour survey results is 16.42 ou/m^2/s. For the purpose of this assessment to produce reasonable prediction under different ambient temperature, the odour emission rates during periods with ambient temperature equal to or greater than 30 °C would be derived from the 2007 odour survey results, whereas the odour emission rates during periods with ambient temperature less than 30 °C would be taken as the highest odour emission rate derived from the 2006 odour survey results, ie. 0.38 ou/m^2/s.

The emission factors of the existing source areas under different temperature ranges are summarized in **Table 5.1.**

Table 5.1 Existing Odour Emission Inventory for the Worst Case Scenario

Sample ID	Odour Emission Rate ($ou/m^2/s$)	
	(for ambient temperature <30 °C)	(for ambient temperature >= 30 °C)
1	0.38	15.32
2	0.38	0.43
3	0.38	2.35
4	0.38	1.28
5	0.38	1.24
8	0.38	16.42
9	0.38	1.77
10	0.38	16.42
11	0.38	1.15

Future Odour Emission Sources

5.15 The Project itself would not introduce any additional odour emission sources within the study area. The future possible status of the existing odour pollution sources without enhancement proposal are described as follows:

(a) Polluted sewage from drainage outfall

5.16 DSD has conducted the Causeway Bay Typhoon Shelter Expedient Connection Surveys during August 1997 and January 1999. According to the "Final Report of the Causeway Bay Typhoon Shelter Expedient Connection Surveys" under Agreement No. CE 78/94 Wan Chai East and North Point Sewerage issued in October 2000, DSD was responsible to rectify 6 number of expedient connection in Causeway Bay area. Five of the 6 expedient connections had been blocked/rectified. The remaining one is scheduled to be completed in early 2008. Except these 6 expedient connections, the report also identified a list of buildings where polluted flows into stormwater system which would require the Building Department to follow up or improper discharges causing pollution to stormwater system which would involve EPD's pollution control. It is expected that most of the expedient connections to storm water outfall would be rectified in future, the odour generated from sewage discharged from outfall would be reduced comparing with the existing scenario.

(b) Floating refuse discharged from the boats

5.17 As advised by the Marine Department, it is a routine exercise that they collect the floating refuse at CBTS every day. In view of no significant increase in the number of boats mooring at CBTS during operation year of the Project, it is expected that odour impact generated from floating refuse in future would be similar to the existing condition.

(c) Slime attached on the shoreline seawall and sediment at CBTS

5.18 The shoreline of CBTS would not be changed under the Project, therefore, dredging activities would be focused on the proposed Trunk Road area. As most of the expedient connections within the study area are expected to be rectified in future with follow up action by DSD, EPD, FEHD and BD as proposed in the "Final Report of the Causeway Bay Typhoon Shelter Expedient Connection Surveys", the flow of raw sewage discharged from the outfall would be significantly decreased. Less odour emission generated from the sediment and the slime in future would be expected.

Enhancement Package

5.19 In addition to the rectification works for expedient connections, the Project Proponent would like to improve the existing situation. Details of the enhancement proposal shall refer to the separate paper on "Enhancement Package for Existing Odour Sources Identified at Causeway Bay Typhoon Shelter" (**Annex A**). Dredging would be conducted at the corner of CBTS to remove the sediment (see **Figure 4**) and the slime attached on the shoreline seawall would be cleaned during the construction of the Project.

5.20 With the concerted efforts from various government departments, including DSD, EPD, FEHD, BD, MD, HyD and CEDD, on the implementation of the above enhancement package, the existing accumulated sediments and slimes on the seawall would be removed, the expedient connections would be rectified, the floating refuse would be removed by the regular harbour cleansing service, illegal discharge and dumping into the CBTS and misconnection of drainage system would be controlled by enforcement of relevant ordinance with patrol, the potential odour sources would be substantially reduced and the future situation would be improved as compared to the existing condition. Taking into account the potential effect of the above measures in reducing odour nuisance, including complete removal of the major generator of odour namely the sediment at the corner of CBTS by dredging, the future mitigated odour emission strength of the identified odour sources is estimated to be reduced by 70%. This odour reduction efficiency is considered to be reasonable and conservative.

5.21 The mitigated emission factors of the future source areas under different temperature ranges are summarized in **Table 5.2**. The locations of potential odour sources areas are similar as in existing scenario.

Table 5.2 Future Odour Emission Inventory

Sample ID	Odour Emission Rate (ou/m^2/s) (for ambient temperature <30 °C)	Odour Emission Rate (ou/m^2/s) (for ambient temperature >= 30 °C)
1	0.114	4.596
2	0.114	0.129
3	0.114	0.705
4	0.114	0.384
5	0.114	0.372
8	0.114	4.926
9	0.114	0.531
10	0.114	4.926
11	0.114	0.345

Air Sensitive Receiver

5.22 Based on the latest RODP, the planned air sensitive receivers (ASRs) include mid breakwater of CBTS which would be open space with sensitive use. The odour impact at this ASR will be assessed in the EIA study.

5.23 Regarding the corner of CBTS (i.e. the area in the vicinity of POC), in accordance with the RODP, the pavement at that area would not be changed. The land strip with 1.5m – 4.5m width would not attract pedestrian to stay here. It is expected that this narrow strip of land will continue to serve as pedestrian walkway, not a sensitive land use. The area in the vicinity of drainage culvert outfall Q is also a walkway. No active and passive recreational uses are proposed under the Project along the existing Gloucester Road/Victoria Park Road from the POC to Causeway Bay Flyover. It is not expected that the land uses along CBTS between POC and Causeway Bay Flyover would be changed.

Air Dispersion Model

5.24 Odour impacts would be modelled with the air dispersion model, ISCST3. Hourly meteorological data for the year 2005 (including wind speed, wind direction, air temperature, Pasquill stability class and mixing height) of the Hong Kong Observatory Weather Station would be employed for the model run. The study area is in an urban area, "Urban" model would be adopted in the model.

5.25 The modelled hourly odour concentrations at the ASRs were converted into the 5-second odour concentration so as to compare with the EIAO-TM odour criteria. In accordance with EPD's "Guidelines on Choice of Models and Model Parameters", it is recommended to follow the methodologies proposed by Duffee et al.[1] and Keddie[2] in performing the conversion from hourly and 5-second average concentration. However, it is noted that these methodologies are based on findings of earlier researches on dispersion of odour emissions from point sources. More recent researches indicated that the peak-to-mean ratio of odour dispersion would depend upon the type of source, atmospheric stability and distance downwind. Depends on the physical source configuration, the peak-to-mean ratio of odour dispersion from area source could be far smaller than that from point source. In this assessment, the potential odour sources to be studied are in the form of area sources in CBTS. Therefore, for the purpose of this assessment to produce more reasonable predictions for odour dispersion from area sources, reference was made to the peak-to-mean ratio for area source stipulated in "Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales" published by the Department of Environment and Conservation, New South Wales, Australia (NSW Approved Method).

5.26 The dispersion modelling techniques employed for this assessment followed those described in EPD's "Guidelines on Choice of Models and Model Parameters" using ISCST3 model except the use of alternative peak-to-mean ratios discussed above. However, it should be noted that the peak-to-mean ratios stated in the NSW Approved Method are derived based on experimental and theoretical analyses and assuming a 0.1% exceedance level (Ref.: Statistical Elements of Predicting the Impact of a Variety of Odour Sources, Peter R. Best, Karen E. Lunney and Christine A. Killip, Water Science and Technology, Australia, 44: 9 pp 157-164 2001). In other words, there would be a 0.1% probability that the actual peak concentration would be higher than those derived with the peak-to-mean ratios stated in the NSW Approved Method. The residual odour impact associated with this 0.1% probability would be addressed in the odour impact assessment.

5.27 In accordance with the NSW Approved Method, the conversion factors are used for converting the 1-hour average concentrations to 1-second average concentrations. As a conservative approach, these conversion factors were directly adopted for converting the 1-hour average concentrations predicted by the ISCST3 model to 5-second average concentrations for compliance checking with the odour criteria. Besides, in this case, the potential odour sources are located in the vicinity of the ASRs, therefore, the ASRs are considered to be located in the near field region with regards to the odour sources as per the NSW Approved Method. The conversion factors adopted in this assessment for different stability classes are shown in **Table 5.3**.

[1] Richard A. Duffee, Martha A. O"Brien and Ned Ostojic (1991). Odour Modelling – Why and How, Recent Developments and Current Practices in Odour Regulation, Controls and Technology, Air & Waste Management Association.
[2] Keddie, A. W, C(1980). Dispersion of Odours, Odour Control – A concise Guide, Warren Spring Laboratory.

Table 5.3 Conversion Factors to 5-second Mean Concentration

Pasquill Stability Class	Conversion Factor (1 hour to 5 seconds)
A	2.5
B	2.5
C	2.5
D	2.5
E	2.3
F	2.3

Presentation of Assessment Results

5.28 The predicted odour concentrations at representative planned ASRs proposed under WDII Project were determined. The odour concentrations within the study area under existing scenario were presented in the form of contour plots.

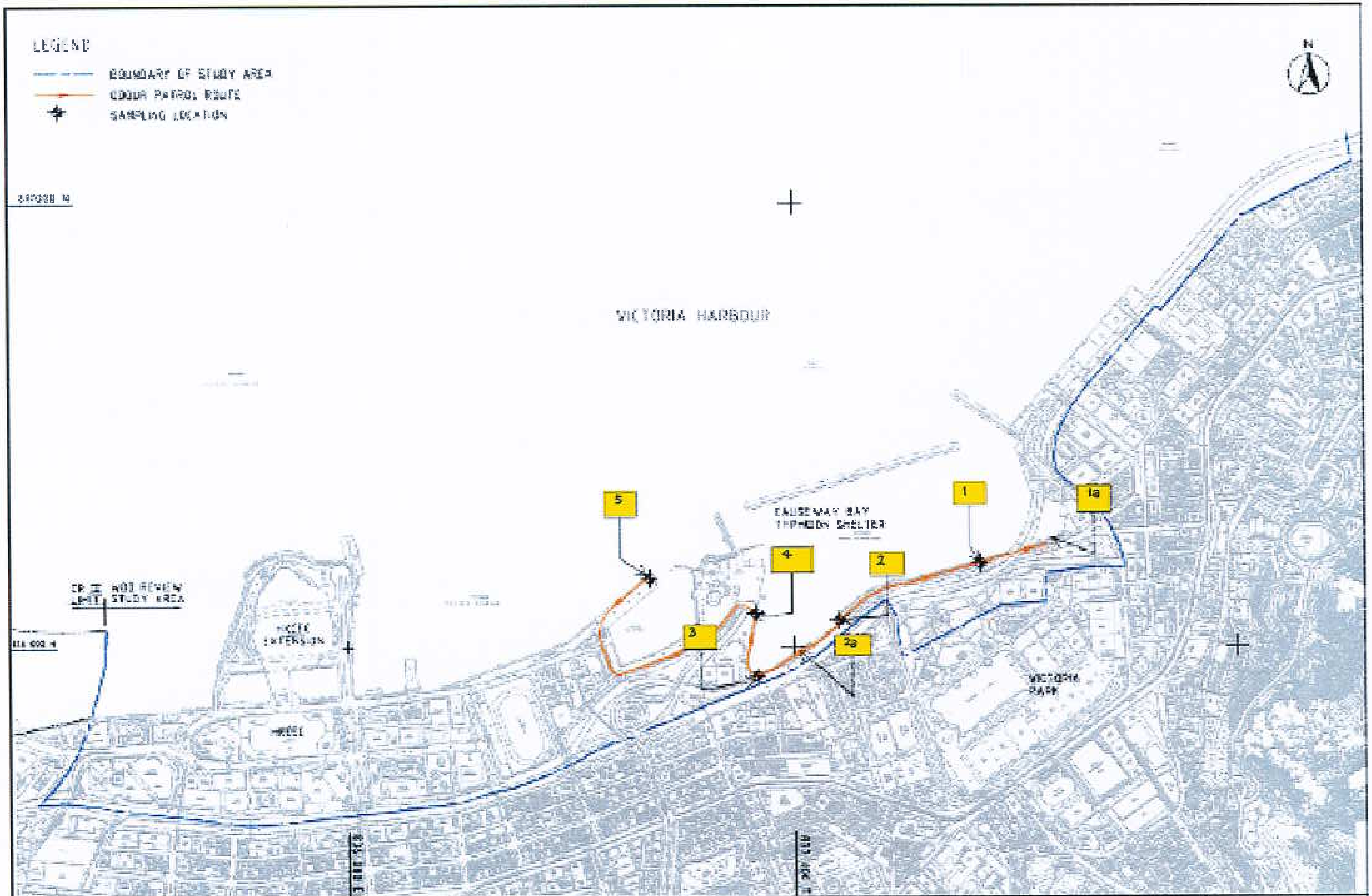
Limitations and Uncertainties of the Assessment

5.29 The degree of certainty of the predicted odour impacts depends on the accuracy of the estimated odour emission rates and the air dispersion modelling. The number of air samples collected as well as the intrinsic limitations of the air sampling technique and the olfactometry analysis would also affect the accuracy of odour emission rate estimation.

5.30 The odour patrol was conducted in a limited number of days to identify the potential odour source locations, however, the patrol days were all sunny days in very hot season and the patrol period covered the low tide condition. It is believed that the potential odour source locations at CBTS have been identified. Besides, given that the odour surveys were carried out in a limited number of days, the measured odour concentrations are basically snapshot values. Yet, given that all the odour surveys were carried out during hot season and low tide conditions, the estimated odour emission rates are considered representing reasonable worst case conditions.

5.31 Air sampling is an important step in the process of measuring the odour concentrations of the sources, it would affect the quality and reliability of the results. All the odour sampling was carried out by the odour sampling team of HKPU which has the most extensive local experience in odour sampling. The potential error associated with odour sampling process is considered to be on the low side.

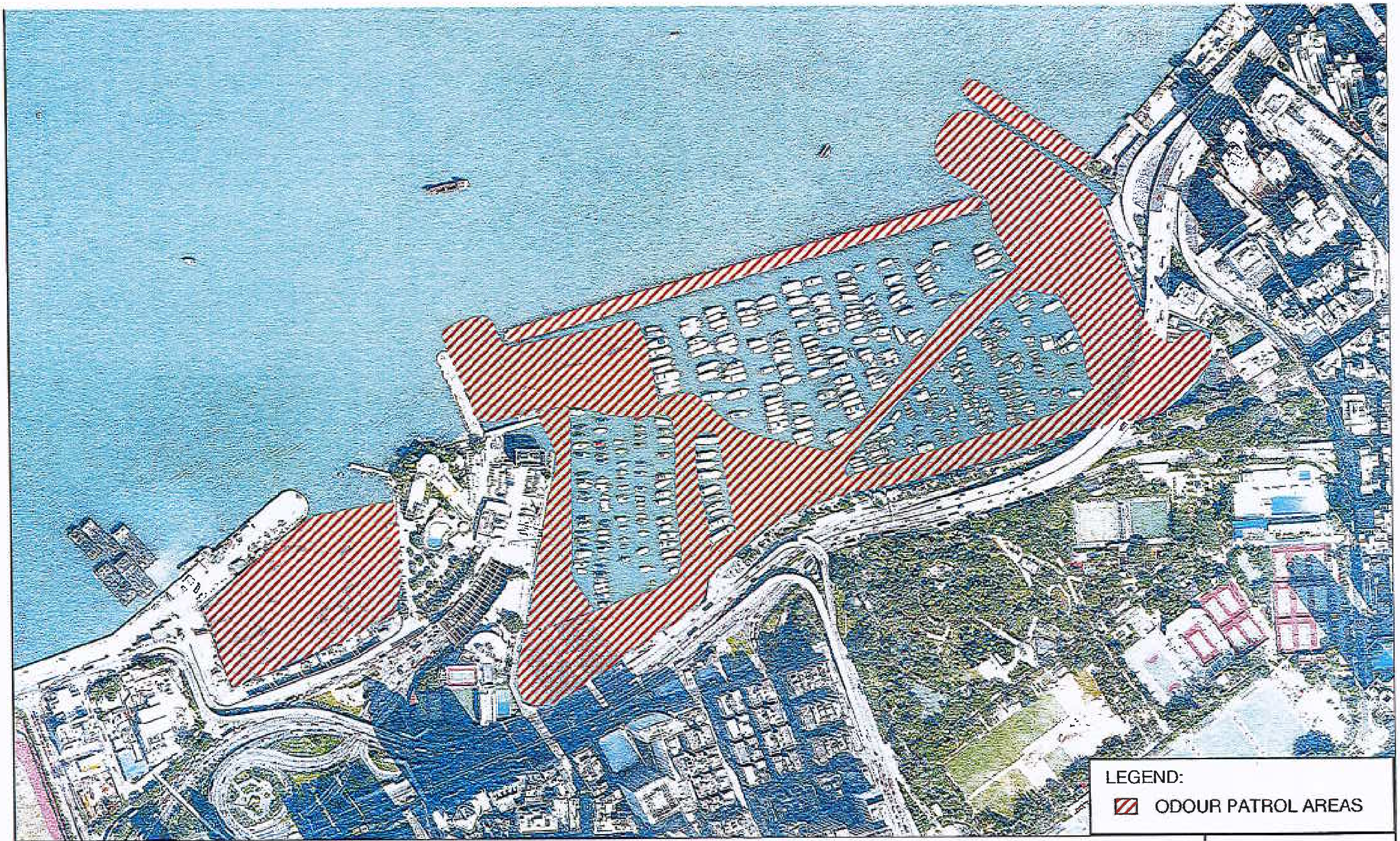
5.32 It should be noted that all the odour concentrations (in ou/m^3) and hence area source emission rates (in $ou/m^2/s$) were measured by olfactometry analysis carried out at the Odour Research Laboratory of HKPU in accordance with the European Standard Method (EN13725). This European Standard Method specifies a method for the objective determination of the odour concentration of a gaseous sample using dynamic olfactometry with human assessors. The detection limit for this European Standard Method is 10 ou/m^3. Yet the detection limit of this European Standard Method could vary between laboratories. Therefore, in reviewing the odour concentration results (in ou/m^3), it should be noted that a measured low odour concentration value would normally has a higher degree of error due to the inherent properties of the olfactometry analysis method.



MAUNSELL | AECOM

PROPOSED ODOUR PATROL ROUTE AND SAMPLING LOCATIONS

FIGURE 1



MAUNSELL | AECOM

Maunsell Consultants Asia Ltd

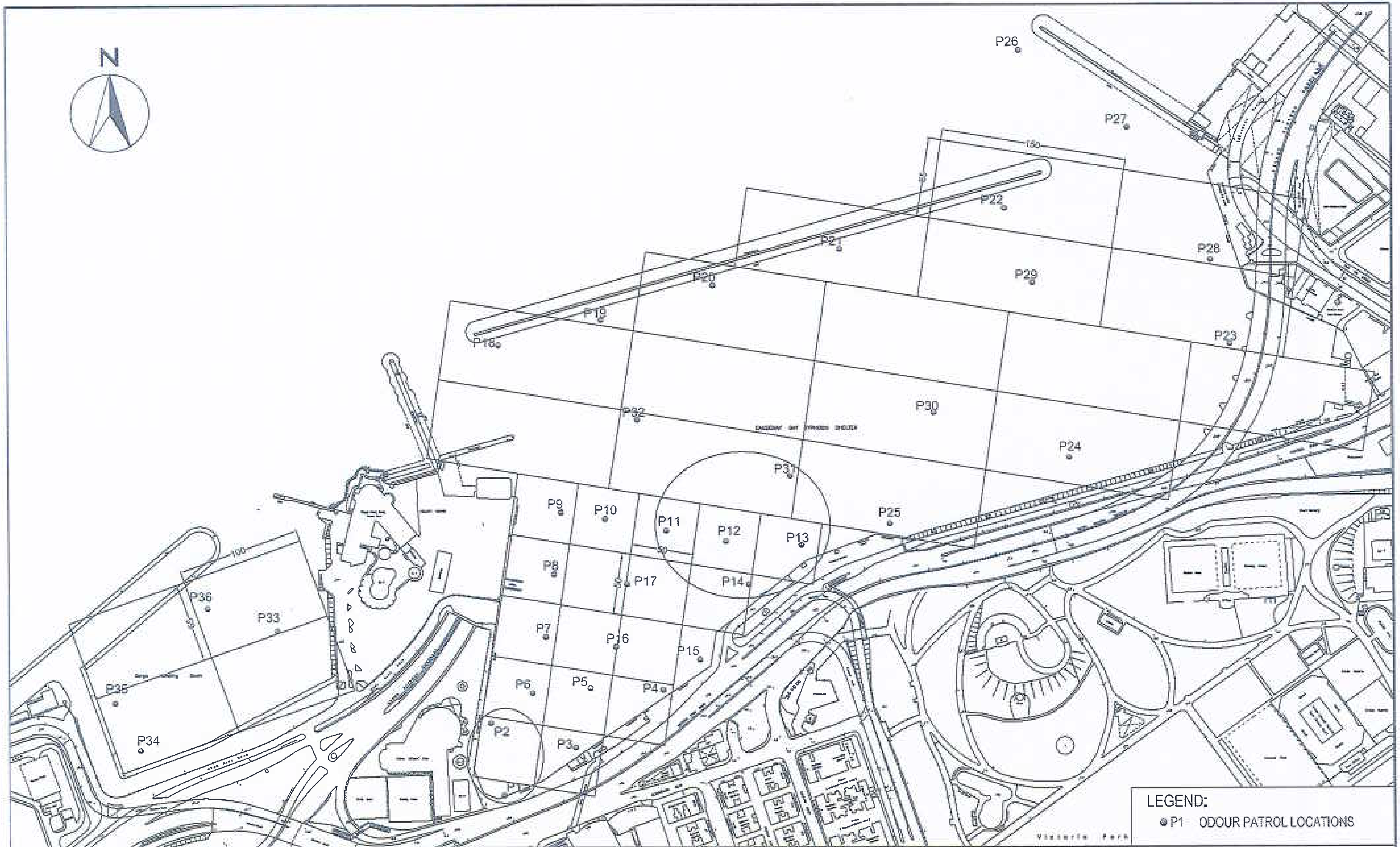
WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

PROPOSED ODOUR PATROL AREAS

FIGURE 1a

P:/60017193/REPORTS\AIR\ODOUR\ADDITIONAL SPEC\FIG1a.xls

SCALE N.T.S.



MAUNSELL | AECOM

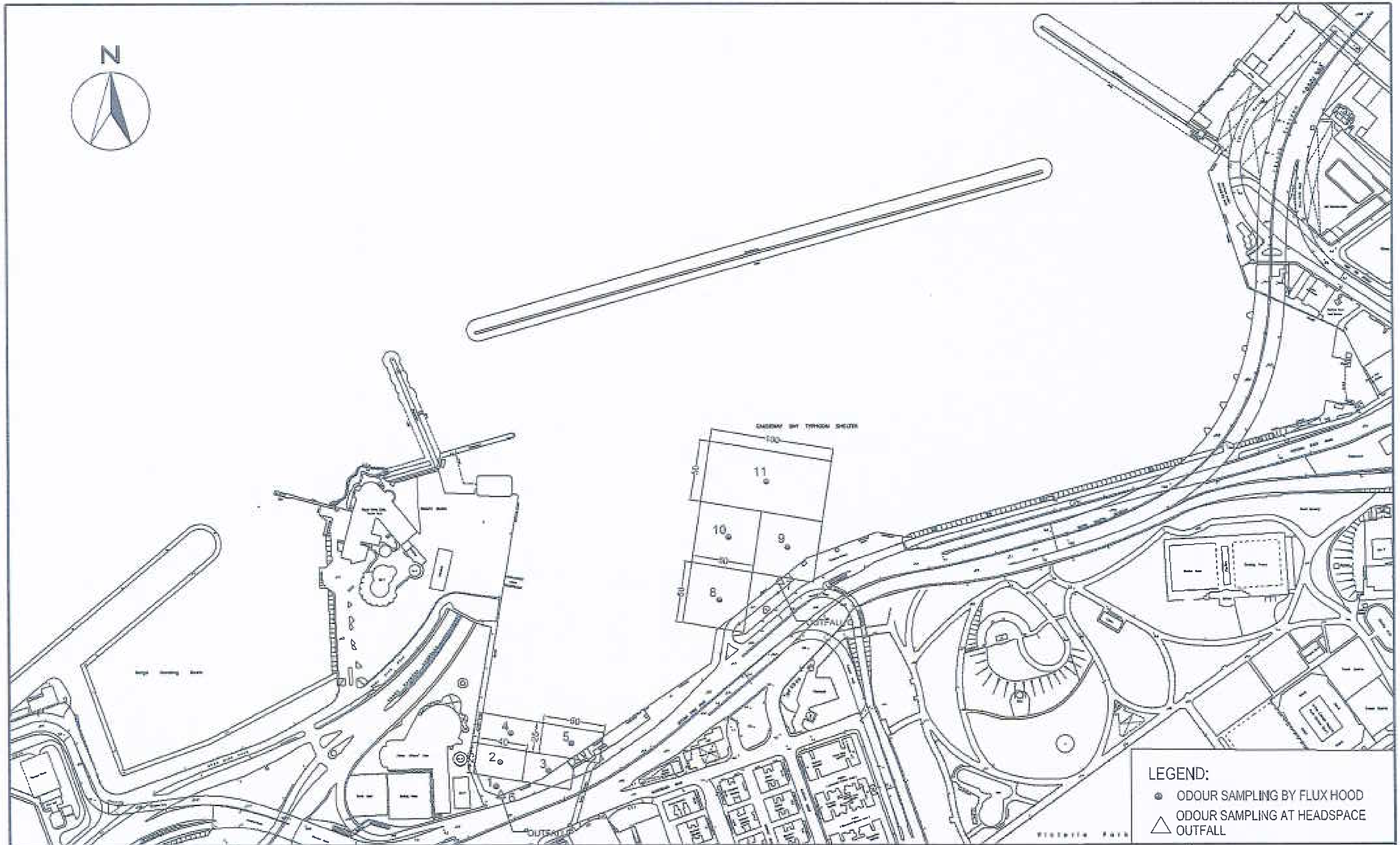
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

ODOUR PATROL LOCATIONS

FIGURE 1b

P:\60017193/REPORTS\AIR\ODOUR\ODOUR PATROL\FIG1b.DWG SCALE 1:4000 (A4)



MAUNSELL | AECOM

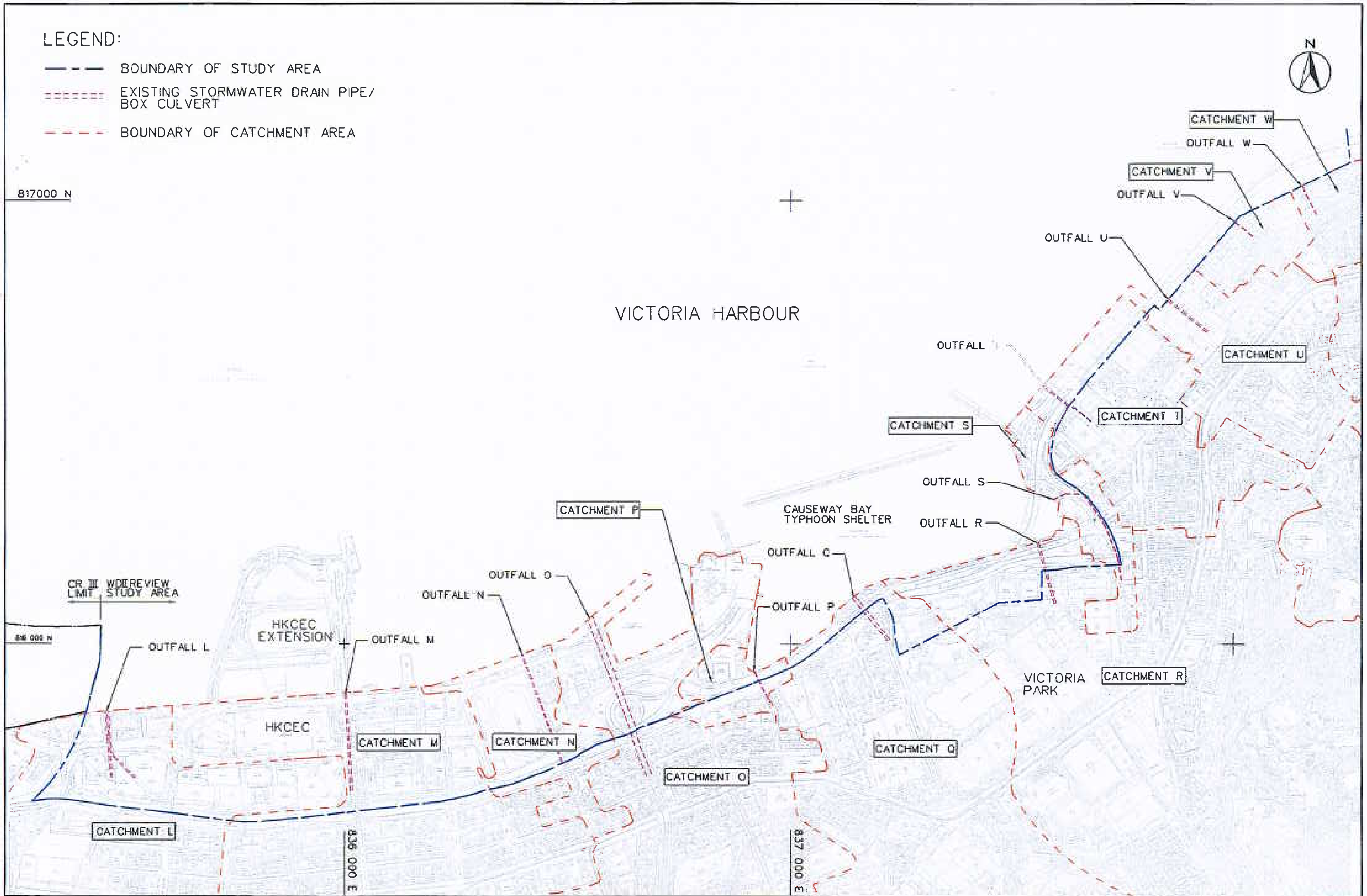
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

ODOUR SAMPLING LOCATIONS

FIGURE 2

P:/60017193/REPORTS\AIR\ODOUR\ODOUR SAMPLINGS\FIG2.DWG SCALE 1:4000 (A4)

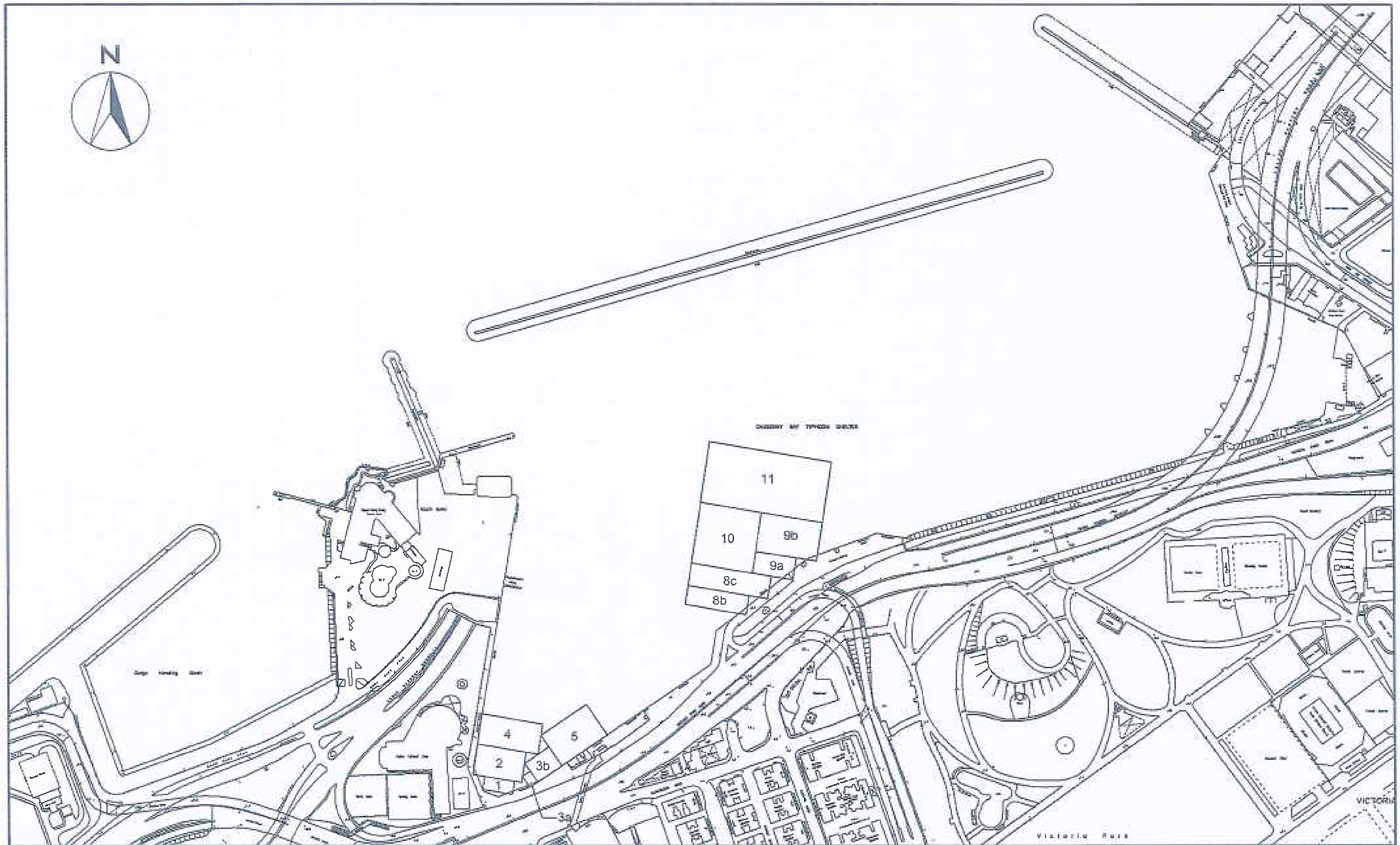


MAUNSELL

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

LOCATIONS OF EXISTING STORM OUTFALLS

FIGURE 3



MAUNSELL | AECOM

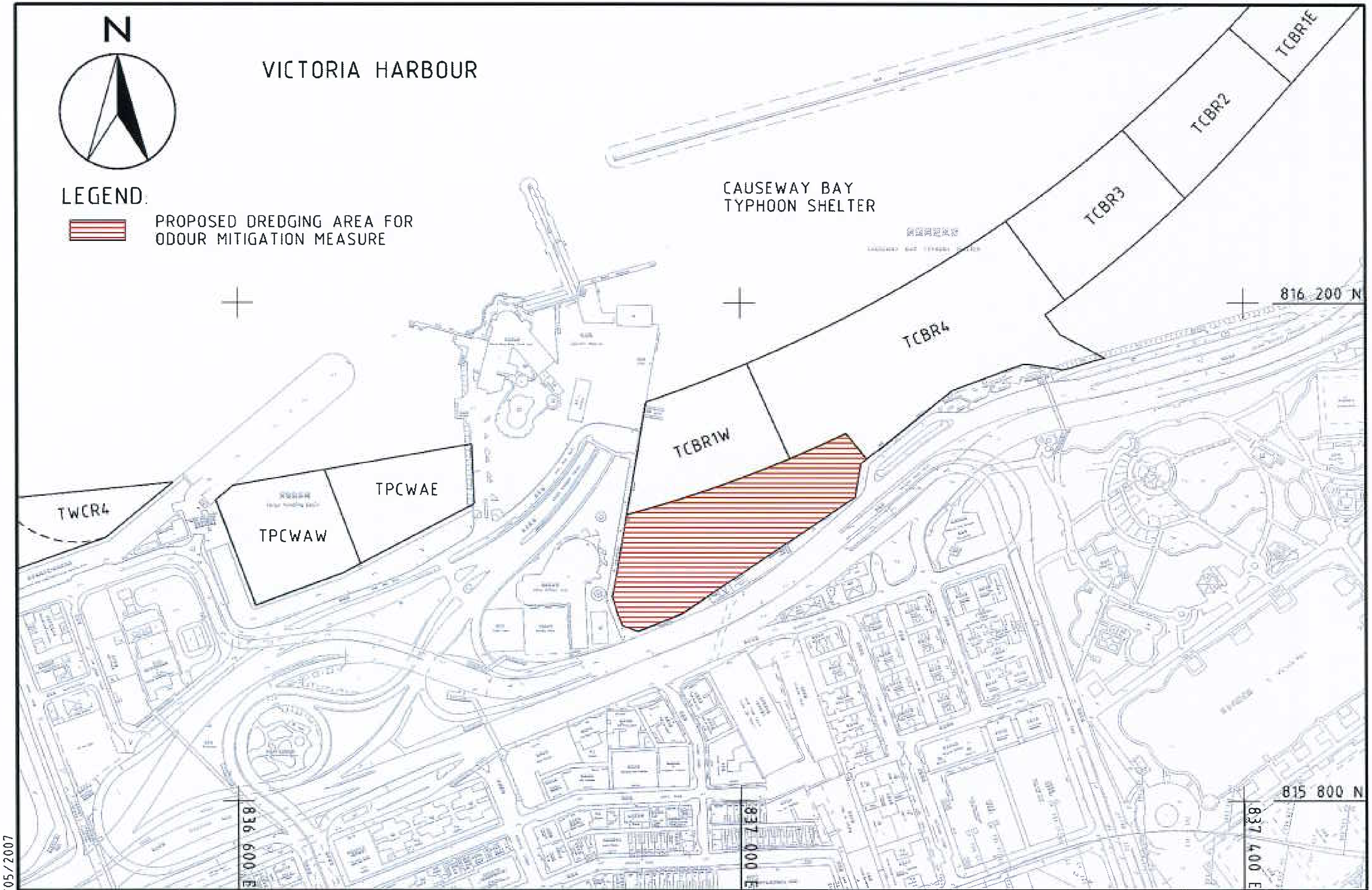
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

LOCATIONS OF ODOUR SOURCE

FIGURE 3a

P:/60017193/REPORTS\AIR\ODOUR\707_MODEL\FIG A3.14-1.DWG SCALE 1:4000 (A4)



DATE: 03/05/2007

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

PROPOSED DREDGED AREA

FIGURE 4

Annex A

Enhancement Package for Existing Odour Sources Identified At Causeway Bay Typhoon Shelter

SA1 to Agreement No. CE54/2001 (CE)
WAN CHAI DEVELOPMENT PHASE II
PLANNING AND ENGINEERING REVIEW

Wan Chai Development Phase II and Central-Wan Chai Bypass – Environmental Impact Assessment

Enhancement Package for Existing Odour Sources Identified At Causeway Bay Typhoon Shelter

1 Introduction

1.1 In the course of the environmental impact assessment for the Wan Chai Development Phase II (WDII) and Central-Wan Chai Bypass (CWB) projects, an odour survey was carried out by the Hong Kong Polytechnic University (HKPU) to survey the existing background condition of the Causeway Bay Typhoon Shelter (CBTS) and to identify any existing potential odour impact. The odour survey results indicate that the existing water area at the southwest corner of the CBTS (including the area at outfall P and Q) and the area in the vicinity of the Police Officer's Club (POC) as existing potential odour source emission area.

1.2 Despite the fact that the odour identified at the southwest corner of the CBTS is an existing condition and the WDII and CWB projects will not, by themselves, generate odour at the CBTS to worsen the existing condition, nor change the existing land uses at that corner, the implementation of WDII and CWB projects provide an opportunity to enhance the existing condition at the southwest corner of the CBTS.

1.3 This paper provides a package of enhancement measures for existing odour sources identified at the southwest corner of the CBTS for the agreement with relevant government departments. The agreed paper will be attached in the EIA Report of the WDII&CWB projects as an enhancement package.

2 Odour Sources Identified

2.1 Photos of the existing condition at the southwest corner of the CBTS are given in **Figure 1**.

2.2 According to the results from the odour survey, the water area at the southwest corner of CBTS (including the area at Outfall P and Q) and the area in the vicinity of the POC were identified as potential odour source emission area and the odour emissions were possibly due to:-

(i) the rotten organics/decayed sediment; and
(ii) polluted sewage from drainage outfall.

2.3 Other than the potential odour sources identified in the survey, the following sources are considered to have contribution to the existing odour problems at the concerned southwest corner of CBTS:-

(i) refuses discharged from the boats mooring at CBTS; and
(ii) slime attached at the seawall at the southwest corner of CBTS.

2.4 The action plan to reduce the odour impact of the above identified potential odour sources is given in the following sections.

3 Rectification of Expedient Connection

3.1 Drainage Services Department (DSD) has conducted Expedient Connection Surveys in CBTS during August 1997 and January 1999. According to the "Final Report of the Causeway Bay Typhoon Shelter Expedient Connection Surveys" (CBTSEC Final Report) under Agreement No. CE78/99 Wan Chai East and North Point Sewerage issued in October 2000, the following remedial measures were identified:-

Reconnection or Repair Works by DSD

3.2 Six expedient connections were identified and given in Table 10.1 of the CBTSEC Final Report. Out of these six expedient connections, DSD have already blocked/rectified five of them. Based on the latest information from DSD, the remaining one is scheduled for completion in 2008.

Serving orders under Buildings Ordinance to Private Property Owners for Rectification of Defective Drainage and Unauthorized Connection of Drainage inside Premises by BD

3.3 Polluted flows were identified in the CBTSEC Final Report as being directly discharged from buildings into the stormwater system. In these cases, the problem cannot be resolved by construction works in the public systems. Rectification have to be undertaken by the owners themselves through enforcement of the Buildings Ordinance by Buildings Department (BD).

3.4 A list of buildings where polluted flows into the stormwater system were identified and given in Appendix E of the CBTSEC Final Report.

Enforcement of WPCO by EPD and PHMSO by FEHD to Control Unauthorized Discharge

3.5 Locations where waste effluents, such as food waste, cleaning waste and waste oil are disposed of into the stormwater drainage system through road or footpath gullies were also identified in the CBTSEC Final Report. These problems do not involve misconnections. Enforcement of both the Water Pollution Control Ordinance (WPCO) by EPD and the Public Health and Municipal Services Ordinance (PHMSO) by FEHD are required.

3.6 Through periodic monitoring in a joint effort by EPD & FEHD in the back alleyways of restaurants and within market areas, illegal discharges of polluted flows into channelled gullies can be controlled. Often by performing periodic inspections, EPD/FEHD would be able to deter restaurants from completing dishwashing duties in the alleyways which is another detrimental source of pollution to the storm water system.

3.7 Educational materials showing procedures in properly disposing rubbish in back alleyways could also help in controlling the pollution leached out of basket garbage containers which often line the U-channels along back alleyways.

3.8 Careful monitoring of automobile garages and small industrial business also would deter further irresponsible behaviour.

3.9 The results of defective nodes which involve pollution control are given in Appendix G of the CBTSEC Final Report.

Further Investigation to Identify Sources of Pollution inside Private Premises

3.10 The CBTSEC Final Report also recommends further surveys within private premises to confirm the source of polluted flows. The proposed field investigation include interviews with private owners or managers for updated layout of sewerage and drainage systems within private premises and dye tests within the private premises to investigate connectivity between sewerage/drainage systems.

3.11 List of buildings for future pollution control investigations was given in Appendix F of the CBTSEC Final Report.

3.12 Under Agreement No. CE74/98 "Comprehensive Feasibility Study of Wan Chai Development Phase II" (WDIICFS), TDD (the former CEDD) carried out an Expedient Connection Survey of the storm water catchments affected by the WDII project in 2000. The results are given in the "WDII Expedient Connection Survey Final Report" (WDIIEC Final Report). The coverage of the WDIIEC Final Report includes not only the CBTS but extents from catchment L (Luard Road) at the east to catchment S (Gordon Road/Whitfield Road) at the west. The recommended remedial measures given in the WDIIEC Final Report are similar to the four categories of measures proposed in the CBTSEC Final Report but for different locations identified. The identified expedient connection manholes with recommendations for each location are given in Appendix A of the WDIIEC Final Report.

3.13 It is recommended to implement the proposed remedial measures recommended in the CBTSEC Final Report and the WDIIEC Final Report, some of which are on-going actions already undertaken by DSD, EPD and FEHD, to improve the existing problem with expedient connections.

4 Refuse from User of CBTS

4.1 The existing CBTS provides shelter for pleasure and operational vessels together with a few dwelling vessels and miscellaneous craft. Currently, about 700 vessels of various types use the CBTS as a base. Barges do not use this typhoon shelter. With reference to "Ports of Hong Kong Statistic Table 2004", there are 6 licensed dwelling boats and 336 private moorings in CBTS with the 14.2 ha of water area. Out of the 14.2 ha of typhoon shelter area, 9.9 ha of area is reserved for use by pleasure vessels. It is anticipated that floating refuse in the CBTS may be discharged from the above vessels based in the typhoon shelter, in particular the dwelling boats with people living on the boats.

4.2 Marine Department (MD) is the government agent for harbour cleansing services. It operates a fleet of specialised refuse collection vessels, including six Sea Cleaners, and more than 70 contractor vessels to provide a refuse scavenging and collection service around the territory. Littering the waters of Hong Kong is an offence and liable to prosecution by MD. MD also operates 24-hour hotline for complaints about floating refuse and receiving reports on matters concerning marine littering and floating refuse. Within the CBTS, besides providing regular refuse collection vessels and prosecuting the offenders who litter the water, MD also engage good management practice by distributing garbage bags to the vessels in the typhoon shelter for collection of refuse regularly.

4.3 With the on-going regular harbour cleansing services, regular patrol and the gradual decrease in numbers of licensed dwelling boats in the typhoon shelter (government policy to stop issuing new license for dwelling boats), the problem of floating refuse from users of CBTS would be improved. MD is recommended to continue with the regular harbour cleansing services and patrol in the CBTS.

5 Existing Polluted Sediments Accumulated at the Seabed and Slime Attached at existing Seawalls

5.1 The southwest corner of the existing CBTS (including the area at outfall P and Q) will be dredged to remove the existing polluted sediments. The extent of dredging is given in **Figure 2**. The existing seawall along the southwest corner of the CBTS will be washed by high pressure water jets to detach the slime. CEDD will identify an implementation agent to carry out the above-mentioned works. Dredging inside the CBTS for the construction of the Trunk Road as shown in **Figure 2** will also improve the existing odour conditions at CBTS.

6 Conclusion

6.1 A summary of the enhancement package with the implementation agents are given in Table 1 below: -

Table 1 Summary of Enhancement Package

	Actions	Implementation Agent
Expedient Connection	Rectify the misconnections identified in the CBTSEC Final Report and WDIIEC Final Report	DSD
	Enforcement of WPCO to control unauthorized discharge with particular attention to the areas identified in the CBTSEC Final Report and WDIIEC Final Report	EPD
	Enforcement of PHMSO to control unauthorized discharge with particular attention to the areas identified in the CBTSEC Final Report and WDIIEC Final Report	FEHD
	Serving orders under Buildings Ordinance to Private Property Owners for rectification of defective drainage and unauthorized connection of drainage inside Premises with particular attention to the areas identified in the CBTSEC Final Report and WDIIEC Final Report	BD
	Further Investigation to identify sources of pollution inside Private Premises	DSD, BD and EPD
Refuse from existing CBTS users	Continue with the regular harbour cleansing services and patrol in the CBTS	MD
Existing sediments accumulated at the seabed and slime attached at the seawall	Removal of polluted sediments and slime attached at the seawall at the southwest corner of the CBTS (including the area at outfall P and Q).	CEDD*

*CEDD will identify an implementation agent

6.2 With the concerned efforts from various government departments on the implementation of above enhancement package, the potential odour sources would be significantly reduced and the future situation at the southwest corner of the CBTS (including the area at outfall P and Q) is expected to be improved as compared to the existing condition.

Figure 1 - Photos of existing condition at the southwest corner of the CBTS

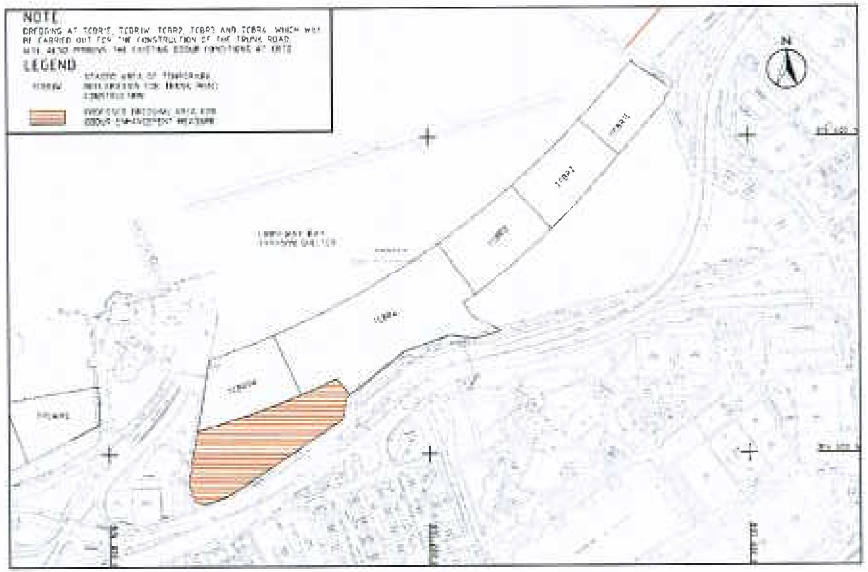


Figure 2 – Proposed dredging at the southwest corner of CBTS

MEMO

From	Director of Environmental Protection	To	Project Manager (HKI&I), CEDD
Ref.	( ) in EP860/E3/12	(Attn.:	Attn : Mr. C H NG)
Tel. No.	2516 1817 Fax. No. 2960 1761	Your Ref.	in HKI 2/4/50 EI
E-mail		Dated	6.8.2007 Fax. No. 2577 5040
Date	8 August 2007	Total Pages	1

RECEIVED
AUG 2007
HKI&I Dev. O

(By Fax Only)

Wan Chai Development Phase II – Planning and Engineering Review

Enhancement Package for Existing Odour Sources at Causeway Bay Typhoon Shelter

I refer to your above-referenced memo and have no comment on the revised notes of meeting and the revised summary of enhancement package for odour problems at CBTS.

(MA Chor Kay)
for Director of Environmental Protection

BY FAX

MEMO

From	CE/HK&I, DSD	To	PM(HKI&I), CEDD
Ref.	(9) in DSD HK 8/CE542001 Pt. 6	(Attn. :	Mr. C.H. NG)
Tel. No.	2594 7202	Your Ref.	( ) in HKI 2/4/50 EI — (
Fax. No.	2827 6657	Dated	6.8.2007 Fax. No. 2577 5040
Date	8 August 2007	Total Pages	1

HKI&I Dev. Office
13 AUG 2007
RECEIVED

Wan Chai Development Phase II – Planning and Engineering Review

Enhancement Package for Existing Odour Sources at Causeway Bay Typhoon Shelter

I refer to your memo under reference and have no comment on the revised draft notes of meeting.

(C.T. Tse)
for Chief Engineer / Hong Kong & Islands
Drainage Services Department

(E)

MEMO

From	SBS/B2, Buildings Department	To	Project Manager(HKI & I),CEDD
Ref. (10) in	BD A&B/OA/329	(Attn.:	Mr. C H NG)
Tel. No.	2626 1657	Your Ref. in	HKI 2/4/50 EI
Fax. No.	2524 3291	dated	6.8.2007 Fax. No. 2577 5040
Date	9 August 2007	Total Pages	1

Wan Chai Development Phase II – Planning and Engineering Review

Enhancement package for Existing Odour Sources at Causeway May Typhoon Shelter

With regard to your memo dated 6.8.2007 with enclosures, I would like to suggest the following amendments to tie in with the revised notes of meeting for your consideration please:-

The wording of "according to the departmental enforcement policy" should be added before "inside Premises with particular attention to the areas identified in the CBTSEC Final Report and WDIIEC Final Report" in the 4th item under actions column of Appendix B.

(K H YU)
SBS/B2
Buildings Department

+ 852 2581 1765

P.01/02

By Fax

Maunsell Consultants Asia Ltd.
Received 13 AUG 2007
Reg. No. 1313
File No. 47103/1a6
Project Eng. PMC
Others
Copied To CAKM

MEMO

From	Director of Marine	To	Project Manager/HKI&I, CEDD
Ref.	(38) in PA/S 492/41/7 (42)	(Attn.:	Mr. C. H. Ng
Tel. No.	28524350	Email	
Fax. No.	25811765	Your Ref.	in HK12/4/60 Pt.
Email	mk_chan@mardep.gov.hk	Dated	06.08.07 Fax. No.
Date	9 August 2007	Total Pages	2

Wan Chai Development Phase II – Planning and Engineering Review

Enhancement Package for Existing Odour Sources at Causeway Bay Typhoon Shelter

Thank you for the revised notes of meeting and the revised summary of the enhancement package for mitigating odour problems identified at CBTS.

2. The following 'Post Meeting Note' is suggested to insert under Para. 12 please:- "[Post Meeting Note : MD replied on 31.7.2007, since floating refuse was not a source of odour and that just by removing the floating refuse would not alleviate the odour at all, MD considered that continuing with the existing harbour cleansing service would be suffice to serve the purpose.]

3. In response to your CK Lam's suggestion made in the meeting, that some kind of floating refuse would contribute to odour problem, please note that 'floating refuse' is solid insoluble floating substances that could be collected by pole nets from cleansing boats, and thus should not become a source of odour. Whereas kitchen exhausts, both in the forms of floating grease and sediments, are best to be curbed before entering the confined waters of the TS, which would probably controlled under WPCO.

4. As far as we understand it, most of the refuse and odour generating substances are coming from land. For the enhancement works to be fruitful, the Review should aim at disallowing/minimizing odour generating substances from the land entering into the confined waters of CBTS. As a matter of facts, condition of floating refuse of the CBTS is being regularly and frequently monitored by MD and so far, the overall condition has been satisfactory for most of the time. I believe this message had been passed to the meeting by my colleague attended the meeting.

5. While noting that the meeting had 'agreed that the scope of the enhancement package should cover those that were discharging pollutants to CBTS', regarding 'Table 1 – Summary of Enhancement Package', we would like to re-iterate that, 'regular harbour cleansing services and patrol in the CBTS' would already serve the purpose. As stated in our email to you on 31.7.2007, MD will no doubt continue to devote effort to keep the Victoria Harbour reasonably cleared of floating refuse.

(M. K. Chan)
Senior Marine Officer/Planning & Development
for Director of Marine

c.c.

SDEV	(Attn – Mr. Michael Leung)	Fax : 25371961
CE/HKI&I, DSD	(Attn – Mr. Tse Chau Tong)	28276657
DEP	(Attn – Mr. Arthur CK Ma)	29601761
SBS/B2, BD	(Attn – Mr. K. H. Yu)	26261763
FEHD	(Attn – Mr. W. Y. Yuen)	25196884
FEHD	(Attn – Mr. W. C. Lai)	25658203
CHE/MW2, HyD	(Attn – Mr. CY Wong/HT Leung)	27145289
MCAL	(Attn – Mr. Eric Ma/Ms. Carmen Au)	26912649
ENSR	(Attn – Ms. Anna Ciiung)	28910305

Internal

MO/PCU

----- Forwarded by CH NG/CEDD/HKSARG on 13.09.2007 18:42 -----

wyyuen@fehd.gov.hk

02.08.2007 11:42

To: chng@cedd.gov.hk
cc: wclai@fehd.gov.hk
Subject: Notes of Meeting held on 6.7.2007

Our Ref.: (10) in FEHD WCH(ENH)(C) 148/209

Your Ref.: ( ) in HKI 2/4/50 EI

We just spoke earlier on on the caption.

I have the following comments:

Re: Paragraph 4 of Notes of Meeting

Mr. Yuen and Mr. Lai of FEHD said that they had the duty to control unauthorised discharge of grease from licensed food premises under the Public Health and Municipal Services Ordinance, Chapter 132....

I should be grateful if you would amend the Notes of Meeting according.

ENDS

----- Forwarded by CH NG/CEDD/HKSARG on 21.09.2007 14:56 -----

wclai@fehd.gov.hk
21/09/2007 14:53:54

To: chng@cedd.gov.hk
cc: cslaw@fehd.gov.hk
wyyuen@fehd.gov.hk
Subject: 轉寄： Wan Chai Development Phase II- Planning and Engineering Review-Enhancement Package for Existing Odour Sources at Causeway Bay Typhoon Shelter

EDMS No.: Doc. Src.:

Dear Mr NG,

I have no further comment, pl.

Regards,

LAI Wing-chi
SHI(EH)E4/FEHD
Tel. 3103 7014
Ref.(9) in FEHD E 105/763/111
----- Forwarded by Wing Chi LAI/FEHD/HKSARG on 21/09/2007 14:51 -----

CH NG@CEDD

20-Sep 2007 11:51

To: Wing Chi LAI/FEHD/HKSARG@FEHD

cc

|------------|
[ ] Urgent

[ ] Return
Receipt

Subject: 轉寄： Wan Chai Development Phase II- Planning and Engineering Review-Enhancement Package for Existing Odour Sources at Causeway Bay Typhoon Shelter

Dear Mr Lai,

Can't reach you by phone.
Please advise whether you have any comments on the revised notes of meeting and summary of enhancement package for mitigation odour problems at Causeway Bay Typhoon Shelter which was sent to you vide my memo ref HKI2/4/50EI dated 24.8.07. Your prompt reply is highly appreciated. Sorry for the rush.

Regards,
Richard NG
for PM/HKI&I, CEDD

Tel: 2231 4419

----- Forwarded by CH NG/CEDD/HKSARG on 20.09.2007 11:47 -----

wyyuen@fehd.gov.hk

To: chng@cedd.gov.hk

20/09/2007
11:33:16 cc:
Subject: 轉寄： Wan Chai Development Phase II-
Planning and Engineering
Review-Enhancement Package for Existing Odour
Sources at Causeway Bay Typhoon
Shelter
|------------|
| [ ] Urgent |
|------------| |-------------------|
| [ ] Return Receipt
|
|-------------------|
EDMS No.: Doc.
Src.:

----- Forwarded by Wei Yan YUEN/FEHD/HKSARG on 20/09/2007 11:32 -----

Wei Yan YUEN

CHI(Wch)1

To
20-Sep 2007 11:29 cheng@cedd.gov.hk

|------------|
cc
| [ ] Urgent | Wing Chi LAI/FEHD/HKSARG

|------------|
Subject
|----------------| Wan Chai Development Phase II-
Planning and Engineering Review-Enhancement
| [ ] Return | Package for Existing Odour Sources
at Causeway Bay Typhoon Shelter
| Receipt |

|----------------|

Our Ref.: (16) in FEHD WCH(ENH)(C) 148/209

Your Ref.: in HKI 2/4/50 EI

Your MUR.

I have the following comments:

Re: Line 6 of Item 4 of the revised notes of meeting

The word " wastewater" should be replaced by "grease water".

ENDS

+852 2119 9062

Maunsell Consultants Asia Ltd.
Received - 5 AUG 2007
Reg. No. 7308
File No. 97103/10.6
TS DLO EMSC ML CW Sign Off
AKWL MCP SAR FSKY
SHRS TKH TKST YY HTS
WCH JYL CWN PMC
Project Eng. CAKM
Others PMC
Copied To CAKM
Reply Date

Urgent by Fax

MEMO

From Project Manager(HKI&I), CEDD
Ref. in HKI 2/4/50 EI
Tel. No. 2231 4419 Fax. No. 2577 5040
E-mail chng@cedd.gov.hk
Date 6 August 2007

To Distribution
(Attn.:
Your Ref. in
dated Fax No.
Total Pages 1 + encl.

Wan Chai Development Phase II – Planning and Engineering Review

Enhancement Package for Existing Odour Sources at Causeway Bay Typhoon Shelter

I refer to my memo of the same series of 31.7.2007 and attach for your consideration the further revised notes of meeting and the revised summary of the enhancement package for mitigating odour problems identified at Causeway Bay Typhoon Shelter (CBTS).

2. After the circulation of the revised notes of meeting on 31.7.2007, comments were received. The notes of meeting have been revised with the following amendments:

(a) Para 4 – The first sentence was amended according to FEHD's comment.
(b) Appendix B – The revised summary of enhancement package for odour problems at CBTS based on the discussion at the meeting on 6.7.2007 is attached.

3. In view of the tight implementation programme of Wan Chai Development Phase II, I would be grateful for your reply **by 9 August 2007**. Nil return is required for record purpose.

(C H NG)
for Project Manager(Hong Kong Island & Islands)
Civil Engineering and Development Department

Distribution – with encl.

SDEV	(Attn: Mr Michael LEUNG)	Fax No.: 2537 1961
CE/HK&I, DSD	(Attn: Mr TSE Chau Tong)	Fax No.: 2827 6657
DEP	(Attn: Mr Arthur C K MA)	Fax No.: 2960 1761
Director of Marine	(Attn: Mr S S CHAN)	Fax No.: 2581 1765
Director of Marine	(Attn: Mr M H LEUNG)	Fax No.: 2543 6877
SBS/B2, BD	(Attn: Mr K H YU)	Fax No.: 2626 1763
FEHD	(Attn: Mr W Y YUEN)	Fax No.: 2519 6884
FEHD	(Attn: Mr W C LAI)	Fax No.: 2565 8203
CHE/MW2, HyD	(Attn: Mr CY WONG/Mr HT LEUNG)	Fax No.: 2714 5289

c.c. - with encl.

MCAL	(Attn: Mr Eric Ma/Ms Carmen Au)	Fax No.: 2691 2649
ENSR	(Attn: Ms Anna CHUNG)	Fax No.: 2891 0305

Wan Chai Development Phase II - Planning and Engineering Review
Enhancement Package for Existing Odour Sources at Causeway Bay Typhoon Shelter

Notes of Meeting

Date:	6 July 2007 (Friday)
Time:	9:30 a.m. – 12:30 p.m.
Venue:	13/F Conference Room, North Point Government Offices 333 Java Road, North Point, Hong Kong

Present:

Mr S K Lam	CE/HK2, HKI&I, CEDD (Chairman)
Mr C K Lam	SE/PM, HKI&I, CEDD
Mr Bosco Chan	SE5, HKI&I, CEDD (Mr Bosco Chan joined the meeting at 12:00 noon for discussing the option of carrying out dredging of polluted sediments under the CWB project. All the representatives of MD, BD, DSD and EPD left the meeting at this time.)
Mr Richard Ng	E1, HKI&I, CEDD (Secretary)
Mr Michael Leung	AS(PM)3, DEVB
Mr Arthur Ma	EPO, EPD
Mr C T Tse	E/EW1, DSD
Mr S S Chan	Marine Officer, MD
Mr M H Leung	Marine Inspector, MD
Mr K H Yu	SBS/B2, BD
Mr C Y Wong	SE1/CWB, HyD
Mr H T Leung	SE2/CWB, HyD
Mr W C Lai	Sr Health Inspector (Env Hygiene)4, FEHD
Mr W Y Yuen	Ch Health Inspector, FEHD
The Consultants	
Mr Eric Ma	MCAL
Ms Carmen Au	MCAL
Ms Anna Chung	ENSR

	Action
1. **The Chairman** welcomed representatives from bureau and departments concerned and stated that the purpose of the meeting was to discuss the Consultants' suggested enhancement package for existing odour sources at Causeway Bay Typhoon Shelter, a paper on which was circulated to the bureau and departments concerned before the meeting. Table 1 of this paper listed out the proposed enhancement measures and the responsible departments (copy attached in **Appendix A**). He would like to have agreement from the responsible departments to this list so that the list could be put in the EIA report for the WDII and CWB projects which	

Action

were under preparation.

Expedient Connection

2. Regarding the rectification of misconnections as identified in the "Final Report of the CBTS Expedient Connection Surveys (CBTSEC Final Report)" and "WDII Expedient Connection Survey Final Report (WDIIEC Final Report)", **Mr Tse of DSD** reported that all the expedient connections as identified in the CBTSEC Final Report would be rectified by 2008 and those identified in the WDIIEC Final Report would be rectified by 2009. DSD

3. **Mr Ma of EPD** said that EPD had carried out investigations and necessary enforcements under Water Pollution Control Ordinance (WPCO) for those unauthorized discharges identified for EPD's action in CBTSEC Final Report. Nevertheless, **Mr Ma of EPD** supplemented that their Local Control teams had the duty to enforce WPCO to control illegal discharge and would continue to carry out investigations and enforcements upon receipt of complaints against illegal discharges. **Mr Ma of EPD** commented that the recommended measures in WDIIEC Final Report were widely spread from Wan Chai to North Point so he suggested and **the Meeting** agreed that the scope of the enhancement package should cover those that were discharging pollutants to CBTS. EPD

4. **Mr Yuen and Mr Lai of FEHD** said that they had the duty to control unauthorized discharge of grease from licensed food premises under the Public Health and Municipal Services Ordinance (PHMSO) as identified in CBTSEC Final Report and in WDIIEC Final Report. They added that all the food industries (e.g. restaurants) would be license-controlled by FEHD. Under the license conditions, all the wastewater from the food industries should pass through a grease trap and then discharged to the public sewerage system. They supplemented that FEHD had regular patrol to those licensed food industries to control the illegal discharge.

5. Regarding the illegal discharges of polluted flows at the back alleyways of food industries into channeled gullies, both **EPD** and **FEHD** confirmed that these activities could be controlled under WPCO and PHMSO. However, **EPD** commented that they might have difficulties to collect evidence for prosecution against these kinds of occasional misbehaviours.

6. **Mr Yu of BD** advised that the fourth bullet of Expedient Connection in Table 1 should be amended to "*Serving orders under Buildings Ordinance* to Private Property Owners for Rectification of *defective drainage* inside .....".

7. **Mr Yu of BD** commented that they would have resources problem to deal with all those buildings as identified in the two Reports within a short timeframe. Nevertheless, **Mr Yu of BD** said that they had the duty to deal with defective drainage and unauthorized connection of drainage

Action

according to the departmental enforcement policy. **Mr Yu of BD** further explained that follow-up action on the buildings would be in accordance with the departmental enforcement policy. The enforcement policy could not be revised to suit the target of combating those buildings that would contribute pollutions to CBTS.

8. **Mr Yu of BD** said that they had previous experience in carrying out joint operations with other government departments to deal with building and drainage problems arising from private premises in other large scale operation. Further discussion on joint operations in dealing with drainage problems from private premises would be required. — BD, EPD and DSD

9. **Mr Yu of BD** further commented that statutory orders instead of abatement notices would be served by BD. In response to the request from Mr Yu of BD for records of defective drainage within private lots, MCAL replied that the records under the WDIIEC Final Report were not available because no investigations inside private lots had been carried out at that time.

<u>**Floating Refuse from Existing CBTS users**</u>

10. **Mr Chan of MD** commented that the floating refuse found at CBTS mainly were plastic bottles, foam cups and plastic bags. These materials would not generate odour and therefore should not form part of the enhancement package. **Mr C K Lam of CEDD** responded that some kind of floating refuse would contribute to odour problem. **Mr Chan of MD** said that they had a designated sampan for collecting all floating refuse but not floating grease within CBTS every day. Also, he said that MD would distribute garbage bags to the vessels in the CBTS for collection of refuse regularly. **MD** added that as there was only 6 licenced dwelling boats at CBTS and this kind of licence for new boat would not be issued under the current policy, the problem of floating refuse from dwelling boats would be improved with time.

11. Upon **the Chairman's** enquiry on the control of sewage discharge from the vessels, **Mr Chan of MD** responded that the existing vessel license conditions covered vessel safety and fire fighting equipment but not covered the control of sewage discharge. **The Chairman** requested **EPD** to check whether this act would be controlled under the WPCO. — EPD

12. **Mr Chan of MD** generally agreed with the findings as stated in the working paper but he had reservation on the wording "reinforce the regular harbour cleansing ......" as stated in Table 1 of the working paper because he could not quantify the extent of additional work load. The **Chairman** suggested that the wording be changed to "reinforce, *if necessary*, the regular harbour cleansing ......". **Mr Chan of MD** responded that they needed further consideration and would reply to **the Chairman** later. — MD

Action

Existing Polluted Sediments at the Seabed and Slime attached at the Seawall

13. Regarding the implementation of the dredging of polluted sediments, **Mr Wong of HyD** said that the dredging works at those areas other than the construction of CWB tunnel inside Causeway Bay Typhoon Shelter (CBTS) could be included in their CWB construction contract if CEDD could entrust this part of works to HyD. He commented that the gazettal of the CWB under the Roads (Works, Use and Compensation) Ordinance could not cover the areas for dredging of sediments to improve odour impact so he considered that CEDD needed to clear all the statutory procedures before the entrustment. CEDD

14. **The Chairman** responded that under the current WDII Review proposals, no work would be carried out in the CBTS under the WDII project. The dredging of polluted sediments therefore could not be included as part of this project. As the dredging of the polluted sediments was proposed in response to the strong public aspirations during the HER public participation exercises that the water quality problem in CBTS should be resolved during the construction of CWB, such dredging works should be considered as works incidental to the CWB project. He considered that it would be more appropriate to include the dredging works within the scope of the CWB project, instead of the WDII project. **HyD** maintained their above views. Hence, CEDD and HyD would escalate the matter for resolution. HyD & CEDD

15. **Mr Chan of CEDD** said that the dredging of polluted sediments would have beneficial effect on the water quality for those cooling water intakes within CBTS during the construction of the CWB tunnel. As such, he considered that it would be more appropriate to include the dredging works within the scope of the CWB project.

16. Upon the **HyD's** enquiry on the extent of the dredging of polluted sediments in the CBTS, **Mr C K Lam of CEDD** responded that the south-west corner of the CBTS was identified as the polluted areas for dredging according to the preliminary findings of the EIA study. He added that additional odour patrol and sampling to cover the whole CBTS would be carried out in response to EPD's comments, and the actual extent of dredging of polluted sediments would be finalized in July/August 2007.

Implementation Time Frame

17. **Mr C K Lam of CEDD** said that a tentative implementation programme for the works as mentioned in the enhancement package would be required under the Study Brief of the EIA for the WDII and CWB projects. He highlighted that the completion date, including the completion date for further investigation together with the follow-up mitigation measures, could be set at 2016 because it was the target date for opening the CWB to the public. **The Meeting** raised no objection to

	Action
this target completion date but **Mr Yu of BD** expressed concerns that the two expedient connections reports as mentioned in paragraph 2 had not provided adequate evidences to show the extent of defects and rectification works required. However, BD would aim to complete the identified defective drainage and unauthorized connection by the target date.	BD

Any Other Business

18. There being no other business, the meeting was adjourned at 12:30 p.m.

Post Meeting Note

19. Based on the comments received from the relevant departments, the revised summary table of enhancement package with the implementation agents is attached in **Appendix B**.

* * * * *

6 Conclusion

6.1 A summary of the enhancement package with the implementation agents are given in Table 1 below: -

Table 1 Summary of Enhancement Package

	Actions	Implementation Agent
Expedience Connection	Rectify the misconnections identified in the CBTSEC Final Report and WDIIEC Final Report	DSD
	Enforcement of WPCO to Control Unauthorized Discharge with particular attention to the areas identified in the CBTSEC Final Report and WDIIEC Final Report	EPD
	Enforcement of PHMSO to Control Unauthorized Discharge with particular attention to the areas identified in the CBTSEC Final Report and WDIIEC Final Report	FEHD
	Serving Abatement Notices to Private Property Owners for Rectification of Misconnections inside Premises with particular attention to the areas identified in the CBTSEC Final Report and WDIIEC Final Report	BD
	Further Investigation to Identify Sources of Pollution inside Private Premises	DSD, BD and EPD
Refuse from existing CBTS users	Continue with and reinforce the regular harbour cleansing services and patrol in the CBTS	MD
Existing sediments accumulated at the seabed and slime attached at the seawall	Removal of sediments and slime attached at the seawall at the southwest corner of the CBTS during construction of CWB project	HyD (Contractor of the CWB project)

6.2 With the concerned efforts from various government departments on the implementation of above enhancement package, the potential odour sources would be reduced and the future situation at the southwest corner of the CBTS is expected to be improved as compared to the existing condition.

Appendix B

Revised Summary of Enhancement Package for Mitigating Existing Odour Sources Identified at Causeway Bay Typhoon Shelter

	Actions	Implementation Agent
Expedient Connection	Rectify the misconnections identified in the CBTSEC Final Report and WDIIEC Final Report	DSD
	Enforcement of WPCO to control unauthorized discharge with particular attention to the areas identified in the CBTSEC Final Report and WDIIEC Final Report	EPD
	Enforcement of PHMSO to control unauthorized discharge with particular attention to the areas identified in the CBTSEC Final Report and WDIIEC Final Report	FEHD
	Serving orders under Buildings Ordinance to Private Property Owners for rectification of defective drainage and unauthorized connection of drainage inside Premises with particular attention to the areas identified in the CBTSEC Final Report and WDIIEC Final Report	BD
	Further investigation to identify sources of pollution inside Private Premises	DSD, BD and EPD
Refuse from existing CBTS users	Continue with the regular harbour cleansing services and patrol in the CBTS	MD
Existing sediments accumulated at the seabed and slime attached at the seawall	Removal of polluted sediments and slime attached at the seawall at the southwest corner of the CBTS	CEDD*

* CEDD will identify an implementation agent.

Urgent by Fax

MEMO

From	Director of Environmental Protection	To	Project Manager/HKI&I, CEDD
Ref. in	EP2/H4/S3/15 Pt.2	(Attn.:	Mr. C. K. Lam)
Tel. No.	2835 1155	Your Ref. in	HKI 2/4/50 EI
Fax. No.	2591 0558	dated	7.9.07 Fax. No. 25775040
Date	10 September 2007	Total Pages	1

Environmental Impact Assessment Ordinance (EIAO)
Project Title: Wan Chai Development Phase II and Central-Wan Chai Bypass
EIA Study Brief No. 153/2006
<u>Fleet Average Emission Factors and EMFAC-HK Model Assumptions</u>

I refer to your memo under reference on the above subject and a letter from your consultant, ENSR/Maunsell (ref: 6017193/C/SWCW708101) dated 10 August 2007 submitting the revised EMFAC-HK Model assumptions and fleet average emission factors for our agreement under Section 3.4.5.3(v)(b) of the EIA Study Brief No. ESB-153/2006.

2. Please be informed that after taking into the advice from our air assessment section, the submission is considered as basically acceptable for the Project. Nevertheless, CEDD and the consultant should note that according to Section 3.4 of the EIAO-Technical Memorandum, the assessment shall be based on the best available information at the time of the assessment.

3. Given the above, agreements are hereby given under the following requirements of the captioned EIA Study Brief for you to carry out the air quality assessment as proposed and explained in the submission:

Reference in the Study Brief Stipulating the Requirements	Description
Section 3.4.5.3(v)(b)	EMFAC-HK Model assumptions and fleet average emission factors

4. Please note that above agreements are only for the concerned requirements under the EIA Study Brief and shall not prejudice the EPD's final decision on approval of the EIA report to be submitted under the EIAO. If there is any significant change in circumstances, project design/details or assessment methodology/assumptions, etc. CEDD and the consultant should review the situations; carry out necessary updating/revisions; and seek our advice whether further agreements under the EIA Study Brief are necessary.

5. You are also reminded that the requirements on documentations of key assessment assumptions, limitations of assessment methodologies and related prior agreement(s) with the DEP as stipulated under Section 3.4.14 of the EIA Study Brief shall be followed.

(Victor YEUNG)
Senior Environmental Protection Officer
for Director of Environmental Protection

<u>c.c.:</u>
ENSR/Maunsell (Attn: Mr. Freeman Cheung Fax: 28910305
and Mr. Peter Cheek) Fax: 26912649

<u>c.c. internal:</u> S(SA)5, E(MA)31

\\EIA0 WDII CWB\CEDD SB3.4.5.3vb EMFACagree.doc

ENSR | AECOM

FILE

MAUNSELL | AECOM

A01604

FAXED
DATE 13/8/07.

ENSR Asia (HK) Ltd.
(formerly Maunsell Environmental Management Consultants Ltd)
11/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong
安社亞洲(香港)有限公司
(前茂盛環境管理顧問有限公司)
香港新界沙田鄉事會路 138 號新城市中央廣場 2 座 11 樓
T +852 2893 1551 F +852 2891 0305 www.ensr.aecom.com www.maunsell.aecom.com

Your Ref: -
Our Ref: 60017193/C/SWCW708101

By Hand

Environmental Protection Department
Metro Assessment Group
27th floor, Southern Centre,
130 Hennessy Road
Wan Chai, Hong Kong

Attn: Mr. Raymond Lai

10 August, 2007

Dear Sir,

Supplemental Agreement No.1 to Agreement No. CE 54/2001(CE)
Wan Chai Development Phase II – Planning and Engineering Review
Wan Chai Development Phase II and Central-Wan Chai Bypass – EIA Study

In accordance with Clause 3.4.5.3 (v) (b) of the EIA Study Brief No. ESB-153/2006 and your comments on the air quality assessment for the captioned EIA Study dated 13 June 2007, the EMFAC-HK model have been revised. We are pleased to enclose herewith the revised EMFAC-HK model assumptions and the derived fleet average emission factors for your agreement.

Should you need any further clarification or information, please feel free to contact Ms Christine Tam at 3105 8568. Thank you for your kind attention.

Yours faithfully,
For and on behalf of
ENSR Asia (HK) Ltd.

Freeman Cheung
Executive Director

Encl.

cc CEDD – CK Lam (w/o enclosure) By fax (2577 5040)
MCAL - Peter Cheek (w/o enclosure) By fax (2691 2649)

Assumptions for EMFAC-HK Model to be Adopted in the EIA Study

Vehicle Classes

EMFAC-HK model was adopted to estimate the emission rates and inventories of exhaust, carbon monoxide, oxides of nitrogen and particulate matter.

The "vehicle fleet" refers to all motor vehicles operating on roads within this Study Area. The modelled fleet was broken down into 16 vehicle classes based on the information as shown on Table 4.4 (Registration and Licensing of Vehicle by Fuel Type) of the *"Transport Monthly Digest (May 2006)"* and the vehicle group classification was based on the definition in the *"The Annual Traffic Census 2005 – Appendix F Vehicle Classification System"*.

Referring to *"Transport Monthly Digest (May 2006)"*, there were only 0.5% of private car using diesel fuel. It was therefore assumed that all private cars would be grouped as "petrol private car" in the model in view of negligible value. The *"Transport Monthly Digest (May 2006)"* also indicated that there were 3% light good vehicle using petrol fuel. Besides, in accordance with the Up to Date Vehicle Licensed Number by Age and Technology Group Fractions launched on EPD' website, the % of LGV under MC1 is less than 7% of the total vehicle of MC1. Moreover, refer to EPD's Guideline on Modelling Vehicle Emissions Appendix 2 Implementation Schedule of Vehicle Emission Standards in Hong Kong, the implementation schedule of diesel LGV emission standards were later than petrol private car. As a conservative approach, all light good vehicles would be grouped as "diesel light good vehicle". The 16 vehicle classes which were modelled in EMFAC-HK are summarized in **Table 1** and the grouping of each vehicle class is shown in the **Annex 1**.

Table 1 Vehicle Classes in EMFAC-HK Model

Vehicle Class	Description	Fuel Type	Gross Vehicle Weight
MC1	Petrol Private Cars (PC) & Light Goods Vehicles (LGV)	Petrol	ALL
MC3	Diesel Private Cars & Light Goods Vehicles<2.5t	Diesel	<=2.5t
MC4	Diesel Private Cars & Light Goods Vehicles 2.5-3.5t	Diesel	>2.5-3.5t
MC5	Public Light Buses	LPG, Diesel	ALL

Vehicle Class	Description	Fuel Type	Gross Vehicle Weight
MC6	Light Goods Vehicles >3.5t	Diesel	>3.5-5.5t
MC7	Medium & Heavy Goods Vehicles with GVW 5.5-15t	Diesel	>5.5-15t
MC8	Medium & Heavy Goods Vehicles with GVW >=15t	Diesel	>15t
MC10	Double Deck Franchised Buses	Diesel	ALL
MC11	Motor Cycles	Petrol	ALL
Taxi3	Taxi	LPG	ALL
Taxi4	Private Light Buses <3.5t	LPG, Diesel	<=3.5t
Taxi5	Private Light Buses >3.5t	LPG, Diesel	>3.5t
Taxi6	Non- franchised Buses <6.4t	Diesel	<=6.4t
Taxi7	Non- franchised Buses 6.4-15t	Diesel	>6.4-15t
Taxi8	Non- franchised Buses >15t	Diesel	>15t
Taxi10	Single Deck Franchised Buses	Diesel	ALL

Road Grouping

Based on different road speed limits in local road and trunk road, two sets of emission factors for the two road types were calculated. Gloucester Road, Cross Harbour Road and Central Wan Chai Bypass Trunk Roads (except the tunnel section), which speed limit were 70kph, were grouped as trunk roads. Other roads within the Study Area, which design speed limit were 50kph, were grouped as local roads. The emission rates of the Trunk Roads Tunnel Section would be calculated by the tunnel engineer. Their calculations would not apply the fleet emission factor generated by EMFAC-HK model. Details of the classification of road type are presented in **Figure 1**.

Input Assumptions in EMFAC-HK

The latest model version EMFAC-HK v1.2 provided by EPD was employed in this Study. The input parameters and model assumptions made in EMFAC-HK model are summarized as follows.

Modelling Modes

As suggested in EPD guideline, "Burden mode" which can provide hourly vehicular emissions according to the diurnal variations of traffic flow, temperature, relative humidity and speed, was selected for this Project. Both CVs and MVE17G CVS output file formats were produced.

Technology Fractions

Exhaust Technology Fractions

Each vehicle class had diverse technological factors in different years. According to the underlying assumption in EMFAC-HK, each vehicle class could be modelled by the individual behaviour of unique technology groups. Each technology group represented the same vehicle class had distinct emission control technologies, similar in-use deterioration rates and responded the same to repair. It means that the vehicles from the same class had the same emission standards or specific equipment installed on them (e.g. multi-port fuel injection, three-way catalyst, adaptive fuel controls, etc) which made them had the same performance.

According to the "EPD Guideline on Modelling Vehicle Emissions" (released July 2005), it mentioned that the existing vehicle emission control programmes were included in the EMFAC-HK. It was considered that the vehicle exhaust technology fractions in EMFAC-HK model before Year 2004 was correct and can be adopted for all assessments. The project technology fractions after Year 2004 were estimated in accordance with EPD's Guideline on Modelling Vehicle Emission Standards in Hong Kong and found that it matched with the default value in EMFAC-HK. No other vehicle emission control measures were assumed in the assessment, thus the default data was assumed to be adopted in the model.

Comparing with the technology group fraction in EPD website, difference is noted for some vehicles classes in some years. The difference is directly sum of the vehicle population at the affected years. **Table 2** summarizes any difference found in exhaust technology fraction of different vehicle class comparing the default value in EMFAC-HK Model and EPD website information.

Table 2 Difference in exhaust technology fraction (comparing Default Value in EMFAC-HK Model and EPD Website Information)

Vehicle Class	Year that difference in exhaust technology fraction is noted	Population in 2016 (total: 515,348 vehicles) which have different exhaust technology fraction comparing with EPD website information
PLB	1988-1995 (Age 22-29)	There is no PLB under the Ages 22-29 in Year 2016, i.e. no difference
PrLB(4)	1986-1995 (Age 22-31)	There is no PrLB(4) under the Ages 22-31 in Year 2016 , i.e. no difference
PrLB(5)	1985-1995 (Age 22-32)	There is no PrLB(5) under the Ages 22-32 in Year 2016, i.e. no difference
PC+LGV	1992-1997 (Age 20-25)	767 vehicles belong to type PC+LGV under the Ages 20-25 in Year 2016, the contribution % in Year 2016 population = (114+86+177+190+127+73)/340,713 = 0.23%
LGV(3)	1977-1995 (Age 22-40)	1 vehicle belong to type LGV(3) under the Ages 22-40 in Year 2016, the contribution % in Year 2016 population = 1(Age24)/3,538 = 0.03%
LGV (4)	1986-1995(Age 22-31)	Only 1 vehicle belongs type LGV(4) under the Ages 22-31 in Year 2016, the contribution % in Year 2016 population = 1(Age 26)/34,075 = 0% difference
LGV(6)	1983-1995 (Age 22-34)	6 vehicles belong to type LGV(6) under the Ages 22-23 in Year 2016 and no vehicle under the Ages 24-34, the contribution % in Year 2016 population = (2+4)/27,281 = 0.02% difference
HGV(7)	1981-1995 (Age22-36)	6 vehicles belong to type HGV(7) under the Ages 22-23 in Year 2016 and no vehicle under Age 24-36, the contribution % in Year 2016 population = (3+3)/9,714 = 0.06% difference
HGV(8)	1980-1995 (Age 22-37)	55 vehicles belong to type HGV(8) under the Ages 22-28 in Year 2016 and no vehicles under the Ages 29-37, the contribution % in Year 2016 population = (24+11+15+1+1+1+2)/32,012 = 0.17%
NFB(6)	1988-1995 (Age 22-29)	There is no NFB(6) under the Ages 22-29 in Year 2016, i.e. 0% difference
NFB (7)	1987-1995 (Age22-30)	16 vehicles belong to type NFB(7) under the Ages 22-25 in Year 2016 and no vehicle under the Age 26-30, the

Vehicle Class	Year that difference in exhaust technology fraction is noted	Population in 2016 (total: 515,348 vehicles) which have different exhaust technology fraction comparing with EPD website information
		contribution % in Year 2016 population = (3+6+3+4)/2,932 = 0.55%
NFB (8)	1984, 1987-1994 (Age 23-30,33)	6 vehicles belong to type NFB(8) under the Ages 26 & 32 in Year 2016 and no vehicle under other Ages, the contribution % in Year 2016 population = (2+4)/1,179 = 0.51%
FBSD	2005-2006 (Age11-12)	4 vehicles belong to type FBSD under the Ages 11-12, the contribution % in Year 2016 population: Age11&12 = (90.8078%-86.8750%)×2 Overall contribution = 4/287 = 1.56%
FBDD	1995-2006 (Age11-22)	43 vehicles belong to type FBDD under the Ages 11-18 in Year 2016 and no vehicle under Age 19-22, the contribution % in Year 2016 population: Age11 = (90.8078%-86.8750%)×239 = 9.40veh Age12 = (90.8078%-86.8750%)×121 = 4.76veh Age13 = (90.8078%-86.8750%)×243 = 9.56veh Age14 = (90.8078%-86.8750%)×91 = 3.58veh Age15 = (90.8078%-86.8750%)×154 = 6.06veh Age16 = (82.8342%-80.0136%)×87 = 2.46veh Age17 = (80.9028%-78%)×269 = 6.86veh Age18 = (80.9028%-78.3516%)×1 = 0.03veh Overall contribution = 43/5883 = 0.73%

The exhaust technology fraction of vehicle types including PLB, PrLB(4), PrLB(5), LGV (4) and NFB(6) in the default values of EMFAC model are similar to the values in EPD website; while insignificant difference (0.02% - 1.56%) is recorded for vehicle types including PC+LGV, LGV(3), LGV(6), HGV(7), HGV(8), NFB(7), NFB(8), FBDD and FBSD. In view of negligible difference (about 0.14% of total vehicle population in the EMFAC model would be different from that in EPD website), the adoption of default values in EMFAC model for calculation of vehicle emission for Year 2016 is appropriate.

Evaporative Technology Fractions

Evaporative technology fraction in the model was based on the default value.

Vehicle Population

As recommended in the *"EPD Guideline on Modeling Vehicle Emissions"*, the latest vehicle age distribution data provided in the EPD's website, that is, the Vehicle Population in Year 2003, was used except the population of diesel private car, taxi and public light bus.

After the implementation of stringent emission standard in 1998, there was no new certification of diesel private car registration in Hong Kong. Thus, the number of diesel private car was extracted and grouped into the "petrol private car". Since diesel Taxi started to switch to LPG from Year 2001, 100% LPG taxi was therefore be assumed for assessment years namely 2016 to 2031.

Environment, Transport and Works Bureau (ETWB) implemented an incentive scheme to encourage the early replacement of diesel light buses with LPG or electric ones since 2002. In view of the environmental reported established by EPD, newly 80% of new public light buses in 2004 operating on LPG. However, as a conservative approach, the ratio of LPG and diesel public light bus in 2003 was adopted for population in future year in the assessment. Since less private light buses operating in the Study Area, the incentive scheme for private light buses would not be considered in this assessment as a conservative approach.

According to the above assumptions, vehicle population in Year 2016 is calculated and is presented in **Annex 2**.

Accrual Rate

The default accrual rates in EMFAC-HK were estimated from the local mileage data adjusted to reflect the total vehicle-mile-traveled (VMT) for each vehicle class. The default value was used.

Diurnal Variation of Daily Trips and Daily Vehicle-Mile-Travelled (VMT)

Diurnal Variation of Daily Trips

The diurnal variation of daily trips was used to estimate the start emissions of petrol vehicles, thus the trips of other vehicles would be zero. The number of trips per day of petrol vehicle was equal to the number of cold starts per day. For IEC trunk road, CWB trunk road, some slip roads of CWB and Road P2, there would not be cold start at the middle of the above roads, thus, zero vehicle trip per day was assumed for those roads. For other roads, the diurnal variation of daily trips could be estimated based on the ratio of trip/VMT in the entire territory and the Study Area. For other roads, the number of vehicle trips was calculated by the following equation:

> Vehicle Trip of Class 1 in the Study Area at hour 1 = Vehicle trip of Class 1 in the territory* at hour 1 × VMT for vehicle class 1 in the Study Area at hour 1 / VMT for vehicle class 1 in the territory

* where the trip and VMT in the territory could be read from the default data of EMFAC-HK model

Diurnal Variation of Daily Vehicle-Mile-Travelled (VMT)

Vehicle-mile-travelled (VMT) represents the total distance travelled on a weekday. The VMT was calculated by multiplying the number of vehicle which based on the forecast hourly traffic flow in Year 2031 and the length of road travelled in the Study Area. The input in the model was by vehicle/fuel/hour.

The hourly profile of traffic flow was made reference to the *"Annual Traffic Census 2005"*. The major core station along Gloucester Road (No. 1028) was selected for representing the hourly profile of all roads within the Study Area. However, the same traffic breakdown in % would be applied to all hours.

Those assumptions of producing the hourly traffic flow and the traffic breakdown were approved by Transport Department. The adopted daily trips and VMT are summarized in **Annex 3**.

<u>Hourly Temperature and Relative Humidity Profile</u>

According to the information provided by Hong Kong Observatory (HKO), there is no meteorological station at Hong Kong Island, except South Hong Kong Island. Thus, King's Park (anemometer height of 90m) and Hong Kong Observatory (anemometer height of 74m) meteorological stations are the nearest station of the Project. The characteristic of HKO meteorological station was considered to be more similar to the Study Area, thus the hourly temperature and relative humidity of HKO meteorological station were adopted for the model input.

<u>Speed Fractions</u>

The speed limits of each road were made reference to the Traffic AIDs from Transport Department. Referring to the Traffic AIDs, the speed limits of all road links within the Study Area (except Trunk Road Tunnel Section) would not be exceeding 70kph. In the assessment, as a conservative approach, the speed limit of 70 kph was assumed for Trunk Road. Therefore, all vehicle classes were assumed to have the same speed profile in the model.

To simulate the effect of different road speed during the rush and non-rush hour, sensitivity test had been done. The design road speed limits were assumed for representing the situation during non-rush hour; while the vehicle speed of peak hour flow in Year 2031 would be representing the situation during rush-hour.

The flow speeds were calculated based on the peak traffic flow in Year 2031 and volume/capacity ratio of different road type. For obtaining the speed fractions of each vehicle type, the vehicle speeds of each road link were first calculated and weighing by VMT. If the road links are in two-way direction, the vehicle speeds were calculated by weighing vehicle speeds of each direction. In addition, the design speed limits of Victoria Park Road (section between Top Glory Tower and Prospect Mansion) eastbound and westbound are different, as a conservative approach, this section would be grouped as local road.

In the model, same road speeds were applied to all hours to demonstrate the effect of using peak flow speed and design speed. Based on the comparison of the total daily emission rate, the worst road speed fraction was applied for predicting the vehicle emissions. Model year of 2031 was adopted in the sensitivity test.

From the results of the sensitivity test, it indicated that higher total daily NO_x and RSP emissions would be obtained at lower road speed, only the total daily NO_x emissions of trunk roads under design speed fractions were slightly greater than that under peak hour flow speed fractions. However, the dominant NO_x emissions were obtained on other roads under all scenarios. Thus, the peak hour flow speed in Year 2031 was applied to all hours for predicting the total daily emissions in this assessment as a conservative approach. The sensitivity results are presented in **Annex 4**.

Model Year

For the purpose of finding the worst emission year, 15 sets vehicle emissions based on the emission control schemes from Year 2016 to 2031 by using the same VMT in 2031 were produced. The emission standards of each vehicle class were the major factor influencing the vehicle exhaust emission. According to the implementation schedule of emission standards, the latest program was up to Year 2006 or 2009. Better emission controlled vehicles (Euro IV and V) would be replaced the old pre-Euro diesel/petrol vehicles. The vehicle exhaust emissions of Year 2016 to Year 2031 were calculated. Sensitivity tests were undertaken to calculate the vehicle exhaust emissions in different year by using the VMT of each road category and the flow speed fractions in Year 2031. By using the peak hour flow speed in Year 2031 at all hours, the total daily NOx emissions by 16 vehicle classes in different vehicle exhaust emission year from 2016 to 2031 were summarized in **Annex 5**.

Model Input to be Adopted in the Air quality Impact Assessment

Comparing the total daily NO_x and RSP emissions under different vehicle exhaust emission years from Year 2016 to 2031 as shown in **Annex 5**, the highest vehicle emissions were found in Year 2016 using emission control scenario and were decreased from Year 2016 to 2031. Therefore, as a conservative approach, the emissions using emission control scenario in Year 2016 were adopted for this Project.

As a conservative approach, the hourly emissions in Year 2016 were first divided by the number of vehicles and the distance travelled to obtain the emission factors in gram per miles per vehicle. The calculated maximum vehicle emission factors were then selected for incorporation into the air dispersion model. These conservative vehicle emission factors together with the forecasted Year 2031 peak traffic flow were adopted in the air quality impact assessment for this Project. The calculation of fleet vehicle emission for is presented in **Annex 6**. The forecast traffic flow and speed fraction for year 2031 with 16 vehicle classes have been submitted to the Transport Department (TD) on 12 April 2007 and received no objection from TD for using the forecasted traffic flow for the EIA. The response letter from TD is attached in **Annex 7** for reference. The calculated vehicular emissions for different vehicle categories were listed in **Table 3**.

Table 3 Emission Factors for Year 2016 for Different Vehicle Classes (EMFAC-HK)

Vehicle Class	Description	Emission Factors for 2016, g/mile-veh			
		NO_x		RSP	
		Trunk Road	Other Road	Trunk Road	Other Road
MC1	Petrol Private Cars (PC) & Light Goods Vehicles (LGV)	0.1433	0.1545	0.0047	0.0063
MC3	Diesel Private Cars & Light	0.4012	0.4157	0.1284	0.1516

	Goods Vehicles<2.5t				
MC4	Diesel Private Cars & Light Goods Vehicles 2.5-3.5t	0.2642	0.2702	0.0813	0.0896
MC5	Public Light Buses	0.1208	0.1163	0.0887	0.0835
MC6	Light Goods Vehicles >3.5t	2.1532	2.2242	0.1547	0.1836
MC7	Medium & Heavy Goods Vehicles with GVW 5.5-15t	4.4177	4.6047	0.2553	0.3066
MC8	Medium & Heavy Goods Vehicles with GVW >=15t	5.4535	6.0203	0.3635	0.4121
MC10	Double Deck Franchised Buses	2.7890	2.8216	0.0808	0.0902
MC11	Motor Cycles	1.1216	1.0611	0.0487	0.0503
Taxi3	Taxi	0.2376	0.2585	0.0188	0.0252
Taxi4	Private Light Buses <3.5t	0.0000	0.0000	0.0000	0.0000
Taxi5	Private Light Buses >3.5t	0.3270	0.3390	0.1972	0.2421
Taxi6	Non- franchised Buses <6.4t	0.0000	0.0000	0.0000	0.0000
Taxi7	Non- franchised Buses 6.4-15t	3.7716	4.7213	0.1433	0.1790
Taxi8	Non- franchised Buses >15t	7.1778	3.6599	0.1433*	0.1790*
Taxi10	Single Deck Franchised Buses	2.5173	2.4728	0.1631	0.1126

Note: * - Since the VMT of non-franchised buses >15t is too small, the calculated RSP emission factor for this vehicle class is zero. As a conservative approach, the RSP emission factor of non-franchised buses 6.4-15t would be adopted for non-franchised buses >15t.

Appendix 3.4 2016 Vehicle Population

Population end 2016

2003		MC	taxi		PLB		PrLB(4)	PrLB(5)		PC+LGV(1)	% of	no of	PC+LGV(1)	PC+LGV(3)		PC+LGV(3)	LGV(4)	LGV(6)	HGV(7)
FirstR(	Age	PETROL	LPG	DIESEL	LPG	DIESEL	DIESEL	LPG	DIESEL	PETROL	PC	LGV	PETROL	DIESEL		DIESEL	DIESEL	DIESEL	DIESEL
2003	1	4,479	1,494		335	133	19	19	19	22,671	99.713%	65	22,672	2	50.00%	1	1,620	1,065	340
2002	2	4,268	2,653		238	95	33	34	22	29,696	99.552%	133	29,697	22	95.45%	21	1,811	1,332	377
2001	3	3,860	9,847		127	51	25	3	59	34,031	98.255%	594	34,031	126	100.00%	126	2,091	1,548	400
2000	4	3,058	3,888		99	40	29	2	70	33,403	98.057%	649	33,403	103	100.00%	103	2,473	1,799	475
1999	5	2,785	277		127	50	45	1	72	27,860	98.816%	330	27,861	73	98.63%	72	2,496	1,345	448
1998	6	2,305	16		124	49	55		73	31,133	99.554%	139	31,267	232	42.24%	98	3,456	1,486	395
1997	7	2,546	17		162	65	47	1	93	38,709	99.866%	52	39,004	396	25.51%	101	4,007	2,326	637
1996	8	1,931	3		154	61	41		93	19,924	99.744%	51	20,119	312	37.50%	117	2,233	1,906	459
1995	9	1,510	2		162	64	63		185	19,128	99.148%	163	19,378	448	44.20%	198	2,096	1,717	537
1994	10	1,112	7		252	100	70		186	25,672	99.536%	119	25,891	656	66.62%	437	2,716	2,115	788
1993	11	693	1		350	139	57	2	112	22,703	99.436%	128	22,916	770	72.34%	557	3,499	2,856	1,097
1992	12	489	2		301	120	42		69	16,346	99.480%	85	16,460	560	79.64%	446	3,019	3,169	1,308
1991	13	314	2		271	108			91	6,827	98.989%	69	7,007	408	55.88%	228	1,301	1,535	927
1990	14	216			205	81			54	4,087	97.68%	95	4,228	469	69.94%	328	974	1,133	492
1989	15	198			200	31	12		40	2,439	96.97%	74	2,542	330	68.79%	227	212	855	346
1988	16	98			5	42	3		29	1,362	95.59%	60	1,436	274	72.99%	200	40	610	315
1987	17	47			0	1			27	731	95.43%	48	777	238	80.67%	192	18	327	201
1986	18	22			0	0	8		2	510	95.10%	25	558	120	60.00%	72	8	116	94
1985	19	7			0	1			11	245	99.18%	2	262	26	34.62%	9	3	26	45
1984	20	10					3			106	99.06%	1	114	9	11.11%	1	1	6	25
1983	21	12								75	100.00%	0	86	14	21.43%	3		3	2
1982	22	24								170	98.82%	2	177	7		0		2	3
1981	23	28								175	100.00%	0.00	190	15		0		4	3
1980	24	18								122	100.00%	0.00	127	6	16.67%	1			
1979	25	10								68	100.00%	0.00	73	5					
1978	26	5								53	100.00%	0.00	61	8			1		
1977	27	2								55	100.00%	0.00	57	2					
1976	28	3								38	100.00%	0.00	39	1					
1975	29	2								26	100.00%	0.00	27	1					
1974	30	3								42	100.00%	0.00	42						
1973	31	11								67	100.00%	0.00	67						
1972	32	7								37	100.00%	0.00	37						
1971	33	5								24	100.00%	0.00	24						
1970	34	2								31	100.00%	0.00	31						
1969	35	2								16	100.00%	0.00	16						
1968	36	1								5	100.00%	0.00	5						
1967	37									6	100.00%	0.00	6						
1966	38									3	100.00%	0.00	3						
1965	39	1								6	100.00%	0.00	6						
1964	40									1	100.00%	0.00	1						
1963	41									2	100.00%	0.00	2						
1962	42									2	100.00%	0.00	2						
1961	43									3	100.00%	0.00	3						
1960	44									2	100.00%	0.00	2						
	>44									6	100.00%	0.00	6						

Appendix 3.4 2016 Vehicle Population

Population en

2003		HGV(8)	NFB(6)	NFB(7)	NFB(8)	FBSD	FBDD
FirstR(	Age	DIESEL	DIESEL	DIESEL	DIESEL	DIESEL	DIESEL
2003	1	1,380	321	122	173		200
2002	2	1,544	368	133	168		401
2001	3	1,535	424	157	152	1	359
2000	4	2,350	300	158	89	5	400
1999	5	1,424	274	134	37	37	538
1998	6	1,472	211	202	134	56	974
1997	7	2,468	243	271	104	13	750
1996	8	2,100	326	386	89	13	378
1995	9	1,937	260	339	39	20	372
1994	10	2,246	172	246	30	35	306
1993	11	2,504	139	164	1	50	239
1992	12	3,223	87	209	54	57	121
1991	13	2,307	30	180			243
1990	14	1,730		124			91
1989	15	1,297	8	39	24		154
1988	16	1,105	11	30	13		87
1987	17	729		11	36		269
1986	18	251	1	4	2		1
1985	19	291		4			
1984	20	48		2	18		
1983	21	16		1	10		
1982	22	24		3			
1981	23	11		6			
1980	24	15		3			
1979	25	1		4			
1978	26	1			2		
1977	27	1					
1976	28	2					
1975	29						
1974	30						
1973	31						
1972	32				4		
1971	33		1				
1970	34						
1969	35						
1968	36						
1967	37						
1966	38						
1965	39						
1964	40						
1963	41						
1962	42						
1961	43						
1960	44						
	>44		1				

Annex 5 Summary Results of Comparing the Total Emission from Year 2016 to 2031

Total daily NO_x emissions (ton/day) by 16 vehicle classes in Year 2016 to 2031 (Trunk Roads).

Vehicle Class	Yr2016	Yr2017	Yr2018	Yr2019	Yr2020	Yr2021	Yr2022	Yr2023	Yr2024	Yr2025	Yr2026	Yr2027	Yr2028	Yr2029	Yr2030	Yr2031
PC&LGV	0.0214	0.0203	0.0198	0.0194	0.0192	0.0190	0.0189	0.0188	0.0187	0.0187	0.0186	0.0186	0.0186	0.0186	0.0185	0.0185
PC&LGV <2.5t	0.0027	0.0023	0.0021	0.0019	0.0018	0.0017	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016
LGV2.5-3.5t	0.0018	0.0017	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016
PLB	0.0006	0.0005	0.0004	0.0004	0.0004	0.0004	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
LGV>3.5t	0.0169	0.0156	0.0144	0.0135	0.0126	0.0116	0.0111	0.0108	0.0105	0.0104	0.0103	0.0103	0.0103	0.0103	0.0103	0.0103
HGV<15t	0.0304	0.0282	0.0260	0.0239	0.0220	0.0201	0.0186	0.0178	0.0173	0.0169	0.0166	0.0165	0.0165	0.0164	0.0164	0.0164
HGV>15t	0.0016	0.0015	0.0014	0.0013	0.0012	0.0011	0.0011	0.0010	0.0010	0.0010	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009
FBDD	0.0199	0.0186	0.0174	0.0165	0.0160	0.0155	0.0150	0.0144	0.0141	0.0140	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135
MC	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161
Taxi	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212	0.0212
PrLB<3.5t	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PrLB>3.5t	0.0013	0.0012	0.0012	0.0011	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
NFB<6.4t	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NFB 6.4-15t	0.0500	0.0457	0.0418	0.0388	0.0368	0.0350	0.0335	0.0325	0.0322	0.0319	0.0318	0.0318	0.0317	0.0317	0.0316	0.0316
NFB>15t	1.7E-05	1.6E-05	1.5E-05	1.5E-05	1.5E-05	1.4E-05	1.4E-05	1.4E-05	1.4E-05	1.4E-05	1.3E-05	1.3E-05	1.3E-05	1.3E-05	1.3E-05	1.3E-05
FBSD	0.0017	0.0015	0.0014	0.0013	0.0011	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
Total Emissions	0.1856	0.1747	0.1647	0.1571	0.1509	0.1452	0.1409	0.1380	0.1366	0.1355	0.1345	0.1343	0.1342	0.1341	0.1340	0.1339

Annex 5 Summary Results of Comparing the Total Emission from Year 2016 to 2031

Total daily RSP emissions (ton/day) by 16 vehicle classes in Year 2016 to 2031 (Trunk Roads).

Vehicle Class	Yr2016	Yr2017	Yr2018	Yr2019	Yr2020	Yr2021	Yr2022	Yr2023	Yr2024	Yr2025	Yr2026	Yr2027	Yr2028	Yr2029	Yr2030	Yr2031
PC&LGV	0.00068	0.00068	0.00068	0.00068	0.00068	0.00067	0.00067	0.00067	0.00067	0.00067	0.00067	0.00067	0.00067	0.00067	0.00067	0.00067
PC&LGV <2.5t	0.00084	0.00072	0.00064	0.00061	0.00056	0.00053	0.00051	0.00050	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
LGV2.5-3.5t	0.00050	0.00048	0.00046	0.00045	0.00044	0.00044	0.00044	0.00044	0.00044	0.00044	0.00044	0.00044	0.00044	0.00044	0.00044	0.00044
PLB	0.00037	0.00034	0.00031	0.00030	0.00029	0.00028	0.00028	0.00028	0.00028	0.00028	0.00028	0.00028	0.00028	0.00028	0.00028	0.00028
LGV>3.5t	0.00120	0.00099	0.00078	0.00067	0.00059	0.00053	0.00049	0.00047	0.00046	0.00046	0.00046	0.00046	0.00046	0.00046	0.00046	0.00046
HGV<15t	0.00172	0.00141	0.00109	0.00087	0.00076	0.00068	0.00061	0.00057	0.00055	0.00054	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053
HGV>15t	0.00007	0.00006	0.00004	0.00004	0.00003	0.00003	0.00003	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002
FBDD	0.00056	0.00050	0.00043	0.00039	0.00038	0.00035	0.00033	0.00028	0.00028	0.00028	0.00028	0.00028	0.00028	0.00028	0.00028	0.00028
MC	0.00064	0.00064	0.00064	0.00064	0.00064	0.00064	0.00064	0.00064	0.00064	0.00064	0.00064	0.00064	0.00064	0.00064	0.00064	0.00064
Taxi	0.00168	0.00168	0.00168	0.00168	0.00168	0.00168	0.00168	0.00168	0.00168	0.00168	0.00168	0.00168	0.00168	0.00168	0.00168	0.00168
PrLB<3.5t	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
PrLB>3.5t	0.00082	0.00074	0.00068	0.00062	0.00059	0.00057	0.00056	0.00055	0.00055	0.00055	0.00055	0.00055	0.00055	0.00055	0.00055	0.00055
NFB<6.4t	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
NFB 6.4-15t	0.00190	0.00166	0.00141	0.00120	0.00105	0.00101	0.00097	0.00095	0.00094	0.00092	0.00092	0.00091	0.00091	0.00090	0.00090	0.00089
NFB>15t	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
FBSD	0.00006	0.00005	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003
Total Emissions	0.01102	0.00993	0.00886	0.00817	0.00771	0.00744	0.00724	0.00707	0.00702	0.00699	0.00698	0.00698	0.00697	0.00696	0.00696	0.00695

Annex 5 Summary Results of Comparing the Total Emission from Year 2016 to 2031

Notes:

1. PC&LGV – Petrol Private Cars & Light Goods Vehicles
2. PC&LGV <2.5t – Diesel Private Cars & Light Goods Vehicles <2.5t
3. LGV2.5-3.5t – Diesel Private Cars & Light Goods Vehicles 2.5-3.5t
4. PLB – Public Light Buses
5. LGV>3.5t – Light Goods Vehicles >3.5t
6. HGV<15t – Medium & Heavy Goods Vehicles with GVW 5.5-15t
7. HGV>15t –Medium & Heavy Goods Vehicles with GVW >=15t
8. FBDD – Double Deck Franchised Buses
9. MC – Motor Cycles
10. Taxi – Taxi (LPG)
11. PrLB<3.5t – Private Light Buses <3.5t
12. PrLB>3.5t – Private Light Buses >3.5t
13. NFB<6.4t – Non-franchised Buses <6.4t
14. NFB6.4-15t – Non-franchised Buses 6.4-15t
15. NFB>15t – Non-franchised Buses >15t
16. FBSD – Single Deck Franchised Buse

Annex 15.2

Prior Agreement on Noise Impact Assessment From EPD and GFS

Urgent by Fax

MEMO

From	Director of Environmental Protection	To	Project Manager/HKI&I, CEDD
Ref. in	EP2/H4/S3/15 Pt.2	(Attn.:	Mr. C. K. Lam)
Tel. No.	2835 1155	Your Ref. in	HKI 2/4/50 EI
Fax. No.	2591 0558	dated	13.7.07 Fax. No. 25775040
Date	16 July 2007	Total Pages	2

Environmental Impact Assessment Ordinance (EIAO)
Project Title: Wan Chai Development Phase II and Central-Wan Chai Bypass
EIA Study Brief No. 153/2006
Noise Impact Assessment

I refer to your memo of 13 July 2007 and 2 letters from your consultant, ENSR/Maunsell (ref: 6017193/C/DCFL706151 & 706201) dated 15 and 20 June 2007 submitting the representative assessment points for quantitative noise assessment; sample calculations and input parameters for 10 representative assessment points; and data structure of the electronic file (ASCII format) containing information on road segments, barriers and noise sensitive receivers for our agreement under various sections of the EIA Study Brief No. ESB-153/2006.

2. Please be informed that after taking into the advice from our noise assessment section, the submission is considered as basically acceptable taking into account of the project details, sensitive receivers, assumptions, scenarios, etc as stated in the submissions. Nevertheless, though S.3.4.6.2(iii)(b) of the EIA Study Brief stated that *"The assessment points shall be agreed with the Director prior to the quantitative noise assessment."*, CEDD and the consultant should note that according to Section 3.4 of the EIAO-Technical Memorandum, the assessment shall be based on the best available information at the time of the assessment. For example, there could be minor adjustment(s) to the locations of the assessment points during the course of noise assessment in order to complete some dedicated tasks (such as material change test, determination of the extent of noise mitigation measures, differentiation of measures for existing and planned NSRs). Hence, the assessment points could be subject to changes when there is updated best available information during the course of the assessment.

3. Regarding the 10 selected points for sample calculations, they might also be subject to changes when there is any relevant updated best available information as mentioned above.

4. With the above understanding, agreements are hereby given under the following requirements of the captioned EIA Study Brief for you to proceed with the noise assessment as proposed and explained in your submissions of 15 and 20 June 2007:

Reference in the Study Brief Stipulating the Requirements	Description
Section 3.4.6.2(iii)(b)	Representative assessment points for quantitative noise assessment
Section 3.4.6.2(vi)(a1)	Sample calculations and input parameters for 10 representative assessment points; and data structure of the electronic file (ASCII format) containing information on road segments, barriers and noise sensitive receivers for road traffic noise

5. Please note that above agreements are only for the concerned requirements under the EIA Study Brief and shall not prejudice the EPD's final decision on approval of the EIA report to be submitted under the EIAO. If there is any significant change in circumstances, project design/details or assessment methodology/assumptions, etc. CEDD and the consultant should review the situations; carry out necessary updating/revisions; and seek our advice whether further agreements under the EIA Study Brief are necessary.

6. You are also reminded that the requirements on documentations of key assessment assumptions, limitations of assessment methodologies and related prior agreement(s) with the DEP as stipulated under Section 3.4.14 of the EIA Study Brief shall be followed.

(Victor YEUNG)
Senior Environmental Protection Officer
for Director of Environmental Protection

c.c.:

ENSR/Maunsell	(Attn: Mr. Freeman Cheung	Fax:	28910305
	and Mr. Peter Cheek)	Fax:	26912649

c.c. internal: S(MA)4, E(MA)31

ENSR | AECOM

MAUNSELL | AECOM

ENSR Asia (HK) Ltd.
(formerly Maunsell Environmental Management Consultants Ltd)
11/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong
安社亞洲(香港)有限公司
(前茂盛環境管理顧問有限公司)
香港新界沙田鄉事會路 138 號新城市中央廣場 2 座 11 樓
T +852 2893 1551 F +852 2891 0305 www.ensr.aecom.com www.maunsell.aecom.com

Your Ref.: -
Our Ref.: 60017193/C/DCFL706201

Ad604

By E-mail and Post
Environmental Protection Department
Metro Assessment Group
27th floor, Southorn Centre,
130 Hennessy Road,
Wan Chai, Hong Kong

Attn : Mr. Raymond Lai

20 June 2007

Dear Sir,

Supplemental Agreement No.1 to Agreement No. CE 54/2001 (CE)
Wan Chai Development Phase II - Planning and Engineering Review
Wan Chai Development Phase II and Central-Wan Chai Bypass – EIA Study

As per the requirements in Section 3.4.6.2 (vi)(a1) of the EIA Study Brief (ESB-153/2006), we would like to seek your agreement on inclusion of sample calculations and input parameters for 10 representative assessment points in the EIA Report. These assessment points include: N2, N5, N7, N10, N15, N17, N18, N18-A, N19 and N22. A figure showing the location and description of the assessment points is enclosed for your reference. Besides, we would like to enclose sample input and output files of the road traffic noise model for your agreement on the data structure.

Should you need any further clarification or information, please feel free to contact Mr. Derek Lam at 3105 8513. Thank you for your kind attention.

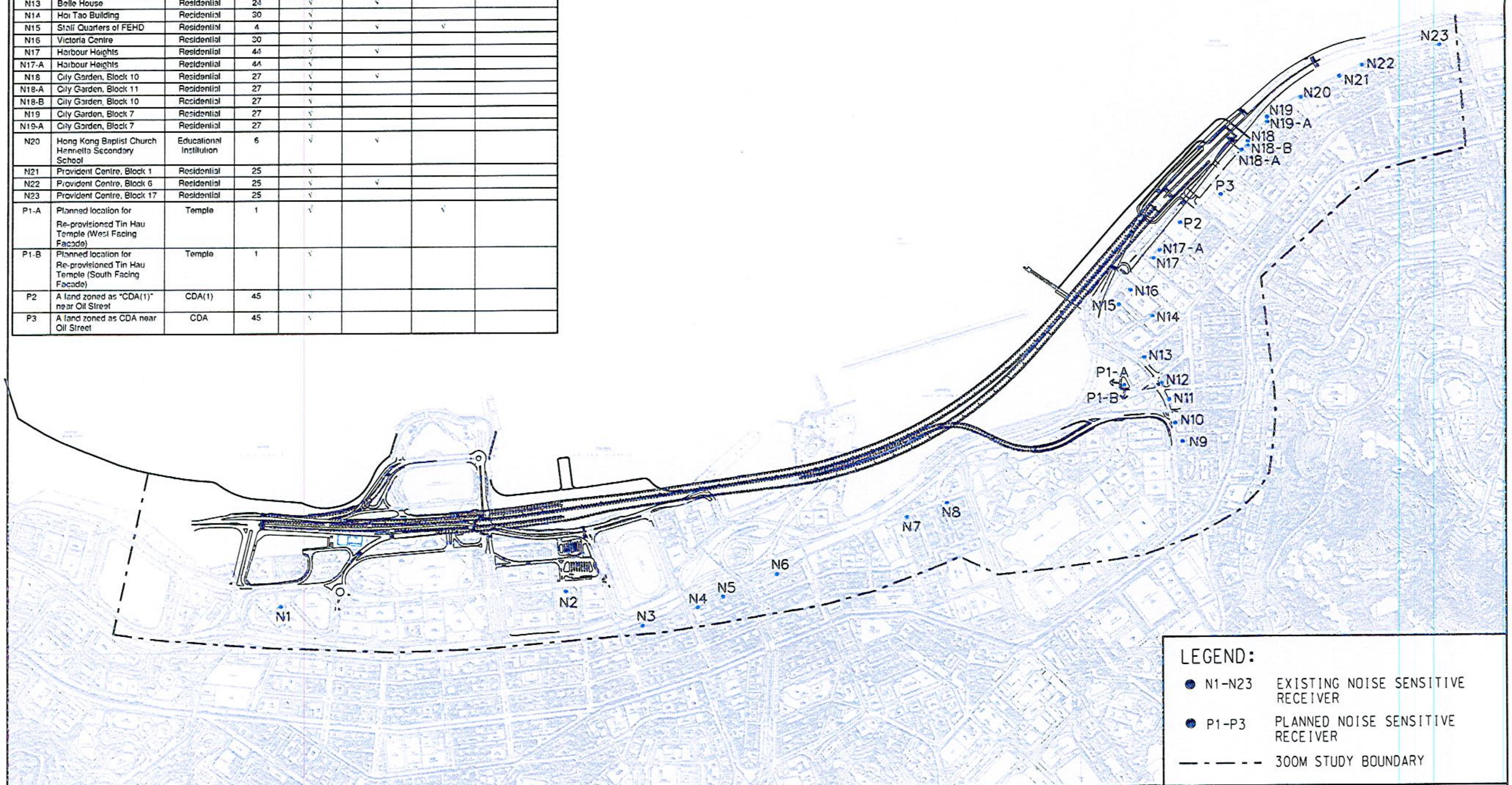
Yours faithfully
for and on behalf of
ENSR Asia (HK) Ltd

Freeman Cheung
Executive Director

Encl.

cc
CEDD – CK Lam (w/enclosure) By e-mail: cklam@cedd.gov.hk
MCAL - Peter Cheek (w/enclosure) By e-mail: peter.cheek@maunsell.aecom.com
MCAL – Carmen Au (w/enclosure) By e-mail: carmen.au@maunsell.aecom.com

NSR	Description	Use	No. of Floors	NSR for Assessment			
				Road Traffic Noise	Construction Noise	Ventilation Shaft Noise	PTI and Helicopter Noise
N1	HKAPA (Open Arena)	Performing Arts Centre	G/F	√	√		
N2	Causeway Centre	Residential	42	√	√		√
N3	Gloucester Road 169-170	Residential	12	√	√		
N4	Kam Kwok Building	Residential	18	√			
N5	Hyde Centre	Residential	22	√			
N6	Elizabeth House	Residential	21	√	√		
N7	Riviera Mansion	Residential	15	√			
N8	Marco Polo Mansion	Residential	15	√	√		
N9	Viking Garden	Residential	25	√			
N10	Victoria Court	Residential	18	√			
N11	Mayson Garden	Residential	24	√	√		
N12	Gordon House	Residential	15	√			
N13	Belle House	Residential	24	√	√		
N14	Hoi Tao Building	Residential	30	√			
N15	Staff Quarters of FEHD	Residential	4	√	√	√	
N16	Victoria Centre	Residential	30	√			
N17	Harbour Heights	Residential	44	√	√		
N17-A	Harbour Heights	Residential	44	√			
N18	City Garden, Block 10	Residential	27	√	√		
N18-A	City Garden, Block 11	Residential	27	√			
N18-B	City Garden, Block 10	Residential	27	√			
N19	City Garden, Block 7	Residential	27	√			
N19-A	City Garden, Block 7	Residential	27	√			
N20	Hong Kong Baptist Church Henrietta Secondary School	Educational Institution	6	√	√		
N21	Provident Centre, Block 1	Residential	25	√			
N22	Provident Centre, Block 6	Residential	25	√	√		
N23	Provident Centre, Block 17	Residential	25	√			
P1-A	Planned location for Re-provisioned Tin Hau Temple (West Facing Facade)	Temple	1	√		√	
P1-B	Planned location for Re-provisioned Tin Hau Temple (South Facing Facade)	Temple	1	√			
P2	A land zoned as "CDA(1)" near Oil Street	CDA(1)	45	√			
P3	A land zoned as CDA near Oil Street	CDA	45	√			



MAUNSELL

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

LOCATIONS OF REPRESENTATIVE NOISE SENSITIVE RECEIVERS

FIGURE 4.8

K:/A01604/DRAWING/REPORT/MAY07/FIGURE4.8.DGN

SCALE 1:10000 [A3]

Appendix 4.9 Sample Output File for Road Traffice Noise Model

```
MARC v2.0.1 Modelling Result Listing
Date:2007-06-15
Time:18:11:15

Input Date File: MIT.dat

Project: WDD1.DIG
Scenario: Trial
Traffic Flow Year: 2031 AM

Barrier Correction..........................................Yes
Facade Correction...........................................Yes
Opposite Facade Correction..................................Yes
Prompt check messages during processing......................No
Print Perp.Dist. & Angles of View...........................No
Print Corrections & Noise Contribution from each Road Seg....No
Print Noise Contribution from Each Road.....................No

Cut-off angle =   1.00
Cut-off distance =  300.00
Cut-off distance for reflection from barrier =   20.00

No. of Roads      =212
No. of Barriers   =142
No. of Receivers   = 10

Road Configuration :

Node  Easting  Northing    Elevation   % Grad.   Width   Surface  Included

Road   1: D1R1          New Road
Flow:  1464.00( 14.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835261.13  815930.13      5.30      .00     7.00   Bituminous   Y
 2  835229.00  815932.38      5.30      .00     7.00   Bituminous   Y
 3  835201.88  815934.00      5.30      .00     7.00   Bituminous   Y
 4  835186.31  815934.81      5.30

Road   2: D1R2          New Road
Flow:  1464.00( 14.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835407.30  815920.81      5.50      .00     7.00   Bituminous   Y
 2  835378.13  815923.88      5.10      .47     7.00   Bituminous   Y
 3  835335.38  815926.13      5.30      .81     7.00   Bituminous   Y
 4  835298.19  815928.19      5.60      .81     7.00   Bituminous   Y
 5  835261.19  815930.13      5.90

Road   3: D1R3-1          New Road
Flow:    93.00( 15.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835700.31  815900.69      4.40      .00     7.00   Bituminous   Y
 2  835680.93  815902.21      4.40      .00     7.00   Bituminous   Y
 3  835659.36  815903.80      4.40

Road   4: D1R3-2          New Road
Flow:  1179.00( 13.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835659.36  815903.80      4.40      .00     7.00   Bituminous   Y
 2  835630.19  815906.00      3.50      .65     7.00   Bituminous   Y
 3  835584.31  815908.88      3.80     1.30     7.00   Bituminous   Y
 4  835530.63  815912.88      4.50      .93     7.00   Bituminous   Y
 5  835498.31  815914.50      4.80      .62     7.00   Bituminous   Y
 6  835466.13  815916.50      5.00     1.44     7.00   Bituminous   Y
 7  835431.50  815918.69      5.50     4.12     7.00   Bituminous   Y
 8  835407.31  815920.81      6.50

Road   5: D1R4          New Road
Flow:  1039.00( 15.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835188.88  815944.81      5.30      .00     7.00   Bituminous   Y
 2  835217.81  815943.13      5.30      .00     7.00   Bituminous   Y
 3  835261.19  815942.31      5.30      .00     7.00   Bituminous   Y
 4  835282.31  815942.31      5.30      .00     7.00   Bituminous   Y
 5  835302.63  815943.88      5.30      .00     7.00   Bituminous   Y
 6  835323.88  815945.88      5.30      .00     7.00   Bituminous   Y
 7  835336.81  815946.88      5.30

Road   6: D1R5          New Road
Flow:  2642.00( 21.60%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
```



```
 1  835336.88  815938.00      5.90      .00     7.00   Bituminous   Y
 2  835367.50  815937.38      5.90      .00     7.00   Bituminous   Y
 3  835409.88  815935.88      5.50

Road   7: D1R6          New Road
Flow:  2642.00( 21.60%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835409.88  815935.88      5.50      .00     7.00   Bituminous   Y
 2  835433.63  815934.81      5.00      .00     7.00   Bituminous   Y
 3  835467.00  815932.69      4.50      .00     7.00   Bituminous   Y
 4  835498.38  815930.81      4.00      .30     7.00   Bituminous   Y
 5  835531.63  815929.13      4.10      .00     7.00   Bituminous   Y
 6  835584.88  815927.38      3.80      .00     7.00   Bituminous   Y
 7  835629.13  815927.81      3.40      .00     7.00   Bituminous   Y
 8  835650.19  815928.13      3.40

Road   8: D1R7          New Road
Flow:   420.00( 25.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835651.00  815922.38      3.40      .00     7.00   Bituminous   Y
 2  835675.38  815923.38      3.40      .00     7.00   Bituminous   Y
 3  835700.31  815924.13      3.40

Road   9: D1R8          New Road
Flow:     1.00(   .00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835336.50  815947.13      5.90      .00     7.00   Bituminous   Y
 2  835368.63  815950.81      5.00      .00     7.00   Bituminous   Y
 3  835386.63  815951.69      4.80      .00     7.00   Bituminous   Y
 4  835411.31  815952.31      4.30      .00     7.00   Bituminous   Y
 5  835433.38  815951.38      4.20      .00     7.00   Bituminous   Y
 6  835468.63  815948.31      4.10      .00     7.00   Bituminous   Y
 7  835497.88  815945.19      4.10     1.15     7.00   Bituminous   Y
 8  835532.31  815941.38      4.50      .75     7.00   Bituminous   Y
 9  835585.19  815937.31      4.90      .82     7.00   Bituminous   Y
10  835621.81  815937.38      5.20     1.10     7.00   Bituminous   Y
11  835639.81  815939.63      5.40

Road  10: D1R9          New Road
Flow:  2222.00( 21.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835639.81  815936.13      5.40      .00     7.00   Bituminous   Y
 2  835650.19  815936.50      5.40

Road  11: D1R10          New Road
Flow:  2222.00( 21.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835650.13  815936.38      5.40     1.70     7.00   Bituminous   Y
 2  835673.63  815935.19      5.80     3.00     7.00   Bituminous   Y
 3  835700.31  815935.88      6.60

Road  12: D1R11          New Road
Flow:   590.00( 57.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835639.13  815943.13      5.40      .65     7.00   Bituminous   Y
 2  835653.13  815949.50      5.50     1.96     7.00   Bituminous   Y
 3  835671.31  815958.81      5.90

Road  13: D1R12          New Road
Flow:   590.00( 57.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835670.00  815962.00      5.90     2.53     7.00   Bituminous   Y
 2  835677.31  815971.31      6.20     1.19     7.00   Bituminous   Y
 3  835692.81  815991.19      6.50

Road  14: D1R13          New Road
Flow:   559.00( 57.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835692.69  815991.00      6.50      .00     7.00   Bituminous   Y
 2  835700.13  816002.81      6.50

Road  15: D1R14          New Road
Flow:     1.00(   .00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835672.13  815954.81      5.90      .00     7.00   Bituminous   Y
 2  835683.38  815957.81      5.90      .00     7.00   Bituminous   Y
 3  835700.38  815960.31      5.90

Road  16: D1R16          New Road
Flow:  1397.00(  9.60%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1  835700.31  815869.63      4.30     1.92     7.00   Bituminous   Y
 2  835692.13  815863.19      4.50     2.60     7.00   Bituminous   Y
 3  835683.13  815856.00      4.80

Road  17: D1R17          New Road
```

```
Flow:  692.00( 10.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835685.81 815853.81      4.80      .00     7.00    Bituminous   Y
 2 835675.88 815845.69      4.50      .00     7.00    Bituminous   Y
 3 835668.88 815838.88      4.20

Road  18: D1R18              New Road
Flow:  705.00( 17.70%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835680.38 815857.88      4.80      .00     7.00    Bituminous   Y
 2 835671.31 815850.81      4.80      .00     7.00    Bituminous   Y
 3 835655.81 815837.13      4.80

Road  19: D1R19              Existing Road
Flow: 1044.00( 13.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835695.50 815843.13      4.80      .00     7.00    Bituminous   Y
 2 835688.63 815840.19      4.70      .00     7.00    Bituminous   Y
 3 835680.38 815836.19      4.50      .00     7.00    Bituminous   Y
 4 835672.63 815831.81      4.30

Road  20: D1R20              Existing Road
Flow: 1736.00( 11.80%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835670.81 815836.13      4.30      .00     8.00    Bituminous   Y
 2 835661.00 815825.81      4.20      .00     8.00    Bituminous   Y
 3 835650.19 815815.31      4.10      .00     8.00    Bituminous   Y
 4 835645.88 815809.81      4.00      .00     8.00    Bituminous   Y
 5 835643.69 815806.00      3.90      .00     8.00    Bituminous   Y
 6 835639.81 815795.88      3.90      .00     8.00    Bituminous   Y
 7 835639.00 815789.38      3.90      .00     8.00    Bituminous   Y
 8 835638.31 815782.38      3.90      .00     8.00    Bituminous   Y
 9 835638.88 815774.38      3.90      .00     8.00    Bituminous   Y
10 835639.81 815768.63      3.90

Road  21: D1R21              Existing Road
Flow: 1538.00( 13.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835655.69 815837.19      4.50     2.07     7.00    Bituminous   Y
 2 835646.88 815825.69      4.80     4.29     7.00    Bituminous   Y
 3 835637.69 815812.19      5.50      .00     7.00    Bituminous   Y
 4 835629.31 815800.63      5.50      .00     7.00    Bituminous   Y
 5 835623.63 815794.38      5.50      .00     7.00    Bituminous   Y
 6 835618.63 815790.13      5.50      .00     7.00    Bituminous   Y
 7 835609.31 815784.31      5.00      .00     7.00    Bituminous   Y
 8 835601.13 815780.19      4.80      .00     7.00    Bituminous   Y
 9 835586.63 815776.88      4.10

Road  22: D1R23              Existing Road
Flow: 3246.00( 14.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835614.31 815753.13      3.90     1.28     8.00    Bituminous   Y
 2 835607.19 815756.38      4.00     1.03     8.00    Bituminous   Y
 3 835599.19 815761.88      4.10      .00     8.00    Bituminous   Y
 4 835588.38 815767.38      4.10

Road  23: D1R24              Existing Road
Flow: 3246.00( 14.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835586.69 815771.88      4.10      .00     7.00    Bituminous   Y
 2 835568.81 815771.00      4.10      .00     7.00    Bituminous   Y
 3 835547.13 815769.13      4.10      .00     7.00    Bituminous   Y
 4 835525.88 815767.13      4.10      .00     7.00    Bituminous   Y
 5 835508.69 815765.81      4.10      .00     7.00    Bituminous   Y
 6 835482.88 815763.63      4.10

Road  24: D1R25              Existing Road
Flow:  137.00( 11.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835481.00 815770.38      4.40      .00     7.00    Bituminous   Y
 2 835459.69 815768.38      4.40      .00     7.00    Bituminous   Y
 3 835442.81 815767.13      4.40      .00     7.00    Bituminous   Y
 4 835420.38 815764.88      4.40      .00     7.00    Bituminous   Y
 5 835406.69 815763.13      4.40      .00     7.00    Bituminous   Y
 6 835394.38 815762.88      4.40      .00     7.00    Bituminous   Y
 7 835381.38 815762.81      4.30      .00     7.00    Bituminous   Y
 8 835371.00 815764.31      4.20      .00     7.00    Bituminous   Y
 9 835364.50 815766.31      4.10      .00     7.00    Bituminous   Y
10 835360.19 815771.81      4.10

Road  25: D1R26              New Road
Flow:  137.00( 11.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835360.38 815771.88      4.10      .00     7.00    Bituminous   Y
 2 835351.31 815772.88      4.10      .00     7.00    Bituminous   Y
```



```
 3 835319.31 815780.81      4.10      .00     7.00    Bituminous   Y
 4 835298.00 815787.81      4.10      .00     7.00    Bituminous   Y
 5 835275.00 815794.81      4.10      .00     7.00    Bituminous   Y
 6 835253.31 815800.88      4.10      .00     7.00    Bituminous   Y
 7 835247.13 815801.31      4.10

Road  26: D1R27              New Road
Flow: 2006.00( 10.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835252.50 815803.81      4.10      .00     7.00    Bituminous   Y
 2 835265.63 815801.69      4.10      .00     7.00    Bituminous   Y
 3 835282.00 815800.31      4.10      .00     7.00    Bituminous   Y
 4 835299.31 815793.81      4.10      .00     7.00    Bituminous   Y
 5 835321.31 815786.19      4.10      .00     7.00    Bituminous   Y
 6 835344.63 815778.81      4.10

Road  27: D1R28              New Road
Flow:  207.00(  7.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835261.38 815930.19      5.80      .00     7.00    Bituminous   Y
 2 835253.63 815921.38      5.60      .00     7.00    Bituminous   Y
 3 835249.19 815913.81      5.50      .00     7.00    Bituminous   Y
 4 835244.81 815895.50      5.40      .00     7.00    Bituminous   Y
 5 835238.31 815869.19      5.20      .00     7.00    Bituminous   Y
 6 835233.13 815848.13      4.80      .00     7.00    Bituminous   Y
 7 835230.88 815834.81      4.50      .00     7.00    Bituminous   Y
 8 835231.38 815827.13      4.40      .00     7.00    Bituminous   Y
 9 835234.31 815819.88      4.30      .00     7.00    Bituminous   Y
10 835238.63 815813.63      4.20      .00     7.00    Bituminous   Y
11 835243.19 815808.88      4.10      .00     7.00    Bituminous   Y
12 835244.00 815808.13      4.10      .00     7.00    Bituminous   Y
13 835248.63 815803.81      4.10

Road  28: D1R29              New Road
Flow: 2160.00( 12.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835344.38 815778.88      4.10      .00     7.00    Bituminous   Y
 2 835351.50 815781.19      4.10      .00     7.00    Bituminous   Y
 3 835356.63 815785.19      4.10      .00     7.00    Bituminous   Y
 4 835363.31 815790.13      4.10      .00    13.00    Bituminous   Y
 5 835369.31 815812.38      4.10     1.40    13.00    Bituminous   Y
 6 835375.88 815840.13      4.50     1.15    13.00    Bituminous   Y
 7 835382.63 815865.31      4.80     1.65    13.00    Bituminous   Y
 8 835388.31 815888.88      5.20     1.16    13.00    Bituminous   Y
 9 835390.88 815905.88      5.40      .00    13.00    Bituminous   Y
10 835397.06 815936.21      4.10

Road  29: D1R30              New Road
Flow:    .10(   .00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835384.69 815905.38      5.50      .00     7.00    Bituminous   N
 2 835381.00 815914.13      5.50      .00     7.00    Bituminous   N
 3 835377.81 815924.00      5.50

Road  30: D1R31              New Road
Flow:    .10(   .00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835395.38 815905.50      5.50      .00     7.00    Bituminous   N
 2 835397.38 815915.50      5.50      .00     7.00    Bituminous   N
 3 835398.81 815926.81      5.50      .00     7.00    Bituminous   N
 4 835400.31 815936.31      5.50

Road  31: D1R32              New Road
Flow:  225.00( 11.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835418.19 815935.63      5.50      .00     7.00    Bituminous   Y
 2 835416.38 815925.88      5.50      .00     9.00    Bituminous   Y
 3 835412.50 815908.13      5.50      .00    10.00    Bituminous   Y
 4 835405.19 815880.63      5.10      .00    13.00    Bituminous   Y
 5 835400.63 815859.81      4.80      .00    13.00    Bituminous   Y
 6 835395.63 815841.63      4.50      .00    13.00    Bituminous   Y
 7 835390.81 815822.69      4.10      .00    13.00    Bituminous   Y
 8 835386.81 815805.50      4.10      .00    13.00    Bituminous   Y
 9 835383.31 815789.63      4.10      .00    13.00    Bituminous   Y
10 835384.00 815782.13      4.10      .00    13.00    Bituminous   Y
11 835387.69 815776.31      4.10      .00    13.00    Bituminous   Y
12 835393.63 815770.63      4.10

Road  32: D1R33-1            Existing Road
Flow:  833.00(  9.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835393.69 815770.63      4.10      .65     7.00    Bituminous   Y
 2 835409.13 815770.13      4.20      .37     7.00    Bituminous   Y
```

```
 3 835436.13 815771.88      4.30     .39    7.00   Bituminous  Y
 4 835461.50 815773.81      4.40     .33    7.00   Bituminous  Y
 5 835491.88 815776.50      4.50     .00    7.00   Bituminous  Y
 6 835519.81 815778.81      4.50

Road  33: D1R33-2          New Road
Flow:  833.00(  9.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 835519.81 815778.81      4.50     .00    7.00   Bituminous  Y
 2 835533.31 815784.38      4.50     .00    7.00   Bituminous  Y
 3 835538.50 815788.31      4.50     .00    7.00   Bituminous  Y
 4 835544.13 815793.31      4.50     .00    7.00   Bituminous  Y
 5 835547.50 815797.81      4.50     .00    7.00   Bituminous  Y
 6 835550.69 815802.88      4.50     .00    7.00   Bituminous  Y
 7 835553.38 815809.31      4.50     .00    7.00   Bituminous  Y
 8 835555.19 815817.63      4.50     .00    7.00   Bituminous  Y
 9 835555.69 815827.63      4.50     .00    7.00   Bituminous  Y
10 835554.88 815843.81      4.50     .00    7.00   Bituminous  Y
11 835553.50 815858.38      4.50     .00    7.00   Bituminous  Y
12 835566.31 815860.19      4.50     .00    7.00   Bituminous  Y
13 835584.88 815862.13      4.50     .00    7.00   Bituminous  Y
14 835609.88 815864.63      4.50     .00    7.00   Bituminous  Y
15 835630.31 815866.13      4.50     .00    7.00   Bituminous  Y
16 835641.00 815865.31      4.50     .00    7.00   Bituminous  Y
17 835651.13 815862.31      4.50     .00    7.00   Bituminous  Y
18 835657.00 815854.31      4.50     .00    7.00   Bituminous  Y
19 835659.31 815847.50      4.50     .00    7.00   Bituminous  Y
20 835655.88 815837.00      4.50

Road  34: D1RR1            Existing Road
Flow: 1072.00( 10.80%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 835617.81 815746.19      3.90     .00   11.00   Bituminous  Y
 2 835614.31 815753.19      3.90     .00   11.00   Bituminous  Y
 3 835613.00 815759.13      3.90     .00   11.00   Bituminous  Y
 4 835616.13 815765.88      3.90     .00   11.00   Bituminous  Y
 5 835622.38 815769.88      3.90     .00   11.00   Bituminous  Y
 6 835630.81 815770.63      3.90     .00   11.00   Bituminous  Y
 7 835639.63 815768.63      3.90     .00   11.00   Bituminous  Y
 8 835644.19 815760.69      3.90     .00   11.00   Bituminous  Y
 9 835644.31 815752.63      3.90     .00   11.00   Bituminous  Y
10 835640.31 815745.19      3.90     .00   11.00   Bituminous  Y
11 835634.38 815742.00      3.90     .00   11.00   Bituminous  Y
12 835627.31 815741.63      3.90     .00   11.00   Bituminous  Y
13 835617.69 815746.19      3.90

Road  35: D2R1             Existing Road
Flow:  709.00( 14.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836415.15 815948.89      4.00     .00    7.00   Bituminous  Y
 2 836400.00 815942.81      4.00     .00    7.00   Bituminous  Y
 3 836377.31 815937.69      4.00     .00    7.00   Bituminous  Y
 4 836336.38 815925.31      4.00     .00    7.00   Bituminous  Y
 5 836291.38 815911.81      4.00     .00    7.00   Bituminous  Y
 6 836261.81 815902.81      4.00

Road  36: D2R2             Existing Road
Flow: 1024.00( 12.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836262.13 815902.81      4.10     .00    7.00   Bituminous  Y
 2 836243.81 815901.69      4.10     .00    7.00   Bituminous  Y
 3 836203.63 815897.13      4.10     .00    7.00   Bituminous  Y
 4 836169.81 815893.69      4.10     .00    7.00   Bituminous  Y
 5 836134.88 815892.00      4.10     .00    7.00   Bituminous  Y
 6 836105.31 815893.19      4.10     .00    7.00   Bituminous  Y
 7 836093.50 815893.38      4.10     .00    7.00   Bituminous  Y
 8 836083.31 815892.81      4.10     .00    7.00   Bituminous  Y
 9 836049.00 815899.19      4.10    3.11    7.00   Bituminous  Y
10 836014.38 815906.69      5.20     .00    7.00   Bituminous  Y
11 835992.88 815910.88      4.10

Road  37: D2R3             New Road
Flow: 1337.00(  9.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 835993.13 815910.63      5.90     .00    7.00   Bituminous  Y
 2 835975.31 815914.31      5.50     .00    7.00   Bituminous  Y
 3 835945.13 815918.13      5.30     .00    7.00   Bituminous  Y
 4 835924.63 815918.81      5.20

Road  38: D2R4             New Road
Flow:  639.00(  5.80%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
```



```
 1 835924.69 815918.88      5.20     .00    7.00   Bituminous  Y
 2 835934.48 815918.70      5.20     .00    7.00   Bituminous  N
 3 835897.38 815917.88      5.20
 * 835897.38 815917.88      5.20     N/A    7.00   Bituminous   Same (X,Y), segment ignored *

Road  39: D2R5             New Road
Flow: 1110.00( 14.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 835897.31 815917.63      5.40     .00    7.00   Bituminous  N
 2 835873.88 815916.31      5.20     .00    7.00   Bituminous  N
 3 835841.81 815914.38      4.80     .00    7.00   Bituminous  N
 4 835804.63 815911.81      4.50     .00    7.00   Bituminous  Y
 5 835755.31 815909.31      4.10     .00    7.00   Bituminous  Y
 6 835719.13 815907.63      3.80     .00    7.00   Bituminous  Y
 7 835659.40 815903.81      3.80

Road  40: D2R6             New Road
Flow:   93.00( 15.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 835731.69 815899.81      4.70     .61    7.00   Bituminous  Y
 2 835715.31 815900.19      4.80

Road  41: D2R7             New Road
Flow:   93.00( 15.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 835715.31 815900.13      4.80     .00    7.00   Bituminous  Y
 2 835705.63 815900.81      4.60     .00    7.00   Bituminous  Y
 3 835699.69 815901.19      4.40

Road  42: D2R8             New Road
Flow:  420.00( 25.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 835700.00 815923.69      3.40    2.27    7.00   Bituminous  Y
 2 835748.38 815925.31      4.50    1.31    7.00   Bituminous  Y
 3 835809.19 815928.63      5.30     .89    7.00   Bituminous  N
 4 835876.63 815933.13      5.90     .00    7.00   Bituminous  N
 5 835921.38 815935.13      5.90     .00    7.00   Bituminous  N
 6 835943.08 815934.58      5.90     .00    7.00   Bituminous  Y
 7 835961.00 815932.50      5.90     .00    7.00   Bituminous  Y
 8 835992.63 815931.13      5.90

Road  43: D2R9             Existing Road
Flow: 1383.00( 22.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 835992.38 815930.88      5.80     .00    7.00   Bituminous  Y
 2 836016.81 815922.81      5.20     .00    7.00   Bituminous  Y
 3 836059.13 815913.31      4.10     .00    7.00   Bituminous  Y
 4 836092.19 815907.81      4.10     .00    7.00   Bituminous  Y
 5 836120.00 815905.13      4.10     .00    7.00   Bituminous  Y
 6 836144.31 815904.63      4.10     .00    7.00   Bituminous  Y
 7 836174.13 815906.69      4.10     .00    7.00   Bituminous  Y
 8 836221.38 815911.81      4.10     .00    7.00   Bituminous  Y
 9 836255.31 815916.31      4.00     .00    7.00   Bituminous  Y
10 836283.19 815922.13      4.00     .00    7.00   Bituminous  Y
11 836320.88 815932.88      4.00     .00    7.00   Bituminous  Y
12 836371.31 815947.63      4.00     .00    7.00   Bituminous  Y
13 836399.88 815957.81      4.00     .00    7.00   Bituminous  Y
14 836413.16 815962.31      4.00

Road  44: D2R10            New Road
Flow: 1634.00(  7.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 835699.81 815935.63      6.60     .00    7.00   Bituminous  Y
 2 835721.13 815937.19      6.60     .00    7.00   Bituminous  Y
 3 835744.88 815939.19      6.20     .00    7.00   Bituminous  Y
 4 835780.63 815941.81      6.00     .00    7.00   Bituminous  Y
 5 835807.69 815943.63      4.00     .00    7.00   Bituminous  N
 6 835832.31 815944.50      2.00     .00    7.00   Bituminous  N
 7 835844.81 815945.13      1.00     .00    7.00   Bituminous  N
 8 835856.50 815945.69       .00     .00    7.00   Bituminous  N
 9 835866.19 815946.63      -.50     .00    7.00   Bituminous  N
10 835873.88 815946.69     -1.00     .00    7.00   Bituminous  N
11 835883.38 815947.13     -2.00     .00    7.00   Bituminous  N
12 835893.63 815947.88     -3.00     .00    7.00   Bituminous  N
13 835906.13 815948.38     -4.00

Road  45: D2R11            New Road
Flow: 1490.00( 10.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 835886.63 815906.81     -2.90    6.74    8.00   Bituminous  N
 2 835873.31 815905.88     -2.00    5.18    8.00   Bituminous  N
 3 835863.69 815905.00     -1.50    4.51    8.00   Bituminous  N
 4 835852.63 815904.38     -1.00    6.41    8.00   Bituminous  N
```

```
 5 835840.19 815903.31    -.20    7.55    8.00   Bituminous  N
 6 835827.00 815902.13     .80    9.14    8.00   Bituminous  N
 7 835816.13 815900.88    1.80    4.18    8.00   Bituminous  N
 8 835804.19 815900.13    2.30    3.18    8.00   Bituminous  Y
 9 835785.38 815898.81    2.90    3.14    9.00   Bituminous  Y
10 835756.81 815896.13    3.80    4.12   10.00   Bituminous  Y
11 835735.88 815889.88    4.70

Road 46: D2R12           New Road
Flow:  590.00( 57.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835700.00 816003.81    6.50     .00    7.00   Bituminous  Y
 2 835712.38 816020.19    5.70     .00    7.00   Bituminous  Y
 3 835724.00 816036.38    5.50     .00    7.00   Bituminous  Y
 4 835733.81 816050.38    5.00     .00    7.00   Bituminous  Y
 5 835743.38 816063.00    4.50    2.28    7.00   Bituminous  Y
 6 835752.88 816072.13    4.80    1.63    7.00   Bituminous  Y
 7 835763.00 816079.13    5.00    4.34    7.00   Bituminous  Y
 8 835776.88 816087.38    5.70

Road 47: D2R13           New Road
Flow: 1049.00( 24.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835706.88 815992.88   -1.60    5.52    8.00   Bituminous  Y
 2 835714.31 816000.81   -1.00    1.87    8.00   Bituminous  Y
 3 835721.38 816008.81    -.80    2.65    8.00   Bituminous  Y
 4 835728.38 816017.69    -.50   17.96    8.00   Bituminous  Y
 5 835732.63 816024.88    1.00    9.49    8.00   Bituminous  Y
 6 835738.50 816033.63    2.00    9.83    8.00   Bituminous  Y
 7 835743.81 816042.31    3.00    7.21    8.00   Bituminous  Y
 8 835752.89 816052.80    4.00   13.49    8.00   Bituminous  Y
 9 835757.63 816058.50    5.00    3.59    8.00   Bituminous  Y
10 835765.88 816066.00    5.40    1.02    8.00   Bituminous  Y
11 835773.88 816071.69    5.50    1.78    8.00   Bituminous  Y
12 835784.13 816076.31    5.70

Road 48: D2R14           New Road
Flow:  271.00(  7.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835775.88 816058.63    5.70     .83    7.00   Bituminous  Y
 2 835767.13 816050.38    5.80     .88    7.00   Bituminous  Y
 3 835761.19 816040.69    5.90    1.84    7.00   Bituminous  Y
 4 835753.31 816026.38    6.20    1.77    7.00   Bituminous  Y
 5 835743.81 816005.88    6.60    1.25    7.00   Bituminous  Y
 6 835738.31 815990.81    6.80

Road 49: D2R15           New Road
Flow:    1.00(   .00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835734.69 815991.81    6.60     .00    7.00   Bituminous  Y
 2 835729.00 815980.69    6.60     .00    7.00   Bituminous  Y
 3 835724.19 815973.81    6.60     .00    7.00   Bituminous  Y
 4 835718.38 815970.69    6.60     .00    7.00   Bituminous  Y
 5 835711.31 815970.88    6.60     .00    7.00   Bituminous  Y
 6 835705.13 815971.88    6.60     .00    7.00   Bituminous  Y
 7 835700.19 815974.81    6.60     .00    7.00   Bituminous  Y
 8 835696.50 815978.13    6.60     .00    7.00   Bituminous  Y
 9 835694.50 815983.81    6.60     .00    7.00   Bituminous  Y
10 835692.81 815990.88    6.60

Road 50: D2316           New Road
Flow:  271.00(  7.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835742.63 815990.38    6.80     .00    7.00   Bituminous  Y
 2 835744.69 815983.63    6.50     .00    7.00   Bituminous  Y
 3 835749.38 815975.88    6.30     .00    7.00   Bituminous  Y
 4 835755.38 815971.00    6.00     .00    7.00   Bituminous  Y
 5 835765.63 815966.13    5.80

Road 51: D2R17           New Road
Flow:    1.00(   .00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835699.81 815959.88     .00   22.99    7.00   Bituminous  Y
  ** WARNING : Elevation diff. btn road node 1 and node 2 > 3m **
 2 835725.38 815962.13    5.90    1.00    7.00   Bituminous  Y
 3 835745.38 815963.69    6.10     .98    7.00   Bituminous  Y
 4 835765.69 815966.00    6.30

Road 52: D2R18           New Road
Flow: 1397.00(  9.60%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835735.81 815890.00    4.80     .95    7.00   Bituminous  Y
 2 835726.19 815885.63    4.90    1.58    7.00   Bituminous  Y
```



```
 3 835715.31 815879.19    5.10     .00    7.00   Bituminous  Y
 4 835707.63 815874.31    4.50     .00    7.00   Bituminous  Y
 5 835699.88 815869.31    4.30

Road 53: D2R19           Existing Road
Flow: 2214.00( 24.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835987.13 816082.50    5.50     .00    7.00   Bituminous  Y
 2 835992.31 816074.63    5.50     .00    7.00   Bituminous  Y
 3 835994.38 816042.81    5.50     .00    7.00   Bituminous  Y
 4 835995.81 815999.88    5.50     .00    7.00   Bituminous  Y
 5 835999.63 815975.88    5.50     .00    7.00   Bituminous  Y
 6 836004.13 815954.63    5.50     .00    7.00   Bituminous  Y
 7 836004.88 815938.19    5.50     .00    7.00   Bituminous  Y
 8 836007.25 815918.30    5.50

Road 54: D2R20           Existing Road
Flow:  527.00( 12.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835987.69 815923.31    5.50     .00    7.00   Bituminous  Y
 2 835985.88 815952.19    5.50     .00    7.00   Bituminous  Y
 3 835984.63 815983.13    5.50

Road 55: D2R21           Existing Road
Flow:  914.00(  9.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835984.63 815982.81    5.50     .00    7.00   Bituminous  Y
 2 835983.31 816004.81    5.50     .00    7.00   Bituminous  Y
 3 835981.88 816036.31    5.50     .00    7.00   Bituminous  Y
 4 835980.13 816064.13    5.50     .00    7.00   Bituminous  Y
 5 835977.13 816082.00    5.50

Road 56: D2R22           Existing Road
Flow:  332.00( 29.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835990.63 815887.31    5.50     .00    7.00   Bituminous  Y
 2 835989.31 815902.31    5.50     .00    7.00   Bituminous  Y
 3 835987.81 815923.00    5.50

Road 57: D2R23           Existing Road
Flow:  462.00( 18.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835986.88 815864.63    5.30     .00    7.00   Bituminous  Y
 2 835980.38 815867.00    5.10     .00    7.00   Bituminous  Y
 3 835973.69 815867.00    4.90     .00    7.00   Bituminous  Y
 4 835958.19 815865.88    4.80     .00    7.00   Bituminous  Y
 5 835930.81 815864.13    4.80     .00    7.00   Bituminous  N
 6 835915.50 815862.81    4.80

Road 58: D2R25           New Road
Flow:  471.00( 25.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835901.13 815861.63    4.80     .89    7.00   Bituminous  N
 2 835904.31 815872.38    4.90     .73    7.00   Bituminous  N
 3 835903.81 815886.00    5.00    1.44    7.00   Bituminous  N
 4 835902.69 815899.81    5.20     .00    7.00   Bituminous  N
 5 835900.81 815908.81    5.20     .00    7.00   Bituminous  N
 6 835897.63 815917.69    5.20

Road 59: D2R26           New Road
Flow:  698.00( 10.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835924.88 815918.81    4.80    1.75    8.00   Bituminous  N
 2 835919.38 815908.81    5.00    1.77    8.00   Bituminous  N
 3 835917.69 815897.63    5.20     .00    8.00   Bituminous  N
 4 835919.13 815889.88    4.80

Road 60: D2R27           New Road
Flow:  600.00(  8.50%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835914.38 815888.13    4.80     .00    7.00   Bituminous  N
 2 835914.81 815877.63    4.80     .00    7.00   Bituminous  N
 3 835915.31 815863.00    4.80

Road 61: D2R28           New Road
Flow:   98.00( 19.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 835922.88 815890.88    4.80     .80    7.00   Bituminous  Y
 2 835931.38 815881.81    4.90    2.12    7.00   Bituminous  Y
 3 835938.13 815875.19    5.10    2.06    7.00   Bituminous  Y
 4 835942.63 815873.38    5.20    4.29    7.00   Bituminous  Y
 5 835949.63 815873.38    5.50     .00    7.00   Bituminous  Y
 6 835964.31 815874.69    5.50     .00    7.00   Bituminous  Y
 7 835976.81 815875.63    5.50     .00    7.00   Bituminous  Y
 8 835984.88 815879.88    5.50     .00    7.00   Bituminous  Y
```

```
9 835990.38 815886.81      5.50

Road 62: D2R29          Existing Road
Flow: 1073.00( 18.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 836011.81 815874.31      5.50     .00    7.00   Bituminous  Y
 2 836007.63 815897.38      5.50     .00    7.00   Bituminous  Y
 3 836007.25 815918.30      5.50

Road 63: D2R30          New Road
Flow: 462.00( 18.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 835915.38 815862.81      4.80     .00    7.00   Bituminous  N
 2 835911.31 815862.13      4.80     .00    7.00   Bituminous  N
 3 835901.00 815861.50      4.80

Road 64: D2R31          Existing Road
Flow: 322.00( 29.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 835992.00 815871.63      5.50     .00    7.00   Bituminous  Y
 2 835991.31 815880.00      5.50     .00    7.00   Bituminous  Y
 3 835990.63 815887.31      5.50

Road 65: D2R32          New Road
Flow:    1.00(  .00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 835765.69 815966.13      6.30     .00    7.00   Bituminous  Y
 2 835781.63 815967.19      6.30     .00    7.00   Bituminous  Y
 3 835805.13 815968.81      6.30

Road 66: D2RR1          Existing Road
Flow: 1277.00( 25.60%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 835965.63 816101.00      5.60     .00    7.00   Bituminous  Y
 2 835974.38 816105.38      5.60     .00    7.00   Bituminous  Y
 3 835985.19 816106.81      5.60     .00    7.00   Bituminous  Y
 4 835991.63 816099.00      5.60     .00    7.00   Bituminous  Y
 5 835991.13 816089.69      5.60     .00    7.00   Bituminous  Y
 6 835987.31 816082.81      5.60     .00    7.00   Bituminous  Y
 7 835977.13 816082.31      5.60     .00    7.00   Bituminous  Y
 8 835969.81 816087.63      5.60     .00    7.00   Bituminous  Y
 9 835965.81 816100.88      5.60

Road 67: D3R1           Existing Road
Flow: 1719.00( 30.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 836413.16 815962.31      3.90     .00    7.00   Bituminous  Y
 2 836431.81 815968.38      3.90    2.22    7.00   Bituminous  Y
 3 836471.38 815977.13      4.80

Road 68: D3R2           Existing Road
Flow: 1719.00( 30.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 836471.38 815977.31      4.00     .00    7.00   Bituminous  Y
 2 836482.88 815976.50      4.00     .00    7.00   Bituminous  Y
 3 836491.81 815979.63      4.00     .00    7.00   Bituminous  Y
 4 836505.81 815984.50      4.00

Road 69: D3R3           Existing Road
Flow: 709.00( 14.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 836467.13 815957.50      4.00     .00    7.00   Bituminous  Y
 2 836463.31 815962.50      4.00     .00    7.00   Bituminous  Y
 3 836459.38 815964.50      4.00     .00    7.00   Bituminous  Y
 4 836450.88 815962.31      4.00     .00    7.00   Bituminous  Y
 5 836440.13 815958.69      4.00     .00    7.00   Bituminous  Y
 6 836429.13 815954.88      4.00     .00    7.00   Bituminous  Y
 7 836415.15 815948.89      4.00

Road 70: D3R4           Existing Road        Group: 81
Flow: 1293.00( 29.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 836507.50 815980.81      3.90    4.03    7.00   Bituminous  Y
 2 836514.38 815983.63      4.20    4.03    7.00   Bituminous  Y
 3 836521.19 815986.63      4.50    6.35    7.00   Bituminous  Y
 4 836528.63 815989.19      5.00    2.45    7.00   Bituminous  Y
 5 836536.31 815992.00      5.20    5.46    7.00   Bituminous  Y
 6 836541.63 815993.38      5.50    8.00    7.00   Bituminous  Y
 7 836547.88 815993.19      6.00    8.40    7.00   Bituminous  Y
 8 836553.81 815992.69      6.50   25.25    7.00   Bituminous  Y
 9 836558.63 815990.88      7.80    9.65    7.00   Bituminous  Y
10 836564.63 815986.81      8.50    7.28    7.00   Bituminous  Y
11 836569.13 815978.31      9.20    9.25    7.00   Bituminous  Y
12 836572.00 815971.31      9.90    4.38    7.00   Bituminous  Y
13 836576.81 815958.50     10.50    5.06    7.00   Bituminous  Y
```



```
14 836582.50 815945.88     11.20    5.56    7.00   Bituminous  Y
15 836587.63 815936.38     11.80    1.20    7.00   Bituminous  Y
16 836592.81 815929.81     11.90    1.38    7.00   Bituminous  Y
17 836599.31 815926.63     12.00     .00    7.00   Bituminous  Y
18 836608.31 815925.31     12.00     .00    7.00   Bituminous  Y
19 836617.88 815925.88     12.00

Road 71: D3R5           Existing Road
Flow: 200.00( 79.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 836504.69 815987.63      3.90    1.22    7.00   Bituminous  Y
 2 836512.31 815990.63      4.00    1.20    7.00   Bituminous  Y
 3 836528.13 815995.88      4.20     .00    7.00   Bituminous  Y
 4 836541.63 816000.13      4.20     .00    7.00   Bituminous  Y
 5 836553.31 816000.13      4.20     .00    7.00   Bituminous  Y
 6 836564.31 815996.50      4.20     .00    7.00   Bituminous  Y
 7 836574.00 815986.69      4.20     .00    7.00   Bituminous  Y
 8 836579.31 815975.13      4.20     .00    7.00   Bituminous  Y
 9 836586.19 815958.63      4.20     .00    7.00   Bituminous  Y
10 836591.31 815947.31      4.20     .00    7.00   Bituminous  Y
11 836600.13 815933.31      4.20

Road 72: D3R6           Existing Road
Flow: 200.00( 79.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 836602.50 815936.13      4.00     .00    7.00   Bituminous  Y
 2 836607.63 815935.31      4.00     .00    7.00   Bituminous  Y
 3 836615.00 815935.38      4.00

Road 73: D5R3-2         New Road
Flow: 4917.00( 16.00%hv) veh/hr  Speed: 70.00 km/h   Texture Depth: 1.50 mm
 1 837893.91 816895.66     12.00     .00    7.00   Pervious  N
 2 837870.31 816873.13     10.00     .00    7.00   Pervious  N
 3 837855.31 816858.19      9.00     .00    7.00   Pervious  N
 4 837839.69 816843.69      8.00     .00    7.00   Pervious  N
 5 837828.00 816831.63      7.40     .00    7.00   Pervious  N
 6 837806.69 816811.13      4.50     .00    7.00   Pervious  N
 7 837794.63 816799.88      3.00     .00    7.00   Pervious  N
 8 837772.88 816778.81      1.60     .00    7.00   Pervious  N
 9 837755.63 816762.38       .00     .00    7.00   Pervious  N
10 837741.81 816748.63     -1.30     .00    7.00   Pervious  N
11 837731.38 816738.63     -2.00     .00    7.00   Pervious  N
12 837715.19 816722.63     -4.00     .00    7.00   Pervious  N
13 837702.63 816709.31     -6.20

Road 74: D1R19          New Road
Flow: 1736.00( 22.80%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 835248.19 815802.81      5.10    1.20   16.00   Bituminous  Y
 2 835240.31 815800.13      5.20    1.25   16.00   Bituminous  Y
 3 835233.00 815796.88      5.30    1.25   16.00   Bituminous  Y
 4 835226.81 815791.81      5.40     .94   16.00   Bituminous  Y
 5 835220.69 815783.13      5.50     .70   16.00   Bituminous  Y
 6 835213.81 815755.31      5.30     .00   16.00   Bituminous  Y
 7 835207.19 815728.81      5.30    2.17   16.00   Bituminous  Y
 8 835193.63 815675.31      4.10

Road 75: D4R1           Existing Road
Flow: 4426.00( 27.00%hv) veh/hr  Speed: 70.00 km/h   Texture Depth: 1.50 mm
 1 836879.19 815915.19      4.20     .00    7.00   Bituminous  Y
 2 836906.19 815923.63      4.20     .00    7.00   Bituminous  Y
 3 836945.50 815940.00      4.20     .00    7.00   Bituminous  Y
 4 836996.81 815962.13      4.20     .00    7.00   Bituminous  Y
 5 837026.88 815983.00      4.20     .00    7.00   Bituminous  Y
 6 837063.19 816011.19      4.20     .00    7.00   Bituminous  Y
 7 837082.88 816026.38      4.20     .00    7.00   Bituminous  Y
 8 837093.00 816033.81      4.20

Road 76: D4R2           Existing Road        Group: 2
Flow: 1412.00( 24.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 837102.50 816031.81      6.80    7.57   12.00   Bituminous  Y
 2 837121.69 816048.00      8.70    7.00   12.00   Bituminous  Y
 3 837137.19 816060.63     10.10    8.84    7.00   Bituminous  Y
 4 837151.81 816073.13     11.80    1.98   12.00   Bituminous  Y
 5 837165.13 816080.38     12.10     .00   12.00   Bituminous  Y
 6 837175.88 816082.13     12.10     .00   12.00   Bituminous  Y
 7 837190.63 816080.88     11.80     .00   12.00   Bituminous  Y
 8 837201.63 816076.38     11.10     .00   12.00   Bituminous  Y
 9 837213.81 816067.00     11.10     .00   12.00   Bituminous  Y
```

```
10 837222.81 816052.81      9.00     .00    12.00   Bituminous   Y
11 837225.50 816040.63      8.00     .00    12.00   Bituminous   Y
12 837225.88 816023.38      6.50     .00    12.00   Bituminous   Y
13 837226.81 816012.31      4.00

Road  77: D4R3           Existing Road
Flow:  1241.00( 14.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837092.88 816033.63     4.20     .00     7.00   Bituminous   Y
 2 837113.31 816053.38     4.20     .00     7.00   Bituminous   Y
 3 837143.88 816078.81     4.20     .00     7.00   Bituminous   Y
 4 837163.88 816092.38     4.20     .00     7.00   Bituminous   Y
 5 837187.50 816105.19     4.20     .00     7.00   Bituminous   Y
 6 837207.81 816113.81     4.20     .00     7.00   Bituminous   Y
 7 837222.63 816122.13     4.20     .00     7.00   Bituminous   Y
 8 837243.63 816130.81     4.20    1.08     7.00   Bituminous   Y
 9 837279.72 816138.48     4.60

Road  78: D4R4           Existing Road
Flow:  1241.00( 14.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837226.80 816012.31     4.10     .00     7.00   Bituminous   Y
 2 837229.00 816003.00     4.10     .00     7.00   Bituminous   Y
 3 837235.13 815981.13     4.10     .00     7.00   Bituminous   Y
 4 837246.81 815942.50     4.10

Road  79: DAR1           Existing Road
Flow:   613.00( 12.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837726.41 816167.30     5.00     .00     7.00   Bituminous   Y
 2 837720.18 816173.77     5.00     .00     7.00   Bituminous   Y
 3 837716.06 816177.41     5.00     .00     7.00   Bituminous   Y
 4 837713.36 816179.41     5.00     .00     7.00   Bituminous   Y
 5 837708.95 816182.66     5.00     .00     7.00   Bituminous   Y
 6 837703.66 816185.36     5.00     .00     7.00   Bituminous   Y
 7 837697.90 816188.07     5.00     .00     7.00   Bituminous   Y
 8 837688.24 816190.16     5.00     .00     7.00   Bituminous   Y
 9 837663.21 816189.10     5.00

Road  80: DAR2           New Road
Flow:   835.00( 14.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837663.21 816189.10     5.00     .00     7.00   Bituminous   Y
 2 837648.19 816188.16     4.80     .00     7.00   Bituminous   Y
 3 837637.68 816187.88     4.70     .00     7.00   Bituminous   Y
 4 837615.93 816186.36     4.30     .00     7.00   Bituminous   Y
 5 837606.85 816185.52     4.30     .00     7.00   Bituminous   Y
 6 837594.34 816184.66     4.30     .00     8.00   Bituminous   Y
 7 837581.25 816183.45     4.30     .00     9.00   Bituminous   Y
 8 837559.28 816179.22     4.00     .00    10.00   Bituminous   Y
 9 837538.75 816169.64     2.00     .00    10.00   Bituminous   Y
10 837520.67 816159.95      .00     .00     9.00   Bituminous   Y
11 837503.11 816149.73    -1.20     .00     8.00   Bituminous   Y
12 837493.78 816144.11    -1.30     .00     8.00   Bituminous   Y
13 837483.33 816137.58    -1.50     .00     8.00   Bituminous   Y
14 837474.24 816132.40    -2.00     .00     8.00   Bituminous   Y
15 837464.55 816126.90    -2.30     .00     7.50   Bituminous   Y
16 837455.56 816122.40    -2.50     .00     7.50   Bituminous   Y
17 837446.11 816118.35    -3.00     .00     7.00   Bituminous   Y
18 837436.81 816115.00    -3.50     .00     7.00   Bituminous   Y
19 837428.62 816112.64    -4.00     .00     7.00   Bituminous   Y
20 837412.62 816108.97    -5.00     .00     7.00   Bituminous   Y
21 837401.15 816106.83    -6.00     .00     7.00   Bituminous   Y
22 837389.79 816105.71    -6.50

Road  81: DAR7-1         Existing Road
Flow:  1884.00( 24.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837651.31 816197.22     4.30     .00     7.00   Bituminous   Y
 2 837615.06 816194.97     4.30     .00     7.00   Bituminous   Y
 3 837588.74 816192.32     4.30     .00     8.00   Bituminous   Y
 4 837565.48 816190.03     4.30     .00     9.00   Bituminous   Y
 5 837547.43 816188.75     4.30     .00     9.00   Bituminous   Y
 6 837530.77 816187.16     4.30     .00     8.00   Bituminous   Y
 7 837510.79 816183.59     4.30     .00     7.50   Bituminous   Y
 8 837493.30 816178.43     4.30     .00     7.00   Bituminous   Y
 9 837470.63 816168.63     4.30

Road  82: DAR7-2         Existing Road
Flow:  1884.00( 24.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837470.63 816168.63     4.30     .00     7.00   Bituminous   Y
```



```
 2 837454.13 816161.81     4.30     .00     7.00   Bituminous   Y
 3 837432.38 816152.50     4.30     .00     7.00   Bituminous   Y
 4 837415.50 816145.69     4.30    1.17     7.00   Bituminous   Y
 5 837399.31 816140.00     4.50    1.49     7.00   Bituminous   Y
 6 837379.88 816134.63     4.80    3.13     7.00   Bituminous   Y
 7 837364.69 816129.69     5.30    2.72     7.00   Bituminous   Y
 8 837346.81 816125.38     5.80    3.54     7.00   Bituminous   Y
 9 837333.13 816121.81     6.30

Road  83: WAR1           Existing Road
Flow:     1.00(   .00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837584.10 816577.60     4.00     .00    16.50   Bituminous   N
 2 837713.50 816468.10     4.00

Road  84: WAR2           Existing Road
Flow:     1.00(   .00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837713.50 816468.10     4.00     .49    16.50   Bituminous   N
 2 837759.40 816427.30     4.30

Road  85: KMR1           Existing Road
Flow:   193.00( 23.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837713.50 816468.10     4.00     .00     7.00   Bituminous   Y
 2 837595.50 816380.70     4.00

Road  86: WHR            Existing Road
Flow:   655.00( 21.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837756.10 816421.90     4.30     .00     8.00   Bituminous   Y
 2 837747.70 816413.90     4.30     .00    16.00   Bituminous   Y
 3 837697.20 816375.80     3.90     .00    16.00   Bituminous   Y
 4 837656.30 816345.90     3.50

Road  87: GOR            Existing Road
Flow:  1792.00( 22.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837688.80 816284.10     4.00     .49    13.00   Bituminous   Y
 2 837706.80 816293.70     4.10     .23    13.00   Bituminous   Y
 3 837777.00 816345.00     4.30

Road  88: K2             Existing Road
Flow:   476.00( 10.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837607.29 816228.81     4.80     .00     7.00   Bituminous   Y
 2 837632.94 816239.56     4.50     .00     7.00   Bituminous   Y
 3 837654.30 816248.00     4.20     .00     7.00   Bituminous   Y
 4 837680.40 816254.00     4.10     .00     7.00   Bituminous   Y
 5 837704.80 816259.80     4.00

Road  89: L3             Existing Road
Flow:   765.00( 17.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837605.44 816234.52     4.80     .00     7.00   Bituminous   Y
 2 837630.86 816246.10     4.50     .00     7.00   Bituminous   Y
 3 837650.54 816258.02     4.20     .00     7.00   Bituminous   Y
 4 837670.40 816271.80     4.10     .00     7.00   Bituminous   Y
 5 837688.60 816284.30     4.00

Road  90: NIE11          Existing Road
Flow:  1887.00( 16.30%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837640.90 816333.40     3.50     .56    17.00   Bituminous   Y
 2 837655.30 816322.60     3.60     .65    17.00   Bituminous   Y
 3 837667.00 816312.60     3.70     .84    17.00   Bituminous   Y
 4 837688.70 816284.20     4.00

Road  91: HFS1           Existing Road
Flow:  1539.00( 23.90%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837704.80 816259.80     4.00     .00    14.50   Bituminous   Y
 2 837695.31 816274.49     4.00     .00    14.50   Bituminous   Y
 3 837688.80 816284.10     4.00

Road  92: HFS2           Existing Road
Flow:   704.00( 29.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837721.05 816220.94     4.00     .00    11.50   Bituminous   Y
 2 837711.65 816243.36     4.00     .00    11.50   Bituminous   Y
 3 837704.80 816259.70     4.00

Road  93: HFS3           Existing Road
Flow:  1503.00( 20.40%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837734.20 816160.13     4.00     .00    12.50   Bituminous   Y
 2 837734.30 816169.70     4.00     .00    11.00   Bituminous   Y
```

```
 3 837728.70 816199.80     4.00     .00   11.00  Concrete     Y
 4 837721.10 816220.94     4.00

Road  94: HFS4            Existing Road
Flow:  2116.00( 18.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837744.80 816019.50     4.00     .00   10.50  Bituminous   Y
 2 837739.60 816101.10     4.00     .00   10.50  Bituminous   Y
 3 837734.16 816160.15     4.00

Road  95: LLR1            Existing Road
Flow:   257.00( 26.80%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837737.00 816140.60     4.00    1.03    8.50  Bituminous   Y
 2 837795.40 816144.10     4.60    2.95    6.00  Bituminous   Y
 3 837822.50 816143.90     5.40    2.79   12.00  Bituminous   Y
 4 837828.50 816147.80     5.60    1.94   12.00  Bituminous   Y
 5 837854.30 816148.90     6.10    2.83   12.00  Bituminous   Y
 6 837896.50 816151.50     7.30

Road  96: J2              Existing Road
Flow:  3540.00( 20.50%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837333.10 816121.81     6.30    1.10    7.00  Bituminous   Y
 2 837306.43 816116.43     6.60     .00    7.00  Bituminous   Y
 3 837274.89 816113.04     6.00     .00    7.00  Bituminous   Y
 4 837252.66 816108.17     6.00     .00    7.00  Bituminous   Y
 5 837227.57 816101.96     5.60     .00    7.00  Bituminous   Y
 6 837207.11 816091.80     5.30     .00    7.00  Bituminous   Y
 7 837196.90 816080.50     4.90     .00    7.00  Bituminous   Y
 8 837186.40 816069.10     4.70     .00    7.00  Bituminous   Y
 9 837172.90 816054.50     4.40     .00    7.00  Bituminous   Y
10 837159.60 816040.00     4.20     .46    7.00  Bituminous   Y
11 837145.40 816023.30     4.30

Road  97: VPs2            Existing Road
Flow:  1864.00( 22.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837142.40 816023.80     4.30     .00   10.50  Bituminous   Y
 2 837141.30 816009.10     4.30     .00   10.50  Bituminous   Y
 3 837149.00 815978.70     4.20

Road  98: VPs3            Existing Road
Flow:  1676.00( 19.80%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837133.20 816029.10     4.30     .00   11.00  Bituminous   Y
 2 837111.10 816011.00     4.30     .00   10.00  Bituminous   Y
 3 837089.50 815995.80     4.30

Road  99: GW              Existing Road
Flow:      .10(   .00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837247.40 815889.20     3.90     .20    7.00  Bituminous   N
 2 837231.70 815937.70     4.00     .18    7.00  Bituminous   N
 3 837213.90 815989.70     4.10     .00    7.00  Bituminous   N
 4 837210.30 815997.90     4.10

Road 100: GLn1            Existing Road            Group: 16
Flow:  1205.00(  8.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837253.60 815891.70     3.90    3.21    7.00  Bituminous   Y
 2 837245.00 815918.40     4.80    3.53    7.00  Bituminous   Y
 3 837236.70 815942.50     5.70    9.28    7.00  Bituminous   Y
 4 837231.00 815959.90     7.40    7.93    7.00  Bituminous   Y
 5 837227.20 815970.60     8.30    8.07    7.00  Bituminous   Y
 6 837223.10 815982.30     9.30    7.57    7.00  Bituminous   Y
 7 837219.40 815993.60    10.20    7.13    7.00  Bituminous   Y
 8 837215.50 816005.60    11.10     .00    7.00  Bituminous   Y
 9 837203.50 816041.40    11.10     .00    7.00  Bituminous   Y
10 837198.70 816052.30    11.10     .00    7.00  Bituminous   Y
11 837191.90 816060.90    11.10     .00    7.00  Bituminous   Y
12 837183.90 816066.40    11.10    3.42    7.00  Bituminous   Y
13 837175.40 816068.60    11.40    4.41    7.00  Bituminous   Y
14 837166.40 816067.50    11.80    4.19    7.00  Bituminous   Y
15 837159.40 816066.00    12.10     .00    7.00  Bituminous   Y
16 837153.00 816061.40    11.70     .00    7.00  Bituminous   Y
17 837140.80 816051.30    10.10     .00    7.00  Bituminous   Y
18 837120.80 816034.40     7.70     .00    7.00  Bituminous   Y
19 837103.90 816019.80     5.60     .00    7.00  Bituminous   Y
20 837083.80 816003.40     4.30

Road 101: VPs4            Existing Road
Flow:  1676.00( 19.80%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
```



```
 1 837089.70 815995.70     4.30     .70    7.00  Bituminous   Y
 2 837055.60 815969.60     4.60     .00    7.00  Bituminous   Y
 3 837029.30 815954.40     4.50     .00    7.00  Bituminous   Y
 4 837015.90 815944.30     4.50

Road 102: GLW1            Existing Road
Flow:   800.00( 30.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837212.70 815997.00     4.10     .16    7.00  Bituminous   Y
 2 837152.40 815976.10     4.20

Road 103: GLW2            Existing Road
Flow:  2264.00( 24.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837152.60 815976.10     4.20     .00    7.00  Bituminous   Y
 2 837115.60 815963.00     4.20     .60    7.00  Bituminous   Y
 3 837084.10 815952.20     4.40

Road 104: GLW3            Existing Road
Flow:  2264.00( 24.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837084.10 815952.20     4.40     .00    7.00  Bituminous   Y
 2 837045.90 815939.50     4.30     .00    7.00  Bituminous   Y
 3 837032.10 815938.50     4.30    1.54    7.00  Bituminous   Y
 4 837020.00 815933.80     4.50

Road 105: GLw4            Existing Road
Flow:  5085.00( 39.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837019.90 815933.80     4.50     .00    7.00  Bituminous   Y
 2 836985.20 815919.80     4.30     .00    7.00  Bituminous   Y
 3 836940.10 815900.20     4.20

Road 106: GLw5-1          Existing Road
Flow:  5085.00( 39.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836940.20 815900.10     4.20     .00    7.00  Bituminous   Y
 2 836892.01 815880.84     4.20

Road 107: GLw5-2          Existing Road
Flow:  5085.00( 39.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836889.11 815887.19     4.20     .00   20.00  Bituminous   Y
 2 836848.47 815870.26     4.20     .00   22.00  Bituminous   Y
 3 836787.02 815845.49     4.20

Road 108: CHT1            Existing Road
Flow:  3697.00( 34.00%hv) veh/hr  Speed:  70.00 km/h   Texture Depth:  1.50 mm
 1 836896.20 816080.90      .00    4.27    7.00  Bituminous   Y
 2 836884.40 816060.70     1.00    3.87    7.00  Bituminous   Y
 3 836869.60 816039.50     2.00    3.93    7.00  Bituminous   Y
 4 836852.90 816020.30     3.00    3.47    7.00  Bituminous   Y
 5 836832.40 816000.00     4.00     .00    7.00  Bituminous   Y
 6 836809.90 815978.00     4.00

Road 109: CHT2            Existing Road
Flow:  3697.00( 34.00%hv) veh/hr  Speed:  70.00 km/h   Texture Depth:  1.50 mm
 1 836809.80 815978.10     4.00     .00    7.00  Bituminous   Y
 2 836802.90 815971.30     4.00     .00    7.00  Bituminous   Y
 3 836792.70 815955.80     4.00

Road 110: CHT3            Existing Road
Flow:  3775.00( 26.00%hv) veh/hr  Speed:  70.00 km/h   Texture Depth:  1.50 mm
 1 836767.50 815985.60     4.00     .00    7.00  Bituminous   Y
 2 836790.50 815996.30     4.00

Road 111: CHT4            Existing Road
Flow:  3775.00( 26.00%hv) veh/hr  Speed:  70.00 km/h   Texture Depth:  1.50 mm
 1 836790.40 815996.30     4.00     .00    7.00  Bituminous   Y
 2 836817.80 816015.00     4.00     .00    7.00  Bituminous   Y
 3 836839.80 816032.80     3.00     .00    7.00  Bituminous   Y
 4 836856.20 816049.80     2.00     .00    7.00  Bituminous   Y
 5 836871.20 816069.90     1.00     .00    7.00  Bituminous   Y
 6 836882.20 816087.80      .00

Road 112: CHT5            Existing Road
Flow:  1224.00( 23.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836774.30 815970.30     4.00     .00    7.00  Bituminous   Y
 2 836796.30 815989.40     4.00

Road 113: GLe2            Existing Road
Flow:     1.00(   .00%hv) veh/hr  Speed:  70.00 km/h   Texture Depth:  1.50 mm
```

```
 1 836792.70 815955.70    4.00   2.04   7.00  Bituminous  Y
 2 836790.00 815946.30    4.20   1.90   7.00  Bituminous  Y
 3 836789.20 815935.80    4.40   2.20   7.00  Bituminous  Y
 4 836790.60 815926.80    4.60   1.97   7.00  Bituminous  Y
 5 836794.70 815917.50    4.80    .00   7.00  Bituminous  Y
 6 836801.90 815909.70    4.70    .00   7.00  Bituminous  Y
 7 836811.40 815904.60    4.50    .00   7.00  Bituminous  Y
 8 836821.20 815902.50    4.40    .00   7.00  Bituminous  Y
 9 836831.20 815904.10    4.20    .00   7.00  Bituminous  Y
10 836853.70 815909.50    4.10    .00   7.00  Bituminous  Y
11 836878.20 815916.40    4.00

Road 114: GLe3-1          Existing Road         Group: 15
Flow: 2439.00( 21.30%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836758.30 815907.25   10.20    .00  17.50  Bituminous  Y
 2 836775.29 815901.02    9.10    .00  17.50  Bituminous  Y
 3 836790.38 815896.08    8.00    .00  17.50  Bituminous  Y
 4 836799.72 815893.02    7.40

Road 115: GLe3-2          Existing Road
Flow: 2439.00( 21.30%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836799.72 815893.02    7.40    .00  15.00  Bituminous  Y
 2 836818.80 815889.48    6.50    .00  14.50  Bituminous  Y
 3 836835.34 815892.79    5.40    .00  11.00  Bituminous  Y
 4 836852.27 815897.55    4.30    .00   9.00  Bituminous  Y
 5 836880.85 815908.79    4.00

Road 116: GLe4            Existing Road
Flow: 1138.00( 46.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836773.90 815867.50    3.80    .96   7.00  Bituminous  Y
 2 836794.50 815871.00    4.00   1.28   7.00  Bituminous  Y
 3 836817.30 815876.60    4.30    .00   7.00  Bituminous  Y
 4 836852.00 815887.60    4.30    .00   7.00  Bituminous  Y
 5 836884.20 815900.80    4.30

Road 117: HH1             Existing Road
Flow:    1.00(   .00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836763.00 815994.90    4.00    .00   7.00  Bituminous  Y
 2 836776.90 816001.70    4.00    .00   7.00  Bituminous  Y
 3 836793.50 816010.90    4.00    .00   7.00  Bituminous  Y
 4 836809.80 816022.30    4.00    .00   7.00  Bituminous  Y
 5 836825.40 816034.80    4.00    .00   7.00  Bituminous  Y
 6 836832.70 816041.60    4.00    .00   7.00  Bituminous  Y
 7 836846.60 816056.20    4.00    .00   7.00  Bituminous  Y
 8 836855.40 816068.30    4.00    .00   7.00  Bituminous  Y
 9 836865.60 816085.90    4.00    .00   7.00  Bituminous  Y
10 836871.20 816098.70    4.00

Road 118: GLn2            Existing Road
Flow:     .10(   .00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837310.00 815711.70    3.20    .00   7.00  Bituminous  N
 2 837299.80 815739.60    3.20    .00   7.00  Bituminous  N
 3 837287.50 815773.00    3.20    .75   7.00  Bituminous  N
 4 837274.80 815810.70    3.50    .57   7.00  Bituminous  N
 5 837263.70 815844.20    3.70

Road 119: GLn3            Existing Road
Flow:     .10(   .00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837314.90 815716.00   11.50    .00   7.00  Bituminous  N
 2 837301.20 815755.80   11.10    .00   7.00  Bituminous  N
 3 837296.50 815768.80   10.30    .00   7.00  Bituminous  N
 4 837292.90 815780.20    9.50    .00   7.00  Bituminous  N
 5 837290.00 815788.60    8.70    .00   7.00  Bituminous  N
 6 837287.50 815795.90    7.80    .00   7.00  Bituminous  N
 7 837284.60 815804.10    7.00    .00   7.00  Bituminous  N
 8 837282.00 815812.90    6.10    .00   7.00  Bituminous  N
 9 837270.60 815845.90    3.70

Road 120: GLn4            Existing Road
Flow:     .10(   .00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837263.70 815844.20    3.70    .42   7.00  Bituminous  N
 2 837248.50 815889.80    3.90

Road 121: GLs2            Existing Road
Flow: 1241.00( 14.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837245.76 815943.70    3.90    .00   7.00  Bituminous  Y
```



```
 2 837277.80 815848.30    3.70    .57   7.00  Bituminous  Y
 3 837289.40 815815.00    3.90    .76   7.00  Bituminous  Y
 4 837302.00 815777.70    4.20    .56   7.00  Bituminous  Y
 5 837313.40 815743.80    4.40    .00   7.00  Bituminous  Y
 6 837323.00 815715.80    4.40

Road 122: TOR1            Existing Road
Flow: 1002.00( 32.10%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836305.10 815784.80    4.00    .00  16.00  Bituminous  Y
 2 836281.20 815845.30    4.00    .00  14.50  Bituminous  Y
 3 836260.40 815900.70    4.00

Road 123: Gle5-1          Existing Road         Group: 14
Flow: 1146.00( 13.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836687.89 815919.36    6.00   9.42  16.00  Bituminous  Y
 2 836698.48 815920.02    7.00   3.36  14.00  Bituminous  Y
 3 836710.25 815918.30    7.40   5.14  13.00  Bituminous  Y
 4 836727.32 815914.34    8.30   6.60  13.00  Bituminous  Y
 5 836744.48 815908.29    9.50

Road 124: Gle5-2          Existing Road         Group: 14
Flow: 2439.00( 21.30%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836746.10 815912.43    9.50   5.30  17.50  Bituminous  Y
 2 836758.26 815907.28   10.20

Road 125: CHT3            Existing Road
Flow: 2551.00( 27.40%hv) veh/hr  Speed:  70.00 km/h   Texture Depth:  1.50 mm
 1 836628.38 815919.77    6.00    .00   8.50  Bituminous  Y
 2 836643.20 815931.14    6.00    .00   8.50  Bituminous  Y
 3 836655.37 815936.43    5.70    .00   8.50  Bituminous  Y
 4 836673.10 815944.90    5.30    .00   8.50  Bituminous  Y
 5 836692.15 815951.78    5.00    .00   8.50  Bituminous  Y
 6 836710.40 815958.39    5.00    .00   8.50  Bituminous  Y
 7 836720.31 815963.22    4.70    .00   8.50  Bituminous  Y
 8 836738.83 815971.15    4.40    .00   7.00  Bituminous  Y
 9 836767.20 815985.40    4.00

Road 126: GLe6            Existing Road
Flow:  730.00(  9.80%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836633.73 815911.10    6.00    .00  10.00  Bituminous  Y
 2 836648.41 815917.45    6.00    .00  10.00  Bituminous  Y
 3 836660.58 815922.48    6.00    .00  10.00  Bituminous  Y
 4 836675.00 815923.01    6.00    .00  10.00  Bituminous  Y
 5 836686.78 815922.88    6.00

Road 127: GLe7            Existing Road
Flow:  849.00( 18.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836625.10 815894.30    6.00    .00   7.00  Bituminous  Y
 2 836641.30 815902.10    6.00    .00   7.00  Bituminous  Y
 3 836657.10 815907.60    6.00    .00   7.00  Bituminous  Y
 4 836673.00 815911.70    6.00    .00   7.00  Bituminous  Y
 5 836688.80 815914.10    6.00

Road 128: CHT5            Existing Road
Flow: 1224.00( 23.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836627.40 815889.20    6.00    .00   7.00  Bituminous  Y
 2 836637.50 815889.90    5.90    .00   7.00  Bituminous  Y
 3 836647.70 815889.10    5.80    .00   7.00  Bituminous  Y
 4 836657.60 815887.30    5.70    .00   7.00  Bituminous  Y
 5 836677.80 815884.00    5.50    .00   7.00  Bituminous  Y
 6 836687.90 815883.30    5.40    .00   7.00  Bituminous  Y
 7 836697.90 815883.70    5.30    .00   7.00  Bituminous  Y
 8 836707.70 815886.60    5.20    .00   7.00  Bituminous  Y
 9 836716.80 815891.10    5.00    .00   7.00  Bituminous  Y
10 836725.30 815897.00    4.90    .00   7.00  Bituminous  Y
11 836731.80 815904.00    4.80    .00   7.00  Bituminous  Y
12 836737.40 815912.60    4.70    .00   7.00  Bituminous  Y
13 836742.20 815920.70    4.60    .00   7.00  Bituminous  Y
14 836751.40 815938.60    4.40    .00   7.00  Bituminous  Y
15 836762.40 815955.60    4.20    .00   7.00  Bituminous  Y
16 836775.50 815970.20    4.00

Road 129: CRW1            Existing Road         Group: 13
Flow: 2073.00( 20.90%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836649.10 815769.10   11.00    .00   7.00  Bituminous  Y
 2 836637.30 815782.30   11.00    .00   7.00  Bituminous  Y
```

```
 3 836629.60 815789.10     11.00    .00    7.00  Bituminous  Y
 4 836621.70 815795.20     11.00    .00    7.00  Bituminous  Y
 5 836613.90 815802.00     11.00    .00    7.00  Bituminous  Y
 6 836606.30 815808.20     11.00    .00    7.00  Bituminous  Y
 7 836599.80 815816.40     11.00    .00    7.00  Bituminous  Y
 8 836595.20 815824.30     11.00    .00    7.00  Bituminous  Y
 9 836592.00 815833.70     11.00    .00    7.00  Bituminous  Y
10 836590.90 815843.90     11.00    .00    7.00  Bituminous  Y
11 836591.60 815853.20     10.20    .00    7.00  Bituminous  Y
12 836594.70 815862.80      9.30    .00    7.00  Bituminous  Y
13 836599.80 815871.50      8.50    .00    7.00  Bituminous  Y
14 836605.90 815879.10      7.70    .00    7.00  Bituminous  Y
15 836613.10 815885.80      6.80    .00    7.00  Bituminous  Y
16 836625.00 815894.40      6.00

Road 130: CRW2          Existing Road          Group: 9
Flow: 3756.00( 24.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836708.80 815600.30     11.00    .00    7.00  Bituminous  Y
 2 836707.80 815609.20     11.00    .00    7.00  Bituminous  Y
 3 836704.40 815623.40     11.00    .00    7.00  Bituminous  Y
 4 836685.90 815670.30     11.00    .00    7.00  Bituminous  Y
 5 836671.50 815706.30     11.00    .00    7.00  Bituminous  Y
 6 836659.10 815737.50     11.00    .00    7.00  Bituminous  Y
 7 836649.90 815759.00     11.00    .00    7.00  Bituminous  Y
 8 836642.50 815766.20     11.00

Road 131: CRE1          Existing Road          Group: 13
Flow: 1258.00( 27.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836631.20 815880.80      6.00   5.80    7.00  Bituminous  Y
 2 836621.70 815876.70      6.60   5.59    7.00  Bituminous  Y
 3 836614.50 815871.40      7.10   7.17    7.00  Bituminous  Y
 4 836609.10 815865.00      7.70   6.90    7.00  Bituminous  Y
 5 836605.70 815858.60      8.20   8.11    7.00  Bituminous  Y
 6 836604.00 815851.40      8.80   6.80    7.00  Bituminous  Y
 7 836603.10 815844.10      9.30   7.97    7.00  Bituminous  Y
 8 836603.80 815836.60      9.90   6.20    7.00  Bituminous  Y
 9 836606.20 815828.90     10.40   8.07    7.00  Bituminous  Y
10 836609.80 815822.40     11.00    .00    7.00  Bituminous  Y
11 836614.90 815816.40     11.00    .00    7.00  Bituminous  Y
12 836621.90 815810.70     11.00    .00    7.00  Bituminous  Y
13 836629.30 815804.90     11.00    .00    7.00  Bituminous  Y
14 836637.10 815798.40     11.00    .00    7.00  Bituminous  Y
15 836645.20 815791.40     11.00    .00    7.00  Bituminous  Y
16 836658.50 815773.40     11.00

Road 132: CRE2          Existing Road          Group: 9
Flow: 4608.00( 22.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836666.70 815775.20     11.00    .00    7.00  Bituminous  Y
 2 836668.20 815766.00     11.00    .00    7.00  Bituminous  Y
 3 836676.60 815744.60     11.00    .00    7.00  Bituminous  Y
 4 836689.10 815713.00     11.00    .00    7.00  Bituminous  Y
 5 836703.60 815677.50     11.00    .00    7.00  Bituminous  Y
 6 836722.20 815630.50     11.00    .00    7.00  Bituminous  Y
 7 836726.70 815614.10     11.00    .00    7.00  Bituminous  Y
 8 836729.60 815600.20     11.00

Road 133: CHT6          Existing Road
Flow: 1258.00( 27.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836733.80 815896.00      3.40   6.10    7.00  Bituminous  Y
 2 836728.60 815892.00      3.80   3.73    7.00  Bituminous  Y
 3 836720.00 815885.60      4.20   2.70    7.00  Bituminous  Y
 4 836710.10 815880.60      4.50   2.58    7.00  Bituminous  Y
 5 836699.00 815877.20      4.80   2.72    7.00  Bituminous  Y
 6 836688.00 815876.50      5.10   3.66    7.00  Bituminous  Y
 7 836677.10 815877.10      5.50   3.00    7.00  Bituminous  Y
 8 836660.70 815880.00      6.00

Road 134: GLe8          Existing Road
Flow: 1760.00( 20.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836518.30 815772.20      4.00   1.01    7.00  Bituminous  Y
 2 836526.20 815778.20      4.10    .95    7.00  Bituminous  Y
 3 836534.70 815784.40      4.20   1.01    7.00  Bituminous  Y
 4 836543.40 815789.20      4.30   1.01    7.00  Bituminous  Y
 5 836552.20 815793.80      4.40   1.00    7.00  Bituminous  Y
 6 836561.30 815798.00      4.50    .99    7.00  Bituminous  Y
 7 836570.70 815801.70      4.60   1.00    7.00  Bituminous  Y
```



```
 8 836580.40 815804.30      4.70   1.00    7.00  Bituminous  Y
 9 836590.10 815806.60      4.80    .49    7.00  Bituminous  Y
10 836610.20 815810.50      4.90    .49    7.00  Bituminous  Y
11 836630.20 815813.50      5.00    .96    7.00  Bituminous  Y
12 836640.40 815815.70      5.10    .96    7.00  Bituminous  Y
13 836650.30 815818.80      5.20   1.01    7.00  Bituminous  Y
14 836658.70 815824.00      5.30    .95    7.00  Bituminous  Y
15 836665.50 815832.10      5.40   1.88    7.00  Bituminous  Y
16 836669.70 815841.90      5.60   1.11    7.00  Bituminous  Y
17 836670.00 815850.90      5.70   1.11    7.00  Bituminous  Y
18 836668.20 815859.70      5.80   1.07    7.00  Bituminous  Y
19 836663.90 815868.00      5.90   1.13    7.00  Bituminous  Y
20 836657.60 815874.20      6.00

Road 135: GLe9          Existing Road
Flow: 1258.00( 27.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836657.60 815874.20      6.00    .00    7.00  Bituminous  Y
 2 836645.70 815880.10      6.00    .00    7.00  Bituminous  Y
 3 836631.00 815880.80      6.00

Road 136: GLe10         Existing Road
Flow: 2374.00( 23.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 836510.70 815778.06      4.00    .00   13.00  Bituminous  Y
 2 836527.75 815804.70      4.00    .00   12.00  Bituminous  Y
 3 836543.63 815830.98      4.00    .00   12.00  Bituminous  Y
 4 836564.53 815861.15      4.00

Road 137: CHT7          Existing Road
Flow: 3281.00( 23.50%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836562.83 815862.53      4.00   2.23   16.50  Bituminous  Y
 2 836578.17 815878.93      4.50   2.12   16.50  Bituminous  Y
 3 836595.37 815895.07      5.00   2.29   16.50  Bituminous  Y
 4 836613.89 815906.71      5.50   2.62   16.50  Bituminous  Y
 5 836630.29 815916.50      6.00

Road 138: CHT8          Existing Road
Flow: 3697.00( 34.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836787.46 815961.13      4.00    .00    9.00  Bituminous  Y
 2 836775.90 815947.63      4.00    .00   11.00  Bituminous  Y
 3 836770.79 815941.55      4.00    .00   12.00  Bituminous  Y
 4 836760.73 815929.05      4.00    .00    9.00  Bituminous  Y
 5 836754.38 815921.91      4.00    .00   10.00  Bituminous  Y
 6 836744.86 815906.04      4.00    .00    9.00  Bituminous  Y
 7 836735.86 815893.34      4.00

Road 139: CHT9          Existing Road
Flow: 1301.00( 29.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 836739.80 815891.70      4.00    .00    7.00  Bituminous  Y
 2 836731.70 815877.60      4.00    .00    7.00  Bituminous  Y
 3 836724.30 815861.60      4.00    .00    7.00  Bituminous  Y
 4 836717.60 815853.50      4.00    .00    7.00  Bituminous  Y
 5 836697.50 815837.70      4.00    .00    7.00  Bituminous  Y
 6 836671.30 815818.90      4.00

Road 140: GLe4          Existing Road
Flow: 1138.00( 46.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836747.20 815890.80      3.40   1.03    7.00  Bituminous  Y
 2 836750.40 815881.60      3.50    .94    7.00  Bituminous  Y
 3 836757.90 815874.00      3.60   1.18    7.00  Bituminous  Y
 4 836765.30 815869.80      3.70   1.20    7.00  Bituminous  Y
 5 836773.40 815867.70      3.80

Road 141: MAR2          Existing Road          Group: 8
Flow: 1524.00( 30.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836537.70 815621.30      3.70    .00    7.00  Bituminous  Y
 2 836521.00 815663.10      3.70  18.15    7.00  Bituminous  Y
 3 836517.30 815672.30      5.50  16.17    7.00  Bituminous  Y
 4 836513.50 815682.10      7.20  15.78    7.00  Bituminous  Y
 5 836509.50 815692.10      8.90  14.58    7.00  Bituminous  Y
 6 836505.00 815703.60     10.70    .00    7.00  Bituminous  Y
 7 836496.70 815724.50     10.70    .00    7.00  Bituminous  Y
 8 836489.50 815743.40     10.70    .00    7.00  Bituminous  Y
 9 836482.70 815761.50     10.70    .00    7.00  Bituminous  Y
10 836473.90 815783.80     10.70  13.13    7.00  Bituminous  Y
11 836470.20 815793.80      9.30  12.86    7.00  Bituminous  Y
12 836466.40 815804.00      7.90  12.99    7.00  Bituminous  Y
```

```
13 836462.60 815814.90      6.40     4.73     7.00   Bituminous  Y
14 836452.00 815844.80      4.90      .96     7.00   Bituminous  Y
15 836444.70 815864.30      4.70

Road 142: MAR3-1          Existing Road
Flow:    1.00(  .00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836473.70 815757.60      4.00     1.01     7.00   Bituminous  Y
 2 836473.20 815767.50      4.10      .94     7.00   Bituminous  Y
 3 836470.20 815777.70      4.20      .50     7.00   Bituminous  Y
 4 836463.10 815796.60      4.30      .50     7.00   Bituminous  Y
 5 836456.10 815815.50      4.40      .50     7.00   Bituminous  Y
 6 836449.10 815834.20      4.50      .66     7.00   Bituminous  Y
 7 836438.90 815862.50      4.70

Road 143: MAR3-2          Existing Road
Flow: 1524.00( 30.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836438.90 815862.50      4.70      .00     7.00   Bituminous  Y
 2 836407.80 815945.91      4.70

Road 144: MAR4            Existing Road
Flow:    1.00(  .00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836532.50 815619.50      3.70      .46     7.00   Bituminous  Y
 2 836516.00 815659.80      3.90      .26     7.00   Bituminous  Y
 3 836502.00 815695.70      4.00      .00     7.00   Bituminous  Y
 4 836497.50 815702.00      4.00

Road 145: MAR5            Existing Road
Flow:    1.00(  .00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836511.70 815707.90      4.00      .00     7.00   Bituminous  Y
 2 836515.60 815694.60      4.00      .00     7.00   Bituminous  Y
 3 836527.90 815664.40      3.90      .00     7.00   Bituminous  Y
 4 836544.30 815623.40      3.70

Road 146: TOR2            Existing Road        Group: 7
Flow: 1516.00( 20.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836457.00 815720.60      4.00     1.51     7.00   Bituminous  Y
 2 836432.40 815711.00      4.40     8.26     7.00   Bituminous  Y
 3 836415.40 815704.60      5.90    12.01     7.00   Bituminous  Y
 4 836402.20 815699.50      7.60     7.71     7.00   Bituminous  Y
 5 836381.70 815691.40      9.30     9.48     7.00   Bituminous  Y
 6 836370.70 815687.70     10.40     8.15     7.00   Bituminous  Y
 7 836358.50 815686.40     11.40      .00     7.00   Bituminous  Y
 8 836346.20 815689.20     11.40      .00     7.00   Bituminous  Y
 9 836336.60 815694.90     11.40      .00     7.00   Bituminous  Y
10 836329.00 815701.90     10.70      .00     7.00   Bituminous  Y
11 836323.50 815712.60      9.90      .00     7.00   Bituminous  Y
12 836320.20 815721.20      8.90      .00     7.00   Bituminous  Y
13 836317.60 815729.40      7.90      .00     7.00   Bituminous  Y
14 836315.50 815737.10      6.90      .00     7.00   Bituminous  Y
15 836312.90 815746.00      5.90      .00     7.00   Bituminous  Y
16 836305.80 815769.90      4.30      .00     7.00   Bituminous  Y
17 836301.60 815783.20      4.00

Road 147: TOR3            Existing Road
Flow:  227.00( 19.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836309.40 815786.30      4.00      .00     7.00   Bituminous  Y
 2 836318.90 815753.00      4.00      .00     7.00   Bituminous  Y
 3 836329.00 815718.40      4.00      .00     7.00   Bituminous  Y
 4 836335.30 815707.70      4.00      .00     7.00   Bituminous  Y
 5 836345.70 815700.20      4.00

Road 148: TOR4            Existing Road
Flow:  211.00( 63.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836319.70 815688.70      4.00      .00     7.00   Bituminous  Y
 2 836320.40 815696.00      4.00      .00     7.00   Bituminous  Y
 3 836310.10 815729.90      4.00      .00     7.00   Bituminous  Y
 4 836300.20 815761.70      4.00      .00     7.00   Bituminous  Y
 5 836296.70 815771.80      4.00

Road 149: GLe11           Existing Road
Flow: 4214.00( 19.00%hv) veh/hr  Speed:  70.00 km/h   Texture Depth:  1.50 mm
 1 836482.40 815750.81      4.00      .00    14.00   Bituminous  Y
 2 836498.12 815763.43      4.00      .00    15.00   Bituminous  Y
 3 836510.70 815778.07      4.00

Road 150: GLe12           Existing Road
```



```
Flow: 4213.00( 19.00%hv) veh/hr  Speed:  70.00 km/h   Texture Depth:  1.50 mm
 1 836350.50 815691.00      4.00      .00    16.50   Bituminous  Y
 2 836357.45 815695.83      4.00      .00    16.50   Bituminous  Y
 3 836377.04 815703.54      4.00      .00    16.50   Bituminous  Y
 4 836410.63 815717.42      4.00      .00    16.50   Bituminous  Y
 5 836441.18 815730.42      4.00      .00    16.50   Bituminous  Y
 6 836463.38 815737.88      4.00      .00    16.50   Bituminous  Y
 7 836473.33 815744.44      4.00      .00    16.50   Bituminous  Y
 8 836482.43 815750.79      4.00

Road 151: GLe13           Existing Road
Flow: 4258.00( 12.00%hv) veh/hr  Speed:  70.00 km/h   Texture Depth:  1.50 mm
 1 836323.63 815679.55      4.00      .00    14.00   Bituminous  Y
 2 836350.52 815690.98      4.00

Road 152: GLe14           Existing Road
Flow: 4469.00( 14.00%hv) veh/hr  Speed:  70.00 km/h   Texture Depth:  1.50 mm
 1 836064.80 815639.80      4.00      .00     7.00   Bituminous  Y
 2 836114.00 815643.10      4.00      .00     7.00   Bituminous  Y
 3 836173.00 815648.10      4.00      .00     7.00   Bituminous  Y
 4 836230.30 815655.80      4.00      .00     7.00   Bituminous  Y
 5 836275.20 815669.60      4.00      .00     7.00   Bituminous  Y
 6 836297.40 815677.10      4.00      .00     7.00   Bituminous  Y
 7 836317.00 815686.10      4.00

Road 153: HAR1            Existing Road
Flow: 2523.00( 16.10%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836025.70 815756.80      4.00      .00    13.50   Bituminous  Y
 2 836078.30 815761.10      4.00      .00    13.50   Bituminous  Y
 3 836087.20 815761.90      4.00      .25    13.50   Bituminous  Y
 4 836126.70 815765.30      4.10      .00    13.50   Bituminous  Y
 5 836155.20 815767.70      4.10      .00    13.50   Bituminous  Y
 6 836166.10 815768.40      4.10      .00    13.50   Bituminous  Y
 7 836175.80 815769.30      4.10      .00    13.50   Bituminous  Y
 8 836182.50 815769.90      4.10      .00    13.50   Bituminous  Y
 9 836217.80 815773.00      4.10      .00    13.50   Bituminous  Y
10 836226.10 815773.70      4.10

Road 154: HAR2            Existing Road
Flow: 2523.00( 16.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836226.10 815773.70      4.10      .00    13.50   Bituminous  Y
 2 836298.70 815779.80      4.00

Road 155: CRE3-1          Existing Road
Flow: 1590.00( 20.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836787.50 815842.00      4.00      .00     7.00   Bituminous  Y
 2 836755.30 815827.30      4.00      .00     7.00   Bituminous  Y
 3 836737.70 815819.20      4.00      .00     7.00   Bituminous  Y
 4 836718.40 815810.20      4.00

Road 156: CRE3-2          Existing Road        Group: 11
Flow: 1590.00( 20.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836718.40 815810.20      4.00     9.84     7.00   Bituminous  Y
 2 836709.10 815806.10      5.00     9.71     7.00   Bituminous  Y
 3 836699.70 815801.90      6.00    10.35     7.00   Bituminous  Y
 4 836690.90 815797.90      7.00     9.55     7.00   Bituminous  Y
 5 836681.40 815793.50      8.00     8.90     7.00   Bituminous  Y
 6 836672.10 815787.20      9.00    17.41     7.00   Bituminous  Y
 7 836669.10 815782.30     10.00    13.29     7.00   Bituminous  Y
 8 836666.60 815775.20     11.00

Road 157: GLw6            Existing Road
Flow: 1700.00( 64.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836784.66 815850.27      4.00      .00    10.00   Bituminous  Y
 2 836751.33 815837.57      4.00      .00    12.00   Bituminous  Y
 3 836721.96 815825.66      4.00      .00    14.00   Bituminous  Y
 4 836712.17 815820.90      4.00

Road 158: CHT10           Existing Road        Group: 12
Flow: 1683.00( 27.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 836714.20 815816.50      4.00      .00     7.00   Bituminous  Y
 2 836658.20 815791.30      4.00      .00     7.00   Bituminous  Y
 3 836629.10 815779.30      4.00      .00     7.00   Bituminous  Y
 4 836596.30 815765.80      4.00     5.99     7.00   Bituminous  Y
 5 836577.60 815758.60      5.20     5.39     7.00   Bituminous  Y
 6 836558.60 815751.20      6.30     7.97     7.00   Bituminous  Y
```

```
 7 836544.50 815745.90     7.50    8.00    7.00   Bituminous  Y
 8 836529.60 815744.10     8.70    7.15    7.00   Bituminous  Y
 9 836514.70 815747.90     9.80    8.14    7.00   Bituminous  Y
10 836502.00 815755.40    11.00     .00    7.00   Bituminous  Y
11 836493.20 815767.30    11.00     .00    7.00   Bituminous  Y
12 836488.20 815781.20     9.60     .00    7.00   Bituminous  Y
13 836488.10 815796.20     8.20     .00    7.00   Bituminous  Y
14 836492.30 815810.30     6.80     .00    7.00   Bituminous  Y
15 836498.00 815818.70     5.40     .00    7.00   Bituminous  Y
16 836506.60 815826.30     4.00     .00    7.00   Bituminous  Y
17 836519.10 815834.40     4.00     .00    7.00   Bituminous  Y
18 836530.90 815843.20     4.00     .00    7.00   Bituminous  Y
19 836538.50 815849.80     4.00     .00    7.00   Bituminous  Y
20 836555.80 815868.20     4.00

Road 159: GLw7          Existing Road
Flow:  1700.00( 64.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836710.58 815824.46     4.00     .00    9.00   Bituminous  Y
 2 836691.00 815815.99     4.00     .00   11.00   Bituminous  Y
 3 836674.60 815811.80     4.00

Road 160: CRW3-1        Existing Road          Group: 10
Flow:  1683.00( 27.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836642.30 815766.10    11.00     .00    7.00   Bituminous  Y
 2 836635.20 815769.50     9.80     .00    7.00   Bituminous  Y
 3 836626.30 815769.80     8.70     .00    7.00   Bituminous  Y
 4 836615.40 815765.70     7.50     .00    7.00   Bituminous  Y
 5 836604.50 815761.50     6.30     .00    7.00   Bituminous  Y
 6 836593.60 815757.10     5.20     .00    7.00   Bituminous  Y
 7 836582.70 815752.70     4.00

Road 161: CRW3-2        Existing Road
Flow:  1683.00( 27.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836582.70 815752.70     4.00     .00    7.00   Bituminous  Y
 2 836568.10 815746.50     4.00     .00    7.00   Bituminous  Y
 3 836553.80 815740.70     4.00     .00    7.00   Bituminous  Y
 4 836537.90 815734.10     4.00     .00    7.00   Bituminous  Y
 5 836521.80 815727.20     4.00     .00    7.00   Bituminous  Y
 6 836495.00 815716.50     4.00     .00    7.00   Bituminous  Y
 7 836462.80 815703.80     4.00

Road 162: GLw8          Existing Road
Flow:  3001.00( 49.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 836674.50 815811.80     4.00     .00   14.30   Bituminous  Y
 2 836654.72 815807.17     4.00     .00   14.30   Bituminous  Y
 3 836626.44 815798.35     4.00     .00   14.30   Bituminous  Y
 4 836607.13 815792.27     4.00     .00   14.30   Bituminous  Y
 5 836587.90 815784.90     4.00     .00   14.25   Bituminous  Y
 6 836568.60 815777.60     4.00     .00   14.25   Bituminous  Y
 7 836549.80 815769.48     4.00     .00   14.25   Bituminous  Y
 8 836531.25 815760.16     4.00     .00   14.25   Bituminous  Y
 9 836517.76 815752.49     4.00     .00   14.25   Bituminous  Y
10 836505.32 815743.23     4.00     .00   14.25   Bituminous  Y
11 836495.80 815733.97     4.00     .00   14.25   Bituminous  Y
12 836482.19 815725.50     4.00     .00   16.00   Bituminous  Y
13 836459.70 815715.18     4.00

Road 163: GLw9-1        Existing Road
Flow:  4684.00( 41.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 836461.12 815707.82     4.00     .00   15.00   Bituminous  Y
 2 836439.02 815699.94     4.00     .00   15.00   Bituminous  Y
 3 836419.42 815692.16     4.00     .00   14.00   Bituminous  Y
 4 836390.97 815682.07     4.00     .00   11.00   Bituminous  Y
 5 836362.60 815673.60     4.00     .00   12.00   Bituminous  Y
 6 836334.12 815665.46     4.00

Road 164: GLw9-2        Existing Road
Flow:  4684.00( 41.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 836334.80 815663.80     4.00     .37    7.00   Bituminous  Y
 2 836309.10 815655.70     4.10     .25    7.00   Bituminous  Y
 3 836232.80 815634.30     4.30

Road 165: GLw10         Existing Road
Flow:  3172.00( 26.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 836232.80 815634.20     4.30     .00    7.00   Bituminous  Y
 2 836190.70 815627.80     4.20     .00    7.00   Bituminous  Y
```



```
 3 836147.30 815622.70     4.10     .00    7.00   Bituminous  Y
 4 836112.10 815618.50     4.00     .00    7.00   Bituminous  Y
 5 836073.50 815614.10     3.90

Road 166: GSw1          Existing Road
Flow:  1795.00( 32.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 836789.20 815827.20     4.00     .00    7.00   Bituminous  Y
 2 836762.90 815812.50     4.00     .00    7.00   Bituminous  Y
 3 836752.90 815808.60     4.00     .00    7.00   Bituminous  Y
 4 836732.50 815800.40     4.00     .00    7.00   Bituminous  Y
 5 836712.10 815792.00     4.00     .00    7.00   Bituminous  Y
 6 836666.50 815773.00     4.00

Road 167: GSw2-1        Existing Road
Flow:   879.00( 25.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 836645.90 815764.50     4.00     .00    7.00   Bituminous  Y
 2 836496.20 815704.50     4.00

Road 168: GSw2-2        Existing Road
Flow:  1157.00( 27.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 836496.20 815704.50     4.00     .00    7.00   Bituminous  Y
 2 836366.10 815662.70     4.00     .00    7.00   Bituminous  Y
 3 836341.40 815654.10     4.00     .00    7.00   Bituminous  Y
 4 836293.60 815639.00     4.00     .00    7.00   Bituminous  Y
 5 836245.00 815625.50     4.00

Road 169: FLN1          Existing Road          Group: 5
Flow:  1259.00( 32.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836029.10 815603.40    10.50     .00    7.00   Bituminous  Y
 2 836021.80 815630.80    10.40     .00    7.00   Bituminous  Y
 3 836018.20 815652.70    10.20     .00    7.00   Bituminous  Y
 4 836016.90 815665.20     8.60     .00    7.00   Bituminous  Y
 5 836015.60 815678.30     7.00     .00    7.00   Bituminous  Y
 6 836014.30 815690.30     5.40     .00    7.00   Bituminous  Y
 7 836012.90 815701.90     3.80     .00    7.00   Bituminous  Y
 8 836008.20 815738.10     3.80    1.20    7.00   Bituminous  Y
 9 836006.30 815754.60     4.00

Road 170: FLS1          Existing Road          Group: 6
Flow:  1556.00( 28.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836020.80 815755.90     4.00     .00    7.00   Bituminous  Y
 2 836022.70 815739.40     3.80     .00    7.00   Bituminous  Y
 3 836026.80 815703.60     3.80   13.38    7.00   Bituminous  Y
 4 836028.00 815691.70     5.40   13.45    7.00   Bituminous  Y
 5 836029.50 815679.90     7.00   11.94    7.00   Bituminous  Y
 6 836031.10 815666.60     8.60   12.92    7.00   Bituminous  Y
 7 836032.50 815654.30    10.20     .89    7.00   Bituminous  Y
 8 836033.20 815631.90    10.40     .35    7.00   Bituminous  Y
 9 836032.40 815603.70    10.50

Road 171: GLW10         Existing Road
Flow:  4013.00( 21.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 836073.50 815613.90     3.90     .00    7.00   Bituminous  Y
 2 836057.20 815614.40     3.90     .00    7.00   Bituminous  Y
 3 836018.00 815610.20     3.90

Road 172: GLE15         Existing Road
Flow:  4469.00( 14.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 836027.40 815631.80     3.90     .00    7.00   Bituminous  Y
 2 836065.10 815636.30     3.90

Road 173: FLN2          Existing Road
Flow:  1248.00( 31.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836003.60 815755.70     3.80     .36    7.00   Bituminous  Y
 2 836000.10 815783.50     3.90     .50    7.00   Bituminous  Y
 3 835995.50 815802.90     4.00     .37    7.00   Bituminous  Y
 4 835992.50 815830.10     4.10     .67    7.00   Bituminous  Y
 5 835993.30 815845.10     4.20     .00    7.00   Bituminous  Y
 6 835992.00 815871.63     4.20

Road 174: FLS2          Existing Road
Flow:  1167.00( 33.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 836011.80 815874.31     4.20     .00    7.00   Bituminous  Y
 2 836018.10 815832.50     4.10     .00    7.00   Bituminous  Y
 3 836020.90 815805.00     4.00     .00    7.00   Bituminous  Y
 4 836022.80 815785.50     3.90     .00    7.00   Bituminous  Y
```

```
5 836026.10 815757.30     3.80

Road 175: HAR3            Existing Road
Flow: 2013.00( 12.50%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 836003.30 815755.70     3.80    .12   13.50   Bituminous  Y
 2 835921.20 815749.40     3.90    .13   13.50   Bituminous  Y
 3 835845.10 815744.00     4.00

Road 176: HAR4            Existing Road
Flow: 2013.00( 12.50%hv) veh/hr  Speed: 70.00 km/h   Texture Depth: 1.50 mm
 1 835845.20 815743.90     4.00    .00   13.50   Bituminous  Y
 2 835835.00 815743.70     4.00    .00   10.50   Bituminous  Y
 3 835816.30 815742.50     4.00    .00   12.00   Bituminous  Y
 4 835811.70 815740.80     4.00    .00   13.50   Bituminous  Y
 5 835728.40 815735.50     4.00    .00   13.50   Bituminous  Y
 6 835683.30 815738.80     4.00    .00   13.50   Bituminous  Y
 7 835640.69 815751.00     4.00

Road 177: CAw2            Existing Road
Flow: 1044.00( 13.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 835901.00 815861.50     4.20    .00    7.00   Bituminous  N
 2 835866.10 815859.90     4.20    .00    7.00   Bituminous  N
 3 835811.70 815855.60     4.20    .00    7.00   Bituminous  Y
 4 835761.40 815851.10     4.20    .00    7.00   Bituminous  Y
 5 835713.20 815847.00     4.20    .00    7.00   Bituminous  Y
 6 835695.50 815843.10     4.20

Road 178: FPw2            Existing Road
Flow: 1811.00( 19.00%hv) veh/hr  Speed: 70.00 km/h   Texture Depth: 1.50 mm
 1 835482.80 815763.00     4.60   1.37    7.00   Bituminous  Y
 2 835446.50 815759.70     5.10   7.30    7.00   Bituminous  Y
 3 835431.50 815758.30     6.20   7.46    7.00   Bituminous  Y
 4 835415.80 815754.80     7.40   7.47    7.00   Bituminous  Y
 5 835402.10 815746.40     8.60    .00    7.00   Bituminous  Y
 6 835392.00 815735.50     8.60

Road 179: FPw3            Existing Road
Flow:  701.00( 11.00%hv) veh/hr  Speed: 70.00 km/h   Texture Depth: 1.50 mm
 1 835404.80 815762.00     4.10    .00    7.00   Bituminous  Y
 2 835390.70 815752.80     4.10    .00    7.00   Bituminous  Y
 3 835380.40 815739.20     4.10

Road 180: NPR1            Existing Road
Flow: 1241.00( 14.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 837279.72 816138.48     4.60    .22    7.00   Bituminous  Y
 2 837366.24 816162.29     4.80    .00    7.00   Bituminous  Y
 3 837456.60 816187.82     4.80    .00    7.00   Bituminous  Y
 4 837552.11 816214.81     4.80    .00    7.00   Bituminous  Y
 5 837606.09 816232.67     4.80

Road 181: D3R9            Existing Road         Group: 81
Flow: 1293.00( 29.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 836618.35 815926.74    12.00    .00    7.00   Bituminous  Y
 2 836632.49 815928.22    12.00    .00    7.00   Bituminous  Y
 3 836643.97 815929.83    11.90    .00    7.00   Bituminous  Y
 4 836661.01 815932.05    11.80    .00    7.00   Bituminous  Y
 5 836673.97 815933.53    11.70    .00    7.00   Bituminous  Y
 6 836680.64 815933.53    11.60    .00    7.00   Bituminous  Y
 7 836686.32 815933.65    11.50

Road 182: D3R10           Existing Road         Group: 14
Flow: 1293.00( 29.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 836686.21 815933.76    11.50    .00    7.00   Bituminous  Y
 2 836698.65 815932.70    11.20    .00    7.00   Bituminous  Y
 3 836712.14 815929.79    11.10    .00    7.00   Bituminous  Y
 4 836729.87 815925.03    11.00    .00    7.00   Bituminous  Y
 5 836746.80 815918.15    10.80

Road 183: D5R4-1-1-2      Existing Road
Flow: 6535.00( 13.00%hv) veh/hr  Speed: 70.00 km/h   Texture Depth: 1.50 mm
 1 838044.08 817063.91    14.30    .00    7.00   Pervious  Y
 2 838065.09 817076.79    14.10    .00    7.00   Pervious  Y
 3 838085.75 817088.26    14.00   1.50    7.00   Pervious  Y
 4 838097.75 817093.98    14.20

Road 184: D5R4-1-2        Existing Road
```



```
Flow: 6535.00( 13.00%hv) veh/hr  Speed: 70.00 km/h   Texture Depth: 1.50 mm
 1 838097.75 817093.98    14.20    .00    7.00   Pervious  Y
 2 838133.88 817108.63    14.00    .00    7.00   Pervious  Y
 3 838161.13 817118.31    13.80

Road 185: D5R4-2          Existing Road
Flow: 6535.00( 13.00%hv) veh/hr  Speed: 70.00 km/h   Texture Depth: 1.50 mm
 1 838161.13 817118.31    13.80    .00    7.00   Pervious  Y
 2 838188.19 817125.88    13.60    .00    7.00   Pervious  Y
 3 838216.53 817132.82    13.50    .00    7.00   Pervious  Y
 4 838227.37 817135.20    13.40    .00    7.00   Pervious  Y
 5 838237.69 817137.06    13.20

Road 186: NPW2            Existing Road
Flow:  959.00( 11.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 838474.04 817126.97     6.00   2.99    7.00   Bituminous  Y
 2 838453.40 817144.03     6.80   2.62    7.00   Bituminous  Y
 3 838434.75 817148.00     7.30   4.11    7.00   Bituminous  Y
 4 838406.04 817142.71     8.50   3.85    7.00   Bituminous  Y
 5 838368.34 817132.79    10.00   3.13    7.00   Bituminous  Y
 6 838327.86 817123.26    11.30    .00    7.00   Bituminous  Y
 7 838271.63 817112.89    11.00

Road 187: NPW3            Existing Road         Group: 30
Flow: 6322.00( 16.00%hv) veh/hr  Speed: 70.00 km/h   Texture Depth: 1.50 mm
 1 838542.12 817169.34    13.70    .00    7.00   Pervious  Y
 2 838498.86 817168.15    13.70    .00    7.00   Pervious  Y
 3 838440.13 817161.01    12.80    .00    7.00   Pervious  Y
 4 838365.65 817143.28    12.30    .42    7.00   Pervious  Y
 5 838272.38 817123.04    12.70

Road 188: NPE2            Existing Road
Flow:  710.00( 15.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.50 mm
 1 838312.99 817159.56    12.30    .00    7.00   Bituminous  Y
 2 838332.84 817166.30    11.60    .00    7.00   Bituminous  Y
 3 838364.19 817175.83    10.90    .00    7.00   Bituminous  Y
 4 838411.29 817188.92     8.00    .00    7.00   Bituminous  Y
 5 838433.65 817189.32     7.50    .00    7.00   Bituminous  Y
 6 838454.68 817183.37     6.20    .00    7.00   Bituminous  Y
 7 838472.94 817171.06     4.80    .00    7.00   Bituminous  Y
 8 838482.06 817159.56     3.80

Road 189: NPE3            Existing Road         Group: 31
Flow: 5569.00( 19.00%hv) veh/hr  Speed: 70.00 km/h   Texture Depth: 1.50 mm
 1 838318.42 817149.90    12.30    .46    7.00   Pervious  Y
 2 838381.65 817164.05    12.60    .55    7.00   Pervious  Y
 3 838452.37 817179.21    13.00   2.96    7.00   Pervious  Y
 4 838465.79 817180.72    13.40    .95    7.00   Pervious  Y
 5 838497.15 817184.69    13.70    .46    7.00   Pervious  Y
 6 838540.27 817186.01    13.90

Road 190: iece1           Existing Road
Flow: 6535.00( 13.00%hv) veh/hr  Speed: 70.00 km/h   Texture Depth: 1.20 mm
 1 838237.69 817137.06    13.20    .00    7.00   Pervious  Y
 2 838259.13 817142.89    12.00   2.83    7.00   Pervious  Y
 3 838282.83 817150.09    12.70    .00    7.00   Pervious  Y
 4 838312.99 817159.56    12.30

Road 191: iecw1-1         Existing Road
Flow: 7208.00( 19.00%hv) veh/hr  Speed: 70.00 km/h   Texture Depth: 1.20 mm
 1 838271.63 817112.89    12.50    .92    7.00   Pervious  Y
 2 838239.35 817107.47    12.80   1.48    7.00   Pervious  Y
 3 838212.62 817103.06    13.20    .66    7.00   Pervious  Y
 4 838182.95 817096.22    13.40    .52    7.00   Pervious  Y
 5 838164.60 817090.67    13.50   1.07    7.00   Pervious  Y
 6 838146.88 817084.58    13.70    .63    7.00   Pervious  Y
 7 838132.19 817078.50    13.80    .67    7.00   Pervious  Y
 8 838105.20 817065.53    14.00    .83    7.00   Pervious  Y
 9 838084.30 817053.54    14.20    .35    7.00   Pervious  Y
10 838060.25 817038.04    14.30

Road 192: TFS             Existing Road         Group: 41
Flow:  472.00( 23.00%hv) veh/hr  Speed: 50.00 km/h   Texture Depth: 1.20 mm
 1 837791.88 816204.41    14.00    .00    7.00   Bituminous  Y
 2 837768.47 816203.48    13.00    .00    7.00   Bituminous  Y
 3 837743.99 816201.89    12.00    .00    7.00   Bituminous  Y
```

```
 4 837720.97 816200.97     11.00    .00   7.00  Bituminous  Y
 5 837699.63 816199.60      8.00    .00   7.00  Bituminous  Y
 6 837677.40 816198.54      6.00    .00   7.00  Bituminous  Y
 7 837651.31 816197.22      4.30

Road 193: D4R6          New Road            Group: 82
Flow:  635.00( 15.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837535.50 816500.13     12.50   1.90   7.00  Bituminous  Y
 2 837545.50 816512.38     12.80   1.08   7.00  Bituminous  Y
 3 837556.13 816527.63     13.00   3.17   7.00  Bituminous  Y
 4 837565.38 816540.38     13.50   3.24   7.00  Bituminous  Y
 5 837574.50 816552.81     14.00   2.12   7.00  Bituminous  Y
 6 837579.93 816560.55     14.20   2.66   7.00  Bituminous  Y
 7 837586.38 816569.81     14.50

Road 194: D4R7          New Road            Group: 83
Flow: 1713.00( 23.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837562.31 816499.88     13.50   1.74   7.00  Bituminous  Y
 2 837567.38 816510.19     13.70   1.50   7.00  Bituminous  Y
 3 837573.19 816522.19     13.90    .60   7.00  Bituminous  Y
 4 837581.00 816536.81     14.00   1.07   7.00  Bituminous  Y
 5 837589.63 816553.38     14.20   2.27   7.00  Bituminous  Y
 6 837594.13 816565.81     14.50

Road 195: D4R8          Altered Road        Group: 84
Flow: 2348.00( 20.80%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837589.63 816567.81     14.50    .00  12.00  Bituminous  Y
 2 837593.88 816573.63     14.50    .00  12.00  Bituminous  Y
 3 837599.13 816581.69     14.50    .00  12.00  Bituminous  Y
 4 837603.50 816587.31     14.50

Road 196: D5R1          New Road            Group: 84
Flow: 2348.00( 21.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837603.50 816587.31     14.50    .00  12.00  Bituminous  Y
 2 837611.50 816605.31     14.40    .00  12.00  Bituminous  Y
 3 837624.31 816631.50     14.30    .00  12.00  Bituminous  Y
 4 837639.50 816660.88     14.20    .00  12.00  Bituminous  Y
 5 837655.81 816691.38     13.80    .00  12.00  Bituminous  Y
 6 837669.81 816715.38     13.60    .00  12.00  Bituminous  Y
 7 837688.88 816742.88     13.50    .00  12.00  Bituminous  Y
 8 837716.13 816774.13     13.20    .00   9.00  Bituminous  Y
 9 837747.88 816806.38     13.00    .00   9.00  Bituminous  Y
10 837776.38 816834.50     12.80    .00   9.00  Bituminous  Y
11 837810.63 816867.50     12.50    .00   9.00  Bituminous  Y
12 837834.31 816890.28     12.20    .00   9.00  Bituminous  Y
13 837855.31 816909.63     12.10    .00   9.00  Bituminous  Y
14 837873.25 816925.39     11.90    .00   9.00  Bituminous  Y
15 837889.44 816939.20     11.80    .00   9.00  Bituminous  Y
16 837908.19 816954.88     11.70    .00   9.00  Bituminous  Y
17 837918.10 816963.36     11.70

Road 197: D5R2-2        Existing Road
Flow: 4187.00(  9.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 837879.27 816911.77      9.00   5.28   7.00  Pervious  Y
 2 837892.90 816924.92     10.00   3.65   7.00  Pervious  Y
 3 837908.74 816940.08     10.80   4.14   7.00  Pervious  Y
 4 837924.32 816955.27     11.70

Road 198: D5R3-1        Existing Road
Flow: 4917.00( 16.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 837938.85 816939.82     11.70    .00   7.00  Pervious  Y
 2 837923.79 816925.37     11.10    .00   7.00  Pervious  Y
 3 837908.38 816910.67     10.30    .00   7.00  Pervious  Y
 4 837897.50 816900.35      9.20    .00   7.00  Pervious  Y
 5 837893.91 816896.92      8.90

Road 199: D5R4-1-1-1    Existing Road
Flow: 6535.00( 13.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 837918.03 816963.46     11.70  10.27   7.00  Pervious  Y
 2 837923.99 816968.48     12.50   2.54   7.00  Pervious  Y
 3 837944.98 816986.29     13.20   4.18   7.00  Pervious  Y
 4 837957.99 816996.85     13.90   1.19   7.00  Pervious  Y
 5 837970.91 817007.63     14.10    .92   7.00  Pervious  Y
 6 837987.61 817021.55     14.30   1.00   7.00  Pervious  Y
 7 838003.22 817033.95     14.50    .00   7.00  Pervious  Y
 8 838022.72 817048.32     14.40    .75   7.00  Pervious  Y
```



```
 9 838044.75 817063.09     14.60

Road 200: D6R1-2-1      Existing Road
Flow: 7208.00( 19.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 838060.25 817038.04     14.30    .83   7.00  Pervious  Y
 2 838050.45 817031.09     14.40    .29   7.00  Pervious  Y
 3 838036.51 817020.89     14.45    .27   7.00  Pervious  Y
 4 838022.07 817009.59     14.50

Road 201: D6R1-2-2      Existing Road
Flow: 7208.00( 19.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 838022.07 817009.59     14.50    .00   7.00  Pervious  Y
 2 838008.26 816998.01     14.30    .00   7.00  Pervious  Y
 3 837991.65 816983.30     14.10    .00   7.00  Pervious  Y
 4 837978.25 816971.35     13.90    .00   7.00  Pervious  Y
 5 837964.05 816956.91     13.20    .00   7.00  Pervious  Y
 6 837953.16 816944.50     12.50    .00   7.00  Pervious  Y
 7 837944.78 816934.94     11.70

Road 202: D6R2-1-2      Existing Road       Group: 21
Flow: 2291.00( 24.00%hv) veh/hr  Speed:  70.00 km/h    Texture Depth:  1.50 mm
 1 837944.78 816934.94     11.70    .00   7.00  Bituminous  Y
 2 837931.16 816919.31     11.10    .00   7.00  Bituminous  Y
 3 837917.17 816902.88     10.50    .00   7.00  Bituminous  Y
 4 837904.08 816887.68     10.20

Road 203: D6R2-2        Existing Road       Group: 21
Flow: 2291.00( 24.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837904.08 816887.68     10.20    .69   7.00  Bituminous  Y
 2 837894.51 816876.74     10.30   1.52   7.00  Bituminous  Y
 3 837877.37 816856.73     10.70   2.79   7.00  Bituminous  Y
 4 837863.34 816840.47     11.30   3.25   7.00  Bituminous  Y
 5 837849.25 816824.15     12.00   3.47   7.00  Bituminous  Y
 6 837836.16 816808.79     12.70   4.17   7.00  Bituminous  Y
 7 837825.34 816795.93     13.40   3.37   7.00  Bituminous  Y
 8 837814.07 816782.12     14.00   4.46   7.00  Bituminous  Y
 9 837804.12 816769.97     14.70

Road 204: NIEs1         Existing Road       Group: 32
Flow: 2291.00( 24.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837611.07 816536.39     14.60    .00   7.00  Bituminous  Y
 2 837601.55 816523.53     14.60    .00   7.00  Bituminous  Y
 3 837593.96 816510.30     14.30    .00   7.00  Bituminous  Y
 4 837586.73 816496.48     14.10    .00   7.00  Bituminous  Y
 5 837584.61 816490.76     13.80

Road 205: NIEs1         Existing Road       Group: 21
Flow: 2291.00( 24.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837804.12 816769.97     14.70   2.53   7.00  Bituminous  Y
 2 837786.47 816748.69     15.40   4.07   7.00  Bituminous  Y
 3 837777.06 816737.32     16.00   1.68   7.00  Bituminous  Y
 4 837761.81 816719.10     16.40    .00   7.00  Bituminous  Y
 5 837725.04 816676.60     16.40    .00   7.00  Bituminous  Y
 6 837688.69 816634.31     15.40    .00   7.00  Bituminous  Y
 7 837664.23 816605.65     15.20    .00   7.00  Bituminous  Y
 8 837648.56 816585.38     14.90    .00   7.00  Bituminous  Y
 9 837634.69 816566.06     14.80    .00   7.00  Bituminous  Y
10 837619.17 816546.62     14.60    .00   7.00  Bituminous  Y
11 837611.07 816536.39     14.60

Road 206: NIEs3         Existing Road       Group: 33
Flow: 2291.00( 24.40%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837584.61 816490.76     13.80    .00   7.00  Bituminous  Y
 2 837579.90 816479.30     12.90    .00   7.00  Bituminous  Y
 3 837575.00 816462.10     12.30    .00   7.00  Bituminous  Y
 4 837573.30 816455.19     11.70

Road 207: NIEs3         Existing Road       Group: 17
Flow:  635.00( 19.00%hv) veh/hr  Speed:  50.00 km/h    Texture Depth:  1.50 mm
 1 837573.30 816455.19     11.70    .00   7.00  Bituminous  Y
 2 837571.49 816440.71     11.70    .00   7.00  Bituminous  Y
 3 837571.01 816422.13     10.50    .00   7.00  Bituminous  Y
 4 837572.50 816406.80      9.90    .00   7.00  Bituminous  Y
 5 837578.70 816390.40      9.20    .00   7.00  Bituminous  Y
 6 837590.40 816374.20      7.90    .00   7.00  Bituminous  Y
 7 837601.40 816363.60      5.80    .00   7.00  Bituminous  Y
```

```
 8 837625.40 816347.90     5.70    .00   7.00  Bituminous  Y
 9 837642.50 816336.00     3.50

Road 208: M1            Existing Road        Group: 18
Flow:  635.00( 15.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837638.60 816330.20     3.50    .95   7.00  Bituminous  Y
 2 837620.80 816341.40     3.70   1.37   7.00  Bituminous  Y
 3 837596.20 816357.10     4.10   1.14   7.00  Bituminous  Y
 4 837574.10 816371.50     4.40    .82   7.00  Bituminous  Y
 5 837554.60 816386.00     4.60

Road 209: WIEC1         Existing Road        Group: 19
Flow: 1615.00( 28.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837563.90 816454.94    15.30    .00   7.00  Bituminous  Y
 2 837557.94 816422.07    15.00    .00   7.00  Bituminous  Y
 3 837555.82 816389.79    14.80    .00   7.00  Bituminous  Y
 4 837553.18 816334.40    14.50    .00   7.00  Bituminous  Y
 5 837548.95 816301.06    14.50    .00   7.00  Bituminous  Y
 6 837542.60 816279.90    14.00    .00   7.00  Bituminous  Y
 7 837528.84 816244.97    13.00    .00   7.00  Bituminous  Y
 8 837506.26 816212.69    12.00    .00   7.00  Bituminous  Y
 9 837473.45 816183.59    11.00    .00   7.00  Bituminous  Y
10 837423.89 816156.78     9.80    .00   7.00  Bituminous  Y
11 837367.26 816139.32     9.00    .00   7.00  Bituminous  Y
12 837330.22 816129.26     7.10

Road 210: EIEC1-1       Existing Road        Group: 19
Flow: 1713.00( 23.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837285.98 816131.33     5.50   3.17   7.00  Bituminous  Y
 2 837331.63 816144.03     7.00   6.07   7.00  Bituminous  Y
 3 837368.01 816154.62     9.30   2.30   7.00  Bituminous  Y
 4 837396.98 816163.74    10.00   9.79   7.00  Bituminous  Y
 5 837415.63 816172.08    12.00   4.05   7.00  Bituminous  Y
 6 837438.25 816182.00    13.00   3.73   7.00  Bituminous  Y
 7 837461.67 816195.10    14.00    .00   7.00  Bituminous  Y
 8 837484.69 816214.15    14.00    .00   7.00  Bituminous  Y
 9 837500.17 816230.82    14.00    .00   7.00  Bituminous  Y
10 837517.23 816259.79    14.00   1.78   7.00  Bituminous  Y
11 837526.89 816286.11    14.50    .00   7.00  Bituminous  Y
12 837533.11 816313.37    14.50    .00   7.00  Bituminous  Y
13 837539.06 816355.04    14.50   1.00   7.00  Bituminous  Y
14 837540.51 816404.78    15.00    .56   7.00  Bituminous  Y
15 837546.07 816457.96    15.30

Road 211: EIEC1-2       Existing Road        Group: 33
Flow: 1713.00( 23.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837546.07 816457.96    15.30    .00   7.00  Bituminous  Y
 2 837555.20 816487.33    15.30    .00   7.00  Bituminous  Y
 3 837562.30 816499.88    13.50

Road 212: HFS1          Existing Road        Group: 18
Flow:  635.00( 15.00%hv) veh/hr  Speed:  50.00 km/h   Texture Depth:  1.50 mm
 1 837554.74 816385.82     4.60   7.97   7.00  Bituminous  Y
 2 837534.74 816402.97     6.70    .00   7.00  Bituminous  Y
 3 837524.26 816422.02     5.50   6.69   7.00  Bituminous  Y
 4 837518.55 816440.59     6.80   7.41   7.00  Bituminous  Y
 5 837519.02 816456.78     8.00  12.97   7.00  Bituminous  Y
 6 837521.40 816472.02    10.00  10.31   7.00  Bituminous  Y
 7 837529.50 816489.64    12.00   4.14   7.00  Bituminous  Y
 8 837535.50 816500.13    12.50

Barrier Configuration :

Node  Easting  Northing  Base   Barr.  Cantilever Angle  Type      Segment
                         Height Height Length                      Length

Barrier  1: D2B1        Grade barrier
 1 835807.13 815951.88  5.50  .00  .00   .00 Reflective  10.57
 2 835817.38 815949.31  5.50  .00  .00   .00 Reflective  13.50
 3 835830.88 815949.31  5.50  .00  .00   .00 Reflective  13.26
 4 835844.13 815949.88  5.50  .00  .00   .00 Reflective  12.10
 5 835856.19 815950.81  5.50  .00  .00   .00 Reflective   9.20
 6 835865.38 815951.31  5.50  .00  .00   .00 Reflective   8.02
 7 835873.38 815951.81  5.50  .00  .00   .00 Reflective   9.51
 8 835882.88 815952.31  5.50  .00  .00   .00 Reflective  10.94
 9 835893.81 815952.88  5.50  .00  .00   .00 Reflective  12.52
```



```
10 835906.31 815953.50  5.50  .00  .00   .00 Reflective   4.62
11 835906.50 815948.88  5.50  .00  .00   .00 Reflective   4.57
12 835906.63 815944.31  5.50  .00  .00   .00 Reflective  22.87
13 835883.81 815942.81  5.50  .00  .00   .00 Reflective   8.94
14 835874.88 815942.31  5.50  .00  .00   .00 Reflective   8.08
15 835866.81 815941.88  5.50  .00  .00   .00 Reflective   9.95
16 835856.88 815941.31  5.50  .00  .00   .00 Reflective  12.03
17 835844.88 815940.50  5.50  .00  .00   .00 Reflective  12.09
18 835832.81 815939.88  5.50  .00  .00   .00 Reflective  25.04
19 835807.81 815938.38  5.50  .00  .00   .00

Barrier  2: D2B2        Grade barrier
 1 835788.31 815906.19  4.50  .00  .00   .00 Reflective  14.53
 2 835802.81 815907.19  4.50  .00  .00   .00 Reflective  12.83
 3 835815.63 815907.69  4.50  .00  .00   .00 Reflective  10.72
 4 835826.31 815908.63  4.50  .00  .00   .00 Reflective  14.10
 5 835840.38 815909.50  4.50  .00  .00   .00 Reflective  11.95
 6 835852.31 815910.13  4.50  .00  .00   .00 Reflective  11.09
 7 835863.38 815910.81  4.50  .00  .00   .00 Reflective   8.96
 8 835872.31 815911.50  4.50  .00  .00   .00 Reflective  13.83
 9 835886.13 815912.13  4.50  .00  .00   .00 Reflective   5.06
10 835886.88 815907.13  4.50  .00  .00   .00 Reflective   5.44
11 835886.88 815901.69  4.50  .00  .00   .00 Reflective  12.08
12 835874.88 815900.31  4.50  .00  .00   .00 Reflective  10.06
13 835864.88 815899.19  4.50  .00  .00   .00 Reflective  11.54
14 835853.38 815898.19  4.50  .00  .00   .00 Reflective  11.74
15 835841.69 815897.13  4.50  .00  .00   .00 Reflective  13.49
16 835828.31 815895.38  4.50  .00  .00   .00 Reflective  11.54
17 835816.81 815894.38  4.50  .00  .00   .00 Reflective  12.00
18 835804.88 815893.13  4.50  .00  .00   .00 Reflective  16.32
19 835788.63 815891.63  4.50  .00  .00   .00 Reflective    .13
20 835788.50 815891.63  4.50  .00  .00   .00

Barrier  3: D3B1A       Flyover barrier (1)  Group:81
 1 836508.19 815978.13   .00  .00  .00   .00 Reflective   7.50
 2 836515.31 815980.50   .00  .00  .00   .00 Reflective   7.78
 3 836522.63 815983.13   .00  .00  .00   .00 Reflective   7.78
 4 836530.00 815985.63   .00  .00  .00   .00 Reflective   7.81
 5 836537.38 815988.19   .00  .00  .00   .00 Reflective   5.08
 6 836542.19 815989.81   .00  .00  .00   .00 Reflective   5.50
 7 836547.69 815989.88   .00  .00  .00   .00 Reflective   5.20
 8 836552.81 815989.00   .00  .00  .00   .00 Reflective   5.32
 9 836557.69 815986.88   .00  .00  .00   .00 Reflective   5.27
10 836561.88 815983.69   .00  .00  .00   .00 Reflective   8.30
11 836566.63 815976.88   .00  .00  .00   .00 Reflective   7.92
12 836569.50 815969.50   .00  .00  .00   .00 Reflective  12.39
13 836573.81 815957.88   .00  .00  .00   .00 Reflective  14.49
14 836578.88 815944.31   .00  .00  .00   .00 Reflective  11.79
15 836583.88 815933.63   .00  .00  .00   .00 Reflective  10.04
16 836591.31 815926.88   .00  .00  .00   .00 Reflective   9.04
17 836599.38 815922.81   .00  .00  .00   .00 Reflective   9.48
18 836608.81 815921.88   .00  .00  .00   .00 Reflective   9.75
19 836618.50 815923.00   .00  .00  .00   .00 Reflective    .23
20 836618.63 815923.19   .00  .00  .00   .00

Barrier  4: D3B1B       Flyover barrier (2)  Group:81
 1 836505.81 815984.81   .00  .00  .00   .00 Reflective   7.43
 2 836512.81 815987.31   .00  .00  .00   .00 Reflective   7.46
 3 836519.81 815989.88   .00  .00  .00   .00 Reflective   7.94
 4 836527.31 815992.50   .00  .00  .00   .00 Reflective   8.42
 5 836535.13 815995.63   .00  .00  .00   .00 Reflective   6.40
 6 836541.31 815997.31   .00  .00  .00   .00 Reflective   6.22
 7 836547.50 815997.88   .00  .00  .00   .00 Reflective   7.46
 8 836554.88 815996.81   .00  .00  .00   .00 Reflective   5.36
 9 836559.88 815994.88   .00  .00  .00   .00 Reflective   8.55
10 836566.81 815989.88   .00  .00  .00   .00 Reflective  11.35
11 836573.38 815980.63   .00  .00  .00   .00 Reflective   8.24
12 836576.50 815973.00   .00  .00  .00   .00 Reflective  12.75
13 836580.81 815961.00   .00  .00  .00   .00 Reflective  14.27
14 836585.81 815947.63   .00  .00  .00   .00 Reflective   9.04
15 836589.50 815939.38   .00  .00  .00   .00 Reflective   7.07
16 836594.50 815934.38   .00  .00  .00   .00 Reflective   6.68
17 836600.19 815930.88   .00  .00  .00   .00 Reflective   9.56
18 836609.63 815929.38   .00  .00  .00   .00 Reflective   8.88
19 836618.50 815929.88   .00  .00  .00   .00
```

```
Barrier  5: DAB1            Grade barrier
 1 837518.19 816163.88   4.50  .00  .00   .00 Reflective  19.60
 2 837501.38 816153.81   4.50  .00  .00   .00 Reflective  12.10
 3 837491.13 816147.38   4.50  .00  .00   .00 Reflective  11.19
 4 837481.69 816141.38   4.50  .00  .00   .00 Reflective  11.06
 5 837472.13 816135.81   4.50  .00  .00   .00 Reflective  10.33
 6 837463.19 816130.63   4.50  .00  .00   .00 Reflective  10.65
 7 837453.69 816125.81   4.50  .00  .00   .00 Reflective  10.10
 8 837444.50 816121.63   4.50  .00  .00   .00 Reflective   9.34
 9 837435.66 816118.60   4.50  .00  .00   .00 Reflective   8.27
10 837427.71 816116.31   4.50  .00  .00   .00 Reflective   8.77
11 837419.15 816114.41   4.50  .00  .00   .00 Reflective   7.40
12 837411.91 816112.88   4.50  .00  .00   .00 Reflective  11.43
13 837400.66 816110.86   4.50  .00  .00   .00 Reflective  11.32
14 837389.42 816109.51   4.50  .00  .00   .00

Barrier  6: DAB2            Grade barrier
 1 837389.45 816109.31   4.50  .00  .00   .00 Reflective   3.62
 2 837389.79 816105.71   4.50  .00  .00   .00 Reflective   3.40
 3 837390.13 816102.33   4.50  .00  .00   .00 Reflective  11.80
 4 837401.90 816103.10   4.50  .00  .00   .00 Reflective  19.28
 5 837420.81 816106.88   4.50  .00  .00   .00

Barrier  7: DAB3            Grade barrier
 1 837420.88 816106.81   4.50  .00  .00   .00 Reflective   8.94
 2 837429.57 816108.93   4.50  .00  .00   .00 Reflective   8.75
 3 837437.96 816111.41   4.50  .00  .00   .00 Reflective  10.16
 4 837447.53 816114.81   4.50  .00  .00   .00 Reflective  10.80
 5 837457.51 816118.94   4.50  .00  .00   .00 Reflective   9.97
 6 837466.31 816123.63   4.50  .00  .00   .00 Reflective  10.76
 7 837475.81 816128.69   4.50  .00  .00   .00 Reflective  11.23
 8 837485.55 816134.27   4.50  .00  .00   .00 Reflective  12.43
 9 837496.00 816141.00   4.50  .00  .00   .00 Reflective  10.57
10 837505.30 816146.03   4.50  .00  .00   .00 Reflective  19.77
11 837522.57 816155.66   4.50  .00  .00   .00 Reflective  20.50
12 837540.91 816164.83   4.50  .00  .00   .00

Barrier  8: DAB4            Grade barrier
 1 837705.31 816239.38   5.00  .00  .00   .00 Reflective   4.84
 2 837707.63 816235.13   5.00  .00  .00   .00 Reflective   4.70
 3 837709.63 816230.88   5.00  .00  .00   .00 Reflective   3.95
 4 837711.31 816227.31   5.00  .00  .00   .00 Reflective    .00
 5 837711.31 816227.31   5.00  .00  .00   .00

Barrier  9: DAB7            Grade barrier
 1 837726.50 816171.63   5.00  .00  .00   .00 Reflective   4.44
 2 837724.13 816175.38   5.00  .00  .00   .00 Reflective   3.60
 3 837721.88 816178.19   5.00  .00  .00   .00 Reflective   4.12
 4 837719.00 816181.13   5.00  .00  .00   .00 Reflective   3.20
 5 837716.50 816183.13   5.00  .00  .00   .00 Reflective   6.97
 6 837710.63 816186.88   5.00  .00  .00   .00 Reflective   6.49
 7 837704.88 816189.88   5.00  .00  .00   .00 Reflective   4.92
 8 837700.19 816191.38   5.00  .00  .00   .00 Reflective   5.66
 9 837694.81 816193.13   5.00  .00  .00   .00 Reflective   5.54
10 837689.31 816193.81   5.00  .00  .00   .00 Reflective   3.70
11 837685.63 816194.19   5.00  .00  .00   .00 Reflective   4.94
12 837680.69 816194.13   5.00  .00  .00   .00 Reflective    .12
13 837680.81 816194.13   5.00  .00  .00   .00

Barrier 10: DAB8            Grade barrier
 1 837728.69 816171.50   5.00  .00  .00   .00 Reflective   6.93
 2 837727.38 816178.31   5.00  .00  .00   .00 Reflective   9.46
 3 837725.13 816187.50   5.00  .00  .00   .00 Reflective   9.41
 4 837722.38 816196.50   5.00  .00  .00   .00 Reflective   8.53
 5 837720.00 816204.69   5.00  .00  .00   .00 Reflective   9.38
 6 837716.31 816213.31   5.00  .00  .00   .00

Barrier 11: D4F1A           Flyover barrier (2)  Group: 2
 1 837117.84 816052.17   8.70  .00  .00   .00 Reflective  20.44
 2 837133.70 816065.07  10.10  .00  .00   .00 Reflective  20.12
 3 837150.13 816076.69  11.80  .00  .00   .00 Reflective  16.22
 4 837163.48 816085.90  12.10  .00  .00   .00 Reflective  12.98
 5 837176.31 816087.85  12.10  .00  .00   .00 Reflective  16.19
 6 837192.45 816086.53  11.10  .00  .00   .00 Reflective  13.84
 7 837205.35 816081.52  11.10  .00  .00   .00 Reflective  16.74
 8 837218.32 816070.94   9.20  .00  .00   .00 Reflective  18.51
```



```
 9 837227.84 816055.06   6.50  .00  .00   .00 Reflective  14.01
10 837231.48 816041.53   8.00  .00  .00   .00 Reflective  18.25
11 837231.74 816023.28   6.50  .00  .00   .00 Reflective   9.92
12 837233.33 816013.49   4.10  .00  .00   .00

Barrier 12: D4F1B           Flyover barrier (1)  Group: 2
 1 837124.69 816043.31   8.70  .00  .00   .00 Reflective  20.90
 2 837140.31 816057.19  10.10  .00  .00   .00 Reflective  18.29
 3 837154.38 816068.88  11.80  .00  .00   .00 Reflective  12.48
 4 837165.81 816073.88  12.10  .00  .00   .00 Reflective  10.72
 5 837176.38 816075.69    .00  .00  .00   .00 Reflective  12.22
 6 837188.50 816074.13  11.80  .00  .00   .00 Reflective  11.77
 7 837199.72 816070.59  11.10  .00  .00   .00 Reflective  11.36
 8 837208.99 816064.02  11.10  .00  .00   .00 Reflective  14.18
 9 837216.77 816052.17   9.20  .00  .00   .00 Reflective  12.93
10 837220.10 816039.68   8.00  .00  .00   .00 Reflective  16.94
11 837219.57 816022.75   6.50  .00  .00   .00 Reflective  10.93
12 837220.90 816011.90   4.80  .00  .00   .00

Barrier 13: D1BARA          Grade barrier
 1 835783.86 816069.51   6.00  .00  .00   .00 Reflective  15.12
 2 835771.16 816061.30   6.00  .00  .00   .00 Reflective  11.41
 3 835763.22 816053.10   6.00  .00  .00   .00 Reflective  29.71
 4 835744.44 816030.08   6.00  .00  .00   .00 Reflective  19.32
 5 835733.06 816014.47   6.00  .00  .00   .00 Reflective  34.29
 6 835710.26 815988.86   6.00  .00  .00   .00 Reflective  12.64
 7 835701.66 815998.12   6.00  .00  .00   .00 Reflective  34.77
 8 835725.69 816023.25   6.00  .00  .00   .00 Reflective  33.95
 9 835744.22 816051.70   6.00  .00  .00   .00 Reflective  22.33
10 835758.99 816068.45   6.00  .00  .00   .00 Refle-Dual  19.69
11 835775.30 816079.48   6.00  .00  .00   .00

Barrier 14: Bu10            Grade barrier
 1 837744.70 816426.20  89.20  .00  .00   .00 Reflective  46.76
 2 837709.00 816456.40  89.20  .00  .00   .00 Reflective  59.22
 3 837660.80 816422.00  89.20  .00  .00   .00 Refle-Dual  46.83
 4 837694.81 816389.81  89.20  .00  .00   .00 Refle-Dual  61.75
 5 837744.70 816426.19  89.20  .00  .00   .00

Barrier 15: Bu4             Grade barrier
 1 837770.90 816023.80  13.60  .00  .00   .00 Reflective  13.29
 2 837758.20 816027.70  13.60  .00  .00   .00 Reflective   6.24
 3 837754.10 816032.40  13.60  .00  .00   .00 Reflective  13.98
 4 837751.30 816046.10  13.60  .00  .00   .00 Reflective  19.63
 5 837750.20 816065.70  13.60  .00  .00   .00 Reflective  20.64
 6 837748.90 816086.30   7.50  .00  .00   .00 Reflective   7.51
 7 837748.60 816093.80   7.50  .00  .00   .00 Reflective  14.63
 8 837747.60 816108.40    .00  .00  .00   .00

Barrier 16: Bu5             Grade barrier
 1 837745.60 816146.60  55.60  .00  .00   .00 Reflective  48.56
 2 837743.10 816195.10  55.60  .00  .00   .00 Reflective  22.52
 3 837765.60 816196.00  33.20  .00  .00   .00

Barrier 17: Bu6             Grade barrier
 1 837735.10 816209.90  72.40  .00  .00   .00 Reflective  23.19
 2 837728.40 816232.10  72.40  .00  .00   .00 Reflective  20.89
 3 837720.40 816251.40  72.40  .00  .00   .00 Reflective  44.25
 4 837764.60 816253.60  72.20  .00  .00   .00

Barrier 18: Bu9             Grade barrier
 1 837640.90 816353.90  89.20  .00  .00   .00 Reflective  38.95
 2 837608.90 816376.10  89.20  .00  .00   .00 Reflective   5.77
 3 837607.50 816381.70  89.20  .00  .00   .00 Reflective  54.70
 4 837651.50 816414.20  89.20  .00  .00   .00 Reflective  45.83
 5 837684.50 816382.40  82.00  .00  .00   .00 Refle-Dual  52.10
 6 837640.90 816353.88  82.00  .00  .00   .00

Barrier 19: B17a            Flyover barrier (2)  Group:16
 1 837233.10 815941.40   7.40  .00  .00   .00 Reflective  17.96
 2 837227.60 815958.50   7.90  .00  .00   .00 Reflective  11.64
 3 837223.80 815969.50   8.30  .00  .00   .00 Reflective  12.55
 4 837219.80 815981.40   9.30  .00  .00   .00 Reflective  11.99
 5 837215.80 815992.70  10.20  .00  .00   .00 Reflective  12.21
 6 837212.00 816004.30  11.10  .00  .00   .00 Reflective  37.73
 7 837199.80 816040.00  11.10  .00  .00   .00 Reflective  10.97
```

```
8 837195.30 816050.00 11.10 .00 .00 .00 Reflective 9.78
9 837189.40 816057.80 11.10 .00 .00 .00 Reflective 9.29
10 837181.70 816063.00 11.40 .00 .00 .00 Reflective 6.43
11 837175.50 816064.70 11.80 .00 .00 .00 Reflective 8.72
12 837166.80 816064.10 12.10 .00 .00 .00 Reflective 5.95
13 837161.20 816062.10 11.70 .00 .00 .00 Reflective 6.76
14 837155.30 816058.80 10.10 .00 .00 .00 Reflective 15.84
15 837143.80 816047.90 7.70 .00 .00 .00 Reflective 26.67
16 837123.50 816030.60 5.60 .00 .00 .00 Reflective 21.92
17 837106.80 816016.40 4.30 .00 .00 .00

Barrier 20: B17b Flyover barrier (1) Group:16
1 837240.20 815943.70 7.40 .00 .00 .00 Reflective 18.41
2 837234.20 815961.10 8.30 .00 .00 .00 Reflective 11.13
3 837230.80 815971.70 9.30 .00 .00 .00 Reflective 12.27
4 837226.80 815983.30 10.20 .00 .00 .00 Reflective 12.02
5 837223.00 815994.70 11.10 .00 .00 .00 Reflective 12.84
6 837219.00 816006.90 11.10 .00 .00 .00 Reflective 37.38
7 837207.00 816042.30 11.10 .00 .00 .00 Reflective 12.96
8 837202.10 816054.30 11.10 .00 .00 .00 Reflective 12.37
9 837194.30 816063.90 11.10 .00 .00 .00 Reflective 11.10
10 837184.90 816069.80 11.40 .00 .00 .00 Reflective 9.80
11 837175.40 816072.20 12.10 .00 .00 .00 Reflective 9.90
12 837165.50 816071.90 12.00 .00 .00 .00 Reflective 8.34
13 837157.80 816068.70 11.70 .00 .00 .00 Reflective 8.61
14 837150.40 816064.30 10.10 .00 .00 .00 Reflective 15.52
15 837138.70 816054.10 7.70 .00 .00 .00 Reflective 26.66
16 837118.50 816036.70 5.60 .00 .00 .00 Reflective 22.07
17 837101.60 816022.50 4.30 .00 .00 .00

Barrier 21: B18a Flyover barrier (1) Group:15
1 836797.00 815884.80 6.50 .00 .00 .00 Reflective 11.79
2 836785.60 815887.80 7.40 .00 .00 .00 Reflective 16.95
3 836769.60 815893.40 8.00 .00 .00 .00 Reflective 16.27
4 836754.40 815899.20 9.10 .00 .00 .00 Reflective 13.00
5 836742.20 815903.70 10.20 .00 .00 .00

Barrier 22: B18b Flyover barrier (2) Group:15
1 836802.50 815900.80 5.40 .00 .00 .00 Reflective 10.18
2 836793.10 815904.70 7.40 .00 .00 .00 Reflective 17.79
3 836776.50 815911.10 8.00 .00 .00 .00 Reflective 15.67
4 836761.90 815916.80 9.10 .00 .00 .00 Reflective 13.29
5 836749.40 815921.30 10.20 .00 .00 .00

Barrier 23: B28a Grade barrier
1 837277.80 815814.20 6.60 .80 .00 .00 Reflective 11.89
2 837281.80 815803.00 7.40 .80 .00 .00 Reflective 8.57
3 837284.30 815794.80 8.30 .80 .00 .00 Reflective 7.67
4 837287.20 815787.70 9.10 .80 .00 .00 Reflective 8.79
5 837289.80 815779.30 9.90 .80 .00 .00 Reflective 12.02
6 837293.60 815767.90 10.70 .80 .00 .00 Reflective 13.72
7 837298.00 815754.90 11.30 .80 .00 .00 Reflective 42.41
8 837311.80 815714.80 .00 .00 .00 .00

Barrier 24: B28b Grade barrier
1 837284.10 815816.00 6.60 .80 .00 .00 Reflective 11.58
2 837288.00 815805.10 7.40 .80 .00 .00 Reflective 8.48
3 837290.80 815797.10 8.30 .80 .00 .00 Reflective 7.94
4 837293.40 815789.60 9.10 .80 .00 .00 Reflective 8.51
5 837296.00 815781.50 9.90 .80 .00 .00 Reflective 12.05
6 837299.90 815770.10 10.70 .80 .00 .00 Reflective 13.92
7 837304.60 815757.00 11.30 .80 .00 .00 Reflective 42.19
8 837318.60 815717.20 .00 .00 .00 .00

Barrier 25: B19a Flyover barrier (2) Group:13
1 836632.70 815877.00 6.60 .00 .00 .00 Reflective 8.99
2 836624.30 815873.80 7.10 .00 .00 .00 Reflective 8.68
3 836617.20 815868.80 7.70 .00 .00 .00 Reflective 7.58
4 836612.20 815863.10 8.20 .00 .00 .00 Reflective 6.62
5 836609.20 815857.20 9.30 .00 .00 .00 Reflective 6.55
6 836607.40 815850.90 9.90 .00 .00 .00 Reflective 6.54
7 836606.70 815844.40 10.40 .00 .00 .00 Reflective 7.02
8 836607.20 815837.40 11.00 .00 .00 .00 Reflective 7.09
9 836609.20 815830.60 11.00 .00 .00 .00 Reflective 7.16
10 836612.60 815824.30 11.00 .00 .00 .00 Reflective 7.39
11 836617.30 815818.60 11.00 .00 .00 .00 Reflective 8.68
```



```
12 836624.10 815813.20 11.00 .00 .00 .00 Reflective 8.86
13 836631.20 815807.90 11.00 .00 .00 .00 Reflective 10.17
14 836639.10 815801.50 11.00 .00 .00 .00 Reflective 10.98
15 836647.30 815794.20 11.00 .00 .00 .00 Reflective 20.36
16 836660.50 815778.70 11.00 .00 .00 .00

Barrier 26: B19b Flyover barrier (1) Group:13
1 836623.70 815897.50 5.50 .00 .00 .00 Reflective 15.53
2 836610.90 815888.70 6.00 .00 .00 .00 Reflective 10.48
3 836603.10 815881.70 6.80 .00 .00 .00 Reflective 10.26
4 836596.80 815873.60 7.70 .00 .00 .00 Reflective 10.93
5 836591.40 815864.10 8.50 .00 .00 .00 Reflective 11.10
6 836588.10 815853.50 9.30 .00 .00 .00 Reflective 9.83
7 836587.30 815843.70 10.20 .00 .00 .00 Reflective 10.77
8 836588.50 815833.00 11.00 .00 .00 .00 Reflective 10.18
9 836591.60 815823.30 11.00 .00 .00 .00 Reflective 10.62
10 836596.90 815814.10 11.00 .00 .00 .00 Reflective 10.72
11 836603.80 815805.90 11.00 .00 .00 .00 Reflective 10.54
12 836611.50 815798.70 11.00 .00 .00 .00 Reflective 9.95
13 836619.20 815792.40 11.00 .00 .00 .00 Reflective 10.08
14 836627.30 815786.40 11.00 .00 .00 .00 Reflective 10.12
15 836634.80 815779.60 11.00 .00 .00 .00 Reflective 6.72
16 836639.40 815774.70 11.00 .00 .00 .00

Barrier 27: B20a Flyover barrier (2) Group: 8
1 836462.80 815825.10 4.90 .00 .00 .00 Reflective 9.66
2 836466.30 815816.10 4.90 .00 .00 .00 Reflective 11.48
3 836470.20 815805.30 6.40 .00 .00 .00 Reflective 10.48
4 836473.90 815795.50 7.90 .00 .00 .00 Reflective 10.92
5 836477.80 815785.30 9.30 .00 .00 .00 Reflective 23.76
6 836486.00 815763.00 10.70 .00 .00 .00 Reflective 19.31
7 836493.00 815745.00 10.70 .00 .00 .00 Reflective 20.61
8 836500.50 815725.80 10.70 .00 .00 .00 Reflective 22.25
9 836508.40 815705.00 10.70 .00 .00 .00 Reflective 12.55
10 836513.20 815693.40 8.90 .00 .00 .00 Reflective 10.45
11 836517.10 815683.70 7.20 .00 .00 .00 Reflective 10.90
12 836521.20 815673.60 5.50 .00 .00 .00 Reflective 9.81
13 836525.10 815664.60 3.70 .00 .00 .00

Barrier 28: B20b Flyover barrier (1) Group: 8
1 836455.70 815822.60 6.40 .00 .00 .00 Reflective 9.49
2 836459.00 815813.70 7.90 .00 .00 .00 Reflective 11.29
3 836462.90 815803.10 9.30 .00 .00 .00 Reflective 11.33
4 836466.90 815792.50 10.70 .00 .00 .00 Reflective 10.82
5 836470.50 815782.30 10.70 .00 .00 .00 Reflective 23.62
6 836479.10 815760.30 10.70 .00 .00 .00 Reflective 19.43
7 836485.90 815742.10 10.70 .00 .00 .00 Reflective 20.32
8 836493.10 815723.10 10.70 .00 .00 .00 Reflective 22.32
9 836501.20 815702.30 10.70 .00 .00 .00 Reflective 12.61
10 836505.90 815690.60 8.90 .00 .00 .00 Reflective 10.90
11 836510.00 815680.50 7.20 .00 .00 .00 Reflective 10.10
12 836513.70 815671.10 5.50 .00 .00 .00 Reflective 10.40
13 836517.70 815661.50 3.70 .00 .00 .00

Barrier 29: B21a Flyover barrier (1) Group:12
1 836597.10 815762.90 5.20 .00 .00 .00 Reflective 19.63
2 836578.80 815755.80 6.30 .00 .00 .00 Reflective 20.41
3 836559.90 815748.10 7.50 .00 .00 .00 Reflective 15.67
4 836545.30 815742.40 8.10 .00 .00 .00 Reflective 15.97
5 836529.40 815740.90 8.70 .00 .00 .00 Reflective 16.32
6 836513.50 815744.60 9.80 .00 .00 .00 Reflective 15.80
7 836500.00 815752.80 11.00 .00 .00 .00 Reflective 16.34
8 836489.60 815765.40 11.00 .00 .00 .00 Reflective 15.94
9 836484.50 815780.50 9.60 .00 .00 .00 Reflective 16.30
10 836484.30 815796.80 8.20 .00 .00 .00 Reflective 15.91
11 836489.00 815812.00 6.10 .00 .00 .00 Reflective 11.13
12 836495.40 815821.10 6.80 .00 .00 .00 Reflective 12.41
13 836504.80 815829.20 5.40 .00 .00 .00

Barrier 30: B21b Flyover barrier (2) Group:12
1 836594.70 815768.90 5.20 .00 .00 .00 Reflective 19.63
2 836576.40 815761.80 6.30 .00 .00 .00 Reflective 20.48
3 836557.30 815754.40 7.50 .00 .00 .00 Reflective 14.40
4 836543.80 815749.40 8.70 .00 .00 .00 Reflective 14.09
5 836529.80 815747.80 9.80 .00 .00 .00 Reflective 14.53
6 836515.70 815751.30 11.00 .00 .00 .00 Reflective 13.48
```

```
7 836504.30 815758.50  11.00  .00  .00   .00 Reflective  13.65
8 836495.70 815769.10  9.60  .00  .00   .00 Reflective  13.44
9 836491.30 815781.80  8.20  .00  .00   .00 Reflective  14.30
10 836491.40 815796.10  6.80  .00  .00   .00 Reflective  13.16
11 836495.50 815808.60  5.40  .00  .00   .00 Reflective  9.21
12 836500.40 815816.40  4.00  .00  .00   .00 Reflective  10.47
13 836508.10 815823.50  4.00  .00  .00   .00

Barrier 31: B22a           Flyover barrier (1)  Group:10
 1 836584.00 815749.40  5.20  .00  .00   .00 Reflective  11.81
 2 836595.00 815753.70  6.30  .00  .00   .00 Reflective  11.94
 3 836606.10 815758.10  7.50  .00  .00   .00 Reflective  11.61
 4 836616.80 815762.60  8.10  .00  .00   .00 Reflective  11.64
 5 836627.90 815766.10  8.70  .00  .00   .00 Reflective  6.80
 6 836634.70 815766.10  9.80  .00  .00   .00 Reflective  6.77
 7 836641.10 815763.90  11.00  .00  .00   .00

Barrier 32: B22b           Flyover barrier (2)  Group:10
 1 836581.60 815755.30  5.20  .00  .00   .00 Reflective  11.70
 2 836592.40 815759.80  5.80  .00  .00   .00 Reflective  12.11
 3 836603.60 815764.40  6.30  .00  .00   .00 Reflective  11.53
 4 836614.30 815768.70  7.50  .00  .00   .00 Reflective  11.75
 5 836625.20 815773.10  8.70  .00  .00   .00 Reflective  10.75
 6 836635.90 815774.10  9.80  .00  .00   .00 Reflective  3.45
 7 836639.30 815773.50  11.00  .00  .00   .00

Barrier 33: B23a           Flyover barrier (1)  Group: 9
 1 836641.00 815763.90  11.00  .00  .00   .00 Reflective  8.91
 2 836647.50 815757.80  11.00  .00  .00   .00 Reflective  23.05
 3 836656.30 815736.50  11.00  .00  .00   .00 Reflective  33.50
 4 836669.00 815705.50  11.00  .00  .00   .00 Reflective  38.55
 5 836683.30 815669.70  11.00  .00  .00   .00 Reflective  50.80
 6 836701.30 815622.20  11.00  .00  .00   .00 Reflective  13.22
 7 836704.20 815609.30  11.00  .00  .00   .00 Reflective  8.75
 8 836705.10 815600.60  11.00  .00  .00   .00

Barrier 34: B23b           Flyover barrier (2)  Group: 9
 1 836670.40 815775.40  11.00  .00  .00   .00 Reflective  8.41
 2 836670.70 815767.00  11.00  .00  .00   .00 Reflective  22.93
 3 836679.20 815745.70  11.00  .00  .00   .00 Reflective  33.76
 4 836691.60 815714.30  11.00  .00  .00   .00 Reflective  38.46
 5 836705.90 815678.60  11.00  .00  .00   .00 Reflective  50.58
 6 836724.60 815631.60  11.00  .00  .00   .00 Reflective  17.01
 7 836730.10 815615.50  11.00  .00  .00   .00 Reflective  15.70
 8 836733.60 815600.20  11.00  .00  .00   .00

Barrier 35: B24a           Flyover barrier (2)  Group:11
 1 836717.10 815813.20  4.00  .00  .00   .00 Reflective  10.03
 2 836707.90 815809.20  5.00  .00  .00   .00 Reflective  10.39
 3 836698.40 815805.00  6.00  .00  .00   .00 Reflective  9.62
 4 836689.70 815800.90  7.00  .00  .00   .00 Reflective  10.42
 5 836680.30 815796.40  8.00  .00  .00   .00 Reflective  12.64
 6 836669.40 815790.00  9.00  .00  .00   .00 Reflective  7.07
 7 836665.50 815784.10  10.00  .00  .00   .00 Reflective  5.99
 8 836662.90 815778.70  11.00  .00  .00   .00

Barrier 36: B24b           Flyover barrier (2)  Group:11
 1 836719.50 815807.40  4.00  .00  .00   .00 Reflective  9.98
 2 836710.40 815803.30  5.00  .00  .00   .00 Reflective  10.29
 3 836701.10 815798.90  6.00  .00  .00   .00 Reflective  9.89
 4 836692.10 815794.80  7.00  .00  .00   .00 Reflective  10.25
 5 836682.80 815790.50  8.00  .00  .00   .00 Reflective  9.50
 6 836675.20 815784.80  9.00  .00  .00   .00 Reflective  5.19
 7 836672.30 815780.50  10.00  .00  .00   .00 Reflective  5.52
 8 836670.20 815775.40  11.00  .00  .00   .00

Barrier 37: B25a           Flyover barrier (2)  Group:14
 1 836742.10 815903.60  10.50  .00  .00   .00 Reflective  17.01
 2 836725.90 815908.80  11.00  .00  .00   .00

Barrier 38: B25b           Flyover barrier (2)  Group:14
 1 836749.30 815921.20  10.50  .00  .00   .00 Reflective  20.34
 2 836730.40 815928.73  11.00  .00  .00   .00 Refle-Dual  18.49
 3 836712.40 815932.96  11.10  .00  .00   .00 Refle-Dual  14.06
 4 836698.65 815935.88  11.20  .00  .00   .00 Refle-Dual  12.25
 5 836686.47 815937.20  11.50  .00  .00   .00
```



```
Barrier 39: B26a           Flyover barrier (2)  Group:14
 1 836725.80 815908.70  10.20  .00  .00   .00 Reflective  16.42
 2 836709.60 815911.40  9.50  .00  .00   .00 Reflective  12.50
 3 836697.10 815911.60  8.30  .00  .00   .00 Reflective  11.77
 4 836685.40 815910.30  7.40  .00  .00   .00

Barrier 40: B26b           Flyover barrier (1)  Group:14
 1 836728.50 815920.60  7.40  .00  .00   .00 Reflective  17.76
 2 836711.40 815925.40  8.30  .00  .00   .00 Reflective  12.93
 3 836698.80 815928.30  9.50  .00  .00   .00 Reflective  12.88
 4 836686.00 815929.70  10.20  .00  .00   .00

Barrier 41: Bu1            Grade barrier
 1 836531.00 815672.20  55.30  .00  .00   .00 Reflective  35.39
 2 836517.70 815705.00  55.30  .00  .00   .00 Reflective  34.34
 3 836549.60 815717.70  3.70  .00  .00   .00 Reflective  11.53
 4 836560.30 815722.00  55.30  .00  .00   .00 Reflective  11.88
 5 836571.30 815728.50  66.50  .00  .00   .00 Reflective  32.57
 6 836601.50 815738.70  .00  .00  .00   .00

Barrier 42: Bu2            Grade barrier
 1 836643.00 815755.60  94.50  .00  .00   .00 Reflective  19.63
 2 836650.60 815737.50  94.50  .00  .00   .00 Reflective  16.22
 3 836657.00 815722.60  .00  .00  .00   .00

Barrier 43: B29a           Flyover barrier (1)  Group: 7
 1 836403.40 815695.20  7.60  .00  .00   .00 Reflective  21.67
 2 836383.30 815687.10  9.30  .00  .00   .00 Reflective  12.06
 3 836372.00 815682.90  10.40  .00  .00   .00 Reflective  14.34
 4 836357.70 815681.80  11.40  .00  .00   .00 Reflective  13.61
 5 836344.40 815684.70  11.40  .00  .00   .00 Reflective  12.57
 6 836333.30 815690.60  11.40  .00  .00   .00 Reflective  11.54
 7 836325.60 815699.20  11.40  .00  .00   .00 Reflective  13.25
 8 836319.20 815710.80  10.70  .00  .00   .00 Reflective  9.96
 9 836315.90 815720.20  9.90  .00  .00   .00 Reflective  8.03
10 836313.30 815727.80  7.40  .00  .00   .00 Reflective  8.45
11 836310.90 815735.90  8.90  .00  .00   .00

Barrier 44: B29b           Flyover barrier (2)  Group: 7
 1 836400.50 815703.60  7.60  .00  .00   .00 Reflective  22.29
 2 836379.70 815695.60  9.30  .00  .00   .00 Reflective  10.50
 3 836369.80 815692.10  10.40  .00  .00   .00 Reflective  10.62
 4 836359.20 815691.40  11.40  .00  .00   .00 Reflective  11.62
 5 836347.90 815694.10  11.40  .00  .00   .00 Reflective  9.35
 6 836339.70 815698.60  11.40  .00  .00   .00 Reflective  9.55
 7 836332.90 815705.30  11.40  .00  .00   .00 Reflective  10.80
 8 836327.40 815714.60  10.70  .00  .00   .00 Reflective  8.58
 9 836324.30 815722.60  8.90  .00  .00   .00 Reflective  8.70
10 836321.70 815730.90  7.90  .00  .00   .00 Reflective  7.67
11 836319.70 815738.30  6.90  .00  .00   .00

Barrier 45: B32A           Flyover barrier (2)  Group: 6
 1 836029.70 815704.00  3.80  .00  .00   .00 Reflective  12.37
 2 836031.00 815691.70  5.40  .00  .00   .00 Reflective  11.78
 3 836032.40 815680.00  7.00  .00  .00   .00 Reflective  13.20
 4 836034.00 815666.90  8.60  .00  .00   .00 Reflective  12.39
 5 836035.50 815654.60  10.20  .00  .00   .00 Reflective  22.30
 6 836035.60 815632.30  10.40  .00  .00   .00 Reflective  28.90
 7 836035.40 815603.40  10.50  .00  .00   .00

Barrier 46: B32b           Flyover barrier (1)  Group: 6
 1 836024.20 815703.40  3.80  .00  .00   .00 Reflective  12.09
 2 836025.70 815691.40  5.40  .00  .00   .00 Reflective  11.85
 3 836026.80 815679.60  7.00  .00  .00   .00 Reflective  13.48
 4 836028.30 815666.20  8.60  .00  .00   .00 Reflective  12.29
 5 836029.80 815654.00  10.20  .00  .00   .00 Reflective  22.31
 6 836030.60 815631.70  10.40  .00  .00   .00 Reflective  19.45
 7 836029.20 815612.30  10.50  .00  .00   .00

Barrier 47: B33a           Flyover barrier (2)  Group: 5
 1 836016.80 815702.30  3.80  .00  .00   .00 Reflective  11.76
 2 836018.00 815690.60  5.40  .00  .00   .00 Reflective  11.80
 3 836019.50 815678.90  7.00  .00  .00   .00 Reflective  13.19
 4 836021.00 815665.80  8.60  .00  .00   .00 Reflective  12.58
 5 836022.40 815653.30  10.20  .00  .00   .00 Reflective  22.05
```

```
 6 836023.90 815631.30  10.40  .00  .00   .00 Reflective  19.60
 7 836029.10 815612.40  10.50  .00  .00   .00

Barrier 48: B33b          Flyover barrier (1)  Group: 5
 1 836008.90 815701.40   3.80  .00  .00   .00 Reflective  11.46
 2 836010.10 815690.00   5.40  .00  .00   .00 Reflective  12.07
 3 836011.40 815678.00   7.00  .00  .00   .00 Reflective  13.10
 4 836013.00 815665.00   8.60  .00  .00   .00 Reflective  12.78
 5 836014.40 815652.30  10.20  .00  .00   .00 Reflective  22.31
 6 836019.60 815630.60  10.40  .00  .00   .00 Reflective  28.13
 7 836026.40 815603.30  10.50  .00  .00   .00

Barrier 49: SSP           Grade barrier
 1 835505.00 815828.40   3.90  8.00  .00   .00 Reflective  20.26
 2 835525.20 815830.00   3.90  8.00  .00   .00 Reflective  29.82
 3 835542.20 815805.50   3.90  8.00  .00   .00 Reflective  20.00
 4 835533.70 815787.40   3.90  8.00  .00   .00

Barrier 50: SGA           Grade barrier
 1 835460.10 815781.10   5.10  9.60  .00   .00 Reflective  56.70
 2 835455.30 815837.60   5.10  9.60  .00   .00 Reflective  22.07
 3 835433.30 815835.90   5.10  9.60  .00   .00 Reflective  10.14
 4 835426.70 815828.20   5.10  9.60  .00   .00 Reflective  33.74
 5 835407.30 815800.60   5.10  9.60  .00   .00 Reflective   6.01
 6 835407.60 815794.60   5.10  9.60  .00   .00

Barrier 51: fire          Grade barrier
 1 837656.42 816307.70   3.60 16.00  .00   .00 Reflective  40.58
 2 837621.70 816286.70   3.60 16.00  .00   .00 Reflective  25.98
 3 837635.20 816264.50   3.60 16.00  .00   .00 Refle-Dual  40.31
 4 837669.38 816285.86   3.60 16.00  .00   .00 Refle-Dual  25.40
 5 837656.42 816307.70   3.60 16.00  .00   .00

Barrier 52: bw            Grade barrier
 1 835415.40 815741.10   5.00  3.00  .00   .00 Reflective   7.83
 2 835422.40 815744.60   5.00  3.00  .00   .00 Reflective   6.63
 3 835428.90 815745.90   5.00  3.00  .00   .00 Reflective  13.00
 4 835441.90 815746.00   5.00  3.00  .00   .00 Reflective   6.33
 5 835436.50 815749.30   5.00  3.00  .00   .00 Reflective  11.28
 6 835447.70 815750.60   5.00  3.00  .00   .00 Reflective  10.22
 7 835457.90 815751.20   5.00  3.00  .00   .00 Reflective   8.69
 8 835466.40 815753.00   5.00  3.00  .00   .00 Reflective   2.82
 9 835469.20 815752.70   5.00  3.00  .00   .00 Reflective   3.11
10 835470.90 815755.30   5.00  3.00  .00   .00 Reflective  56.09
11 835526.80 815759.90    .00   .00  .00   .00

Barrier 53: NBAR1         Grade barrier
 1 836042.03 815775.80  12.00 162.00  .00   .00 Reflective  34.27
 2 836039.36 815809.97  12.00 162.00  .00   .00 Reflective  44.61
 3 836083.84 815813.37  12.00 162.00  .00   .00 Reflective  34.21
 4 836086.22 815779.24  12.00 162.00  .00   .00 Reflective  44.32
 5 836042.03 815775.80  12.00 162.00  .00   .00

Barrier 54: NBAR2         Grade barrier
 1 836114.88 815782.18  12.00 162.00  .00   .00 Reflective  33.16
 2 836112.50 815815.25  12.00 162.00  .00   .00 Reflective  43.53
 3 836155.89 815818.69  12.00 162.00  .00   .00 Reflective  33.24
 4 836158.89 815785.59  12.00 162.00  .00   .00 Reflective  44.12
 5 836114.90 815782.19  12.00 162.00  .00   .00

Barrier 55: NBAR3         Grade barrier
 1 836185.18 815824.58   4.00 22.00  .00   .00 Reflective  56.99
 2 836180.09 815881.34   4.00 22.00  .00   .00 Reflective  41.07
 3 836221.03 815884.64   4.00 22.00  .00   .00 Reflective  56.87
 4 836226.32 815828.02   4.00 22.00  .00   .00 Reflective  41.28
 5 836185.18 815824.58   4.00 22.00  .00   .00

Barrier 56: BARGH         Grade barrier
 1 835755.01 815801.18   4.00 55.00  .00   .00 Reflective  38.60
 2 835752.23 815839.68   4.00 55.00  .00   .00 Reflective   3.37
 3 835754.61 815842.06   4.00 55.00  .00   .00 Reflective  63.07
 4 835817.32 815848.81   4.00 55.00  .00   .00 Reflective   9.16
 5 835818.11 815839.68   4.00 55.00  .00   .00 Reflective  15.64
 6 835808.98 815826.98   4.00 55.00  .00   .00 Reflective  23.14
 7 835785.96 815824.60   4.00 55.00  .00   .00 Reflective  17.48
 8 835774.85 815811.11   4.00 55.00  .00   .00 Reflective  11.18
```



```
 9 835776.04 815799.99   4.00 55.00  .00   .00 Reflective  18.67
10 835757.39 815799.20   4.00 55.00  .00   .00 Reflective    .00
11 835757.39 815799.20   4.00 55.00  .00   .00

Barrier 57: D3B9A         Flyover barrier (1)  Group:81
 1 836618.29 815930.32  11.90  .00  .00   .00 Reflective  14.19
 2 836632.36 815932.17  12.00  .00  .00   .00 Reflective  11.58
 3 836643.85 815933.65  11.90  .00  .00   .00 Reflective  17.19
 4 836660.89 815935.88  11.80  .00  .00   .00 Reflective  12.90
 5 836673.73 815937.17  11.70  .00  .00   .00 Reflective   6.66
 6 836680.39 815937.36  11.60  .00  .00   .00 Reflective   5.38
 7 836685.76 815936.99  11.50  .00  .00   .00

Barrier 58: D3B9B         Flyover barrier (2)  Group:81
 1 836618.53 815922.91  11.90  .00  .00   .00 Reflective  14.20
 2 836632.61 815924.76  12.00  .00  .00   .00 Reflective  11.40
 3 836643.91 815926.24  11.90  .00  .00   .00 Reflective  17.94
 4 836661.69 815928.65  11.80  .00  .00   .00 Reflective  12.27
 5 836673.91 815929.76  11.70  .00  .00   .00 Reflective   6.86
 6 836680.76 815930.13  11.60  .00  .00   .00 Reflective   5.38
 7 836686.14 815929.95  11.50  .00  .00   .00

Barrier 59: BLD1          Grade barrier
 1 836042.82 815742.53  12.00 12.00  .00   .00 Reflective  22.25
 2 836065.01 815744.20  12.00 12.00  .00   .00 Reflective  78.33
 3 836071.63 815666.15  12.00 12.00  .00   .00 Reflective  22.58
 4 836049.14 815664.16  12.00 12.00  .00   .00 Reflective  78.60
 5 836042.80 815742.50  12.00 12.00  .00   .00

Barrier 60: BLD2          Grade barrier
 1 836087.50 815698.56  12.00 124.00  .00   .00 Reflective  37.13
 2 836090.15 815661.52  12.00 124.00  .00   .00 Reflective  64.44
 3 836154.31 815667.47  12.00 124.00  .00   .00 Reflective  37.13
 4 836151.66 815704.51  12.00 124.00  .00   .00 Reflective  64.33
 5 836087.50 815699.88  12.00 124.00  .00   .00

Barrier 61: BLD3          Grade barrier
 1 836174.15 815757.43   4.00 20.00  .00   .00 Reflective  47.80
 2 836221.78 815761.40   4.00 20.00  .00   .00 Reflective  88.23
 3 836228.39 815673.42   4.00 20.00  .00   .00 Reflective  46.42
 4 836182.09 815670.12   4.00 20.00  .00   .00 Reflective  87.68
 5 836174.10 815757.44   4.00 20.00  .00   .00

Barrier 62: BLD3A         Grade barrier
 1 836200.32 815753.16  12.00 107.00  .00   .00 Reflective  22.68
 2 836201.91 815730.54    .00 107.00  .00   .00 Reflective  12.08
 3 836213.94 815731.60    .00 107.00  .00   .00 Reflective  22.57
 4 836212.09 815754.09    .00 107.00  .00   .00 Reflective  11.93
 5 836200.19 815753.29    .00 107.00  .00   .00

Barrier 63: BLD3B         Grade barrier
 1 836187.35 815726.04  12.00 107.00  .00   .00 Reflective  24.02
 2 836189.34 815702.10  12.00 107.00  .00   .00 Reflective  12.11
 3 836201.38 815703.42  12.00 107.00  .00   .00 Reflective  23.66
 4 836199.13 815726.97  12.00 107.00  .00   .00 Reflective  11.82
 5 836187.35 815726.04  12.00 107.00  .00   .00

Barrier 64: BLD3C         Grade barrier
 1 836204.99 815700.77  12.00 107.00  .00   .00 Reflective  22.81
 2 836206.58 815678.02  12.00 107.00  .00   .00 Reflective  12.20
 3 836218.75 815678.81  12.00 107.00  .00   .00 Reflective  22.69
 4 836217.03 815701.43  12.00 107.00  .00   .00 Reflective  11.81
 5 836205.26 815700.51  12.00 107.00  .00   .00

Barrier 65: BLD4          Grade barrier
 1 836239.27 815762.73   4.00  8.00  .00   .00 Reflective  85.24
 2 836246.41 815677.79   4.00  8.00  .00   .00 Reflective  71.44
 3 836314.68 815698.83   4.00  8.00  .00   .00 Reflective  71.47
 4 836294.83 815767.49   4.00  8.00  .00   .00 Reflective  13.14
 5 836281.74 815766.30   4.00  8.00  .00   .00 Reflective   7.07
 6 836277.37 815760.74   4.00  8.00  .00   .00 Reflective  13.15
 7 836264.27 815759.55   4.00  8.00  .00   .00 Reflective   8.74
 8 836257.53 815765.11   4.00  8.00  .00   .00 Reflective  18.87
 9 836238.87 815762.33   4.00  8.00  .00   .00

Barrier 66: BLD4A         Grade barrier
```

```
 1 836248.80 815730.98  12.00 138.00  .00  .00 Reflective  32.39
 2 836252.76 815698.83  12.00 138.00  .00  .00 Reflective  46.68
 3 836299.20 815703.59  12.00 138.00  .00  .00 Reflective  31.84
 4 836296.82 815735.34  12.00 138.00  .00  .00 Reflective  47.83
 5 836249.19 815730.98  12.00 138.00  .00  .00

Barrier 67: BLD5        Grade barrier
 1 836038.45 815746.37  4.00  8.00  .00  .00 Reflective  88.00
 2 836045.60 815658.66  4.00  8.00  .00  .00 Reflective 131.23
 3 836176.43 815668.84  4.00  8.00  .00  .00 Reflective  38.20
 4 836173.65 815706.94  4.00  8.00  .00  .00 Reflective 101.14
 5 836072.85 815698.61  4.00  8.00  .00  .00 Reflective  50.13
 6 836069.28 815748.61  4.00  8.00  .00  .00 Reflective  30.26
 7 836039.11 815746.23  4.00  8.00  .00  .00

Barrier 68: BLD6        Grade barrier
 1 836032.76 815815.69  4.00  8.00  .00  .00 Reflective  46.58
 2 836036.33 815769.25  4.00  8.00  .00  .00 Reflective 130.19
 3 836166.11 815779.57  4.00  8.00  .00  .00 Reflective  46.60
 4 836162.14 815826.00  4.00  8.00  .00  .00 Reflective 129.76
 5 836032.76 815816.08  4.00  8.00  .00  .00

Barrier 69: STS         Grade barrier
 1 836291.70 815870.60  4.60  11.00  .00  .00 Reflective  61.50
 2 836311.54 815812.39  4.60  11.00  .00  .00 Reflective  17.37
 3 836316.84 815795.85  4.60  11.00  .00  .00 Reflective  67.56
 4 836343.29 815733.68  4.60  11.00  .00  .00

Barrier 70: VM1         Grade barrier
 1 837406.70 816000.61  5.50  .00  .00  .00 Reflective  34.66
 2 837420.59 816032.36  6.20  .00  .00  .00 Reflective  35.99
 3 837410.01 816066.76  7.10  .00  .00  .00 Reflective  32.14
 4 837390.83 816092.55  8.40  .00  .00  .00 Reflective  20.61
 5 837375.61 816106.44  8.90  .00  .00  .00 Reflective  25.35
 6 837350.48 816103.14  8.90  .00  .00  .00 Reflective  40.81
 7 837312.11 816089.25  9.70  .00  .00  .00

Barrier 71: VM2         Grade barrier
 1 837357.09 816024.42  14.00  .00  .00  .00 Reflective  40.48
 2 837365.03 816064.11  12.00  .00  .00  .00 Reflective  18.43
 3 837358.41 816081.31  10.80  .00  .00  .00 Reflective  21.98
 4 837337.25 816087.26  10.80  .00  .00  .00 Reflective  23.39
 5 837316.74 816076.02  11.20  .00  .00  .00

Barrier 72: VM3         Grade barrier
 1 837322.03 816048.24  11.20  .00  .00  .00 Reflective  17.25
 2 837339.23 816046.91  11.10  .00  .00  .00 Reflective  19.55
 3 837347.17 816064.77  12.40  .00  .00  .00 Reflective  13.40
 4 837339.89 816076.02  11.20  .00  .00  .00 Reflective  15.72
 5 837324.68 816072.05  12.50  .00  .00  .00

Barrier 73: HKCEC       Grade barrier
 1 835858.68 816183.11  4.00  44.40  .00  .00 Reflective  24.40
 2 835838.18 816169.88  4.00  44.40  .00  .00 Reflective  18.64
 3 835829.58 816153.34  4.00  44.40  .00  .00 Reflective  15.49
 4 835816.07 816145.76  4.00  44.40  .00  .00 Reflective  10.48
 5 835810.91 816136.64  4.00  44.40  .00  .00 Reflective  20.58
 6 835797.82 816120.76  4.00  44.40  .00  .00 Reflective  41.42
 7 835784.72 816081.47  4.00  44.40  .00  .00 Reflective  48.67
 8 835776.78 816033.45  4.00  44.40  .00  .00 Reflective  22.10
 9 835773.34 816011.62  4.00  44.40  .00  .00 Reflective  59.41
10 835810.78 815965.49  4.00  44.40  .00  .00 Reflective 144.16
11 835954.45 815977.40  4.00  44.40  .00  .00 Reflective  20.24
12 835963.98 815995.26  4.00  44.40  .00  .00 Reflective  43.72
13 835966.36 816038.92  4.00  44.40  .00  .00 Reflective  87.24
14 835951.14 816124.82  4.00  44.40  .00  .00 Reflective  42.25
15 835913.04 816143.07  4.00  44.40  .00  .00 Reflective  24.37
16 835893.60 816157.76  4.00  44.40  .00  .00 Reflective  25.82
17 835875.74 816176.41  4.00  44.40  .00  .00 Reflective  18.73
18 835858.27 816183.16  4.00  44.40  .00  .00

Barrier 74: APA         Grade barrier
 1 835468.22 815718.08  8.00  2.50  .00  .00 Reflective  7.22
 2 835474.83 815720.99  8.00  2.50  .00  .00 Reflective  5.59
 3 835480.39 815721.52  8.00  2.50  .00  .00 Reflective  4.94
 4 835485.15 815720.20  8.00  2.50  .00  .00
```



```
Barrier 75: D5B2B-2-2-1      Grade barrier
 1 838113.38 817083.31  14.20  .80  .00  .00 Reflective  27.78
 2 838138.81 817094.50  14.00  .80  .00  .00

Barrier 76: D5B2B-2-2-2-1    Grade barrier
 1 838138.81 817094.50  14.60  .80  .00  .00 Reflective  27.39
 2 838164.38 817104.31  13.80  .80  .00  .00

Barrier 77: D5B2B-2-2-2-2    Grade barrier
 1 838164.38 817104.31  13.80  .80  .00  .00 Reflective  26.57
 2 838189.81 817112.00  13.60  .80  .00  .00 Reflective  34.85
 3 838223.65 817120.32  13.50  .80  .00  .00

Barrier 78: Bu11        Grade barrier
 1 837700.70 816464.31  89.20  .00  .00  .00 Reflective  45.49
 2 837664.10 816437.30  89.20  .00  .00  .00 Reflective  56.91
 3 837620.60 816474.00  89.20  .00  .00  .00 Reflective  21.26
 4 837634.00 816490.50  89.20  .00  .00  .00 Reflective  12.64
 5 837624.30 816498.60  89.20  .00  .00  .00 Reflective  22.23
 6 837638.50 816515.70  89.20  .00  .00  .00 Reflective  80.69
 7 837700.70 816464.30  89.20  .00  .00  .00

Barrier 79: Bu13        Grade barrier
 1 837786.16 816470.57  38.80  .00  .00  .00 Reflective  36.25
 2 837763.60 816442.20  38.80  .00  .00  .00 Reflective 154.25
 3 837644.90 816540.70  38.80  .00  .00  .00 Reflective  38.95
 4 837670.10 816570.40  38.80  .00  .00  .00 Refle-Dual 153.09
 5 837786.16 816470.57  38.80  .00  .00  .00

Barrier 80: ABULD1      Grade barrier
 1 837776.91 816760.61  4.50  5.00  .00  .00 Reflective  23.99
 2 837795.19 816745.08  4.50  5.00  .00  .00 Reflective  13.65
 3 837803.91 816755.58  4.50  5.00  .00  .00 Reflective  22.46
 4 837786.88 816770.23  4.50  5.00  .00  .00 Reflective  13.85
 5 837776.91 816760.61  4.50  5.00  .00  .00

Barrier 81: ABULD2      Grade barrier
 1 837786.88 816770.28  4.50  3.00  .00  .00 Reflective  73.25
 2 837839.25 816821.49  4.50  3.00  .00  .00 Reflective  16.19
 3 837851.52 816810.92  4.50  3.00  .00  .00 Reflective  73.00
 4 837803.91 816755.58  4.50  3.00  .00  .00

Barrier 82: ACARP1      Grade barrier
 1 837852.52 816834.47  4.50  2.50  .00  .00 Reflective  23.00
 2 837867.52 816851.90  4.50  2.50  .00  .00 Reflective  8.61
 3 837874.05 816846.29  4.50  2.50  .00  .00 Reflective  23.00
 4 837859.05 816828.85  4.50  2.50  .00  .00 Reflective  8.62
 5 837852.52 816834.47  4.50  2.50  .00  .00

Barrier 83: ACARP2      Grade barrier
 1 837871.76 816856.83  4.50  2.50  .00  .00 Reflective  25.00
 2 837888.07 816875.78  4.50  2.50  .00  .00 Reflective  8.61
 3 837894.60 816870.17  4.50  2.50  .00  .00 Reflective  25.01
 4 837878.29 816851.21  4.50  2.50  .00  .00 Reflective  8.57
 5 837871.80 816856.81  4.50  2.50  .00  .00

Barrier 84: NPB1        Grade barrier
 1 838106.97 817062.35  14.00  .80  .00  .00 Reflective  29.59
 2 838133.58 817075.29  13.80  .80  .00  .00 Reflective  15.73
 3 838148.09 817081.37  13.70  .80  .00  .00 Reflective  18.62
 4 838165.75 817087.27  13.50  .80  .00  .00 Reflective  18.99
 5 838183.89 817092.90  13.40  .80  .00  .00 Reflective  30.12
 6 838213.25 817099.61  13.20  .80  .00  .00 Reflective  64.82
 7 838277.23 817110.01  12.00  .80  .00  .00

Barrier 85: BUDA1       Grade barrier
 1 837988.48 816947.70  4.50  71.55  .00  .00 Reflective  16.29
 2 837977.59 816935.59  4.50  71.55  .00  .00 Reflective  6.03
 3 837982.27 816931.79  4.50  71.55  .00  .00 Reflective  17.37
 4 837971.08 816918.51  4.50  71.55  .00  .00 Reflective  5.97
 5 837966.38 816922.19  4.50  71.55  .00  .00 Reflective  60.86
 6 837927.66 816875.23  4.50  71.55  .00  .00 Reflective  5.47
 7 837931.65 816871.49  4.50  71.55  .00  .00 Reflective  11.66
 8 837924.77 816862.07  4.50  71.55  .00  .00 Reflective  6.19
 9 837919.94 816865.94  4.50  71.55  .00  .00 Reflective  26.90
```

10	837902.53	816845.44	4.50	71.55	.00	.00	Reflective	31.30
11	837926.71	816825.57	4.50	71.55	.00	.00	Reflective	132.83
12	838012.53	816926.95	4.50	71.55	.00	.00	Reflective	44.68
13	838043.65	816959.01	4.50	71.55	.00	.00	Reflective	19.44
14	838028.56	816971.27	4.50	71.55	.00	.00	Reflective	16.83
15	838012.06	816967.97	4.50	71.55	.00	.00	Reflective	11.72
16	838004.51	816959.01	4.50	71.55	.00	.00	Reflective	19.62
17	837988.48	816947.70	4.50	71.55	.00	.00		

Barrier 86: NPB2 Grade barrier

1	838277.23	817110.01	12.00	.80	.00	.00	Reflective	52.27
2	838328.61	817119.64	11.30	.80	.00	.00	Reflective	80.72
3	838406.92	817139.22	8.50	.80	.00	.00	Reflective	28.14
4	838434.73	817143.49	736.00	.80	.00	.00	Reflective	17.89
5	838451.98	817138.73	6.80	.80	.00	.00	Reflective	24.61
6	838471.83	817124.18	6.00	.80	.00	.00		

Barrier 87: NPB3 Flyover barrier (1) Group:30

1	838542.27	817165.80	13.70	.80	.00	.00	Reflective	43.28
2	838499.01	817164.61	13.70	.80	.00	.00	Reflective	58.83
3	838440.67	817157.07	12.80	.80	.00	.00	Reflective	76.14
4	838366.49	817139.92	12.30	.80	.00	.00	Reflective	95.63
5	838273.04	817119.64	12.70	.80	.00	.00		

Barrier 88: NPB3B Flyover barrier (2) Group:31

1	838317.85	817153.94	12.30	.80	.00	.00	Reflective	64.56
2	838380.95	817167.57	12.60	.80	.00	.00	Reflective	43.79
3	838423.68	817177.14	13.00	.80	.00	.00	Reflective	22.99
4	838446.17	817181.90	13.00	.80	.00	.00	Reflective	19.27
5	838465.22	817184.81	13.40	.80	.00	.00	Reflective	32.17
6	838497.23	817187.99	13.70	.80	.00	.00	Reflective	42.99
7	838540.19	817189.49	13.90	.80	.00	.00		

Barrier 89: NPB6 Grade barrier

1	838479.21	817131.95	6.00	.80	.00	.00	Reflective	27.78
2	838456.57	817148.04	6.80	.80	.00	.00	Reflective	22.11
3	838434.76	817151.64	7.30	.80	.00	.00	Reflective	30.14
4	838404.92	817147.40	8.50	.80	.00	.00	Reflective	39.38
5	838366.82	817137.45	10.00	.80	.00	.00	Reflective	41.07
6	838327.03	817127.29	11.30	.80	.00	.00	Reflective	53.19
7	838274.74	817117.56	12.00	.80	.00	.00		

Barrier 90: NPBA99 Flyover barrier (2) Group:30

1	838244.46	817125.51	13.20	.80	.00	.00	Reflective	118.30
2	838360.03	817150.80	12.30	.80	.00	.00	Reflective	43.33
3	838402.36	817160.06	12.60	.80	.00	.00	Reflective	32.57
4	838434.11	817167.33	12.90	.80	.00	.00	Reflective	35.68
5	838469.17	817173.95	13.40	.80	.00	.00	Reflective	37.13
6	838506.21	817176.60	13.70	.80	.00	.00	Reflective	32.44
7	838538.62	817177.92	13.90	.80	.00	.00		

Barrier 91: NPBB99 Flyover barrier (1) Group:31

1	838244.46	817125.51	13.20	.80	.00	.00	Reflective	118.30
2	838360.03	817150.80	12.30	.80	.00	.00	Reflective	43.33
3	838402.36	817160.06	12.60	.80	.00	.00	Reflective	32.57
4	838434.11	817167.33	12.90	.80	.00	.00	Reflective	35.68
5	838469.17	817173.95	13.40	.80	.00	.00	Reflective	37.13
6	838506.21	817176.60	13.70	.80	.00	.00	Reflective	32.44
7	838538.62	817177.92	13.90	.80	.00	.00		

Barrier 92: NPB4 Grade barrier

1	838477.46	817155.66	3.80	.80	.00	.00	Reflective	14.95
2	838468.60	817167.70	4.80	.80	.00	.00	Reflective	19.12
3	838452.86	817178.55	6.20	.80	.00	.00	Reflective	20.07
4	838433.54	817183.97	7.50	.80	.00	.00	Reflective	21.17
5	838412.38	817184.50	8.00	.80	.00	.00	Reflective	48.70
6	838365.41	817171.63	10.80	.80	.00	.00	Reflective	50.97
7	838316.86	817156.10	11.50	.80	.00	.00		

Barrier 93: NPB5 Grade barrier

1	838236.90	817140.50	13.20	.80	.00	.00	Reflective	21.95
2	838258.08	817146.27	12.00	.80	.00	.00	Reflective	24.90
3	838281.93	817153.41	12.70	.80	.00	.00	Reflective	31.32
4	838311.77	817162.91	12.30	.80	.00	.00	Reflective	54.06
5	838363.21	817179.52	10.80	.80	.00	.00	Reflective	49.47
6	838410.75	817193.19	8.00	.80	.00	.00	Reflective	23.68

7	838434.43	817193.59	7.50	.80	.00	.00	Reflective	22.87
8	838456.47	817187.50	6.20	.80	.00	.00	Reflective	24.12
9	838476.98	817174.80	4.80	.80	.00	.00	Reflective	19.88
10	838489.94	817159.72	3.80	.80	.00	.00		

Barrier 94: TFSB1 Flyover barrier (1) Group:41

1	837792.12	816200.88	14.00	.00	.00	.00	Reflective	23.44
2	837768.70	816199.82	13.00	.00	.00	.00	Reflective	24.51
3	837744.23	816198.37	12.00	.00	.00	.00	Reflective	23.17
4	837721.08	816197.31	11.00	.00	.00	.00	Reflective	21.29
5	837699.82	816196.16	8.00	.00	.00	.00		

Barrier 95: TFSB2 Flyover barrier (2) Group:41

1	837791.72	816208.29	14.00	.00	.00	.00	Reflective	23.59
2	837768.17	816206.97	13.00	.00	.00	.00	Reflective	24.25
3	837743.96	816205.64	12.00	.00	.00	.00	Reflective	23.32
4	837720.68	816204.32	11.00	.00	.00	.00	Reflective	21.33
5	837699.38	816203.13	8.00	.00	.00	.00		

Barrier 96: TEMBB Grade barrier

1	837610.12	816284.46	3.60	2.50	.00	.00	Reflective	7.71
2	837617.79	816285.26	3.60	2.50	.00	.00	Reflective	26.69
3	837629.56	816261.31	3.60	2.50	.00	.00	Reflective	5.72
4	837624.67	816258.34	3.60	2.50	.00	.00	Reflective	13.94
5	837611.04	816261.25	3.60	2.50	.00	.00	Reflective	23.23
6	837610.12	816284.46	3.60	2.50	.00	.00		

Barrier 97: D4R1A Flyover barrier (2) Group:83

1	837556.81	816500.13	13.50	.80	.00	.00	Reflective	14.11
2	837563.00	816512.81	13.70	.80	.00	.00	Reflective	13.86
3	837569.81	816524.88	13.90	.80	.00	.00	Reflective	16.63
4	837577.00	816539.88	14.00	.80	.00	.00	Reflective	18.08
5	837585.19	816556.00	14.20	.80	.00	.00	Reflective	10.93
6	837590.00	816565.81	14.50	.80	.00	.00		

Barrier 98: D4B1B-1 Flyover barrier (1) Group:83

1	837568.38	816497.50	13.50	5.50	1.00	-45.00	Reflective	10.63
2	837572.31	816507.38	13.70	5.50	1.00	-45.00	Reflective	13.89
3	837577.81	816520.13	13.90	5.50	1.00	-45.00		

Barrier 99: D4B1B-2 Flyover barrier (1) Group:83

1	837577.81	816520.13	13.90	5.50	1.00	-45.00	Reflective	16.69
2	837585.00	816535.19	14.00	5.50	1.00	-45.00	Reflective	18.56
3	837593.13	816551.88	14.20	5.50	1.00	-45.00	Reflective	12.97
4	837598.63	816563.63	14.30	5.50	1.00	-45.00		

Barrier 100: D4B2A Flyover barrier (2) Group:82

1	837532.50	816502.38	12.50	.80	.00	.00	Reflective	16.18
2	837542.13	816515.38	12.80	.80	.00	.00	Reflective	18.71
3	837552.88	816530.69	13.00	.80	.00	.00	Reflective	16.06
4	837562.81	816543.31	13.50	.80	.00	.00	Reflective	15.22
5	837571.50	816555.81	14.00	.80	.00	.00	Reflective	10.56
6	837578.31	816563.88	14.20	.80	.00	.00	Reflective	9.84
7	837584.13	816571.81	14.50	.80	.00	.00		

Barrier 101: D4B2B Flyover barrier (1) Group:82

1	837538.63	816495.63	12.50	.80	.00	.00	Reflective	17.48
2	837548.31	816510.19	12.80	.80	.00	.00	Reflective	18.80
3	837559.38	816525.38	13.00	.80	.00	.00	Reflective	15.47
4	837567.88	816538.31	13.50	.80	.00	.00	Reflective	15.52
5	837576.63	816551.13	14.00	.80	.00	.00	Reflective	10.70
6	837582.88	816559.81	14.20	.80	.00	.00	Reflective	9.49
7	837588.69	816567.31	14.50	.80	.00	.00		

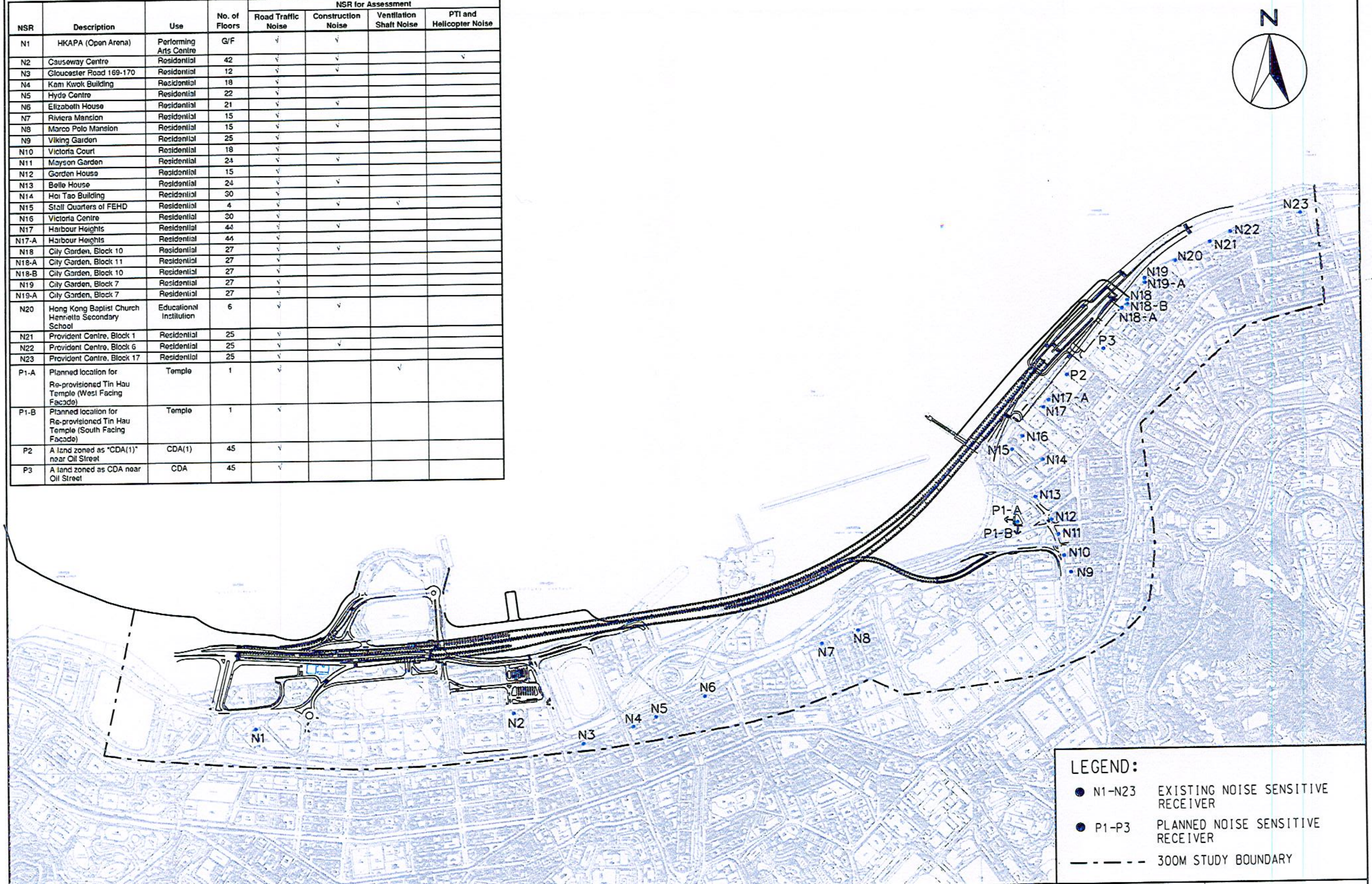
Barrier 102: D4B3A Flyover barrier (2) Group:84

1	837584.19	816571.88	14.50	.00	.00	.00	Reflective	7.64
2	837588.31	816578.31	14.50	.00	.00	.00	Reflective	10.12
3	837593.81	816586.81	14.50	.00	.00	.00	Reflective	2.17
4	837595.00	816588.63	14.50	.00	.00	.00		

Barrier 103: D4B3B Flyover barrier (1) Group:84

1	837598.42	816563.10	14.50	5.50	1.00	-45.00	Reflective	6.85
2	837601.31	816569.31	14.50	5.50	1.00	-45.00	Reflective	9.68
3	837605.31	816578.13	14.50	5.50	1.00	-45.00	Reflective	10.83
4	837610.40	816587.69	14.50	5.50	1.00	-45.00		

NSR	Description	Use	No. of Floors	NSR for Assessment			
				Road Traffic Noise	Construction Noise	Ventilation Shaft Noise	PTI and Helicopter Noise
N1	HKAPA (Open Arena)	Performing Arts Centre	G/F	√	√		
N2	Causeway Centre	Residential	42	√	√		√
N3	Gloucester Road 169-170	Residential	12	√	√		
N4	Kam Kwok Building	Residential	18	√			
N5	Hyde Centre	Residential	22	√			
N6	Elizabeth House	Residential	21	√	√		
N7	Riviera Mansion	Residential	15	√			
N8	Marco Polo Mansion	Residential	15	√	√		
N9	Viking Garden	Residential	25	√			
N10	Victoria Court	Residential	18	√			
N11	Mayson Garden	Residential	24	√	√		
N12	Gorden House	Residential	15	√			
N13	Belle House	Residential	24	√	√		
N14	Hoi Tao Building	Residential	30	√			
N15	Staff Quarters of FEHD	Residential	4	√	√	√	
N16	Victoria Centre	Residential	30	√			
N17	Harbour Heights	Residential	44	√	√		
N17-A	Harbour Heights	Residential	44	√			
N18	City Garden, Block 10	Residential	27	√	√		
N18-A	City Garden, Block 11	Residential	27	√			
N18-B	City Garden, Block 10	Residential	27	√			
N19	City Garden, Block 7	Residential	27	√			
N19-A	City Garden, Block 7	Residential	27	√			
N20	Hong Kong Baptist Church Henrietta Secondary School	Educational Institution	6	√	√		
N21	Provident Centre, Block 1	Residential	25	√			
N22	Provident Centre, Block 6	Residential	25	√	√		
N23	Provident Centre, Block 17	Residential	25	√			
P1-A	Planned location for Re-provisioned Tin Hau Temple (West Facing Facade)	Temple	1	√		√	
P1-B	Planned location for Re-provisioned Tin Hau Temple (South Facing Facade)	Temple	1	√			
P2	A land zoned as "CDA(1)" near Oil Street	CDA(1)	45	√			
P3	A land zoned as CDA near Oil Street	CDA	45	√			



MAUNSELL AECOM

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

LOCATIONS OF REPRESENTATIVE NOISE SENSITIVE RECEIVERS

FIGURE 4.8

SCALE 1:10000 [A3]

K:/A01604/DRAWING/REPORT/MAY07/FIGURE4.8.DGN

Barrier 104: D5B1A   Flyover barrier (2)   Group:84
1 837595.00 816588.63 14.50 .80 .00 .00 Reflective 22.08
2 837605.81 816607.88 14.50 .80 .00 .00 Reflective 30.11
3 837619.63 816634.63 14.20 .80 .00 .00 Reflective 33.40
4 837634.81 816664.38 14.00 .80 .00 .00 Reflective 34.30
5 837650.63 816694.81 13.80 .80 .00 .00 Reflective 28.23
6 837665.19 816719.00 13.80 .80 .00 .00 Reflective 33.71
7 837684.69 816746.50 13.50 .80 .00 .00 Reflective 41.08
8 837711.50 816777.63 13.50 .80 .00 .00 Reflective 46.71
9 837744.31 816810.88 13.00 .80 .00 .00 Reflective 39.92
10 837773.31 816838.31 12.80 .80 .00 .00 Reflective 46.81
11 837807.00 816870.81 12.50 .80 .00 .00 Reflective 33.82
12 837831.50 816894.13 12.20 .80 .00 .00 Reflective 28.35
13 837852.31 816913.38 12.10 .80 .00 .00 Reflective 24.79
14 837870.88 816929.81 11.90 .80 .00 .00 Reflective 21.65
15 837887.50 816943.69 11.80 .80 .00 .00 Reflective 23.70
16 837905.69 816958.88 11.70 .80 .00 .00 Reflective 12.56
17 837915.31 816966.95 11.70 .80 .00 .00

Barrier 105: D5B1B   Flyover barrier (1)   Group:84
1 837610.38 816587.69 14.50 5.50 1.00 -45.00 Reflective 16.73
2 837617.38 816602.88 14.40 5.50 1.00 -45.00 Reflective 28.59
3 837629.81 816628.63 14.30 5.50 1.00 -45.00 Reflective 33.12
4 837644.50 816658.31 14.20 5.50 1.00 -45.00 Reflective 34.36
5 837661.13 816688.38 13.80 5.50 1.00 -45.00 Reflective 27.13
6 837674.81 816711.81 13.60 5.50 1.00 -45.00 Reflective 32.77
7 837693.38 816738.81 13.50 5.50 1.00 -45.00 Reflective 41.12
8 837719.81 816770.31 13.20 5.50 1.00 -45.00 Reflective 45.19
9 837750.69 816803.31 13.00 5.50 1.00 -45.00 Reflective 39.95
10 837779.00 816831.50 12.80 5.50 1.00 -45.00 Reflective 47.22
11 837813.13 816864.13 12.50 5.50 1.00 -45.00 Reflective 33.05
12 837836.69 816887.31 12.20 5.50 1.00 -45.00 Reflective 29.38
13 837858.50 816907.00 12.10 5.50 1.00 -45.00 Reflective 22.34
14 837875.38 816921.63 11.90 5.50 1.00 -45.00 Reflective 21.89
15 837892.00 816935.88 11.80 5.50 1.00 -45.00 Reflective 23.83
16 837910.31 816951.13 11.70 5.50 1.00 -45.00 Reflective 9.56
17 837917.77 816957.11 11.70 5.50 1.00 -45.00

Barrier 106: D5B2B-1   Grade barrier
1 837930.59 816944.78 11.70 .80 .00 .00 Refle-Dual 16.23
2 837942.13 816956.19 12.50 .80 .00 .00 Refle-Dual 19.53
3 837956.13 816969.81 13.20 .80 .00 .00

Barrier 107: D5B2B-2-1   Grade barrier
1 837956.13 816969.81 13.20 .80 .00 .00 Refle-Dual 18.40
2 837969.63 816982.31 13.90 .80 .00 .00 Refle-Dual 15.08
3 837980.63 816992.63 14.10 .80 .00 .00 Refle-Dual 22.39
4 837997.69 817007.13 14.30 .80 .00 .00 Refle-Dual 18.57
5 838012.13 817018.81 14.50 .80 .00 .00 Refle-Dual 24.29
6 838031.38 817033.63 14.40 .80 .00 .00 Refle-Dual 25.32
7 838052.31 817047.88 14.60 .80 .00 .00 Refle-Dual 26.06
8 838074.13 817062.13 14.10 .80 .00 .00 Refle-Dual 21.27
9 838092.63 817072.63 14.00 .80 .00 .00 Refle-Dual 23.34
10 838113.38 817083.31 14.20 .80 .00 .00

Barrier 108: D5B2B-2-2-1   Grade barrier
1 838113.38 817083.31 14.20 .80 .00 .00 Reflective 27.78
2 838138.81 817094.50 14.00 .80 .00 .00

Barrier 109: D5B2B-2-2-2-1   Grade barrier
1 838138.81 817094.50 14.60 .80 .00 .00 Reflective 27.39
2 838164.38 817104.31 14.60 .80 .00 .00

Barrier 110: D5B2B-2-2-2-2   Grade barrier
1 838164.38 817104.31 14.60 .80 .00 .00 Reflective 26.57
2 838189.81 817112.00 14.60 .80 .00 .00 Reflective 34.85
3 838223.65 817120.32 14.60 .80 .00 .00

Barrier 111: D5B2C   Grade barrier
1 837947.98 816931.71 11.70 1.50 .00 .00 Refle-Dual 13.36
2 837956.74 816941.80 12.50 1.50 .00 .00 Refle-Dual 16.00
3 837967.34 816953.78 13.20 1.50 .00 .00 Refle-Dual 19.85
4 837981.19 816968.00 13.90 1.50 .00 .00 Refle-Dual .00
5 837981.19 816968.00 13.00 .80 .00 .00 Refle-Dual 17.92
6 837993.99 816980.54 14.10 .80 .00 .00 Refle-Dual 22.12
7 838010.52 816995.24 14.30 .80 .00 .00 Refle-Dual 18.05

8 838024.25 817006.95 14.50 .80 .00 .00 Refle-Dual 18.82
9 838039.19 817018.39 14.45 .80 .00 .00 Refle-Dual 16.90
10 838052.72 817028.51 14.40 .80 .00 .00 Refle-Dual 10.64
11 838061.40 817034.66 14.30 .80 .00 .00 Refle-Dual 29.37
12 838086.04 817050.64 14.20 .80 .00 .00 Refle-Dual 23.98
13 838106.97 817062.35 14.00 .80 .00 .00

Barrier 112: D5B3   Grade barrier
1 837813.69 816856.31 5.00 .00 .00 .00 Reflective 24.05
2 837796.19 816839.81 5.00 .00 .00 .00 Reflective 23.73
3 837779.31 816823.13 5.00 .00 .00 .00 Reflective 21.44
4 837763.81 816808.31 5.00 .00 .00 .00 Reflective 22.88
5 837747.38 816792.38 5.00 .00 .00 .00 Reflective 35.19
6 837722.19 816767.81 5.00 .00 .00 .00 Reflective 21.03
7 837707.13 816753.13 5.00 .00 .00 .00 Reflective 18.08
8 837694.62 816740.07 5.00 .00 .00 .00 Reflective 7.52
9 837689.58 816734.49 5.00 .00 .00 .00 Reflective 8.82
10 837683.60 816728.00 5.00 .00 .00 .00

Barrier 113: D5B5   Grade barrier
1 837706.40 816705.71 -6.20 8.00 34.00 -90.00 Refle-Dual 18.80
2 837719.38 816719.31 -4.00 8.00 34.00 -90.00 Refle-Dual 23.39
3 837736.13 816735.63 -3.00 8.00 34.00 -90.00 Refle-Dual 13.44
4 837745.63 816745.13 -2.00 8.00 34.00 -90.00 Refle-Dual 19.86
5 837760.31 816758.50 -1.00 8.00 34.00 -90.00 Refle-Dual 24.09
6 837777.50 816775.38 .00 8.00 34.00 -90.00 Refle-Dual 30.45
7 837799.31 816796.63 .50 8.00 34.00 -90.00 Refle-Dual 16.67
8 837811.38 816808.13 4.50 8.00 34.00 -90.00 Refle-Dual 27.57
9 837831.19 816827.31 2.00 8.00 34.00 -90.00

Barrier 114: B1a   Flyover barrier (2)   Group:21
1 837947.98 816931.71 11.70 1.50 .00 .00 Refle-Dual 20.75
2 837934.36 816916.05 11.10 1.50 .00 .00 Refle-Dual 20.31
3 837921.07 816900.69 10.50 1.50 .00 .00 Refle-Dual 20.79
4 837907.51 816884.93 10.20 1.50 .00 .00 Refle-Dual 14.86
5 837897.75 816873.72 10.30 1.50 .00 .00 Refle-Dual 26.22
6 837880.80 816853.72 10.70 1.50 .00 .00 Refle-Dual 21.20
7 837867.00 816837.62 11.30 1.50 .00 .00 Refle-Dual 21.56
8 837852.77 816821.42 12.00 1.50 .00 .00 Refle-Dual 20.79
9 837839.30 816805.59 12.70 1.50 .00 .00 Refle-Dual 16.26
10 837828.98 816793.02 13.40 1.50 .00 .00 Refle-Dual 18.19
11 837817.43 816778.97 14.00 1.50 .00 .00 Refle-Dual 15.52
12 837807.61 816766.95 14.70 1.50 .00 .00

Barrier 115: B1aa   Flyover barrier (2)   Group:21
1 837807.61 816766.95 14.70 1.50 .00 .00 Reflective 27.63
2 837789.89 816745.75 15.40 1.50 .00 .00 Reflective 14.62
3 837780.53 816734.52 16.00 1.50 .00 .00 Reflective 23.91
4 837765.25 816716.13 16.40 1.50 .00 .00 Reflective 56.27
5 837728.58 816673.45 16.40 1.50 .00 .00 Reflective 55.82
6 837692.14 816631.16 15.40 1.50 .00 .00 Reflective 37.46
7 837667.80 816602.69 15.20 1.50 .00 .00 Reflective 25.64
8 837652.04 816582.47 14.90 1.50 .00 .00 Reflective .00
9 837652.04 816582.47 14.90 .80 .00 .00 Reflective 23.64
10 837637.43 816563.89 14.80 .80 .00 .00 Reflective 24.90
11 837621.94 816544.39 14.60 .80 .00 .00 Reflective 12.94
12 837613.92 816534.23 14.60 .80 .00 .00

Barrier 116: B4a   Flyover barrier (2)   Group:18
1 837538.60 816495.63 12.50 .80 .00 .00 Reflective 14.26
2 837531.35 816483.35 11.80 .80 .00 .00 Reflective 11.51
3 837526.59 816472.87 10.00 .80 .00 .00 Reflective 16.72
4 837523.36 816456.46 8.00 .80 .00 .00 Reflective 6.93
5 837523.20 816449.53 7.10 .80 .00 .00 Reflective 10.86
6 837524.00 816438.70 6.10 .80 .00 .00 Reflective 11.98
7 837527.00 816427.10 5.50 .80 .00 .00 Reflective 11.36
8 837531.80 816416.80 5.30 .80 .00 .00 Reflective 12.32
9 837538.40 816406.40 5.00 .80 .00 .00 Reflective 12.97
10 837546.90 816396.60 4.80 .80 .00 .00 Reflective 12.96
11 837556.50 816387.90 4.50 .80 .00 .00 Reflective 24.25
12 837576.30 816373.90 4.30 .80 .00 .00 Reflective 25.66
13 837598.00 816360.20 4.00 .00 .00 .00

Barrier 117: B4b   Flyover barrier (1)   Group:18
1 837532.50 816502.38 12.50 .80 .00 .00 Reflective 19.94
2 837521.77 816485.57 11.80 .80 .00 .00 Reflective 16.72

```
 3 837516.06 816469.85  10.00  .80  .00   .00 Reflective  12.93
 4 837513.52 816457.17   8.00  .80  .00   .00 Reflective   6.38
 5 837513.20 816450.80   7.10  .80  .00   .00 Reflective  16.30
 6 837514.90 816434.59   6.10  .80  .00   .00 Reflective  15.27
 7 837519.53 816420.04   5.50  .80  .00   .00 Reflective  13.42
 8 837526.14 816408.36   5.30  .80  .00   .00 Reflective   7.91
 9 837530.11 816401.52   5.00  .80  .00   .00 Reflective  15.69
10 837542.50 816391.90   4.80  .80  .00   .00 Reflective  13.24
11 837552.30 816383.00   4.50  .80  .00   .00 Reflective  24.27
12 837572.20 816369.10   4.30  .80  .00   .00 Reflective  26.30
13 837594.40 816355.00   4.00  .00  .00   .00

Barrier 118: B5a          Flyover barrier (1)  Group:17
 1 837576.67 816453.45  11.70  .80  .00   .00 Reflective  13.48
 2 837574.80 816440.10  11.70  .80  .00   .00 Reflective  16.71
 3 837574.10 816423.40  10.50  .80  .00   .00 Reflective  16.05
 4 837576.30 816407.50   9.90  .80  .00   .00 Reflective  16.81
 5 837582.30 816391.80   9.20  .80  .00   .00 Reflective  19.12
 6 837593.50 816376.30   7.90  .80  .00   .00 Reflective  18.20
 7 837607.00 816364.10   5.70  .80  .00   .00

Barrier 119: B5b          Flyover barrier (2)  Group:17
 1 837570.20 816455.80  11.70  .80  .00   .00 Reflective  14.96
 2 837568.00 816441.00  11.70  .80  .00   .00 Reflective  18.01
 3 837567.40 816423.00  10.50  .80  .00   .00 Reflective  16.98
 4 837569.00 816406.10   9.90  .80  .00   .00 Reflective  18.57
 5 837575.50 816388.70   9.20  .80  .00   .00 Reflective  20.84
 6 837587.70 816371.80   7.90  .80  .00   .00 Reflective  20.81
 7 837603.10 816357.80   5.70  .80  .00   .00

Barrier 120: Bu11         Grade barrier
 1 837700.70 816464.31  89.20  .00  .00   .00 Reflective  45.49
 2 837664.10 816437.30  89.20  .00  .00   .00 Reflective  56.91
 3 837620.60 816474.00  89.20  .00  .00   .00 Reflective  21.26
 4 837634.00 816490.50  89.20  .00  .00   .00 Reflective  12.64
 5 837624.30 816498.60  89.20  .00  .00   .00 Reflective  22.23
 6 837638.50 816515.70  89.20  .00  .00   .00 Reflective  80.69
 7 837700.70 816464.30  89.20  .00  .00   .00

Barrier 121: Bu13         Grade barrier
 1 837786.16 816470.57  38.80  .00  .00   .00 Reflective  36.25
 2 837763.60 816442.20  38.80  .00  .00   .00 Reflective 154.25
 3 837644.90 816540.70  38.80  .00  .00   .00 Reflective  38.95
 4 837670.10 816570.40  38.80  .00  .00   .00 Refle-Dual 153.09
 5 837786.16 816470.57  38.80  .00  .00   .00

Barrier 122: IECER1A      Flyover barrier (1)  Group:19
 1 837366.41 816159.19   9.30  .80  .00   .00 Reflective  30.53
 2 837395.78 816167.53  10.00  .80  .00   .00 Reflective  19.39
 3 837413.64 816175.07  11.00  .80  .00   .00 Reflective  24.70
 4 837436.26 816184.99  12.00  .80  .00   .00 Reflective  26.14
 5 837458.88 816198.09  14.00  .80  .00   .00 Reflective  29.71
 6 837481.90 816216.87  14.00  .80  .00   .00 Reflective  22.19
 7 837496.98 816233.15  14.00  .80  .00   .00 Reflective  31.99
 8 837512.85 816260.93  14.50  .80  .00   .00 Reflective  27.64
 9 837522.78 816286.72  14.50  .80  .00   .00 Reflective  27.82
10 837528.99 816313.84  14.50  .80  .00   .00 Reflective  41.31
11 837534.95 816354.72  14.50  .80  .00   .00 Reflective  82.17
12 837538.38 816436.82  15.00  .80  .00   .00 Reflective  21.54
13 837542.09 816458.04  15.30  .80  .00   .00 Refle-Dual    .00
14 837542.09 816458.04  15.30  .80  .00   .00

Barrier 123: IECER1B      Flyover barrier (2)  Group:19
 1 837568.29 816451.30  15.00  .80  .00   .00 Reflective  29.67
 2 837561.94 816422.32  15.00  .80  .00   .00 Reflective  33.03
 3 837559.55 816389.38  14.50  .80  .00   .00 Reflective  55.21
 4 837557.17 816334.22  14.50  .80  .00   .00 Reflective  34.44
 5 837552.54 816300.09  14.50  .80  .00   .00 Reflective  22.91
 6 837546.99 816277.86  14.00  .80  .00   .00 Reflective  38.79
 7 837532.17 816242.01  13.00  .80  .00   .00 Reflective  39.27
 8 837509.81 816209.73  12.00  .80  .00   .00 Reflective  45.23
 9 837476.47 816179.17  11.00  .80  .00   .00 Reflective  57.32
10 837425.15 816153.64  10.00  .80  .00   .00 Reflective  59.03
11 837369.19 816134.85   9.00  .80  .00   .00

Barrier 124: IECER2A      Flyover barrier (2)  Group:33
```



```
 1 837542.10 816458.06  15.30  .80  .00   .00 Reflective  33.43
 2 837552.24 816489.92  15.30  .80  .00   .00 Refle-Dual  11.18
 3 837556.80 816500.13  13.50  .80  .00   .00

Barrier 125: IECER2B-1    Flyover barrier (1)  Group:33
 1 837576.67 816453.45  11.70  .80  .00   .00 Reflective   7.76
 2 837578.35 816461.03  12.90  .80  .00   .00 Reflective  17.73
 3 837583.15 816478.10  12.90  .80  .00   .00 Reflective  12.01
 4 837587.28 816489.38  13.80  .80  .00   .00

Barrier 126: IECER2B-2    Flyover barrier (1)  Group:32
 1 837587.28 816489.38  13.80  .80  .00   .00 Reflective   6.15
 2 837589.90 816494.94  14.10  .80  .00   .00 Reflective  15.44
 3 837597.13 816508.58  14.30  .80  .00   .00 Reflective  14.76
 4 837604.39 816521.43  14.60  .80  .00   .00 Reflective  15.96
 5 837613.92 816534.23  14.60  .80  .00   .00

Barrier 127: IECCDD       Flyover barrier (1)  Group:21
 1 837603.49 816545.96  14.60  .80  .00   .00 Reflective  90.05
 2 837662.23 816614.22  15.20  .80  .00   .00 Reflective  66.42
 3 837705.49 816664.62  15.00  .80  .00   .00 Reflective  44.28
 4 837733.97 816698.52  15.00  .80  .00   .00

Barrier 128: IECCDDA      Flyover barrier (1)  Group:21
 1 837733.97 816698.52  15.00  .80  .00   .00 Reflective  33.60
 2 837756.10 816723.80  16.40  .80  .00   .00 Reflective  23.98
 3 837771.72 816742.00  16.00  .80  .00   .00 Reflective  14.46
 4 837781.25 816752.88  15.40  .80  .00   .00 Reflective  27.69
 5 837799.44 816773.76  14.70  .80  .00   .00 Reflective  15.61
 6 837809.70 816785.52  14.00  .80  .00   .00 Reflective  18.05
 7 837821.50 816799.18  13.40  .80  .00   .00 Reflective  16.56
 8 837832.36 816811.68  12.70  .80  .00   .00 Reflective  20.43
 9 837845.64 816827.21  12.00  .80  .00   .00 Refle-Dual  22.09
10 837859.97 816844.02  11.30  .80  .00   .00 Refle-Dual  20.92
11 837873.51 816859.97  10.70  .80  .00   .00 Refle-Dual  26.45
12 837890.76 816880.02  10.30  .80  .00   .00 Refle-Dual  12.96
13 837899.17 816889.88  10.20  .80  .00   .00

Barrier 129: d6v1         Grade barrier
 1 837683.63 816728.03   5.00  .00  .00   .00 Reflective  14.33
 2 837693.57 816717.71   5.00  .00  .00   .00 Reflective  17.59
 3 837706.27 816705.54   5.00  .00  .00   .00

Barrier 130: IECB1-1      Grade barrier
 1 837930.59 816944.78  11.70  .80  .00   .00 Refle-Dual  11.39
 2 837921.89 816937.43  12.50  .80  .00   .00 Refle-Dual  10.77
 3 837913.95 816930.16  12.40  .80  .00   .00

Barrier 131: IECB1-2      Grade barrier
 1 837913.95 816930.16  12.40  .80  .00   .00 Reflective  11.92
 2 837905.04 816922.24  12.40  .80  .00   .00 Reflective  25.68
 3 837886.92 816904.05   9.00  .80  .00   .00 Reflective  21.47
 4 837871.70 816888.90   8.00  .80  .00   .00 Reflective  28.96
 5 837851.22 816868.42   3.00  .80  .00   .00 Reflective  29.53
 6 837830.00 816847.89   4.00  .80  .00   .00 Reflective  14.03
 7 837820.08 816837.97   2.00  .80  .00   .00

Barrier 132: IECB2        Grade barrier
 1 837820.08 816837.97   7.40  .80  .00   .00 Reflective  28.76
 2 837799.29 816818.10   4.50  .80  .00   .00 Reflective  15.16
 3 837788.34 816807.62    .50  .80  .00   .00 Reflective  30.99
 4 837765.95 816786.19    .00  .80  .00   .00 Reflective  22.90
 5 837749.76 816770.00  -1.00  .80  .00   .00 Reflective  20.54
 6 837735.00 816755.71  -2.00  .80  .00   .00 Reflective  12.82
 7 837725.47 816747.14  -3.00  .80  .00   .00 Reflective  23.24
 8 837708.80 816730.94  -4.00  .80  .00   .00 Reflective  20.19
 9 837694.52 816716.66   6.20  .80  .00   .00

Barrier 133: IECB3-1      Grade barrier
 1 837831.20 816827.31   2.40  8.00  34.00  -90.00 Refle-Dual  16.97
 2 837843.08 816839.43   4.00  8.00  34.00  -90.00 Refle-Dual  21.52
 3 837858.69 816854.24   3.00  8.00  34.00  -90.00

Barrier 134: IECB3-2      Grade barrier
 1 837858.69 816854.24   3.00  8.00  34.00  -90.00 Refle-Dual  36.75
 2 837885.11 816879.78   8.00  8.00  34.00  -90.00 Refle-Dual  16.85
```

```
 3 837897.35 816891.36   9.20  8.00 34.00 -90.00

Barrier 135: ABULD1        Grade barrier
 1 837776.91 816760.61  4.50  5.00  .00   .00 Reflective  23.99
 2 837795.19 816745.08  4.50  5.00  .00   .00 Reflective  13.65
 3 837803.91 816755.58  4.50  5.00  .00   .00 Reflective  22.46
 4 837786.88 816770.23  4.50  5.00  .00   .00 Reflective  13.85
 5 837776.91 816760.61  4.50  5.00  .00   .00

Barrier 136: ABULD2        Grade barrier
 1 837786.88 816770.28  4.50  3.00  .00   .00 Reflective  73.25
 2 837839.25 816821.49  4.50  3.00  .00   .00 Reflective  16.19
 3 837851.52 816810.92  4.50  3.00  .00   .00 Reflective  73.00
 4 837803.91 816755.58  4.50  3.00  .00   .00

Barrier 137: ACARP1        Grade barrier
 1 837852.52 816834.47  4.50  2.50  .00   .00 Reflective  23.00
 2 837867.52 816851.90  4.50  2.50  .00   .00 Reflective   8.61
 3 837874.05 816846.29  4.50  2.50  .00   .00 Reflective  23.00
 4 837859.05 816828.85  4.50  2.50  .00   .00 Reflective   8.62
 5 837852.52 816834.47  4.50  2.50  .00   .00

Barrier 138: ACARP2        Grade barrier
 1 837871.76 816856.83  4.50  2.50  .00   .00 Reflective  25.00
 2 837888.07 816875.78  4.50  2.50  .00   .00 Reflective   8.61
 3 837894.60 816870.17  4.50  2.50  .00   .00 Reflective  25.01
 4 837878.29 816851.21  4.50  2.50  .00   .00 Reflective   8.57
 5 837871.80 816856.81  4.50  2.50  .00   .00

Barrier 139: NPB1          Grade barrier
 1 838106.97 817062.35 14.00   .80  .00   .00 Reflective  29.59
 2 838133.58 817075.29 13.80   .80  .00   .00 Reflective  15.73
 3 838148.09 817081.37 13.70   .80  .00   .00 Reflective  18.62
 4 838165.75 817087.27 13.50   .80  .00   .00 Reflective  18.99
 5 838183.89 817092.90 13.40   .80  .00   .00 Reflective  30.12
 6 838213.25 817099.61 13.20   .80  .00   .00 Reflective  64.82
 7 838277.23 817110.01 12.00   .80  .00   .00

Barrier 140: D5B2A         Grade barrier
 1 837915.31 816966.95 11.70   .80  .00   .00 Reflective   7.47
 2 837921.01 816971.78 12.50   .80  .00   .00 Reflective  27.81
 3 837942.34 816989.63 13.20   .80  .00   .00 Reflective  16.73
 4 837955.14 817000.40 13.90   .80  .00   .00 Reflective  16.41
 5 837967.73 817010.93 14.10   .80  .00   .00 Reflective  22.42
 6 837985.05 817025.16 14.30   .80  .00   .00 Reflective  19.01
 7 837999.90 817037.03 14.50   .80  .00   .00 Reflective  25.42
 8 838020.38 817052.09 14.40   .80  .00   .00 Reflective  26.47
 9 838042.42 817066.75 14.80   .80  .00   .00 Reflective  24.49
10 838063.36 817079.44 14.10   .80  .00   .00 Reflective  23.90
11 838084.23 817091.08 14.00   .80  .00   .00 Reflective  14.17
12 838096.88 817097.47 14.20   .80  .00   .00 Reflective  38.54
13 838132.63 817111.88 14.00   .80  .00   .00 Reflective  28.47
14 838159.38 817121.63 13.80   .80  .00   .00 Reflective  29.11
15 838187.44 817129.37 13.60   .80  .00   .00 Reflective  28.92
16 838215.52 817136.31 13.50   .80  .00   .00 Refle-Dual  11.39
17 838226.70 817138.51 13.40   .80  .00   .00 Refle-Dual  10.39
18 838236.90 817140.50 13.20   .80  .00   .00

Barrier 141: CDB1          Flyover barrier (2)  Group:32
 1 837603.49 816545.96 14.60   .80  .00   .00 Reflective  19.23
 2 837592.14 816530.44 14.60   .80  .00   .00 Reflective  13.43
 3 837584.32 816519.52 14.30   .80  .00   .00 Reflective  18.44
 4 837574.62 816503.84 14.10   .80  .00   .00 Reflective  10.04
 5 837569.73 816495.07 13.50   .80  .00   .00

Barrier 142: BUDA1         Grade barrier
 1 837988.48 816947.70  4.50 71.55  .00   .00 Reflective  16.29
 2 837977.59 816935.59  4.50 71.55  .00   .00 Reflective   6.03
 3 837982.27 816931.79  4.50 71.55  .00   .00 Reflective  17.37
 4 837971.08 816918.51  4.50 71.55  .00   .00 Reflective   5.97
 5 837966.38 816922.19  4.50 71.55  .00   .00 Reflective  60.86
 6 837927.66 816875.23  4.50 71.55  .00   .00 Reflective   5.47
 7 837931.65 816871.49  4.50 71.55  .00   .00 Reflective  11.66
 8 837924.77 816862.07  4.50 71.55  .00   .00 Reflective   6.19
 9 837919.94 816865.94  4.50 71.55  .00   .00 Reflective  26.90
10 837902.53 816845.44  4.50 71.55  .00   .00 Reflective  31.30
```



```
11 837926.71 816825.57  4.50 71.55  .00   .00 Reflective 132.83
12 838012.53 816926.95  4.50 71.55  .00   .00 Reflective  44.68
13 838043.65 816959.01  4.50 71.55  .00   .00 Reflective  19.44
14 838028.56 816971.27  4.50 71.55  .00   .00 Reflective  16.83
15 838012.06 816967.97  4.50 71.55  .00   .00 Reflective  11.72
16 838004.51 816959.01  4.50 71.55  .00   .00 Reflective  19.62
17 837988.48 816947.70  4.50 71.55  .00   .00

Receiver Configuration :

Receiver  1: N1

East      North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
                     mPD      m  Ht, m  (1)   (2)    (3)      Bearing
835477.22 815718.61  8.00   1.20  2.75  0 x 0  0 x 0  0 x 0 335.78  43.21


Receiver Configuration :

Receiver  2: N2

East      North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
                     mPD      m  Ht, m  (1)   (2)    (3)      Bearing
836202.60 815754.40 24.00   1.20  2.80  4 x 1  5 x 7  2 x 1 266.07  91.79


Receiver Configuration :

Receiver  3: N3

East      North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
                     mPD      m  Ht, m  (1)   (2)    (3)      Bearing
836396.60 815666.30  7.70   1.20  2.80  4 x 1  5 x 1  2 x 1 258.56  67.15


Receiver Configuration :

Receiver  4: N4

East      North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
                     mPD      m  Ht, m  (1)   (2)    (3)      Bearing
836534.60 815712.90  7.70   1.20  2.80  4 x 1  5 x 2  3 x 1 246.55  65.17


Receiver Configuration :

Receiver  5: N5

East      North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
                     mPD      m  Ht, m  (1)   (2)    (3)      Bearing
836597.26 815738.30  7.70   1.20  2.80  4 x 1  5 x 3  2 x 1 247.80  64.53


Receiver Configuration :

Receiver  6: N6

East      North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
                     mPD      m  Ht, m  (1)   (2)    (3)      Bearing
836738.00 815794.60  7.70   1.20  2.80  4 x 1  5 x 3  1 x 1 247.13  58.07


Receiver Configuration :

Receiver  7: N7

East      North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
                     mPD      m  Ht, m  (1)   (2)    (3)      Bearing
837064.30 815937.50  8.30   1.20  2.80  4 x 1  5 x 2  0 x 0 258.86  71.81


Receiver Configuration :

Receiver  8: N8

East      North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
```

mPD m Ht, m (1) (2) (3) Bearing
837167.85 815973.20 8.30 1.20 2.80 4 x 1 5 x 2 0 x 0 252.90 69.88

Receiver Configuration :

Receiver 9: N9

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837746.79 816098.64 8.00 1.20 2.80 4 x 1 5 x 4 0 x 0 175.99 350.01

Receiver Configuration :

Receiver 10: N10

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837743.70 816171.10 8.00 1.20 2.80 4 x 1 5 x 2 3 x 1 176.42 342.58

Receiver Configuration :

Receiver 11: N11

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837728.00 816230.30 8.00 1.20 2.80 4 x 1 5 x 3 4 x 1 167.74 330.32

Receiver Configuration :

Receiver 12: N12

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837708.80 816271.20 8.00 1.20 2.80 4 x 1 5 x 2 0 x 0 159.11 326.36

Receiver Configuration :

Receiver 13: N13

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837664.40 816335.90 7.60 1.20 2.80 4 x 1 5 x 3 4 x 1 185.72 20.06

Receiver Configuration :

Receiver 14: N14

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837685.50 816440.90 8.00 1.20 2.80 4 x 1 5 x 5 0 x 0 233.13 57.15

Receiver Configuration :

Receiver 15: N15

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837601.55 816469.62 7.00 1.20 2.75 1 x 3 0 x 0 0 x 0 190.36 324.03

Receiver Configuration :

Receiver 16: N16

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837630.02 816507.95 8.00 1.20 2.80 4 x 1 5 x 5 0 x 0 215.18 32.98

Receiver Configuration :

Receiver 17: N17

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837688.00 816586.90 8.30 1.20 2.80 4 x 1 5 x 7 4 x 1 171.78 358.82

Receiver Configuration :

Receiver 18: N17-A

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837703.57 816607.18 8.30 1.20 2.80 4 x 1 5 x 7 4 x 1 258.07 90.00

Receiver Configuration :

Receiver 19: N18

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837929.34 816879.65 12.52 1.20 2.65 4 x 1 5 x 4 2 x 1 219.22 40.41

Receiver Configuration :

Receiver 20: N18-A

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837909.84 816855.99 12.47 1.20 2.65 4 x 1 5 x 4 2 x 1 217.78 39.97

Receiver Configuration :

Receiver 21: N18-B

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837928.13 816869.17 12.52 1.20 2.65 4 x 1 5 x 4 2 x 1 249.84 351.41

Receiver Configuration :

Receiver 22: N19

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837979.69 816939.73 12.55 1.20 2.65 4 x 1 5 x 4 2 x 1 219.11 39.53

Receiver Configuration :

Receiver 23: 19-A

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
837978.88 816929.81 12.55 1.20 2.65 4 x 1 5 x 4 2 x 1 239.91 346.61

Receiver Configuration :

Receiver 24: N20

East North Base Ht Storey No. of Storeys Theta1 Theta2
mPD m Ht, m (1) (2) (3) Bearing
838064.05 816987.48 4.00 1.20 3.00 1 x 7 0 x 0 0 x 0 251.02 62.50

Receiver Configuration :

Receiver 25: N21

```
East       North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
                 mPD     m  Ht, m  (1)     (2)    (3)       Bearing
838161.52  817039.65   7.00    1.20   2.80   4 x 1   5 x 4   0 x 0  249.56    58.12
```

Receiver Configuration :

Receiver 26: N22

```
East       North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
                 mPD     m  Ht, m  (1)     (2)    (3)       Bearing
838219.20  817066.77   7.00    1.20   2.80   4 x 1   5 x 4   0 x 0  246.19    64.50
```

Receiver Configuration :

Receiver 27: N23

```
East       North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
                 mPD     m  Ht, m  (1)     (2)    (3)       Bearing
838413.91  817116.53   8.00    1.20   2.80   4 x 1   5 x 4   0 x 0  266.94    71.37
```

Receiver Configuration :

Receiver 28: P1- A

```
East       North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
                 mPD     m  Ht, m  (1)     (2)    (3)       Bearing
837617.79  816271.84   3.60    1.20   2.75   0 x 0   0 x 0   0 x 0  176.37   357.44
```

Receiver Configuration :

Receiver 29: P1- B

```
East       North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
                 mPD     m  Ht, m  (1)     (2)    (3)       Bearing
837617.79  816271.84   3.60    1.20   2.75   0 x 0   0 x 0   0 x 0   91.77   268.90
```

Receiver Configuration :

Receiver 30: P2

```
East       North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
                 mPD     m  Ht, m  (1)     (2)    (3)       Bearing
837756.71  816675.32   7.00    1.20   3.00   4 x 1   5 x 8   0 x 0  221.63    39.81
```

Receiver Configuration :

Receiver 31: P3

```
East       North      Base    Ht  Storey     No. of Storeys     Theta1  Theta2
                 mPD     m  Ht, m  (1)     (2)    (3)       Bearing
837865.41  816750.12   7.50    1.20   2.75   4 x 1   5 x 8   0 x 0  217.58    37.96
```

Receiver Configuration :

Receiver 1: N2

East	North	Base mPD	Ht m	Storey Ht, m	No. of Storeys (1)	(2)	(3)	Theta1 Bearing	Theta2
836202.60	815754.40	24.00	1.20	2.80	20 x 1	21 x 1	0 x 0	266.07	91.79

Receiver	Level	Easting	Northing	Height	Theta1	Theta2
N2	001	836202.60	815754.40	25.20	266.07	91.79

Road	Cat	Seg	VPC	GC	RSC	BNL	DC	AC	BC	OFC	SGC	LTC	FAC	CNL
D1R6	N	5	2.20	.00	-1.00	77.62	-10.59	-22.35	-30.00	.00	.00	.00	2.50	17.18
		6	2.20	.00	-1.00	77.62	-11.27	-21.83	-30.00	.00	.00	.00	2.50	17.01
D2R1	E	1	1.00	.00	-1.00	70.71	-8.84	-21.74	-4.84	.00	.00	.00	2.50	37.78
		2	1.00	.00	-1.00	70.71	-10.22	-18.23	-6.92	.00	.00	.00	2.50	37.84
		3	1.00	.00	-1.00	70.71	-9.72	-15.09	-9.94	.00	.00	.00	2.50	38.46
		4	1.00	.00	-1.00	70.71	-9.73	-13.19	-2.80	.00	.00	.00	2.50	47.48
		5	1.00	.00	-1.00	70.71	-9.72	-13.70	-2.75	.00	.00	.00	2.50	47.04
D2R2	E	1	.62	.00	-1.00	71.93	-10.34	-14.61	-4.81	.00	.00	.00	2.50	44.67
		2	.62	.00	-1.00	71.93	-10.26	-10.73	-22.93	.00	.00	.00	2.50	30.51
		3	.62	.00	-1.00	71.93	-10.26	-11.20	-24.66	.00	.00	.00	2.50	28.31
		4	.62	.00	-1.00	71.93	-10.23	-11.43	-3.20	.00	.00	.00	2.50	49.57
		5	.62	.00	-1.00	71.93	-10.04	-13.10	-2.86	.00	.00	.00	2.50	48.43
		6	.62	.00	-1.00	71.93	-10.12	-17.64	-7.84	.00	.00	.00	2.50	38.83
		7	.62	.00	-1.00	71.93	-10.35	-18.36	-30.00	.00	.00	.00	2.50	15.71
		8	.62	.00	-1.00	71.93	-9.35	-14.82	-30.00	.00	.00	.00	2.50	20.26
		9	.62	.93	-1.00	72.86	-9.19	-16.19	-30.00	.00	.00	.00	2.50	19.98
		10	.62	.00	-1.00	71.93	-9.26	-19.03	-30.00	.00	.00	.00	2.50	16.13
D2R3	N	1	-.01	.00	-1.00	72.45	-9.17	-20.54	-30.00	.00	.00	.00	2.50	15.24
		2	-.01	.00	-1.00	72.45	-9.88	-18.28	-30.00	.00	.00	.00	2.50	16.79
		3	-.01	.00	-1.00	72.45	-10.63	-19.88	-30.00	.00	.00	.00	2.50	14.44
D2R5	N	4	1.00	.00	-1.00	72.66	-11.20	-18.61	-30.00	.00	.00	.00	2.50	15.34
		5	1.00	.00	-1.00	72.66	-11.16	-20.74	-30.00	.00	.00	.00	2.50	13.25
		6	1.00	.00	-1.00	72.66	-11.37	-19.12	-30.00	.00	.00	.00	2.50	14.67
D2R8	N	1	2.64	.68	-1.00	70.75	-11.40	-19.53	-30.00	.00	.00	.00	2.50	12.32
		2	2.64	.39	-1.00	70.47	-11.62	-17.41	-30.00	.00	.00	.00	2.50	13.94
		6	2.64	.00	-1.00	70.07	-10.46	-20.44	-30.00	.00	.00	.00	2.50	11.66
		7	2.64	.00	-1.00	70.07	-10.96	-16.88	-30.00	.00	.00	.00	2.50	14.73
D2R9	E	1	2.25	.00	-1.00	74.86	-8.89	-19.17	-30.00	.00	.00	.00	2.50	19.29
		2	2.25	.00	-1.00	74.86	-9.71	-14.97	-30.00	.00	.00	.00	2.50	22.68
		3	2.25	.00	-1.00	74.86	-9.99	-14.54	-16.03	.00	.00	.00	2.50	36.80
		4	2.25	.00	-1.00	74.86	-10.27	-14.09	-2.49	.00	.00	.00	2.50	50.52
		5	2.25	.00	-1.00	74.86	-10.47	-13.79	-2.63	.00	.00	.00	2.50	50.47
		6	2.25	.00	-1.00	74.86	-10.61	-12.29	-4.28	.00	.00	.00	2.50	50.18
		7	2.25	.00	-1.00	74.86	-10.62	-10.15	-24.08	.00	.00	.00	2.50	32.50
		8	2.25	.00	-1.00	74.86	-10.60	-12.05	-16.79	.00	.00	.00	2.50	37.93
		9	2.25	.00	-1.00	74.86	-10.43	-13.73	-2.56	.00	.00	.00	2.50	50.64
		10	2.25	.00	-1.00	74.86	-10.18	-13.59	-2.37	.00	.00	.00	2.50	51.21
		11	2.25	.00	-1.00	74.86	-10.15	-13.75	-4.33	.00	.00	.00	2.50	49.13
		12	2.25	.00	-1.00	74.86	-9.74	-17.78	-6.96	.00	.00	.00	2.50	42.88
		13	2.25	.00	-1.00	74.86	-9.87	-21.62	-5.00	.00	.00	.00	2.50	40.87
D2R10	N	2	-.50	.00	-1.00	72.84	-12.20	-21.78	-30.00	.00	.00	.00	2.50	11.36
		3	-.50	.00	-1.00	72.84	-12.10	-19.62	-30.00	.00	.00	.00	2.50	13.62

		4	-.50	.00	-1.00	72.84	-12.14	-20.36	-30.00	.00	.00	.00	2.50	12.84
D2R11	N	9	.21	.94	-1.00	74.08	-11.37	-20.94	-30.00	.00	.00	.00	2.50	14.28
		10	.21	1.24	-1.00	74.38	-12.92	-20.95	-30.00	.00	.00	.00	2.50	13.01
D2R19	E	2	2.51	.00	-1.00	77.17	-11.49	-18.51	-.99	.00	.00	.00	2.50	48.68
		3	2.51	.00	-1.00	77.17	-11.69	-16.24	-14.98	.00	.00	.00	2.50	36.76
		4	2.51	.00	-1.00	77.17	-10.92	-18.76	-30.00	.00	.00	.00	2.50	19.99
		5	2.51	.00	-1.00	77.17	-10.57	-19.04	-30.00	.00	.00	.00	2.50	20.06
		6	2.51	.00	-1.00	77.17	-11.49	-18.85	-30.00	.00	.00	.00	2.50	19.33
		7	2.51	.00	-1.00	77.17	-11.14	-17.91	-30.00	.00	.00	.00	2.50	20.61
D2R20	E	1	.62	.00	-1.00	69.04	-11.81	-16.30	-30.00	.00	.00	.00	2.50	13.43
		2	.62	.00	-1.00	69.04	-11.91	-16.54	-30.00	.42	.00	.00	2.50	13.51
D2R21	E	1	-.01	.00	-1.00	70.80	-11.81	-18.66	-30.00	1.50	.00	.00	2.50	14.33
		2	-.01	.00	-1.00	70.80	-11.89	-17.57	-30.00	1.50	.00	.00	2.50	15.34
		3	-.01	.00	-1.00	70.80	-11.78	-18.80	-9.76	1.50	.00	.00	2.50	34.45
		4	-.01	.00	-1.00	70.80	-10.98	-21.94	-.84	1.50	.00	.00	2.50	41.04
D2R22	E	1	3.11	.00	-1.00	69.52	-11.72	-18.32	-30.00	.00	.00	.00	2.50	11.99
		2	3.11	.00	-1.00	69.52	-11.77	-17.25	-30.00	.00	.00	.00	2.50	13.00
D2R23	E	3	1.67	.00	-1.00	69.52	-9.84	-20.32	-30.00	.00	.00	.00	2.50	11.86
		4	1.67	.00	-1.00	69.52	-9.78	-18.52	-30.00	.00	.00	.00	2.50	13.72
D2R28	N	5	1.82	.00	-1.00	62.94	-10.23	-20.52	-30.00	.00	.00	.00	2.50	4.68
		6	1.82	.00	-1.00	62.94	-10.13	-20.95	-30.00	.00	.00	.00	2.50	4.36
		7	1.82	.00	-1.00	62.94	-11.99	-20.19	-30.00	.00	.00	.00	2.50	3.26
		8	1.82	.00	-1.00	62.94	-12.66	-19.53	-30.00	.00	.00	.00	2.50	3.24
D2R29	E	1	1.67	.00	-1.00	73.18	-10.94	-16.42	-30.00	.00	.00	.00	2.50	18.32
		2	1.67	.00	-1.00	73.18	-11.56	-16.82	-30.00	.00	.00	.00	2.50	17.30
D2R31	E	1	3.11	.00	-1.00	69.39	-11.73	-20.44	-30.00	.00	.00	.00	2.50	9.72
		2	3.11	.00	-1.00	69.39	-11.70	-21.22	-30.00	.00	.00	.00	2.50	8.97
D3R1	E	1	3.22	.00	-1.00	76.77	-9.97	-20.50	-4.41	.00	.00	.00	2.50	44.39
		2	3.22	.67	-1.00	77.44	-10.78	-17.26	-2.44	.00	.00	.00	2.50	49.46
D3R2	E	1	3.22	.00	-1.00	76.77	-12.54	-21.49	-2.29	.00	.00	.00	2.50	42.96
GLw5-2	E	2	4.10	.00	-1.00	82.36	-9.77	-21.61	-3.90	.00	.00	.00	2.50	49.59
CHT1	E	5	4.82	.00	-1.00	81.70	-12.94	-22.17	-4.41	.00	.00	.00	2.50	44.67
TOR1	E	1	3.44	.00	-1.00	74.65	-8.87	-7.25	-8.17	1.50	.00	.00	2.50	54.35
		2	3.44	.00	-1.00	74.65	-8.86	-9.67	-4.28	.19	.00	.00	2.50	54.53
CHT5	E	4	2.39	.00	-1.00	74.46	-11.82	-22.44	-3.52	.00	.00	.00	2.50	39.19
GLe10	E	1	3.69	.00	-1.00	78.64	-12.58	-16.11	-5.29	.00	.00	.00	2.50	47.16
		2	3.69	.00	-1.00	78.64	-12.69	-16.68	-5.64	.00	.00	.00	2.50	46.14
		3	3.69	.00	-1.00	78.64	-12.41	-16.79	-4.84	.00	.00	.00	2.50	47.11
CHT7	E	1	2.45	.67	-1.00	79.48	-11.41	-20.47	-4.66	.00	.00	.00	2.50	45.45
		2	2.45	.64	-1.00	79.45	-10.84	-21.30	-4.43	.00	.00	.00	2.50	45.38
CHT9	E	4	4.34	.00	-1.00	76.68	-12.52	-21.29	-3.56	.00	.00	.00	2.50	41.82
		5	4.34	.00	-1.00	76.68	-12.16	-20.20	-3.71	.00	.00	.00	2.50	43.12
MAR2	E	8	3.22	.00	-1.00	76.25	-12.93	-17.44	-4.59	.00	.00	.00	2.50	43.79
		9	3.22	.00	-1.00	76.25	-12.91	-15.80	-4.63	.00	.00	.00	2.50	45.42
		10	3.22	3.94	-1.00	80.19	-12.94	-19.15	-5.27	.00	.00	.00	2.50	45.33
		11	3.22	3.86	-1.00	80.11	-12.94	-18.99	-8.28	.00	.00	.00	2.50	42.40
		12	3.22	3.90	-1.00	80.15	-12.95	-18.66	-8.50	.00	.00	.00	2.50	42.54
		13	3.22	1.42	-1.00	77.67	-12.95	-14.21	-5.05	.00	.00	.00	2.50	47.96
		14	3.22	.29	-1.00	76.54	-12.95	-16.03	-5.01	.00	.00	.00	2.50	45.06
MAR3-1	E	1	-2.80	.30	-1.00	38.70	-13.04	-19.34	-5.10	.00	.00	.00	2.50	3.72
		2	-2.80	.28	-1.00	38.68	-12.91	-19.12	-5.11	.00	.00	.00	2.50	4.04
		3	-2.80	.15	-1.00	38.55	-12.84	-16.29	-5.19	.00	.00	.00	2.50	6.72
		4	-2.80	.15	-1.00	38.55	-12.84	-16.17	-5.31	.00	.00	.00	2.50	6.73
		5	-2.80	.15	-1.00	38.55	-12.84	-16.13	-5.43	.00	.00	.00	2.50	6.65
		6	-2.80	.20	-1.00	38.60	-12.84	-14.33	-5.15	.00	.00	.00	2.50	8.77
MAR3-2	E	1	3.22	.00	-1.00	76.25	-12.85	-9.89	-4.83	.00	.00	.00	2.50	51.18

TOR2	E	15	1.97	.00	-1.00	74.98	-8.93	-12.41	-14.61	1.50	.00	.00	2.50	43.03
		16	1.97	.00	-1.00	74.98	-8.91	-13.70	-11.04	1.50	.00	.00	2.50	45.32
TOR3	E	1	1.82	.00	-1.00	66.58	-9.24	-10.17	-11.56	1.50	.00	.00	2.50	39.61
		2	1.82	.00	-1.00	66.58	-9.23	-22.14	-12.85	1.50	.00	.00	2.50	26.36
TOR4	E	3	5.83	.00	-1.00	70.28	-8.59	-14.72	-20.76	.00	.00	.00	2.50	28.71
		4	5.83	.00	-1.00	70.28	-8.56	-14.63	-15.51	.00	.00	.00	2.50	34.07
GLe11	E	1	3.19	.00	-1.00	80.64	-11.14	-18.62	-5.06	.00	.00	.00	2.50	48.32
		2	3.19	.00	-1.00	80.64	-12.03	-18.33	-4.97	.00	.00	.00	2.50	47.82
GLe12	E	7	3.19	.00	-1.00	80.64	-10.73	-21.23	-5.57	.00	.00	.00	2.50	45.60
HAR1	E	1	1.37	.00	-1.00	76.59	-2.63	-19.83	-13.14	.00	.00	.00	2.50	43.49
		3	1.37	.08	-1.00	76.66	-2.64	-16.92	-16.28	.28	.00	.00	2.50	43.60
		4	1.37	.00	-1.00	76.59	-2.66	-14.58	-17.81	1.50	.00	.00	2.50	45.53
		5	1.37	.00	-1.00	76.59	-2.57	-16.05	-17.73	1.50	.00	.00	2.50	44.24
		6	1.37	.00	-1.00	76.59	-2.66	-13.99	-17.92	1.50	.00	.00	2.50	46.01
		7	1.37	.00	-1.00	76.59	-2.66	-13.52	-17.86	1.50	.00	.00	2.50	46.55
		8	1.37	.00	-1.00	76.59	-2.66	-2.41	-17.81	.05	.00	.00	2.50	56.27
		9	1.37	.00	-1.00	76.59	-2.66	-12.24	-17.77	.00	.00	.00	2.50	46.42
HAR2	E	1	1.35	.00	-1.00	76.57	-2.65	-9.32	-16.94	1.07	.00	.00	2.50	51.23
CRE3-1	E	1	1.97	.00	-1.00	75.19	-10.86	-22.54	-3.30	.00	.00	.00	2.50	40.99
CHT10	E	1	2.88	.00	-1.00	76.34	-10.59	-18.95	-3.41	.00	.00	.00	2.50	45.88
		2	2.88	.00	-1.00	76.34	-10.19	-21.45	-3.85	.00	.00	.00	2.50	43.35
		3	2.88	.00	-1.00	76.34	-10.18	-20.29	-5.22	.00	.00	.00	2.50	43.15
		4	2.88	1.80	-1.00	78.14	-9.86	-22.48	-8.46	.00	.00	.00	2.50	39.83
		5	2.88	1.62	-1.00	77.96	-9.91	-21.92	-9.04	.00	.00	.00	2.50	39.59
		9	2.88	2.44	-1.00	78.78	-10.55	-21.14	-4.15	.00	.00	.00	2.50	45.44
		10	2.88	.00	-1.00	76.34	-12.53	-18.84	-4.38	.00	.00	.00	2.50	43.09
		11	2.88	.00	-1.00	76.34	-13.15	-18.05	-4.60	.00	.00	.00	2.50	43.05
		12	2.88	.00	-1.00	76.34	-13.26	-17.83	-5.34	.00	.00	.00	2.50	42.41
		13	2.88	.00	-1.00	76.34	-12.88	-18.42	-5.30	.00	.00	.00	2.50	42.25
		14	2.88	.00	-1.00	76.34	-11.89	-21.22	-5.00	.00	.00	.00	2.50	40.73
		15	2.88	.00	-1.00	76.34	-10.40	-22.44	-9.62	.00	.00	.00	2.50	36.39
		19	2.88	.00	-1.00	76.34	-11.26	-19.53	-4.86	.00	.00	.00	2.50	43.18
GLw8	E	6	6.00	.00	-1.00	81.97	-9.56	-22.08	-4.75	.00	.00	.00	2.50	48.08
		7	6.00	.00	-1.00	81.97	-10.17	-20.91	-5.00	.00	.00	.00	2.50	48.39
		8	6.00	.00	-1.00	81.97	-10.61	-21.30	-5.00	.00	.00	.00	2.50	47.57
		9	6.00	.00	-1.00	81.97	-11.42	-20.10	-4.99	.00	.00	.00	2.50	47.96
GSw1	E	1	4.63	.00	-1.00	78.37	-12.19	-21.93	-2.98	.00	.00	.00	2.50	43.77
		5	4.63	.00	-1.00	78.37	-10.81	-19.71	-5.25	.00	.00	.00	2.50	45.11
GSw2-1	E	1	3.92	.00	-1.00	74.56	-10.65	-17.65	-6.43	.00	.00	.00	2.50	42.32
FLN1	E	8	3.43	.36	-1.00	75.99	-11.62	-16.55	-9.37	.00	.00	.00	2.50	40.95
FLS1	E	1	3.00	.00	-1.00	76.12	-11.29	-16.12	-10.15	.00	.00	.00	2.50	41.06
FLN2	E	1	3.33	.11	-1.00	75.60	-11.67	-13.63	-9.72	.00	.00	.00	2.50	43.07
		2	3.33	.15	-1.00	75.64	-11.52	-15.56	-30.00	.00	.00	.00	2.50	21.06
		3	3.33	.11	-1.00	75.60	-11.74	-14.34	-30.00	.00	.00	.00	2.50	22.02
		4	3.33	.20	-1.00	75.69	-12.02	-16.97	-30.00	.00	.00	.00	2.50	19.20
		5	3.33	.00	-1.00	75.49	-11.83	-15.01	-30.00	.00	.00	.00	2.50	21.15
FLS2	E	1	3.53	.00	-1.00	75.41	-11.05	-12.91	-30.00	.00	.00	.00	2.50	23.94
		2	3.53	.00	-1.00	75.41	-11.17	-13.87	-30.00	.00	.00	.00	2.50	22.86
		3	3.53	.00	-1.00	75.41	-11.18	-14.96	-30.00	.00	.00	.00	2.50	21.76
		4	3.53	.00	-1.00	75.41	-11.16	-13.07	-12.13	.00	.00	.00	2.50	41.54
HAR3	E	1	.72	.04	-1.00	75.00	-2.67	-22.07	-9.95	.00	.00	.00	2.50	42.81
HAR4	E	6	2.24	.00	-1.00	76.48	-10.63	-21.25	-4.66	.00	.00	.00	2.50	42.44
CAw2	E	3	.82	.00	-1.00	72.20	-10.07	-19.22	-30.00	.00	.00	.00	2.50	15.41
		4	.82	.00	-1.00	72.20	-10.01	-20.38	-30.00	.00	.00	.00	2.50	14.31
D3R10	E	3	3.11	.00	-1.00	75.43	-13.49	-22.29	-2.66	.00	.00	.00	2.50	39.48

D1R1	New	.00
D1R2	New	.00
D1R3-1	New	.00
D1R3-2	New	.00
D1R4	New	.00
D1R5	New	.00
D1R6	New	20.11
D1R7	New	.00
D1R8	New	.00
D1R9	New	.00
D1R10	New	.00
D1R11	New	.00
D1R12	New	.00
D1R13	New	.00
D1R14	New	.00
D1R16	New	.00
D1R17	New	.00
D1R18	New	.00
D1R19	Exi	.00
D1R20	Exi	.00
D1R21	Exi	.00
D1R23	Exi	.00
D1R24	Exi	.00
D1R25	Exi	.00
D1R26	New	.00
D1R27	New	.00
D1R28	New	.00
D1R29	New	.00
D1R30	New	.00
D1R31	New	.00
D1R32	New	.00
D1R33-1	Exi	.00
D1R33-2	New	.00
D1RR1	Exi	.00
D2R1	Exi	50.99
D2R2	Exi	52.99
D2R3	New	20.37
D2R4	New	.00
D2R5	New	19.28
D2R6	New	.00
D2R7	New	.00
D2R8	New	19.36
D2R9	Exi	58.47
D2R10	New	17.47
D2R11	New	16.70
D2R12	New	.00
D2R13	New	.00
D2R14	New	.00
D2R15	New	.00
D2316	New	.00
D2R17	New	-15.05
D2R18	New	.00
D2R19	Exi	48.97
D2R20	Exi	16.48
D2R21	Exi	41.92
D2R22	Exi	15.54

D2R23	Exi	15.90
D2R25	New	.00
D2R26	New	.00
D2R27	New	.00
D2R28	New	9.95
D2R29	Exi	20.85
D2R30	New	.00
D2R31	Exi	12.37
D2R32	New	-22.34
D2RR1	Exi	.00
D3R1	Exi	50.64
D3R2	Exi	42.96
D3R3	Exi	.00
D3R4	Exi	.00
D3R5	Exi	.00
D3R6	Exi	.00
D5R3-2	New	.00
D1R19	New	.00
D4R1	Exi	.00
D4R2	Exi	.00
D4R3	Exi	.00
D4R4	Exi	.00
DAR1	Exi	.00
DAR2	New	.00
DAR7-1	Exi	.00
DAR7-2	Exi	.00
WAR1	Exi	.00
WAR2	Exi	.00
KMR1	Exi	.00
WHR	Exi	.00
GOR	Exi	.00
K2	Exi	.00
L3	Exi	.00
NIE11	Exi	.00
HFS1	Exi	.00
HFS2	Exi	.00
HFS3	Exi	.00
HFS4	Exi	.00
LLR1	Exi	.00
J2	Exi	.00
VPs2	Exi	.00
VPs3	Exi	.00
GW	Exi	.00
GLn1	Exi	.00
VPs4	Exi	.00
GLW1	Exi	.00
GLW2	Exi	.00
GLW3	Exi	.00
GLw4	Exi	.00
GLw5-1	Exi	.00
GLw5-2	Exi	49.59
CHT1	Exi	44.67
CHT2	Exi	.00
CHT3	Exi	.00
CHT4	Exi	.00
CHT5	Exi	.00

GLe2	Exi	.00
GLe3-1	Exi	.00
GLe3-2	Exi	.00
GLe4	Exi	.00
HH1	Exi	.00
GLn2	Exi	.00
GLn3	Exi	.00
GLn4	Exi	.00
GLs2	Exi	.00
TOR1	Exi	57.45
GIe5-1	Exi	.00
GIe5-2	Exi	.00
CHT3	Exi	.00
GLe6	Exi	.00
GLe7	Exi	.00
CHT5	Exi	39.19
CRW1	Exi	.00
CRW2	Exi	.00
CRE1	Exi	.00
CRE2	Exi	.00
CHT6	Exi	.00
GLe8	Exi	.00
GLe9	Exi	.00
GLe10	Exi	51.60
CHT7	Exi	48.42
CHT8	Exi	.00
CHT9	Exi	45.53
GLe4	Exi	.00

MAR2	Exi	53.48
MAR3-1	Exi	14.23
MAR3-2	Exi	51.18
MAR4	Exi	.00
MAR5	Exi	.00
TOR2	Exi	47.33
TOR3	Exi	39.81
TOR4	Exi	35.18
GLe11	Exi	51.08
GLe12	Exi	45.60
GLe13	Exi	.00
GLe14	Exi	.00
HAR1	Exi	58.20
HAR2	Exi	51.23
CRE3-1	Exi	40.99
CRE3-2	Exi	.00
GLw6	Exi	.00
CHT10	Exi	53.92
GLw7	Exi	.00
CRW3-1	Exi	.00
CRW3-2	Exi	.00
GLw8	Exi	54.03
GLw9-1	Exi	.00
GLw9-2	Exi	.00
GLw10	Exi	.00
GSw1	Exi	47.50
GSw2-1	Exi	42.32
GSw2-2	Exi	.00

FLN1	Exi	40.95
FLS1	Exi	41.06
GLW10	Exi	.00
GLE15	Exi	.00
FLN2	Exi	43.18
FLS2	Exi	41.72
HAR3	Exi	42.81
HAR4	Exi	42.44
CAw2	Exi	17.91
FPw2	Exi	.00
FPw3	Exi	.00
NPR1	Exi	.00
D3R9	Exi	.00
D3R10	Exi	39.48
D5R4-1-1-2	Exi	.00
D5R4-1-2	Exi	.00
D5R4-2	Exi	.00
NPW2	Exi	.00
NPW3	Exi	.00
NPE2	Exi	.00
NPE3	Exi	.00
iece1	Exi	.00
iecw1-1	Exi	.00
TFS	Exi	.00
D4R6	New	.00
D4R7	New	.00
D4R8	Alt	.00
D5R1	New	.00

D5R2-2	Exi	.00
D5R3-1	Exi	.00
D5R4-1-1-1	Exi	.00
D6R1-2-1	Exi	.00
D6R1-2-2	Exi	.00
D6R2-1-2	Exi	.00
D6R2-2	Exi	.00
NIEs1	Exi	.00
NIEs1	Exi	.00
NIEs3	Exi	.00
NIEs3	Exi	.00
M1	Exi	.00
WIEC1	Exi	.00
EIEC1-1	Exi	.00
EIEC1-2	Exi	.00
HFS1	Exi	.00

New Road(s) Noise Level = 26.95
Altered Road(s) Noise Level = .00
Existing Road(s) Noise Level = 66.30
Overall Noise Level = 66.30

ENSR | AECOM

MAUNSELL | AECOM

ENSR Asia (HK) Ltd.
(formerly Maunsell Environmental Management Consultants Ltd)
11/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong
安社亞洲(香港)有限公司
(前茂盛環境管理顧問有限公司)
香港新界沙田鄉事會路 138 號新城市中央廣場 2 座 11 樓
T +852 2893 1551 F +852 2891 0305 www.ensr.aecom.com www.maunsell.aecom.com

FAXED
DATE: 15/6/07

Your Ref.: -
Our Ref.: 60017193/C/DCFL706151

A01664

By Fax (2591 0558) and Post
Environmental Protection Department
Metro Assessment Group
27th floor, Southorn Centre,
130 Hennessy Road,
Wan Chai, Hong Kong

Attn : Mr. Raymond Lai

15 June 2007

Dear Sir,

Supplemental Agreement No.1 to Agreement No. CE 54/2001 (CE)
Wan Chai Development Phase II - Planning and Engineering Review
Wan Chai Development Phase II and Central-Wan Chai Bypass – EIA Study

With regard to the assessment of noise for the captioned EIA Study and further to our letters dated 2 November 2006 (ref.: A01604/C/YKT611022), 21 November 2006 (ref.: A01604/C/YKT611211) and 19 April 2007 (ref: A01604/C/YKT70419/1) in response to your technical advisory observations, the selected assessment points for the noise assessment have been reviewed and updated. We are pleased to enclose herewith a figure showing the location and description of the selected assessment points for your agreement as per the requirements in Section 3.4.6.2 (iii)(b) of the EIA Study Brief (ESB-153/2006).

Only the first layer of noise sensitive receivers (NSRs) has been identified for assessment because it would provide acoustic shielding to those receivers at further distance behind. We would like to have your agreement on the assessment area as per the requirements in Section 3.4.6.2 (i) of the EIA Study Brief (ESB-153/2006).

Should you need any further clarification or information, please feel free to contact Mr. Derek Lam at 3105 8513. Thank you for your kind attention.

Yours faithfully
for and on behalf of
ENSR Asia (HK) Ltd

Freeman Cheung
Executive Director

Encl.

cc	CEDD – CK Lam (w/enclosure)	By fax (2577 5040)
	MCAL - Peter Cheek / Carmen Au (w/enclosure)	By fax (2691 2649)

+ 852 2753 9327

By fax (2691 2649) and Post

政府飛行服務隊
香港大嶼山
香港國際機場
南環路 18 號

GOVERNMENT FLYING SERVICE
18 South Perimeter Road
Hong Kong International Airport
Lantau, Hong Kong

電話 Tel.: 2305 8269

傳真 Fax: 2753 9327

網站 Web Site: http://www.gfs.gov.hk/

電郵 E-mail:

齊為飛援，赴嶺重洋
We Serve Over and Above

19 October 2006

本處檔號 Our Ref.: (39) in AIR/10/10/2/1(17)

來函檔號 Your Ref.: PMC:CAKM:qc:97103/10.6-0524

Mr Peter Cheek
Associate
Maunsell Consultants Asia Ltd
8/F, Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road
Shatin
N.T.

Dear Mr Cheek,

Supplemental Agreement No. 1 to Agreement No. CE 54/2001 (CE)
Wan Chai Development Phase II - Planning and Engineering Review

Wan Chai Development Phase II and Central-Wan Chai Bypass - EIA Study
Validation of Operation Parameters for Helipad

With reference to your letter of 12.10.2006, I confirm that the operation parameters as stated for the purpose of the current EIA study are valid.

Yours sincerely,

(Captain West Wu)
for Controller
Government Flying Service

Maunsell Environmental Management Consultants Ltd.
Received 20/10/06.
File No. 60017193 /C/F/Q

TS MKO	AYK JLAM	TYUT	Sign Off
Env. Consultant YKF DCFL			
Others			
Copied To			
Reply Date			

TOTAL P.01

Maunsell Consultants Asia Ltd
8/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T. Hong Kong
茂盛(亞洲)工程顧問有限公司
香港新界沙田鄉事會路138號新城市中央廣場第2座8樓
T +852 2605 6262 F +852 2691 2649 www.maunsell.aecom.com

Our Ref.: PMC:CAKM:qc:97103/10.6-0524

By Fax (2511 8483, 2753 8438) and Post

FAX 13.10.06

Government Flying Services
15 Hung Hing Road
Wanchai
Hong Kong

12 October 2006

Dear Sir,

Supplemental Agreement No.1 to Agreement No. CE 54/2001 (CE)
Wan Chai Development Phase II - Planning and Engineering Review

Wan Chai Development Phase II and Central-Wan Chai Bypass – EIA Study
Validation of Operation Parameters for Helipad

We are commissioned by the Civil Engineering and Development Department to conduct a planning and engineering review of Wan Chai Development Phase II, and Environmental Impact Assessment (EIA) forms part of the study.

Similar to the previous approved EIA report for "Wan Chai Development Phase II Comprehensive Feasibility Study" (WDIICFS), helicopter noise from the proposed helipad re-provision at the existing pier located near the northern end of Expo Drive East are required to address in the current EIA study.

As per the requirements of the EIA Study Brief (para. 3.4.6.2 (vi)(c)(c1)) issued by EPD, we are writing to seek you confirmation on the validity of the operation parameters that were adopted in the previous approved EIA report for WDIICFS for the purpose of the current EIA study. For your ease of reference, the relevant part of the approved EIA report is enclosed. The operation parameters adopted in the previous approved EIA report are summarized below for your confirmation:-

Use of helipad by GFS:	-	to serve VIPs as well as for emergency services
Frequency:	-	base on the above usage, the proposed helipad will be used infrequently, routine tasking or regular flights are not expected
Type of helicopter:	-	Eurocopter AS-332 L2 (Super Puma); and
	-	Eurocopter EC 155B
Approach route and Take-off route:	-	no designated approach and take-off route. However, the helicopters will generally fly along the coastline to approach the landing pad

We should most appreciate if you would confirm us that the above assumptions are still valid, otherwise please provide the latest operation parameters (such as flight types, flight paths, flight frequency, flight hours), by 19 October 2006.

Should you need any further clarification or information, please feel free to contact Ms Joanne Tsoi at 3105 8506 or Mr. Derek Lam at 3105 8513. Thank you for your kind attention.

Yours faithfully

Peter Cheek
Associate

cc	CEDD – Mr. CK Lam	By fax (2577 5040)
	MEMCL – Mr. Tim Cramp	By fax (2891 0305)

土木工程拓展署
CEDD Civil Engineering and Development Department

港島及離島拓展處
Hong Kong Island and Islands Development Office

Web site 網址 : http://www.cedd.gov.hk
E-mail 電子郵件 : cklam@cedd.gov.hk
Telephone 電話 : (852) 2231 4415
Facsimile 傳真 : (852) 2577 5040
Our ref 本署檔號 : HKI 2/4/50EI
Your ref 來函檔號 : PMC:CAKM:TSC1:tkk:97103/10.6-0809

香港北角渣華道 333 號
北角政府合署 13 樓
13/F, North Point Government Offices,
333 Java Road,
North Point, Hong Kong

Urgent by fax (Fax No. 2691 2649)

21 September 2007

Maunsell Consultants Asia Ltd
8/F Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road
Shatin, NT

(Attn: Mr Peter Cheek)

Dear Sirs,

SA1 to Agreement No. CE 54/2001 (CE)
WDII – Planning and Engineering Review

Wan Chai Development Phase II and Central – Wan Chai Bypass – EIA Study
Construction Plant Inventories for the EIA Study

I refer to your letter dated 19.9.2007 and have no comment on the construction plant inventories for the EIA Study for the Wan Chai Development Phase II and Central – Wan Chai Bypass projects.

Yours faithfully,

(C K LAM)
for Project Manager (Hong Kong Island and Islands)
Civil Engineering and Development Department

c.c. CHE/MW2-1, HyD (Attn: Mr CY WONG) Fax No. 2714 5289

MAUNSELL | AECOM

Maunsell Consultants Asia Ltd
8/F Grand Central Plaza, Tower 1, 138 Shatin Rural Committee Road, Shatin, N.T. Hong Kong
茂盛(亞洲)工程顧問有限公司
[illegible]
T +852 2605 6262 F +852 2691 2649 www.maunsell.aecom.com

Your Ref:
Our Ref: PMC:CAKM:TSC1:tkk:97103/10.6-0809

FAXED 19.9.07

****URGENT****
By Fax & Post (F: 2577 5040)

PM/HKI&I
Civil Engineering and Development Department
13/F, North Point Government Offices
333 Java Road
North Point
Hong Kong

Attn: Mr C K Lam

19 September 2007

Dear Sir,

SA1 to Agreement No. CE54/2001(CE)
Wan Chai Development Phase II - Planning and Engineering Review

Wan Chai Development Phase II and Central-Wan Chai Bypass – EIA Study
Construction Plant Inventories for the EIA Study

As per the requirements in Section 3.4.6.2(iv)(a) of the EIA Study Brief (ESB-153/2006) for the Wan Chai Development Phase II and Central-Wan Chai Bypass (WDII&CWB) EIA Study, we write to seek your confirmation on the validity of the enclosed construction plant inventories for the WDII&CWB EIA Study.

Yours faithfully,

Peter Cheek
Technical Director

Encl.

cc MW/HyD Attn: Mr C Y Wong (w/e) (F: 2714 5289)

Appendix 4.13 **Powered Mechanical Equipment (PME) for the Different Construction Tasks during Normal Daytime Working Hours (With Mitigation Measures)**

1 Causeway Bay Reclamation

1.1 Temporary Relocation CBTS

1.1.1 Temporary Breakwater

1.1.1A Dredging, Filling and Armour Placing

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

1.1.1B Piling

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Piling Rig	CNP 164	2	115.0	100.0%	0.0	118.0
Generator*	EPD-00064**	2	96.0	100.0%	0.0	99.0
Water Pump#	CNP 281	2	88.0	100.0%	10.0	81.0
Air Compressor*#	Table C7/16	2	96.0	100.0%	10.0	89.0
Concrete Pump*#	Table C6/36	2	106.0	100.0%	10.0	99.0
Barge	-	2	0.0	100.0%	0.0	0.0
					Total	118.1

1.2 CBTS Temporary Reclamation Stage 1

1.2.1 Dredging, Seawalls & Filling (TCBR1)

1.2.1A Dredging (TCBR1E)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	60.0%	110.8
Barges	-	4	0.0	100.0%	0.0
				Total	116.4

1.2.1B Temporary Seawall (TCBR1E)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	60.0%	107.8
Crane*	Table C7/114	2	101.0	70.0%	102.5
Barges	-	2	0.0	100.0%	0.0
				Total	111.1

1.2.1C Filling behind seawall (TCBR1E)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	60.0%	110.8
Bulldozer*	Table C9/2	2	104.0	100.0%	107.0
				Total	113.4

*Use of QPME
#Use of Barrier
** EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

1.2.1D Dredging (TCBR1W)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

1.2.1E Temporary Seawall (TCBR1W)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane*	Table C7/114	2	101.0	100.0%	104.0
Barges	-	2	0.0	100.0%	0.0
				Total	112.4

1.2.1F Filling behind seawall (TCBR1W)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer*	Table C9/2	2	104.0	100.0%	107.0
					114.8

1.2.2 CWB Tunnel (TCBR1)

1.2.2A Diaphragm Wall (TCBR1E)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	Table C7/114	4	101.0	70.0%	0.0	105.5
Excavator*#	Table C3/97	4	105.0	70.0%	5.0	104.5
Dump Truck*	Table C9/27	8	105.0	100.0%	0.0	114.0
Concrete Pump*#	Table C6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	Table C6/35	4	100.0	100.0%	0.0	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.0	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.0	116.0
					Total	119.1

1.2.2B Excavation (TCBR1E)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	Table C3/97	4	105.0	70.0%	5.0	104.5
Dump Truck*	Table C9/27	12	105.0	100.0%	0.0	115.8
					Total	116.1

*Use of QPME
#Use of Barrier
** EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

1.2.2C Construction of Slabs (TCBR1E)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	Table C7/114	2	101.0	70.0%	0.0	102.5
Concrete Pump*#	Table C6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	Table C6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	Table C6/32	4	100.0	70.0%	5.0	99.5
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	Table C7/16	4	96.0	100.0%	10.0	92.0
					Total	110.9

1.2.2D Backfill (TCBR1E)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	Table C3/97	4	105.0	70.0%	5.0	104.5
Bulldozer*	Table C9/2	2	104.0	100.0%	0.0	107.0
Roller*	Table C8/27	2	104.0	100.0%	0.0	107.0
Dump Truck*	Table C9/27	4	105.0	100.0%	0.0	111.0
					Total	114.1

1.2.2E Diaphragm Wall (TCBR1W)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	Table C7/114	4	101.0	100.0%	0.0	107.0
Excavator*#	Table C3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	Table C9/27	8	105.0	100.0%	0.0	114.0
Concrete Pump*#	Table C6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	Table C6/35	4	100.0	100.0%	0.0	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.0	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.0	116.0
					Total	119.2

1.2.2F Excavation (TCBR1W)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	Table C3/97	8	105.0	100.0%	5.0	109.0
Dump Truck*	Table C9/27	24	105.0	100.0%	0.0	118.8
					Total	119.2

1.2.2G Construction of Slabs (TCBR1W)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	Table C7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	Table C6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	Table C6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	Table C6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	Table C7/16	4	96.0	100.0%	10.0	92.0
					Total	111.3

*Use of QPME
#Use of Barrier
** EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

1.2.2H Backfill (TCBR1W)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Bulldozer*#	TableC9/2	2	104.0	100.0%	0.0	107.0
Roller*	TableC8/27	2	104.0	100.0%	0.0	107.0
Trucks*	TableC9/27	4	105.0	100.0%	0.0	111.0
					Total	114.3

1.2.3 CWB Tunnel (CHT)

1.2.3A Rock Blasting/Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Breaker, excavator mounted*#	Table C8/13	2	110.0	100.0%	5.0	108.0
Backhoe*#	Table C3/97	2	105.0	100.0%	5.0	103.0
Ventilation fan#	CNP241	2	108.0	100.0%	10.0	101.0
Rock Drill#	CNP182	2	123.0	100.0%	5.0	121.0
Truck*	Table C9/39	4	103.0	100.0%	0.0	109.0
Crane*	Table C7/114	1	101.0	100.0%	0.0	101.0
					Total	121.6

1.2.3B Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	Table C7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	Table C6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	Table C6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	Table C6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	Table C7/16	4	96.0	100.0%	10.0	92.0
					Total	111.3

1.3 CBTS Temporary Reclamation Stage 2

1.3.1 Dredging, Seawalls & Filling (TCBR2)

1.3.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

1.3.1B Temporary Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	0.0	107.0
Tug boat	CNP 221	1	110.0	100.0%	0.0	110.0
Crane*#	TableC7/114	2	101.0	100.0%	5.0	99.0
Barges	-	2	0.0	100.0%	0.0	0.0
					Total	112.0

*Use of QPME
#Use of Barrier
** EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

1.3.1C Filling behind seawall

Powered Mechanical Equipment (PME)	EPD-00064** other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer*#	TableC9/2	2	104.0	100.0%	107.0
				Total	114.8

1.3.2 CWB Tunnel

1.3.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	Table C7/114	4	101.0	100.0%	0.0	107.0
Excavator*#	Table C3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	Table C9/27	8	105.0	100.0%	0.0	114.0
Concrete Pump*#	Table C6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	Table C6/35	4	100.0	100.0%	0.0	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.0	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.0	116.0
					Total	119.2

1.3.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*	Table C3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	Table C9/27	12	105.0	100.0%	0.0	115.8
					Total	116.2

1.3.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	Table C7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	Table C6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	Table C6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	Table C6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	Table C7/16	4	96.0	100.0%	10.0	92.0
					Total	111.3

1.3.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	Table C3/97	4	105.0	100.0%	5.0	106.0
Bulldozer*	Table C9/2	2	104.0	100.0%	0.0	107.0
Roller*	Table C3/116	2	106.0	100.0%	0.0	109.0
Dump Truck*	Table C9/27	4	105.0	100.0%	0.0	111.0
					Total	114.7

*Use of QPME
#Use of Barrier
** EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

1.4 CBTS Temporary Reclamation Stage 3

1.4.1 Dredging, Seawalls & Filling (TCBR3)

1.4.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

1.4.1B Temporary Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane*	TableC7/114	2	101.0	100.0%	104.0
Barges	-	2	0.0	100.0%	0.0
				Total	112.4

1.4.1C Filling behind seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer*	TableC9/2	2	104.0	100.0%	107.0
				Total	114.8

1.4.2 CWB Tunnel

1.4.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	Table C7/114	4	101.0	100.0%	0.0	107.0
Excavator*#	Table C3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	Table C9/27	8	105.0	100.0%	0.0	114.0
Concrete Pump*#	Table C6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	Table C6/35	4	100.0	100.0%	0.0	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.0	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.0	116.0
					Total	119.2

1.4.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	Table C9/27	12	105.0	100.0%	0.0	115.8
					Total	116.2

*Use of QPME
#Use of Barrier
** EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

1.4.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	Table C7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	Table C6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	Table C6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	Table C7/16	4	96.0	100.0%	10.0	92.0
					Total	111.3

1.4.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	Table C3/97	4	105.0	100.0%	5.0	106.0
Bulldozer*	Table C9/2	2	104.0	100.0%	0.0	107.0
Roller*	Table C8/27	2	104.0	100.0%	0.0	107.0
Dump Truck*	Table C9/27	4	105.0	100.0%	0.0	111.0
					Total	114.3

1.5 CBTS Temporary Reclamation Stage 4

1.5.1 Dredging, Seawalls & Filling (TCBR4)

1.5.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

1.5.1B Temporary Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane*	TableC7/114	2	101.0	100.0%	104.0
Barges	-	2	0.0	100.0%	0.0
				Total	112.4

1.5.1C Filling behind seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer*	TableC9/2	2	104.0	100.0%	107.0
				Total	114.8

*Use of QPME
#Use of Barrier
** EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

1.5.2 CWB Tunnel

1.5.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	Table C7/114	4	101.0	100.0%	0.0	107.0
Excavator*#	Table C3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	Table C9/27	8	105.0	100.0%	0.0	114.0
Concrete Pump*#	Table C6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	Table C6/35	4	100.0	100.0%	0.0	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.0	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.0	116.0
					Total	119.2

1.5.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	8	105.0	100.0%	5.0	109.0
Dump Truck*	Table C9/27	24	105.0	100.0%	0.0	118.8
					Total	119.2

1.5.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	Table C7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	Table C7/16	4	96.0	100.0%	10.0	92.0
					Total	111.3

1.5.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	Table C3/97	4	105.0	100.0%	5.0	106.0
Bulldozer*	Table C9/2	2	104.0	100.0%	0.0	107.0
Roller*	Table C8/27	2	104.0	100.0%	0.0	107.0
Dump Truck*	Table C9/27	4	105.0	100.0%	0.0	111.0
					Total	114.3

1.6 Temporary diversion of cooling system

1.6.1 Temporary cooling water pipeline

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	Table C7/114	2	101.0	100.0%	0.0	104.0
Excavator*#	Table C3/97	2	105.0	100.0%	5.0	103.0
Dump Truck*	Table C9/27	2	105.0	100.0%	0.0	108.0
Concrete Lorry Mixer*	Table C6/35	2	100.0	100.0%	0.0	103.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Air Compressor#	TableC7/16	2	96.0	100.0%	10.0	89.0
Compactor	CNP 050	1	105.0	100.0%	0.0	105.0
					Total	112.4

*Use of QPME
#Use of Barrier
** EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

1.9 Slip Road 8 & Victoria Park Reprovisioning

1.9.1 Slip Road 8 Tunnel

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Pilling Rig#	CNP 164	2	115.0	100.0%	5.0	113.0
Generator*#	EPD-00064**	2	96.0	100.0%	5.0	94.0
Water Pump#	CNP 281	2	88.0	100.0%	10.0	81.0
Crane*	Table C7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	Table C6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	Table C6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.0	92.0
					Total	115.3

1.9.2 At-grade Road(Group 1 and Group 2 PME)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Dump Truck*	Table C9/27	2	105.0	70.0%	0.0	106.5
Excavator*	Table C3/97	2	105.0	80.0%	0.0	107.0
Grader*	Table C9/11	2	110.0	80.0%	0.0	112.0
Loader*	Table C3/97	2	105.0	80.0%	0.0	107.0
Vibratory Roller*	Table C3/116	1	106.0	80.0%	0.0	105.0
Road Roller*	Table C8/27	1	104.0	80.0%	0.0	103.0
Asphalt Paver*	Table C8/24	2	101.0	80.0%	0.0	103.0
Planer	CNP 184	2	111.0	80.0%	0.0	113.0
					Total	117.6

1.9.2 At-grade Road(Group 1 PME)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Dump Truck*	Table C9/27	1	105.0	70.0%	0.0	103.5
Excavator*	Table C3/97	1	105.0	80.0%	0.0	104.0
Grader*	Table C9/11	1	110.0	80.0%	0.0	109.0
Loader*	Table C3/97	1	105.0	80.0%	0.0	104.0
Vibratory Roller*	Table C3/116	1	106.0	80.0%	0.0	105.0
Planer	CNP 184	1	111.0	80.0%	0.0	110.0
					Total	114.6

1.9.2 At-grade Road(Group 2 PME)(For N11 &N13)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Dump Truck*	Table C9/27	1	105.0	50.0%	0.0	102.0
Loader*	Table C3/97	1	105.0	50.0%	0.0	102.0
Road Roller*	Table C8/27	1	104.0	60.0%	0.0	101.8
Asphalt Paver*	Table C8/24	1	101.0	60.0%	0.0	98.8
					Total	107.3

*Use of QPME
#Use of Barrier
** EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

1.9.3 Landscape Deck

1.9.3A Substructure works

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Pilling Rig#	CNP 164	2	115.0	100.0%	5.0	113.0
Generator*#	EPD-00064**	2	96.0	100.0%	5.0	94.0
Water Pump#	CNP 281	2	88.0	100.0%	10.0	81.0
Crane*	Table C7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	Table C6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	Table C6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.0	92.0
					Total	115.3

1.9.3B Superstructure works

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	Table C7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	Table C6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	Table C6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.0	92.0
					Total	111.3

*Use of QPME
#Use of Barrier
** EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

Appendix 4.13 **Powered Mechanical Equipment (PME) for the Different Construction Tasks during Normal Daytime Working Hours (With Mitigation Measures)**

2 Wan Chai Reclamation

2.1 Wan Chai Reclamation Stage 1 (WCR1)

2.1.1 Dredging , Seawalls & Filling

2.1.1A Dredging(=Removal Temp. seawall)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

2.1.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane*	TableC7/114	2	101.0	100.0%	104.0
Barges	-	2	0.0	100.0%	0.0
				Total	112.4

2.1.1C Filling behind seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer*	TableC9/2	2	104.0	100.0%	107.0
				Total	114.8

2.1.2 Drainage Culverts (2 cell)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Dump Truck*	TableC9/27	4	105.0	100.0%	0.0	111.0
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	0.0	103.0
Excavator*#	TableC3/97	2	105.0	100.0%	5.0	103.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.0	107.0
Roller	TableC3/116	2	106.0	100.0%	0.0	109.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	2	96.0	100.0%	10.0	89.0
					Total	114.9

2.1.3 Cooling Water System

2.1.3A Cooling water intake chamber

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	104.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Barges	-	2	0.0	100.0%	0.0
				Total	111.0

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

2.1.3B Pipeline works

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.0	104.0
Excavator*#	TableC3/97	2	105.0	100.0%	5.0	103.0
Dump Truck*	TableC9/27	2	105.0	100.0%	0.0	108.0
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	0.0	103.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Air Compressor*#	TableC7/16	2	96.0	100.0%	10.0	89.0
Compactor	CNP 050	1	105.0	100.0%	0.0	105.0
					Total	112.4

2.1.4 CWB Tunnel

2.1.4A Diaphragm Wall (WCR1)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	4	101.0	100.0%	0.0	107.0
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	TableC9/27	8	105.0	100.0%	0.0	114.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Truck*	TableC6/35	4	100.0	100.0%	0.0	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.0	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.0	116.0
					Total	119.2

2.1.4B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Dump Trucks*	TableC9/27	12	105.0	100.0%	0.0	115.8
					Total	116.2

2.1.4C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Compressor*#	TableC7/16	4	96.0	100.0%	10.0	92.0
					Total	111.3

2.1.4D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.0	107.0
Roller*	TableC3/116	2	106.0	100.0%	0.0	109.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.0	111.0
					Total	114.7

2.2 Wan Chai Reclamation Stage 2 (WCR2)

2.2.1 Dredging, Seawalls & Filling

2.2.1A Dredging(=Removal Temp. seawall)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

2.2.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane*	TableC7/114	2	101.0	100.0%	104.0
Barges	-	2	0.0	100.0%	0.0
				Total	112.4

2.2.1C Filling behind seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer*	TableC9/2	2	104.0	100.0%	107.0
				Total	114.8

2.2.2 CWB Tunnel

2.2.2A Diaphragm Wall (WCR2)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	4	101.0	100.0%	0.0	107.0
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	TableC9/27	8	105.0	100.0%	0.0	114.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	4	100.0	100.0%	0.0	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.0	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.0	116.0
					Total	119.2

2.2.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	TableC9/27	12	105.0	100.0%	0.0	115.8
					Total	116.2

2.2.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.0	92.0
					Total	111.3

2.2.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.00	106.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.00	107.0
Roller*	TableC3/116	2	106.0	100.0%	0.00	109.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.00	111.0
					Total	114.7

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

2.3 Wan Chai Reclamation Stage 3 (WCR3)

2.3.1 Dredging, Seawalls & Filling

2.3.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	6	0.0	100.0%	0.0
				Total	117.1

2.3.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane*	TableC7/114	2	101.0	100.0%	104.0
Barges	-	2	0.0	100.0%	
				Total	112.4

2.3.1C Filling behind Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer*	TableC9/2	2	104.0	100.0%	107.0
				Total	114.8

2.3.2 CWB Tunnel (WCR3)

2.3.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	8	101.0	100.0%	0.0	110.0
Excavator*#	TableC3/97	8	105.0	100.0%	5.0	109.0
Dump Truck*	TableC9/27	16	105.0	100.0%	0.0	117.0
Concrete Pump*#	TableC6/36	8	106.0	100.0%	10.0	105.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.0	109.0
Bentonite Plants#	CNP 162	8	105.0	100.0%	5.0	109.0
Bar Bender#	CNP 021	4	90.0	100.0%	10.0	86.0
Diaphragm Wall Rigs#	CNP 164	8	115.0	100.0%	5.0	119.0
					Total	122.3

2.3.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.00	106.0
Dump Truck*	TableC9/27	12	105.0	100.0%	0.00	115.8
					Total	116.2

2.3.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	5.0	107.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	5.0	97.0
					Total	112.4

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

2.3.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.0	107.0
Roller*	TableC3/116	2	106.0	100.0%	0.0	109.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.0	111.0
					Total	114.7

2.4 Wan Chai Reclamation Stage 4 (WCR4)

2.4.1 Dredging, Seawalls & Filling

2.4.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	6	0.0	100.0%	0.0
				Total	117.1

2.4.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane*	TableC7/114	2	101.0	100.0%	104.0
Barges	-	2	0.0	100.0%	0.0
				Total	112.4

2.4.1C Filling behind Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer*	TableC9/2	2	104.0	100.0%	107.0
				Total	114.8

2.4.2 Drainage Culvert

Powered Mechanical Equipment (PME)	TableC3/97 other Ref.	No. Items	105 dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Dump Truck*	TableC9/27	4	105.0	100.0%	0.0	111.0
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	0.0	103.0
Excavator*#	TableC3/97	2	105.0	100.0%	5.0	103.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Bulldozer*	Table C9/2	2	104.0	100.0%	0.0	107.0
Roller*	TableC3/116	2	106.0	100.0%	0.0	109.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	2	96.0	100.0%	10.0	89.0
					Total	114.9

2.4.3 CWB Tunnel

2.4.3A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	4	101.0	100.0%	0.00	107.0
Excavator*#	TableC3/97	4	105.0	100.0%	5.00	106.0
Dump Truck*	TableC9/27	8	105.0	100.0%	0.00	114.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.00	102.0
Concrete Lorry Mixer*	TableC6/35	4	100.0	100.0%	0.00	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.00	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.00	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.00	116.0
					Total	119.2

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

2.4.3B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.00	106.0
Dump Truck*	TableC9/27	12	105.0	100.0%	0.00	115.8
					Total	116.2

2.4.3C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.0	92.0
					Total	111.3

2.4.3D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.0	107.0
Roller*	TableC3/116	2	106.0	100.0%	0.0	109.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.0	111.0
					Total	114.7

2.5 Temporary Reclamation at PCWA Stage 1

2.5.1 Dredging , Seawalls & Filling (TPCWAF)

2.5.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

2.5.1B Temporary Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP221	1	110.0	100.0%	110.0
Crane*	TableC7/114	2	101.0	100.0%	104.0
Barges	-	2	0.0	100.0%	0.0
				Total	112.4

2.5.1C Filling behind seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer*	TableC9/2	2	104.0	100.0%	107.0
				Total	114.8

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

2.5.2 CWB Tunnel (TPCWAE)

2.5.2A Diaphragm Wall

(PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	5 Reduction	Total SWL dB(A)
Crane*	TableC7/114	4	101.0	100.0%	0.0	107.0
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	TableC9/27	8	105.0	100.0%	0.0	114.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	4	100.0	100.0%	0.0	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.0	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.0	116.0
					Total	119.2

2.5.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	TableC9/27	12	105.0	100.0%	0.0	115.8
					Total	116.2

2.5.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.0	92.0
					Total	111.3

2.5.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.0	107.0
Roller*	TableC3/116	2	106.0	100.0%	0.0	109.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.0	111.0
					Total	114.7

2.6 Temporary Reclamation at PCWA Stage 2

2.6.1 Dredging, Seawalls & Filling (TPCWAW)

2.6.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

2.6.1B Temporary Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane*	TableC7/114	2	101.0	100.0%	104.0
Barges	-	2	0.0	100.0%	0.0
				Total	112.4

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

2.6.1C Filling behind seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer*	Table C9/2	2	104.0	100.0%	107.0
				Total	114.8

2.6.2 CWB Tunnel (TPCWAW)

2.6.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	4	101.0	100.0%	0.0	107.0
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	TableC9/27	8	105.0	100.0%	0.0	114.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	4	100.0	100.0%	0.0	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.0	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.0	116.0
					Total	119.2

2.6.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	TableC9/27	12	105.0	100.0%	0.0	115.8
					Total	116.2

2.6.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.0	92.0
					Total	111.3

2.6.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.0	107.0
Roller*	TableC3/116	2	106.0	100.0%	0.0	109.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.0	111.0
					Total	114.7

2.7 Ferry Pier Reprovisioning

2.7.1 Temporary Ferry Pier

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Pilling rig#	CNP 164	1	115.0	100.0%	5.0	110.0
Generator*#	EPD-00064**	1	96.0	100.0%	5.0	91.0
Water Pump#	CNP 281	1	88.0	100.0%	10.0	78.0
Crane*	TableC7/114	1	101.0	100.0%	0.0	101.0
Concrete Pump*#	TableC6/36	2	106.0	100.0%	10.0	99.0
Concrete Lorry Mixer*	TableC6/35	4	100.0	100.0%	0.0	106.0
Derrick Barge	CNP061	1	104.0	100.0%	0.0	104.0
Poker Vibrator*#	TableC6/32	2	100.0	100.0%	5.0	98.0
Bar Bender#	CNP 021	1	90.0	100.0%	10.0	80.0
Air Compressor*#	TableC7/16	2	96.0	100.0%	10.0	89.0
					Total	112.9

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

2.7.2 New Ferry Pier

2.7.2A Piling, Deck construction, & Superstructure

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Pilling rig#	CNP 164	1	115.0	100.0%	5.0	110.0
Generator*#	EPD-00064**	1	96.0	100.0%	5.0	91.0
Water Pump#	CNP 281	1	88.0	100.0%	10.0	78.0
Crane*	TableC7/114	1	101.0	100.0%	0.0	101.0
Concrete Pump*#	TableC6/36	2	106.0	100.0%	10.0	99.0
Concrete Lorry Mixer*	TableC6/35	4	100.0	100.0%	0.0	106.0
Derrick Barge	CNP 061	1	104.0	100.0%	0.0	104.0
Poker Vibrator*#	TableC6/32	2	100.0	100.0%	5.0	98.0
Bar Bender#	CNP 021	1	90.0	100.0%	10.0	80.0
Air Compressor*#	TableC7/16	2	96.0	100.0%	10.0	89.0
					Total	112.9

2.7.2B Demolition of Structure

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Breaker, excavator mounted*#	TableC8/13	2	110.0	100.0%	5.0	108.0
Excavator*#	TableC3/97	2	105.0	100.0%	5.0	103.0
Bulldozer*	Table C9/2	2	104.0	100.0%	0.0	107.0
Hand-held Breaker*#	Table C2/10	6	110.0	100.0%	5.0	112.8
Dump Truck*	TableC9/27	4	105.0	100.0%	0.0	111.0
Derrick Barge	CNP 061	2	104.0	100.0%	0.0	107.0
Crane*	TableC7/114	1	101.0	100.0%	0.0	101.0
					Total	117.1

2.8 Helipad Reprovisioning at HKCEC

2.8.1 Reprovisioning at HKCEC

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Breaker, excavator mounted*#	TableC8/13	2	110.0	100.0%	5.0	108.0
Excavator*#	TableC3/97	2	105.0	100.0%	5.0	103.0
Dump Truck*	TableC9/27	2	105.0	100.0%	0.0	108.0
Pilling rig#	CNP 164	1	115.0	100.0%	5.0	110.0
Generator*#	EPD-00064**	1	100.0	100.0%	5.0	95.0
Water Pump#	CNP 281	1	88.0	100.0%	10.0	78.0
Crane*	TableC7/114	1	101.0	100.0%	0.0	101.0
Concrete Pump*#	TableC6/36	2	106.0	100.0%	10.0	99.0
Concrete Lorry Mixer*	TableC6/35	4	100.0	100.0%	0.0	106.0
Derrick Barge	CNP061	1	104.0	100.0%	0.0	104.0
Poker Vibrator*#	TableC6/32	2	100.0	100.0%	5.0	98.0
Bar Bender#	CNP 021	1	90.0	100.0%	10.0	80.0
Air Compressor*#	TableC7/16	2	96.0	100.0%	10.0	89.0
					Total	115.3

2.9 Sewage Outfall

2.9.1 Marine Section

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane*	TableC7/114	2	101.0	100.0%	104.0
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.5

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

2.9.2 Land Section

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	1	101.0	100.0%	0.0	101.0
Breaker, excavator mounted*#	TableC8/13	1	110.0	100.0%	5.0	105.0
Eacavator*#	Table C3/97	1	105.0	100.0%	5.0	100.0
Dump Truck*	TableC9/27	2	105.0	100.0%	0.0	108.0
Concrete Lorry Mixer*	TableC6/35	1	100.0	100.0%	0.0	100.0
Poker Vibrator*#	TableC6/32	2	100.0	100.0%	5.0	98.0
Compactor, vibratory#	CNP 050	1	105.0	100.0%	5.0	100.0
Air Compressor*#	TableC7/16	1	96.0	100.0%	10.0	86.0
					Total	111.6

2.10 WSD's Salt Water Pumping Station

2.10A Diversion of Intake/Connection back to existing system

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	1	101.0	100.0%	0.0	101.0
Breaker, excavator mounted*#	TableC8/13	1	110.0	100.0%	5.0	105.0
Eacavator*#	Table C3/97	1	105.0	100.0%	5.0	100.0
Dump Truck*	TableC9/27	2	105.0	100.0%	0.0	108.0
Concrete Lorry Mixer*	TableC6/35	1	100.0	100.0%	0.0	100.0
Poker Vibrator*#	TableC6/32	2	100.0	100.0%	5.0	98.0
Compactor, vibratory#	CNP 050	1	105.0	100.0%	5.0	100.0
Air Compressor*#	TableC7/16	1	96.0	100.0%	10.0	86.0
					Total	111.6

2.10B Construction of new pumping station

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.0	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.0	92.0
					Total	111.3

2.11 Roads

2.11A Roadworks

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Dump Truck*	TableC9/27	2	105.0	100.0%	0.0	108.0
Excavator*#	TableC3/97	2	105.0	100.0%	5.0	103.0
Grader*#	TableC9/11	2	110.0	100.0%	5.0	108.0
Loader*#	TableC3/97	2	105.0	100.0%	5.0	103.0
Vibratory Roller*	Table C3/116	1	106.0	100.0%	0.0	106.0
Road Roller*	TableC8/27	1	104.0	100.0%	0.0	104.0
Asphalt Paver*	TableC8/24	2	101.0	100.0%	0.0	104.0
Planer	CNP 184	2	111.0	100.0%	0.0	114.0
					Total	117.1

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

Appendix 4.13 **Powered Mechanical Equipment (PME) for the Different Construction Tasks during Normal Daytime Working Hours (With Mitigation Measures)**

3 Hong Kong Convention and Exhibition Centre (HKCEC) Reclamation

3.1 HKCEC Reclamation Stage 1 (Water Channel)

3.1.1 Dredging, Seawalls & Filling

3.1.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

3.1.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane*	TableC7/114	2	101.0	100.0%	104.0
Barges	-	2	0.0	100.0%	0.0
				Total	112.4

3.1.1C Filling behind Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104	100.0%	107.0
Barges	-	2	0	100.0%	0
Tug Boat	CNP221	2	110	100.0%	113.0
Bulldozer*	TableC9/2	2	104.0	100.0%	107.0
				Total	114.8

3.1.2 Cooling Water Systems

Powered Mechanical Equipment (PME)	TableC3/97 other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.00	104.0
Excavator*#	TableC3/97	2	105.0	100.0%	5.00	103.0
Breaker, excavator mounted*#	TableC8/13	2	110.0	100.0%	5.00	108.0
Dump Truck*	TableC9/27	2	105.0	100.0%	0.00	108.0
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	0.00	103.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.00	101.0
Air Compressor*#	TableC7/16	2	96.0	100.0%	10.00	89.0
Compactor#	CNP 050	1	105.0	100.0%	5.00	100.0
					Total	113.3

3.1.3 CWB Tunnel

3.1.3A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	4	101.0	100.0%	0.00	107.0
Excavator*#	TableC3/97	4	105.0	100.0%	5.00	106.0
Dump Truck*	TableC9/27	8	105.0	100.0%	0.00	114.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.00	102.0
Concrete Lorry Mixer*	TableC6/35	4	100.0	100.0%	0.00	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.00	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.0	116.0
					Total	119.2

*Use of QPME
#Use of Barrier
**EPD wedsite (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

3.1.3B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.00	106.0
Dump Truck*	TableC9/27	12	105.0	100.0%	0.00	115.8
					Total	116.2

3.1.3C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.00	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.00	102.0
Concrete Lorry Mixer*	Table C6/35	8	100.0	100.0%	0.00	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.00	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.00	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.00	92.0
					Total	111.3

3.1.3D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.00	106.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.00	107.0
Roller*	TableC3/116	2	106.0	100.0%	0.00	109.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.00	111.0
					Total	114.7

3.2 HKCEC Reclamation Stage 2

3.2.1 Dredging, Seawalls & Filling

3.2.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

3.2.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane *	TableC7/114	2	101.0	100.0%	104.0
Barges	-	2	0.0	100.0%	0.0
				Total	112.4

3.2.1C Filling behind Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barges	-	2	0.0	100.0%	0
Tug Boat	CNP221	2	110.0	100.0%	113.0
Bulldozer*	TableC9/2	2	104.0	100.0%	107.0
				Total	114.8

*Use of QPME
#Use of Barrier
**EPD wedsite (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

3.2.1D Demolition of Structure

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Breaker, excavator mounted*#	TableC8/13	2	110.0	100.0%	5.00	108.0
Excavator*#	TableC3/97	2	105.0	100.0%	5.00	103.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.00	107.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.00	111.0
Crane *	TableC7/114	1	101.0	100.0%	0.00	101.0
					Total	114.4

3.2.2 Drainage Culverts (2 cell)

Powered Mechanical Equipment (PME)	TM Ref./ TableC2/10	No. Items	SWL/Item 110	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Dump Truck*	TableC9/27	4	105.0	100.0%	0.00	111.0
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	0.00	103.0
Excavator*#	TableC3/97	2	105.0	100.0%	5.00	103.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.00	101.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.00	107.0
Roller*	TableC3/116	2	106.0	100.0%	0.00	109.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.00	83.0
Air Compressor*#	TableC7/16	2	96.0	100.0%	10.00	89.0
					Total	114.9

3.2.4 Cooling Water Systems - Intakes Pipeline

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.00	104.0
Breaker, excavator mounted*#	TableC8/13	2	110.0	100.0%	5.00	108.0
Excavator*#	TableC3/97	2	105.0	100.0%	5.00	103.0
Dump Truck*	TableC9/27	2	105.0	100.0%	0.00	108.0
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	0.00	103.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.00	101.0
Air Compressor*#	TableC7/16	2	96.0	100.0%	10.00	89.0
Compactor#	CNP 050	1	105.0	100.0%	5.00	100.0
					Total	113.3

3.2.3 CWB Tunnel

3.2.3A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	4	101.0	100.0%	0.00	107.0
Excavator*#	TableC3/97	4	105.0	100.0%	5.00	106.0
Dump Truck*	TableC9/27	8	105.0	100.0%	0.00	114.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.00	102.0
Concrete Lorry Mixer*	TableC6/35	4	100.0	100.0%	0.00	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.00	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.00	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.00	116.0
					Total	119.2

3.2.3B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.00	106.0
Dump Truck*	TableC9/27	12	105.0	100.0%	0.00	115.8
					Total	116.2

*Use of QPME
#Use of Barrier
**EPD wedsite (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

3.2.3C Construction of slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.00	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.00	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.00	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.00	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.00	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.00	92.0
					Total	111.3

3.2.3D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	101.0	100.0%	5.00	102.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.00	107.0
Roller*	TableC3/116	2	106.0	100.0%	0.00	109.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.00	111.0
					Total	114.4

3.3 MTR Tunnel Crossing

3.3.1 Pilling

3.3.1A Pilling for CWB tunnel unit

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Piling Rig*#	CNP 164	2	115.0	100.0%	5.00	113.0
Generator*#	EPD-00064**	2	96.0	100.0%	5.00	94.0
Water Pump#	CNP 281	2	88.0	100.0%	10.00	81.0
Air Compressor*#	TableC7/16	2	96.0	100.0%	10.00	89.0
Concrete Pump*#	TableC6/36	2	106.0	100.0%	10.00	99.0
Barge	-	2	0.0	100.0%	0.00	0.0
Tug Boat	CNP 221	1	110.0	100.0%	0.0	110.0
					Total	114.9

3.3.1B Pilling for deck

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Piling Rig#	CNP 164	2	115.0	100.0%	5.00	113.0
Generator*#	EPD-00064**	2	96.0	100.0%	5.00	94.0
Water Pump#	CNP 281	2	88.0	100.0%	10.00	81.0
Air Compressor*#	TableC7/16	2	96.0	100.0%	10.00	89.0
Concrete Pump*#	TableC6/36	2	106.0	100.0%	10.00	99.0
Barge	-	2	0.0	100.0%	0.00	0.0
Tug Boat	CNP 221	1	110.0	100.0%	0.0	110.0
					Total	114.9

3.3.2 Tunnel & Deck Construction

3.3.2A Place precast CWB Tunnel Unit

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Cranes*	TableC7/114	6	101.0	100.0%	108.8
Barges		6	0.0	100.0%	0.0
Tug Boat	CNP 221	3	110.0	100.0%	114.8
				Total	115.7

*Use of QPME
#Use of Barrier
**EPD wedsite (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

3.3.2B Deck Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.00	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.00	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.00	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.00	101.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.00	92.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.00	83.0
					Total	111.3

3.4 HKCEC Reclamation Stage 3

3.4.1 Dredging, Seawalls & Filling

3.4.1A Dredging HKCEC3W, 3Ea & 3Eb

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	6	0.0	100.0%	0.0
				Total	117.1

3.4.1B Seawall Construction HKCEC3W & 3Eb

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane*	TableC7/114	2	101.0	100.0%	104.0
Barges	-	2	0.0	100.0%	0.0
				Total	112.4

3.4.1C Filling behind Seawall HKCEC3W, 3Ea & 3Eb

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104	100.0%	107.0
Barges	-	2	0	100.0%	0
Tug Boat	CNP221	2	110	100.0%	113.0
Bulldozer*	TableC9/2	2	104.0	100.0%	107.0
				Total	114.8

3.4.2 Demolition of Structure East Bridge

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Breaker, excavator mounted*#	Table C8/13	2	110.0	100.0%	5.00	108.0
Excavator*#	TableC3/97	2	105.0	100.0%	5.00	103.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.00	107.0
Dump Truck*	Table C9/27	4	105.0	100.0%	0.00	111.0
Crane *	TableC7/114	1	101.0	100.0%	0.00	101.0
					Total	114.4

3.4.3 Drainage Culverts (2 cell)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Dump Truck*	TableC9/27	4	105.0	100.0%	0.00	111.0
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	0.00	103.0
Excavator*#	TableC3/97	2	105.0	100.0%	5.00	103.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.00	101.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.00	107.0
Roller*	TableC3/116	2	106.0	100.0%	0.00	109.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.00	83.0
Air Compressor*#	TableC7/16	2	96.0	100.0%	10.00	89.0
					Total	114.9

*Use of QPME
#Use of Barrier
**EPD wedsite (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

3.4.4 CWB Tunnel

3.4.4A Diaphragm Wall HKCEC3Ea

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	4	101.0	100.0%	0.00	107.0
Excavator*#	TableC3/97	4	105.0	100.0%	5.00	106.0
Dump Truck*	TableC9/27	8	105.0	100.0%	0.00	114.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.00	102.0
Concrete Lorry Mixer*	TableC6/35	4	100.0	100.0%	0.00	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.00	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.00	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.00	116.0
					Total	119.2

3.4.4B Excavation HKCEC3Ea

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	101 dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.00	106.0
Dump Truck*	TableC9/27	12	105.0	100.0%	0.00	115.8
					Total	116.2

3.4.4C Construction of slabs HKCEC3Ea

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.00	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.00	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.00	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.00	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.00	83.0
Air Compressor*#	TableC6/32	4	96.0	100.0%	10.00	92.0
					Total	111.3

3.4.4D Backfill HKCEC3Ea

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	101.0	100.0%	5.00	102.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.00	107.0
Roller*	TableC3/116	2	106.0	100.0%	0.00	109.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.00	111.0
					Total	114.4

3.4.4E Diaphragm Wall HKCEC3W & Eb

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	4	101.0	100.0%	0.00	107.0
Excavator*#	TableC3/97	4	105.0	100.0%	5.00	106.0
Dump Truck*	TableC9/27	8	105.0	100.0%	0.00	114.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.00	102.0
Concrete Lorry Mixer*	TableC6/35	4	100.0	100.0%	0.00	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.00	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.00	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.00	116.0
					Total	119.2

*Use of QPME
#Use of Barrier
**EPD wedsite (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

3.4.4F Excavation HKCEC3W & Eb

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.00	106.0
Dump Truck*	TableC9/27	12	105.0	100.0%	0.00	115.8
					Total	116.2

3.4.4G Construction of slabs HKCEC3W & Eb

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	100.0%	0.00	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.00	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.00	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.00	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.00	83.0
Air Compressor*#	TableC6/32	4	96.0	100.0%	10.00	92.0
					Total	111.3

3.4.4H Backfill HKCEC3W & Eb

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	101.0	100.0%	5.00	102.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.00	107.0
Roller*	TableC3/116	2	106.0	100.0%	0.00	109.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.00	111.0
					Total	114.4

3.5 Roads

3.5 Roadworks

Powered Mechanical Equipment	TM Ref./ other Ref.	No. Items	101 101	On-time %	Noise Barrier 500.0%	Total SWL dB(A)
Dump Truck*#	TableC9/27	2	105.0	100.0%	5.00	103.0
Excavator*#	TableC3/97	2	105.0	100.0%	5.00	103.0
Grader*#	TableC9/11	2	110.0	100.0%	5.00	108.0
Loader*#	TableC3/97	2	105.0	100.0%	5.00	103.0
Vibratory Roller	CNP 186	1	108.0	100.0%	0.00	108.0
Road Roller*	TableC8/30	1	101.0	100.0%	0.00	101.0
Asphalt Paver*	TableC8/24	2	101.0	100.0%	0.00	104.0
Planer	CNP 184	2	111.0	100.0%	0.00	114.0
					Total	116.8

*Use of QPME
#Use of Barrier
**EPD wedsite (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

Appendix 4.13

Powered Mechanical Equipment (PME) for the Different Construction Tasks during Normal Daytime Working Hours (With Mitigation Measures)

4 Cross Harbour Watermains

4.1 SubmarinePipeline

4.1 Marine Section

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane*	Table C7/114	2	101.0	100.0%	104.0
Dredger	CNP 063	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.5

4.2 Land Section

4.2 Land Section

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	1	101.0	100.0%	0.0	101.0
Breaker, excavator mounted*#	Table C8/13	1	110.0	100.0%	5.0	105.0
Excavator*#	TableC3/97	1	105.0	100.0%	5.0	100.0
Dump Truck*	TableC9/27	2	105.0	100.0%	0.0	108.0
Concrete Lorry Mixer*	TableC6/35	1	100.0	100.0%	0.0	100.0
Poker Vibrator*#	TableC6/35	2	100.0	100.0%	5.0	98.0
Compactor, vibratory	CNP 050	1	105.0	100.0%	0.0	105.0
Air Compressor*#	TableC6/35	1	96.0	100.0%	10.0	86.0
					Total	112.2

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

Appendix 4.13

Powered Mechanical Equipment (PME) for the Different Construction Tasks during Normal Daytime Working Hours (With Mitigation Measures)

5 North Point Reclamtion

5.1 North Point Reclamtion Stage 1

5.1.1 Dredging, Seawalls & Filling

5.1.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	60.0%	110.8
Barges	-	4	0.0	100.0%	0.0
				Total	116.4

5.1.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	60.0%	107.8
Crane*	TableC7/114	2	101.0	70.0%	102.5
Barges	-	2	0.0	100.0%	0.0
				Total	111.1

5.1.1C Filling behind Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barges	-	2	0.0	100.0%	0
Tug Boat	CNP221	2	110.0	60.0%	110.8
Bulldozer*	TableC9/2	2	104.0	100.0%	107.0
				Total	113.4

5.1.2 CWB Tunnel

5.1.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*#	TableC7/114	4	101.0	70.0%	10.0	95.5
Excavator*#	TableC3/97	4	105.0	70.0%	10.0	99.5
Dump Truck*#	TableC9/27	8	105.0	100.0%	10.0	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*#	TableC6/35	4	100.0	100.0%	10.0	96.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	10.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Diaphragm Wall Rigs#	CNP164	4	115.0	100.0%	10.0	111.0
					Total	112.9

5.1.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	70.0%	5.0	104.5
Dump Truck*	TableC9/27	12	105.0	100.0%	0.0	115.8
					Total	116.1

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

5.1.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	70.0%	0.0	102.5
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	TableC6/32	4	100.0	70.0%	5.0	99.5
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.0	92.0
					Total	110.9

5.1.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	70.0%	5.0	104.5
Bulldozer*	TableC9/2	2	104.0	100.0%	0.0	107.0
Roller*	TableC8/27	2	104.0	100.0%	0.0	107.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.0	111.0
					Total	114.1

5.2 North Point Reclamtion Stage 2

5.2.1 Dredging, Seawalls & Filling(NPR2E)

5.2.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	60.0%	110.8
Barges	-	4	0.0	100.0%	0.0
				Total	116.4

5.2.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	101.0	60.0%	98.8
Crane*	TableC7/114	2	101.0	70.0%	102.5
Barges	-	2	0.0	100.0%	0.0
				Total	108.8

5.2.1C Filling behind Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104	100.0%	107.0
Barges	-	2	0	100.0%	0
Tug Boat	CNP221	2	110	60.0%	110.8
Bulldozer*	Table C9/2	2	104.0	100.0%	107.0
				Total	113.4

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

5.2.2 CWB Tunnel (NPR2W)

5.2.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*#	TableC7/114	4	101.0	70.0%	10.0	95.5
Excavator*#	TableC3/97	4	105.0	70.0%	10.0	99.5
Dump Truck*#	TableC9/27	8	105.0	100.0%	10.0	104.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*#	TableC6/35	4	100.0	100.0%	10.0	96.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	10.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	10.0	111.0
					Total	112.9

5.2.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	70.0%	5.0	104.5
Dump Truck*	TableC9/27	12	105.0	100.0%	0.0	115.8
					Total	116.1

5.2.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	2	101.0	70.0%	0.0	102.5
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	TableC6/32	4	100.0	70.0%	5.0	99.5
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.0	92.0
					Total	110.9

5.2.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	70.0%	5.0	104.5
Bulldozer*	TableC9/2	2	104.0	100.0%	0.0	107.0
Roller*	TableC3/116	2	106.0	100.0%	0.0	109.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.0	111.0
					Total	114.5

5.2.2E Foundation of East Vent Building

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*#	TableC7/114	2	101.0	70.0%	10.0	92.5
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*#	TableC6/35	8	100.0	100.0%	10.0	99.0
Poker Vibrator*#	TableC6/32	4	100.0	70.0%	10.0	94.5
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.0	92.0
					Total	104.8

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging.

Powered Mechanical Equipment (PME) for the Different Construction Tasks during Normal Daytime Working Hours (With Mitigation Measures)

6.0 Construction of IECL

6.2 IEC Connection Work

6.2A Substructures(Group 1 and 2 PME)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Concrete Lorry Mixer*#	Table C6/35	2	100.0	100.0%	10.0	93.0
Poker Vibrator*#	TableC6/32	2	100.0	70.0%	10.0	91.5
Crane*#	TableC7/114	1	101.0	70.0%	10.0	89.5
Air Compressor*#	TableC7/16	5	96.0	100.0%	10.0	93.0
Excavator*#	TableC3/97	2	105.0	70.0%	10.0	96.5
Water Pump#	CNP 281	6	88.0	100.0%	10.0	85.8
Concrete Pump*#	TableC6/35	2	100.0	100.0%	10.0	93.0
Piling, Large diameter bored#	CNP 164	1	115.0	100.0%	10.0	105.0
					Total	106.5

6.2A Substructures(Group 1 PME)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Concrete Lorry Mixer*#	TableC6/35	1	100.0	70.0%	10.0	88.5
Poker Vibrator*#	TableC6/32	1	100.0	70.0%	10.0	88.5
Crane*#	TableC7/114	1	101.0	70.0%	10.0	89.5
Compressor*#	TableC7/16	1	96.0	100.0%	10.0	86.0
Concrete Pump*#	TableC6/36	1	106.0	100.0%	10.0	96.0
					Total	98.2

6.2A Substructures(Group 2 PME)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*#	TableC7/114	1	101.0	70.0%	10.0	89.5
Excavator*#	TableC3/97	1	105.0	50.0%	10.0	92.0
Water Pump#	CNP 281	1	88.0	100.0%	10.0	78.0
Piling, Large diameter bored#	CNP 164	1	115.0	100.0%	10.0	105.0
					Total	105.3

6.2B Superstructures

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Concrete Lorry Mixer#	TableC6/35	2	100.0	100.0%	0.0	103.0
Poker Vibrator*#	TableC6/32	2	100.0	70.0%	5.0	96.5
Crane*	TableC7/114	1	101.0	70.0%	0.0	99.5
Compressor*#	TableC7/16	5	96.0	100.0%	10.0	93.0
Excavator*#	TableC3/97	2	105.0	70.0%	5.0	101.5
Water Pump#	CNP 281	6	88.0	100.0%	10.0	85.8
Concrete Pump*#	TableC6/35	2	100.0	100.0%	10.0	93.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
					Total	107.1

6.2A Substructures(Group 1 and 2 PME)(For Marine Works)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Concrete Lorry Mixer*#	Table C6/35	2	100.0	100.0%	0.0	103.0
Poker Vibrator*#	TableC6/32	2	100.0	70.0%	5.0	96.5
Crane*#	TableC7/114	1	101.0	70.0%	0.0	99.5
Air Compressor*#	TableC7/16	5	96.0	100.0%	10.0	93.0
Water Pump#	CNP 281	6	88.0	100.0%	10.0	85.8
Concrete Pump*#	TableC6/35	2	100.0	100.0%	10.0	93.0
Piling, Large diameter bored#	CNP 164	1	115.0	100.0%	5.0	110.0
Tug boat	CNP 221	1	110.0	50.0%	0.0	107.0
Barges	-	2	0.0	100.0%	0.0	0.0
					Total	112.7

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging

6.2A Substructures(Group 1 PME)(For Marine Works)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Concrete Lorry Mixer*#	TableC6/35	1	100.0	70.0%	0.0	98.5
Poker Vibrator*#	TableC6/32	1	100.0	70.0%	5.0	93.5
Crane*#	TableC7/114	1	101.0	70.0%	0.0	99.5
Compressor*#	TableC7/16	1	96.0	100.0%	10.0	86.0
Concrete Pump*#	TableC6/36	1	106.0	100.0%	10.0	96.0
Tug boat	CNP 221	1	110.0	50.0%	0.0	107.0
Barges	-	1	0.0	100.0%	0.0	0.0
					Total	108.6

6.2A Substructures(Group 2 PME)(For Marine Works)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*#	TableC7/114	1	101.0	70.0%	0.0	99.5
Water Pump#	CNP 281	1	88.0	100.0%	10.0	78.0
Piling, Large diameter bored#	CNP 164	1	115.0	100.0%	5.0	110.0
Tug boat	CNP 221	1	110.0	50.0%	0.0	107.0
Barges	-	1	0.0	100.0%	0.0	0.0
					Total	112.0

6.2B Superstructures(For Marine Works)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Concrete Lorry Mixer#	TableC6/35	2	100.0	100.0%	0.0	103.0
Poker Vibrator*#	TableC6/32	2	100.0	70.0%	5.0	96.5
Crane*	TableC7/114	1	101.0	70.0%	0.0	99.5
Compressor*#	TableC7/16	5	96.0	100.0%	10.0	93.0
Excavator*#	TableC3/97	2	105.0	70.0%	5.0	101.5
Water Pump#	CNP 281	6	88.0	100.0%	10.0	85.8
Concrete Pump*#	TableC6/35	2	100.0	100.0%	10.0	93.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Tug boat	CNP 221	1	110.0	50.0%	0.0	107.0
Barges	-	2	0.0	100.0%	0.0	0.0
					Total	110.1

6.2C Demolition of Structure (For IEC E/B)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Breaker, excavator mounted*#	TableC8/13	2	110.0	80.0%	5.0	107.0
Hand-held Breaker*#	Table C2/10	2	110.0	100.0%	5.0	108.0
Backhoe*	TableC3/97	2	105.0	70.0%	5.0	101.5
Dump Truck*	TableC9/27	4	105.0	70.0%	0.0	109.5
Crane*	TableC7/114	1	101.0	100.0%	0.0	101.0
					Total	113.6

6.2C Demolition of Structure (For IEC W/B)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Breaker, excavator mounted*#	TableC8/13	1	110.0	80.0%	5.0	104.0
Hand-held Breaker*#	Table C2/10	1	110.0	100.0%	5.0	105.0
Backhoe*	TableC3/97	1	105.0	70.0%	5.0	98.5
Dump Truck*	TableC9/27	2	105.0	70.0%	0.0	106.5
Crane*	TableC7/114	1	101.0	100.0%	0.0	101.0
					Total	110.8

6.2C Demolition of Structure (For IEC E/B)(For Marine Works)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Breaker, excavator mounted*#	TableC8/13	2	110.0	80.0%	5.0	107.0
Hand-held Breaker*#	Table C2/10	2	110.0	100.0%	5.0	108.0
Backhoe*	TableC3/97	2	105.0	70.0%	5.0	101.5
Dump Truck*	TableC9/27	4	105.0	70.0%	0.0	109.5
Tug boat	CNP 221	1	110.0	100.0%	0.0	110.0
Barges	-	2	0.0	100.0%	0.0	0.0
Crane*	TableC7/114	1	101.0	100.0%	0.0	101.0
					Total	115.2

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging

6.2C Demolition of Structure (For IEC W/B)(For Marine Works)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Breaker, excavator mounted*#	TableC8/13	1	110.0	80.0%	5.0	104.0
Hand-held Breaker*#	Table C2/10	1	110.0	100.0%	5.0	105.0
Backhoe*	TableC3/97	1	105.0	70.0%	5.0	98.5
Dump Truck*	TableC9/27	2	105.0	70.0%	0.0	106.5
Tug boat	CNP 221	1	110.0	100.0%	0.0	110.0
Barges	-	2	0.0	100.0%	0.0	0.0
Crane*	TableC7/114	1	101.0	100.0%	0.0	101.0
					Total	113.4

6.3 East Portal and IEC Connection Work

6.3.1 Substructures

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	10.0	93.0
Poker Vibrator*#	TableC6/32	2	100.0	70.0%	10.0	91.5
Crane*	TableC7/114	1	101.0	70.0%	10.0	89.5
Air Compressor*#	TableC7/16	5	96.0	100.0%	10.0	93.0
Excavator*#	TableC3/97	2	105.0	70.0%	10.0	96.5
Water Pump#	CNP 281	6	88.0	100.0%	10.0	85.8
Concrete Pump*#	TableC6/36	2	106.0	100.0%	10.0	99.0
Piling, Large diameter bored#	CNP 164	1	115.0	100.0%	10.0	105.0
					Total	107.0

6.3.2 Retaining Structures

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Concrete Lorry Mixer*#	TableC6/35	2	100.0	100.0%	0.0	103.0
Poker Vibrator*#	TableC6/32	2	100.0	70.0%	5.0	96.5
Crane*#	TableC7/114	1	101.0	70.0%	0.0	99.5
Air Compressor*#	TableC7/16	5	96.0	100.0%	10.0	93.0
Excavator*#	TableC3/97	2	105.0	70.0%	5.0	101.5
Water Pump#	CNP 281	6	88.0	100.0%	10.0	85.8
Concrete Pump*#	TableC6/36	2	106.0	100.0%	10.0	99.0
Piling, Large diameter bored#	CNP 164	1	115.0	100.0%	5.0	110.0
					Total	112.0

6.3.3 Demolition of Structure

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Breaker, excavator mounted*#	TableC8/13	2	110.0	70.0%	5.0	106.5
Excavator*#	TableC3/97	2	105.0	80.0%	5.0	102.0
Hand-held Breaker*#	TableC2/10	2	110.0	100.0%	5.0	108.0
Dump Truck*	TableC9/27	4	105.0	70.0%	0.0	109.5
Crane*	TableC7/114	1	101.0	100.0%	0.0	101.0
					Total	113.5

7.0 Construction of Central Interchange

7.1.1 Road Formation & Earthworks

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Lorry	CNP 141	1	112.0	100.0%	0.0	112.0
Dump Truck*	TableC9/31	6	110.0	100.0%	0.0	117.8
Excavator*#	TableC3/97	2	105.0	70.0%	5.0	101.5
Grader*#	TableC9/11	1	110.0	100.0%	5.0	105.0
Roller*	TableC3/116	2	106.0	100.0%	0.0	109.0
Loader*#	TableC3/97	1	105.0	100.0%	5.0	100.0
					Total	119.5

7.1.2 Road Pavement + misc

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	101 110	On-Time %	Noise Barrier Reduction	Total SWL dB(A)
Vibratory Roller*	TableC3/116	1	106.0	100.0%	0.0	106.0
Roller*	TableC3/116	1	106.0	100.0%	0.0	106.0
Asphalt paver*#	TableC8/24	1	101.0	100.0%	5.0	96.0
Dump Truck*	TableC9/2	4	105.0	100.0%	0.0	111.0
					Total	113.2

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging

7.1.3 Building Construction for west ventilation building - Building Foundation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Lorry	CNP 141	4	112.0	100.0%	0.0	118.0
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	0.0	103.0
Bentonite Filtering Plant#	CNP 162	1	105.0	100.0%	5.0	100.0
Piling, Large diameter bored#	CNP 164	1	115.0	100.0%	5.0	110.0
Excavator*#	TableC3/97	2	105.0	70.0%	5.0	101.5
Concrete Pump*#	TableC6/36	2	106.0	100.0%	10.0	99.0
Water Pump#	CNP 281	2	88.0	100.0%	10.0	81.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Poker Vibrator*#	TableC6/32	4	100.0	70.0%	5.0	99.5
					Total	119.0

7.1.4 Building Superstructure

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-Time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	1	101.0	70.0%	0.0	99.5
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Concrete Lorry Mixer*	TableC6/35	1	100.0	100.0%	0.0	100.0
Concrete Pump*#	TableC6/36	1	106.0	100.0%	10.0	96.0
Poker Vibrator*#	Table C6/32	2	100.0	100.0%	5.0	98.0
					Total	104.6

7.1.5 Tunnel Construction - Diaphragm Walls

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*#	TableC7/114	2	101.0	70.0%	10.0	92.5
Dump Truck*#	TableC9/27	2	105.0	100.0%	10.0	98.0
Excavator*#	TableC3/97	1	105.0	70.0%	10.0	93.5
Concrete Pump*#	TableC6/36	2	106.0	100.0%	10.0	99.0
Concrete Lorry Mixer*#	TableC6/35	2	100.0	100.0%	10.0	93.0
Bentonite Plant#	CNP 162	2	105.0	100.0%	10.0	98.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Diaphragm Wall Rig#	CNP 164	2	115.0	100.0%	10.0	108.0
					Total	109.5

7.1.6 Excavation between walls

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-Time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	2	105.0	70.0%	5.0	101.5
Bulldozer*	TableC9/2	1	104.0	100.0%	0.0	104.0
Dump Truck*	TableC9/27	6	105.0	100.0%	0.0	112.8
					Total	113.6

7.1.7 RC Slab Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-Time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	1	101.0	70.0%	0.0	99.5
Concrete Pumps*#	TableC6/36	2	106.0	100.0%	10.0	99.0
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	0.0	103.0
Poker Vibrator*#	Table C6/32	2	100.0	100.0%	5.0	98.0
Bar Bender#	CNP 021	1	90.0	100.0%	10.0	80.0
Air Compressor*#	TableC7/16	1	96.0	100.0%	10.0	86.0
					Total	106.4

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging

7.1.8 Tunnel Modification at Road D5 Junction

Powered Mechanical Equipment	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Piling, Large diameter bored#	CNP 164	1	115.0	100.0%	5.0	110.0
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	0.0	103.0
Concrete Pump*#	TableC6/36	2	106.0	100.0%	10.0	99.0
Excavator*#	TableC3/97	1	105.0	70.0%	5.0	98.5
Dump Trucks*	TableC9/31	2	110.0	100.0%	0.0	113.0
Water Pump#	CNP 281	2	88.0	100.0%	10.0	81.0
Crane*	TableC7/114	1	101.0	70.0%	0.0	99.5
					Total	115.4

7.1.9 Deck Formation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	0.0	103.0
Poker Vibrator*#	TableC6/32	2	100.0	70.0%	5.0	96.5
Crane*	TableC7/114	1	101.0	70.0%	0.0	99.5
Air Compressor#	CNP 002	2	96.0	100.0%	10.0	89.0
Concrete Pump*#	TableC6/36	2	106.0	100.0%	10.0	99.0
					Total	106.2

7.1.10 Road Pavement for Deck

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-Time %	Noise Barrier Reduction	Total SWL dB(A)
Vibratory Roller*	TableC3/116	1	106.0	100.0%	0.0	106.0
Roller*	TableC8/27	1	104.0	100.0%	0.0	104.0
Asphalt paver*#	TableC8/24	1	101.0	100.0%	5.0	96.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.0	111.0
					Total	112.9

7.1.11 Foundation Work for Road

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	0.0	103.0
Poker Vibrator*#	TableC6/32	2	100.0	70.0%	5.0	96.5
Crane*	TableC7/114	1	101.0	70.0%	0.0	99.5
Air Compressor*#	TableC7/16	5	96.0	100.0%	10.0	93.0
Excavator*#	TableC3/97	2	105.0	70.0%	5.0	101.5
Water Pump#	CNP 281	6	88.0	100.0%	10.0	85.8
Concrete Pump*#	TableC6/36	2	106.0	100.0%	10.0	99.0
Piling, Large diameter bored#	CNP 164	1	115.0	100.0%	5.0	110.0
					Total	112.0

8.0 Construction of CWB Tunnel under CRIII

8.0 Construction of CWB Tunnel under CRIII at Initial Reclamation Area East, Final Reclamtion Area West, & Final Reclamation Area East

8.0A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Crane*	TableC7/114	4	101.0	100.0%	0.0	107.0
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	TableC9/27	8	105.0	100.0%	0.0	114.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	4	100.0	100.0%	0.0	106.0
Bentonite Plants#	CNP 162	4	105.0	100.0%	5.0	106.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Diaphragm Wall Rigs#	CNP 164	4	115.0	100.0%	5.0	116.0
					Total	119.2

8.0B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Dump Truck*	TableC9/29	12	105.0	105.0%	0.0	116.0
					Total	116.4

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging

8.0C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Diaphragm Wall Rigs#	CNP164	2	115.0	100.0%	5.0	113.0
Concrete Pump*#	TableC6/36	4	106.0	100.0%	10.0	102.0
Concrete Lorry Mixer*	TableC6/35	8	100.0	100.0%	0.0	109.0
Poker Vibrator*#	TableC6/32	4	100.0	100.0%	5.0	101.0
Bar Bender#	CNP 021	2	90.0	100.0%	10.0	83.0
Air Compressor*#	TableC7/16	4	96.0	100.0%	10.0	92.0
					Total	114.9

8.0D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Excavator*#	TableC3/97	4	105.0	100.0%	5.0	106.0
Bulldozer*	TableC9/2	2	104.0	100.0%	0.0	107.0
Roller*	TableC8/27	2	104.0	100.0%	5.0	102.0
Dump Truck*	TableC9/27	4	105.0	100.0%	0.0	111.0
					Total	113.7

9.0 Tunnel Building and Installation

9.0 Tunnel Building and Installation at East Ventilation Building, Adminisatrtion Building, & Central Ventilation Building, West Ventilation Building

9.0A Substructures

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	0.0	103.0
Poker Vibrator*#	TableC6/32	2	100.0	70.0%	5.0	96.5
Crane*	TableC7/114	1	101.0	70.0%	0.0	99.5
Compressor*#	TableC7/16	5	96.0	100.0%	10.0	93.0
Excavator*#	TableC3/97	2	105.0	70.0%	5.0	101.5
Water Pump#	CNP 281	6	88.0	100.0%	10.0	85.8
Concrete Pump*#	TableC6/35	2	100.0	100.0%	10.0	93.0
Piling, Large diameter bored#	CNP 164	1	115.0	100.0%	5.0	110.0
					Total	111.8

9.0B Superstructures

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Noise Barrier Reduction	Total SWL dB(A)
Concrete Lorry Mixer*	TableC6/35	2	100.0	100.0%	0.0	103.0
Poker Vibrator*	TableC6/32	2	100.0	70.0%	5.0	96.5
Crane*	TableC7/114	1	101.0	70.0%	0.0	99.5
Compressor*#	TableC7/16	5	96.0	100.0%	10.0	93.0
Excavator*#	TableC3/97	2	105.0	70.0%	5.0	101.5
Water Pump#	CNP 281	6	88.0	100.0%	10.0	85.8
Concrete Pump*#	TableC6/35	2	100.0	100.0%	10.0	93.0
Piling, Large diameter bored#	CNP 164	1	115.0	100.0%	5.0	110.0
					Total	111.8

*Use of QPME
#Use of Barrier
**EPD website (www.epd.gov.hk/cgi-bin/npg/qpme/search.gen.pl)
Note: No noise emits from barges during dredging

Appendix 4.5 **Powered Mechanical Equipment (PME) for the Different Construction Tasks during Normal Daytime Working Hours (Without Mitigation Measures)**

1 Causeway Bay Reclamation

1.1 Temporary Relocation CBTS

1.1.1 Temporary Breakwater

1.1.1A Dredging, Filling and Armour Placing

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

1.1.1B Piling

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Piling Rig	CNP 164	2	115.0	100.0%	118.0
Generator	CNP 102	2	100.0	100.0%	103.0
Water Pump	CNP 281	2	88.0	100.0%	91.0
Air Compressor	CNP 002	2	100.0	100.0%	103.0
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Barge	-	2	0.0	100.0%	0.0
				Total	119.2

1.2 CBTS Temporary Reclamation Stage I

1.2.1 Dredging, Seawalls & Filling (TCBR1)

1.2.1A Dredging (TCBR1E)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	60.0%	110.8
Barges	-	4	0.0	100.0%	0.0
				Total	116.4

1.2.1B Temporary Seawall (TCBR1E)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	60.0%	107.8
Crane	CNP 048	2	112.0	70.0%	113.5
Barges	-	2	0.0	100.0%	0.0
				Total	115.2

1.2.1C Filling behind seawall (TCBR1E)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	3.0
Tug Boat	CNP 221	2	110.0	60.0%	110.8
Bulldozer	CNP 030	2	115.0	100.0%	118.0
				Total	119.0

Note: No noise emits from barges during dredging.

1.2.1D Dredging (TCBR1W)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

1.2.1E Temporary Seawall (TCBR1W)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.7

1.2.1F Filling behind seawall (TCBR1W)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	3.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
				Total	119.5

1.2.2 CWB Tunnel (TCBR1)

1.2.2A Diaphragm Wall (TCBR1E)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	70.0%	116.5
Excavator	CNP 081	4	112.0	70.0%	116.5
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.4

1.2.2B Excavation (TCBR1E)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	70.0%	116.5
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.1

Note: No noise emits from barges during dredging.

1.2.2C Construction of Slabs (TCBR1E)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	70.0%	113.5
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	70.0%	117.5
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	122.5

1.2.2D Backfill (TCBR1E)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	70.0%	116.5
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.1

1.2.2E Diaphragm Wall (TCBR1W)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	100.0%	118.0
Excavator	CNP 081	4	112.0	100.0%	118.0
DumpTruck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.6

1.2.2F Excavation (TCBR1W)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	8	112.0	100.0%	121.0
Dump Truck	CNP 067	24	117.0	100.0%	130.8
				Total	131.2

1.2.2G Construction of Slabs (TCBR1W)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

Note: No noise emits from barges during dredging.

1.2.2H Backfill (TCBR1W)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

1.2.3 CWB Tunnel (CHT)

1.2.3A Rock Blasting/Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Breaker	CNP 027	2	122.0	100.0%	125.0
Backhoe	CNP 081	2	112.0	100.0%	115.0
Ventilation fan	CNP241	2	108.0	100.0%	111.0
Rock Drill	CNP182	2	123.0	100.0%	126.0
Truck	CNP 067	4	117.0	100.0%	123.0
Crane	CNP 048	1	112.0	100.0%	112.0
				Total	129.9

1.2.3B Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

1.3 CBTS Temporary Reclamation Stage 2

1.3.1 Dredging, Seawalls & Filling (TCBR2)

1.3.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

1.3.1B Temporary Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.7

Note: No noise emits from barges during dredging.

1.3.1C Filling behind seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
				Total	119.5

1.3.2 CWB Tunnel

1.3.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	100.0%	118.0
Excavator	CNP 081	4	112.0	100.0%	118.0
DumpTruck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.6

1.3.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.2

1.3.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

1.3.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

Note: No noise emits from barges during dredging.

1.4 CBTS Temporary Reclamation Stage 3

1.4.1 Dredging, Seawalls & Filling (TCBR3)

1.4.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

1.4.1B Temporary Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.7

1.4.1C Filling behind seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	3.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
				Total	119.5

1.4.2 CWB Tunnel

1.4.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	100.0%	118.0
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.6

1.4.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.2

Note: No noise emits from barges during dredging.

1.4.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

1.4.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

1.5 CBTS Temporary Reclamation Stage 4

1.5.1 Dredging, Seawalls & Filling (TCBR4)

1.5.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

1.5.1B Temporary Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.7

1.5.1C Filling behind seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	3.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
				Total	119.5

Note: No noise emits from barges during dredging.

1.5.2 CWB Tunnel

1.5.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	100.0%	118.0
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Truck	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121:0
				Total	128.6

1.5.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	8	112.0	100.0%	121.0
Dump Truck	CNP 067	24	117.0	100.0%	130.8
				Total	131.2

1.5.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

1.5.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

1.6 Temporary diversion of cooling system

1.6.1 Temporary cooling water pipeline

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Excavator	CNP 081	2	112.0	100.0%	115.0
Dump Truck	CNP 067	2	117.0	100.0%	120.0
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Air Compressor	CNP 002	2	100.0	100.0%	103.0
Compactor	CNP 050	1	105.0	100.0%	105.0
				Total	124.2

Note: No noise emits from barges during dredging.

1.9 Slip Road 8 & Victoria Park Reprovisioning

1.9.1 Slip Road 8 Tunnel

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Pilling Rig	CNP 164	2	115.0	100.0%	118.0
Generator	CNP 102	2	100.0	100.0%	103.0
Water Pump	CNP 281	2	88.0	100.0%	91.0
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	124.4

1.9.2 At-grade Road

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Dump Truck	CNP 067	2	117.0	70.0%	118.5
Excavator	CNP 081	2	112.0	80.0%	114.0
Grader	CNP 104	2	113.0	80.0%	115.0
Loader	CNP 081	2	112.0	80.0%	114.0
Vibratory Roller	CNP 186	1	108.0	80.0%	107.0
Road Roller	CNP 185	1	108.0	80.0%	107.0
Asphalt Paver	CNP 004	2	109.0	80.0%	111.0
Planer	CNP 184	2	111.0	80.0%	113.0
				Total	122.9

1.9.3 Landscape Deck

1.9.3A Substructure works

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Pilling Rig	CNP 164	2	115.0	100.0%	118.0
Generator	CNP 102	2	100.0	100.0%	103.0
Water Pump	CNP 281	2	88.0	100.0%	91.0
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	124.4

1.9.3B Superstructure works

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

Note: No noise emits from barges during dredging.

Appendix 4.5 **Powered Mechanical Equipment (PME) for the Different Construction Tasks during Normal Daytime Working Hours (Without Mitigation Measures)**

2 Wan Chai Reclamation

2.1 Wan Chai Reclamation Stage 1 (WCR1)

2.1.1 Dredging , Seawalls & Filling

2.1.1A Dredging(=Removal Temp. seawall)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

2.1.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.7

2.1.1C Filling behind seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
				Total	119.5

2.1.2 Drainage Culverts (2 cell)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Dump Trunk	CNP 067	4	117.0	100.0%	123.0
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Excavator	CNP 081	2	112.0	100.0%	115.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	2	100.0	100.0%	103.0
				Total	126.1

2.1.3 Cooling Water System

2.1.3A Cooling water intake chamber

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.2

Note: No noise emits from barges during dredging.

2.1.3B Pipeline works

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Excavator	CNP 081	2	112.0	100.0%	115.0
Dump Truck	CNP 067	2	117.0	100.0%	120.0
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Compressor	CNP 002	2	102.0	100.0%	105.0
Compactor	CNP 050	1	105.0	100.0%	105.0
				Total	124.2

2.1.4 CWB Tunnel

2.1.4A Diaphragm Wall (WCR1)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	100.0%	118.0
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.6

2.1.4B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.2

2.1.4C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

2.1.4D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

2.2 Wan Chai Reclamation Stage 2 (WCR2)

2.2.1 Dredging, Seawalls & Filling

2.2.1A Dredging(=Removal Temp. seawall)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

Note: No noise emits from barges during dredging.

2.2.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.7

2.2.1C Filling behind seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
				Total	119.5

2.2.2 CWB Tunnel

2.2.2A Diaphragm Wall (WCR2)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	100.0%	118.0
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.6

2.2.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.2

2.2.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

2.2.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

Note: No noise emits from barges during dredging.

2.3 Wan Chai Reclamation Stage 3 (WCR3)

2.3.1 Dredging, Seawalls & Filling

2.3.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	6	0.0	100.0%	0.0
				Total	117.1

2.3.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.7

2.3.1C Filling behind Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
				Total	119.5

2.3.2 CWB Tunnel (WCR3)

2.3.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	8	112.0	100.0%	121.0
Excavator	CNP 081	8	112.0	100.0%	121.0
Dump Truck	CNP 067	16	117.0	100.0%	129.0
Concrete Pump	CNP 047	8	109.0	100.0%	118.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Bentonite Plants	CNP 162	8	105.0	100.0%	114.0
Bar Bender	CNP 021	4	90.0	100.0%	96.0
Diaphragm Wall Rigs	CNP 164	8	115.0	100.0%	124.0
				Total	131.6

2.3.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.2

2.3.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

Note: No noise emits from barges during dredging.

2.3.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

2.4 Wan Chai Reclamation Stage 4 (WCR4)

2.4.1 Dredging, Seawalls & Filling

2.4.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	6	0.0	100.0%	0.0
				Total	117.1

2.4.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.7

2.4.1C Filling behind Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
				Total	119.5

2.4.2 Drainage Culvert (WCR4)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Dump Trunk	CNP 067	4	117.0	100.0%	123.0
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Excavator	CNP 081	2	112.0	100.0%	115.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	2	100.0	100.0%	103.0
				Total	126.1

2.4.3 CWB Tunnel (WCR4)

2.4.3A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	100.0%	118.0
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.6

Note: No noise emits from barges during dredging.

2.4.3B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.2

2.4.3C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

2.4.3D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

2.5 Temporary Reclamation at PCWA Stage 1

2.5.1 Dredging , Seawalls & Filling (TPCWAE)

2.5.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

2.5.1B Temporary Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.7

2.5.1C Filling behind seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer	CNP 221	2	115.0	100.0%	118.0
				Total	119.5

Note: No noise emits from barges during dredging.

2.5.2 CWB Tunnel (TPCWAE)

2.5.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	100.0%	118.0
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.6

2.5.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.2

2.5.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

2.5.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

2.6 Temporary Reclamation at PCWA Stage 2

2.6.1 Dredging , Seawalls & Filling (TPCWAW)

2.6.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

2.6.1B Temporary Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.7

Note: No noise emits from barges during dredging.

2.6.1C Filling behind seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Barge	-	2	0.0	100.0%	0.0
Tug Boat	CNP 221	2	110.0	100.0%	113.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
				Total	119.5

2.6.2 CWB Tunnel (TPCWAW)

2.6.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	100.0%	118.0
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.6

2.6.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.2

2.6.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

2.6.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

2.7 Ferry Pier Reprovisioning

2.7.1 Temporary Ferry Pier

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Pilling rig	CNP 164	1	115.0	100.0%	115.0
Generator	CNP 102	1	100.0	100.0%	100.0
Water Pump	CNP 281	1	88.0	100.0%	88.0
Crane	CNP 048	1	112.0	100.0%	112.0
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Barge	CNP 061	1	104.0	100.0%	104.0
Poker Vibrator	CNP 170	2	113.0	100.0%	116.0
Bar Bender	CNP 021	1	90.0	100.0%	90.0
Air Compressor	CNP 002	2	100.0	100.0%	103.0
				Total	121.5

Note: No noise emits from barges during dredging.

2.7.2 New Ferry Pier

2.7.2A Piling, Deck construction, & Superstructure

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Pilling rig	CNP 164	1	115.0	100.0%	115.0
Generator	CNP 102	1	100.0	100.0%	100.0
Water Pump	CNP 281	1	88.0	100.0%	88.0
Crane	CNP 048	1	112.0	100.0%	112.0
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Barge	CNP 061	1	104.0	100.0%	104.0
Poker Vibrator	CNP 170	2	113.0	100.0%	116.0
Bar Bender	CNP 021	1	90.0	100.0%	90.0
Air Compressor	CNP 002	2	100.0	100.0%	103.0
				Total	121.5

2.7.2B Demolition of Structure

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Breaker	CNP 027	2	122.0	100.0%	125.0
Excavator	CNP 081	2	112.0	100.0%	115.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Hand-held Breaker	CNP 026	6	114.0	100.0%	121.8
Dump Truck	CNP 067	4	117.0	100.0%	123.0
Barge	CNP 061	2	104.0	100.0%	107.0
Crane	CNP 048	1	112.0	100.0%	112.0
				Total	128.9

2.8 Helipad Reprovisioning at HKCEC

2.8.1 Reprovisioning at HKCEC

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Breaker, excavator mounted	CNP 027	2	122	100.0%	125.0
Excavator	CNP 081	2	112.0	100.0%	115.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
Pilling rig	CNP 164	1	115.0	100.0%	115.0
Generator	CNP 102	1	100.0	100.0%	100.0
Water Pump	CNP 281	1	88.0	100.0%	88.0
Crane	CNP 048	1	112.0	100.0%	112.0
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Barge	-	1	0.0	100.0%	0.0
Poker Vibrator	CNP 170	2	113.0	100.0%	116.0
Bar Bender	CNP 021	1	90.0	100.0%	90.0
Air Compressor	CNP 002	2	100.0	100.0%	103.0
				Total	128.4

2.9 Sewage Outfall

2.9.1 Marine Section

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Dredger	CNP 063	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	
				Total	118.7

Note: No noise emits from barges during dredging.

2.9.2 Land Section

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	1	112.0	100.0%	112.0
Breaker, excavator mounted	CNP027	1	122.0	100.0%	122.0
Excavator	CNP 081	1	112.0	100.0%	112.0
Dump Truck	CNP 067	2	117.0	100.0%	120.0
Concrete Lorry Mixer	CNP 044	1	109.0	100.0%	109.0
Poker Vibrator	CNP 170	2	113.0	100.0%	116.0
Compactor, vibratory	CNP 050	1	105.0	100.0%	105.0
Air Compressor	CNP 002	1	100.0	100.0%	100.0
				Total	125.3

2.10 WSD's Salt Water Pumping Station

2.10A Diversion of Intake/Connection back to existing system

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	1	112.0	100.0%	112.0
Breaker, excavator mounted	CNP027	1	122.0	100.0%	122.0
Excavator	CNP 081	1	112.0	100.0%	112.0
Dump Truck	CNP 067	2	117.0	100.0%	120.0
Concrete Lorry Mixer	CNP 044	1	109.0	100.0%	109.0
Poker Vibrator	CNP 170	2	113.0	100.0%	116.0
Compactor, vibratory	CNP 050	1	105.0	100.0%	105.0
Air Compressor	CNP 002	1	100.0	100.0%	100.0
				Total	125.3

2.10B Construction of new pumping station

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

2.11 Roads

2.11A Roadworks

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Dump Truck	CNP 067	2	117.0	100.0%	120.0
Excavator	CNP 081	2	112.0	100.0%	115.0
Grader	CNP 104	2	113.0	100.0%	116.0
Loader	CNP 081	2	112.0	100.0%	115.0
Vibratory Roller	CNP 186	1	108.0	100.0%	108.0
Road Roller	CNP 185	1	108.0	100.0%	108.0
Asphalt Paver	CNP 004	2	109.0	100.0%	112.0
Planer	CNP 184	2	111.0	100.0%	114.0
				Total	124.1

Note: No noise emits from barges during dredging.

3 Hong Kong Convention and Exhibition Centre (HKCEC) Reclamation

3.1 HKCEC Reclamation Stage 1 (Water Channel)

3.1.1 Dredging, Seawalls & Filling

3.1.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

3.1.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.7

3.1.1C Filling behind Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104	100.0%	107.0
Barges	-	2	0	100.0%	0
Tug Boat	CNP221	2	110	100.0%	113.0
Bulldozer	CNP030	2	111.0	100.0%	114.0
				Total	117.0

3.1.2 Cooling Water Systems

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Excavator	CNP 081	2	112.0	100.0%	115.0
Breaker, excavator mounted	CNP 027	2	122.0	100.0%	125.0
Dump Truck	CNP 067	2	117.0	100.0%	120.0
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Air Compressor	CNP 002	2	100.0	100.0%	103.0
Compactor	CNP 050	1	105.0	100.0%	105.0
				Total	127.6

3.1.3 CWB Tunnel

3.1.3A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	100.0%	118.0
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.6

Note: No noise emits from barges during dredging.

3.1.3B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.2

3.1.3C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

3.1.3D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

3.2 HKCEC Reclamation Stage 2

3.2.1 Dredging, Seawalls & Filling

3.2.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	4	0.0	100.0%	0.0
				Total	117.1

3.2.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.7

3.2.1C Filling behind Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104	100.0%	107.0
Barges	-	2	0	100.0%	0
Tug Boat	CNP221	2	110	100.0%	113.0
Bulldozer	CNP030	2	115.0	100.0%	118.0
				Total	119.5

Note: No noise emits from barges during dredging.

3.2.1D Demolition of Structure

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Breaker	CNP 027	2	122.0	100.0%	125.0
Excavator	CNP 081	2	112.0	100.0%	115.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
Crane	CNP 048	1	112.0	100.0%	112.0
				Total	128.0

3.2.2 Drainage Culverts (2 cell)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Dump Trunk	CNP 067	4	117.0	100.0%	123.0
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Excavator	CNP 081	2	112.0	100.0%	115.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	2	100.0	100.0%	103.0
				Total	126.1

3.2.4 Cooling Water Systems - Intakes Pipeline

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Breaker, excavator mounted	CNP 027	2	122.0	100.0%	125.0
Excavator	CNP 081	2	112.0	100.0%	115.0
Dump Truck	CNP 067	2	117.0	100.0%	120.0
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Air Compressor	CNP 002	2	100.0	100.0%	103.0
Compactor	CNP 050	1	105.0	100.0%	105.0
				Total	127.6

3.2.3 CWB Tunnel

3.2.3A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	100.0%	118.0
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.6

3.2.3B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.2

Note: No noise emits from barges during dredging.

3.2.3C Construction of slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

3.2.3D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

3.3 MTR Tunnel Crossing

3.3.1 Pilling

3.3.1A Pilling for CWB tunnel unit

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Piling Rig	CNP 164	2	115.0	100.0%	118.0
Generator	CNP 102	2	100.0	100.0%	103.0
Water Pump	CNP 281	2	88.0	100.0%	91.0
Air Compressor	CNP 002	2	100.0	100.0%	103.0
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Barge	-	2	0.0	100.0%	0.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
				Total	119.7

3.3.1B Pilling for deck

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Piling Rig	CNP 164	2	115.0	100.0%	118.0
Generator	CNP 102	2	100.0	100.0%	103.0
Water Pump	CNP 281	2	88.0	100.0%	91.0
Air Compressor	CNP 002	2	100.0	100.0%	103.0
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Barge	-	2	0.0	100.0%	0.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
				Total	119.7

3.3.2 Tunnel & Deck Construction

3.3.2A Place precast CWB Tunnel Unit

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Cranes	CNP 048	6	112.0	100.0%	119.8
Barges		6	0.0	100.0%	0.0
Tug Boat	CNP 221	3	110.0	100.0%	114.8
				Total	121.0

Note: No noise emits from barges during dredging.

3.3.2B Deck Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
				Total	123.2

3.4 HKCEC Reclamation Stage 3

3.4.1 Dredging, Seawalls & Filling

3.4.1A Dredging HKCEC3W, 3Ea & 3Eb

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	100.0%	113.0
Barges	-	6	0.0	100.0%	0.0
				Total	117.1

3.4.1B Seawall Construction HKCEC3W & 3Eb

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	116.7

3.4.1C Filling behind Seawall HKCEC3W, 3Ea & 3Eb

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104	100.0%	107.0
Barges	-	2	0	100.0%	0
Tug Boat	CNP221	2	110	100.0%	113.0
Bulldozer	CNP030	2	115.0	100.0%	118.0
				Total	119.5

3.4.2 Demolition of Structure East Bridge

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Breaker, excavator mounted	CNP 027	2	122.0	100.0%	125.0
Excavator	CNP 081	2	112.0	100.0%	115.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
Crane	CNP 048	1	112.0	100.0%	112.0
				Total	128.0

3.4.3 Drainage Culverts (2 cell)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Dump Trunk	CNP 067	4	117.0	100.0%	123.0
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Excavator	CNP 081	2	112.0	100.0%	115.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	2	100.0	100.0%	103.0
				Total	126.1

Note: No noise emits from barges during dredging.

3.4.4 CWB Tunnel

3.4.4A Diaphragm Wall HKCEC3Ea

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	100.0%	118.0
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.6

3.4.4B Excavation HKCEC3Ea

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.2

3.4.4C Construction of slabs HKCEC3Ea

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

3.4.4D Backfill HKCEC3Ea

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

3.4.4E Diaphragm Wall HKCEC3W & Eb

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	100.0%	118.0
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.6

Note: No noise emits from barges during dredging.

3.4.4F Excavation HKCEC3W & Eb

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.2

3.4.4G Construction of slabs HKCEC3W & Eb

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

3.4.4H Backfill HKCEC3W & Eb

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

3.5 Roads

3.5 Roadworks

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Dump Truck	CNP 067	2	117.0	100.0%	120.0
Excavator	CNP 081	2	112.0	100.0%	115.0
Grader	CNP 104	2	113.0	100.0%	116.0
Loader	CNP 081	2	112.0	100.0%	115.0
Vibratory Roller	CNP 186	1	108.0	100.0%	108.0
Road Roller	CNP 185	1	108.0	100.0%	108.0
Asphalt Paver	CNP 004	2	109.0	100.0%	112.0
Planer	CNP 184	2	111.0	100.0%	114.0
				Total	124.1

Note: No noise emits from barges during dredging.

4 Cross Harbour Watermains

4.1 SubmarinePipeline

4.1 Marine Section

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Tug boat	CNP 221	1	110.0	100.0%	110.0
Crane	CNP 048	2	112.0	100.0%	115.0
Dredger	CNP 063	2	112.0	100.0%	115.0
Barges	-	2	0.0	100.0%	0.0
				Total	118.7

4.2 Land Section

4.2 Land Section

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	1	112.0	100.0%	112.0
Breaker, excavator mounted	CNP 027	1	122.0	100.0%	122.0
Excavator	CNP 081	1	112.0	100.0%	112.0
Dump Truck	CNP 067	2	117.0	100.0%	120.0
Concrete Lorry Mixer	CNP 044	1	109.0	100.0%	109.0
Poker Vibrator	CNP 170	2	113.0	100.0%	116.0
Compactor, vibratory	CNP 050	1	105.0	100.0%	105.0
Air Compressor	CNP 002	1	100.0	100.0%	100.0
				Total	125.3

Note: No noise emits from barges during dredging.

5 North Point Reclamtion

5.1 North Point Reclamtion Stage 1

5.1.1 Dredging, Seawalls & Filling

5.1.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	60.0%	110.8
Barges	-	4	0.0	100.0%	0.0
				Total	116.4

5.1.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	60.0%	107.8
Crane	CNP 048	2	112.0	70.0%	113.5
Barges	-	2	0.0	100.0%	0.0
				Total	115.2

5.1.1C Filling behind Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104	100.0%	107.0
Barges	-	2	0	100.0%	0
Tug Boat	CNP221	2	110	60.0%	110.8
Bulldozer	CNP030	2	115.0	100.0%	118.0
				Total	119.0

5.1.2 CWB Tunnel

5.1.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	70.0%	116.5
Excavator	CNP 081	4	112.0	70.0%	116.5
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.4

5.1.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	70.0%	116.5
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.1

Note: No noise emits from barges during dredging.

5.1.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	70.0%	113.5
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	70.0%	117.5
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	122.5

5.1.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	70.0%	116.5
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.1

5.2 North Point Reclamtion Stage 2

5.2.1 Dredging, Seawalls & Filling

5.2.1A Dredging

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Grab Dredger	CNP 063	2	112.0	100.0%	115.0
Tug boat	CNP 221	2	110.0	60.0%	110.8
Barges	-	4	0.0	100.0%	0.0
				Total	116.4

5.2.1B Seawall Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104.0	100.0%	107.0
Tug boat	CNP 221	1	110.0	60.0%	107.8
Crane	CNP 048	2	112.0	70.0%	113.5
Barges	-	2	0.0	100.0%	0.0
				Total	115.2

5.2.1C Filling behind Seawall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Derrick Barge	CNP 061	2	104	100.0%	107.0
Barges	-	2	0	100.0%	0
Tug Boat	CNP221	2	110	60.0%	110.8
Bulldozer	CNP030	2	115.0	100.0%	118.0
				Total	119.0

Note: No noise emits from barges during dredging.

5.2.2 CWB Tunnel (NPR2W)

5.2.2A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	70.0%	116.5
Excavator	CNP 081	4	112.0	70.0%	116.5
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.4

5.2.2B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	70.0%	116.5
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.1

5.2.2C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	70.0%	113.5
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	70.0%	117.5
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	122.5

5.2.2D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	70.0%	116.5
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.1

5.2.2E Foundation of East Vent Building

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	70.0%	113.5
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	70.0%	117.5
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	122.5

Note: No noise emits from barges during dredging.

Appendix 4.5 **Powered Mechanical Equipment (PME) for the Different Construction Tasks during Normal Daytime Working Hours (Without Mitigation Measures)**

6.0 Construction of IECL

6.2 IEC Connection Work

6.2A Substructures

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Poker Vibrator	CNP 170	2	113.0	70.0%	114.5
Crane	CNP 048	1	112.0	70.0%	110.5
Air Compressor	CNP 002	5	100.0	100.0%	107.0
Excavator	CNP 081	2	112.0	70.0%	113.5
Water Pump	CNP 281	6	88.0	100.0%	95.8
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Piling, Large diameter bored	CNP 164	1	115.0	100.0%	115.0
				Total	121.1

6.2B Superstructures

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Concrete Lorry Mixer	CNP 044	2	100.0	100.0%	103.0
Poker Vibrator	CNP 170	2	100.0	70.0%	101.5
Crane	CNP 048	1	101.0	70.0%	99.5
Compressor	CNP 002	5	96.0	100.0%	103.0
Excavator	CNP 081	2	105.0	70.0%	106.5
Water Pump	CNP 281	6	88.0	100.0%	95.8
Concrete Pump	CNP 047	2	100.0	100.0%	103.0
Bar Bender	CNP 164	2	100.0	100.0%	103.0
				Total	111.8

6.2A Substructures(For Marine Works)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Poker Vibrator	CNP 170	2	113.0	70.0%	114.5
Crane	CNP 048	1	112.0	70.0%	110.5
Air Compressor	CNP 002	5	100.0	100.0%	107.0
Water Pump	CNP 281	6	88.0	100.0%	95.8
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Piling, Large diameter bored	CNP 164	1	115.0	100.0%	115.0
Tug Boat	CNP 221	1	110.0	50.0%	107.0
Barges	-	2	0.0	100.0%	0.0
				Total	120.5

6.2B Superstructures(For Marine Works)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Concrete Lorry Mixer	CNP 044	2	100.0	100.0%	103.0
Poker Vibrator	CNP 170	2	100.0	70.0%	101.5
Crane	CNP 048	1	101.0	70.0%	99.5
Compressor	CNP 002	5	96.0	100.0%	103.0
Excavator	CNP 081	2	105.0	70.0%	106.5
Water Pump	CNP 281	6	88.0	100.0%	95.8
Concrete Pump	CNP 047	2	100.0	100.0%	103.0
Bar Bender	CNP 164	2	100.0	100.0%	103.0
Tug Boat	CNP 221	1	110.0	50.0%	107.0
Barges	-	2	0.0	100.0%	0.0
				Total	112.3

6.2C Demolition of Structure

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Backhoe	CNP 081	2	112.0	70.0%	113.5
Breaker, excavator mounted	CNP 027	2	122.0	80.0%	124.0
Hand-held Breaker	CNP 026	2	114.0	100.0%	117.0
Dump Truck	CNP 067	4	117.0	70.0%	121.5
Crane	CNP 048	1	101.0	100.0%	101.0
				Total	126.7

6.2C Demolition of Structure(For Marine Works)

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Backhoe	CNP 081	2	112.0	70.0%	113.5
Breaker, excavator mounted	CNP 027	2	122.0	80.0%	124.0
Hand-held Breaker	CNP 026	2	114.0	100.0%	117.0
Dump Truck	CNP 067	4	117.0	70.0%	121.5
Crane	CNP 048	1	101.0	100.0%	101.0
Tug Boat	CNP 221	1	110.0	100.0%	110.0
Barges	-	2	0.0	100.0%	0.0
				Total	126.8

6.3 East Portal and IEC Connection Work

6.3.1 Substructures

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Poker Vibrator	CNP 170	2	113.0	70.0%	114.5
Crane	CNP 048	1	112.0	70.0%	110.5
Air Compressor	CNP 002	4	100.0	100.0%	106.0
Excavator	CNP 081	2	112.0	70.0%	113.5
Water Pump	CNP 281	6	88.0	100.0%	95.8
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Piling, Large diameter bored	CNP 164	1	115.0	100.0%	115.0
				Total	121.1

6.3.2 Retaining Structures

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Poker Vibrator	CNP 170	2	113.0	70.0%	114.5
Crane	CNP 048	1	112.0	70.0%	110.5
Air Compressor	CNP 002	5	100.0	100.0%	107.0
Excavator	CNP 081	2	112.0	70.0%	113.5
Water Pump	CNP 281	6	88.0	100.0%	95.8
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Piling, Large diameter bored	CNP 164	1	115.0	100.0%	115.0
				Total	121.1

6.3.3 Demolition of Structure

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Backhoe	CNP 081	2	112.0	70.0%	113.5
Breaker, excavator mounted	CNP 027	2	122.0	80.0%	124.0
Hand-held Breaker	CNP 026	2	114.0	100.0%	117.0
Dump Truck	CNP 067	4	117.0	70.0%	121.5
Crane	CNP 048	1	112.0	70.0%	110.5
				Total	126.8

7.0 Construction of Central Interchange

7.1.1 Road Formation & Earthworks

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Lorry	CNP 141	1	112.0	100.0%	112.0
Dump Truck	CNP 067	6	117.0	100.0%	124.8
Excavator	CNP 081	2	112.0	70.0%	113.5
Grader	CNP 104	1	113.0	100.0%	113.0
Roller	CNP 185	2	108.0	100.0%	111.0
Loader	CNP 081	1	112.0	100.0%	112.0
				Total	125.9

7.1.2 Road Pavement + misc

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-Time %	Total SWL dB(A)
Vibratory Roller	CNP 186	1	108.0	100.0%	108.0
Road Roller	CNP 185	1	108.0	100.0%	108.0
Asphalt paver	CNP 004	1	109.0	100.0%	109.0
Dump Trunk	CNP 067	4	117.0	100.0%	123.0
				Total	123.4

7.1.3 Building Construction for west ventilation building - Building Foundation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Lorry	CNP 141	4	112.0	100.0%	118.0
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Bentonite Filtering Plant	CNP 162	1	105.0	100.0%	105.0
Piling, Large diameter bored	CNP 164	1	115.0	100.0%	115.0
Excavator	CNP 081	2	112.0	70.0%	113.5
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Water Pump	CNP 281	2	88.0	100.0%	91.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
				Total	123.7

7.1.4 Building Superstructure

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-Time %	Total SWL dB(A)
Crane	CNP 048	1	112.0	70.0%	110.5
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Concrete Lorry Mixer	CNP 044	1	109.0	100.0%	109.0
Concrete Pump	CNP 047	1	109.0	100.0%	109.0
Poker Vibrator	CNP 170	2	113.0	70.0%	114.5
				Total	117.4

7.1.5 Tunnel Construction - Diaphragm Walls

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	70.0%	113.5
Dump Truck	CNP 067	2	117.0	100.0%	120.0
Excavator	CNP 081	1	112.0	70.0%	110.5
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Bentonite Plant	CNP 162	2	105.0	100.0%	108.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rig	CNP 164	2	115.0	100.0%	118.0
				Total	123.7

7.1.6 Excavation between walls

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-Time %	Total SWL dB(A)
Excavator	CNP 081	2	112.0	70.0%	113.5
Bulldozer	CNP 030	1	115.0	100.0%	115.0
Dump Truck	CNP 067	6	117.0	100.0%	124.8
				Total	125.5

7.1.7 RC Slab Construction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-Time %	Total SWL dB(A)
Crane	CNP 048	1	112.0	70.0%	110.5
Concrete Pumps	CNP 047	2	109.0	100.0%	112.0
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Poker Vibrator	CNP 170	2	113.0	100.0%	116.0
Bar Bender	CNP 021	1	90.0	100.0%	90.0
Air Compressor	CNP 002	1	100.0	100.0%	100.0
				Total	119.2

7.1.8 Tunnel Modification at Road D5 Junction

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Piling, Large diameter bored	CNP 164	1	115.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Excavator	CNP 081	1	112.0	70.0%	110.5
Dump Trucks	CNP 067	2	117.0	100.0%	120.0
Water Pump	CNP 281	2	88.0	100.0%	91.0
Crane	CNP 048	1	112.0	70.0%	110.5
				Total	122.7

7.1.9 Deck Formation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Poker Vibrator	CNP 170	2	113.0	70.0%	114.5
Crane	CNP 048	1	112.0	70.0%	110.5
Air Compressor	CNP 002	2	100.0	100.0%	103.0
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
				Total	118.6

7.1.10 Road Pavement for Deck

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-Time %	Total SWL dB(A)
Vibratory Roller	CNP 186	1	108.0	100.0%	108.0
Road Roller	CNP 185	1	108.0	100.0%	108.0
Asphalt paver	CNP 004	1	109.0	100.0%	109.0
Dump Trunk	CNP 067	4	117.0	100.0%	123.0
				Total	123.4

7.1.11 Foundation Work for Road

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Poker Vibrator	CNP 170	2	113.0	70.0%	114.5
Crane	CNP 048	1	112.0	70.0%	110.5
Air Compressor	CNP 002	5	100.0	100.0%	107.0
Excavator	CNP 081	2	112.0	70.0%	113.5
Water Pump	CNP 281	6	88.0	100.0%	95.8
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Piling, Large diameter bored	CNP 164	1	115.0	100.0%	115.0
				Total	121.1

8.0 Construction of CWB Tunnel under CRIII

8.0 Construction of CWB Tunnel under CRIII at Initial Reclamation Area East, Final Reclamtion Area West, & Final Reclamation Area East

8.0A Diaphragm Wall

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	4	112.0	100.0%	118.0
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	8	117.0	100.0%	126.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	4	109.0	100.0%	115.0
Bentonite Plants	CNP 162	4	105.0	100.0%	111.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Diaphragm Wall Rigs	CNP 164	4	115.0	100.0%	121.0
				Total	128.6

8.0B Excavation

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Dump Truck	CNP 067	12	117.0	100.0%	127.8
				Total	128.2

8.0C Construction of Slabs

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Crane	CNP 048	2	112.0	100.0%	115.0
Concrete Pump	CNP 047	4	109.0	100.0%	115.0
Concrete Lorry Mixer	CNP 044	8	109.0	100.0%	118.0
Poker Vibrator	CNP 170	4	113.0	100.0%	119.0
Bar Bender	CNP 021	2	90.0	100.0%	93.0
Air Compressor	CNP 002	4	100.0	100.0%	106.0
				Total	123.2

8.0D Backfill

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Excavator	CNP 081	4	112.0	100.0%	118.0
Bulldozer	CNP 030	2	115.0	100.0%	118.0
Roller	CNP 186	2	108.0	100.0%	111.0
Dump Truck	CNP 067	4	117.0	100.0%	123.0
				Total	125.3

9.0 Tunnel Building and Installation

9.0 Tunnel Building and Installation at East Ventilation Building, Adminisatrtion Building, & Central Ventilation Building, West Ventilation Building

9.0A Substructures

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Poker Vibrator	CNP 170	2	113.0	70.0%	114.5
Crane	CNP 048	1	112.0	70.0%	110.5
Air Compressor	CNP 002	5	100.0	100.0%	107.0
Excavator	CNP 081	2	112.0	70.0%	113.5
Water Pump	CNP 281	6	88.0	100.0%	95.8
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Piling, Large diameter bored	CNP 164	1	115.0	100.0%	115.0
				Total	121.1

9.0B Superstructures

Powered Mechanical Equipment (PME)	TM Ref./ other Ref.	No. Items	SWL/Item dB(A)	On-time %	Total SWL dB(A)
Concrete Lorry Mixer	CNP 044	2	109.0	100.0%	112.0
Poker Vibrator	CNP 170	2	113.0	70.0%	114.5
Crane	CNP 048	1	112.0	70.0%	110.5
Air Compressor	CNP 002	5	100.0	100.0%	107.0
Excavator	CNP 081	2	112.0	70.0%	113.5
Water Pump	CNP 281	6	88.0	100.0%	95.8
Concrete Pump	CNP 047	2	109.0	100.0%	112.0
Piling, Large diameter bored	CNP 164	1	115.0	100.0%	115.0
				Total	121.1

Annex 15.3

Prior Agreement on Water Quality Assessment From EPD

土木工程拓展署
CEDD Civil Engineering and Development Department

港島及離島拓展處
Hong Kong Island and Islands Development Office

Web site 網址 : http://www.cedd.gov.hk
E-mail 電子郵件 : cklam@cedd.gov.hk
Telephone 電話 : (852) 2231 4415
Facsimile 傳真 : (852) 2577 5040
Our ref 本署檔號 : HKI 2/4/50EI
Your ref 來函檔號 : PMC:CAKM:ccht:97103/10.6-0802

香港北角渣華道 333 號
北角政府合署 13 樓
13/F, North Point Government Offices,
333 Java Road,
North Point, Hong Kong

Urgent by fax (Fax No. 2691 2649)

19 September 2007

Maunsell Consultants Asia Ltd
8/F Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road
Shatin, NT
(Attn: Mr Peter Cheek)

Dear Sirs,

SA1 to Agreement No. CE 54/2001 (CE)
WDII – Planning and Engineering Review
Wan Chai Development Phase II and Central – Wan Chai Bypass – EIA Study

Dredging Rates for the EIA Study

I refer to your letter of 6.9.2007 and have no comment on the dredging rates for the EIA Study for the Wan Chai Development Phase II and Central – Wan Chai Bypass projects.

Yours faithfully,

(C K LAM)
for Project Manager (Hong Kong Island and Islands)
Civil Engineering and Development Department

c.c. CHE/MW2-1, HyD (Attn: Mr CY WONG) Fax No. 2714 5289

MAUNSELL | AECOM

Maunsell Consultants Asia Ltd
8/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong
茂盛(亞洲)工程顧問有限公司
香港新界沙田鄉事會路 138 號新城市中央廣場第 2 座 8 樓
T +852 2605 6262 F +852 2691 2649 www.maunsell.aecom.com

Our Ref: PMC:CAKM:ccht:97103/10.6-0802

Urgent By Fax (No. 2577 5040) and Post

Project Manager/HKI&I
Civil Engineering and Development Department
13/F North Point Government Offices
333 Java Road
North Point, Hong Kong

Attn: Mr. C. K. Lam

6 September 2007

Dear Sirs,

SA1 to Agreement No. CE54/2001(CE)
Environmental Impact Assessment
for Wan Chai Development Phase II and Central-Wan Chai Bypass

Dredging Rates

We write to seek your agreement on the dredging rates for the captioned project recommended in the captioned EIA Study as shown in the table below.

<table>
<tr><th colspan="2">Reclamation Area (Reference: Figure 2.7)</th><th>Dredging Rate (m^3 per day)</th></tr>
<tr><td colspan="3">Dredging for construction of seawall foundation or breakwater</td></tr>
<tr><td colspan="2">North Point Reclamation in North Point Shoreline Zone (NPR2W, NPR1 & NPR2E)</td><td>6,000</td></tr>
<tr><td rowspan="2">Causeway Bay Shoreline Zone</td><td>Temporary breakwater (TBW)</td><td>1,500</td></tr>
<tr><td>Temporary Reclamation at Causeway Bay (TCBR1W, TCBR4, TCBR3, TCBR2, TCBR1E)</td><td>6,000</td></tr>
<tr><td colspan="2">Temporary Reclamation in Public Cargo Working Area Zone (TPCWAW, TPCWAE)</td><td>5,000</td></tr>
<tr><td colspan="2">Wan Chai Reclamation in Wan Chai Shoreline Zone (WCR1 (1), WCR2, WCR3, TWCR4, WCR4)</td><td>6,000</td></tr>
<tr><td rowspan="2">HKCEC Shoreline Zone (HKCEC)</td><td>Reclamation at HKCEC1, HKCEC3E & HKCEC3W</td><td>1,500</td></tr>
<tr><td>Reclamation HKCEC2W & HKCEC2E)</td><td>6,000</td></tr>
<tr><td colspan="3">Dredging for construction of pipelines</td></tr>
<tr><td colspan="2">Cross Harbour Water Mains</td><td>1,500</td></tr>
<tr><td colspan="2">Wan Chai East Submarine Sewage Pipeline</td><td>1,500</td></tr>
</table>

Note: (1) Reduced dredging rates of 1,500 m^3 per day are applicable for construction of the western seawall of WCR1 which is close to the WSD Wan Chai intake.

Please be advised that cumulative impact from the cruise terminal dredging has been assessed and the dredging rates for TPCWAW and TPCWAE have been slightly adjusted from 6,000 to 5,000m^3 per day to avoid unacceptable cumulative impact for concurrent dredging for both projects. The minor adjustment on the above dredging rates will have no significant impact on the overall construction programme.

Your response to this submission by 7 September 2007 would be most appreciated. Should you have any queries in this regard, please contact our Ms. Carmen Au or the undersigned.

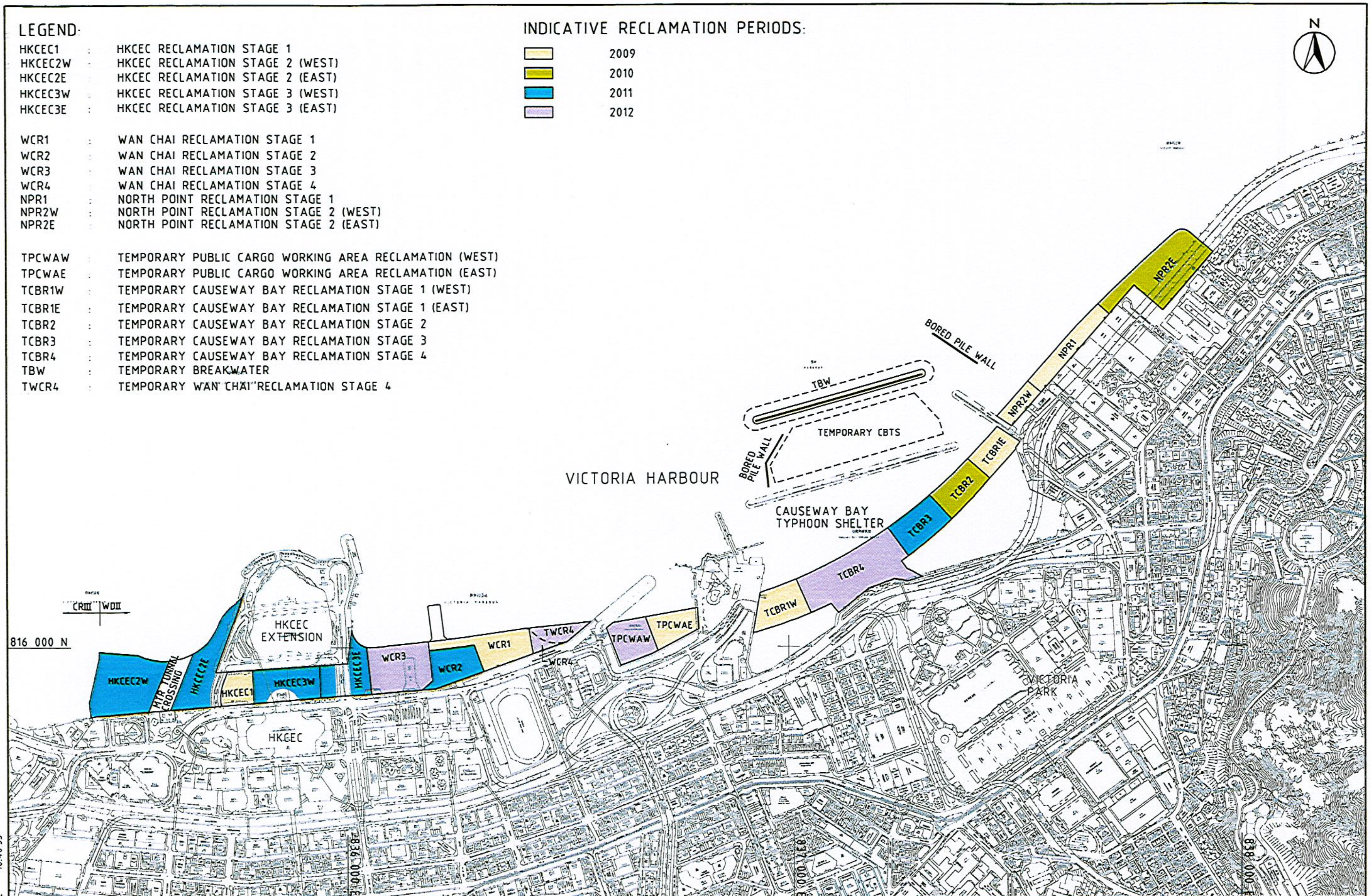
Yours faithfully

p.p.

Peter Cheek
Technical Director

Encl. (Figure 2.7)

cc	MW/HyD	- Attn: Mr. C.Y. Wong – w/e (By Fax: 2714 5289)
	ENSR	- Attn: Mr. Freeman Cheung – w/e (By Fax: 2691 2649)



MAUNSELL | AECOM

Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

RECLAMATION STAGES

FIGURE 2.7

SCALE 1:8000

DATE 2007-5-22 16:48:55

P:\projects\97103\drawing\report\EIA 200705\FIGURE 2-7.dgn

Urgent by Fax

MEMO

From	Director of Environmental Protection	To	Project Manager/HKI&I, CEDD
Ref.	in EP2/H4/S3/15	(Attn.:	Mr. C. K. Lam)
Tel. No.	2835 1155	Your Ref.	in HKI 2/4/50 EI
Fax. No.	2591 0558	dated	11.6.07 Fax. No. 25775040
Date	12 June 2007	Total Pages	2

Environmental Impact Assessment Ordinance (EIAO)
Project Title: Wan Chai Development Phase II and Central-Wan Chai Bypass
EIA Study Brief No. 153/2006
Water Quality Impact Assessment Methodology

I refer to your memo under reference on the above subject and a letter from your consultant, Maunsell (ref: A01604/C/AKYC70516/1) submitting the captioned water quality impact assessment methodology for our agreement under various sections of the EIA Study Brief No. ESB-153/2006.

2. Please be informed that after taking into the advice from our water quality assessment team, the methodology is considered as acceptable. As such, agreements are hereby given under the following requirements of the captioned EIA Study Brief:

Reference in the Study Brief Stipulating the Requirements	Description
Section 3.4.7.6(g)	Existing and likely future pollution reduction due to various drainage/sewerage improvement/rectification works
Section 3.4.7.6(h)	Coverage and boundary of cumulative water quality impact assessment
Section 3.4.7.7(f)	
Item 6 under "Modelling Assessment" in Appendix C	
Item 2 under "Model details – Simulation" in Appendix C	Values of the modeling parameters
Item 4 under "Model details – Simulation" in Appendix C	Model coverage area
Item 5 under "Model details – Simulation" in Appendix C	Grid schematization

3. Please note that above agreements are only for the concerned requirements under the EIA Study Brief and shall not prejudice the EPD's final decision on approval of the EIA report to be submitted under the EIAO. If there is any significant change in circumstances, project design/details or assessment methodology/assumptions, etc. CEDD and its consultant should review the situations; carry out necessary updating/revisions; and seek our advice whether further agreements under the EIA Study Brief are necessary.

4. You are also reminded that the requirements on documentations of key assessment assumptions, limitations of assessment methodologies and related prior agreement(s) with the DEP as stipulated under Section 3.4.14 of the EIA Study Brief.

5. Incidentally, please note that the first 2 bullet points on page 2 of the Maunsell's letter were duplicated but with a wrong numbering in the first bullet point.

(Victor YEUNG)
Senior Environmental Protection Officer
for Director of Environmental Protection

c.c.:

Maunsell	(Attn: Mr. Freeman Cheung	Fax:	28910305
	and Mr. Peter Cheek)	Fax:	26912649

c.c. internal: S(MA)5, E(MA)31

FILE

Maunsell Environmental Management Consultants Ltd
11/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong
茂盛環境管理顧問有限公司
香港新界沙田鄉事會路138號新城市中央廣場2座11樓
T +852 2893 1551 F +852 2891 0305 www.maunsell.aecom.com

Your Ref.: An(4) to EP2/H4/05 Pt.43
Our Ref.: A01604/C/AKYC70516/1

By Post
Environmental Protection Department
Metro Assessment Group
27th floor, Southorn Centre,
130 Hennessy Road,
Wan Chai, Hong Kong

Attn : Mr. Raymond Lai

16 May 2007

Dear Sir,

Supplemental Agreement No.1 to Agreement No. CE 54/2001 (CE)
Wan Chai Development Phase II - Planning and Engineering Review
Wan Chai Development Phase II and Central-Wan Chai Bypass – EIA Study Brief No. ESB-153/2006 – Water Quality Impact Assessment Methodology

With reference to your letter dated 3 May 2007 (Ref: An(4) to EP2/H4/05 Pt.43) on the above subject, we are pleased to submit herewith a copy of the revised water quality impact assessment methodology paper for your formal agreement under the following specific clauses in the EIA Study Brief.

- Clause 3.4.7.6 (g) – Prediction and quantification by mathematical modelling or other technique agreed by the Director, of the impacts on the water system, the existing and planned stormwater outfalls, the sensitive receivers and beneficial uses (e.g. water based recreation uses) due to those alterations and changes identified in (e) and the pollution sources identified in (f). Existing and likely future pollution reduction due to the Harbour Area Treatment Scheme (HATS) and other drainage/sewerage improvement, interception, diversion and/or treatment of the polluted flows in the stormwater outfalls, diversion/extension of stormwater outfalls within the Causeway Bay Typhoon Shelter to discharge outside of the typhoon shelter, and drainage/sewerage mis-connection rectification to be ***agreed*** by the Director shall be estimated and taken into account in the impact prediction. The mathematical modelling requirements are set out in Appendix C of this Study Brief. The prediction shall take into account and include likely different construction stages or sequences (including different coastline configurations at various stages, temporary reclamation, temporary typhoon shelter, temporary diversion of stormwater and sewage), and different operational stages.

- Clause 3.4.7.6 (h) - Assessment of the cumulative impacts due to other related, concurrent and/or planned project elements, including the Central Reclamation Phase III, Hong Kong Convention and Exhibition Centre Atrium Link Extension, Harbour Area Treatment Scheme (HATS) Stage 2A, Laying of Western Cross Harbour Main and Associated Land Mains from West Kowloon to Sai Ying Pun, Western Harbour Submarine Gas Pipeline and Associated Stations, activities or pollution sources within a boundary around the Project area to be ***agreed*** by the Director prior to commence of the assessment, that may have a bearing on the environmental acceptability of the Project. This shall include the potential cumulative construction and operational water quality impact arising from, inter alia, the associated works of the Project, the activities and planned projects to be ***agreed*** by the Director when the programme of the Project and associated works can be confirmed by the Applicant.

- Clause 3.4.7.7 (g) - Predication and quantification of cumulative impacts due to other dredging, filling or dumping activities within a boundary around the Project area to be ***agreed*** by the Director prior to commence of the assessment.

- Item 2 under "Model details – Simulation" in Appendix C - The sediment transport module for assessing impacts of sediment loss due to marine works shall include the processes of settling, deposition and re-erosion. The values of the modelling parameters shall be ***agreed*** with EPD. Contaminants release and DO depletion during dredging and dumping shall be simulated by the model.

- Item 4 under "Model details – Simulation" in Appendix C - The models shall at least cover the Hong Kong waters, the Pearl Estuary and the Dangan Channel to incorporate all major influences on hydrodynamic and water quality. A fine grid model may be used for detailed assessment of this study. It shall either be linked to a far field model or form part of a larger model by gradual grid refinement. The coverage of the fine grid model shall be properly designed such that it is remote enough so that the boundary conditions would not be affected by the waterway and the proposed disposal ground. The model coverage area shall be
- ***agreed*** with EPD.

- Item 5 under "Model details – Simulation" in Appendix C - In general, grid size at the area affected by the project shall be less than 400 m in open waters and less than 75 m around sensitive receivers. The grid shall also be able to reasonably represent coastal features existing and proposed in the project. The grid schematization shall be ***agreed*** with EPD.

- Item 6 under "Modelling Assessment" in Appendix C Cumulative impacts due to other projects, activities or pollution sources within a boundary to the ***agreement*** of EPD shall also be predicted and quantified.

Please note that the existing and likely future pollution reduction due to Harbour Area Treatment Scheme (HATS) and other drainage/sewerage improvement, interception, diversion and / or treatment of the polluted flows inn the stormwater outfalls, diversion / extension of stormwater outfalls within the Causeway Bay Typhoon Shelter to discharge outside of the typhoon shelter, and drainage/ sewerage mis-connection rectification are given in Section 7.1.6, Section 7.1.7, Section 12, Section 13.1.3 and Appendix A-4 of the methodology paper (refer to the requirements in **Clause 3.4.7.6 g of the EIA Study Brief**). Justifications of the time horizon and modelling scenarios for construction and operational phase water quality assessment are detailed in Sections 5.1.1 to 5.1.10 and Section 9 of the methodology paper.

Assessment of the cumulative impacts due to other <u>related, concurrent and / or planned project elements, activities or pollution sources within the boundary of HKSAR</u> are considered in Section 5.1.4 to Section 5.1.8, Section 10, Section 12, Appendix A-4, Section 7.1.32 to Section 7.1.34 of the methodology paper (refer to **Clause 3.4.7.6h of the EIA Study Brief** and **Item 6 under sub-heading "Modelling assessment" in Appendix C of the EIA Study Brief**). The cumulative impacts due to the concurrent dredging, filling or dumping activities within the <u>boundaries of Victoria Harbour and Western Buffer WCZ</u> are considered in Section 7.1.32 to Section 7.1.34, Tables 5.10 to 5.12 of the methodology paper (refer to **Clause 3.4.7.7f of the EIA Study Brief** and **Item 6 under sub-heading "Modelling assessment" in Appendix C of the EIA Study Brief**).

The values of modelling parameters for sediment plume model are provided in Table 5.8 of the methodology paper (refer to **Item 2 under sub-heading "Model details - simulation" in**

Appendix C of the EIA Study Brief). The model coverage area and grid schematization is given in Appendix A.1 of the methodology paper (refer to **Item 4 and Item 5 under sub-heading "Model details - simulation" in Appendix C of the EIA Study Brief).**

Yours faithfully
for and on behalf of
Maunsell Environmental Management Consultants Ltd

Joanne Tsoi
Senior Environmental Consultant

cc CEDD – CK Lam (w/o enclosure) By fax (2577 5040)
MCAL - Peter Cheek (w/o enclosure) By fax (2691 2649)

FAXED 17 MAY

1 Introduction

1.1.1 This Paper presents the methodology for assessment of the potential hydrodynamic and water quality impact associated with the construction and operation of the proposed Wan Chai Development Phase II (WDII) and Central-Wan Chai Bypass (CWB). Key environmental issues in respect of hydrodynamic and water quality impacts associated with the Project include:

- construction phase water quality impact due to dredging and filling, and construction site runoff and waste water from work force and general site activities
- change of flow regime after completion of the project and the associated water quality impact along the new coastline formed by the proposed reclamation.

1.1.2 It should be highlighted that no secondary contact recreation zones and water sports activities will be proposed for the coastal water within the Project site boundary.

2 Water Sensitive Receivers

2.1.1 In order to evaluate the potential water quality impacts from the Project, water sensitive receivers (WSR) in Victoria Harbour and its adjacent waters were considered. Major water sensitive receivers identified include:

- WSD Flushing Water Intakes;
- Cooling Water Intakes; and
- Corals.

2.1.2 Water sensitive receivers identified outside the Project site boundary in farther field within Victoria Harbour and its adjacent waters are shown in **Figure 5.1**. The Green Island and Junk Bay coral communities are located more than 5.5 km west and 6.5 km east of the proposed reclamation site, respectively. These ecological sensitive receivers are included for water quality assessment as they are potentially affected during the construction phase of the Project due to the sedimentation of suspended solids in the water column.

2.1.3 A number of cooling water pumping stations and intakes are located within the proposed permanent reclamation limit along the existing waterfront of Wan Chai. These intakes supply cooling water to the air conditioning systems of various commercial buildings in the Wan Chai area including:

- Hong Kong Convention and Exhibition Centre (HKCEC) Phase 1
- Shui On Centre
- Telecom House
- Government Buildings (Wan Chai Tower/Revenue Tower/Immigration Tower)
- China Resources Building
- Hong Kong Exhibition Centre
- Great Eagle Centre
- Sun Hung Kai Centre.

2.1.4 Cooling water intake for Sun Hung Kai Centre will be reprovisioned to the new waterfront of Wan Chai during operational phase of the Project. The rest of the above listed cooling water intakes will be reprovisioned to the intake chambers to the north of HKCEC Extension.

2.1.5 An existing WSD flushing water pumping station is also located within the proposed reclamation limit at Wan Chai which will be reprovisioned to the new Wan Chai waterfront under this Project.

2.1.6 **Figure 5.2** shows the locations of the existing and reprovisioned seawater intakes within the Project site boundary. Cooling water intakes for some potential future developments are also included in **Figure 5.2** for reference. Further description of these cooling water intakes are provided in Section 6.

2.1.7 It should be noted that the MTRC South Intake previously situated at the Wan Chai waterfront between Central Reclamation Phase III (CRIII) and HKCEC Extension has been relocated to the Central waterfront as shown in **Figure 5.1**.

3 Environmental Legislation, Policies, Plans, Standards and Criteria

3.1.1 The criteria for evaluating water quality impacts in this EIA Study include:

Environmental Impact Assessment Ordinance (EIAO)

3.1.2 The Technical Memorandum on Environmental Impact Assessment Process (Environmental Impact Assessment Ordinance) (EIAO-TM) was issued by EPD under Section 16 of the EIAO. It specifies the assessment method and criteria that were followed in this Study. Reference sections in the EIAO-TM provide the details of assessment criteria and guidelines that are relevant to the water quality assessment, including:

- Annex 6 – Criteria for Evaluating Water Pollution
- Annex 14 – Guidelines for Assessment of Water Pollution.

Water Quality Objectives

3.1.3 The Water Pollution Control Ordinance (WPCO) provides the major statutory framework for the protection and control of water quality in Hong Kong. According to the Ordinance and its subsidiary legislation, Hong Kong waters are divided into ten Water Control Zones (WCZs). Corresponding statements of Water Quality Objectives (WQO) are stipulated for different water regimes (marine waters, inland waters, bathing beaches subzones, secondary contact recreation subzones and fish culture subzones) in the WCZ based on their beneficial uses. The proposed Project is located within Victoria Harbour (Phase Three) WCZ and the corresponding WQO are listed in **Table 5.1**.

Table 5.1 Summary of Water Quality Objectives for Victoria Harbour WCZ

Parameters	Objectives	Sub-Zone
Offensive odour, tints	Not to be present	Whole zone
Visible foam, oil scum, litter	Not to be present	Whole zone
Dissolved oxygen (DO) within 2 m of the seabed	Not less than 2.0 mg/l for 90% of samples	Marine waters
Depth-averaged DO	Not less than 4.0 mg/l for 90% of samples	Marine waters
pH	To be in the range of 6.5 - 8.5, change due to human activity not to exceed 0.2	Marine waters
Salinity	Change due to human activity not to exceed	Whole zone

Parameters	Objectives	Sub-Zone
	10% of ambient	
Temperature	Change due to human activity not to exceed 2 °C	Whole zone
Suspended solids (SS)	Not to raise the ambient level by 30% caused by human activity	Marine waters
Unionised ammonia (UIA)	Annual mean not to exceed 0.021 mg/l as unionised form	Whole zone
Nutrients	Shall not cause excessive algal growth	Marine waters
Total inorganic nitrogen (TIN)	Annual mean depth-averaged inorganic nitrogen not to exceed 0.4 mg/l	Marine waters
Toxic substances	Should not attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole zone
	Human activity should not cause a risk to any beneficial use of the aquatic environment.	Whole zone

Source: Statement of Water Quality Objectives (Victoria Harbour (Phases One, Two and Three) Water Control Zone).

Water Supplies Department (WSD) Water Quality Criteria

3.1.4 Besides the WQO set under the WPCO, the WSD has specified a set of objectives for water quality at flushing water intakes. The list is shown in **Table 5.2**. The target limit for suspended solids (SS) at these intakes is 10 mg/l or less.

Table 5.2 WSD's Water Quality Criteria for Flushing Water at Sea Water Intakes

Parameter (in mg/l unless otherwise stated)	Target Limit
Colour (HU)	< 20
Turbidity (NTU)	< 10
Threshold Odour Number (odour unit)	< 100
Ammoniacal Nitrogen	< 1
Suspended Solids	< 10
Dissolved Oxygen	> 2
Biochemical Oxygen Demand	< 10
Synthetic Detergents	< 5
E. coli (no. per 100 mL)	< 20,000

Cooling Water Intake Standards

3.1.5 Based on a questionnaire survey conducted under the approved Comprehensive Feasibility Study for Wan Chai Development Phase II (CFSWDII) EIA [1], a SS limit of 40 mg/L will be adopted as the assessment criterion for Admiralty Centre intake and MTRC South intake. No information on the SS limit is available for other cooling water intakes. These findings have been confirmed by a telephone survey conducted under the recent approved EIA for the Hong Kong Convention and Exhibition Centre (HKCEC) Atrium Link Extension (ALE). The locations of the cooling water intakes are shown in **Figure 5.1** and **Figure 5.2**.

(1) Territory Development Department (July 2001). Agreement No. CE 74/98, Wan Chai Development Phase II, Comprehensive Feasibility Study, Environmental Impact Assessment Report, Volume I – Text.

Technical Memorandum

3.1.6 Discharges of effluents are subject to control under the WPCO. The Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS) gives guidance on the permissible effluent discharges based on the type of receiving waters (foul sewers, storm water drains, inland and coastal waters). The limits control the physical, chemical and microbial quality of effluents. Any sewage from the proposed construction and operation activities must comply with the standards for effluents discharged into the foul sewers, inshore waters or marine waters of Victoria Harbour WCZ, as given in the TM-DSS.

Practice Note

3.1.7 A Practice Note for Professional Persons (ProPECC) was issued by the EPD to provide guidelines for handling and disposal of construction site discharges. The ProPECC PN 1/94 "Construction Site Drainage" provides good practice guidelines for dealing with ten types of discharge from a construction site. These include surface runoff, groundwater, boring and drilling water, bentonite slurry, water for testing and sterilisation of water retaining structures and water pipes, wastewater from building constructions, acid cleaning, etching and pickling wastewater, and wastewater from site facilities. Practices given in the ProPECC PN 1/94 should be followed as far as possible during construction to minimise the water quality impact due to construction site drainage.

Assessment Criteria for Corals

3.1.8 Potential impacts on benthic organisms, including corals, may arise through excessive sediment deposition. The magnitude of impacts on marine ecological sensitive receivers will be assessed based on the predicted sedimentation rate.

3.1.9 According to Pastorok and Bilyard [2] and Hawker and Connell [3], a sedimentation rate higher than 0.1 $kg/m^2/day$ would introduce moderate to severe impact upon corals. This criterion has been adopted for protecting the corals in Victoria Harbour under the recently approved EIA for Tai Po Sewage Treatment Works Stage 5 [4]. This sedimentation rate criterion is considered to offer sufficient protection to marine ecological sensitive receivers and is anticipated to guard against unacceptable impacts. This protection has been confirmed by previous EM&A results which have indicated no adverse impacts to corals have occurred when this assessment criterion has been adopted.

(2) Pastorok, R.A. and Bilyard, G.R. (1985). "Effects of sewage pollution on coral-reef communities." *Marine Ecology Progress Series* 21: 175-189.

(3) Hawker, D. W. and Connell, D. W. (1992). "Standards and Criteria for Pollution Control in Coral Reef Areas" in Connell, D. W and Hawker, D. W. (eds.), *Pollution in Tropical Aquatic Systems*, CRC Press, Inc.

(4) Maunsell Consultants Asia Limited (2003). Tai Po Sewage Treatment Works Stage 5. EIA Report, Drainage Services Department, 2003

Potential Water Quality Impacts Related to Cooling Water Discharges

3.1.10 Thermal plumes associated with the reprovisioned outfalls for cooling water discharges will lead to a temperature rise in the receiving water. The WQO for Victoria Harbour WCZ stipulated that the temperature rise in the water column due to human activity should not exceed 2 °C (**Table 5.1**).

3.1.11 Chlorine, in the form of sodium hypochlorite solution or produced through electrolysis of sea water, is commonly used as an anti-fouling agent or biocide for the treatment of cooling water within the cooling systems. Residual chlorine discharging to the receiving water is potentially harmful to marine organisms. A previous study (5) indicated that a residual chlorine level of 0.02 mg/l would have an adverse impact on marine organisms. EPD had commissioned an ecotoxicity study (6) on TRC using local species. The lowest No Observable Effect Concentration (NOEC) value from that study was 0.02 mg/L. The United States Environmental Protection Agency (USEPA) has a more stringent limit of 7.5 $\mu g\ L^{-1}$ for residual chlorine that has been adopted as the assessment criterion for this EIA.

3.1.12 C-Treat-6 is the trade name of a commercially available surfactant-based antifouling / anticorrosion chemical agent that is commonly used for the cooling water systems which contains the active ingredient '30% tallow 1,3-propylene diamine' at a typical concentration of 33% (measured as amine content). It is acutely toxic to aquatic life. Ma et al (7) considered an interim maximum permissible concentration (based on an ecotoxicity study on marine brown shrimp) of 0.1 mg C-Treat-6 per litre in the ambient water acceptable from an ecotoxicological standpoint.

4 Identification of Environmental Impact

Operational Phase

4.1.1 The WDII operation could have potential impact on the flow regime and the associated water quality impact in Victoria Harbour as a result of the change of coastline configurations. The formation of the WDII reclamation may affect the water levels, current velocity, and tidal flushing in the vicinity of the reclaimed land and, potentially, over a larger area. In addition, the changes in the hydrodynamics in Victoria Harbour may affect the pattern of pollutant dispersion patterns from sewage outfalls and stormwater culverts into the surrounding waters.

4.1.2 The formation of WDII reclaimed area may create areas susceptible to floating refuse accumulation, affecting the aesthetic quality of the marine water. However, it is considered that the impact of floating refuse can be effectively controlled by regular refuse scavenging.

4.1.3 It is considered that impacts resulting from the operation of CWB, in terms of water quality, will be minimal and similar for both the elevated and tunnel sections of the route. Surface runoff from slip-roads and elevated structures may be contaminated by oils leaked from passing vehicles, and tunnel seepage would potentially be contaminated to the same extent. It is considered that impacts upon water quality will be minimal provided that the tunnel and elevated

(5) Langford, T. E. (1983). Electricity Generation and the Ecology of Natural Waters.
(6) Tender Ref. WP 98-567 Provision of Service for Ecotoxicity Testing of Marine Antifoulant – Chlorine in Hong Kong Final Report January 2000. Submitted to Environmental Protection Department by the Centre for Coastal Pollution and Conservation, City University of Hong Kong.
(7) Ma, S. W. Y., Kueh, C. S. W., Chiu, G. W. L., Wild, S. R. and Yip, J. Y. (1998). "Environmental Management of Coastal Cooling Water Discharges in Hong Kong" in *Wat. Sci. Tech.* Vol. 38, No. 8-9, pp. 267 – 274.

sections of the CWB are designed with adequate drainage systems and appropriate oil interceptors, as required.

4.1.4 Dredging of contaminated mud within the Causeway Bay typhoon shelter is proposed to mitigate the operational phase odour impacts. The dredging operations within this embayed waters, if required should be carefully planned and controlled and suitable mitigation measures should be proposed to minimize the potential impacts on the seawater intakes within the typhoon shelter.

Construction Phase

4.1.5 **Figure 2.7** shows the reclamation stages. Key water quality concerns during the WDII reclamation are identified as follows:

- Dredging and filling works that will disturb the marine bottom sediment, causing an increase in SS concentrations in the water column and forming sediment plume along the tidal flows.
- Temporary embayments will be formed between the partially reclaimed lands as the WDII reclamation proceeds in stages. Potential accumulation of pollutants from contaminated stormwater runoff (due to debris and oil / grease left on the ground, and organic matter from expedient connections) into the temporary embayments may increase the dissolved oxygen demand in the slack water, causing dissolved oxygen depletion and, in turn, potential odour impacts on the neighbouring sensitive receivers.
- Construction runoff and drainage, with effluents potentially contaminated with silt, oil and grease.

4.1.6 Potential impacts on water quality from dredging and filling will vary according to the quantities and level of contamination, as well as the nature and locations of the WSR at or near the dredging sites. These impacts are summarised as follows:

- Increased suspension of sediment in the water column during dredging activities, with possible consequence of reducing DO levels and increasing nutrient levels.
- Release of previously bound organic and inorganic constituents such as heavy metals, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and nutrients into the water column, either via suspension or by disturbance as a result of dredging activities, or depositing of fill materials.
- Release of the same contaminants due to leakage and spillage as a result of poor handling and overflow from barges during dredging and transport.

4.1.7 All of the above may result in deterioration of the receiving marine water quality and may have adverse effects on WSR. They are elaborated in the following paragraphs.

Suspended Sediment

4.1.8 As a result of dredging and filling activities during the construction phase, fine sediment will be lost to suspension. The suspended sediment will be transported by currents to form sediment plumes, which will gradually resettle. The impact from sediment plumes is to increase the suspended sediment concentrations, and cause non-compliance in WQO and other criteria.

4.1.9 Any sediment plume will cause the ambient suspended sediment concentrations to be elevated and the extent of elevation will determine whether or not the impact is adverse or not. The determination of the acceptability of any elevation is based on the WQO. The WQO of SS is defined as being an allowable elevation of 30% above the background. As adopted in the approved CFSWDII EIA for assessing the environmental impacts of released SS, the ambient value is represented by the 90th percentile of baseline (pre-construction) concentrations.

Stormwater Discharges

4.1.10 Stormwater and drainage discharges from the construction sites may contain considerable loads of SS and contaminants during construction activities. Potential water quality impact includes run-off and erosion of exposed bare soil and earth, drainage channels, earth working area and stockpiles. Minimum distances of 100 m shall be maintained between the existing or planned stormwater discharges and the existing or planned WSD flushing water intakes during construction and operation phases.

4.1.11 Local and coastal water pollution impact may be substantial if the construction site run-off is allowed to discharge into the storm drains or natural drainage without mitigation.

Construction Runoff and Drainage

4.1.12 Wastewater generated from construction activities may contain increased loads of SS and contaminants. Potential water quality from site run-off may come from:

- contaminated ground water from any dewatering activities as a result of excavation and disturbance of contaminated sediments
- release of any bentonite slurries and other grouting materials with construction run-off, storm water or ground water dewatering process
- wash water from dust suppression sprays and wheel washing facilities
- fuel, oil and lubricants from maintenance of construction vehicles and equipment.

4.1.13 Underground band drains will be applied during surcharging to enhance the settlement of sand fill above the bottom sediment left *in situ*. Pore water discharging from sediment via the band drains will be absorbed by the filling materials above. Thus, there will be no pore water discharged from the construction site as surface effluent.

General Construction Activities

4.1.14 The general construction works that will be undertaken for the roads and infrastructure will be primarily land-based and may have the potential to cause water pollution. These could result from the accumulation of solid waste such as packaging and construction materials, and liquid waste such as sewage effluent from the construction work force, discharge of bilge water and spillage of oil, diesel or solvents by vessels and vehicles involved with the construction. If uncontrolled, any of these could lead to deterioration in water quality. Increased nutrient levels result from contaminated discharges and sewage effluent could also lead to a number of secondary water quality impacts including decreases in DO concentrations and localised increase in NH_3-N concentrations which could stimulate algal growth and reduction in oxygen levels.

4.1.15 Sewage will arise from sanitary facilities provided for the on-site construction work force. It is characterised by high level of BOD, NH_3-N and *E.coli* counts. There will be no public sewers available for domestic sewage discharge on-site.

5 Approach for Operational Phase Water Quality Modelling

Modelling Scenarios

5.1.1 The presence of the proposed WDII reclamation may change the flushing capacity of Victoria Harbour and thus impact upon the water quality. The proposed permanent reclamation may be divided into 3 main areas, namely:

- the Hong Kong Convention and Exhibition Centre Reclamation (HKCEC);
- the Wan Chai Reclamation (WCR); and
- the North Point Reclamation (NP)

5.1.2 **Figure 1.1** shows the boundaries of the proposed permanent reclamations. The extent of the reclamation has already been minimized to satisfy the Government's requirement and the community's aspiration.

5.1.3 Construction of the Project is scheduled to commence in 2008 for completion by 2016. Two time horizons (Year 2016 and Ultimate Year respectively) were considered for the operational phase impact. Major factors that would affect the water quality simulated would be (i) the change in background pollution loading discharged from storm and sewage outfalls; and (ii) the change in coastline configurations between the two time horizons.

5.1.4 Sewage effluent discharged from the Harbour Area Treatment Scheme (HATS) would be the key background pollution source affecting the water quality in Victoria Harbour. Stage 1 of HATS, comprising the Stonecutters Island Sewage Treatment Works (SCISTW) and the deep tunnels, was commissioned in late 2001, which collects sewage from Kwai Chung, Tsing Yi, Tseung Kwan O, parts of eastern Hong Kong Island and all of Kowloon and deliver it to SCISTW for chemically enhanced primary treatment (CEPT). Stage 2 of HATS would be implemented in two phases, namely Stage 2A and Stage 2B. Under Stage 2A, deep tunnels would be built to bring sewage from the northern and western areas of Hong Kong Island to SCISTW and the design capacity of the SCISTW would be expanded to meet the future demands. Stage 2A is currently scheduled for implementation by 2014. Stage 2B of HATS involves the provision of biological treatment at the SCISTW to improve the effluent quality. Stage 2B is tentatively scheduled for implementation by 2021. It should however be highlighted that the way forward of the HATS is still being studied and the timing for implementation of Stage 2B is still subject to review.

5.1.5 In 2016 during early commissioning of WDII and CWB, the pollution loading discharged from HATS would be larger than that in the ultimate condition (even though the effluent flow in 2016 would be smaller than the ultimate flow). This is based on an assumption that the treatment process of SCISTW would be upgraded from CEPT to biological treatment under Stage 2B by 2021 (before the ultimate condition).

5.1.6 The pollution loading discharged from the storm water outfalls along the seafront of Victoria Harbour is mainly contributed by polluted stormwater runoff, expedient connections or cross connection between the drainage and sewerage systems in the catchment areas. With the continuous efforts by the government to improve the sewerage system and implement water pollution control measures and enforcement in the catchments on both sides of Victoria Harbour, it is unlikely that the storm pollution problem under the ultimate condition would be worse than the 2016 scenario.

5.1.7 Based on the information on the planned developments from the EIA Reports registered under the EIAO, there would not be any change in the coastline configuration within Victoria Harbour between 2016 and the ultimate year. The reclamations for South East Kowloon Development (SEKD) and Yau Tong Bay Reclamation (YTBR) are excluded as they are still subject to planning review. It should be noted that the "no reclamation" scenario is being considered for the SEKD but the feasibility of such scenario is still subject to detailed investigation.

5.1.8 Three proposed reclamation projects, namely Tuen Mun Siu Lang Shui Reclamation, Hei Ling Chau Reclamation and Tai O Reclamation, would unlikely to be in place before 2016 as no implementation schedule is currently available for these development proposals. These reclamations are thus excluded in the 2016 scenario. All these 3 reclamations are located outside Victoria Harbour in farther field. It is therefore anticipated that the possible change of coastline configuration for these 3 development projects would not affect the outcome of the water quality modelling. Details of the coastline configurations assumed under various construction and operation scenarios are given in Section 10.

5.1.9 Based on the above considerations, the 2016 development scenario, with completion of WDII reclamation, represents a worst case in terms of both background pollution discharges and impact on tidal flushing within Victoria Harbour. Year 2016 was therefore selected as the time horizon for operational phase hydrodynamic and water quality modelling. Two scenarios will be simulated to evaluate the change in the hydrodynamic regime due to the WDII reclamation:

Scenario 1A

- 2016 Baseline Scenario without the proposed WDII reclamation

Scenario 1B

- 2016 Development Scenario with the proposed WDII reclamation

5.1.10 Additional scenarios for addressing the hydrodynamic and water quality impact during different interim construction stages are considered in Sections 7 to 9. A summary of the modelling scenarios is given in Section 11.

Modelling Tools

5.1.11 Computer modelling will be used to assess the potential impacts on water quality in Victoria Harbour associated with the operation of the Project. The hydrodynamic and water quality modelling platforms were developed by Delft Hydraulics, namely the Delft3D-FLOW and Delft3D-WAQ respectively.

5.1.12 Delft3D-FLOW is a 3-dimensional hydrodynamic simulation programme with applications for coastal, river and estuarine areas. This model calculates non-steady flow and transport phenomena that result from tidal and meteorological forcing on a curvilinear, boundary fitted grid. Delft3D-WAQ is a water quality model framework for numerical simulation of various physical, biological and chemical processes in 3 dimensions. It solves the advection-diffusion-reaction equation for a predefined computational grid and for a wide range of model substances.

5.1.13 In the present study, the detailed Victoria Harbour (VH) model developed using Delft3D-FLOW and Delft3D-WAQ will be employed for hydrodynamic and water quality impact assessment. This detailed model was originally developed to assess the impacts of the proposed Shatin Sewage Treatment Works Stage III extension on the water quality in Victoria Harbour. The model was extensively calibrated by comparing computational results with measurements of the 1988 Victoria Harbour measurement campaign, and accepted by the EPD.

5.1.14 The model setup of the VH model was further modified under the previous approved Comprehensive Feasibility Study for Wan Chai Development Phase II (CFSWDII) EIA for assessing water quality impacts of the WDII. For example, the grid layout of the original Victoria Harbour model was enhanced in the vicinity of the WDII reclamation resulting in a higher resolution of approximately 50 m by 100 m. Details of the model setup and verification

for the WDII Study were described in the "Technical Note on Hydrodynamic Model & Water Quality Model Set-up" prepared under the CFSWDII [8].

5.1.15 It was assumed under the approved CFSWDII EIA that all the existing storm and spent cooling water outfalls within the Causeway Bay typhoon shelter would be permanently decommissioned and these outfalls would be diverted outside the typhoon shelter. This is deviated from the present Study that the existing storm and spent cooling water outfalls would remain within the Causeway Bay typhoon shelter. The water quality impacts arising from such deviation from the approved CFSWDII EIA need to be examined. Under the present Study, the grid mesh of the detailed VH model has been further modified with a higher resolution (approximately 50m x 50m) at Causeway Bay typhoon shelter to address the water quality concern. **Appendix A.1** shows the grid layout of the refined VH model.

5.1.16 The refined VH Model is linked to the regional Update Model, which was constructed, calibrated and verified under the project "CE42/97 Update on Cumulative Water Quality and Hydrological Effect of Coastal Development and Upgrading of Assessment Tool" (Update Study). Computations are first carried out using the Update Model to provide open boundary conditions to the VH Model. The Update model covers the whole Hong Kong and the adjacent Mainland waters including the discharges from Pearl River. The influence on hydrodynamics and water quality in these outer regions would be fully incorporated into the VH Model.

5.1.17 It should be noted that the WDII reclamation has a curved permanent coastline for the Wan Chai Reclamation Stage 4 (WCR4) as shown in **Figure 2.7**. In the process of refining the operational phase model grids for the detailed VH model under the present Study, a slightly larger reclamation area is assumed for WCR4 with a straight permanent coastline connecting the points between the northeast corner of Wan Chai Reclamation Stage 3 (WCR3) and the northwest corner of the PCWA. The grids of the refined VH model (assuming a straight permanent coastline at WCR4) are compared against the final WDII reclamation limit (with a curved permanent coastline at WCR4) in **Appendix A.1**. The comparison showed that the deviation of the coastline configuration is small. No significant effect on the water quality modelling results is expected from such deviation considering that there is no existing or planned water sensitive receiver located at the waterfront of WCR4.

Simulation Periods

5.1.18 For each operational phase modelling scenario, the simulation period of the hydrodynamic model covers two 15-day full spring-neap cycles (excluding the spin-up period) for dry and wet seasons respectively. The hydrodynamic results will be used repeatedly to drive the water quality simulations for one complete calendar year (excluding the spin-up period) as specified in the EIA Study Brief. It was found that a spin-up period of 8 days and 45 days is required for hydrodynamic simulation and water quality simulation respectively to ensure that initial condition effects can be neglected.

5.1.19 The spin-up (8 days) of hydrodynamic simulation follows that adopted in the approved EPD Update Model and has been tested under the present EIA Study to be sufficient. For water quality simulation, pollution load discharges are included within the embayment areas (e.g. Causeway Bay Typhoon Shelter) and a longer spin-up of 45 days is required for the model to reach an equilibrium status. Spin-up of water quality simulation has also been tested under the present EIA study to be sufficient.

(8) Maunsell Consultants Asia Ltd. (May 2000). Agreement No. CE 74/98. Wan Chai Development Phase II. Comprehensive Feasibility Study. Environmental Impact Assessment Study. Technical Note: Hydrodynamic Model & Water Quality Model Set-up.

Model Setup for Discharges

5.1.20 The Pearl River estuary flows will be incorporated in the hydrodynamic model. Flows from other storm and sewage outfalls within the whole Hong Kong waters are relatively small and would unlikely change the hydrodynamic regime in the area and therefore will be excluded in the hydrodynamic model.

5.1.21 Loading from the sewage outfalls will be allocated in the bottom water layer. Pollution loads from storm outfalls and other point source discharges such as those from typhoon shelters, marine culture zones, landfills and beaches will be specified in the middle layer of the water quality model.

6 Modelling Approach for Assessment of Operational Phase Thermal Plume and Residual Chlorine Impacts

Description of Cooling Water Discharges

6.1.1 The proposed WDII reclamation would require reprovisioning of the existing cooling water intakes and discharges along the Wan Chai waterfront. Computer modelling will be employed to assess the potential impact due to the thermal plumes and discharge of residual chlorine associated with the reprovisioned outfalls for cooling water discharges upon full commissioning of the Project. Locations of intakes and discharges for the cooling systems within the study area have been identified in **Figure 5.2** and **Figure 5.3a** respectively. Spent cooling water from these identified cooling water systems will be discharged through culverts / outfalls into the harbour causing a potential increase in water temperature. Information on the cooling water discharges collected under the CFSWDII at the planning stage is given in **Table 5.5**.

6.1.2 It should be noted that the CFSWDII adopted a conservative approach, based on the available information from the planning stage (**Table 5.5**). For most of the spent cooling water discharges, the maximum discharge flow rates of the water cooling systems have been applied to the model continuously (that is, 24 hours daily). In reality, the maximum flow discharge would only occur during the office hours and depends on the outdoor air temperature in different seasons. Latest design flow rates of these cooling water systems provided in the Study "Implementation Study for Water-cooled Air Conditioning System at Wan Chai and Causeway Bay – Investigation (ISWACS-WCCB)" recently completed in 2005 have been reviewed and compared to those adopted under the CFSWDII. The flow rates provided in the ISWACS-WCCB are based on the latest engineering information and a more detailed estimation. It was found that the cooling water discharge rates adopted under the CFSWDII are more conservative as compared to those used under the ISWACS-WCCB and are therefore used for this EIA for worst-case assessment. The proposed discharge rates used under this EIA are provided in **Table 5.6**.

Table 5.5 Summary of Information of Water Cooling Systems

Name of Building	The Hong Kong Academy for Performing Arts	Hong Kong Convention and Exhibition Centre (Phase I)	Hong Kong Convention and Exhibition Centre (New Wing)	China Resources Building	Great Eagle Centre	Sun Hung Kai Centre	Windsor House
Seawater abstraction rate (m^3 per hour)	3312	3033.0 with a range from 1213.2 to 4852.8	126 (maximum =6120)	2160, with a range from 414 to 3312	1400 (summer) 1085 (winter) (maximum=1635)	1308 (maximum = 2616)	1362.4
Discharge frequency and duration	From 0800 to 2400 continuously	24 hours	24 hours with variable flow	24 hours	24 hours	24 hours	-
Cooling water intake temperature (°C)	30.0	Depends on sea water temperature	26	28 (summer)	24 – 27 (summer) 17 – 19 (winter)	28	26
Cooling water discharge temperature (°C)	35.4	34	32	35 (summer)	30 – 33 (summer) 21 – 23 (winter)	33 – 35	32
Method of treatment	Electrochlorinator	Chemical additives and electrochlorinator	Electro-chlorinate and Biocide dosing system	Electrochlorinator	Electrochlorinator	Chloropac	Electrochlorinator
Name and dosage of chemicals added	-	C-Treat-6, 6 ppm	Hypochlorite, 3 ppm	-	-	Sodium hypochlorite system	-
Main chemical constituents of the additives	Chlorine	Chlorine, C-Treat-6	Chlorine	Chlorine	Chlorine	-	Chlorine
Effluent quality	-	Chlorine, 0.2 ppm; C-Treat-6, 2 ppm	Residual chlorine level at discharge > 0.3 ppm	-	-	0.3 – 0.5 ppm at outlet	-
Remarks	-	-	The Centre was only 60% occupied during survey.	-	-	-	-

Note: ppm = mg/l

Table 5.6 Flow Rates of Water Cooling Systems for Thermal Plume Modelling.

Outfall ID (Figure 5.3a)	Buildings	Discharge Rate (m^3/s)	
		Adopted in CFSWDII EIA	Adopted in this EIA [1]
10	Proposed HKAPA Extension	1	1
2a	The Hong Kong Academy for Performing Arts	0.92	0.92
3	HKCEC (Phase I)	1.35	1.35
2	Shui On Centre	0.94	0.94
2	Telecom House	0.84	0.84
4	Government Buildings	1.2	1.2
5	China Resources Building and Hong Kong Exhibition Centre	0.92	0.92
5	Great Eagle Centre	0.45	0.45
6	Sun Hung Kai Centre	0.72	0.72
1	HKCEC (New Wing)	1.7	1.7
7	Proposed Exhibition Station	1.35	1.35
-	Proposed Hotel / Commercial Development WDII/28	1.4	Not included [2]
-	Proposed Leisure and Entertainment Complex Development WDII/30	1.4	Not included [2]
9	Windsor House	0.38	0.38
8a	No. 27-63 Paterson Street	0.38	0.38
8	Excelsior Hotel and World Trade Centre	1.4	1.4

Notes:
(1) Based on values adopted under the CFSWDII EIA.
(2) Under the CFSWDII EIA, WDII/28 and WDII/30 were proposed to be developed on the new reclamation land within the Causeway Bay Typhoon Shelter. These developments are excluded in this EIA as no such developments / reclamation is currently proposed within the Causeway Bay Typhoon Shelter

Thermal Plume Modelling Tools

6.1.3 In the present study, the basis for modelling of the harbour waters is the refined Victoria Harbour (VH) Model as discussed in Section 5.

6.1.4 The Excess Temperature Model within Delft3D-FLOW model will be employed to simulate the thermal plume dispersion in Victoria Harbour and to assess the impact on the neighbouring cooling water intakes. The model allows for the excess temperature distribution and decay of the thermal plume, and addresses heat transferred from the water surface to the atmosphere. While the total heat flux is proportional to the excess temperature at the surface, the heat transfer coefficient of the formulation depends mainly on water temperature and wind speed. The parameters adopted for the thermal plume modelling are summarised in **Table 5.7**. It should be noted that Delft3D-PART model was employed for the thermal plume modelling conducted under the CFSWDII EIA which did not take into account the surface heat loss as mentioned above. Thus, the thermal plume impact for the CFSWDII EIA may be overestimated. The thermal plume impact predicted by the Delft3D-FLOW model conducted under this Study is considered more realistic.

Table 5.7 Summary of Parameters for Thermal Plume Model (Delft3D-FLOW)

Delft3D-FLOW Excess Temperature Model Parameters		
Background (Air) Temperature (°C)	18 28	Dry Season Wet Season
Temperature of spent cooling water (°C)	24 32 [1]	Dry Season Wet Season
Wind Speed ($m\ s^{-1}$)	5	Dry Season and Wet Season
Ambient Water Temperature (°C)	18 To be computed by model [1]	Dry Season Wet Season

(1) The predicted temperature at various intake locations under the baseline scenario (without any cooling water discharges) have been checked and confirmed to be lower than 26°C for the entire simulation period, the discharge temperature of 32°C for wet season should provide a good approximation of the temperature of spent cooling water for thermal plume modelling and assessment.

6.1.5 Each hydrodynamic FLOW simulation will cover a complete spring-neap tidal cycle, preceded by a spin-up period. It was found that the long spin-up period (about 1.5 tidal cycles) is required to establish the quasi-steady thermal pattern within the Study Area. One-minute time step will be used in the thermal plume modelling. In order to determine whether the time step of 1 minute is acceptable, a sensitivity hydrodynamic run was conducted using a smaller time step of 30 seconds. Comparison of the flow results for the 1-minute time step and the 30-second time step showed that there is no significant deviation between the 2 sets of results. The time step of 1 minute is therefore considered acceptable.

6.1.6 It is conservatively assumed that all cooling water discharges have an excess temperature of 6 °C with reference to the background seawater temperature. As adopted in the CFSWDII EIA, results of the predicted temperature elevation at the intakes will be factored up by [1(1-E/k)] to take into account the potential short circuit problem of the re-circulation of heated water to the cooling water intake.

Where:

E = maximum of the mean temperature elevations predicted at the intakes

k = excess temperature of the cooling system = 6°C

6.1.7 The derivation of the heat re-circulation factor [1(1-E/k)] is given in **Annex I**.

6.1.8 It should be noted that the thermal impact predicted by the temperature model is linearly proportional to the temperature loading of the cooling discharges. A factor of 1.2 will be applied to all the flow rates for model input to allow a safety margin for the discharge rates. Using the safety factor is a conservative approach as most of the concurrent discharges covered in this EIA are already the peak flow rates which will be applied to the model constantly throughout the whole simulation period. It should be noted that the discharge rates as shown in **Table 5.6** did not incorporate the safety factor of 1.2. The seawater intake rates for the cooling water systems will also be incorporated into the thermal plume model to take into account the hydrodynamic influence due to the seawater extractions.

Residual Chlorine

6.1.9 The 3-dimensional particle tracking model (Delft3D-PART) developed by Delft Hydraulics will be employed to model the residual chlorine discharged from the cooling water. The discharge of residual chlorine will be represented by discrete particles released into the surface layer of the model. These discrete particles will be transported with flow fields determined from the hydrodynamic simulation using the refined Delft3D-FLOW Victoria Harbour (VH) Model as mentioned in Section 5, and turbulent diffusion and dispersion, based on a random walk technique. The residual chlorine elevation over the ambient level will then be evaluated from the particle density in each cell of the curvilinear grid of Victoria Harbour model. Due to the high decay rate of chlorine in marine waters, the ambient chlorine level will lbe assumed to be negligible.

6.1.10 The flow data adopted in Delft3D-PART model will be obtained from the Delft3D-FLOW hydrodynamic model results. Each flow simulation will cover a complete spring-neap tidal cycle (about 15 days). The actual simulation period will be preceded by a spin-up period of 8 days.

6.1.11 Each Delft3D-PART simulation will cover a complete spring-neap tidal cycle (about 15 days), preceded by a spin-up period of 15 days. The 15-day flow simulation results will be repeated for the 30-day simulation period for Delft3D-PART with due consideration on the continuity of the tidal level between successive 15-day periods. In order to determine whether the spin-up period for Delft3D-PART is adequate, the time series plot of predicted residual chlorine are compared between the spin-up period and the actual simulation period at two locations (one at the Wan Chai waterfront and the other at the Causeway Bay typhoon shelter) as attached in **Annex II**. It was found that there is no significant difference in the model results for the 2 successive periods. Therefore, it is considered that the simulation period is acceptable.

6.1.12 Delft3D-PART makes use of the information on water flow derived from the Delft3D-FLOW model. One-minute time step for numerical simulation and 6 minutes (for saving model outputs and "com" files) will be applied in the Delft3D-FLOW model. As the number of particles that can be used in the Delft3D-PART is limited, 6 minutes time step will be used for numerical simulation in particle tracking. The parameters adopted for the Delft3D-PART model for modelling residual chlorine are summarised in **Table 5.8**. For cooling water discharge, the flow rate as shown in **Table 5.6** will be factored up by 1.2 and input into the model as a constant rate throughout both dry and wet seasons simulations. It is also conservatively assumed that all cooling water discharges have a residual chlorine concentration of 0.5 mg/l, which will be assumed to be discharged continuously 24 hours a day at the corresponding factored discharge rates.

Table 5.8 Summary of Parameters for Modelling of Residual Chorine (Delft3D-PART)

Partical Track Model Parameters		
Ambient Water Temperature (°C)	18 28	Dry Season Wet Season
Ambient Salinity (ppt)	31 30	Dry Season Wet Season
Ambient Water Density (kg m^{-3})	1024 1016	Dry Season Wet Season
Horizontal Dispersion Coefficient D_H (m^2 s^{-1})	A = 0.003 B = 0.4	$D_H = a\,t^b$, where t is the age of particle from the instant discharge in seconds
Vertical Dispersion Coefficient D_V (m^2 s^{-1})	5 x 10^{-3} 1 x 10^{-5}	Dry Season Wet Season
Residual Chlorine (mg/l)	0.5	-
Decay Factor for Residual Chlorine, T_{90} (s)	8289 (2)	-
Excess Temperature at Intake	From model	-
Flow Rate (m^{3}s^{-1})	Equivalent for Intake and Discharge	No loss of water in the cooling system.
Particle Settling Velocity (m s^{-1})	-0.005 (Constant)	Heated discharge is slightly less dense than ambient water
Critical Shear Stress (1)	N/A	No sedimentation or erosion

(1) Sedimentation and erosion are irrelevant for thermal plume modelling
(2) Approved EIA for Tai Po Sewage Treatment Works Stage V

6.1.13 It should be noted that the residual chlorine concentration represents total residual chlorine as there is no mechanism in the Delft model to partition the chlorine into free chlorine or various compound species. As compared to the decay factor for residual chlorine (T_{90} = 1800s) adopted under the CFSWDII EIA, a more conservative value (T_{90} = 8289s) was used for this EIA for conservative assessment. The T_{90} factor adopted in this EIA is based on the assumption used under the approved EIA for Tai Po Sewage Treatment Works Stage V. Upon our review of relevant past EIA studies, this T90 factor is the most conservative value and was therefore applied to the model for conservative assessment.

6.1.14 As chlorination is being considered as the disinfection method for the HATS, the discharge of residual chlorine from HATS will be included in the model for cumulative assessment assuming a HATS flow rate of 2,800,000 m^3 per day (which is the design capacity of HATS) with a residual chlorine content of 0.02 mg/l.

7 Approach for Construction Phase Sediment Plume Modelling

General Description of Marine Construction Works

7.1.1 The proposed marine construction works will involve:

- Permanent reclamation at Hong Kong Convention and Exhibition Centre (HKCEC)
- Permanent reclamation at Wan Chai (WCR)
- Permanent reclamation at North Point (NPR)
- Temporary reclamation at Public Cargo Working Area (TPCWA) and Causeway Bay (TCBR) for construction of the CWB tunnel
- Construction of Temporary Typhoon Shelter (TBW)
- Construction of new cross-harbour water mains from Wan Chai to Tsim Sha Tsui
- Construction of Wan Chai East submarine sewage outfall.
- Temporary reclamation at Wan Chai (TWCR4)

7.1.2 The proposed construction method adopts an approach where permanent and temporary seawalls will first be formed to enclose each phase of the reclamation. Bulk filling will be carried out behind the completed seawall. Demolition of temporary reclamation will involve excavation of bulk fills and dredging to the existing seabed level which will be carried out behind the temporary seawall. Temporary seawall will be removed after completion of all excavation and dredging works for demolition of the temporary reclamation. Therefore, the sediment plume can be effectively contained within the permanent and temporary reclamation area. Demolition of temporary seawall will involve removal of gravel only, which would not create significant SS impact. Fines content in the filling materials for seawall construction would be negligible and loss of fill material during seawall construction is therefore not expected. Thus, potential water quality impact of SS will only arise during the dredging for seawall foundation.

7.1.3 There will be a total of five main reclamation areas, namely HKCEC, WCR, NPR, TPCWA and TCBR respectively. Each of these five reclamation areas is subdivided into different stages for different engineering and environmental constraints as shown in **Figure 2.7**. Within the same reclamation area, seawall dredging will be performed in sequence instead of operating concurrently. Thus, dredging along the seawall will be undertaken for only one stage at a time to minimize the potential water quality impacts. The sequencing of the reclamation stages are presented in the construction programme in **Appendix A.2**.

7.1.4 Temporary reclamation of Causeway Bay will be divided into four stages (**Figure 2.7**). Construction of TCBR1W and TCBR1E will be undertaken at the first stage with seawall foundation to be constructed in sequence. Thus, dredging along the seawall of TCBR1W will not be carried out simultaneously with the dredging along the seawall of TCBR1E to minimize the dredging impact. At Stage 2, dredging at seawall of TCBR2 will take place when TCBR1W and TCBR1E are in place. Demolition of TCBR1E will then proceed and the whole TCBR1E will be removed before the commencement of TCBR3. Thus, during the third stage, dredging for seawall foundation and seawall trench filling at TCBR3 will take place when both TCBR1W and TCBR2 are in place at the same time. Subsequently, TCBR1W will be removed before the TCBR4 commences. Therefore, water body behind temporary reclamation area will not be fully enclosed, which minimise water quality impacts (also refer to **Figure 2.10** to **Figure 2.14**).

7.1.5 After the construction of the western seawall of HKCEC Reclamation Stage 1 (HKCEC1) is completed in 2008, a temporary embayment will be formed between the existing eastern seawall of CRIII and the HKCEC Extension. This embayment will be a particular cause of concern as a storm outfall (Culvert L) is currently discharging pollutants into this area. Locations of existing storm outfalls within the Project site are shown in **Figure 5.3b**. The potential water quality impact within this embayment will last for more than 2 years until the reclamation of HKCEC Stage 2 where the new Culvert L extension can be constructed via a new land formed under HKCEC2W (**Figure 2.17**). The delay in filling of this embayment arises due to the restriction of piling, dredging and reclamation works in the vicinity of the existing cross harbour water mains, which must be diverted first before any disturbance of the seabed in this area can take place.

7.1.6 As a mitigation measure, to avoid the accumulation of water borne pollutants within this embayment, an impermeable barrier, suspended from a floating boom on the water surface and extending down to the seabed, will be erected by the contractor before the HKCEC1 commences. The barrier will channel the stormwater discharge flows from Culvert L to the outside of the embayment. The contractor will maintain this barrier until the reclamation works in HKCEC2W are carried out and the new Culvert L extension is constructed.

7.1.7 Other storm outfalls, located at the reclamation area, will be temporarily diverted to the adjacent reclamation site before completion of seawall construction, in order to prevent discharging into temporary embayment and this minimise potential water quality impacts. In addition, storm outfalls will be diverted into the area with no nearby seawater intakes to avoid adverse impacts. In case storm outfalls and cooling water intakes are at the same area, water quality impacts have to be modelled to assess whether the impacts would be acceptable. The sequences of temporary diversion of storm outfalls are shown in **Figure 2.8** to **Figure 2.17**.

7.1.8 Diversion of seawater intakes will be undertaken at an early stage of WCR. The existing cooling water intake of Sun Hung Kai Centre (namely 6) and the WSD flushing water intake (namely a) at the Wan Chai seafront will be reprovisioned to the new waterfront (**Figure 5.2**). These two seawater intakes will be diverted across the new land formed under Wan Chai Reclamation Stage 1 (WCR1) before commencement of Wan Chai Reclamation Stages 2 to 4 (WCR2, WCR3 and WCR4).

7.1.9 The existing cooling water intakes (namely 1, 2, 3, 4 and 5) along the HKCEC water channel will be reprovisioned to the intake chambers to the north of the HKCEC Extension (as shown in **Figure 5.2**). These intakes will be diverted via the new land formed under HKCEC Reclamation Stage 1 (HKCEC1). According to the construction programme, these existing intake points will remain in operation during the seawall construction in HKCEC1 and therefore would be potentially affected by the dredging operations. The potential impact during the dredging works at HKCEC2E is considered less critical as these intakes would be diverted to the north of the HKCEC Extension before commencement of this reclamation stage.

7.1.10 There are two cooling water intakes (namely 8 and 9 respectively) in Causeway Bay Typhoon Shelter for Windsor House, Excelsior Hotel and World Trade Centre (as shown in **Figure 5.2**). Intake 9 is located within the reclamation site of TCB4 and thus will be temporarily diverted, in order to ensure continuous operation during the construction (**Figure 2.13**). No temporary diversion will be implemented for Intake 8. Construction of new cross-harbour water mains from Wan Chai to Tsim Sha Tsui and submarine wastewater outfall will also be included in this Project, which will require dredging along the proposed pipelines.

7.1.11 Since the construction of the CWB tunnel will involve temporary reclamation works in the Causeway Bay Typhoon Shelter, it will be necessary to temporarily relocate the existing moorings for those private and operational vessels during construction period for these works. The proposed temporary moorings will require construction of a 400 m long rubble mound

breakwater some 180 m offshore and parallel to the existing Causeway Bay Typhoon Shelter breakwater, together with 120 m and 130 m lengths of piled wave walls at the eastern and western ends of the sheltered mooring area respectively. The layout of the proposed temporary typhoon shelter is shown in **Figure 5.5**.

7.1.12 The primary wave and physical protection will be provided by the conventional rubble mound breakwater, which will be of similar construction to the existing breakwater. The piled wave walls will comprise vertical concrete downstands, supported on tubular steel piles at 8 to 10 m spacing. The down stands will extend down below the surface of the water to reduce wave transmission through the typhoon shelter entrances from the north-easterly and north-westerly direction. Typical details of the breakwater and the piled wave walls are shown in **Figure 5.6**.

Dredging Scenarios

7.1.13 With reference to the construction programme, three worst-case construction phase scenarios were selected for modelling. The proposed scenarios represent the realistic worst cases, including all the potentially concurrent dredging activities, envisaged during the WDII construction. For reclamation activities, impact from the seawall dredging is considered to be the most critical. A summary of the modelling scenarios is given in Section 11.

Scenario 2A

7.1.14 Scenario 2A assumes that the following marine works will take place concurrently in 2008.

a. Dredging for seawall foundation at HKCEC Stage 1 (HKCEC1)
b. Dredging for seawall foundation at WCR Stage 1 (WCR1)
c. Dredging for seawall foundation at PCWA East (TPCWAE)
d. Dredging for seawall foundation at NP Stage 1 (NPR1)
e. Dredging at temporary breakwater (TBW)
f. Dredging along the proposed alignment of the WSD cross harbour water mains from Wan Chai to Tsim Sha Tsui.

7.1.15 Five reclamation areas within the WDII are to be dredged at the same time under this scenario. To compare with other construction periods, no more than five reclamation areas will be dredged or constructed simultaneously. Thus, this scenario is considered the worst case during early stage of construction phase before any new land is formed within the WDII site. The coastline configuration for Scenario 2A is the same as the existing baseline condition. The dredging locations assumed under this scenario are given in **Figure 5.7**.

7.1.16 The existing cooling water intakes will have to be reprovisioned to the new water front during the WDII construction. As previously pointed out, diversion of the existing cooling water intakes along the HKCEC water channel has to be conducted through the new land formed under the HKCEC1. Thus, these cooling water intakes cannot be diverted until the reclamation works of HKCEC1 has been completed as the first stage. Based on the findings of the recent marine site investigation works conducted in 2006, dredging is required for the construction of the temporary seawalls at either side of the HKCEC water channel. Therefore, SS generated from the seawall dredging phase of HKCEC1 may affect the nearby cooling water intakes, which is taken into account in Scenario 2A. These cooling water intakes will be diverted to the intake chambers to the north of the HKCEC Extension before the seawall of HKCEC2W and HKCEC3 is completely constructed. In addition, HKCEC2E will not be carried out before the diversion of these cooling water intakes. Dredging at HKCEC1 will not be carried out concurrently with dredging at HKCEC3. Impact on the cooling water intake between CRIII and HKCEC1 due to the seawall dredging at HKCEC2W is assessed under Scenario 2C.

7.1.17 Scenario 2A also covers the impact during seawall dredging at WCR1 which could potentially affect the existing cooling water intake of Sun Hung Kai Centre and the WSD Wan Chai flushing water intake. As pointed out before, these two intakes are located within the site boundary of WCR2 and cannot be diverted before the reclamation works at WCR1 have been completed.

7.1.18 Dredging for the temporary seawall in PCWA will be performed within the existing breakwater. Therefore, lesser impacts are expected from this area. Nevertheless, this potential impact is also covered under Scenario 2A for cumulative assessment.

7.1.19 In addition, dredging for the cross harbour water mains is assumed to take place concurrently at two locations along the alignment from Wan Chai to Tsim Sha Tsui (**Figure 5.7**) to account for the potential impact upon the exiting seawater intakes on both sides of Victoria Harbour.

Scenario 2B

7.1.20 Scenario 2B assumes that the following marine works will take place concurrently.

g. Dredging for seawall foundation at TCBR Stage 1 West (TCBR1W)
h. Dredging along the proposed alignment of the submarine sewage pipeline of the Wan Chai East Sewage Treatment Works.

7.1.21 This scenario is assumed to take place in 2009 where the seawall for HKCEC1, WCR1, NPR1 and NPR2W would be completely constructed and the temporary breakwater at TBW and the temporary reclamation at TPCWAE would be in place. **Figure 5.8** shows the Wan Chai coastline configuration and sediment source locations assumed for Scenario 2B. This scenario covers the impact due to the seawall dredging at TCBR1W which could affect the nearby existing cooling water intakes together with the potential cumulative impact caused by the pollutants discharged from the existing storm outfalls (Culvert P and Q) at the western part of the typhoon shelter. The potential effect on the water circulation within the Causeway Bay typhoon shelter due to the placement of the temporary breakwater (TBW) will also be taken into account under this scenario.

7.1.22 Dredging for the proposed submarine sewage pipeline is also included under this scenario to assess the potential cumulative impact.

Scenario 2C

7.1.23 Scenario 2C covers the following marine works that will take place concurrently in 2010.

i. Dredging for seawall foundation at HKECE Stage 2 West (HKCEC2W)
j. Dredging for seawall foundation at WCR Stage 3 (WCR3)
k. Dredging for seawall foundation at CBR Stage 3 (TCBR3).

7.1.24 Under this scenario, temporary reclamation at TCBR1W and TCBR2 together with the temporary breakwater (TBW) will be in place at the same time. This is a very adverse scenario in terms of the water circulation inside Causeway Bay typhoon shelter. The potential impact from the seawall dredging at TCBR3 together with the potential cumulative impact due to the pollutants discharged from the storm outfalls (Culvert P and Culvert Q) is assessed in this scenario.

7.1.25 Two more reclamation areas at HKCEC2W and WCR3 respectively are to be dredged at the same time under this scenario. The dredging at HKCEC2W is included to assess the potential impacts on the existing cooling water intakes along the coastline between the eastern seawall of CRIII and the western seawall of the proposed HKCEC1 site. This scenario has also taken account of the potential impacts on the existing cooling water intakes located inside the HKCEC water channel due to the seawall dredging at WCR3. According to the construction programme, WCR2 (rather than WCR3) should be in progress in 2010. However, dredging is assumed to be carried out at WCR3 in 2010 for worst-case assessment, because WCR3 is closer to the seawater intakes inside the HKCEC channel.

7.1.26 It should be noted that, except Scenario 2A, no more than three reclamation areas will be dredged simultaneously according to the construction programme. Scenario 2C includes an additional piece of permanent reclamation (WCR2) when compared to Scenario 2B. **Figure 5.9** shows the Wan Chai coastline configuration and dredging locations assumed under Scenario 2C.

Modelling Tools

7.1.27 Sediment plumes arising from the mud dredging activities during the reclamation works will be simulated using Delft3D-PART. This model has been used for sediment plume modelling in a number of previous reclamation studies in Hong Kong including the approved CFSWDII EIA, Northshore Lantau Development Feasibility Study [9] and the Theme Park Development at Penny's Bay EIA Study [10].

7.1.28 The loss of fines to the water column during dredging operations is represented by discrete particles in the model. These discrete particles are transported by advection, due to the tidal flows determined from hydrodynamic simulation, and turbulent diffusion and dispersion, based on a random walk technique. The detailed Victoria Harbour (VH) Model adopted under the approved CFSWDII EIA will be used to provide the hydrodynamic information for particle tracking. The VH model developed under the approved CFSWDII EIA is considered acceptable for modelling of the construction phase impacts where the effect would be temporary only.

7.1.29 The Delft3D-PART model takes into account the sedimentation process by means of a settling velocity, while erosion of bed sediment, causing resuspension of sediment, is governed by a function of the bed shear stress. The parameters adopted in the present Study are summarised in **Table 5.9**. Each construction Delft3D-PART scenario will be simulated with three typical spring-neap tidal cycles for spin-up and one cycle for actual simulation in both dry and wet seasons following the approach adopted under the CFSWDII EIA.

Table 5.9 Summary of Parameters for Sediment Plume Model (Delft3D-PART)

Sediment Plume Model Parameters		
Horizontal Dispersion Coefficient D_H ($m^2 s^{-1}$)	a = 0.003 b = 0.4	$D_H = a\,t^b$, Where t is the age of particle from the instant of discharge in seconds
Vertical Dispersion Coefficient D_V ($m^2 s^{-1}$)	5×10^{-3} 1×10^{-5}	Dry Season Wet Season
Particle Settling Velocity	0.0001 m s^{-1} (Constant)	Grain size diameter of 10 μm
Critical Shear Stress	0.05 Pa 0.15 Pa	Sedimentation Erosion

Sediment Loss Rates

7.1.30 Assumptions made in the sediment plume modelling simulations are as follows:

- The dry density of harbour mud is 1.370 kg/m^3, based on the geotechnical site investigation for the WDII marine ground investigation works conducted under this Study.

(9) Scott Wilson (Hong Kong) Ltd. (February 2000). Northshore Lantau Development Feasibility Study (Agreement No. CE 60/96), Final Environmental Impact Assessment Report.
(10) Scott Wilson (Hong Kong) Ltd. (February 2000). Construction of an International Theme Park in Penny's Bay of North Lantau and its Essential Associated Infrastructures, Final Environmental Impact Assessment Report.

- Spill loss during mud dredging by closed grab dredger will be continuous, 16 hours a day, 7 days per week. The grab dredger is assumed to work over 16 hours per day in order to maintain the required works rates to meet the tight construction programme.

- With respect to rate of sediment loss during dredging, the Contaminated Spoil Management Study [11] (Mott MacDonald, 1991, Table 6.12) reviewed relevant literature and concluded that losses from closed grab dredgers were estimated at 11 – 20 kg/m^3 of mud removed. Taking the upper figure of 20 kg/m^3 to be conservative, the loss rate in kg/s was calculated based on the daily volume rate of dredging. (Assuming a dry density for marine mud of 1,370 kg/m^3, the sediment loss during dredging is equivalent to a spill amount of approximately 1.5%).

- Spillage of mud dredged by closed grab dredgers is assumed to take place uniformly over the water column.

- Dredging of contaminated and uncontaminated mud will be carried out at the same rate.

7.1.31 The calculated sediment loss rates for the Scenario 2A, Scenario 2B and Scenario 2C are shown in **Table 5.10** to **Table 5.12** respectively. The dredging rates for different construction phases were identified. The corresponding source locations are given in **Figure 5.7** to **Figure 5.9**.

Table 5.10 Maximum Dredging Rates of WDII - Scenario 2A (2008)

Source ID	Activity	Approx. Duration (1) (days)	Production Rate (m^3 per day)	Sediment Loss Rate (kg s^{-1})
HKCEC1				
A1	Dredging (1 closed grab dredger of 8 m^3 capacity)	14	6000	2.08
WCR1				
A2	Dredging (1 closed grab dredger of 8 m^3 capacity)	29	6000	2.08
TPCWAE				
A3	Dredging (1 closed grab dredger of 8 m^3 capacity)	16	6000	2.08
NPR1				
A4	Dredging (1 closed grab dredger of 8 m^3 capacity)	31	6000	2.08
Water Mains from Wan Chai to Tsim Sha Tsui				
A5 (2)	Dredging (1 closed grab dredger of 8 m^3 capacity)	16	6000	2.08
A6 (2)	Dredging (1 closed grab dredger of 8 m^3 capacity)	16	6000	2.08
TBW				
A7	Dredging (1 closed grab dredger of 8 m^3 capacity)	54	6000	2.08
External Concurrent Dredging Activity in Victoria Harbour (area between West Kowloon to Sai Ying Pun)				
A8 (3)	Dredging (1 closed grab dredger of 8 m^3 capacity)	-	3000	1.04

(1) The duration of each operation is based on the construction programme presented in Appendix A.2.
(2) For the purpose of modelling, two dredging locations are considered with A5 close to Hong Kong Island and A6 close to Tsim Sha Tsui. However, it should be noted that the dredging will be performed by 1 close grab dredger during the construction of the cross harbour water mains. Thus, only one dredger will operate at one location at a time.
(3) Two potential dredging activities, for the Western Cross Harbour Main and Western Harbour Submarine Gas Pipelines respectively, are anticipated. The dredging for Water Main is currently scheduled to be carried out in 2008 and 2009. Implementation programme for the submarine gas pipelines was unconfirmed at the stage when the modelling is performed. Both projects are located within the same area between West Kowloon and Sai Pun in Victoria Harbour. It is assumed that these 2 external projects would not be carried out concurrently. Only one dredging location is assumed at the middle of the water main alignment where the tidal current would be largest. The alignment of the water main is provided in the EIA Study Brief No. ESB-132/2005. The assumed maximum production rate is based on the information provided in the EIA Study Brief No. ESB-73/2001. This dredging source is also included for Scenario 2B and Scenario 2C.

(11) Mott MacDonald (1991). Contaminated Spoil Management Study. Final Report. Volume 1, for EPD, October 1991.

Table 5.11 Maximum Dredging and Filling Rates of WDII - Scenario 2B (2009)

Source ID	Activity	Approx. Duration (1) (days)	Maximum Production Rate (m^3 per day)	Sediment Loss Rate (kg s^{-1})
TCBR1W				
B1	Dredging (1 closed grab dredger of 8 m^3 capacity)	30	6000	2.08
Submarine Sewage Pipeline of the Wan Chai East Sewage Treatment Works				
B2	Dredging (1 closed grab dredger of 8 m^3 capacity)	13	6000	2.08
External Dredging Activity in Victoria Harbour (area between West Kowloon to Sai Ying Pun)				
B3 (2)	Dredging (1 closed grab dredger of 8 m^3 capacity)	-	3000	1.04

(1) The duration of each operation is based on the construction programme presented in Appendix A.2.
(2) See Note 3 of Table 5.10

Table 5.12 Maximum Dredging and Filling Rates of WDII - Scenario 2C (2010)

Source ID	Activity	Approx. Duration (1) (days)	Maximum Production Rate (m^3 per day)	Sediment Loss Rate (kg s^{-1})
HKCEC2W				
C1	Dredging (1 closed grab dredger of 8 m^3 capacity)	44	6000	2.08
WCR3				
C2	Dredging (1 closed grab dredger of 8 m^3 capacity)	32	6000	2.08
TCBR3				
C3	Dredging (1 closed grab dredger of 8 m^3 capacity)	41	6000	2.08
External Dredging Activity in Victoria Harbour (area between West Kowloon to Sai Ying Pun)				
C4 (2)	Dredging (1 closed grab dredger of 8 m^3 capacity)	-	3000	1.04

(1) The duration of each operation is based on the construction programme presented in Appendix A.2.
(2) See Note 3 of Table 5.10

Other Concurrent Projects

7.1.32 It should be noted that no dredging activity is anticipated for the HATS Stage 2A and HKCEC Atrium Link Extension. All the marine dredging activities for CRIII will be completed before the construction of WDII.

7.1.33 Dredging for the proposed Western Cross Harbour Main and Western Cross Submarine Gas Pipelines are also included in the sediment plume modelling (refer to Note 3 of **Table 5.10** above).

7.1.34 The proposed cruise terminal at Kai Tak will be located at the southern tip of the old airport runway in the main Harbour area. According to the information provided in the "Project Profile for Dredging Works for Proposed Cruise Terminal at Kai Tak", the worst case dredging impacts from the cruise terminal construction would occur in 2010 with a dredged volume of 1,070,000 m^3 in total (the proposed dredged volumes for cruise terminal construction in 2011 and 2012 are much smaller). It is considered that the dredging rate for cruise terminal construction would be at least 3,600 m^3 per day assuming that the proposed dredging works could spread out over 295 working days in 2010. On the other hand, the worst case scenario (in terms of the dredged volume) to be modelled for the WDII reclamation would occur in 2008 (Scenario 2A) with a dredging rate of 39,000 m^3 per day in total (see **Table 5.10** above). This 2008 worst case scenario will cover the impact due to the dredging of marine mud (about 24,000 m^3 per day) for seawall foundation along the coastline of the WDII Project Site as well as the dredging of marine mud (about 15,000 m^3 per day) in the main flow channel of the Victoria Harbour for construction of the water mains and the breakwater of the temporary typhoon shelter etc (**Table 5.10**). In 2010, the expected dredged volume for WDII reclamation would be much smaller (about 18,000 m^3 per day for seawall construction along the coastline of the WDII Project Site plus only one external dredging activity of about 3000 m^3 per day in the Victoria Harbour main channel) (see

Table 5.12 above). Thus, the worst case dredging scenario for cruise terminal construction would not occur concurrently with the worst case dredging scenario for WDII reclamation. It is expected that the worst case cumulative dredging impacts upon the Victoria Harbour from WDII reclamation would occur in 2008 which already cover several external dredging activities with a rate of 15,000 m^3 per day in the main Harbour area and several local dredging activities with a rate of 24,000 m^3 per day along the coastline of WDII site. In 2010, the key dredging activities for WDII reclamation would be confined within the embayed areas along the Wan Chai and Causeway Bay coastline where the water currents would be relatively small and, with the implementation of mitigation measures such as deployment of silt curtains around the dredging operations, the impacts from WDII are expected to be localized, and the key concern would be the localized impacts upon the seawater intakes at Wan Chai waterfront and within the Causeway Bay typhoon shelter. The WDII reclamation works in 2010 would unlikely contribute any significant cumulative impacts upon the water quality within the main Harbour area where the cruise terminal would be located. The dredging impacts from the cruise terminal construction will be assessed in separate EIA based on more detailed design information and mitigation measures will be recommended in separate EIA to minimize the impacts from the cruise terminal upon the Harbour water quality. The dredging for cruise terminal is therefore not included in the sediment plume modelling under this EIA.

Contaminant Release during Dredging

7.1.35 The loss of sediment to suspension during dredging may have chemical effects on the receiving waters. This is because the sediment may contain organic and chemical pollutants. As part of the marine site investigation works for this Project, laboratory testing of sediment samples was undertaken. A full description of the sediment quality testing and the classification of the sediment according to levels of contaminants is provided to EPD under separate submission.

7.1.36 Oxygen depletion (due to sediment plume) will be calculated using the highest level of 5-day SOD measured in the sediment samples collected during the marine site investigation (SI), based on the predicted increases in suspended sediment concentrations for the construction phase scenarios. The reductions will then be compared with the baseline levels to determine the relative effects of the increases in SS concentrations on DO. Based on the SI results, the highest SOD was measured at the surface sub-sample of a station located within the HKCEC water channel. Details of the SI are given in the draft EIA report.

7.1.37 The nutrient impacts will be assessed using the sediment quality data for TIN and NH_3-N. The predicted increases will be calculated by tracer dilution modelling and will then be compared with the baseline levels to assess the potential nutrient release impact associated with the marine operations.

7.1.38 An indication of the likelihood of release of contaminants (including heavy metals, PCBs, PAHs and TBT) from the sediment during dredging is given by the results of the elutriation tests from the site investigation works. If the contaminant levels are higher in the elutriates in comparison with the blanks (marine water from the same site), it can be concluded that the contaminants are likely to be released into the marine waters during dredging activities. As there is no existing legislative standard or guideline for individual heavy metal contents in marine waters, the UK Water Quality Standards for Coastal Surface Water [12] will be adopted as the assessment criteria.

(12) Environmental Quality Standards and Assessment Levels for Coastal Surface Water (from HMIP (1994) Environmental Economic and BPEO Assessment Principals for Integrated Pollution Control). *(Source: Environmental Impact Assessment Study for Disposal of Contaminated Mud in the East Sha Chau Marine Borrow Pit, by ERM, January 1997).*

8 Approach for Construction Phase Water Quality Modelling

Description of Temporary Marine Embayments

8.1.1 Temporary embayments will be formed between reclaimed areas of land in different stages of the proposed reclamation. Potential water quality impact associated with the accumulation of pollutants discharged from the existing and temporarily diverted storm culverts into the slack water during this period may result in dissolved oxygen depletion and in turn causing odour impact. Water quality modelling will be carried out using Delft3D-WAQ for the interim construction scenarios. The detailed Victoria Harbour (VH) Model adopted under the approved CFSWDII EIA will be used for construction phase water quality modelling. Each construction scenario will be simulated with three typical spring-neap tidal cycles for spin-up and one cycle for actual simulation in both dry and wet seasons following the approach adopted under the CFSWDII EIA. The grid layout along the Wan Chai coastline has been adjusted to fit the construction interim coastline configurations under each construction scenario. Potential embayments at the interim construction scenarios are shown in **Figure 5.10** and **Figure 5.11**.

<u>Permanent Reclamation at HKCEC and Wan Chai</u>

8.1.2 After the construction of the western seawall in HKCEC1 is completed in 2008, a temporary embayment (namely Embayment I) will be formed between the existing eastern seawall of CRIII and the HKCEC Extension as shown in **Figure 5.10**. This embayment will be a particular cause of concern as a storm outfall (Culvert L) is currently discharging pollutants into this area. The potential water quality impact on the cooling water intakes within this embayment will last for more than 2 years until the HKCEC Reclamation Stage 2 proceeds where the new Culvert L extension can be constructed via a new land formed under the HKCEC2W. In 2010, the MTRC tunnel crossing will be placed inside this embayment as illustrated in **Figure 2.17**. It should be noted that the diversion of cooling water intakes will be completed before the MTRC tunnel crossing is fully constructed.

8.1.3 As a mitigation measure, an impermeable barrier, suspended from a floating boom on the water surface and extending down to the seabed, will be erected by the contractor before the HKCEC1 commences. The barrier will channel the stormwater discharge flows from Culvert L to the outside of the embayment. The contractor will maintain this barrier until the reclamation works in HKCEC2W are carried out and the new Culvert L extension can be constructed.

8.1.4 In the area of WCR, an embayment (namely Embayment II) will be created at the proposed WCR2 site after the seawall in Wan Chai Reclamation Stage 1 (WCR1) is constructed as shown in **Figure 5.10**. A cooling water intake and a flushing water intake located within this embayment would be potentially affected. The storm outfall (Culvert N) will be temporarily diverted to the open water at the adjacent WCR4 site before seawall construction in WCR1 is completed to avoid the accumulation of pollutants at this embayment and thus minimize the potential impact to the seawater intakes. According to the construction programme, these two intakes will be permanently diverted to the open water via WCR1 before commencement of WCR2. Thus, the potential water quality impacts at these two intakes would be limited during the remaining reclamation stages in WCR (WCR2, WCR3 and WCR4).

8.1.5 After the temporary seawall in the area of WCR is constructed in 2009, a narrow embayment (namely Embayment III) will be created between the HKCEC1 and WCR as illustrated in **Figure 5.10**. As previously pointed out, the storm outfall (Culvert N) will be temporarily diverted at an early stage of WCR before the seawall in WCR1 is constructed. As a result, the water quality inside this temporary embayment would be influenced by the pollutants discharged from the storm outfall (Culvert M) only. The cooling water intakes along the HKCEC water channel would be potentially affected by the water quality within this embayment for a period of about 2 years. According to the construction programme, these cooling water intakes will be diverted to the intake chambers to the north of HKCEC Extension in 2010 before the seawall of HKCEC2W is completely constructed.

8.1.6 The temporary embayment formed between the eastern seawall of HKCEC3W and the western seawall of WCR2 at a later reclamation stage is considered less critical, as no cooling water intake is located within this embayment. The cooling water intakes originally located inside the HKCEC water channel will be permanently diverted to the open water at the north of HKCEC Extension before the completion of seawall in HKCEC3W.

8.1.7 Temporary embayment would be formed between the eastern seawall of HKCEC3E and the western seawall of WCR2 at a later stage (**Figure 2.17**). Before the seawall of HKCEC3E is completely constructed, the outfall of Culvert M would be temporarily diverted to the adjacent area between HKCEC3E and WCR2. According to the construction programme, the temporary embayment formed between HKCEC3E and WCR2 is potentially affected by the discharge from the outfall of Culvert M for a period of about 6 months. The potential water quality impact inside this embayment will however be limited as there would be no water sensitive receiver (i.e. seawater intake) within this temporary embayment. Before the reclamation at WCR3 commences, the storm outfall (Culvert M) will be permanently diverted to the new water front of HKCEC3E. Thus, the local water quality impact within this embayment is considered temporary and insignificant.

Temporary Reclamation at PCWA

8.1.8 Temporary embayment will also be formed within the existing breakwater of PCWA. In accordance with the construction programme, temporary reclamation at the eastern site (TPCWAE) will be carried out as the first stage. Reclamation works in the western site (PCWAW) will not be conducted until demolition of the temporary reclamation in PCWAE is completed. After the reclamation in PCWAW is completed, the storm outfall (Culvert O) will be temporarily diverted into the embayment at the eastern side of the PCWA for a period of about 2 years. This storm outfall must be diverted for construction of the CWB tunnel. As there is no sensitive use located within this temporary embayment area, the potential water quality impact would be limited. The outfall will be diverted back to the open water at the Wan Chai seafront after the CWB tunnel is completed.

Temporary Reclamation at Causeway Bay Typhoon Shelter

8.1.9 The potential water quality impact within the temporary embayments inside the Causeway Bay typhoon shelter created by the temporary reclamation (TCBR) and temporary typhoon shelter (TWB) is considered most critical. During the construction period in 2011, TWB, TCBR1W, TCBR3 and TCBR2 will be in place at the same time which is the most adverse scenario in terms of the water circulation and dispersion of pollutants within the Causeway Bay typhoon shelter, considering that there will be several cooling water intakes and storm outfalls located within the temporary embayments (**Figure 2.12**). The impact during the early construction phase when TCBR1W, TCBR1E and TCBR2 are in place together (**Figure 2.11**) is considered less critical as a relatively large opening would be kept near the cooling water intake points during this construction stage.

8.1.10 During the construction period from 2012 to 2014, TCBR4 and TCBR3 together with the TWB will be in place at the same time whilst TCBR1W, TCBR2 and TCBR1E will be completely removed (**Figure 2.13**). This scenario is however considered less critical as the storm outfall (Culvert Q) will be diverted to the north of TCBR4 before the seawall construction for TCBR4 is completed. Thus, less pollutant will be discharged into the embayments where the seawater intakes are located. In addition, this temporary land configuration would create two openings close to the storm outfalls (Culverts P, R and S). Thus, more water circulation at the storm outfalls would be expected under this scenario when compared to the period in 2011 when TCBR1W, TCBR3 and TCBR2 are in place.

8.1.11 The storm outfall (Culvert Q) and the cooling water intake for Windsor House are located in the area of TCBR4. Before the seawall construction at TCBR4 is completed, the intake will be diverted into the adjacent area to the south of TCBR3 to ensure continuous operation of the intake during the construction period. Furthermore, the storm outfall (Culvert Q) will be temporarily diverted to the north of TCBR4 before the seawall of TCBR4 is completely constructed. Therefore, no significant water quality impact will be created at the TCBR4.

Modelling Scenarios

8.1.12 Based on the considerations above, three modelling scenarios will be set up to evaluate the water quality impact in temporary embayments as described below. A summary of the modelling scenarios is given in Section 11.

Scenario 3A

8.1.13 This scenario represents the baseline condition without any reclamation at the Project site to simulate the pre-construction conditions of flow and water quality in Victoria Harbour.

Scenario 3B

8.1.14 This scenario (**Figure 5.10**) is the same as Scenario 3A with modified coastline in Wan Chai, Causeway Bay and North Point assuming that only HKCEC1, WCR1, TPCWAE, TBW, NPR1 and NPR2W will be in place. The aim of this scenario is to assess the potential impacts resulting from:

- temporary embayment (namely Embayment I) formed between CRIII and HKCEC1 where a storm outfall (namely Culvert L) and a cooling water intake (namely 2) will be located.
- temporary embayment (namely Embayment II) surrounded by the new land formed under WCR1 where the WSD Wan Chai flushing water intake and the cooling water intake for Sun Hung Kai Centre will be located.
- temporary embayment (namely Embayment III) formed between HKCEC1 and WCR2.

8.1.15 It should be noted that potential impacts within the temporary embayment between CRIII and HKCEC1 would be eliminated with the proposed mitigation measure of channeling the flows from Culvert L into the open water at an early reclamation stage. This scenario assumes that Culvert L would remain inside the embayment for worst case assessment.

Scenario 3C

8.1.16 This scenario (**Figure 5.11**) assumes that HKCEC, WCR2, WCR1, TPCWAE, TCBR1W, TCBR3, TCBR2, TWB, NPR1, NPR2W and NP2E will be in place. The aim of this scenario is to assess the potential impacts resulting from:

- temporary embayment (namely Embayment IV and V) within the Causeway Bay typhoon shelter due to the placement of TWB, TCBR1W, TCBR2 and TCBR3.

Pile Friction

8.1.17 Existing structures including the piers of East Bridge, West Bridge and Seafront Promenade within the proposed reclamation sites at the HKCEC water channel will be considered in the construction phase assessment. The relevant pile layouts will be included in the EIA report as appendix

8.1.18 East Bridge consists of 11 rows of marine steel tubular piles across the waterway from south to north with a spacing of about 7 m in between the piles. Each row consists of 4 piles from east to west with a spacing of 9 m between the piles. The diameter of each pile is 914 mm.

8.1.19 The pile arrangement for West Bridge is the same as that for East Bridge except that the spacing between the piles in the east to west direction is only 7 m.

8.1.20 The Seafront Promenade is supported by 31 marine piles. The diameter of each pile is 1 m. The spacing between the piles is different in different areas of the Seafront Promenade site. The spacing varies from 3.3 m to 9 m.

8.1.21 The presence of these marine piles may affect the flushing and dispersion of sediment and pollutants in the HKCEC water channel and therefore will be incorporated in all the construction phase scenarios as appropriate. The marine piles have variable separation distance. As the dimensions of the marine piles are much smaller than the grid size, the exact pier configurations cannot be adopted in the model simulation. Instead, only the overall influence of the piles on the flow will be taken account. This overall influence will be modelled by a special feature of the Delft3D-FLOW model, namely "Porous Plate". "Porous Plate" represents transparent structures in the model and is placed along the model gridline where momentum can still be exchanged across the plates. The porosity of the plates is controlled by a quadratic friction term in the momentum to simulate the energy losses due to the presence of the piles. The forces on the flow due to a vertical pile or series of piles are used to determine the magnitude of the energy loss terms. The mathematical expressions for representation of piles friction are based on the Cross Border Link Study [13] and the Delft 3D-FLOW module developed by Delft Hydraulics.

8.1.22 For each grid cell where the piles will be located, two loss coefficients will be specified in the model for two different flow directions respectively (i.e. the two directions perpendicular to the model gridline, namely u-direction and v-direction respectively). Details of the equations used in the modelling are contained in **Appendix A.3**.

Piled Wave Walls of the Temporary Typhoon Shelter

8.1.23 The proposed temporary moorings will require construction of piled wave walls at the eastern and western ends of the sheltered mooring area respectively as shown in **Figure 5.5** and **Figure 5.6**. The overall influence of the piled wave walls on the flow will be modelled by a special feature of the Delft3D-FLOW model, namely "Current Deflection Wall (CDW)". The CDW is represented by an impermeable sheet with supporting piles at the bottom and is placed along the model gridline where there will be no flow exchange across the sheet at the upper vertical water layers. The dimension of the impermeable sheet in the vertical direction will be defined in the model with reference to the dimension of the proposed waved walls at the temporary sheltered

(13) Planning Department Agreement No. CE48/97 Feasibility Study for Additional Cross-border Links Stage 2: Investigations on Environment, Ecology, Land Use Planning, Land Acquisition, Economic/Financial Viability and Preliminary Project Feasibility/Preliminary Design Final Water Quality Impact Assessment Working Paper WP2 Volume 1 1999.

mooring area. Flow exchange across the supportive piles of the CDW in the lower water layers is controlled by the same quadratic friction and mathematical expressions for representation of pile friction as discussed in **Appendix A.3**.

9 Time Horizon for Construction Phase Modelling

9.1.1 Based on the construction programme, the worst-case construction impact would occur at early stages of the construction period between 2008 and 2011. It is anticipated that there would not be any significant change in the background pollution loading and coastline configurations between 2008 and 2011. The 2011 pollution loading will be adopted for modelling of the interim construction phase impacts. For areas outside the Project site boundary, the 2011 coastline configurations will be assumed under all the construction phase modelling scenarios.

10 Coastline Configurations

10.1.1 For the hydrodynamic and water quality modelling of this EIA, a Regional Model has been setup to cover the whole of Hong Kong and the Pearl Estuary. The Regional Model, based on the previous Update Model for EPD (refer to Section 5), is used to provide the boundary inputs to the local Victoria Harbour (VH) Model for the present study. The VH Model covers the neighbouring waters of Hong Kong Island, including Victoria Harbour. The construction and the operation phases were simulated using the VH Model.

10.1.2 Two sets of boundary conditions for the detailed VH Model will be generated for 2011 (construction phase modelling) and 2016 (operational phase modelling) respectively using the Update Model. For the purpose of setting up the Update Model properly, the coastline configuration was updated to mimic the envisaged conditions for the modelling scenarios. The details of the coastal developments incorporated in the construction phase (2011) and operation phase (2016) coastline configurations, the source of information and the current status of the planned developments are summarised in **Table 5.13**. It should be noted that reclamation in North Lantau are outside the boundary of the detailed VH model in the far field. Possible change of coastline at these areas would unlikely affect the outcome of the water quality modelling.

Table 5.13 Coastal Developments Incorporated in the Construction and Operational Phase Coastline Configurations

Coastal Development	Information Source	Included in 2011 Construction Scenario (Figure 5.12)	Included in 2016 Operation Scenario (Figure 5.13)
Yam O Reclamation, Northshore Reclamation	EIA Report for "Northshore Lantau Development Feasibility Study" (EIAO Register No.: AEIAR-031/2000).	Yes	Yes
Siu Ho Wan Reclamation	EIA Report for "Northshore Lantau Development Feasibility Study" (EIAO Register No.: AEIAR-031/2000).	No	Yes
Penny's Bay Reclamation	EIA Report for "Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures" (EIAO Register No.: AEIAR-032/2000).	Yes	Yes
Sham Tseng Further Reclamation	EIA Report for "Planning and Engineering Feasibility Study for Sham Tseng Development" (EIAO Register No.: AEIAR-057/2002).	Yes	Yes
Lamma Power Station Extension	EIA Report for "1,800 MW Gas-fired Power Station at Lamma Extension" (EIAO Register No.: AEIAR-010/1999).	Yes	Yes

Coastal Development	Information Source	Included in 2011 Construction Scenario (Figure 5.12)	Included in 2016 Operation Scenario (Figure 5.13)
Further Development of Tseung Kwan O	EIA Report for "Further Development of Tseung Kwan O Feasibility Study" (EIAO Register No.: AEIAR-092/2005).	No	Yes

10.1.3 The baseline coastline configurations (without the Project) assumed for 2011 and 2016, highlighting the incorporated coastal developments, are shown in **Figure 5.12** and **Figure 5.13** respectively. The proposed reclamation limit of the present Project is shown in **Figure 1.1**.

10.1.4 The reclamations for South East Kowloon Development (SEKD) and Yau Tong Bay Reclamation (YTBR) were excluded as they were still subject to planning review when this EIA report was prepared. It should be noted that the reclamation for Central Reclamation Phase III (CRIII) has been incorporated into the existing coastline as shown in **Figure 5.12** and **Figure 5.13**.

10.1.5 The hydrodynamic and water quality simulation results generated from the Update Model under the 2011 baseline scenario (without any reclamation at the Project site) as shown **Figure 5.12** will be used to provide boundary conditions to the VH Model for all the interim construction phase scenarios (namely Scenario 2A, Scenario 2B, Scenario 2C, Scenario 3A, Scenario 3B and Scenario 3C). Although the interim construction scenario would involve some reclaimed land as the reclamation proceeds, this partially reclaimed land is relatively small and is unlikely to have a major effect on the flow through Victoria Harbour or on the boundary conditions of the detailed VH model. Similarly, the hydrodynamic and water quality simulation results generated from the Update Model under the 2016 baseline scenario (without any reclamation at the Project site) as shown **Figure 5.13** will be used to provide boundary conditions to the VH Model for the 2016 development scenario with the Project (namely Scenario 1B). Model results conducted under the approved CFSWDII EIA indicated that the net effect of WDII reclamation on the flow regime would be localized within the Victoria Harbour. The CFSWDII EIA was based on a maximum possible extent of reclamation at Wan Chai and Causeway Bay. The current concept plan involves a lesser extent of reclamation and the associated effect on the overall flow in Victoria Harbour should be even smaller. The change of WDII coastline would have little influence at the open boundary in the far field outside the Victoria Harbour.

11 Summary of Modelling Scenario

11.1.1 A summary of the proposed modeling scenario is given in the table below.

Stage	Scenario	Purpose	Scenario ID	Description	Section Ref.
Operational phase	Water quality modeling scenarios	To assess the water quality impacts associated with the change of coastline configuration and the change of polluted storm water & spent cooling water discharges as a result of WDII	1A	2016 Baseline Scenario without the proposed WDII reclamation	Section 5 and Section 6
			1B	2016 Development Scenario with the proposed WDII reclamation	
Construction Phase	Sediment plume modelling scenarios	To assess the impacts due to sediment release from marine construction activities for WDII	2A	2008 with dredging activities at HKCEC1, WCR1, TPCWAE, NPR1, TBW and WSD cross harbour water mains	Section 7
			2B	2008 with dredging activities at TCBR1W and Wan Chai East submarine sewage pipeline	
			2C	2011 with dredging activities at HKCEC2W, WCR3 and TCBR3	
	Water quality modeling scenarios	To assess the water quality impacts in temporary embayments formed in different stages of the WDII reclamation.	3A	2011 pre-construction conditions	Section 8
			3B	2011 with reclamations at HKCEC1, WCR1, TPCWAE, TBW, NPR1 and NPR2W only	
			3C	2011 with reclamations at HKCEC, WCR2, WCR1, TPCWAE, TCBR1W, TCBR3, TCBR2, TWB, NPR1, NPR2W and NP2E only	

12 Pollution Loading Inventory

12.1.1 The pollution loading inventory was compiled for two time horizons, namely 2011 scenario (for construction phase modelling) and 2016 scenario (for operational phase modelling). The background pollution loading was estimated for the whole HKSAR waters by desk-top method and was input to the water quality model for cumulative impact assessment. The pollution loading inventory for individual storm outfalls within the Project site boundary in Wan Chai, Causeway Bay and North Point was further refined and updated based on desk-top calculations and pollution loading field data.

<u>**HKSAR Waters (Outside the Project Site Boundary)**</u>

12.1.2 The pollution loading inventory covers the whole HKSAR waters and will be input into the Update Model and the detailed VH Model for cumulative impact assessment. The inventory has incorporated all possible pollution sources within the HKSAR waters including those from landfill sites, marine culture zones, beach facilities and typhoon shelters, non-point source surface run-off and sewage from cross connections etc. The inventory has also taken into account the removal of pollutants due to wastewater treatment facilities and the possible redistribution of pollution loads due to different sewage disposal plans and sewage export schemes. The methodologies for compiling the pollution loading are given in **Appendix A.4**.

12.1.3 To take account of the background pollution loading for cumulative assessment, pollution loading from the HATS was considered. Chemically enhanced primary treatment (CEPT) with disinfection is assumed as the treatment process of HATS in this EIA study for water quality modelling which involves a discharge of effluent at the existing Stonecutters Island Sewage Treatment Works (SCISTW). The HATS loading assumed in this EIA is given in **Table 5.14**.

Table 5.14 Pollution Loading from Stonecutters Sewage Treatment Works under HATS

Parameters	2011 Scenario (HATS Stage 1)		2016 Scenario (HATS Stage 2A)	
	Assumed Concentration	Assumed Flow and Loads	Assumed Concentration	Assumed Flow and Loads
Flow rate	-	1,638,000 m³/day (1)	-	2,800,000 m³/day (3)
BOD_5	68 mg/l (2)	107188400 g/day	68 mg/l (2)	190400000 g/day
SS	42 mg/l (2)	66204600 g/day	42 mg/l (2)	117600000 g/day
Organic Nitrogen	9.93 mg/l (2)	15652659 g/day	9.93 mg/l (2)	2780400 g/day
NH_3-N	17.43 mg/l (2)	27474909 g/day	17.43 mg/l (2)	48804000 g/day
E. coli	200,000 no./100ml (2 log bacterial kill) (2)	3.15E+15 no./day	20,000 no./100ml (3 log bacterial kill) (2)	5.6E+14 no./day
Total Phosphorus	3 mg/l (2)	4728900 g/day	3 mg/l (2)	8400000 g/day
Ortho-Phosphate	1.8 mg/l (2)	2837340 g/day	1.8 mg/l (2)	5040000 g/day
Silicate	8.6 mg/l (2)	13556180 g/day	8.6 mg/l (2)	24080000 g/day
Total nitrite and nitrate	0 mg/l (2)	0 g/day	0 mg/l (2)	0 g/day
Total Residual Chlorine	0.2 mg/l (2)	315260 g/day	0.2 mg/l (2)	560000 g/day

Notes:
(1) The projected flow rate for 2011 was estimated using the latest planning and employment statistics as detailed in Appendix A.4.
(2) Based on the "Environmental and Engineering Feasibility Assessment Studies in Relation to the Way Forward of the Harbour Area Treatment Scheme (HATS EEFS) Final Study Report".
(3) Design capacity of the future upgraded SCISTW based on the HATS EEFS.

12.1.4 The sewage flows generated from Wan Chai East (WCE) and Wan Chai West (WCW) catchments would be discharged via the submarine outfalls of WCE Preliminary Treatment Works (PTW) and WCW PTW under the 2011 construction phase scenarios. The locations of catchments WCE and WCW is shown in Table A-4-1 in **Appendix A.4**. Under the 2016

operation scenarios, it is assumed that the sewage flows from both Wan Chai West (WCW) Preliminary Treatment Works (PTW) and Wan Chai East (WCE) PTW would be conveyed to the SCISTW for centralized treatment under the HATS Stage 2A.

<u>**Storm Outfalls within the Project Site Boundary**</u>

12.1.5 Pollution loading discharged from the existing storm system of the Wan Chai, Causeway Bay and North Point catchments was quantified. The storm pollution within the catchments is mainly caused by polluted stormwater runoff or street washing to the drainage system; and expedient connections from trade and residential premises and integrity problems of aged drainage and sewerage systems in the catchment areas. The pollution loading inventory for individual storm outfalls along the coastline of Wan Chai, Causeway Bay and North Point was compiled by a combination of desk-top calculations and field surveys.

<u>Wan Chai and Causeway Bay Area</u>

Loading Growth Ratios by Sewage Catchment Area

12.1.6 The 2003-based Territorial Population and Employment Data Matrices (TPEDM) provided by Planning Department (PlanD), which were the latest planning data available at the time when this EIA was conducted, were used to compile the pollution loads from domestic, commercial and industrial activities. The TPEDM provides the projected population breakdown by Planning Vision and Strategy (PVS) zones. To facilitate the estimation of pollution loading, the population and employment data are required to be presented at the level of sewage catchment areas. The catchments of concern would be the Wan Chai East (WCE) and Wan Chai West (WCW) sewage catchments. However, the projected population from PlanD is provided in a smaller scale at PVS zones. Population and employment data for each of the WCE and WCW catchments were estimated by overlaying the PVS zones on top of the layout of the sewage catchment area for allocating the appropriate PVS zones to the catchment area.

12.1.7 The modeling work will be carried out for two time horizons, namely 2011 and 2016 scenarios where the projected population data provided by PlanD at PVS zones are available for 2006, 2011 and 2016. Relevant per head flow and load were then assigned to residential, transient, commercial and industrial population to obtain the quantity and quality of total untreated wastewater by individual catchments. Further elaboration of the methodologies for compiling the pollution loading is given in **Appendix A.4**.

12.1.8 The pollution loading generated within the WCE and WCW sewage catchments was calculated for 2006, 2011 and 2016 and was used to determine the loading growth ratios between different time horizons. For example, the growth ratios between 2006 and 2016 were calculated with reference to the projected loads (calculated by desk-top method) for 2006 and 2016.

Loading Inventory by individual Storm Culverts

12.1.9 An expedient connection survey and a stormwater flow and pollutant survey were conducted in 2000 [14, 15] under the CFSWDII to estimate the pollution loading discharged via the major storm outfalls along the coastline of Wan Chai and Causeway Bay. The corresponding 2000 dry weather loading results for these storm outfalls, namely Culverts L, M, N, O, P, Q, R and S, are

(14) EGS (Asia) Limited (2000). Wan Chai Development Phase II, Comprehensive Feasibility Study, Section I, Stormwater Flow and Pollutant Survey of Outfalls Entering Victoria Harbour of Outfalls Entering Victoria Harbour, Final Report.
(15) EGS (Asia) Limited (2000). Wan Chai Development Phase II, Expedient Connection Survey, Supplementary Report for Section I of Works.

presented in **Table 5.15**. The locations of these storm outfalls are shown in **Figure 5.3b**. The pollution loading discharged via individual storm culverts for future scenarios was estimated with reference to the 2000 survey data, taking account of the loading growth ratios compiled by desk-top approach as discussed in previous sections.

12.1.10 Based on the review of the population data for Wan Chai District, which covers the storm catchments in Wan Chai and Causeway Bay, released by Census & Statistics Department (C&SD), there was a slight reduction in the population size from mid-2000 to mid-2006 in Wan Chai District. It is therefore assumed that there would be no significant change in the pollution loading discharged via the concerned storm systems as a result of expedient connection or cross connections between drainage and sewerage system assuming that the percentage of sewage lost to the storm water system remains unchanged between 2000 and 2006. The loading due to storm water runoff or street washing to the drainage system can also be assumed to remain the same between 2000 and 2006 as there is no significant change in the land use within the concerned catchments.

12.1.11 The dry weather loading inventory for 2011 was thus compiled by applying the 2000 field data with the loading growth ratios between 2006 and 2011. Similarly, the loading inventory for 2016 was compiled by applying the loading growth ratios between 2006 and 2016 to take account of the population growth between the time horizons. The same loading growth ratios were applied to the storm culverts within the same sewage catchments. As there was only trace rainfall recorded during the 2000 survey period, the loading inventory compiled for 2011 and 2016 is treated as dry weather load.

12.1.12 Following the approach adopted under the CFSWDII EIA, the wet season loading for individual outfalls was calculated using the dry to wet loading ratios. The dry to wet loading ratios were developed under the approved CFSWDII EIA based on desk-top calculation.

12.1.13 The pollution loading discharged from the vessels in Causeway Bay Typhoon Shelter due to domestic activities was taken into account in the pollution load inventory. Data on marine population for the whole territory are available from C&SD for years 1986, 1991, 1996 and 2001 which show significant decline in the total marine population between 1986 and 2001 from 37,280 to 5,895. The annual vessel count in typhoon shelters conducted by Marine Department would provide information on the distribution of marine population between different typhoon shelters. The vessel count data for Causeway Bay typhoon shelter as reported in the EPD Update Study also indicated a trend of decline in the vessel number between 1986 and 1997. The pollution loading in Causeway Bay typhoon shelter was compiled using the marine population estimated for 1997 available from the EPD Update Study. Total pollution from marine population is expected to decrease in future as a result of continued reduction in marine population. So adopting pollution loadings for year 1997 for model input would represent a worst-case scenario.

North Point Area

12.1.14 The same desktop methods as described in Sections 12.1.6 to 12.1.8 for compiling the total loading generated in WCW and WCE catchments were used to estimate the loading inventory for North Point area except that the population data were refined to a smaller scale at the level of the catchments for individual stormwater outfalls, namely T, U, V and W as shown in **Figure 5.3b**, rather than at the level of sewage catchment areas. Population and employment data for each of the catchments of Culverts T, U, V and W were estimated by overlaying the PVS zones on top of the boundaries of the storm catchments for allocating the appropriate PVS zones to the catchment area. Per capital load factors were applied to the population to estimate the total sewage load generated in each storm catchment. It is assumed that 10 percent of the total load generated within the catchment would be lost to the storm water due to expedient connections or cross

connections. Rainfall related load was also calculated theoretically as detailed in **Appendix A.4** for compiling the wet season loading inventory. **Table 5.16** to **Table 5.19** show the pollution loading results for 2011 and 2016 scenarios for model input.

Table 5.15 Locations and Pollution Loadings Survey Results (in 2000) of Wan Chai Stormwater Outfalls

Outfall (Figure 5.3b)	Location		Flow rate (m³ per day)	Pollution Loadings					
	Easting	Northing		BOD (kg per day)	Suspended Solids (kg per day)	Total Kjeldhal Nitrogen (kg per day)	Organic Nitrogen (kg per day)	Ammoniacal Nitrogen (kg per day)	*E. coli* (no. per day)
L	835467	815848	2743	1337.73	2144.12	129.86	106.70	23.16	7.889E+14
M	836000	815889	13775	514.28	581.30	93.60	58.58	35.02	1.84E+14
N	836397	815977	1761	18.80	11.37	5.76	2.69	3.07	1.86E+12
O	836551	816059	3500	378.87	346.35	53.09	33.29	19.80	3.078+14
P	836921	815940	127	84.19	50.92	7.97	2.93	5.04	6.41E+12
Q	837139	816106	13302	372.54	464.28	161.56	126.39	35.17	4.08E+13
R	837551	816230	1197	105.25	362.21	15.82	9.81	6.01	9.71E+12
S	837595	816322	1030	5.86	3.10	1.32	0.64	0.68	1.93E+12

Sources: (1) EGS (Asia) Limited (2000). Wan Chai Development Phase II, Comprehensive Feasibility Study, Section I, Stormwater Flow and Pollutant Survey of Outfalls Entering Victoria Harbour of Outfalls Entering Victoria Harbour, Final Report.
(2) EGS (Asia) Limited (2000). Wan Chai Development Phase II, Expedient Connection Survey, Supplementary Report for Section I of Works.

Table 5.16 Pollution Loading Inventory for Wan Chai, Causeway Bay and North Point - Year 2011 Dry Season

Outfall (Figure 5.3b)	Location		Flow rate (m³ per day)	Pollution Loadings					
	Easting	Northing		BOD (kg per day)	Suspended Solids (kg per day)	Total Kjeldhal Nitrogen (kg per day)	Organic Nitrogen (kg per day)	Ammoniacal Nitrogen (kg per day)	*E. coli* (no. per day)
L	835467	815848	2793	1360.00	2176.44	133.12	109.19	23.77	8.10E+14
M	836000	815889	14007	523.19	590.40	96.22	60.07	36.07	1.90E+14
N	836397	815977	1782	18.99	11.47	5.85	2.73	3.12	1.89E+12
O	836551	816059	3523	382.05	348.72	54.0	33.80	20.17	3.14E+14
P	836921	815940	128	84.76	51.19	8.08	2.97	5.12	6.51E+12
Q	837139	816106	13500	376.25	468.15	165.36	129.02	36.08	4.19E+13
R	837551	816230	1217	106.39	365.50	16.22	10.03	6.18	9.98E+12
S	837595	816322	1061	5.95	3.14	1.37	0.66	0.71	2.01E+12
T	837588	816609	1109	294.63	260.34	37.56	16.77	20.80	1.72E+14
U	837889	816838	788	219.09	192.11	27.51	12.30	15.21	1.26E+14
V	837975	816937	164	46.17	40.44	5.71	2.56	3.15	2.60E+13
W	838226	817085	388	93.29	82.35	13.99	6.06	7.93	6.62E+13

Table 5.17 Pollution Loading Inventory for Wan Chai, Causeway Bay and North Point - Year 2011 Wet Season

Outfall (Figure 5.3b)	Location		Flow rate (m³ per day)	Pollution Loadings					
	Easting	Northing		BOD (kg per day)	Suspended Solids (kg per day)	Total Kjeldhal Nitrogen (kg per day)	Organic Nitrogen (kg per day)	Ammoniacal Nitrogen (kg per day)	*E. coli* (no. per day)
L	835467	815848	12121	1983.60	4280.58	160.01	151.73	25.01	8.10E+14
M	836000	815889	66108	816.03	1278.17	120.09	88.58	38.39	1.90E+14
N	836397	815977	7300	26.17	20.93	6.88	3.65	3.26	1.89E+12
O	836551	816059	16329	579.71	732.93	67.19	49.40	21.46	3.14E+14
P	836921	815940	567	123.51	101.97	9.85	4.20	5.41	6.51E+12
Q	837139	816106	56940	520.33	855.20	196.35	174.80	37.84	4.19E+13
R	837551	816230	5321	165.88	741.93	20.89	15.09	6.68	9.98E+12
S	837595	816322	4039	7.46	4.85	1.55	0.83	0.73	2.01E+12
T	837588	816609	2885	334.55	337.14	40.05	18.90	21.15	1.72E+14
U	837889	816838	1631	238.05	228.58	28.69	13.31	15.38	1.26E+14
V	837975	816937	333	49.97	47.74	5.95	2.76	3.19	2.60E+13
W	838226	817085	709	100.49	96.21	14.44	6.45	7.99	6.62E+13

Table 5.18 Pollution Loading Inventory for Wan Chai, Causeway Bay and North Point - Year 2016 Dry Season

Outfall (Figure 5.3b)	Location		Flow rate (m³ per day)	Pollution Loadings					
	Easting	Northing		BOD (kg per day)	Suspended Solids (kg per day)	Total Kjeldhal Nitrogen (kg per day)	Organic Nitrogen (kg per day)	Ammoniacal Nitrogen (kg per day)	*E. coli* (no. per day)
L	835467	815848	2975	1503.07	2387.15	143.20	117.84	25.51	8.65E+14
M	836000	815889	14551	556.49	624.94	101.01	63.13	37.84	1.98E+14
N	836397	815977	1884	20.86	12.50	6.26	2.93	3.33	2.01E+12
O	836551	816059	3553	390.64	355.73	55.11	34.49	20.58	3.20E+14
P	836921	815940	130	87.91	52.91	8.32	3.06	5.26	6.68E+12
Q	837139	816106	13816	377.47	467.67	167.99	130.80	36.71	4.26E+13
R	837551	816230	1249	106.24	363.35	16.45	10.15	6.28	1.01E+13
S	837595	816322	1110	5.82	3.05	1.39	0.67	0.72	2.04E+12
T	837588	816609	1186	233.38	202.49	36.16	15.65	20.50	1.70E+14
U	837889	816838	846	171.58	147.29	26.39	11.42	14.96	1.24E+14
V	837975	816937	177	35.54	30.41	5.47	2.37	3.10	2.57E+13
W	838226	817085	383	90.75	79.79	13.71	5.94	7.77	6.49E+13

Table 5.19 Pollution Loading Inventory for Wan Chai, Causeway Bay and North Point - Year 2016 Wet Season

Outfall (Figure 5.3b)	Location		Flow rate (m^3 per day)	Pollution Loadings					
	Easting	Northing		BOD (kg per day)	Suspended Solids (kg per day)	Total Kjeldhal Nitrogen (kg per day)	Organic Nitrogen (kg per day)	Ammoniacal Nitrogen (kg per day)	*E. coli* (no. per day)
L	835467	815848	12302	2126.66	4491.29	170.09	160.38	26.745	8.65E+14
M	836000	815889	66652	849.33	1312.71	124.88	91.64	40.154	1.98E+14
N	836397	815977	7401	28.03	21.97	7.28	3.85	3.468	2.01E+12
O	836551	816059	16359	588.30	739.94	68.30	50.10	21.871	3.20E+14
P	836921	815940	569	126.66	103.69	10.08	4.29	5.551	6.68E+12
Q	837139	816106	57256	521.55	854.71	198.98	176.58	38.477	4.26E+13
R	837551	816230	5353	165.73	739.77	21.11	15.20	6.781	1.01E+13
S	837595	816322	4089	7.34	4.76	1.57	0.83	0.744	2.04E+12
T	837588	816609	2962	273.29	279.29	38.64	17.78	20.859	1.70E+14
U	837889	816838	1689	190.54	183.75	27.57	12.44	15.131	1.24E+14
V	837975	816937	346	39.33	37.72	5.71	2.57	3.135	2.57E+13
W	838226	817085	703	97.96	93.65	14.16	6.32	7.838	6.49E+13

12.1.15 A pollution loading field survey for North Point catchment have recently completed. The purpose of the field survey is to investigate the pollution loading discharged via the storm outfalls in the North Point area where no field survey was previously conducted. Details of the loading survey and the field survey results will be presented in a separate survey report to supplement the desk-top calculations as necessary. The key findings of the field survey will be presented in the EIA report if required. It should be highlighted that no permanent marine embayment would be created along the coastline of North Point area as a result of the WDII reclamation and therefore the polluted storm water generated from the North Point catchment would be discharged into the open water and can be easily dispersed by the fast moving tidal currents. In addition, there would be no water sensitive receivers (e.g. seawater intake) located close to these storm water discharges. Thus, the level of pollution loading discharged via the storm system of North Point catchment will not be a critical water quality issue of concern.

13 Uncertainties in Assessment Methodology

Marine-based Construction and Operational Phase Impacts

13.1.1 Quantitative uncertainties in the modelling will be considered when making an evaluation of the modelling predictions. The following approach has been adopted to enhance the model performance:

- The computational grid of the detailed Victoria Harbour (VH) Model was refined along the coastline of Wan Chai, Causeway Bay and North Point to represent the coastal features under different interim construction and operational scenarios;
- Use of a fully calibrated and validated regional Update Model to provide boundary and initial conditions to the detailed VH Model;
- The performance of the detailed VH Model was extensively calibrated and validated with reference to the field data to ensure that reliable predictions of hydrodynamics are provided for the Study area.
- The simulation comprises a sufficient spin up period so that the initial conditions do not affect the results.

13.1.2 The level of uncertainties on the water quality predictions inside the temporary embayment areas would also depend on the accuracy of the pollution loading input into the embayment areas. The storm pollution loading discharged into the embayment areas along the coastline of Wan Chai and Causeway Bay including the Causeway Bay typhoon shelter was derived from detailed field investigation to provide accurate information for model input. The loading input to the water quality model under various future assessment scenarios has also taken into account the future development and population growth in order to provide conservative predictions.

13.1.3 The water quality impacts within the embayed area of Causeway Bay typhoon shelter during operational phase of the Project are of particular concern. It was assumed under the approved CFSWDII EIA that all the existing storm and spent cooling water outfalls within the Causeway Bay typhoon shelter would be permanently decommissioned and these outfalls would be diverted outside the typhoon shelter. This is deviated from the present Study that the existing storm and spent cooling water outfalls would remain within the Causeway Bay typhoon shelter. For the purpose of operational phase modelling, the grid mesh of the detailed VH model developed under the CFSWDII EIA was further modified under this EIA with a higher resolution (approximately 50m x 50m) at Causeway Bay typhoon shelter to address the water quality concern. The performance of the detailed VH model refined under the present Study has been checked against that of the detailed VH model approved under the CFSWDII EIA. The results of water level, depth averaged flow speed and depth averaged flow directions predicted by the two models are compared at three indicator points (namely Stations 3, 6 and 8 respectively as shown in **Figure 5.14a**). The results of momentary flows are compared at two selected cross sections. The eastern cross section is located across the Lei Yue Mun Channel, while the western section is located between Yau Ma Tei and Sheung Wan (**Figure 5.14a**). Momentary flow represents the instantaneous flow rate at a specific time in m^3/s whereas accumulated flow represents the total flow accumulated at a specific time in m^3. The comparison plots are given in **Appendix A.5a** and **Appendix A.5b** for dry season and wet season respectively. The results predicted by both models are in general consistent with each other which implied that the model setting of the refined VH model including the nesting procedure and the derivation of the boundary conditions were carried out correctly.

13.1.4 It is important to realize that the refined VH model has higher resolution than the original approved VH model in the Causeway Bay and nearby areas. The grid cells of the VH model have also been refined under the present Study to improve the orthogonality and smoothness of the grids. The differences in the grid resolution and grid layout between the two models have caused some minor deviations in the simulated flow directions and flow speeds between the two models.

13.1.5 The WAQ model of the refined VH model is not able to fully reproduce the salinity patterns computed by its FLOW model. The numerical scheme used for the WAQ of the refined VH model is Scheme 15 which is the same as that adopted for the original VH model. The scheme was chosen for practical reason because this scheme would allow a reasonable computational run time. Better schemes such as Scheme 12 would produce a better agreement in the salinity results with the FLOW simulation but Scheme 12 requires very small time steps. Scheme 19 would provide the best agreement with the FLOW results but this scheme also needs very small time steps and does not allow flow aggregation. The surface salinity results produced from the WAQ model of the refined VH model are compared with the surface salinity results produced by the FLOW model of the refined VH model as well as the FLOW model of the original VH model in **Appendix A.6** to check for the consistency. It can be seen in **Appendix A.6** that the three sets of salinity results are in general consistent with each other. The differences between the data sets are considered acceptable.

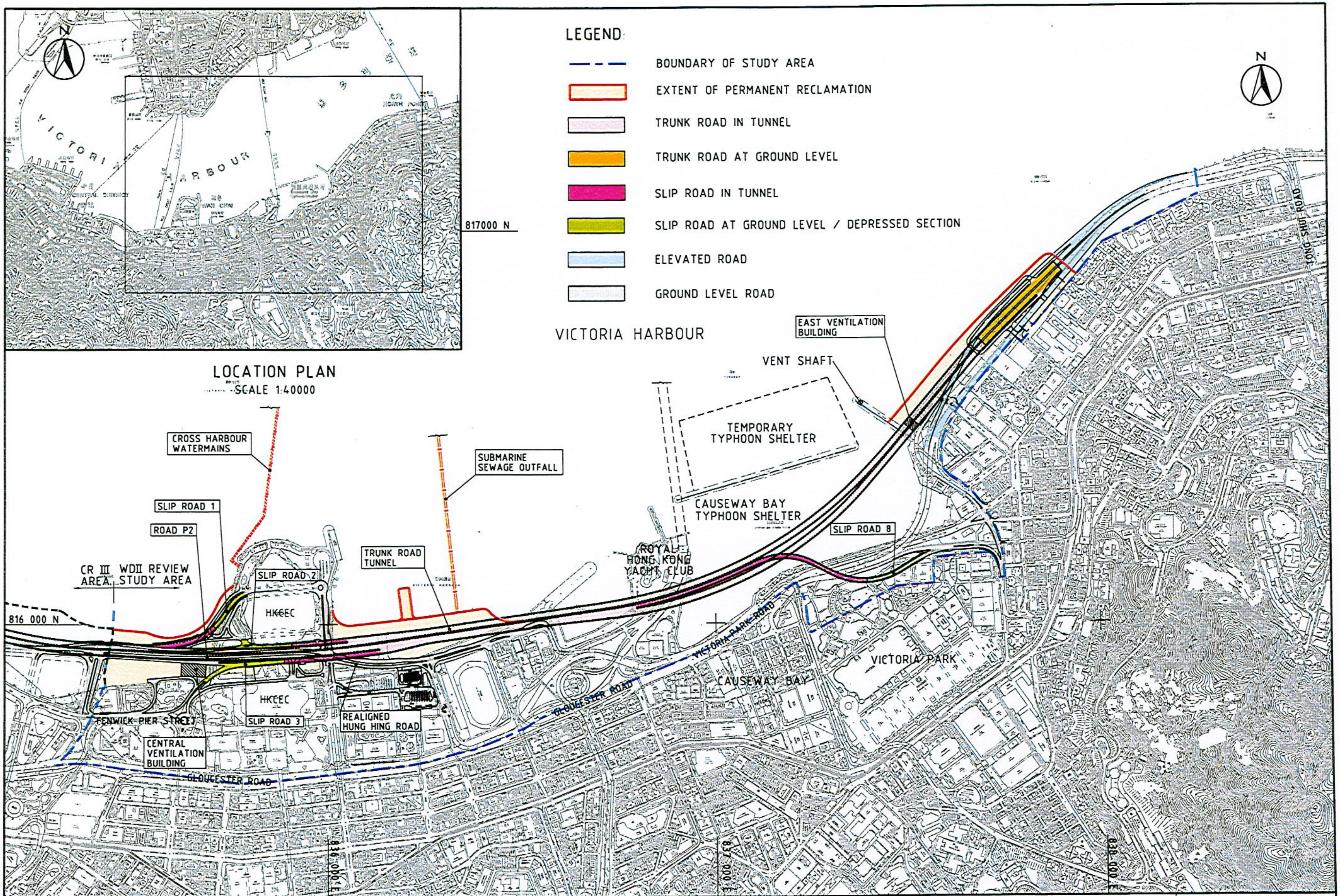
13.1.6 For construction phase modelling, the VH model developed under the CFSWDII EIA will be directly applied. This approach is considered acceptable considering that the construction phase impacts would be interim only.

13.1.7 The VH model was also used to assess the hydrodynamic impacts within the Victoria Harbour under both interim construction and operational phase scenarios. As the key concern would be the overall influences on the main flow channel of the Victoria Harbour, the approved detailed VH model developed under the CFSWDII is considered acceptable for use in the assessment of the potential hydrodynamic impacts.

Land-based Construction Phase Impacts

13.1.8 Proposed construction activities were reviewed to assess the land-based water quality impact upon the nearby water bodies. Practical water pollution control measures / mitigation proposals will be recommended to prevent local flooding and to ensure that effluent discharged from the construction site will comply with the WPCO criteria.

Figures



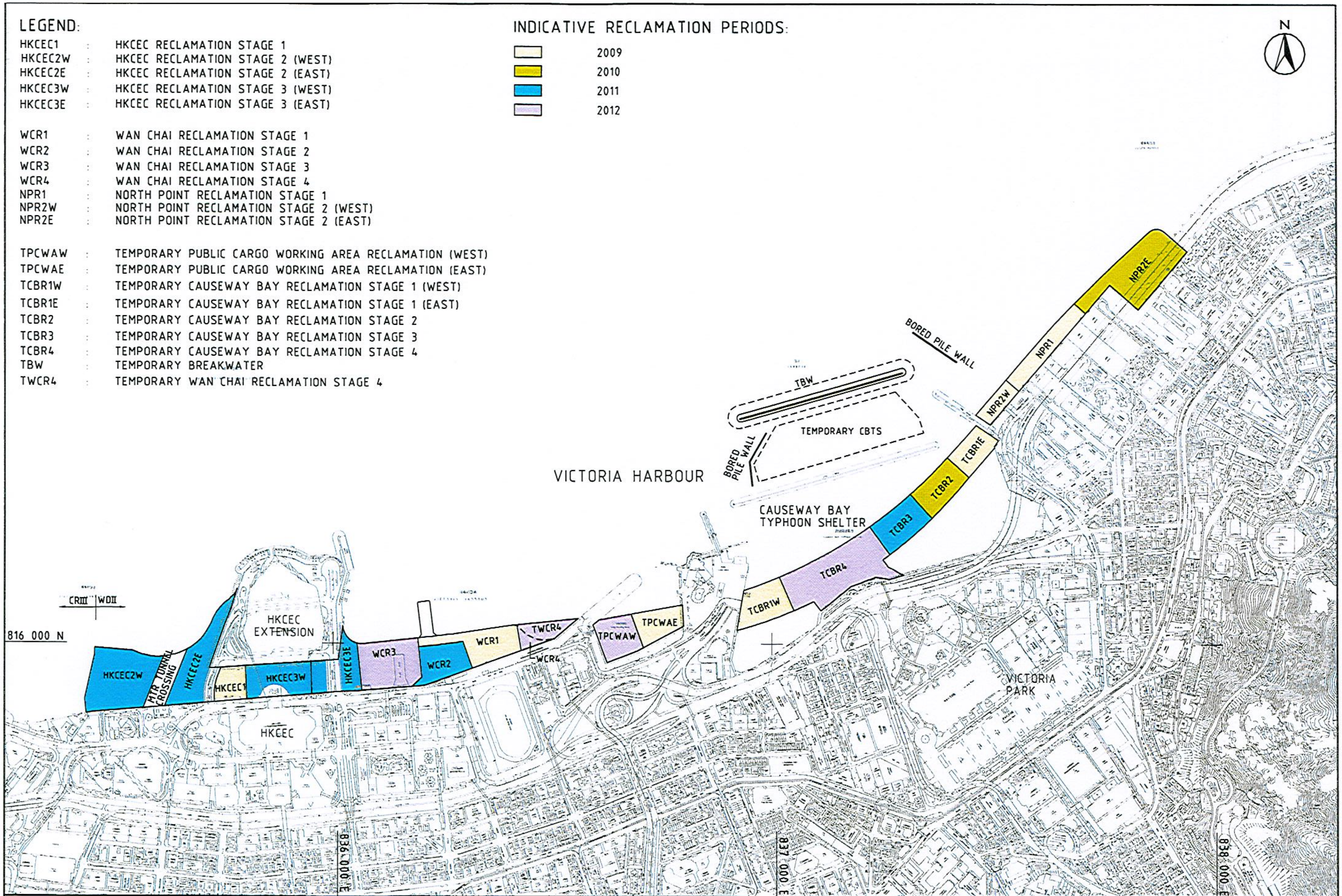
DATE: 03/09/2007 18:53:33

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

WAN CHAI DEVELOPMENT PHASE II AND CENTRAL-WAN CHAI BYPASS - SITE PLAN

FIGURE 1.1



DATE: 2007-5-22 16:48:55

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

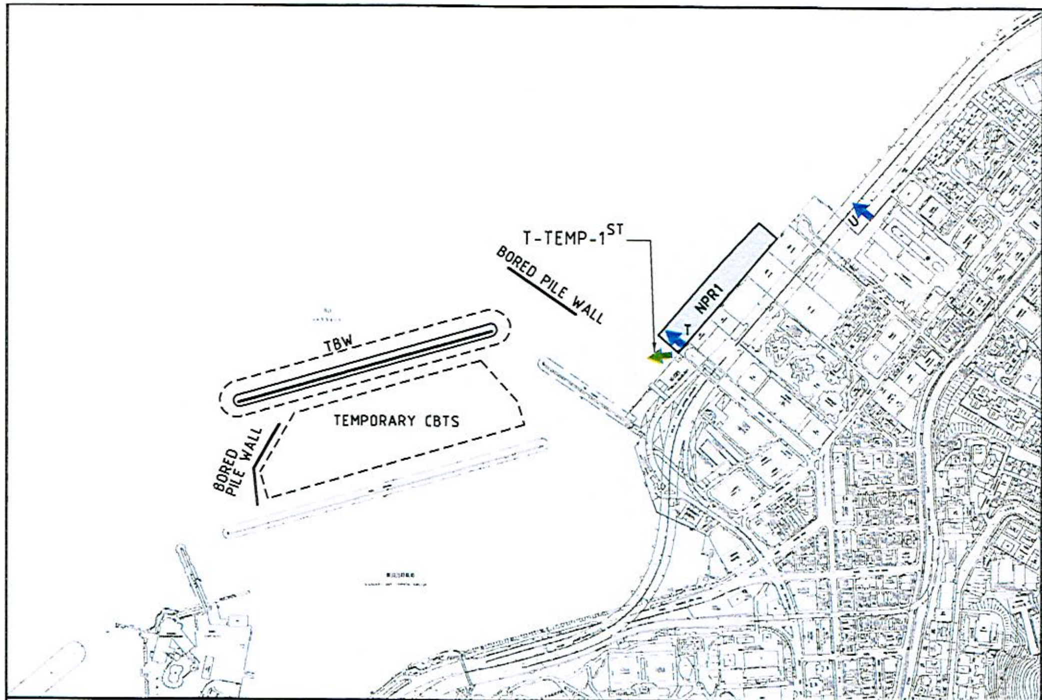
WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

RECLAMATION STAGES

FIGURE 2.7

P:\projects\97103\drawing\report\EIA_200705\FIGURE_2-7.dgn

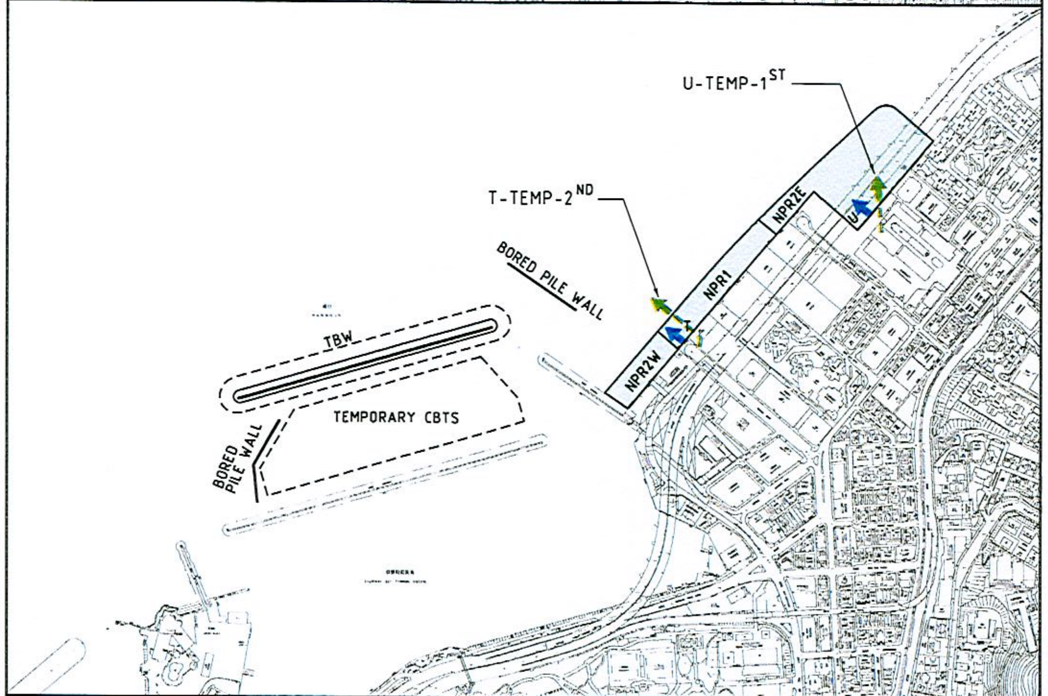
SCALE 1:8000



NORTH POINT RECLAMATION

EARLY 2009 TO MID 2009

- DIVERSION OF OUTFALL T TO TEMPORARY OUTFALL (T-TEMP-1ST) DISCHARGING TO THE WEST OF NPR1
- NPR1 RECLAMATION



MID 2009 TO LATE 2009

- DIVERSION OF OUTFALL T TO TEMPORARY OUTFALL (T-TEMP-2ND) ON THE RECLAIMED PART OF NPR1
- DIVERSION OF OUTFALL U TO TEMPORARY OUTFALL (U-TEMP-1ST) DISCHARGING TO THE EASTERN HALF OF NPR2E
- NPR1 RECLAMATION
- NPR2W RECLAMATION
- NPR2E RECLAMATION

LEGEND:

- EXISTING COOLING WATER INTAKE
- EXISTING STORM WATER OUTFALL
- REPROVISIONED COOLING WATER INTAKE
- REPROVISIONED STORM WATER OUTFALL
- TEMPORARY COOLING WATER INTAKE
- NEW COOLING WATER/SALT WATER CHAMBER
- NEW BOX CULVERT
- TEMPORARY DRAINAGE OUTFALL DIVERSION
- DIVERTED COOLING WATER INTAKE PIPELINES (PERMANENT)
- TEMPORARY COOLING WATER PIPELINES
- RECLAMATION IN THE PERIOD
- CWB TUNNEL CONSTRUCTION IN THE PERIOD
- CWB TUNNEL (COMPLETED)

DATE 2007-8-2 19:04:57

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

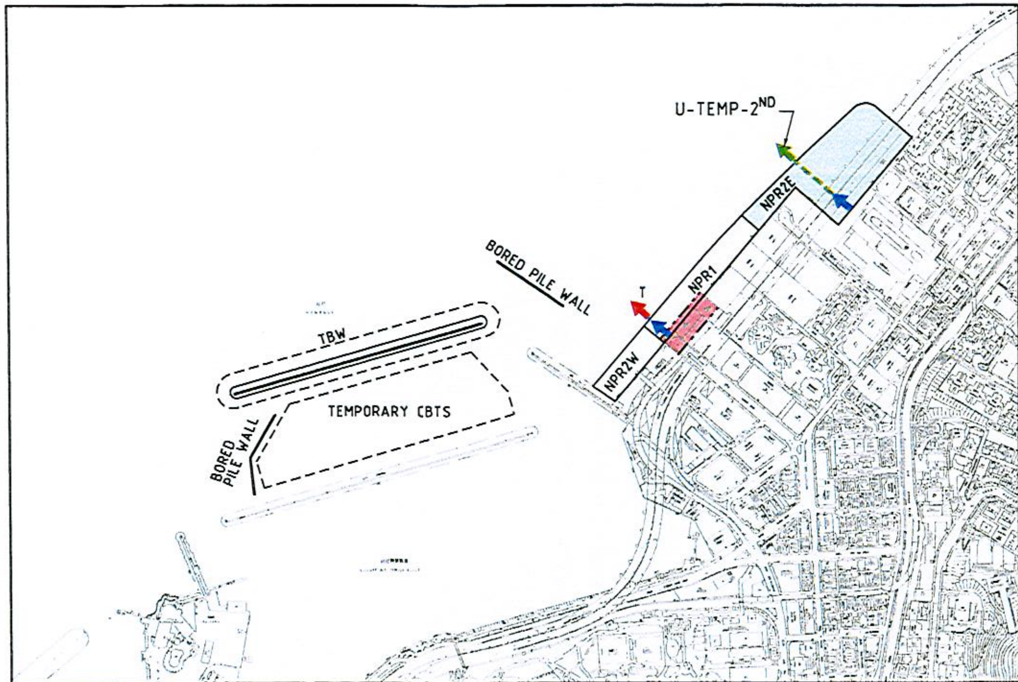
CONSTRUCTION STAGES

(SHEET 1 OF 12)

FIGURE 2.8

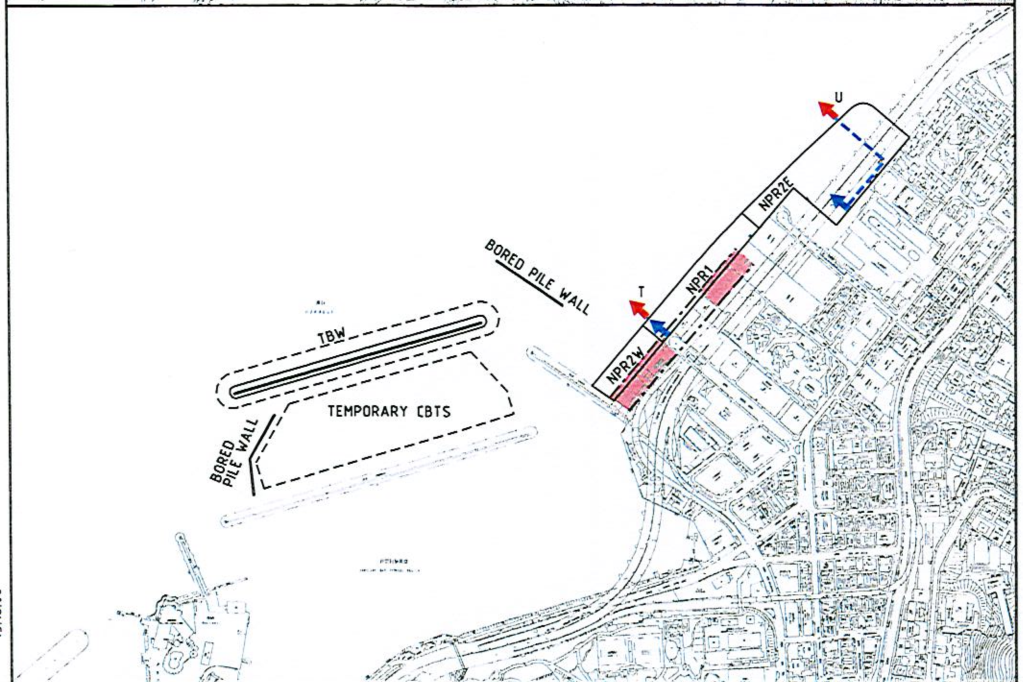
P:\PROJECTS\97103\drawing\report\EIA 200705\FIGURE 2.8\Figure 2.8.dgn

SCALE 1:8000



LATE 2009 TO MID 2010

- DIVERSION OF OUTFALL U TO TEMPORARY OUTFALL (U-TEMP-2ND) ON RECLAIMED PART OF NPR2E
- NPR2E RECLAMATION
- CWB TUNNEL CONSTRUCTION AT NPR1
- CONSTRUCTION OF PERMANENT OUTFALL T ABOVE THE COMPLETED CWB TUNNEL



MID 2010 TO LATE 2012

- CONSTRUCTION OF PERMANENT OUTFALL U
- CWB TUNNEL CONSTRUCTION AT NPR1
- CWB TUNNEL CONSTRUCTION AT NP2W

LEGEND:

- EXISTING COOLING WATER INTAKE
- EXISTING STORM WATER OUTFALL
- REPROVISIONED COOLING WATER INTAKE
- REPROVISIONED STORM WATER OUTFALL
- TEMPORARY COOLING WATER INTAKE
- NEW COOLING WATER/SALT WATER CHAMBER
- NEW BOX CULVERT
- TEMPORARY DRAINAGE OUTFALL DIVERSION
- DIVERTED COOLING WATER INTAKE PIPELINES (PERMANENT)
- TEMPORARY COOLING WATER PIPELINES
- RECLAMATION IN THE PERIOD
- CWB TUNNEL CONSTRUCTION IN THE PERIOD
- CWB TUNNEL (COMPLETED)

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

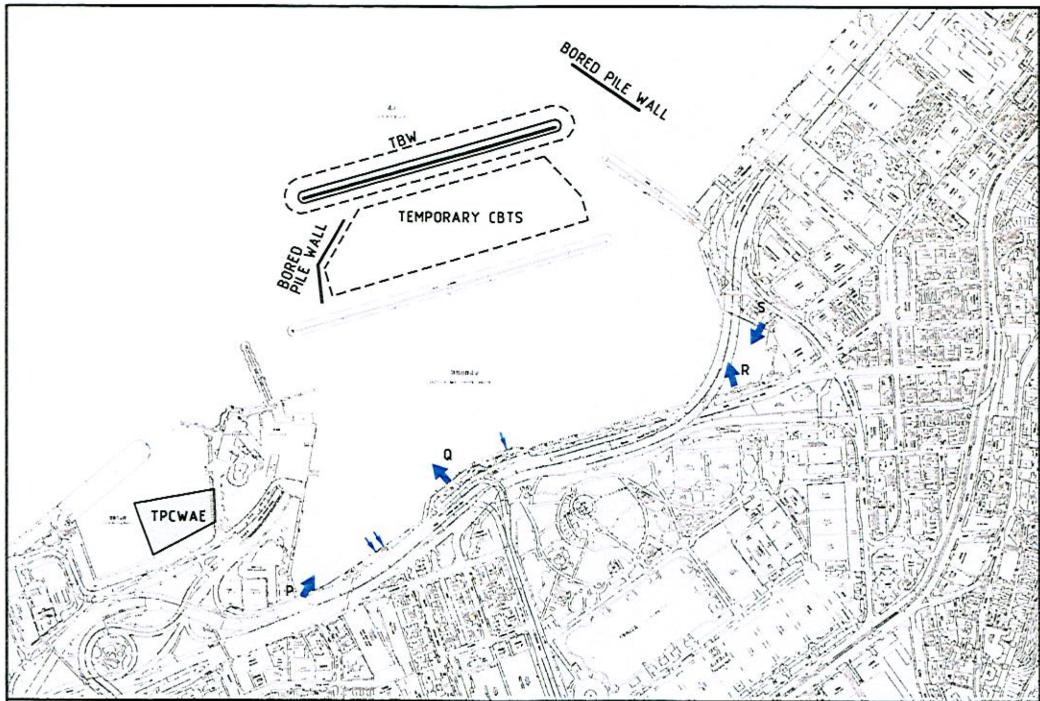
WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

CONSTRUCTION STAGES

(SHEET 2 OF 12)

FIGURE 2.9

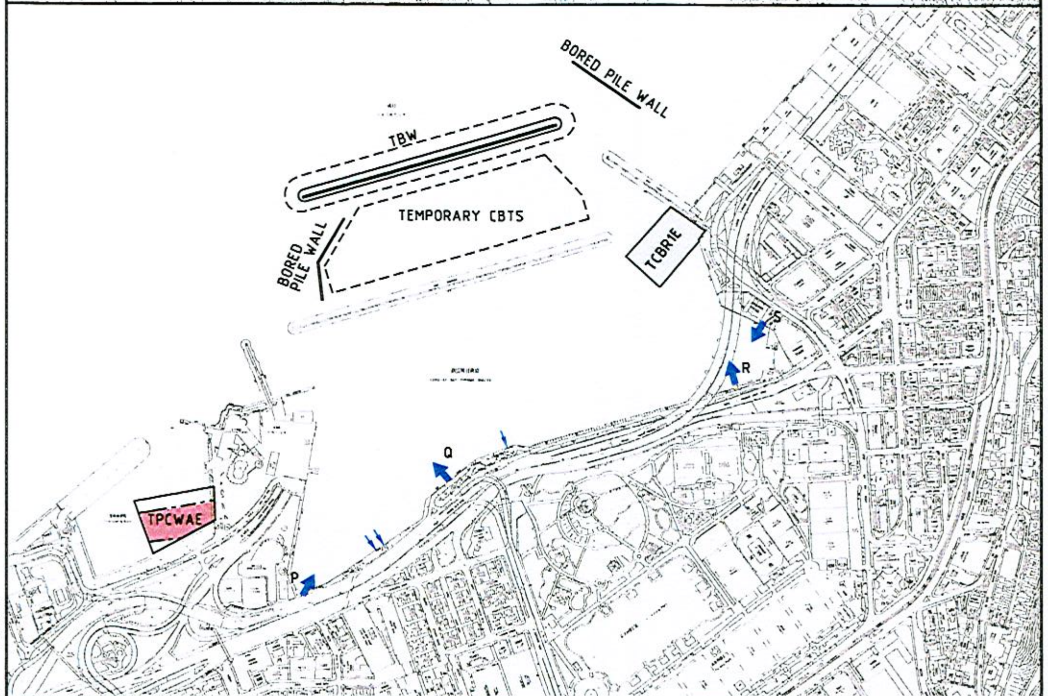
DATE: 2007-8-3 15:18:00



TEMPORARY TYPHOON SHELTER CONSTRUCTION, TEMPORARY CAUSEWAY BAY RECLAMATION & TEMPORARY PCWA RECLAMATION

EARLY 2009 TO MID 2009

- TEMPORARY BREAKWATER (TBW) CONSTRUCTION
- BORED PILE WALL CONSTRUCTION
- TPCWAE RECLAMATION



MID 2009 TO LATE 2009

- TBW CONSTRUCTION
- MOVING MOORING TO TEMP CBTS
- CWB TUNNEL CONSTRUCTION AT TPCWAE
- TCBR1E RECLAMATION

LEGEND:

- EXISTING COOLING WATER INTAKE
- EXISTING STORM WATER OUTFALL
- REPROVISIONED COOLING WATER INTAKE
- REPROVISIONED STORM WATER OUTFALL
- TEMPORARY COOLING WATER INTAKE
- NEW COOLING WATER/SALT WATER CHAMBER
- NEW BOX CULVERT
- TEMPORARY DRAINAGE OUTFALL DIVERSION
- DIVERTED COOLING WATER INTAKE PIPELINES (PERMANENT)
- TEMPORARY COOLING WATER PIPELINES
- RECLAMATION IN THE PERIOD
- CWB TUNNEL CONSTRUCTION IN THE PERIOD
- CWB TUNNEL (COMPLETED)

DATE: 2007-8-20 10:54:57

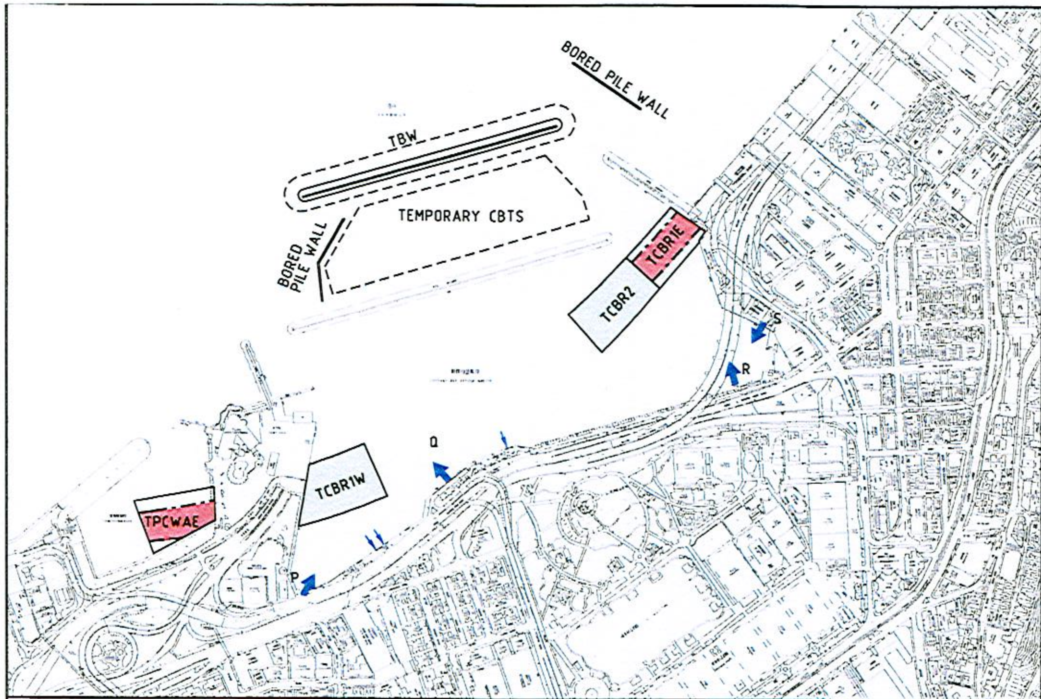
MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

CONSTRUCTION STAGES

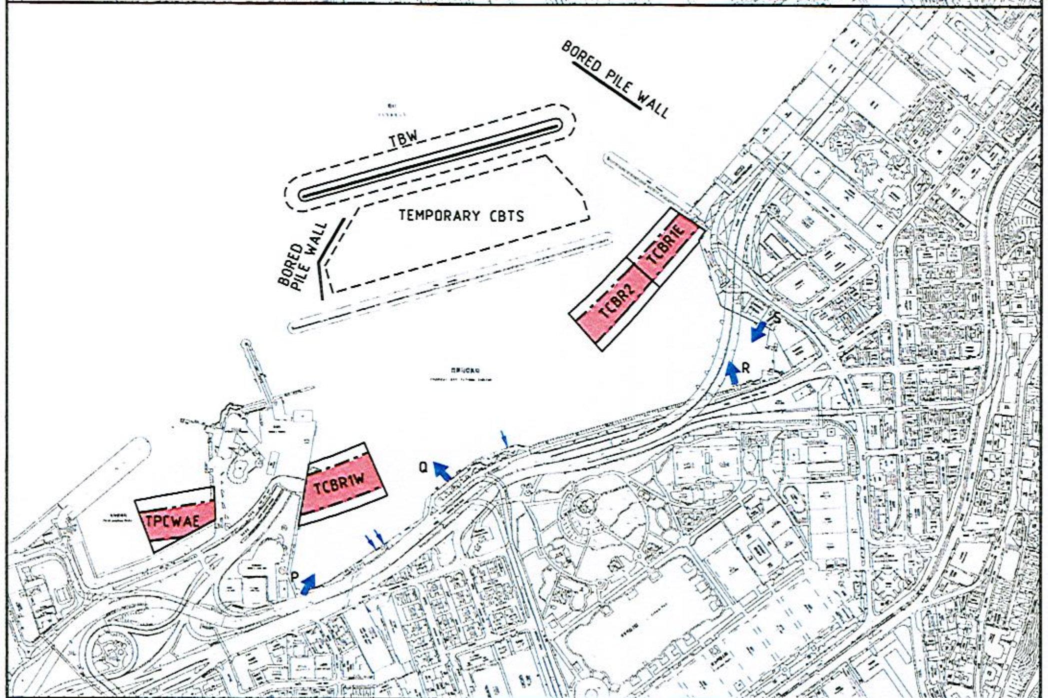
(SHEET 3 OF 12)

FIGURE 2.10



LATE 2009 TO MID 2010

- -TCBR1E RECLAMATION
- -TCBR1W RECLAMATION
- -TCBR2 RECLAMATION
- -CWB TUNNEL CONSTRUCTION AT TPCWAE
- -CWB TUNNEL CONSTRUCTION AT TCBR1E (AFTER COMPLETION OF TCBR1E RECLAMATION)



MID 2010 TO EARLY 2011

- -CWB TUNNEL CONSTRUCTION AT TPCWAE
- -CWB TUNNEL CONSTRUCTION AT TCBR1E
- -CWB TUNNEL CONSTRUCTION AT TCBR1W
- -CWB TUNNEL CONSTRUCTION AT TCBR2

LEGEND:

- EXISTING COOLING WATER INTAKE
- EXISTING STORM WATER OUTFALL
- REPROVISIONED COOLING WATER INTAKE
- REPROVISIONED STORM WATER OUTFALL
- TEMPORARY COOLING WATER INTAKE
- NEW COOLING WATER/SALT WATER CHAMBER
- NEW BOX CULVERT
- TEMPORARY DRAINAGE OUTFALL DIVERSION
- DIVERTED COOLING WATER INTAKE PIPELINES (PERMANENT)
- TEMPORARY COOLING WATER PIPELINES
- RECLAMATION IN THE PERIOD
- CWB TUNNEL CONSTRUCTION IN THE PERIOD
- CWB TUNNEL (COMPLETED)

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

CONSTRUCTION STAGES

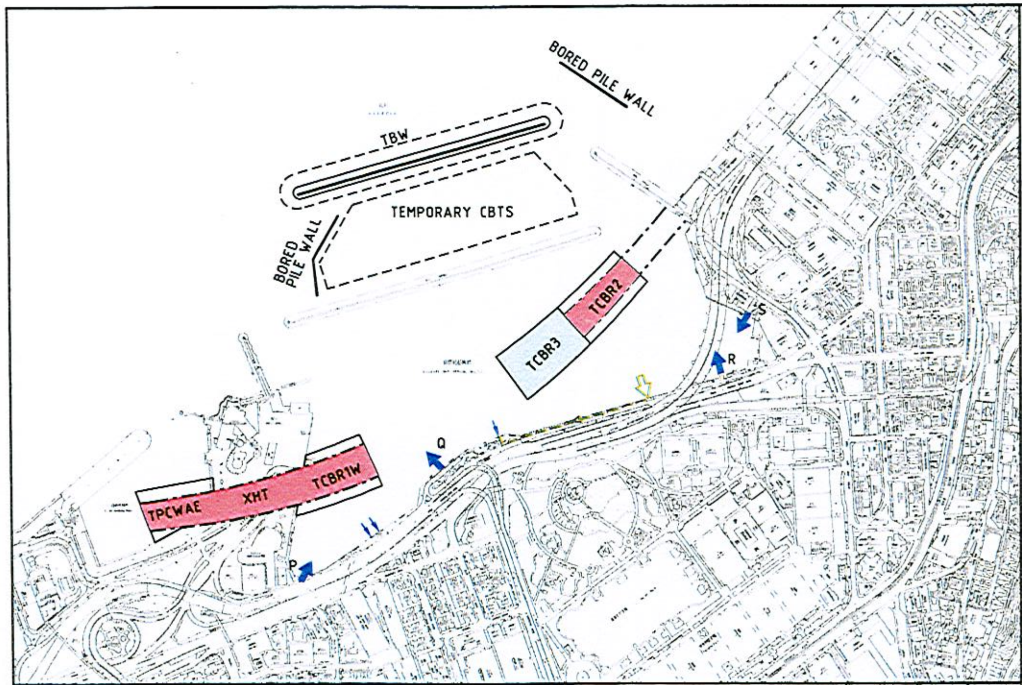
(SHEET 4 OF 12)

FIGURE 2.11

DATE: 2007-8-2 19:10:13

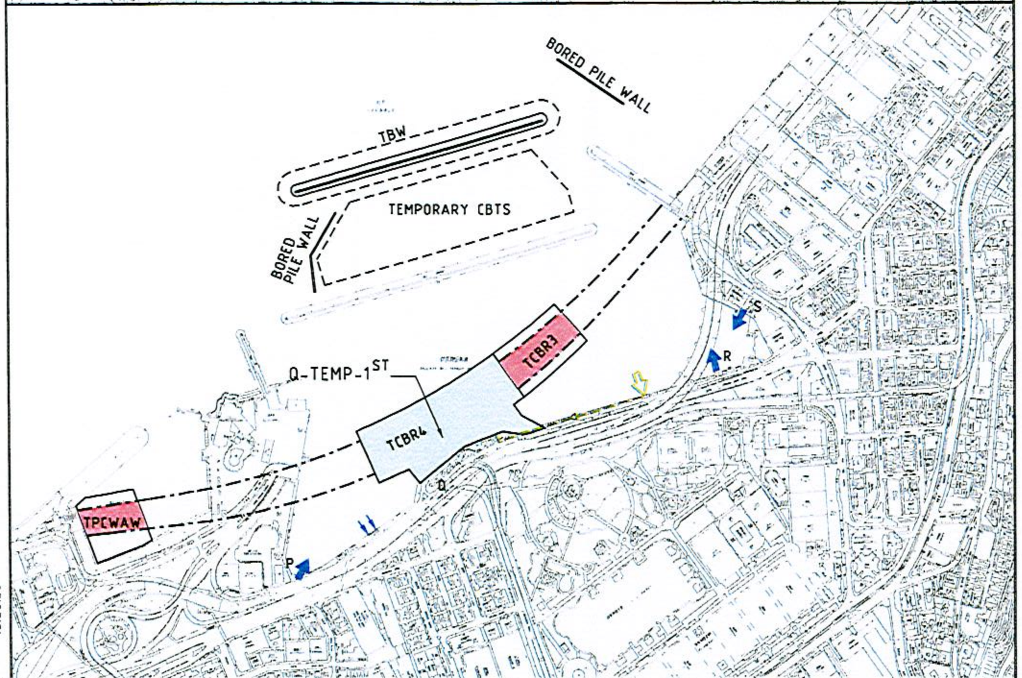
P:\PROJECTS\97103\drawing\report\EIA 200705\FIGURE 2.11\Figure 2.11.dgn

SCALE 1:8000



EARLY 2011 TO MID 2012

-TCBR1E RECLAMATION REMOVAL AFTER CWB TUNNEL IN TCBR1E COMPLETE
-TEMPORARY DIVERSION OF COOLING MAIN & INTAKE (WINDSOR HOUSE)
-COMMISSIONING OF DIVERTED COOLING MAIN & INTAKE
-TCBR3 RECLAMATION
-CWB TUNNEL CONSTRUCTION AT TPCWAE
-CWB TUNNEL CONSTRUCTION AT TCBR1W
-CWB TUNNEL CONSTRUCTION AT TCBR2
-CWB TUNNEL UNDER CROSS HARBOUR TUNNEL PORTAL AREA (XHT)



MID 2012 TO LATE 2012

-TCBR1W RECLAMATION REMOVAL IN EARLY 2012
-TCBR2 RECLAMATION REMOVAL IN EARLY 2012
-TPCWAE RECLAMATION REMOVAL IN EARLY 2012
-DIVERSION OF CULVERT Q TO TEMPORARY CULVERT (Q-TEMP-1ST) DISCHARGING TO EASTERN HALF OF TCBR4
-TCBR4 RECLAMATION (FROM WEST TO EAST)
-TPCWAW RECLAMATION
-CWB TUNNEL CONSTRUCTION AT TCBR3
-CWB TUNNEL CONSTRUCTION AT TPCWAW

LEGEND:

- EXISTING COOLING WATER INTAKE
- EXISTING STORM WATER OUTFALL
- REPROVISIONED COOLING WATER INTAKE
- REPROVISIONED STORM WATER OUTFALL
- TEMPORARY COOLING WATER INTAKE
- NEW COOLING WATER/SALT WATER CHAMBER
- NEW BOX CULVERT
- TEMPORARY DRAINAGE OUTFALL DIVERSION
- DIVERTED COOLING WATER INTAKE PIPELINES (PERMANENT)
- TEMPORARY COOLING WATER PIPELINES
- RECLAMATION IN THE PERIOD
- CWB TUNNEL CONSTRUCTION IN THE PERIOD
- CWB TUNNEL (COMPLETED)

DATE 2007-8-3 15:20:20

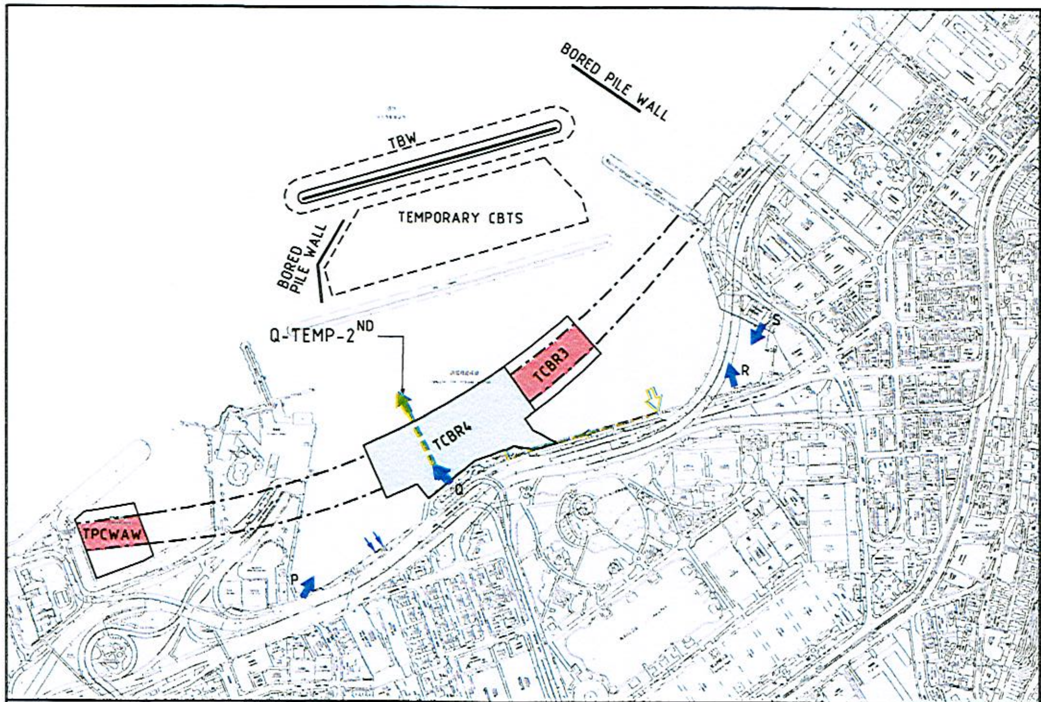
MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

CONSTRUCTION STAGES

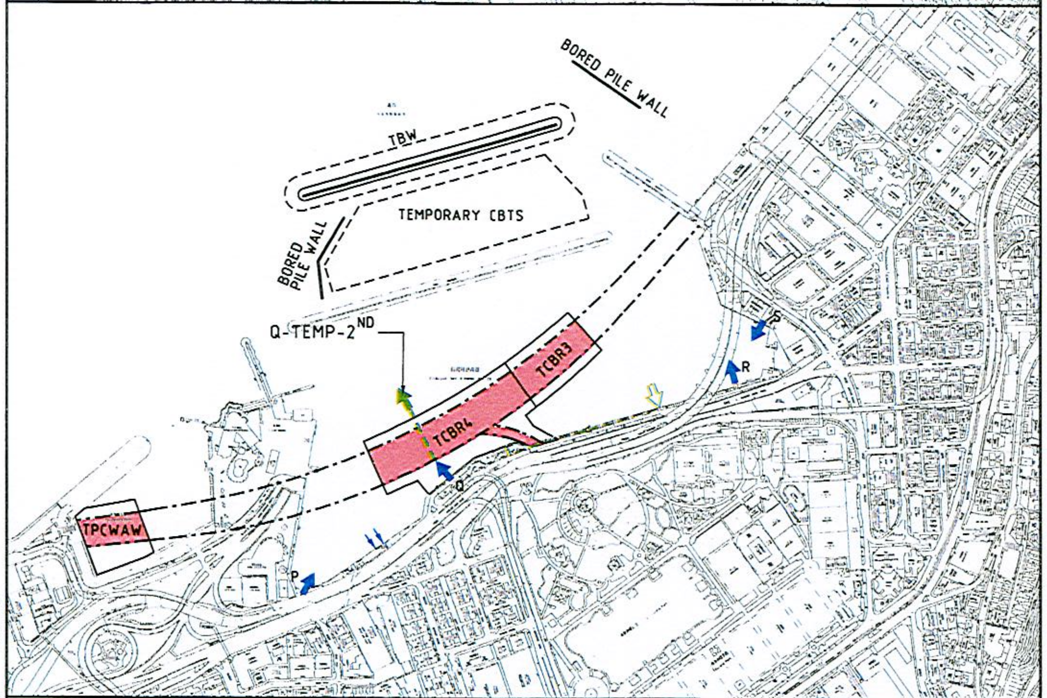
FIGURE 2.12

(SHEET 5 OF 12)



LATE 2012 TO EARLY 2013

-DIVERSION OF OUTFALL Q TO TEMPORARY OUTFALL (Q-TEMP-2ND) ON RECLAIMED WESTERN PART OF TCBR4
-TCBR4 RECLAMATION (EASTERN SECTION)
-CWB TUNNEL CONSTRUCTION AT TCBR3
-CWB TUNNEL CONSTRUCTION AT TPCWAW



EARLY 2013 TO MID 2014

-CWB TUNNEL CONSTRUCTION AT TCBR3
-CWB TUNNEL CONSTRUCTION AT TCBR4
-CWB TUNNEL CONSTRUCTION AT TPCWAW

LEGEND:

- EXISTING COOLING WATER INTAKE
- EXISTING STORM WATER OUTFALL
- REPROVISIONED COOLING WATER INTAKE
- REPROVISIONED STORM WATER OUTFALL
- TEMPORARY COOLING WATER INTAKE
- NEW COOLING WATER/SALT WATER CHAMBER
- NEW BOX CULVERT
- TEMPORARY DRAINAGE OUTFALL DIVERSION
- DIVERTED COOLING WATER INTAKE PIPELINES (PERMANENT)
- TEMPORARY COOLING WATER PIPELINES
- RECLAMATION IN THE PERIOD
- CWB TUNNEL CONSTRUCTION IN THE PERIOD
- CWB TUNNEL (COMPLETED)

DATE: 2007-8-2 20:35:34

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

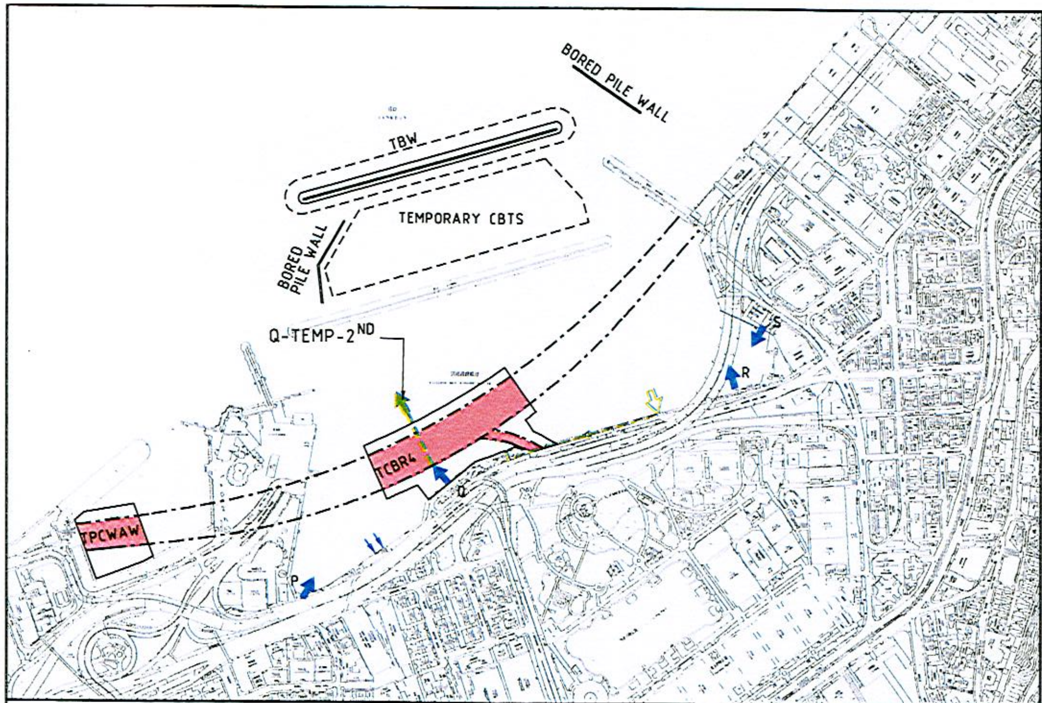
WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

CONSTRUCTION STAGES

(SHEET 6 OF 12)

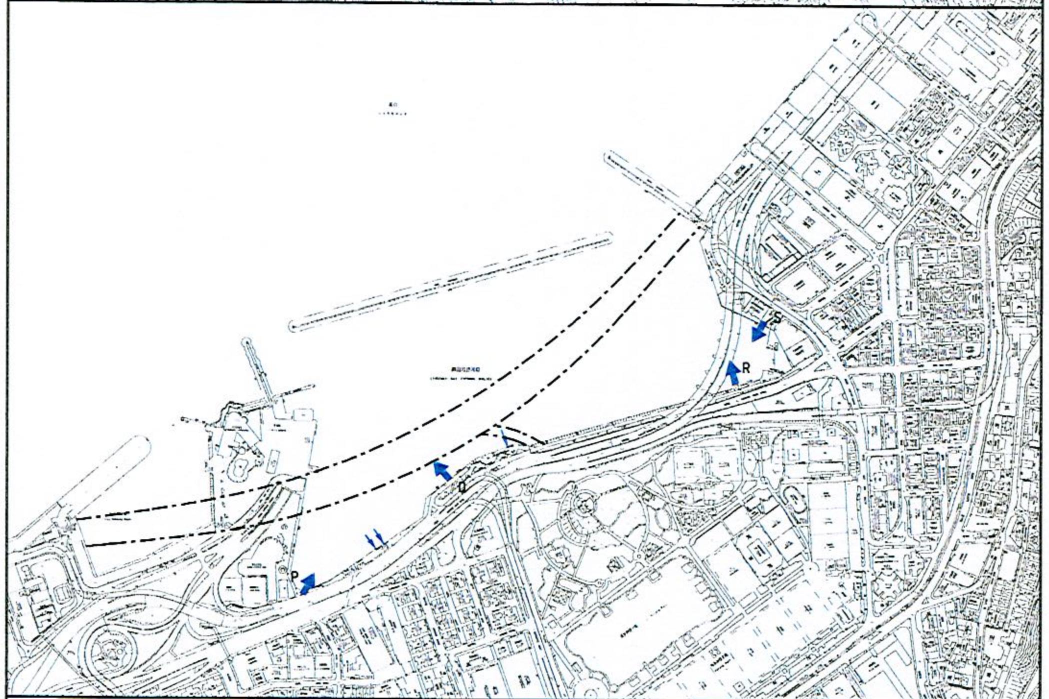
FIGURE 2.13

P:\projects\97103\drawing\report\EIA_200705\FIGURE_2.13\Figure_2.13.dgn
SCALE 1:8000



MID 2014 TO LATE 2015

- CWB TUNNEL CONSTRUCTION AT TPCWAW
- CWB & SLIP ROAD 8 TUNNELS CONSTRUCTION AT TCBR4
- TCBR3 RECLAMATION REMOVAL IN LATE 2013



LATE 2015 TO EARLY 2016

- TPCWAW RECLAMATION REMOVAL IN EARLY 2015
- TCBR4 RECLAMATION REMOVAL IN MID 2015
- REINSTATEMENT OF EXISTING COOLING MAIN & INTAKE (WINDSOR HOUSE)
- REINSTATEMENT OF EXISTING OUTFALL Q
- TEMPORARY TYPHOON SHELTER REMOVAL IN LATE 2015

LEGEND:

- EXISTING COOLING WATER INTAKE
- EXISTING STORM WATER OUTFALL
- REPROVISIONED COOLING WATER INTAKE
- REPROVISIONED STORM WATER OUTFALL
- TEMPORARY COOLING WATER INTAKE
- NEW COOLING WATER/SALT WATER CHAMBER
- NEW BOX CULVERT
- TEMPORARY DRAINAGE OUTFALL DIVERSION
- DIVERTED COOLING WATER INTAKE PIPELINES (PERMANENT)
- TEMPORARY COOLING WATER PIPELINES
- CWB TUNNEL CONSTRUCTION IN THE PERIOD
- CWB TUNNEL (COMPLETED)

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

CONSTRUCTION STAGES

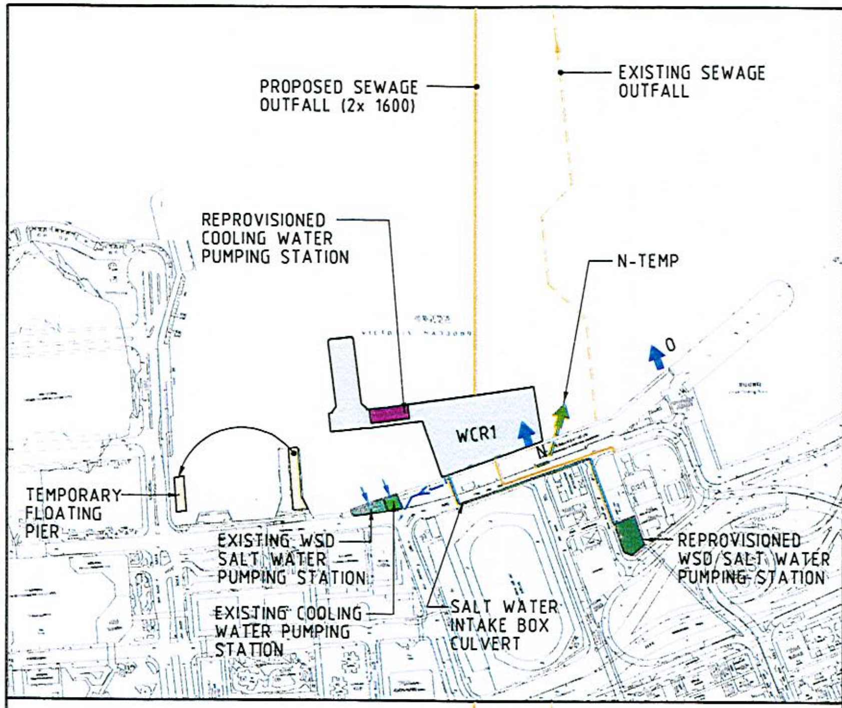
(SHEET 7 OF 12)

FIGURE 2.14

DATE: 2007-8-2 19:20:19

P:\PROJECTS\97103\drawing\report\EIA_200705\FIGURE_2.14\Figure_2.14.dgn

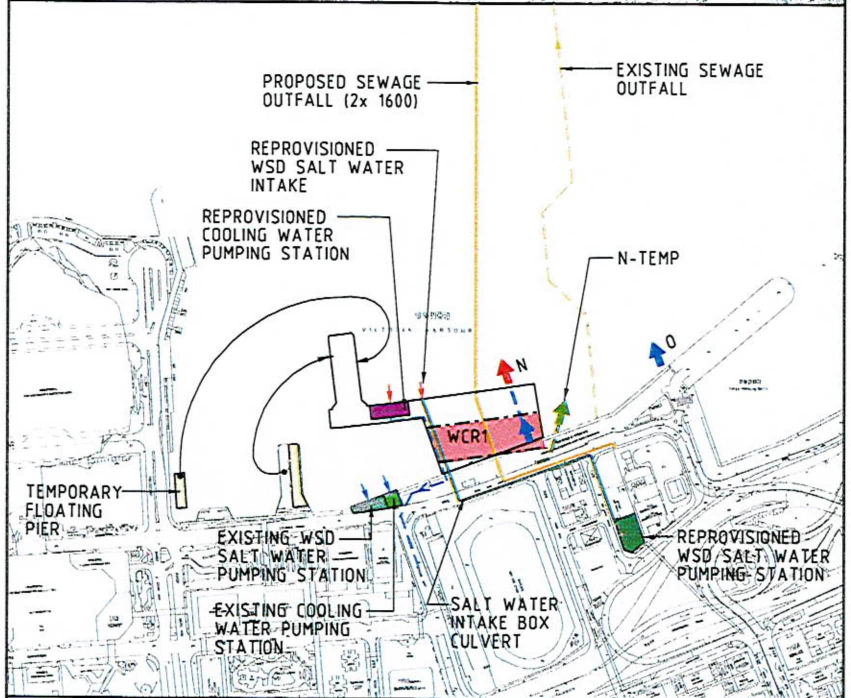
SCALE 1:8000



WAN CHAI RECLAMATION

EARLY 2009 TO EARLY 2010

- -DIVERSION OF EXISTING FERRY SERVICE AT THE EAST BERTH OF WAN CHAI FERRY PIER TO A TEMPORARY FLOATING PIER
- -DIVERSION OF OUTFALL N TO TEMPORARY OUTFALL (N-TEMP) TO THE EAST OF WCR1 RECLAMATION
- -WCR1 RECLAMATION
- -CONSTRUCTION OF NEW FERRY PIER
- -CONSTRUCTION OF NEW SEWAGE OUTFALL AT HARBOUR AREA AND ON EXISTING LAND
- -CONSTRUCTION OF REPROVISIONED WSD SALT WATER PUMPING STATION AND ITS INTAKE BOX CULVERT (LAND SIDE)
- -CONSTRUCTION OF COOLING WATER PUMPING CHAMBERS AT NEW SEAWALL



EARLY 2010 TO EARLY 2011

- -CWB TUNNEL CONSTRUCTION AT WCR1
- -CONSTRUCTION OF SEWAGE OUTFALL AT SEASIDE AND ON RECLAIMED PART OF WCR1 RECLAMATION
- -CONSTRUCTION OF COOLING WATER MAINS (SHK CENTRE)
- -CONSTRUCTION OF NEW SALT WATER INTAKE BOX CULVERT
- -CONSTRUCTION OF PERMANENT CULVERT N
- -DIVERSION OF ALL EXISTING FERRY SERVICE TO THE NEW WAN CHAI FERRY PIER
- -COMMISSIONING OF COOLING WATER MAINS SYSTEM (SHK CENTRE)
- -COMMISSIONING OF SALT WATER INTAKE SYSTEM

LEGEND:

- EXISTING COOLING WATER INTAKE/ EXISTING WSD SALT WATER INTAKE
- EXISTING STORM WATER OUTFALL
- REPROVISIONED COOLING WATER INTAKE/ REPROVISIONED WSD SALT WATER INTAKE
- REPROVISIONED STORM WATER OUTFALL
- TEMPORARY COOLING WATER INTAKE
- NEW COOLING WATER/SALT WATER CHAMBER
- NEW BOX CULVERT
- TEMPORARY DRAINAGE OUTFALL DIVERSION
- DIVERTED COOLING WATER INTAKE PIPELINES (PERMANENT)
- TEMPORARY COOLING WATER PIPELINES
- RECLAMATION IN THE PERIOD
- CWB TUNNEL CONSTRUCTION IN THE PERIOD
- CWB TUNNEL (COMPLETED)

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

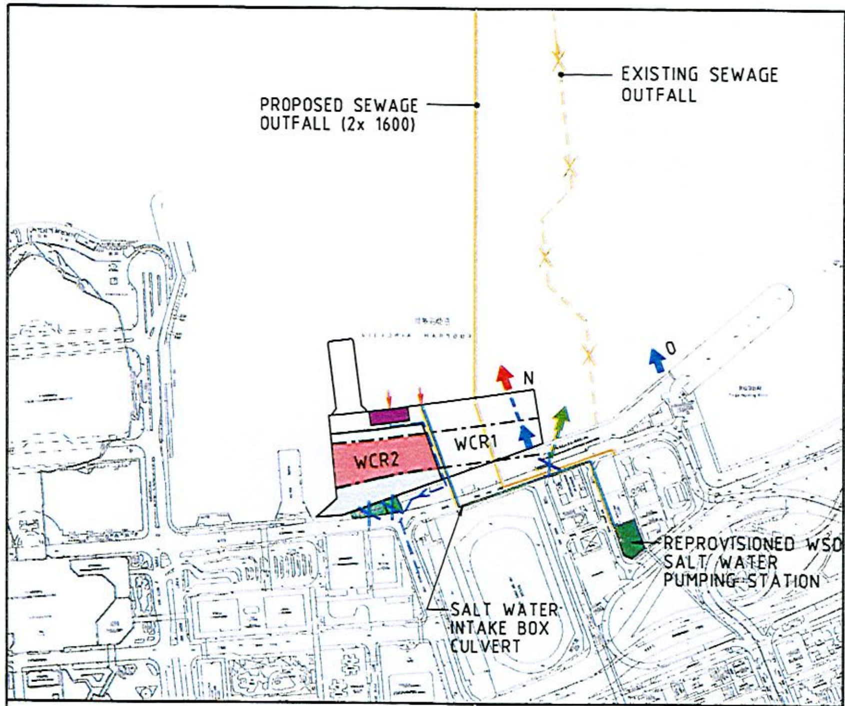
CONSTRUCTION STAGES

FIGURE 2.15

(SHEET 8 OF 12)

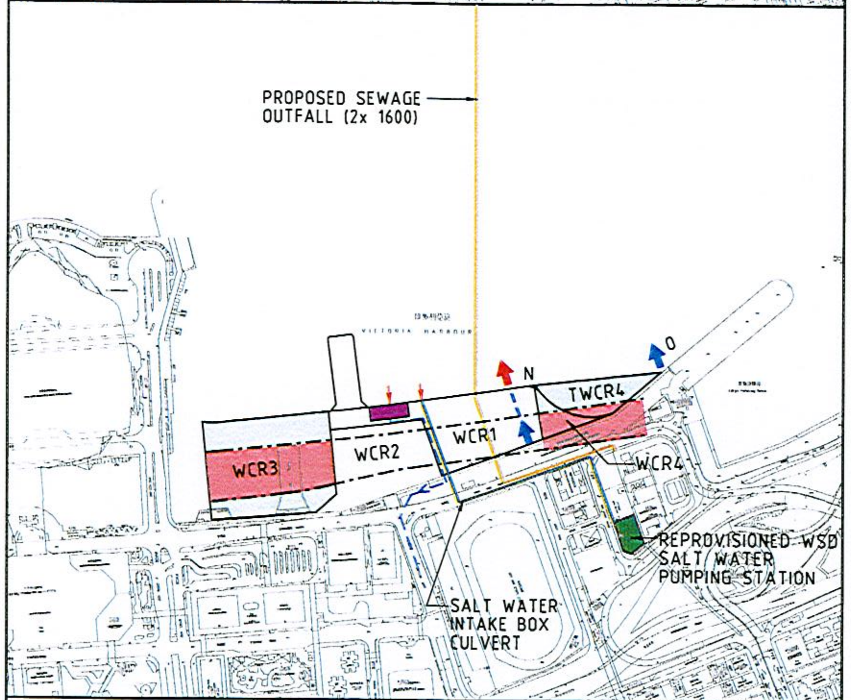
DATE: 2007-8-2 19:30:08

P:\PROJECTS\97103\drawing\report\EIA 200705\FIGURE 2.15\FIGURE 2.15.dgn



EARLY 2011 TO LATE 2012

- -COMMISSIONING OF NEW SEWAGE SUBMARINE OUTFALL
- -WCR2 RECLAMATION
- -DEMOLITION OF EXISTING WSD SALT WATER PUMPING STATION, COOLING WATER PUMPING STATION & EXISTING FERRY PIER
- -ABANDON EXISTING SEWAGE SUBMARINE OUTFALL
- -CWB TUNNEL CONSTRUCTION AT WCR2



LATE 2012 TO EARLY 2015

- -WCR3 RECLAMATION
- -WCR4 RECLAMATION
- -TWCR4 RECLAMATION
- -CWB TUNNEL CONSTRUCTION AT WCR3
- -CWB TUNNEL CONSTRUCTION AT WCR4 & TWCR4

LEGEND:

- EXISTING COOLING WATER INTAKE/ EXISTING WSD SALT WATER INTAKE
- EXISTING STORM WATER OUTFALL
- REPROVISIONED COOLING WATER INTAKE/ REPROVISIONED WSD SALT WATER INTAKE
- REPROVISIONED STORM WATER OUTFALL
- TEMPORARY COOLING WATER INTAKE
- NEW COOLING WATER/SALT WATER CHAMBER
- NEW BOX CULVERT
- TEMPORARY DRAINAGE OUTFALL DIVERSION
- DIVERTED COOLING WATER INTAKE PIPELINES (PERMANENT)
- TEMPORARY COOLING WATER PIPELINES
- RECLAMATION IN THE PERIOD
- CWB TUNNEL CONSTRUCTION IN THE PERIOD
- CWB TUNNEL (COMPLETED)

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

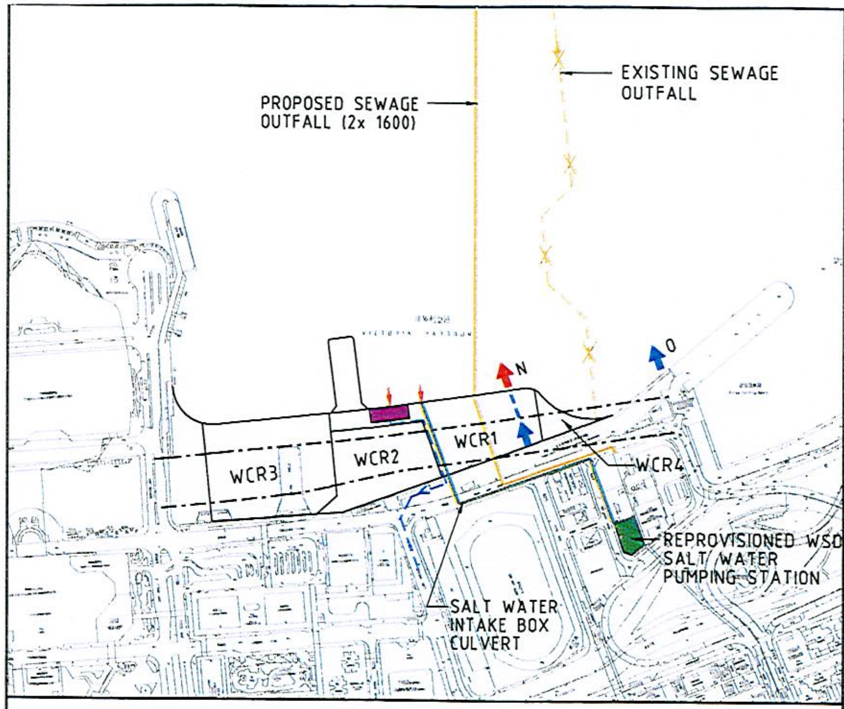
CONSTRUCTION STAGES

FIGURE 2.16

(SHEET 9 OF 12)

DATE: 2007-8-2 19:31:26

P:\PROJECTS\97103\drawing\report\EIA_200705\FIGURE_2.16\FIGURE_2.16.dgn



EARLY 2015 TO LATE 2015

-AT GRADE ROAD
-CONSTRUCTION OF PERMANENT WCR4 SEAWALL
-REMOVAL OF TWCR4 RECLAMATION

LEGEND:

- EXISTING COOLING WATER INTAKE/ EXISTING WSD SALT WATER INTAKE
- EXISTING STORM WATER OUTFALL
- REPROVISIONED COOLING WATER INTAKE/ REPROVISIONED WSD SALT WATER INTAKE
- REPROVISIONED STORM WATER OUTFALL
- TEMPORARY COOLING WATER INTAKE
- NEW COOLING WATER/SALT WATER CHAMBER
- NEW BOX CULVERT
- TEMPORARY DRAINAGE OUTFALL DIVERSION
- DIVERTED COOLING WATER INTAKE PIPELINES (PERMANENT)
- TEMPORARY COOLING WATER PIPELINES
- RECLAMATION IN THE PERIOD
- CWB TUNNEL CONSTRUCTION IN THE PERIOD
- CWB TUNNEL (COMPLETED)

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

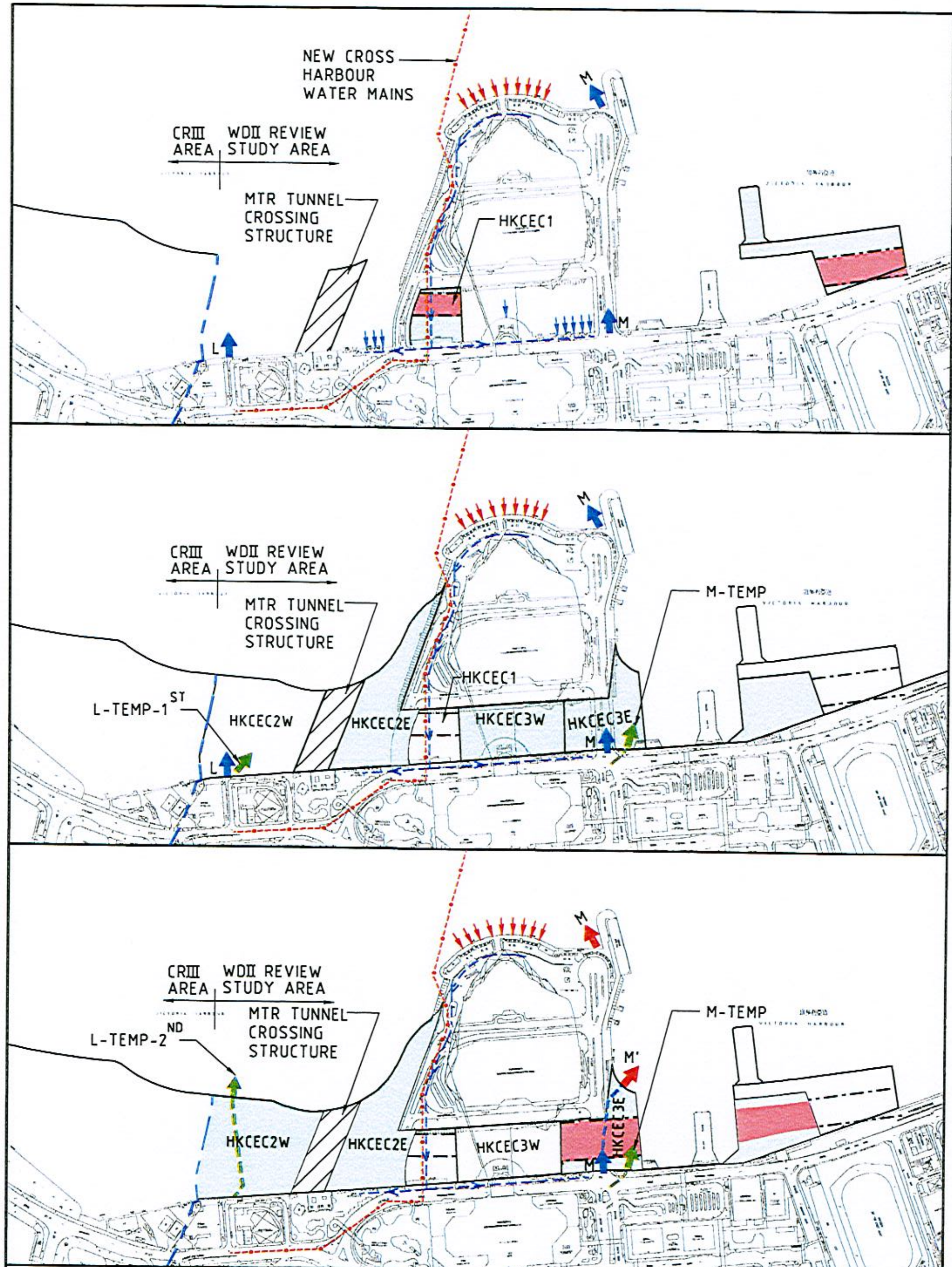
CONSTRUCTION STAGES

(SHEET 10 OF 12)

FIGURE 2.17

DATE: 2007-8-2 19:32:42

P:\PROJECTS\97103\drawing\report\EIA_200705\FIGURE_2.17.dgn



HKCEC RECLAMATION

EARLY 2009 TO EARLY 2011

- -HKCEC1 RECLAMATION
- -MTR TUNNEL CROSSING STRUCTURE CONSTRUCTION
- -CWB TUNNEL CONSTRUCTION AT HKCEC1
- -COOLING WATER INTAKE PIPELINES CONSTRUCTION
- -NEW CROSS HARBOUR WATER MAINS CONSTRUCTION
- -COMMISSIONING OF THE NEW COOLING WATER INTAKE SYSTEM
- -COMMISSIONING OF THE NEW CROSS HARBOUR WATER MAINS

EARLY 2011 TO LATE 2011

- -MTR TUNNEL CROSSING STRUCTURE CONSTRUCTION
- -DIVERSION OF OUTFALL M TO TEMPORARY OUTFALL (M-TEMP) DISCHARGING TO THE EASTERN HALF OF HKCEC3E
- -DIVERSION OF OUTFALL L TO TEMPORARY OUTFALL (L-TEMP-1ST) DISCHARGING TO THE EASTERN HALF OF HKCEC2W
- -HKCEC3E RECLAMATION (WEST TO EAST)
- -HKCEC3W RECLAMATION
- -HKCEC2W RECLAMATION (WEST TO EAST)
- -HKCEC2E RECLAMATION

LATE 2011 TO LATE 2012

- -MTR TUNNEL CROSSING STRUCTURE CONSTRUCTION
- -DIVERSION OF OUTFALL L TO TEMPORARY OUTFALL (L-TEMP-2ND) ON THE RECLAIMED WESTERN PART OF HKCEC2W
- -HKCEC2W RECLAMATION (EASTERN SIDE)
- -HKCEC2E RECLAMATION
- -HKCEC3E RECLAMATION (TO BOX CULVERT INVERT)
- -CWB TUNNEL CONSTRUCTION AT HKCEC3E (AFTER COMPLETION OF HKCEC3E RECLAMATION)
- -CONSTRUCTION OF PERMANENT OUTFALL M' ABOVE THE COMPLETED CWB TUNNEL

LEGEND:

- EXISTING COOLING WATER INTAKE
- EXISTING STORM WATER OUTFALL
- REPROVISIONED COOLING WATER INTAKE
- REPROVISIONED STORM WATER OUTFALL
- TEMPORARY COOLING WATER INTAKE
- NEW COOLING WATER/SALT WATER CHAMBER
- NEW BOX CULVERT
- TEMPORARY DRAINAGE OUTFALL DIVERSION
- DIVERTED COOLING WATER INTAKE PIPELINES (PERMANENT)
- TEMPORARY COOLING WATER PIPELINES
- RECLAMATION IN THE PERIOD
- CWB TUNNEL CONSTRUCTION IN THE PERIOD
- CWB TUNNEL (COMPLETED)
- MTR TUNNEL CROSSING STRUCTURE CONSTRUCTION IN THE PERIOD

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

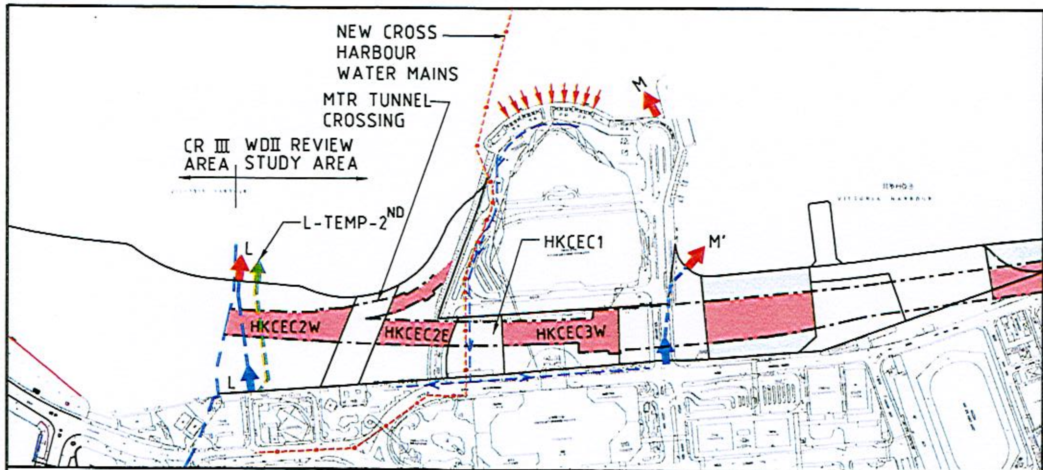
CONSTRUCTION STAGES

FIGURE 2.18

(SHEET 11 OF 12)

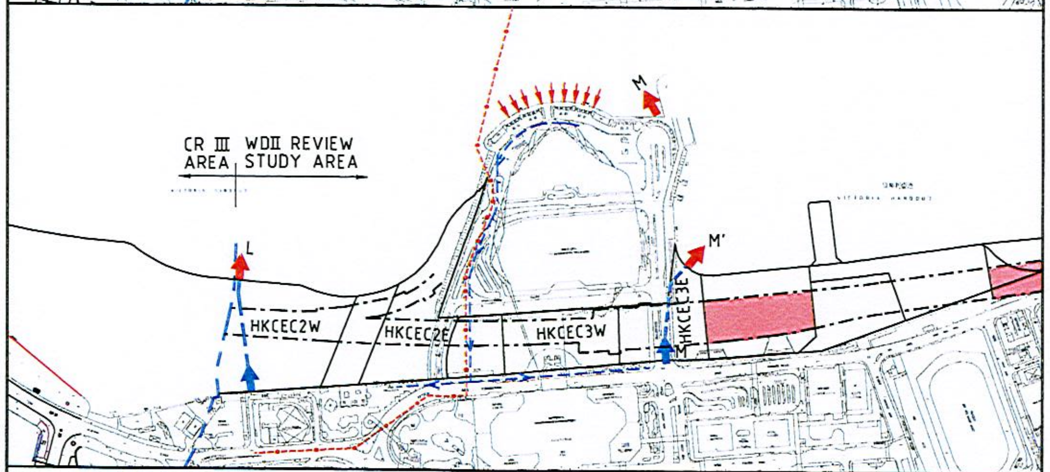
DATE 2007-8-2 19:34:24

P:\PROJECTS\97103\drawing\report\EIA_200705\FIGURE 2.18\FIGURE 2.18.dgn



LATE 2012 TO EARLY 2014

- CWB TUNNEL CONSTRUCTION AT HKCEC3W, HKCEC2E & HKCEC2W
- CONSTRUCTION OF PERMANENT OUTFALL L ABOVE THE COMPLETED CWB TUNNEL



EARLY 2014 TO LATE 2015

- AT-GRADE ROAD

LEGEND:

- EXISTING COOLING WATER INTAKE
- EXISTING STORM WATER OUTFALL
- REPROVISIONED COOLING WATER INTAKE
- REPROVISIONED STORM WATER OUTFALL
- TEMPORARY COOLING WATER INTAKE
- NEW COOLING WATER/SALT WATER CHAMBER
- NEW BOX CULVERT
- TEMPORARY DRAINAGE OUTFALL DIVERSION
- DIVERTED COOLING WATER INTAKE PIPELINES (PERMANENT)
- TEMPORARY COOLING WATER PIPELINES
- RECLAMATION IN THE PERIOD
- CWB TUNNEL CONSTRUCTION IN THE PERIOD
- CWB TUNNEL (COMPLETED)

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

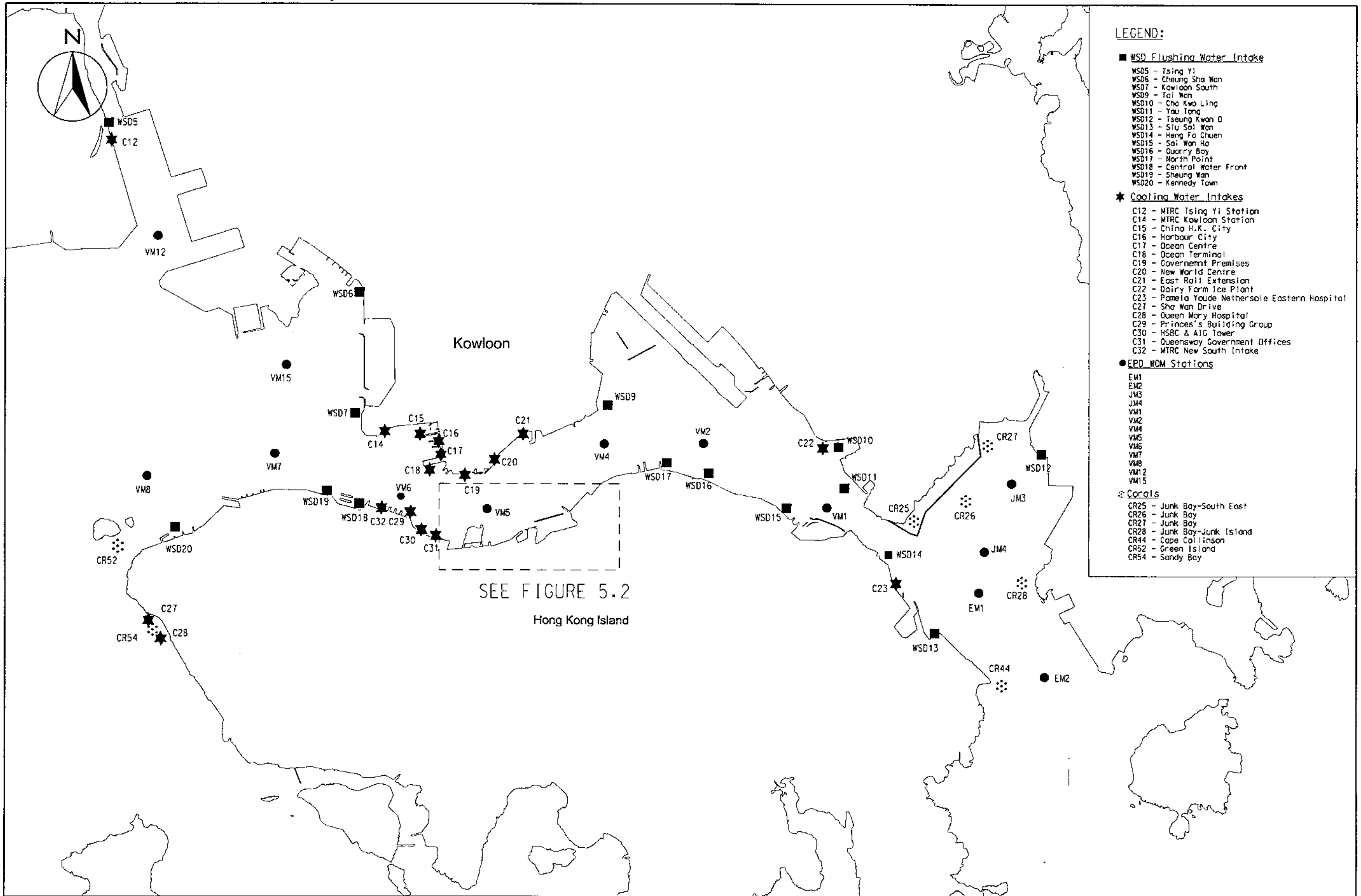
CONSTRUCTION STAGES

FIGURE 2.19

(SHEET 12 OF 12)

DATE: 2007-8-2 19:35:27

P:\PROJECTS\97103\drawing\report\EIA_200705\FIGURE_2.19.dgn



MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

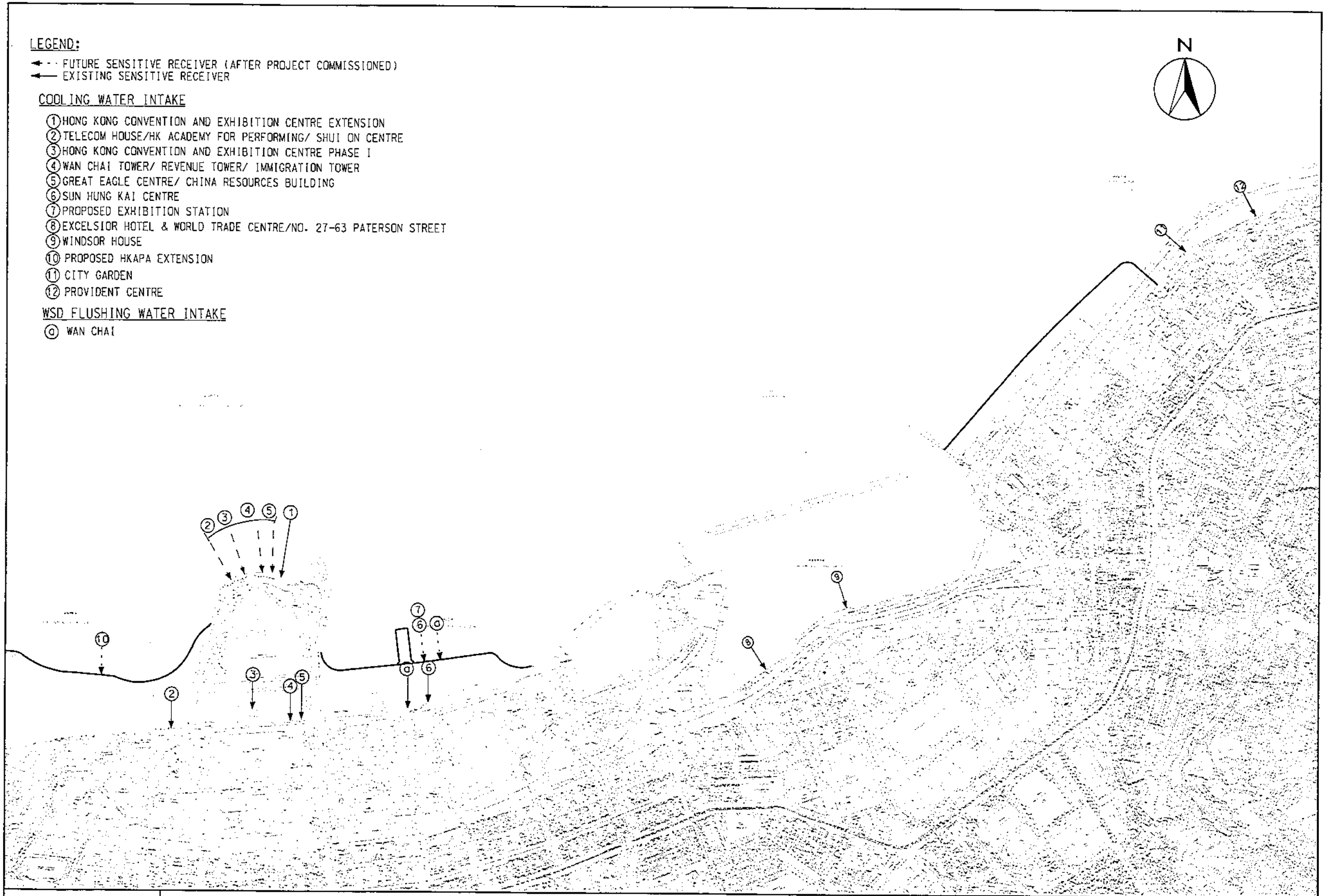
WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

LOCATIONS OF WATER QUALITY SENSITIVE RECEIVERS

(SHEET 1 OF2)

FIGURE 5.1

K:/A01604/DRAWING/REPORT/WQ/FIG5.1_R.DGN   SCALE 1:60000 (A3)



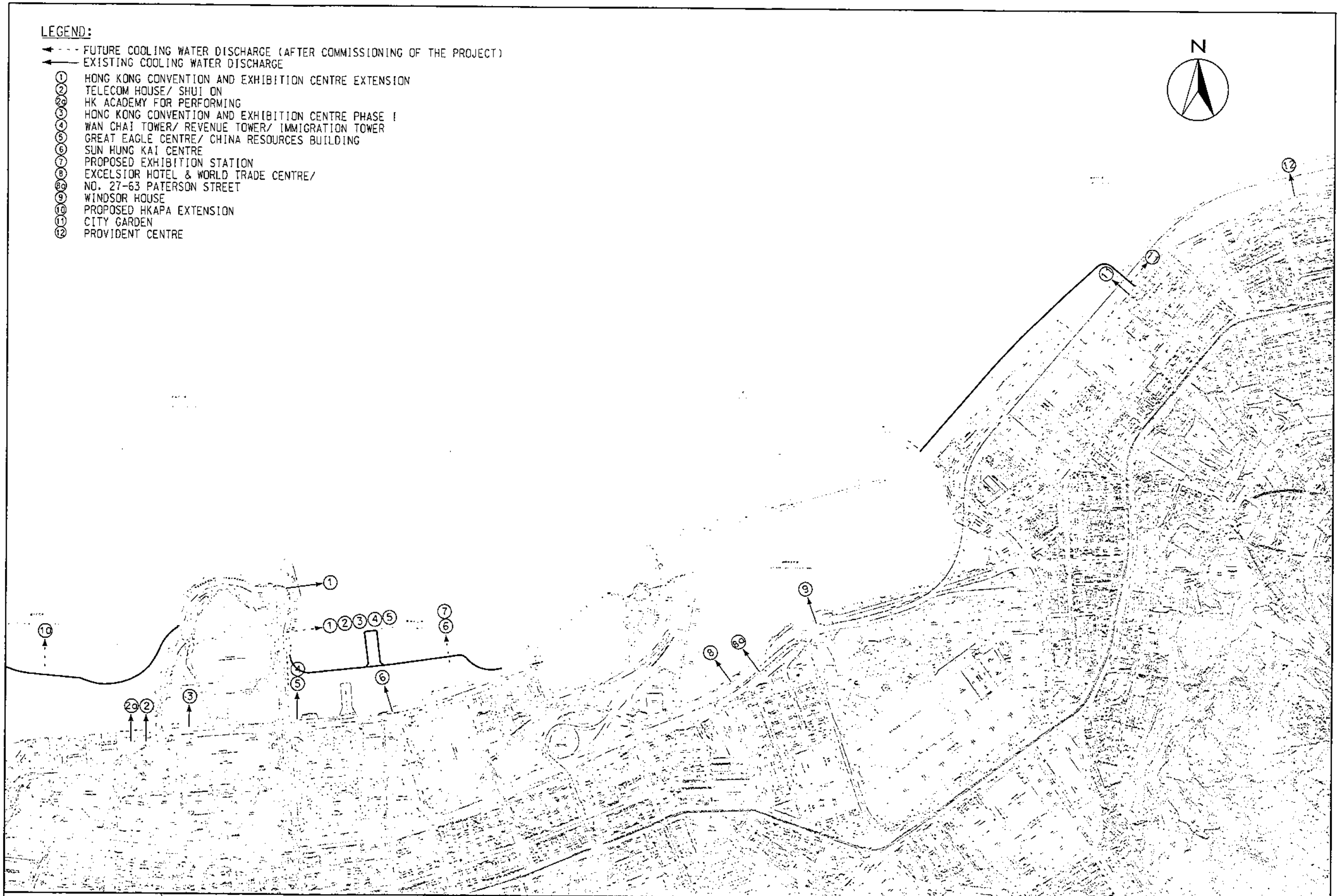
MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

LOCATIONS OF WATER QUALITY SENSITIVE RECEIVERS (SHEET 2 OF2)

FIGURE 5.2

P:/60017193/REPORT/DRAWINGS/DRAFTEIA-0708/WQ/5.2.DGN SCALE 1:8000 (A3)



MAUNSELL | AECOM

Maunsell Consultants Asia Ltd

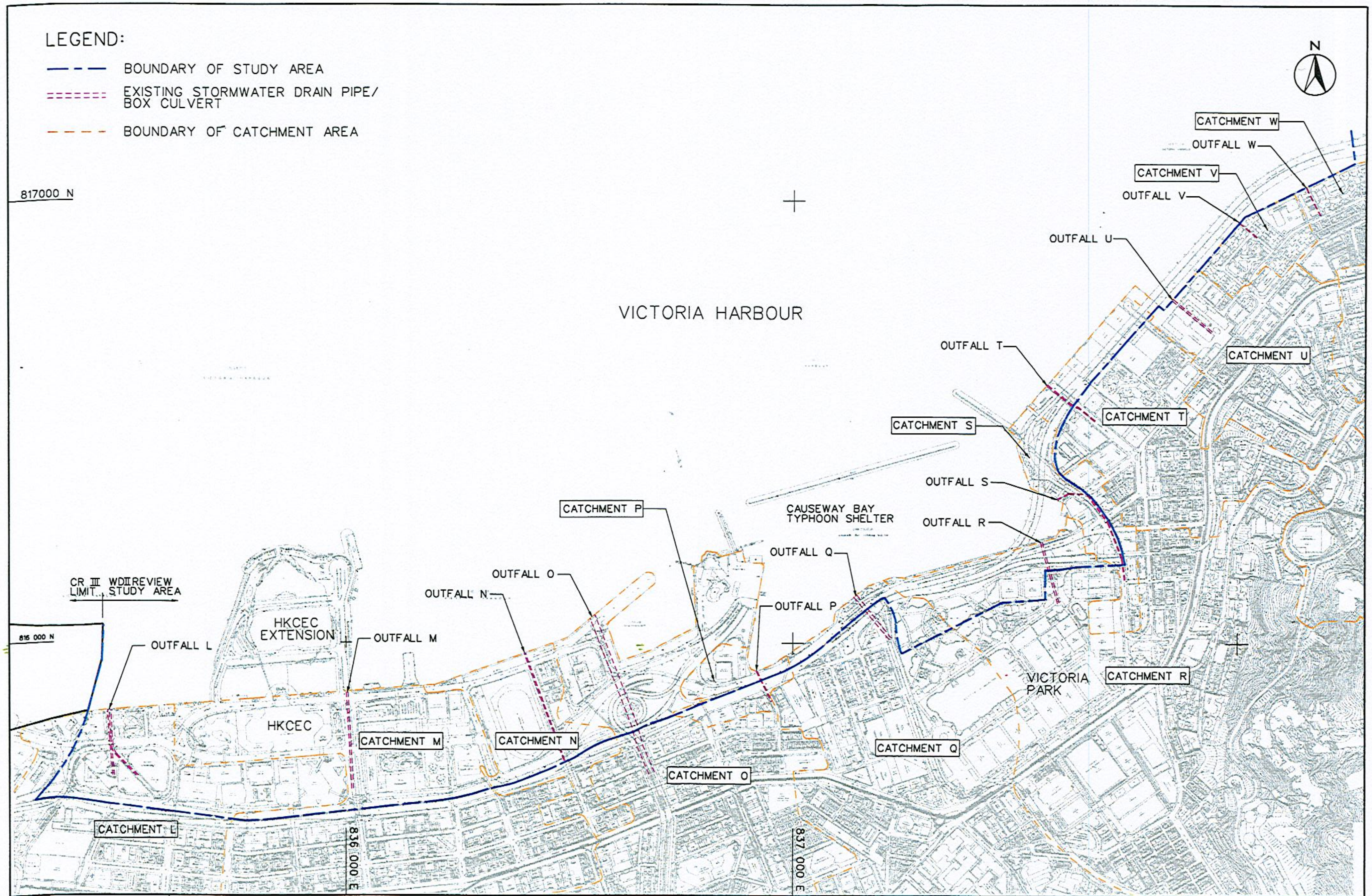
WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

LOCATIONS OF COOLING WATER DISCHARGES

FIGURE 5.3A

P:/60017193/REPORT/DRAWINGS/DRAFTEIA-0709/WQ/5.3a.DGN

SCALE 1:8000 (A3)



MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

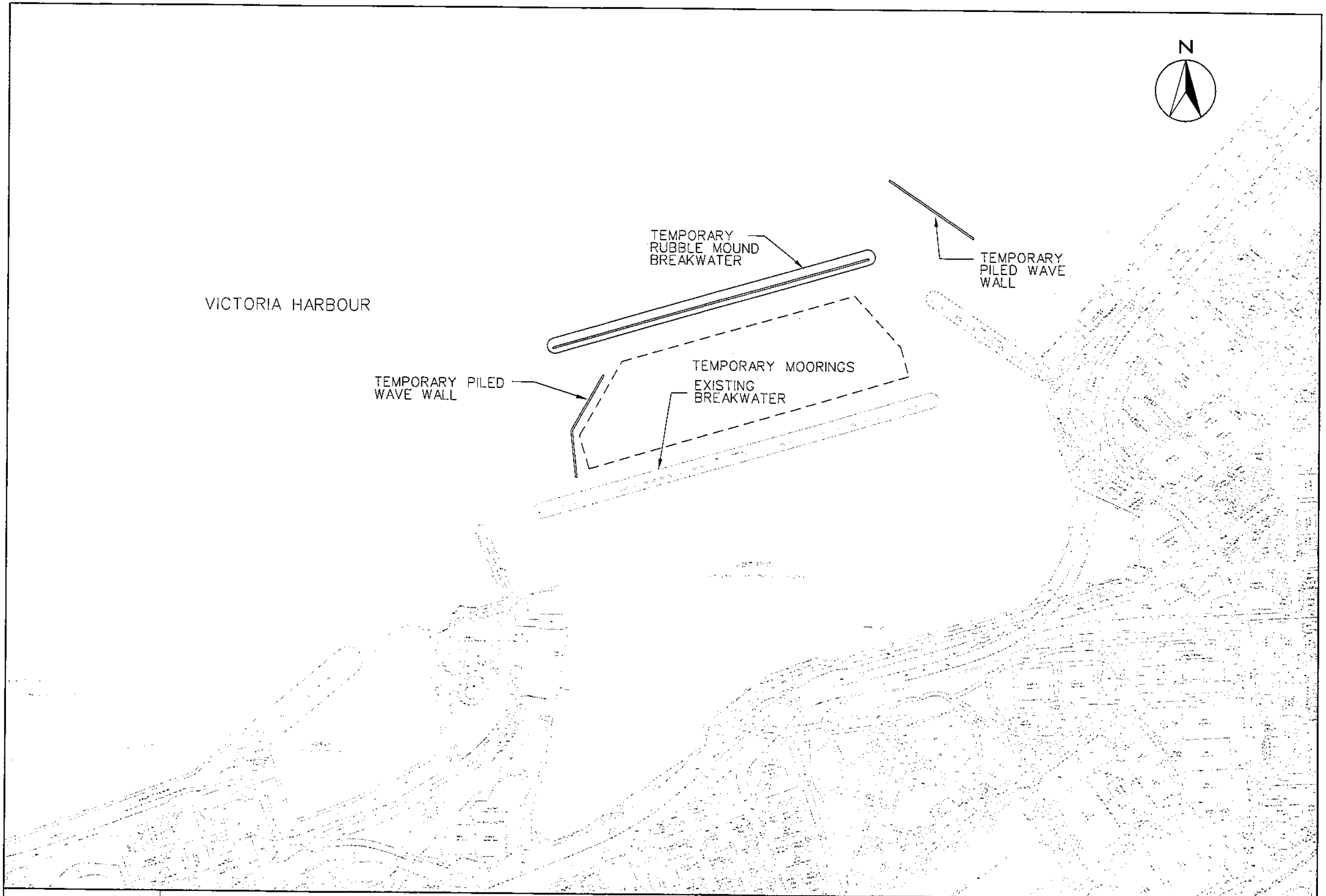
WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

LOCATIONS OF EXISTING STORM OUTFALLS

FIGURE 5.3B

K:/A01604/DRAWING/REPORT/WQ/5.3B.DGN

JUN. 06/SCALE 1:8000

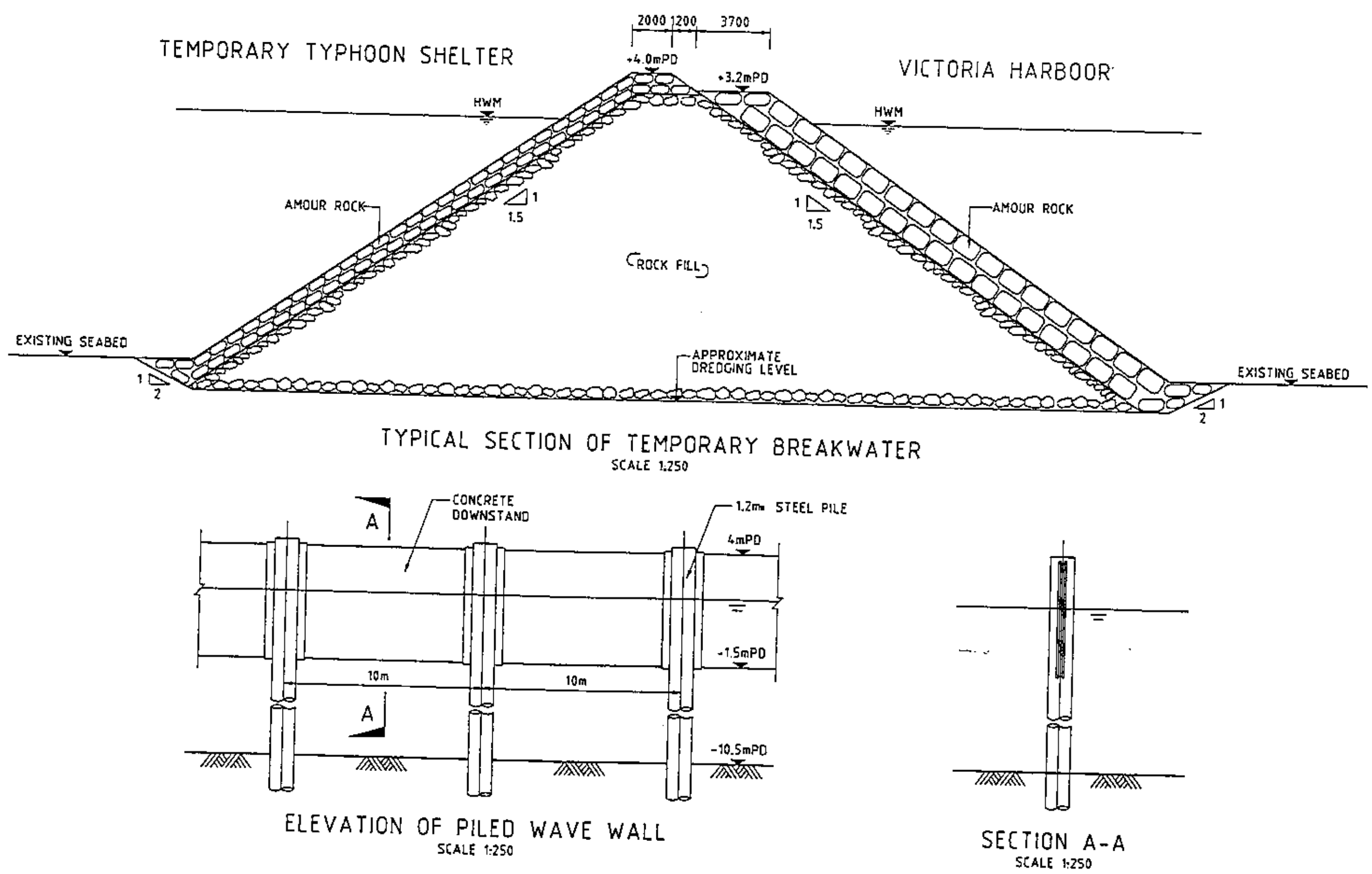


MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

TEMPORARY TYPHOON SHELTER

FIGURE 5.5

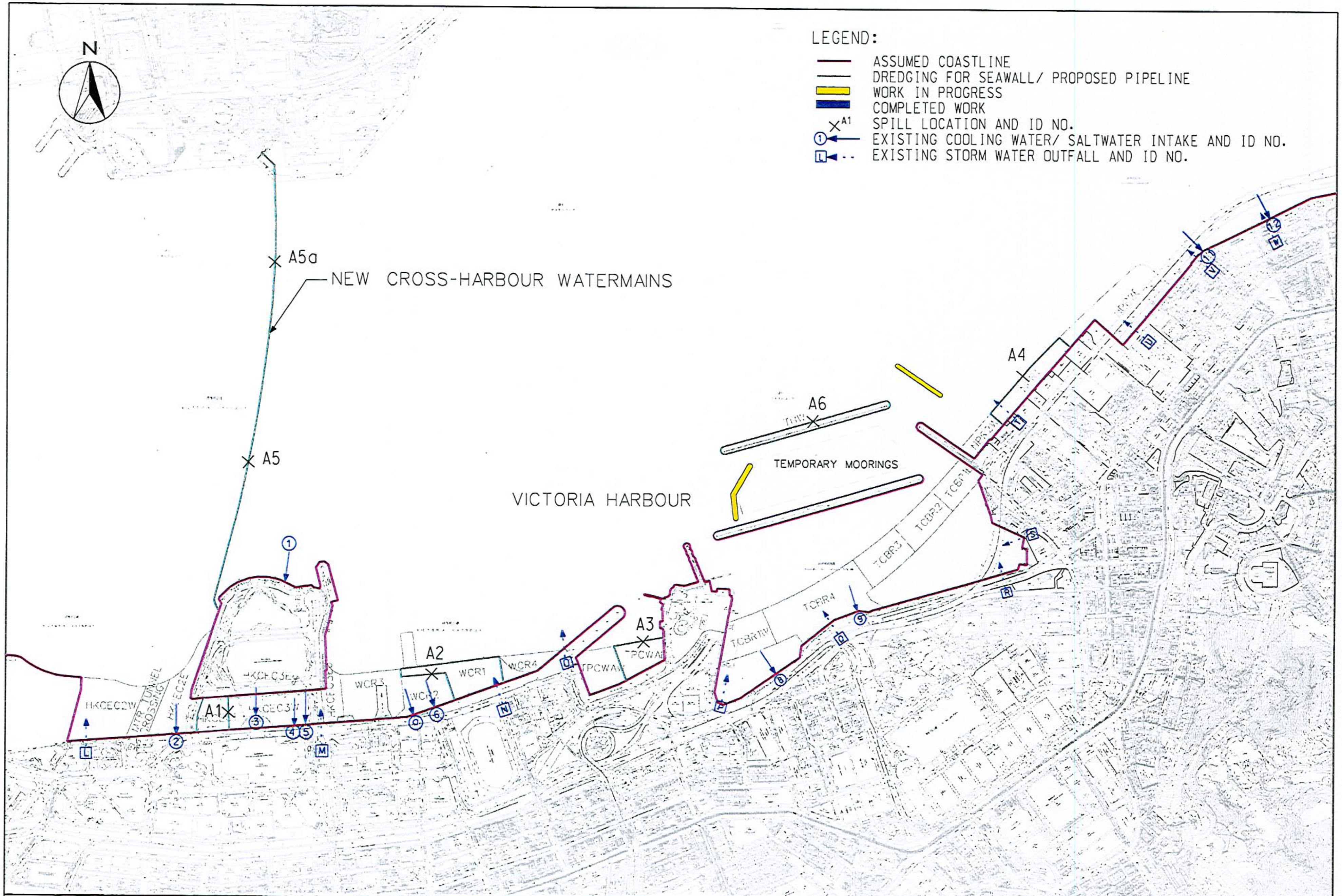


WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

DETAILS OF TEMPORARY BREAKWATER AND PILED WAVE WALL

FIGURE 5.6

MAUNSELL | AECOM



MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

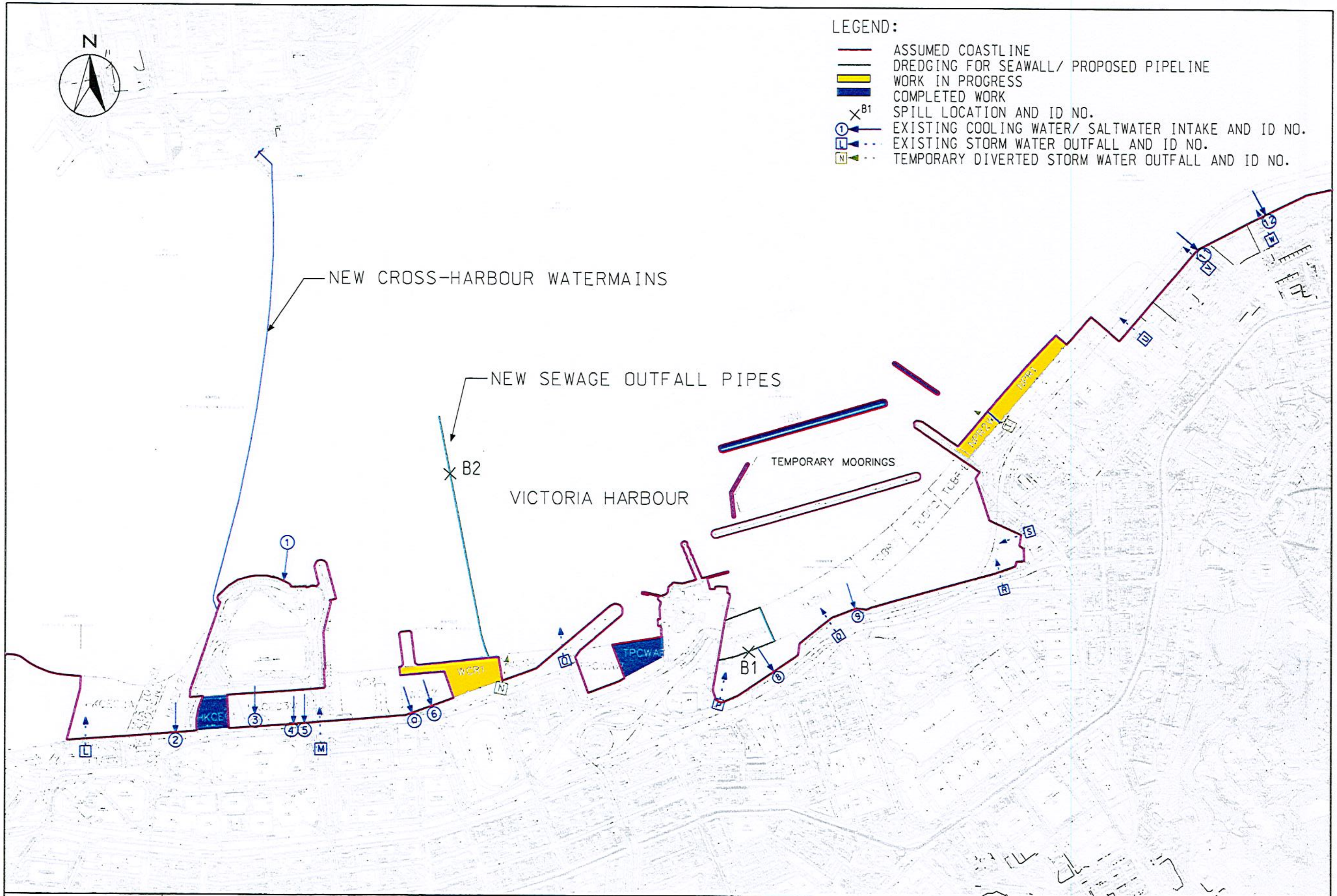
CONSTRUCTION PHASE MODELLING SCENARIO 2A

(SHEET 1 OF 2)

FIGURE 5.7

P:/60017193/REPORT/DRAWINGS/DRAFTEIA-0709/WQ/5.7.DGN

SCALE 1:8000 (A3)



MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

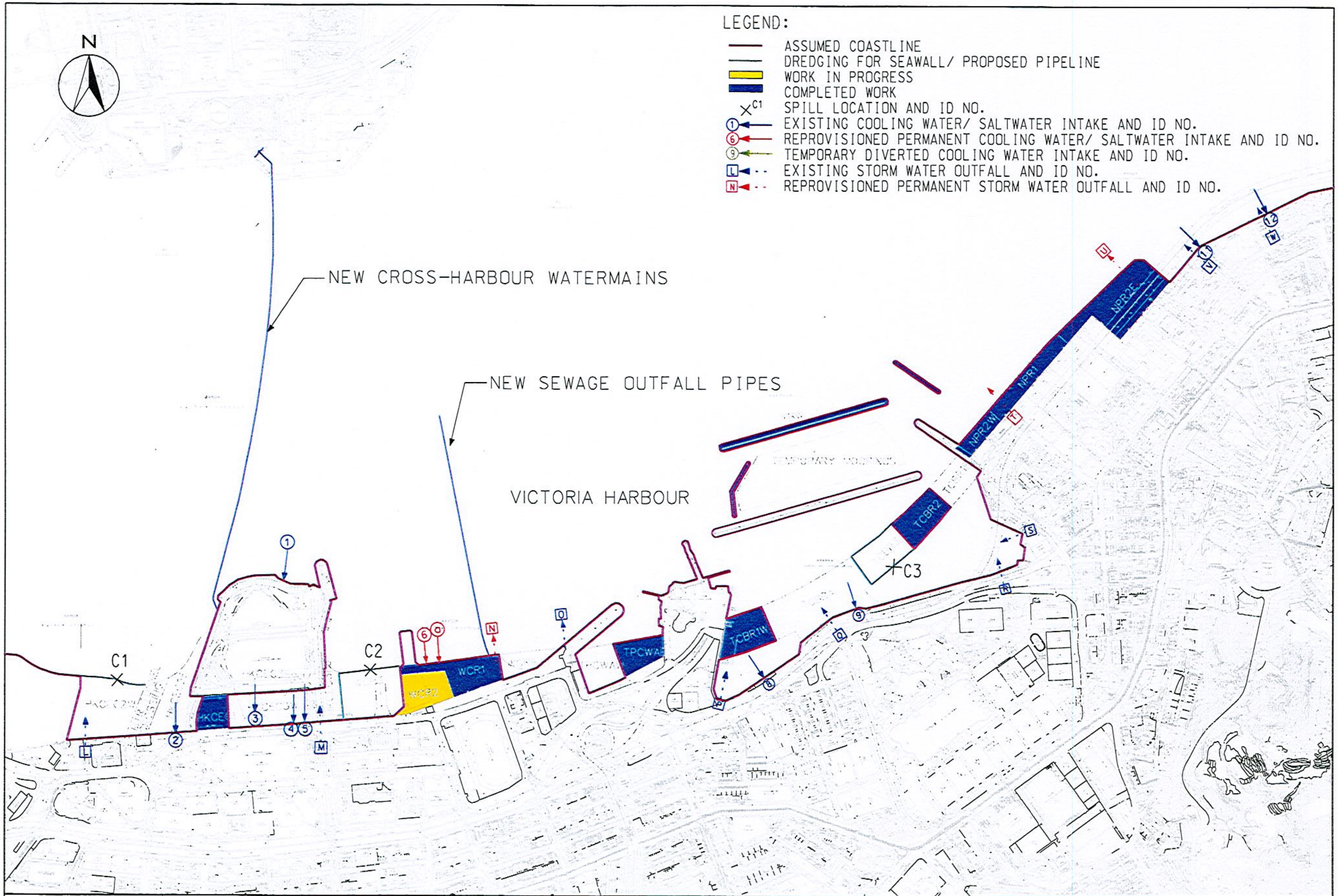
WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

CONSTRUCTION PHASE MODELLING SCENARIO 2B

FIGURE 5.8

P:/60017193/REPORT/DRAWINGS/DRAFTEIA-0709/WQ/5.8.DGN

SCALE 1:8000 (A3)



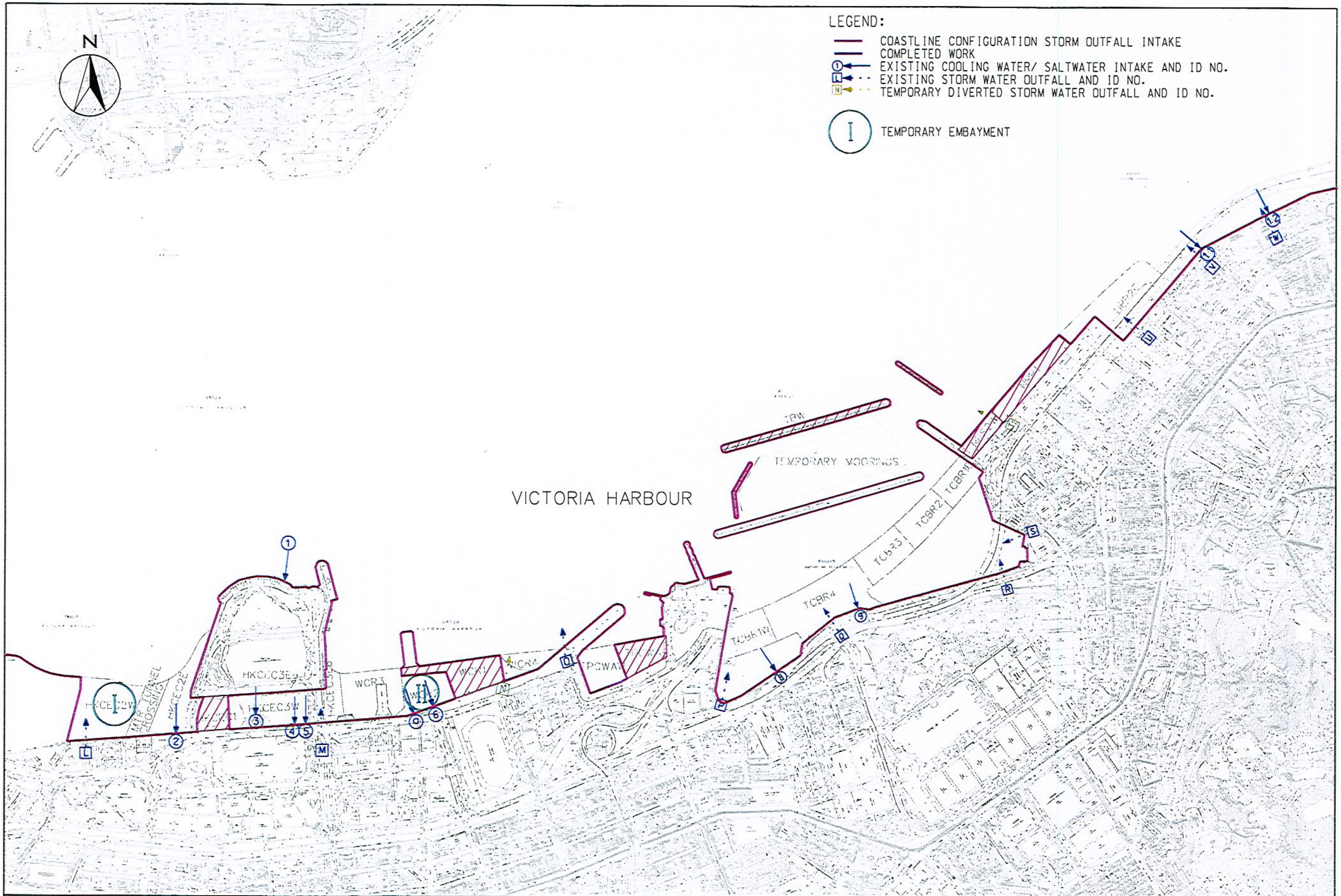
MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

CONSTRUCTION PHASE MODELLING SCENARIO 2C

FIGURE 5.9

P:/60017193/REPORT/DRAWINGS/DRAFTEIA-0709/WQ/5.9.DGN SCALE 1:8000 (A3)



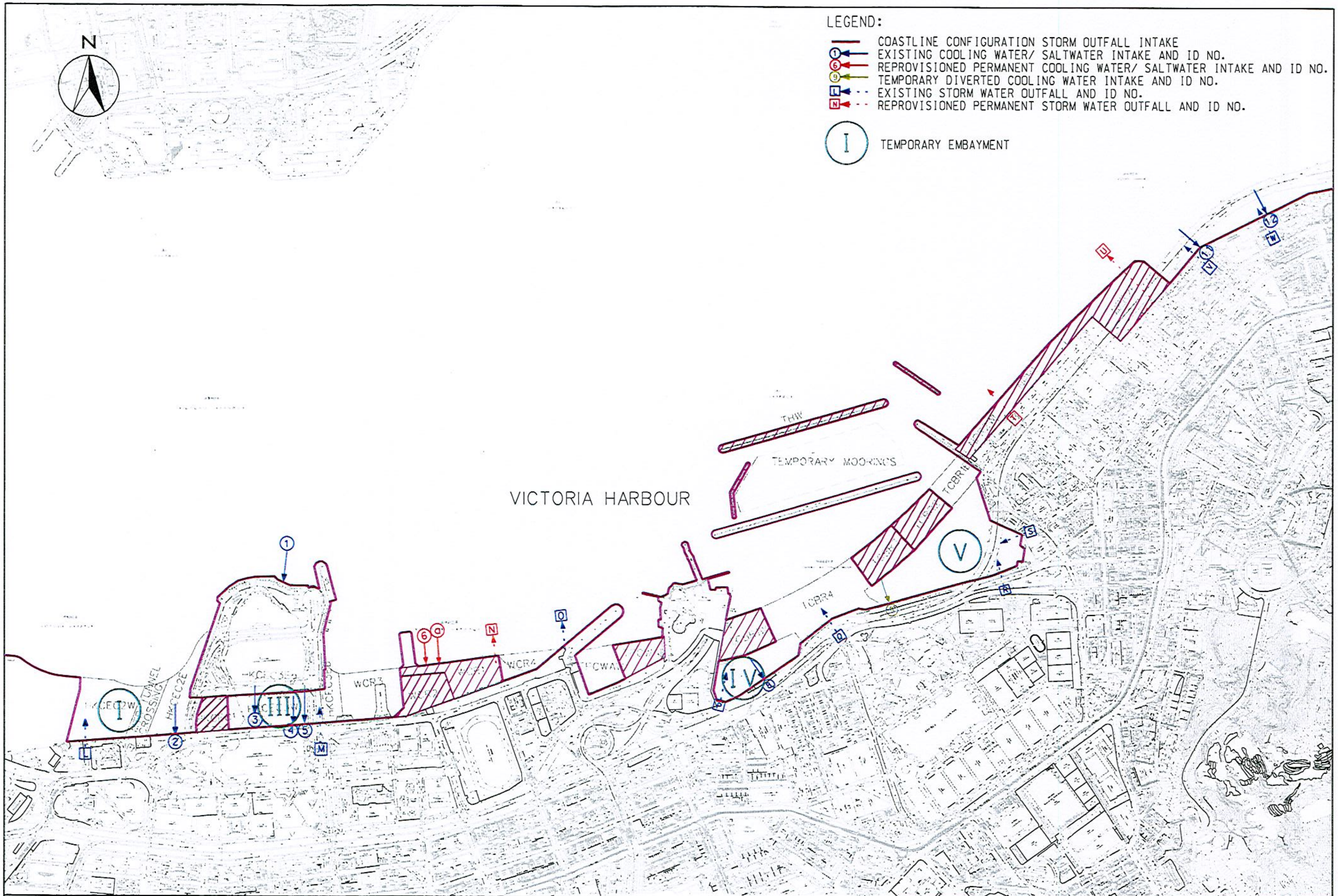
WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

TEMPORARY EMBAYMENT UNDER CONSTRUCTION SCENARIO 3B

FIGURE 5.10

MAUNSELL AECOM

P:/60017193/REPORT/DRAWINGS/DRAFTEIA-0709/WQ/5.10.DGN SCALE 1:8000 (A3)



MAUNSELL AECOM

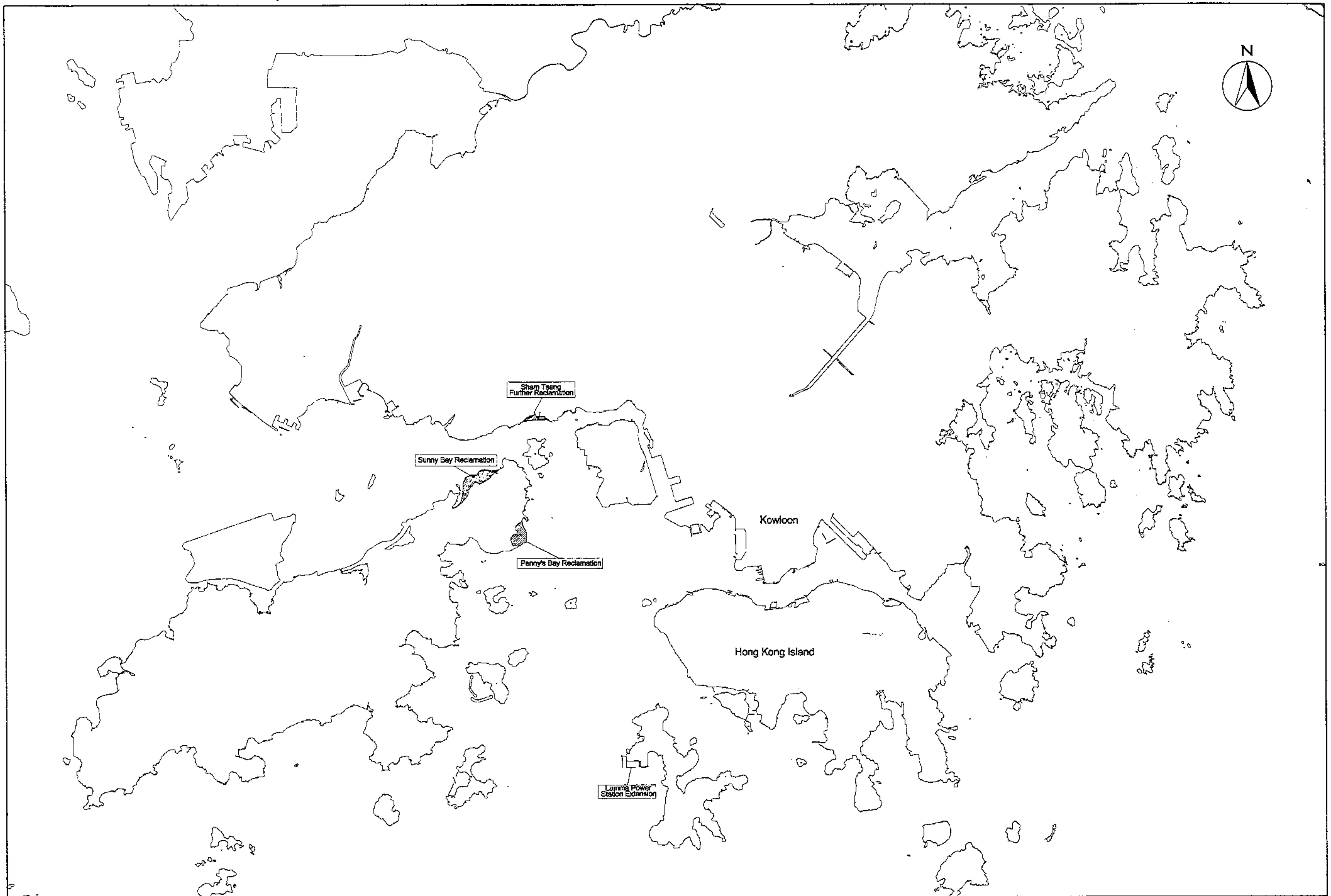
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

TEMPORARY EMBAYMENT UNDER CONSTRUCTION SCENARIO 3C

FIGURE 5.11

P:/60017193/REPORT/DRAWINGS/DRAFTEIA-0709/WQ/5.11.DGN SCALE 1:8000 (A3)



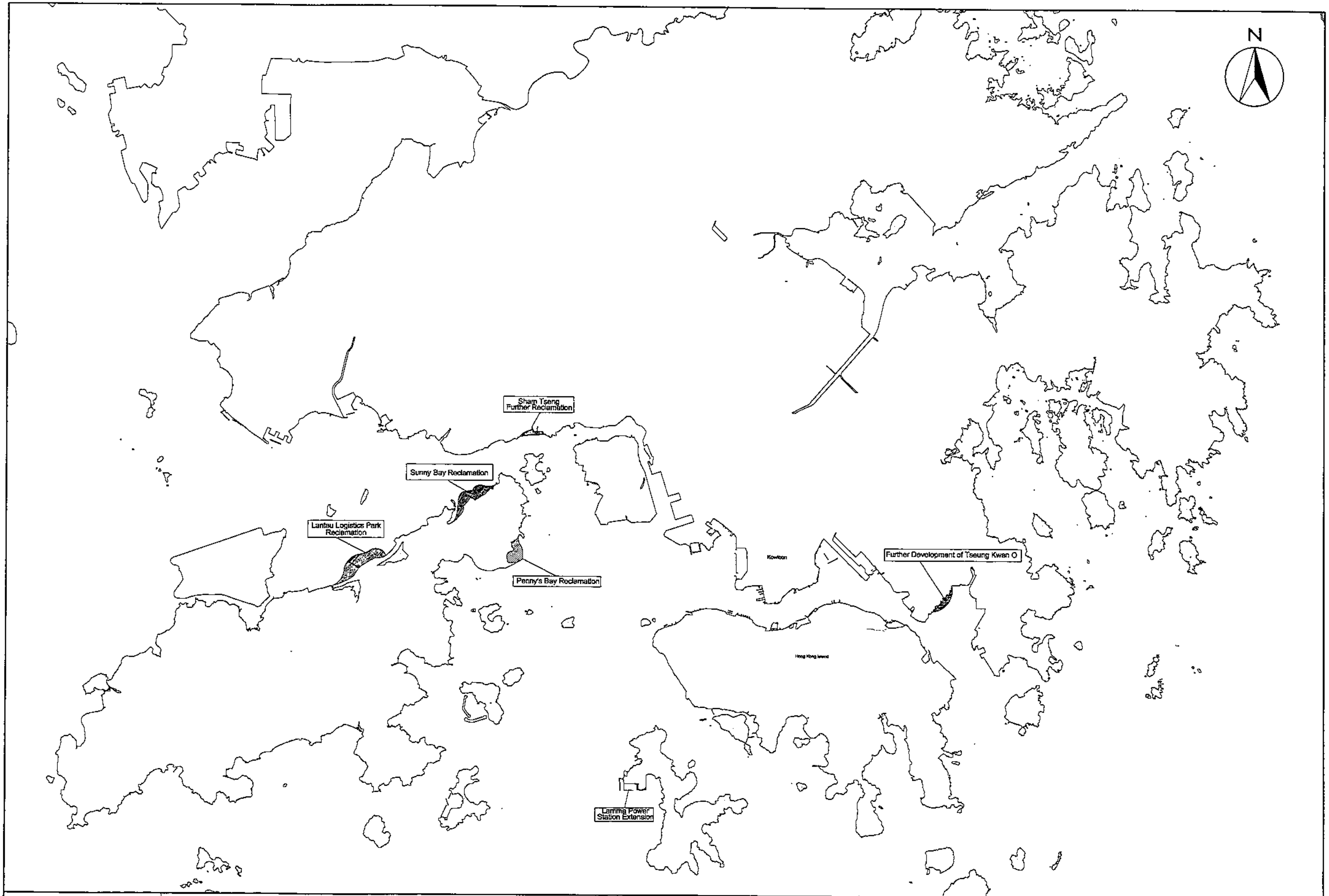
MAUNSELL AECOM

Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

COASTLINE CONFIGURATION FOR 2011

FIGURE 5.12



MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

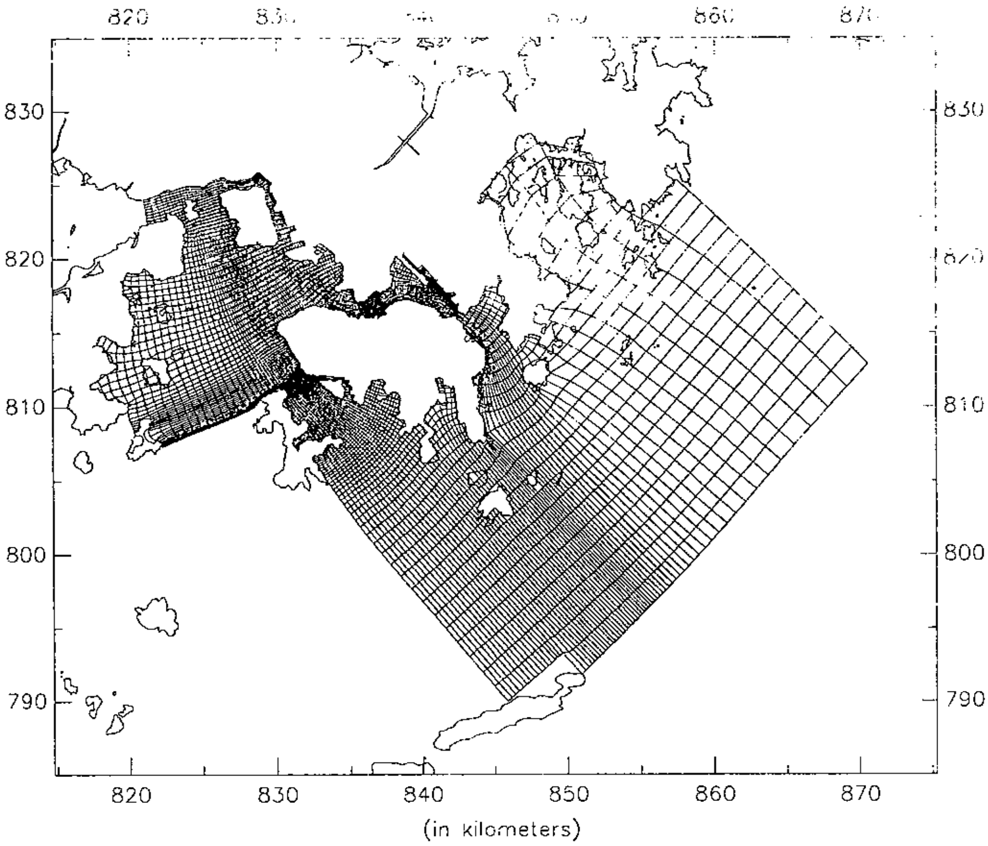
WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

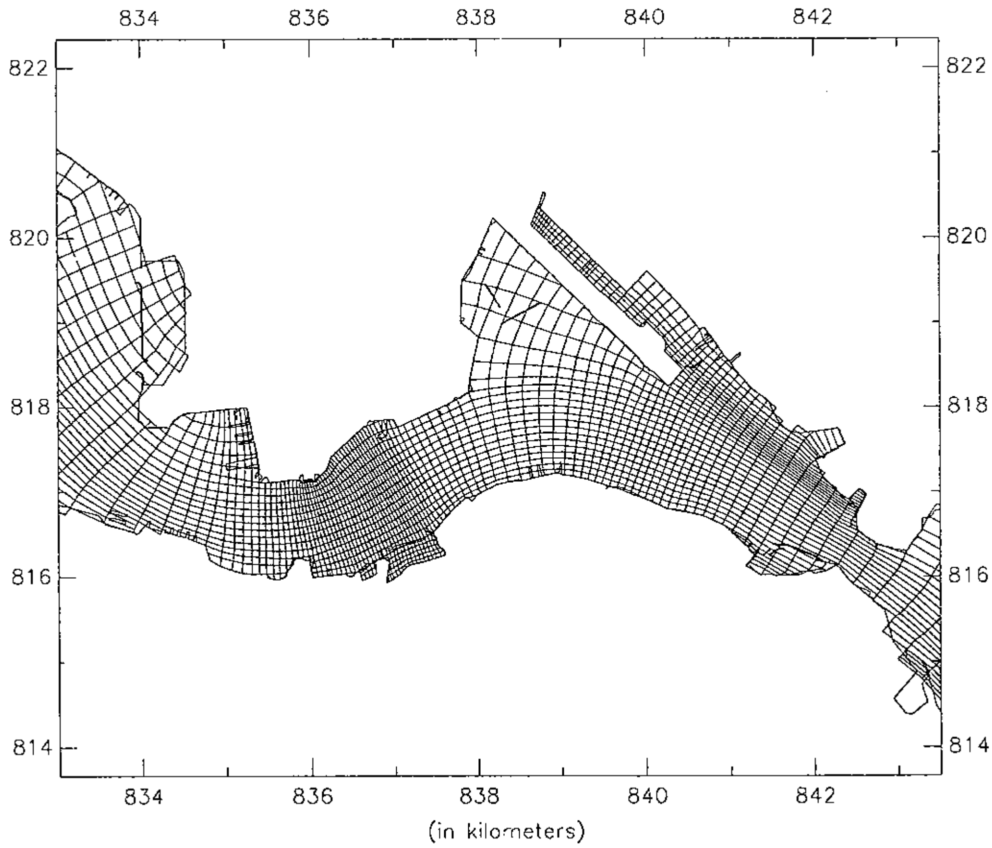
COASTLINE CONFIGURATION FOR 2016

FIGURE 5.13

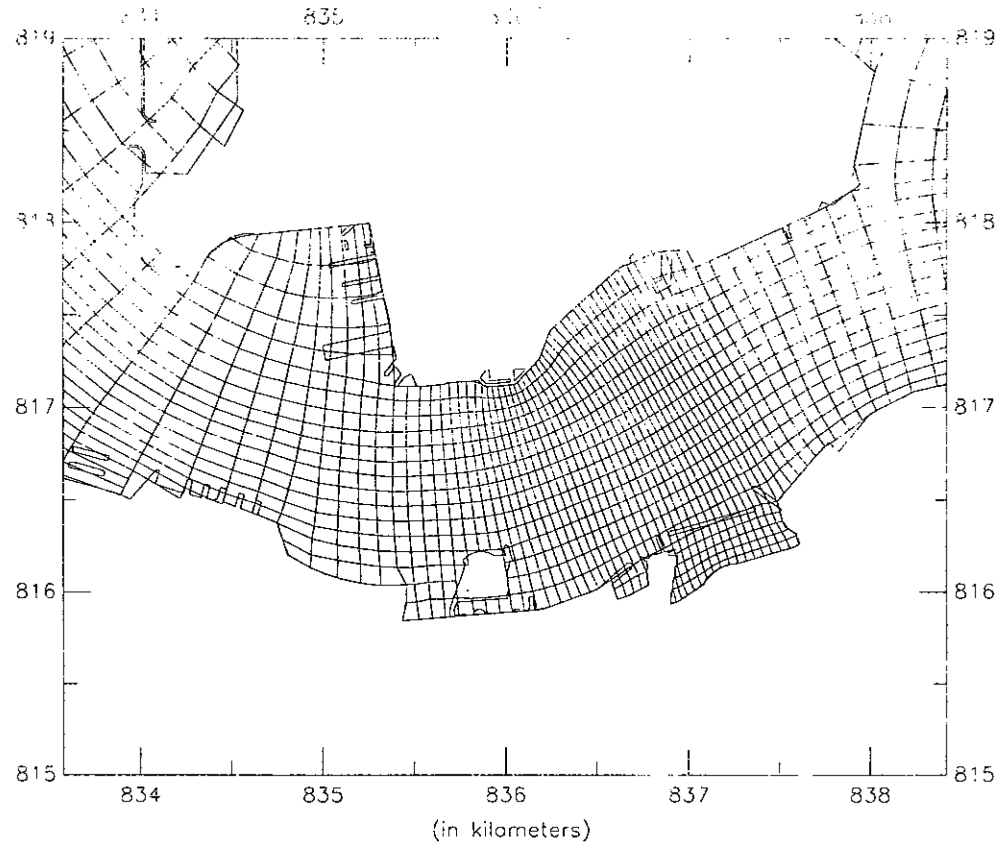
Appendix A.1

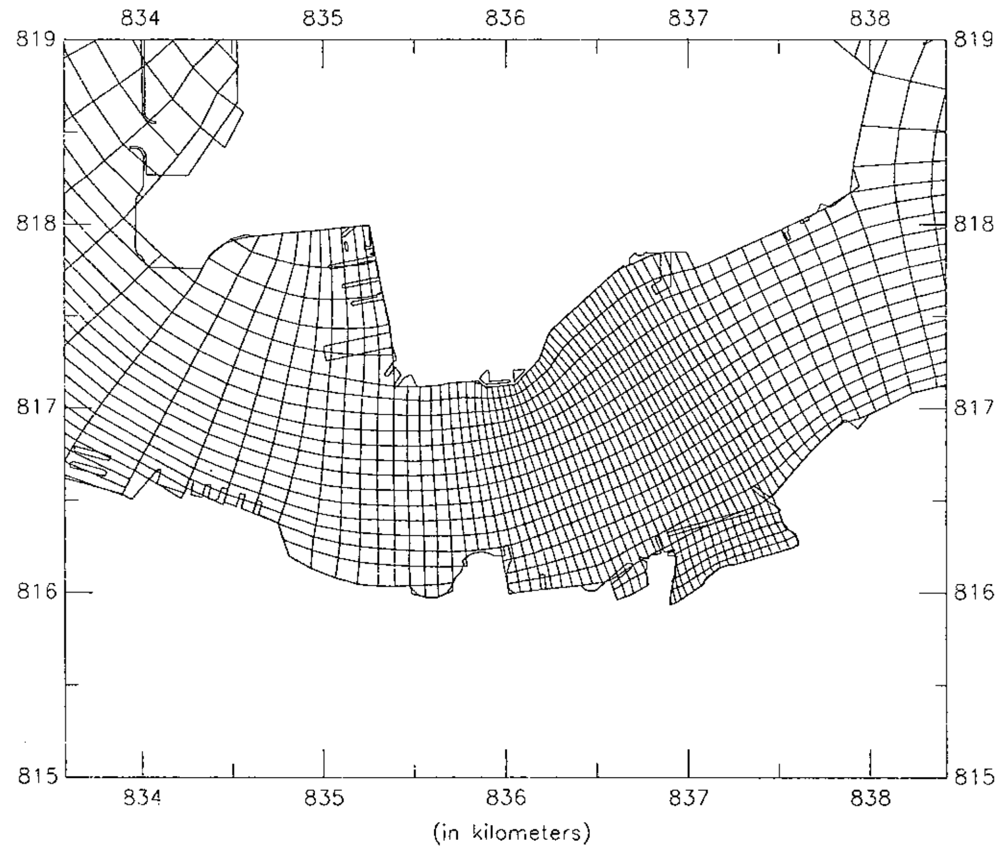
Refined VH Model Grids



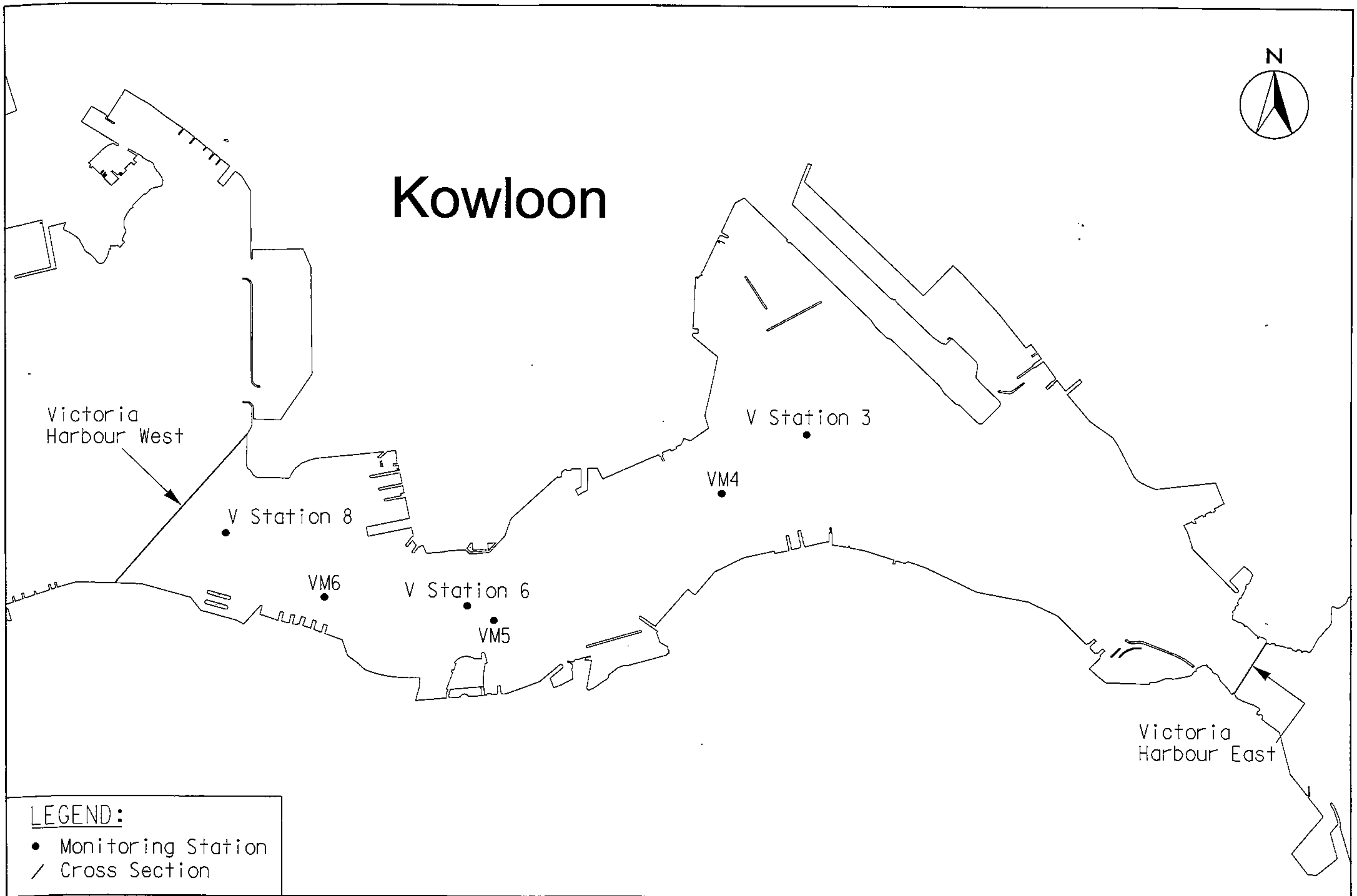


Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review Model Grids for Operation Scenario Upper: Overview; Lower: Close Up at Victoria Harbour	2016 Annual	Jan 2007
	Appendix 5.1-1	
MAUNSELL	A01604/HD/Detailed/plot	Grid-v10.ssn





Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review Model Grids for Operation Scenario (Close Up at Wan Chai) Upper: w/o WDII reclamation; Lower: with WDII reclamation	2016 Annual	Jan 2007
	Appendix 5.1-2	
MAUNSELL	A01604/HD/Detailed/plot	Grid-v10.ssn



MAUNSELL AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

LOCATIONS OF MONITORING STATIONS AND CROSS SECTIONS

FIGURE 5.14a

Appendix A.2

Construction Programme

Act ID	Description	Orig Dur	Early Start	Early Finish
	1. CAUSEWAY BAY RECLAMATION			
		2233d	02JAN09	03MAR16
	1.1 Temporary Relocation CBTS			
		2229d	02JAN09	27FEB16
	Temporary Breakwater			
		149d	02JAN09	24JUN09
1011010	Mobilisation	26d	02JAN09	31JAN09
1011030	Dredging Temporary Breakwater	112d	02FEB09	11JUN09
1011040	RockFilling	58d	06APR09	11JUN09
1011050	Amour placing	11d	12JUN09	24JUN09
1011060	Bored Pile Walls	60d	02FEB09	11APR09
	Relocation Mooring to Temp CBTS			
		52d	25JUN09	24AUG09
1013000	Install temporary moorings	26d	25JUN09	24JUL09
1013010	Moving moorings to Temp CBTS	26d	25JUL09	24AUG09
	Relocation Mooring back to CBTS			
		86d	18NOV15	27FEB16
1014040	Install new moorings in CBTS	26d	18NOV15	17DEC15
1014070	Relocate moorings to CBTS	0		17DEC15
1014080	Removal of temporary breakwater and piles	60d	18DEC15	27FEB16
	1.2 CBTS Temporary Reclamation Stage 1			
		840d	25AUG09	03MAY12
	Dredging, temp seawall & Filling TCBR1			
		206d	25AUG09	23APR10
1021009	Dredging TCBR1E	32d	25AUG09	30SEP09
1021010	Rockfill to TCBR1E temporary seawall	29d	01OCT09	03NOV09
1021020	Temp Seawall construction TCBR1E	54d	04NOV09	07JAN10
1021030	Filling behind seawall TCBR1E	29d	08JAN10	10FEB10
1031000	Dredging TCBR1W	40d	01OCT09	16NOV09
1031010	Rockfill to TCBR1W temp seawall	34d	17NOV09	26DEC09
1031020	Temp seawall construction TCBR1W	62d	28DEC09	10MAR10
1031030	Filling behind temp seawall TCBR1W	38d	11MAR10	23APR10
	CWB Tunnel (TCBR1)			
		696d	11FEB10	03MAY12
1022010	Diaphragm walls (TCBR1E)	95d	11FEB10	01JUN10
1022020	Excavation (TCBR1E) (to filling TCBR2)	116d	28APR10	08SEP10
1022030	Slab construction (TCBR1E)	52d	01SEP10	30OCT10
1022040	Backfill up to -4.0 mPD(TCBR1E)	18d	01NOV10	20NOV10
1022050	Removal Tempporary Seawall (TCBR1E)	30d	22NOV10	27DEC10
1032000	Diaphragm walls (TCBR1W)	148d	24APR10	12OCT10
1032020	Excavation (TCBR1W)	160d	04AUG10	08FEB11
1032030	Slab construction (TCB1W)	84d	24JAN11	30APR11
1032040	Backfill up to -4.0 mPD(TCB1W)	106d	28NOV11	29MAR12
1032050	Removal Temporary Seawall (TCB1W)	30d	30MAR12	03MAY12
	CWB Tunnel (CHT)			
		250d	09FEB11	26NOV11
1033010	Rock Blasting/Excavation (CHT)	180d	09FEB11	06SEP11
1033020	Slab Construction (CHT)	70d	07SEP11	26NOV11
	1.3 CBTS Temporary Reclamation Stage 2			
		791d	17NOV09	30MAY12
	Dredging, Temp Seawall & Filling (TCBR2)			
		173d	17NOV09	08JUN10
1041009	Dredging (TCBR2)	39d	17NOV09	02JAN10
1041010	Rockfill to temporary seawall (TCBR2)	34d	04JAN10	11FEB10
1041020	Seawall construction TCBR2	62d	12FEB10	24APR10
1041030	Filling behind seawall TCBR2 (from TCBR1E)	36d	28APR10	08JUN10

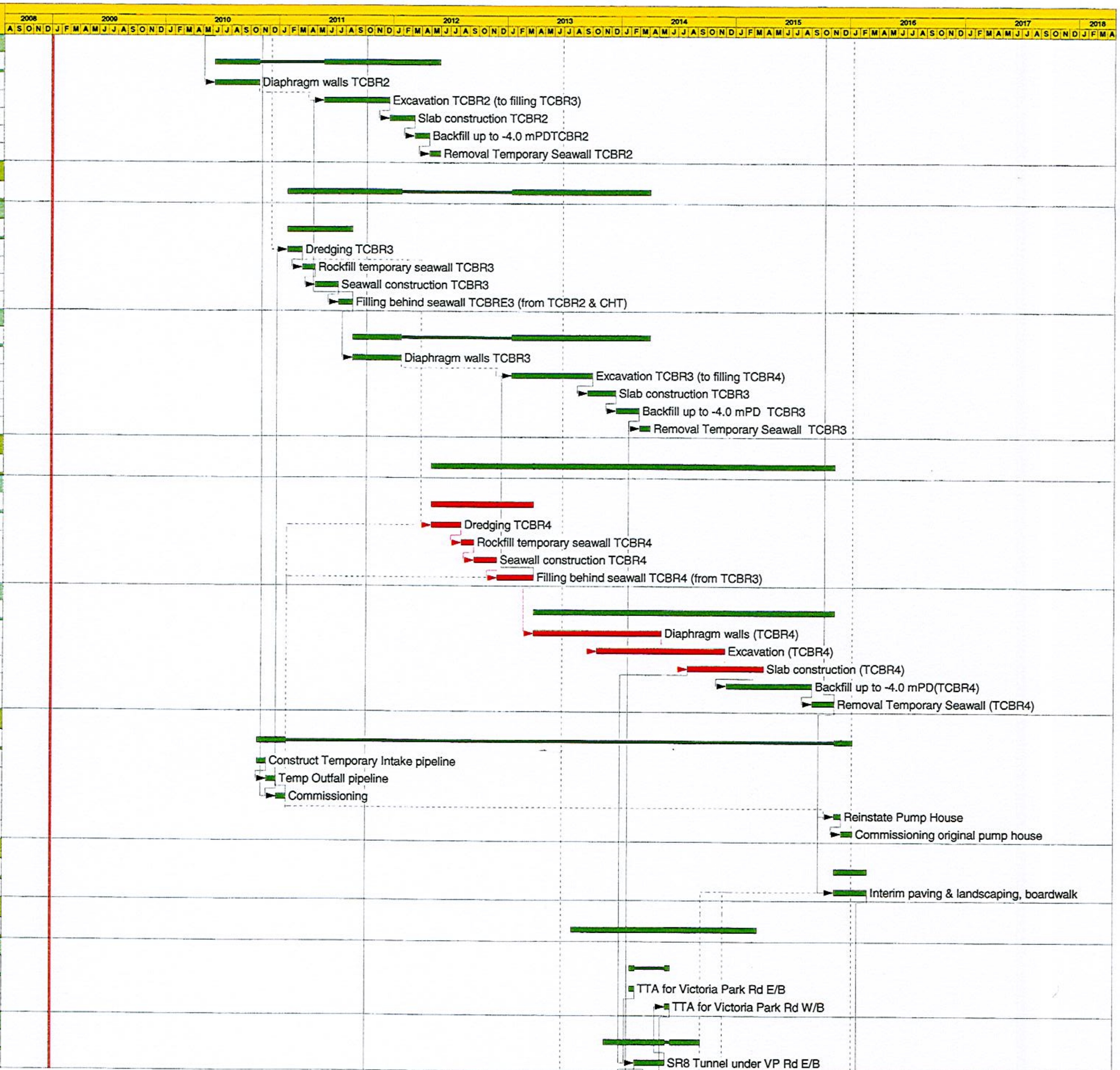
Maunsell

Agreement No. CE 54/2001
Wan Chai Development Phase II - Design & Construction

CONSTRUCTION PROGRAMME

Project name	WDII_Oct08E
Data date	01JAN09
Run date	03SEP07
Page number	1A

Act ID	Description	Orig Dur	Early Start	Early Finish
	CWB Tunnel (TCBR2)			
		618d	09JUN10	30MAY12
1042000	Diaphragm walls TCBR2	124d	09JUN10	29OCT10
1042020	Excavation TCBR2 (to filling TCBR3)	179d	25MAY11	19DEC11
1042030	Slab construction TCBR2	70d	20DEC11	09MAR12
1042040	Backfill up to -4.0 mPDTCBR2	40d	10MAR12	25APR12
1042050	Removal Temporary Seawall TCBR2	30d	26APR12	30MAY12
	1.4 CBTS Temporary Reclamation Stage 3			
		994d	28JAN11	05APR14
	Dredging, Temp Seawall & Filling (TCBR3)			
		179d	28JAN11	24AUG11
1051000	Dredging TCBR3	41d	28JAN11	16MAR11
1051060	Rockfill temporary seawall TCBR3	35d	17MAR11	26APR11
1051070	Seawall construction TCBR3	64d	27APR11	09JUL11
1051080	Filling behind seawall TCBRE3 (from TCBR2 & CHT)	39d	11JUL11	24AUG11
	CWB Tunnel (TCBR3)			
		815d	25AUG11	05APR14
1052000	Diaphragm walls TCBR3	134d	25AUG11	27JAN12
1052020	Excavation TCBR3 (to filling TCBR4)	224d	16JAN13	03OCT13
1052030	Slab construction TCBR3	78d	18SEP13	17DEC13
1052040	Backfill up to -4.0 mPD TCBR3	62d	18DEC13	01MAR14
1052050	Removal Temporary Seawall TCBR3	30d	03MAR14	05APR14
	1.5 CBTS Temporary Reclamation Stage 4			
		1102d	04MAY12	17NOV15
	Dredging, Temp Seawall & Filling (TCBR4)			
		280d	04MAY12	28MAR13
1061000	Dredging TCBR4	82d	04MAY12	07AUG12
1061060	Rockfill temporary seawall TCBR4	35d	08AUG12	17SEP12
1061070	Seawall construction TCBR4	64d	18SEP12	30NOV12
1061080	Filling behind seawall TCBR4 (from TCBR3)	99d	01DEC12	28MAR13
	CWB Tunnel (TCBR4)			
		822d	29MAR13	17NOV15
1062000	Diaphragm walls (TCBR4)	350d	29MAR13	13MAY14
1062020	Excavation (TCBR4)	350d	19OCT13	03DEC14
1062030	Slab construction (TCBR4)	208d	05AUG14	06APR15
1062040	Backfill up to -4.0 mPD(TCBR4)	233d	09DEC14	08SEP15
1062050	Removal Temporary Seawall (TCBR4)	60d	09SEP15	17NOV15
	1.6 Temp Diversion of Cooling Water System			
		1626d	27OCT10	16JAN16
1063010	Construct Temporary Intake pipeline	26d	27OCT10	25NOV10
1063020	Temp Outfall pipeline	26d	26NOV10	27DEC10
1063030	Commissioning	26d	28DEC10	27JAN11
1063040	Reinstate Pump House	20d	18NOV15	10DEC15
1063050	Commissioning original pump house	30d	11DEC15	16JAN16
	1.7 Promenade along CBTS			
		90d	18NOV15	03MAR16
1110000	Interim paving & landscaping, boardwalk	90d	18NOV15	03MAR16
	1.9 Slip Road 8 & Victoria Park Reprovisioning			
		506d	02AUG13	19MAR15
	Victoria Park Road Traffic Diversion			
		111d	06FEB14	14JUN14
1091000	TTA for Victoria Park Rd E/B	14d	06FEB14	21FEB14
1091010	TTA for Victoria Park Rd W/B	14d	30MAY14	14JUN14
	Slip Road 8 Tunnel			
		263d	15NOV13	19SEP14
1092000	SR8 Tunnel under VP Rd E/B	83d	22FEB14	29MAY14



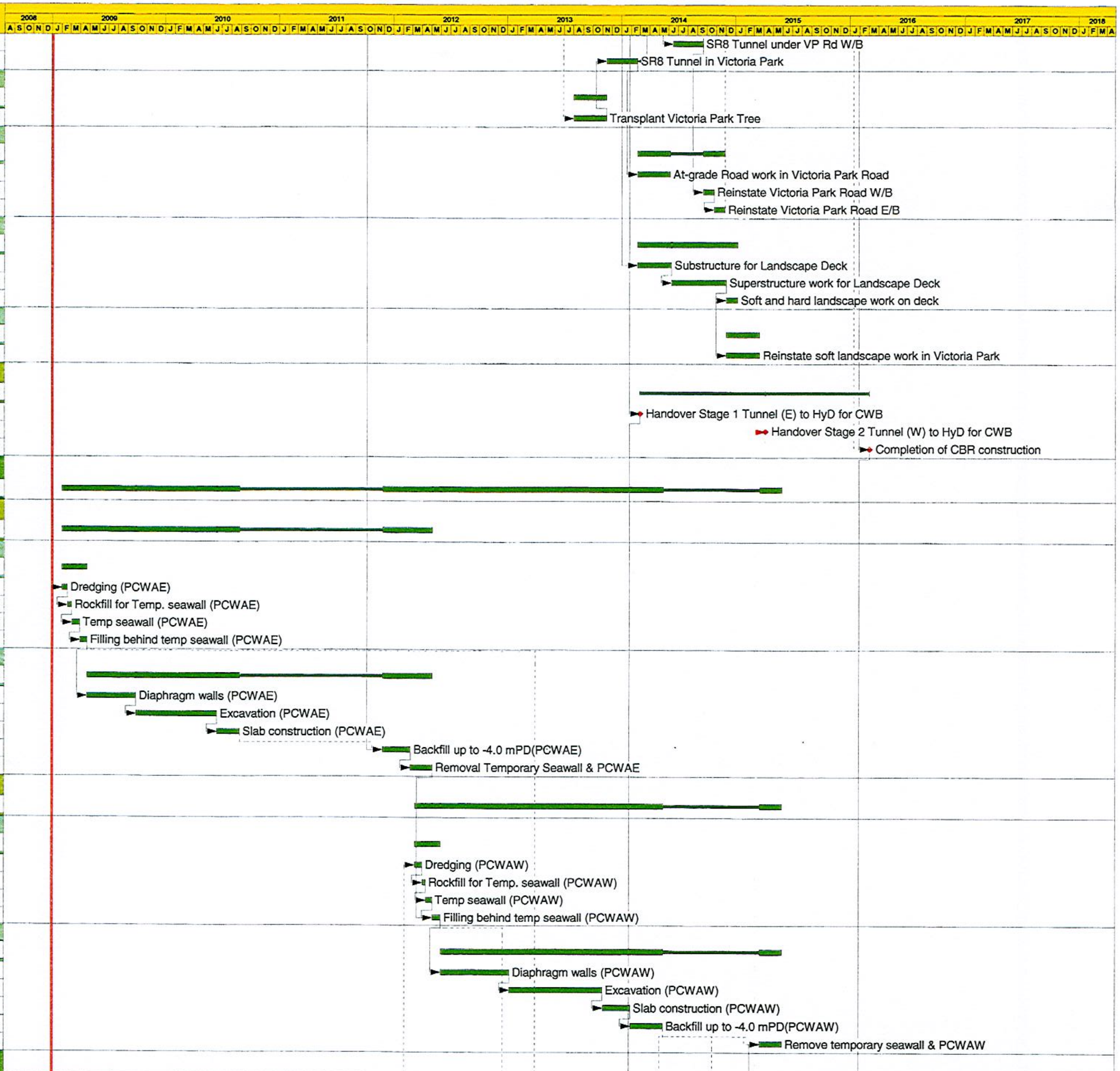
Maunsell

Agreement No. CE 54/2001
Wan Chai Development Phase II - Design & Construction

CONSTRUCTION PROGRAMME

Project name	WDII_Oct08D
Data date	01JAN09
Run date	01AUG07
Page number	2A

Act ID	Description	Orig Dur	Early Start	Early Finish
1092010	SR8 Tunnel under VP Rd W/B	83d	16JUN14	19SEP14
1092020	SR8 Tunnel in Victoria Park	83d	15NOV13	21FEB14
	Transplant Trees in Victoria Park			
		90d	02AUG13	14NOV13
1093000	Transplant Victoria Park Tree	90d	02AUG13	14NOV13
	At-grade road			
		240d	22FEB14	28NOV14
1094000	At-grade Road work in Victoria Park Road	90d	22FEB14	06JUN14
1094010	Reinstate Victoria Park Road W/B	30d	20SEP14	24OCT14
1094020	Reinstate Victoria Park Road E/B	30d	25OCT14	28NOV14
	Landscape Deck			
		273d	22FEB14	08JAN15
1095000	Substructure for Landscape Deck	93d	22FEB14	10JUN14
1095010	Superstructure work for Landscape Deck	150d	11JUN14	02DEC14
1095020	Soft and hard landscape work on deck	30d	03DEC14	08JAN15
	Reinstate Landscape work in VP			
		90d	03DEC14	19MAR15
1096000	Reinstate soft landscape work in Victoria Park	90d	03DEC14	19MAR15
1.10	**Handover / Completion Dates**			
		624d	01MAR14	03MAR16
1100000	Handover Stage 1 Tunnel (E) to HyD for CWB	0		01MAR14
1100010	Handover Stage 2 Tunnel (W) to HyD for CWB	0		06APR15
1100030	Completion of CBR construction	0		03MAR16
2.	**Ex-PCWA Temporary Reclamation**			
		1970d	02FEB09	29MAY15
2.1	**Temporary Reclamation PCWA Stage 1**			
		1016d	02FEB09	04MAY12
	Dredging, Filling and Seawall (PCWAE)			
		70d	02FEB09	23APR09
211000	Dredging (PCWAE)	16d	02FEB09	19FEB09
211010	Rockfill for Temp. seawall (PCWAE)	12d	20FEB09	05MAR09
211020	Temp seawall (PCWAE)	22d	06MAR09	31MAR09
211030	Filling behind temp seawall (PCWAE)	20d	01APR09	23APR09
	CWB Tunnel (PCWAE)			
		946d	24APR09	04MAY12
212000	Diaphragm walls (PCWAE)	135d	24APR09	28SEP09
212010	Excavation (PCWAE)	221d	29SEP09	15JUN10
212020	Slab construction (PCWAE)	64d	16JUN10	27AUG10
212030	Backfill up to -4.0 mPD(PCWAE)	77d	28NOV11	24FEB12
212040	Removal Temporary Seawall & PCWAE	60d	25FEB12	04MAY12
2.2.	**Temporary Reclamation PCWA Stage 2**			
		1002d	10MAR12	29MAY15
	Dredging, filling and Seawall (PCWAW)			
		71d	10MAR12	31MAY12
221000	Dredging (PCWAW)	20d	10MAR12	02APR12
221010	Rockfill for Temp. seawall (PCWAW)	10d	03APR12	13APR12
221020	Temp seawall (PCWAW)	18d	14APR12	04MAY12
221030	Filling behind temp seawall (PCWAW)	23d	05MAY12	31MAY12
	CWB Tunnel (PCWAW)			
		931d	01JUN12	29MAY15
222000	Diaphragm walls (PCWAW)	187d	01JUN12	07JAN13
222010	Excavation (PCWAW)	257d	08JAN13	02NOV13
222020	Slab construction (PCWAW)	75d	04NOV13	31JAN14
222030	Backfill up to -4.0 mPD(PCWAW)	89d	01FEB14	15MAY14
222040	Remove temporary seawall & PCWAW	60d	21MAR15	29MAY15
3	**WAN CHAI RECLAMATION**			



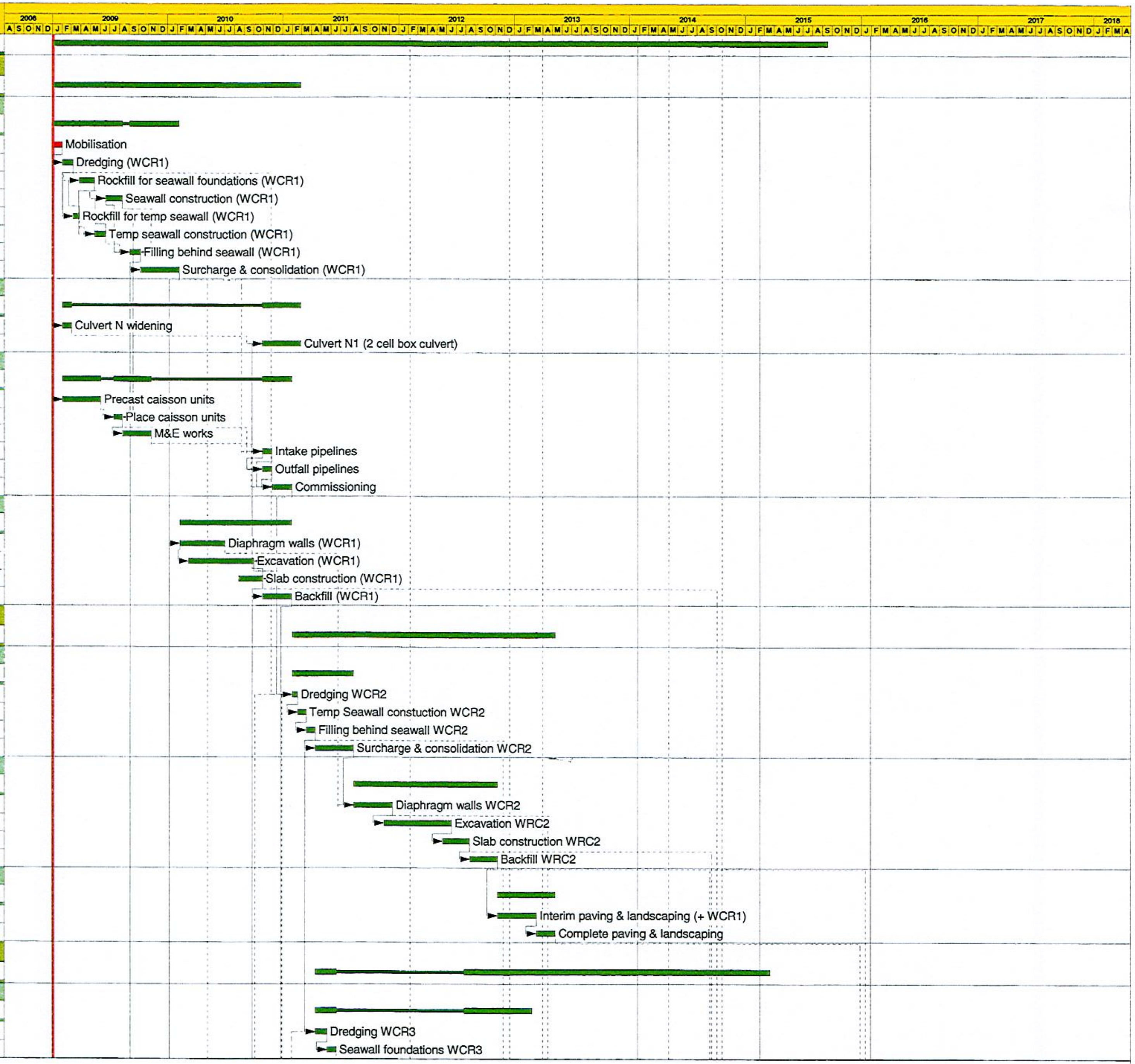
Maunsell

Agreement No. CE 54/2001
Wan Chai Development Phase II - Design & Construction

CONSTRUCTION PROGRAMME

Project name	WDII_Oct08D
Data date	01JAN09
Run date	01AUG07
Page number	3A

Act ID	Description	Orig Dur	Early Start	Early Finish
		2091d	02JAN09	17SEP15
3.1	**Wan Chai Reclamation Stage 1**			
		671d	02JAN09	26FEB11
	Dredging, Seawalls & Filling			
		342d	02JAN09	06FEB10
311000	Mobilisation	26d	02JAN09	31JAN09
311020	Dredging (WCR1)	29d	02FEB09	06MAR09
311030	Rockfill for seawall foundations (WCR1)	41d	27MAR09	13MAY09
311040	Seawall construction (WCR1)	46d	18JUN09	10AUG09
311045	Rockfill for temp seawall (WCR1)	17d	07MAR09	26MAR09
311046	Temp seawall construction (WCR1)	30d	14MAY09	17JUN09
311050	Filling behind seawall (WCR1)	29d	03SEP09	06OCT09
311060	Surcharge & consolidation (WCR1)	104d	07OCT09	06FEB10
	Drainage Culverts			
		645d	02FEB09	26FEB11
312000	Culvert N widening	25d	02FEB09	02MAR09
312020	Culvert N1 (2 cell box culvert)	102d	29OCT10	26FEB11
	Cooling Water Systems			
		621d	02FEB09	29JAN11
313000	Precast caisson units	104d	02FEB09	02JUN09
313010	Place caisson units	24d	14JUL09	10AUG09
313015	M&E works	78d	11AUG09	09NOV09
313020	Intake pipelines	26d	29OCT10	27NOV10
313030	Outfall pipelines	26d	29OCT10	27NOV10
313040	Commissioning	52d	29NOV10	29JAN11
	CWB Tunnel (WCR1)			
		304d	08FEB10	28JAN11
314000	Diaphragm walls (WCR1)	124d	08FEB10	01JUL10
314010	Excavation (WCR1)	179d	08MAR10	30SEP10
314020	Slab construction (WCR1)	65d	14AUG10	28OCT10
314030	Backfill (WCR1)	77d	29OCT10	28JAN11
3.2	**Wan Chai Reclamation Stage 2**			
		711d	31JAN11	10MAY13
	Dredging, Seawalls & Filling			
		166d	31JAN11	11AUG11
321000	Dredging WCR2	15d	31JAN11	16FEB11
321010	Temp Seawall constuction WCR2	23d	17FEB11	15MAR11
321030	Filling behind seawall WCR2	24d	16MAR11	12APR11
321040	Surcharge & consolidation WCR2	104d	13APR11	11AUG11
	CWB Tunnel			
		389d	12AUG11	07NOV12
323000	Diaphragm walls WCR2	105d	12AUG11	12DEC11
323010	Excavation WRC2	184d	15NOV11	15JUN12
323020	Slab construction WRC2	73d	19MAY12	11AUG12
323030	Backfill WRC2	75d	13AUG12	07NOV12
	Promenade			
		156d	08NOV12	10MAY13
324000	Interim paving & landscaping (+ WCR1)	104d	08NOV12	11MAR13
324010	Complete paving & landscaping	52d	12MAR13	10MAY13
3.3	**Wan Chai Reclamation Stage 3**			
		1226d	13APR11	19MAR15
	Dredging, Seawalls & Filling			
		585d	13APR11	25FEB13
331000	Dredging WCR3	32d	13APR11	19MAY11
331010	Seawall foundations WCR3	25d	20MAY11	17JUN11



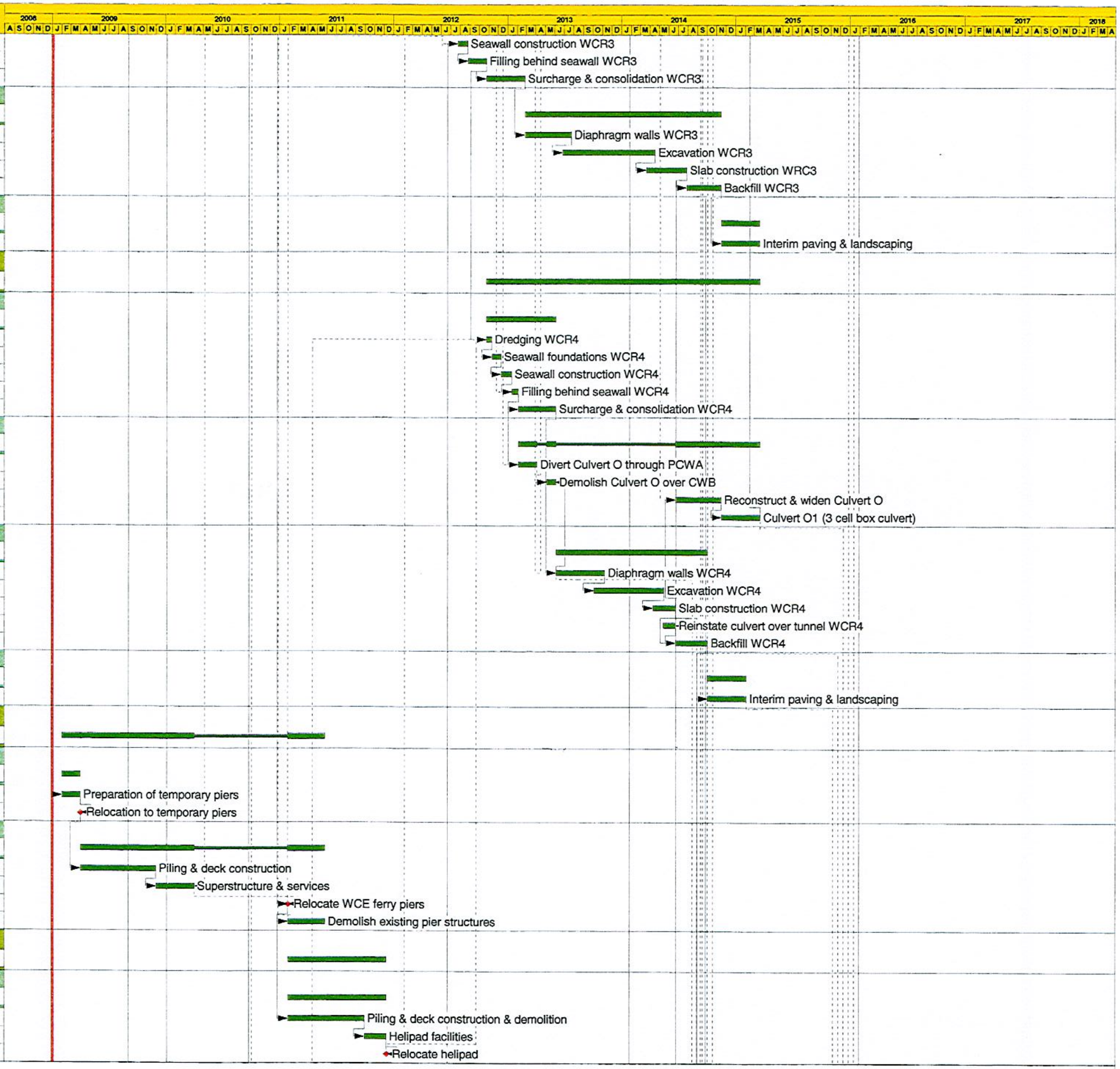
Maunsell

Agreement No. CE 54/2001
Wan Chai Development Phase II - Design & Construction

CONSTRUCTION PROGRAMME

Project name	WDII_Oct08D
Data date	01JAN09
Run date	01AUG07
Page number	4A

Act ID	Description	Orig Dur	Early Start	Early Finish
331020	Seawall construction WCR3	28d	25JUL12	25AUG12
331030	Filling behind seawall WCR3	51d	27AUG12	24OCT12
331100	Surcharge & consolidation WCR3	104d	25OCT12	25FEB13
CWB Tunnel				
		537d	26FEB13	15NOV14
333000	Diaphragm walls WCR3	128d	26FEB13	24JUL13
333010	Excavation WCR3	252d	27JUN13	18APR14
333020	Slab construction WRC3	110d	22MAR14	28JUL14
333030	Backfill WCR3	95d	29JUL14	15NOV14
Promenade				
		104d	17NOV14	19MAR15
333040	Interim paving & landscaping	104d	17NOV14	19MAR15
3.4 Wan Chai Reclamation Stage 4				
		746d	25OCT12	20MAR15
Dredging, Filling & Seawall				
		190d	25OCT12	05JUN13
341000	Dredging WCR4	15d	25OCT12	10NOV12
341010	Seawall foundations WCR4	25d	12NOV12	10DEC12
341020	Seawall construction WCR4	28d	11DEC12	14JAN13
341030	Filling behind seawall WCR4	18d	15JAN13	04FEB13
341040	Surcharge & consolidation WCR4	104d	05FEB13	05JUN13
Drainage Culverts				
		660d	05FEB13	20MAR15
342000	Divert Culvert O through PCWA	52d	05FEB13	05APR13
342010	Demolish Culvert O over CWB	26d	07MAY13	05JUN13
342020	Reconstruct & widen Culvert O	125d	24JUN14	15NOV14
342040	Culvert O1 (3 cell box culvert)	105d	17NOV14	20MAR15
CWB Tunnel				
		414d	06JUN13	03OCT14
343000	Diaphragm walls WCR4	134d	06JUN13	08NOV13
343010	Excavation WCR4	190d	05OCT13	16MAY14
343020	Slab construction WCR4	62d	12APR14	23JUN14
343021	Reinstate culvert over tunnel WCR4	35d	14MAY14	23JUN14
343030	Backfill WCR4	88d	24JUN14	03OCT14
Promenade				
		104d	04OCT14	04FEB15
334000	Interim paving & landscaping	104d	04OCT14	04FEB15
3.6 Ferry Pier Reprovisioning				
		722d	02FEB09	27MAY11
Temporary Ferry Piers				
		52d	02FEB09	02APR09
361000	Preparation of temporary piers	52d	02FEB09	02APR09
361010	Relocation to temporary piers	0		02APR09
New Ferry Piers				
		670d	03APR09	27MAY11
362000	Piling & deck construction	208d	03APR09	01DEC09
362010	Superstructure & services	104d	02DEC09	03APR10
362020	Relocate WCE ferry piers	0		28JAN11
362030	Demolish existing pier structures	102d	29JAN11	27MAY11
3.7 Helipad Reprovisioning				
		270d	29JAN11	09DEC11
Reprovisioning at HKCEC				
		270d	29JAN11	09DEC11
372000	Piling & deck construction & demolition	210d	29JAN11	30SEP11
372010	Helipad facilities	60d	01OCT11	09DEC11
372020	Relocate helipad	0		09DEC11



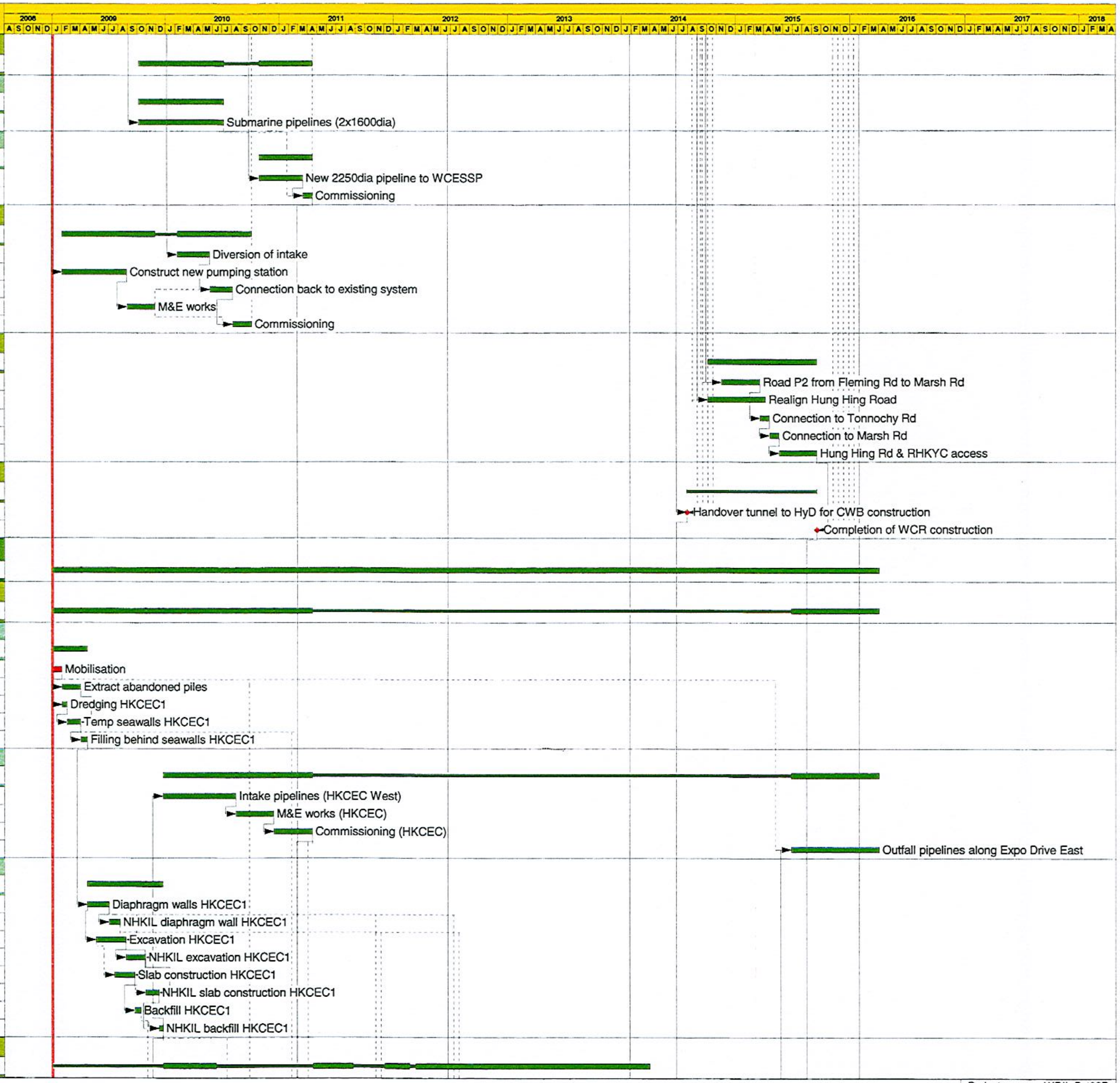
Maunsell

Agreement No. CE 54/2001
Wan Chai Development Phase II - Design & Construction

CONSTRUCTION PROGRAMME

Project name	WDII_Oct08D
Data date	01JAN09
Run date	01AUG07
Page number	5A

Act ID	Description	Orig Dur	Early Start	Early Finish
3.8 Sewage Outfall				
		475d	07OCT09	16APR11
Marine Section				
		234d	07OCT09	07JUL10
381000	Submarine pipelines (2x1600dia)	234d	07OCT09	07JUL10
Land Section				
		144d	29OCT10	16APR11
382000	New 2250dia pipeline to WCESSP	118d	29OCT10	17MAR11
382010	Commissioning	26d	18MAR11	16APR11
3.9 WSD's Salt Water Pumping Station				
		522d	02FEB09	04OCT10
390000	Diversion of intake	90d	08FEB10	22MAY10
390010	Construct new pumping station	180d	02FEB09	29AUG09
390030	Connection back to existing system	64d	24MAY10	04AUG10
390040	M&E works	78d	31AUG09	28NOV09
390050	Commissioning	52d	05AUG10	04OCT10
3.10 Roads				
		297d	04OCT14	17SEP15
3101000	Road P2 from Fleming Rd to Marsh Rd	104d	17NOV14	19MAR15
3101010	Realign Hung Hing Road	156d	04OCT14	06APR15
3101030	Connection to Tonnochy Rd	26d	20MAR15	18APR15
3101040	Connection to Marsh Rd	26d	20APR15	19MAY15
3101050	Hung Hing Rd & RHKYC access	104d	20MAY15	17SEP15
3.11 Handover / Completion Dates				
		355d	28JUL14	17SEP15
3111010	Handover tunnel to HyD for CWB construction	0		28JUL14
3111020	Completion of WCR construction	0		17SEP15
4. HKCEC RECLAMATION				
		2259d	31DEC08	02APR16
4.1 HKCEC Reclamation Stage 1 (Water Channel)				
		2259d	02JAN09	02APR16
Dredging, Seawalls & Filling				
		96d	02JAN09	23APR09
411000	Mobilisation	26d	02JAN09	31JAN09
411010	Extract abandoned piles	52d	02FEB09	02APR09
411015	Dredging HKCEC1	14d	02FEB09	17FEB09
411020	Temp seawalls HKCEC1	38d	18FEB09	02APR09
411030	Filling behind seawalls HKCEC1	18d	03APR09	23APR09
Cooling Water Systems				
		1955d	23DEC09	02APR16
412000	Intake pipelines (HKCEC West)	200d	23DEC09	13AUG10
412020	M&E works (HKCEC)	104d	14AUG10	13DEC10
412030	Commissioning (HKCEC)	104d	14DEC10	15APR11
412050	Outfall pipelines along Expo Drive East	240d	26JUN15	02APR16
CWB Tunnel				
		208d	24APR09	22DEC09
413000	Diaphragm walls HKCEC1	60d	24APR09	02JUL09
413005	NHKIL diaphragm wall HKCEC1	30d	03JUL09	06AUG09
413010	Excavation HKCEC1	82d	22MAY09	25AUG09
413015	NHKIL excavation HKCEC1	54d	26AUG09	27OCT09
413020	Slab construction HKCEC1	56d	20JUL09	22SEP09
413025	NHKIL slab construction HKCEC1	37d	28OCT09	09DEC09
413030	Backfill HKCEC1	17d	23SEP09	12OCT09
413035	NHKIL backfill HKCEC1	11d	10DEC09	22DEC09
4.2 HKCEC Reclamation Stage 2				
		1634d	31DEC08	31MAR14



Maunsell

Agreement No. CE 54/2001
Wan Chai Development Phase II - Design & Construction

CONSTRUCTION PROGRAMME

Project name	WDII_Oct08D
Data date	01JAN09
Run date	01AUG07
Page number	6A

Act ID	Description	Orig Dur	Early Start	Early Finish
Dredging, Seawalls & Filling				
		1170d	31DEC08	01OCT12
421000	CRIII completion of Reclamation FRAE	0		31DEC08
421010	Divert services & road access	104d	23DEC09	24APR10
421020	Demolish west bridge	40d	26APR10	10JUN10
421030	Dredging HKCEC2E	34d	08JUN11	16JUL11
421040	Seawall foundations HKCEC2E	31d	18JUL11	22AUG11
421050	Seawall construction HKCEC2E	30d	16JAN12	18FEB12
421060	Filling behind seawall HKCEC2E	55d	10MAR12	12MAY12
421070	Surcharge & consolidation	104d	14MAY12	11SEP12
421080	Dredging HKCEC2W	44d	18APR11	07JUN11
421090	Seawall foundations HKCEC2W	39d	08JUN11	22JUL11
421100	Seawall construction HKCEC2W	38d	02DEC11	14JAN12
421110	Filling behind seawall HKCEC2W	72d	10MAR12	01JUN12
421120	Surcharge & consolidation	104d	02JUN12	01OCT12
Drainage Culverts				
		240d	22JUN13	31MAR14
422000	Culvert L widening	64d	22JUN13	04SEP13
422010	Culvert L1 (2 cell box culvert)	176d	05SEP13	31MAR14
CWB Tunnel				
		459d	01OCT12	25MAR14
424000	CRIII completion of CWB tunnel box (FRAE)	0		01OCT12
424010	Diaphragm walls (HKCEC2E)	112d	11JUL13	18NOV13
424015	NHKIL diaphragm wall	50d	19NOV13	17JAN14
424020	Excavation (HKCEC2E)	69d	27SEP13	16DEC13
424025	NHKIL excavation	46d	21DEC13	14FEB14
424030	Slab construction (HKCEC2E)	48d	19NOV13	15JAN14
424035	NHKIL slab construction	32d	06FEB14	14MAR14
424040	Backfill (HKCEC2E)	14d	16JAN14	31JAN14
424045	NHKIL backfill	9d	15MAR14	25MAR14
424050	Diaphragm walls (HKCEC2W)	160d	02OCT12	08APR13
424055	NHKIL diaphragm wall	80d	09APR13	10JUL13
424060	Excavation (HKCEC2W)	88d	24JAN13	06MAY13
424065	NHKIL excavation	46d	15JUN13	07AUG13
424070	Slab construction (HKCEC2W)	61d	25MAR13	03JUN13
424075	NHKIL slab construction	32d	30JUL13	04SEP13
424080	Backfill (HKCEC2W)	19d	04JUN13	25JUN13
424085	NHKIL backfill	9d	05SEP13	14SEP13
4.3 MTR Tunnel Crossing				
		404d	29OCT10	14FEB12
Piling				
		144d	29OCT10	16APR11
431000	Piling for tunnel units	92d	29OCT10	15FEB11
431010	Piling for deck	52d	16FEB11	16APR11
Tunnel & Deck Construction				
		364d	15DEC10	14FEB12
433000	Precast & place CWB tunnel unit	130d	17AUG11	14JAN12
433005	Precast & place NIL tunnel unit	104d	15DEC10	16APR11
433006	Precast & place deck units	104d	18APR11	16AUG11
433020	Seawall construction	26d	16JAN12	14FEB12

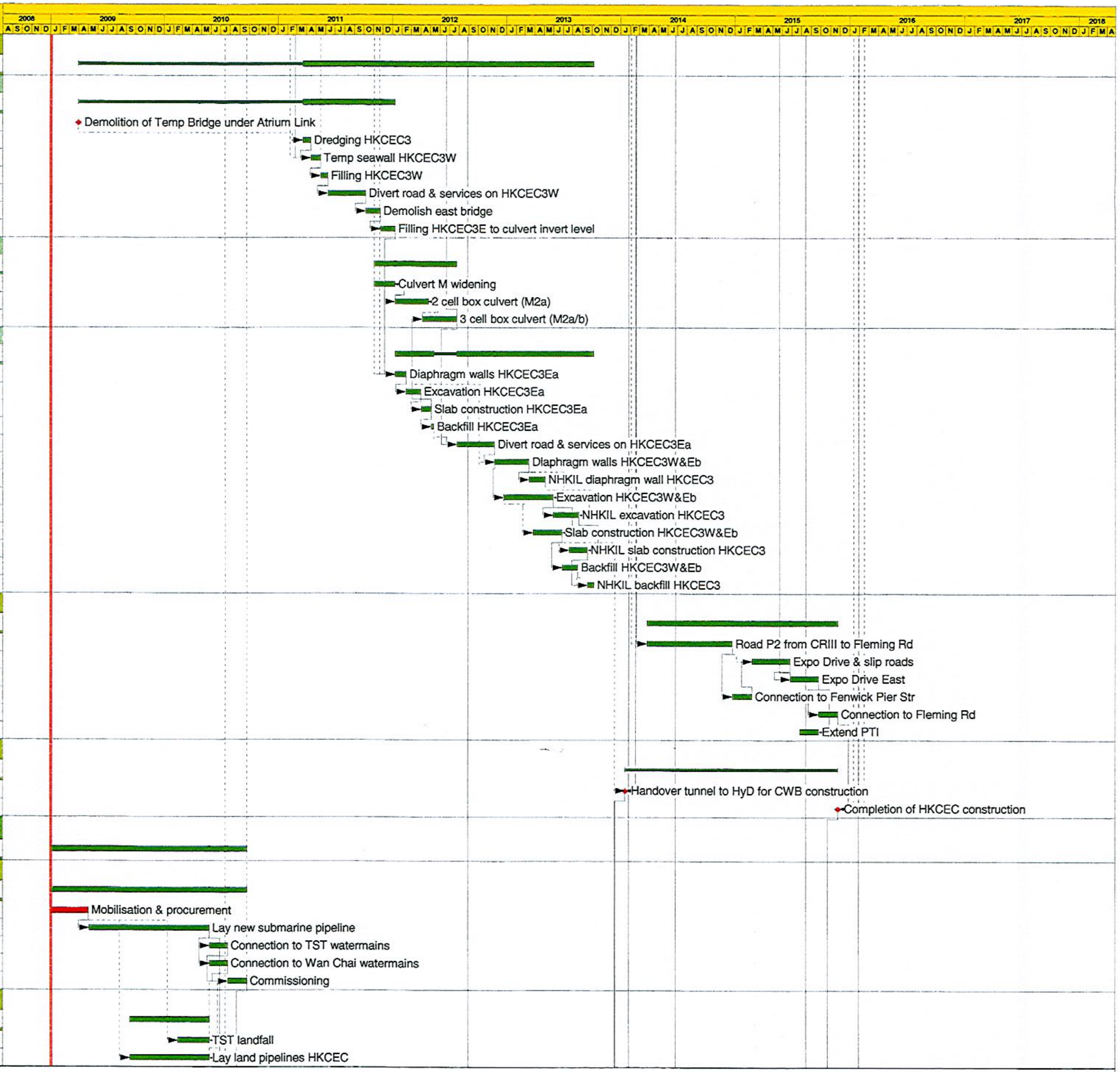
Maunsell

Agreement No. CE 54/2001
Wan Chai Development Phase II - Design & Construction

CONSTRUCTION PROGRAMME

Project name	WDII_Oct08D
Data date	01JAN09
Run date	01AUG07
Page number	7A

Act ID	Description	Orig Dur	Early Start	Early Finish
4.4 HKCEC Reclamation Stage 3				
		1411d	30MAR09	07OCT13
Dredging, Seawalls & Filling				
		867d	30MAR09	09JAN12
441000	Demolition of Temp Bridge under Atrium Link	0		30MAR09
441005	Dredging HKCEC3	23d	21MAR11	15APR11
441010	Temp seawall HKCEC3W	26d	16APR11	16MAY11
441020	Filling HKCEC3W	20d	17MAY11	08JUN11
441030	Divert road & services on HKCEC3W	104d	09JUN11	07OCT11
441040	Demolish east bridge	40d	08OCT11	23NOV11
441050	Filling HKCEC3E to culvert invert level	40d	24NOV11	09JAN12
Drainage Culverts				
		227d	03NOV11	24JUL12
442000	Culvert M widening	58d	03NOV11	09JAN12
442020	2 cell box culvert (M2a)	92d	10JAN12	25APR12
442030	3 cell box culvert (M2a/b)	94d	06APR12	24JUL12
CWB Tunnel				
		544d	10JAN12	07OCT13
443000	Diaphragm walls HKCEC3Ea	30d	10JAN12	13FEB12
443010	Excavation HKCEC3Ea	41d	14FEB12	31MAR12
443020	Slab construction HKCEC3Ea	28d	02APR12	03MAY12
443030	Backfill HKCEC3Ea	8d	04MAY12	12MAY12
443035	Divert road & services on HKCEC3Ea	104d	25JUL12	22NOV12
443040	Diaphragm walls HKCEC3W&Eb	93d	23NOV12	13MAR13
443045	NHKIL diaphragm wall HKCEC3	45d	14MAR13	04MAY13
443050	Excavation HKCEC3W&Eb	135d	21DEC12	29MAY13
443055	NHKIL excavation HKCEC3	70d	30MAY13	19AUG13
443060	Slab construction HKCEC3W&Eb	80d	26MAR13	26JUN13
443065	NHKIL slab construction HKCEC3	50d	20JUL13	16SEP13
443070	Backfill HKCEC3W&Eb	44d	27JUN13	16AUG13
443075	NHKIL backfill HKCEC3	18d	17SEP13	07OCT13
4.5 Roads				
		520d	26MAR14	24NOV15
451000	Road P2 from CRIII to Fleming Rd	234d	26MAR14	23DEC14
451020	Expo Drive & slip roads	104d	25FEB15	25JUN15
451030	Expo Drive East	78d	26JUN15	24SEP15
451040	Connection to Fenwick Pier Str	52d	24DEC14	24FEB15
451050	Connection to Fleming Rd	52d	25SEP15	24NOV15
451060	Extend PTI	52d	27JUL15	24SEP15
4.6 Handover / Completion Dates				
		579d	15JAN14	24NOV15
461000	Handover tunnel to HyD for CWB construction	0		15JAN14
461010	Completion of HKCEC construction	0		24NOV15
5. CROSS HARBOUR WATERMAINS				
		538d	02JAN09	22SEP10
5.1 Submarine Pipeline				
		538d	02JAN09	22SEP10
511000	Mobilisation & procurement	104d	02JAN09	02MAY09
511020	Lay new submarine pipeline	330d	04MAY09	25MAY10
511030	Connection to TST watermains	52d	26MAY10	23JUL10
511040	Connection to Wan Chai watermains	52d	26MAY10	23JUL10
511060	Commissioning	52d	24JUL10	22SEP10
5.2 Land Sections				
		217d	12SEP09	25MAY10
521000	TST landfall	87d	13FEB10	25MAY10
521010	Lay land pipelines HKCEC	217d	12SEP09	25MAY10



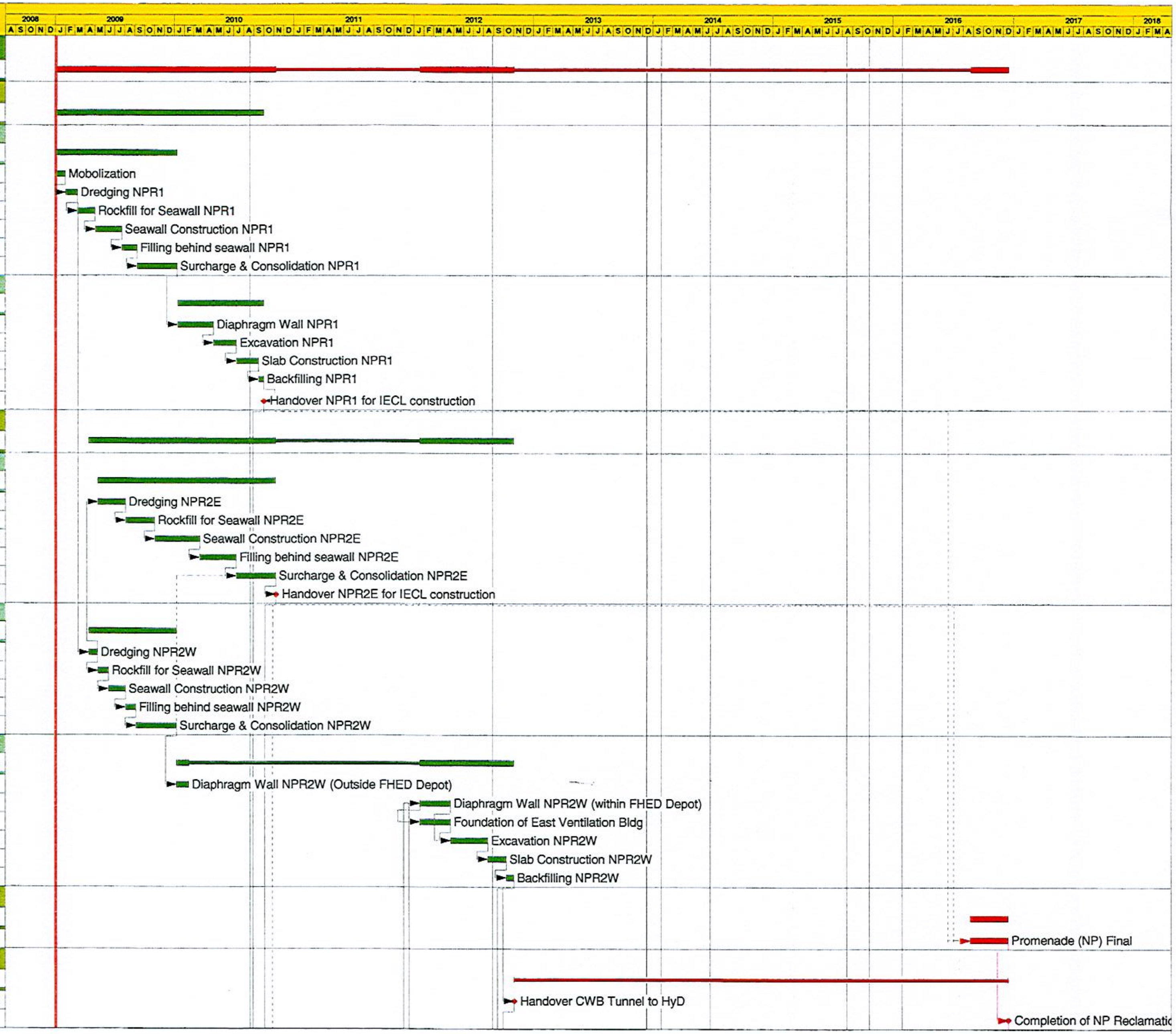
Maunsell

Agreement No. CE 54/2001
Wan Chai Development Phase II - Design & Construction

CONSTRUCTION PROGRAMME

Project name	WDII_Oct08D
Data date	01JAN09
Run date	01AUG07
Page number	8A
© Primavera Systems, Inc.	

Act ID	Description	Orig Dur	Early Start	Early Finish
6. NORTH POINT RECLAMATION				
		2481d	02JAN09	17DEC16
6.1 North Point Reclamation Stage 1				
		546d	02JAN09	01OCT10
Dredging, Seawall & Filling				
		318d	02JAN09	09JAN10
610000	Mobolization	26d	02JAN09	31JAN09
611000	Dredging NPR1	31d	02FEB09	09MAR09
611010	Rockfill for Seawall NPR1	47d	10MAR09	02MAY09
611020	Seawall Construction NPR1	70d	04MAY09	23JUL09
611030	Filling behind seawall NPR1	40d	24JUL09	08SEP09
611040	Surcharge & Consolidation NPR1	104d	09SEP09	09JAN10
CWB Tunnel NPR1				
		228d	11JAN10	01OCT10
612010	Diaphragm Wall NPR1	95d	11JAN10	30APR10
612020	Excavation NPR1	61d	01MAY10	09JUL10
612030	Slab Construction NPR1	58d	10JUL10	15SEP10
612040	Backfilling NPR1	14d	16SEP10	01OCT10
612050	Handover NPR1 for IECL construction	0		01OCT10
6.2 North Point Reclamation Stage 2				
		1110d	14APR09	01NOV12
Dredging, Seawall & Filing (NPR2E)				
		467d	11MAY09	06NOV10
621000	Dredging NPR2E	73d	11MAY09	03AUG09
621010	Rockfill for Seawall NPR2E	77d	04AUG09	31OCT09
621020	Seawall Construction NPR2E	116d	02NOV09	18MAR10
621030	Filling behind seawall NPR2E	97d	19MAR10	08JUL10
621040	Surcharge & Consolidation NPR2E	104d	09JUL10	06NOV10
622050	Handover NPR2E for IECL construction	0		06NOV10
Dredging, Seawall & Filling (NPR2W)				
		228d	14APR09	06JAN10
621050	Dredging NPR2W	23d	14APR09	09MAY09
621060	Rockfill for Seawall NPR2W	29d	11MAY09	12JUN09
621070	Seawall Construction NPR2W	44d	13JUN09	03AUG09
621080	Filling behind seawall NPR2W	28d	04AUG09	04SEP09
621090	Surcharge & Consolidation NPR2W	104d	05SEP09	06JAN10
CWB Tunnel (NPR2W)				
		882d	07JAN10	01NOV12
623010	Diaphragm Wall NPR2W (Outside FHED Depot)	33d	07JAN10	13FEB10
623060	Diaphragm Wall NPR2W (within FHED Depot)	80d	20JAN12	21APR12
623065	Foundation of East Ventilation Bldg	80d	20JAN12	21APR12
623070	Excavation NPR2W	98d	23APR12	14AUG12
623080	Slab Construction NPR2W	48d	15AUG12	09OCT12
623090	Backfilling NPR2W	20d	10OCT12	01NOV12
6.3 Promenade				
		100d	24AUG16	17DEC16
640000	Promenade (NP) Final	100d	24AUG16	17DEC16
6.4 Handover / Completion Dates				
		1284d	01NOV12	17DEC16
650000	Handover CWB Tunnel to HyD	0		01NOV12
650010	Completion of NP Reclamation	0		17DEC16



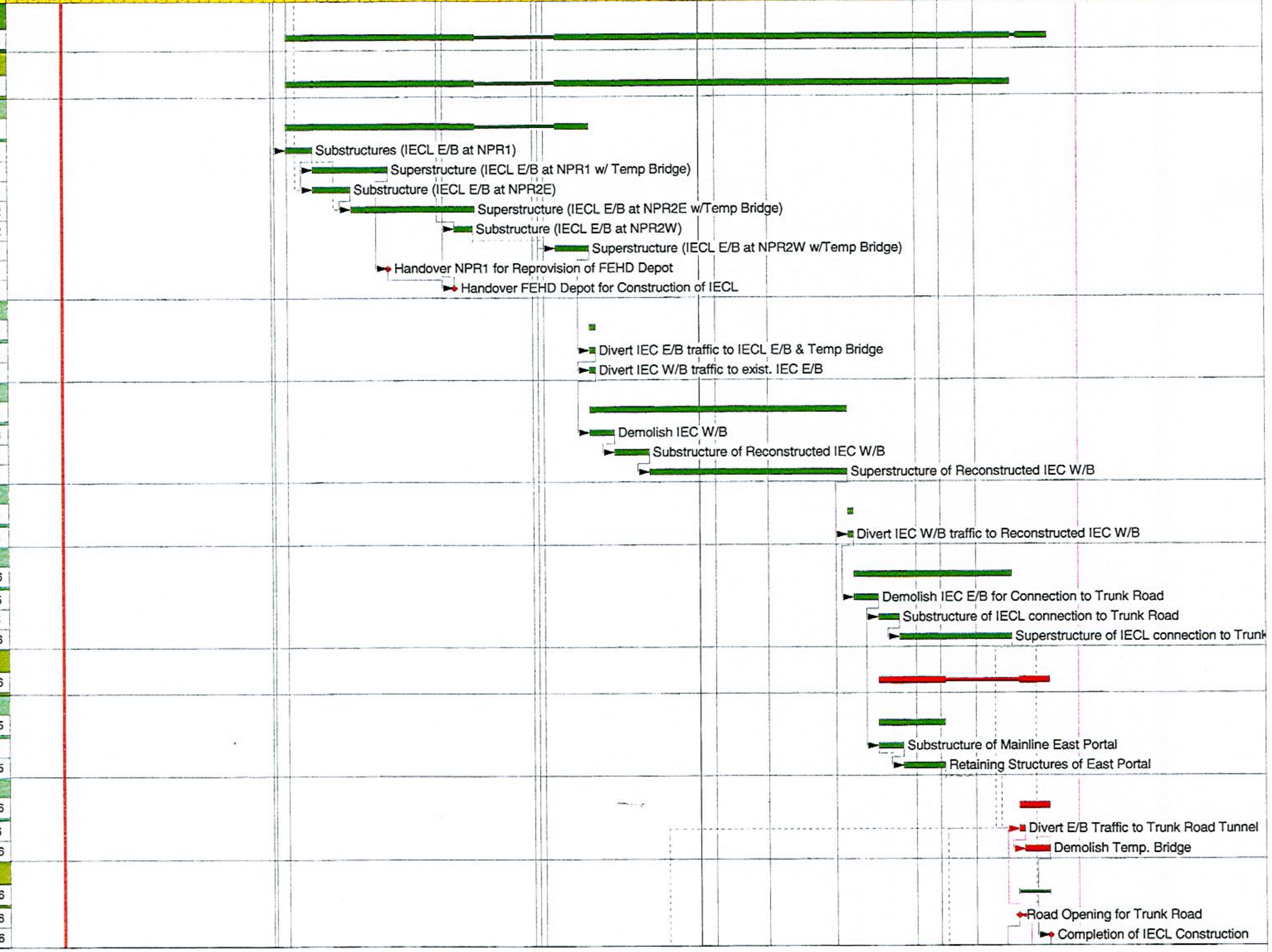
Maunsell

Agreement No. CE 54/2001
Wan Chai Development Phase II - Design & Construction

CONSTRUCTION PROGRAMME

Project name	WDII_Oct08D
Data date	01JAN09
Run date	01AUG07
Page number	9A

Act ID	Description	Orig Dur	Early Start	Early Finish
7. Construction of IECL				
		1835d	02OCT10	23AUG16
7.2 IEC Connection Work				
		1745d	02OCT10	10MAY16
IEC E/B (HFS to Mainline)				
		731d	02OCT10	05FEB13
721010	Substructures (IECL E/B at NPR1)	65d	02OCT10	16DEC10
721040	Superstructure (IECL E/B at NPR1 w/ Temp Bridge)	180d	17DEC10	16JUL11
721050	Substructure (IECL E/B at NPR2E)	90d	17DEC10	02APR11
721060	Superstructure (IECL E/B at NPR2E w/Temp Bridge)	300d	04APR11	17MAR12
721070	Substructure (IECL E/B at NPR2W)	45d	20JAN12	12MAR12
721080	Superstructure (IECL E/B at NPR2W w/Temp	80d	02NOV12	05FEB13
721090	Handover NPR1 for Reprovision of FEHD Depot	0		16JUL11
721100	Handover FEHD Depot for Construction of IECL	0		19JAN12
IEC East Bound Traffic Diversion				
		15d	06FEB13	22FEB13
725010	Divert IEC E/B traffic to IECL E/B & Temp Bridge	15d	06FEB13	22FEB13
725020	Divert IEC W/B traffic to exist. IEC E/B	15d	06FEB13	22FEB13
Reconstruction IEC West Bound				
		620d	06FEB13	03FEB15
727020	Demolish IEC W/B	60d	06FEB13	16APR13
727030	Substructure of Reconstructed IEC W/B	85d	17APR13	24JUL13
727050	Superstructure of Reconstructed IEC W/B	475d	25JUL13	03FEB15
IEC West Bound Traffic Diversion				
		14d	04FEB15	19FEB15
727060	Divert IEC W/B traffic to Reconstructed IEC W/B	14d	04FEB15	19FEB15
Mainline connection to IEC				
		380d	20FEB15	10MAY16
727110	Demolish IEC E/B for Connection to Trunk Road	60d	20FEB15	30APR15
727120	Substructure of IECL connection to Trunk Road	50d	01MAY15	27JUN15
727140	Superstructure of IECL connection to Trunk Road	270d	29JUN15	10MAY16
7.3 East Portal and IEC Connection				
		410d	01MAY15	23AUG16
Portal Construction				
		160d	01MAY15	03NOV15
731010	Substructure of Mainline East Portal	60d	01MAY15	09JUL15
731020	Retaining Structures of East Portal	100d	10JUL15	03NOV15
Traffic Diversion IEC E/B				
		74d	30MAY16	23AUG16
731030	Divert E/B Traffic to Trunk Road Tunnel	14d	30MAY16	14JUN16
731040	Demolish Temp. Bridge	60d	15JUN16	23AUG16
Handover Dates				
		74d	28MAY16	23AUG16
740000	Road Opening for Trunk Road	0		28MAY16
740010	Completion of IECL Construction	0		23AUG16



Maunsell

Agreement No. CE 54/2001
Wan Chai Development Phase II - Design & Construction

CONSTRUCTION PROGRAMME

Project name	WDII_Oct08D
Data date	01JAN09
Run date	01AUG07
Page number	10A
© Primavera Systems, Inc.	

Appendix A.3

Mathematical Expressions for Pile Frictions

Appendix A.3 Mathematical Expressions for Pile Frictions

The mathematical expressions for representation of pile friction were based on the Cross Border Link Study and the Delft 3D-FLOW module developed by Delft Hydraulics. A quadratic friction term added to the momentum equations can be expressed in the form:

$$\text{Friction loss in the u coordinate direction} = [C_{loss,u}\, U\, |\langle U\rangle|\,] / \Delta x \ (m/s^2)$$
$$\text{Friction loss in the v coordinate direction} = [C_{loss,v}\, V\, |\langle U\rangle|\,] / \Delta y \ (m/s^2) \qquad (5.1)$$

Where:
$C_{loss,u}$ and $C_{loss,v}$ = loss coefficients in the u and v coordinate directions;
$\langle U\rangle$ = velocity vector (U, V);
$|\langle U\rangle|$ = magnitude of the velocity vector = $\sqrt{U^2+V^2}$ (m/s); and
Δx and Δy = grid distances in u and v coordinate directions respectively (m).

According to the water speeds in each model layer, the additional quadratic friction term influences the horizontal flow distribution in each layer and so indirectly affects the vertical turbulent exchange.

The force exerted on the vertical section (Δz) of one pile can be expressed as:

Drag force on a pile in the u coordinate direction:

$$F_u = C_d \frac{1}{2} \rho D U_e |\langle U_e\rangle| \Delta z$$

Drag force on a pile in the v coordinate direction:

$$F_v = n C_d \frac{1}{2} \rho D V_e |\langle U_e\rangle| \Delta z \qquad (5.2)$$

Where:
C_d = drag coefficient;
ρ = density of water (kg/m^3);
$\langle U_e\rangle$ = effective approach velocity vector (U_e, V_e) (m/s);
$|\langle U_e\rangle|$ = magnitude of the effective approach velocity vector = $\sqrt{U^2+V^2}$ (m/s);
D = diameter of the pile (m); and
Δz = length of the vertical section (m).

The effective approach velocity can be calculated using the wet cross section as seen in flow direction and is expressed as:

$$\text{Effective approach velocity } \langle U_e\rangle = \langle U\rangle \times [A_T / A_e] = \langle U\rangle \times a \qquad (5.3)$$

Where:
A_T = total cross-sectional area (m^2);
A_e = effective wet cross sectional area
= total cross-sectional area (A_T) - area blocked by the piles (m^2); and
a = ratio of the total area to the effective area.

Assuming the piles are not in the shadow of each other, the total force exerted on the vertical section for n numbers of piles can be expressed as:

Total drag force in the u coordinate direction:

$$F_{tot,u} = n C_d \frac{1}{2} \rho D U_e |\langle U_e\rangle| \Delta z$$

Total drag force in the v coordinate direction:

$$F_{tot,v} = n C_d \frac{1}{2} \rho D V_e |\langle U_e\rangle| \Delta z$$

Where: n = number of piles in the control grid cell

The total friction loss term in the u and v coordinate directions can be determined by dividing the forces by the mass in the control volume (= $\rho\, \Delta x \Delta y \Delta z$) and can be expressed as:

$$\text{Total friction loss in the x-direction} = n C_d \frac{1}{2} D U_e |\langle U_e\rangle| / (\Delta x \Delta y)$$

$$\text{Total friction loss in the y-direction} = n C_d \frac{1}{2} D V_e |\langle U_e\rangle| / (\Delta x \Delta y) \qquad (5.4)$$

Combining Equation (5.1) and Equation (5.4), the loss coefficients for n numbers of piles in the u and v coordinate directions are:

$$\text{Loss coefficient in the u coordinate direction } C_{loss,u} = [n C_d \frac{1}{2} D a^2] / (\Delta y)$$

$$\text{Loss coefficient in the v coordinate direction } C_{loss,v} = [n C_d \frac{1}{2} D a^2] / (\Delta x) \qquad (5.5)$$

Based on the equations (5.1) – (5.5), the loss coefficients were calculated for relevant model grid cells in both u and v directions for model input.

Appendix A.4

Methodology for Compiling the Pollution Loading Inventory

1 INTRODUCTION

1.1 The pollution loading inventory was compiled for the storm and sewage outfalls within the whole Hong Kong waters for input into the Update Model and the detailed Victoria Harbour (VH) Model for two time horizons, namely 2011 and 2016 respectively, for cumulative impact assessment. The methodologies for compiling the pollution loading are given in this Appendix.

2 STORM OUTFALLS

2.1 The key sources of water pollution in storm outfalls include:

- Pollution due to sewage from unsewered developments (dry weather load)
- Pollution due to expedient connections from trade and residential premises, and integrity problems of aged drainage and sewerage systems (dry weather load)
- Pollution due to livestock waste (dry weather load)
- Rainfall related load.

2.2 The total pollution load discharged via the storm system would cover the dry weather load and rainfall related load

Dry Weather Load

2.3 Domestic, commercial and industrial activities are the principle sources of dry weather load in storm drains. Total pollution loads generated from these activities were compiled by catchment areas as shown in **Figure A-4-1** below with reference to the projected population and employment data provided by the Planning Department (PlanD). Details of these planning data and the methodology for calculating the pollution loads from domestic commercial and industrial activities are given in Section 4 of this Appendix.

2.4 It was assumed that a portion of total pollution load generated within a catchment would be lost to the storm system whilst the rest of the flow would be diverted to the sewerage system. The assumed percentages of pollution load discharged into the storm system for different catchments are presented in **Table A-4-1**.

Wan Chai Development Phase II and
Central-Wan Chai Bypass
Draft EIA Report
Appendix A-4
Methodology for Compiling the
Pollution Loading Inventory

Figure A-4-1 Sewage Catchment Boundaries

Table A-4-1 Assumed % of Pollution Load in the Storm System for 2011 and 2016

Catchment	Catchment ID	Assumed % of Load in the Storm System		Foul interception to:	
		2011	2016	2011	2016
Sai Kung	1	10%	10%	Sai Kung STW	
Sai Kung Country Park	1a	50%	50%		
Pak Sha Wan	1b	10%	10%		
Clear Water Bay	1c	100%	100%	-	
Tseung Kwan O	2	5%	5%	HATS	
Yau Tong, East Kowloon	4	10%	10%		
North Kowloon, Central Kowloon, South Kowloon	5	10%	10%		
Northwest Kowloon	8	10%	10%		
Stonecutters	9a	10%	10%		
Kwai Chung and Tsuen Wan East	10a	10%	10%		
Tsing Yi	10b	10%	10%		
Tsuen Wan West (Rural Area)	11	10%	10%	Sham Tseng STW	
Tuen Mun	12	10%	10%	Pillar Point STW	

Catchment	Catchment ID	Assumed % of Load in the Storm System		Foul interception to:	
		2011	2016	2011	2016
Yuen Long and Tin Shui Wai and Deep Bay Streams	12a	10%	10%	San Wan STW	
Kam Tin and Yuen Long New Town	12d	10%	10%	Yuen Long STW	
Discovery Bay	13	0%	0%	Siu Ho Wan STW	
North Lantau	13a	10%	10%		
Chek Lap Kok	13b	0%	0%		
Peng Chau	14	30%	30%	Peng Chau STW	
Mui Wo	15	10%	10%	Mui Wo STW	
South Lantau	15a	100%	100%	-	
Hei Ling Chau	16	0%	0%	Hei Ling Chau STW	
Cheung Chau	17	30%	30%	Cheung Chau STW	
Shek Kwu Chau	17a	100%	100%	-	
Tai A Chau	17b	0%	0%	Tai A Chau PTW	
Shek Pik	18	10%	10%	Shek Pik STW	
Tai O	18a	10%	10%	Tai O STW	
Lamma Island	19	30%	30%	Yung Shue Wan STW and Sok Kwu Wan STW	
Poi Toi Islands	19a	100%	100%	-	
Tung Lung	19b	100%	100%	-	
Pokfulam Sandy Bay	20a	10%	10%	Sandy Bay PTW	HATS
Cyber Port	20b	10%	10%	Cyber Port STW	HATS
Wah Fu Estates and Mt. Kellet	21	10%	10%	Wah Fu PTW	HATS
Aberdeen, Shouson Hill and Repulse Bay, South Bay	22	10%	10%	Aberdeen PTW	HATS
Ap Lei Chau	23	10%	10%	Ap Lei Chau PTW	HATS
Chung Hom Kok	26	10%	10%	Stanley STW	
Stanley	27	10%	10%		
Tai Lam	28	10%	10%		
Shek O	29	10%	10%	Shek O STW	
Chai Wan	30	10%	10%	HATS	
Shau Kei Wan	31	10%	10%		
North Point	32	10%	10%	North Point PTW	HATS
Wan Chai East	33	10%	10%	Wan Chai East PTW	HATS
Wan Chai West	34	10%	10%		
Western and Central, Green Island	35	10%	10%	Central PTW	HATS
Tolo Harbour	37	10%	10%	THEES	
Sheung Shui and Fanling	38	10%	10%	Shek Wo Hui STW	
North New Territories	39	95%	95%		
Sha Tau Kok	40	10%	10%	Sha Tau Kok STW	

2.5 The percentage interceptions assumed in **Table A-4-1** were based on the implementation schedule for sewerage improvement projects as adopted under the EPD Update (CE42/97) and the HATS EEFS (CE42/2001).

2.6 The pollution loading in the storm system contributed from domestic, commercial and industrial activities was compiled to the catchment levels shown in **Figure A-4-1**. The pollution loading compiled for each catchment was distributed to appropriate discharge points (i.e. storm culverts / outfalls, rivers and nullahs). It was assumed that these storm pollutions would be evenly distributed amongst the major storm water discharge points within the catchment.

2.7 The livestock waste load discharged via rivers / streams adopted under the EPD Update Study

(CE42/97) as shown in **Table A-4-2** was directly applied in this EIA for 2011 and 2016.

Table A-4-2 Livestock Waste Load Assumed for 2011 and 2016

Catchment	River Name	Flow (m^3/d)	SS (kg/d)	TKN (kg/d)	NH_3-N (kg/d)	TP (kg/d)	*E.coli* (counts/d)
Tsueng Kwan O	Tseng Lan Shue River	2	0	0	0	0	6.98E+11
Sheung Shui and Fanling	Shenzhen River	3216	363	41	22	18	9.28E+14
Yuen Long, Tin Shui Wai and Kam Tin	Shan Pui Ho River	5034	568	65	34	28	1.45E+15
	Tin Shui Wai Nullah	4190	473	54	28	24	1.21E+15
Deep Bay	Sheung Pak Nai Stream	97	11	1	1	1	2.79E+13
	Ha Pak Nai Stream	677	76	9	5	4	1.95E+14

2.8 The total dry weather load in the storm outfall would include the loading contributed from domestic, commercial and industrial activities and the loading from livestock discharges (if any) as shown in **Table A-4-2.**

Rainfall Related Load

2.9 It was assumed that a rainfall volume of greater than 10mm per day (and rainfall intensity greater than 2mm/hr) would give rise to runoff. The runoff percentage was based on the average rainfall data between 1/01/74 and 31/10/05 from the Hong Kong Observatory. The calculation of the runoff percentage is shown below:

Runoff percentage = (Sum of the rainfall volume for the days with rainfall volume > 10mm and intensity > 2mm/hr within the season) ÷ Total rainfall volume for the season x 100%

2.10 Rainfall data from May to September represent the values for wet season, and those from November to March represent the values for dry season. Accordingly, the runoff percentage was calculated as 93% and 70% for wet and dry seasons respectively

2.11 The 30-year long term average rainfall data were used to determine the daily runoff value as shown below:

Daily runoff value (m/day) = 30year long term average daily rainfall data x runoff percentage

2.12 Thus, the runoff value was calculated as 0.01104 m/day and 0.00102 m/day for wet and dry seasons respectively.

2.13 The amount of rainfall related load that would be discharged into the sea depends on the amount of impermeable area within each catchment. It was assumed that all urbanized/developed areas within the catchment would be impermeable. The daily volume of runoff generated within each catchment was estimated as shown below:

Daily volume of runoff in each catchment (m^3/day)
= daily runoff value (m/day) x impermeable area within each catchment (m^2)

2.14 The daily volume of runoff estimated for each catchment was multiplied with the runoff concentrations to derive the rainfall related loading. The assumed runoff concentrations are shown in **Table A-4-3.**

Table A-4-3 Event Mean Concentrations for Stormwater Runoff

TSS (g/m^3)	BOD_5 (g/m^3)	NH_3N (g/m^3)	Cu (g/m^3)	TP (g/m^3)	OrthoP (g/m^3)	Silicate (g/m^3)	TON (g/m^3)	TKN (g/m^3)
43.25	22.48	0.20	0.01	0.20	0.04	3.28	0.40	1.40

(Source: EPD Pilot Study of Stormwater Pollution)

2.15 The rainfall related loading was compiled to the catchment levels shown in **Figure A-4-1**. The pollution loading compiled for each catchment was distributed to appropriate discharge points (i.e. culverts, outfalls, rivers and nullahs). It was assumed that the rainfall related loading was evenly distributed amongst the major storm water discharge points within the catchment.

3 SEWAGE OUTFALLS

3.1 A portion of the total loads from domestic, commercial and industrial activities generated in each catchment was allocated to the sewerage system according to the percentage of storm interception shown in **Table A-4-1**. The remaining portion of the total load in each catchment was distributed to the storm system.

3.2 Besides the pollution loads from domestic, commercial and industrial activities, the sewerage system would also receive pollution loads from landfills and beaches as most of the landfill sites and beach facilities would be connected to the sewerage system. **Table A-4-4** and **Table A-4-5** show the pollution load of relevant landfills and beaches adopted under the EPD Update Study. These loading data were directly adopted in this EIA for 2011 and 2016. The beach loading was included for the wet season simulations only. Loading from landfills and beaches that would not be connected to the STW is given in Section 6 of this Appendix. It is considered that the effect of this point source pollution loading would be localized. Contributions of these point source pollution loads would be insignificant as compared to the overall pollution loading that would be discharged into the sea. Possible change of these point source loads would unlikely affect the overall modelling results. Thus, the broad assumption of using the same amount of point source pollution loads for all the assessment years is considered acceptable.

Table A-4-4 Pollution Flows and Loads from Landfills

	Discharge Location	Flow (m3/d)	BOD (kg/d)	SS (kg/d)	Org-N (kg/d)	NH_3-N (kg/d)	*E-Coli* (no./d)	Cu (g/d)
SHUEN WAN LANDFILL								
Shuen Wan Landfill	Foul sewer to Tai Po STW	110	8	28	13	76	7.65E+05	2
NEW STRATEGIC LANDFILLS								
WENT	Foul sewer to NWNT sewage outfall	714	2648	288	190	1690	4.97E+06	14
SENT	Foul sewer to HATS	523	30	131	26	1	3.64E+06	10
NENT	Foul sewer to Shek Wu Hui STW	541	11	53	22	1	3.76E+06	11
NWNT LANDFILLS								
Pillar Point Valley	Foul sewer to Pillar Point STW	3283	3165	822	389	2511	2.28E+07	66
Ngau Tam Mei Siu Lang Shui Gin Drinkers Bay Ma Tso Lung	Foul sewer to HATS	200	193	50	24	153	1.39E+06	4
URBAN LANDFILLS								
Jordan Valley Ma Yau Tong Central Sai Tso Wan Ma Yau Tong West Ngau Chi Wan	Foul sewer to HATS	636	615	160	76	488	4.44E+06	13
TKO LANDFILLS								
TKO I	Foul sewer to HATS	69	66	32	8	52	4.77E+05	1

Table A-4-5 Pollution Loads from Beach Users in Bathing Season

Gazetted Beach	Discharge Location	Flow (m^3/day)	BOD (g/day)	SS (g/day)	Org-N (g/day)	NH_3-N (g/day)	*E.coli.* (no./day)	TP (g/day)	OrthoP (g/day)
Big Wave Bay	Shek O STW	3	788	657	432	985	1.04E+13	224	133
Hairpin		1	334	278	183	417	4.41E+12	95	57
Shek O		20	4895	4079	2685	6118	6.46E+13	1393	829
Deep Water Bay	Aberdeen STW for 2011 and HATS for 2016	22	5436	4530	2982	6795	7.17E+13	1547	921
Middle Bay		3	667	556	366	833	8.80E+12	190	113
Repulse Bay		44	10968	9140	6017	13710	1.45E+14	3121	1858
South Bay		2	584	487	321	730	7.71E+12	166	99
Chung Hom Kok	Stanley STW	1	225	187	123	281	2.96E+12	64	38
St. Stephen's		4	875	729	480	1094	1.15E+13	249	148
Stanley Main		6	1504	1254	825	1880	1.98E+13	428	255
Turtle Cove		1	268	223	147	334	3.53E+12	76	45
Silvermine Bay	Mui Wo STW	0	112	93	61	140	1.47E+12	32	19
Hung Shing Yeh	Yung Shue Wan STW	1	308	256	169	384	4.06E+12	88	52
Lo So Shing		0	68	57	37	85	8.99E+11	19	12
Kwun Yau Wan	Cheung Chau STW	0	94	78	52	117	1.24E+12	27	16
Tung Wan, Cheung Chau		4	1089	908	598	1362	1.44E+13	310	185
Silverstrand	Sai Kung STW	18	4556	3797	2500	5695	6.01E+13	1297	772
Trio (Hebe Haven)		3	632	527	347	790	8.34E+12	180	107
Anglers'	Sham Tseng STW	0	87	73	48	109	1.15E+12	25	15
Approach	Sham Tseng STW	0	77	64	42	96	1.02E+12	22	13
Casam	Sham Tseng STW	0	63	53	35	79	8.36E+11	18	11
Gemini	Sham Tseng STW	0	41	34	23	52	5.44E+11	12	7
Hoi Mei Wan	Sham Tseng STW	0	85	71	47	107	1.13E+12	24	14
Lido	Sham Tseng STW	3	662	552	363	828	8.74E+12	188	112
Ting Kau	Sham Tseng STW	0	26	22	14	32	3.42E+11	7	4
Butterfly	Pillar Point STW	17	4248	3540	2331	5310	5.61E+13	1209	720
Castle Peak		2	605	504	332	756	7.98E+12	172	102
Kadoorie		22	5561	4634	3051	6951	7.34E+13	1582	942
New Cafeteria		8	2045	1704	1122	2556	2.70E+13	582	346
Old Cafeteria		3	732	610	401	915	9.65E+12	208	124
Golden Beach		22	5505	4587	3020	6881	7.26E+13	1566	932

3.3 The total load generated in the sewerage system would be reduced after the treatment processes. **Table A-4-6** shows the treatment processes for major STW. It should be noted that SCISTW, Pillar Point Sewage Treatment Works (PPSTW), Siu Ho Wan Sewage Treatment Works (SHWSTW), Tolo Harbour Effluent Export Scheme (THEES), North West New Territories (NWNT) outfall and Sham Tseng Sewage treatment Works (SHTSTW) are not included in **Table A-4-6** as loading discharged from these STW were compiled separately based on the information from recent EIA studies and actual measurements. The treatment efficiencies for different treatment processes are given in **Table A-4-7** for reference. The loading discharged from HATS has been considered separately as shown in Table 5.14 of the methodology paper based on the information provided in the Final Study Report of the EEFS.

Table A-4-6 Summary of Major Sewage Treatment Works and the Corresponding Treatment Levels

STW	Treatment Level 2011	Treatment Level 2016
Stanley	Secondary treatment with disinfection	Secondary treatment with disinfection
Shek O	Preliminary treatment	Preliminary treatment
Tai O	Primary treatment	Primary treatment
Cheung Chau	Primary treatment	Primary treatment
Mui Wo	Secondary treatment with disinfection	Secondary treatment with disinfection
Peng Chau	Secondary treatment with disinfection	Secondary treatment with disinfection
Shek Wu Hui	Secondary treatment with disinfection	Secondary treatment with disinfection
Sha Tau Kok	Secondary treatment with disinfection	Secondary treatment with disinfection
Sai Kung	Secondary treatment with disinfection	Secondary treatment with disinfection
Yung Shue Wan	Secondary treatment with disinfection	Secondary treatment with disinfection
Sok Kwu Wan	Secondary treatment with disinfection	Secondary treatment with disinfection
Hei Ling Chau	Secondary treatment with disinfection	Secondary treatment with disinfection
Shek Pik	Secondary treatment with disinfection	Secondary treatment with disinfection
Cyber Port	Chemically enhanced primary treatment	See Note 1

Note 1 - Effluent from Cyber Port STW would be discharged to the HATS under Stage 2A by 2014.

Table A-4-7 Treatment Efficiency for Treatment Works

Types of Treatment Plant	BOD_5	TSS	NH_3-N	Org-N	OrthoP	TP	Cu	*E.coli*
Screening Plants[A]	0%	0%	0%	0%	0%	0%	0%	0%
Primary Treatment (no disinfection)	32.5%	55%	0%	15%	0%	15%	26%	50%
Primary Treatment (with disinfection)	32.5%	55%	0%	15%	0%	15%	26%	99.95%
Chemical Enhanced Primary Treatment (with no disinfection)[B]	55%	70%	10%	45%[C]	60%	60%	80%	50%
Chemical Enhanced Primary Treatment (with disinfection)[B]	55%	70%	10%	45%[C]	60%	60%	80%	99.95%
Secondary Treatment (no disinfection)	85%	90%	75%	80%	35%	50%	74%	94%
Secondary Treatment (with disinfection)	85%	90%	75%	80%	35%	50%	74%	99.97%

Note

A. It is assumed that the reduction of the pollution parameters is insignificant in screening plants. Therefore, the removal rates for these parameters were all assumed zero.

B. Based on estimation from the SSDS EIA Study: Technical Note 1 (Revised) Wastewater Flows and Loads and Effluent Characteristics. The loading discharged from HATS has been considered separately as shown in Table 5.14 of the methodology paper based on the information provided in the Final Study Report of the EEFS.

C. The removal rate of org-N is calculated from the removal rates of NH_3-N and total N (10% and 25% respectively) assuming that NH_3-N contributes about 57% of total N in raw sewage.

4 POLLUTION LOADS FROM DOMESTIC, COMMERCIAL AND INDUSTRIAL ACTIVITIES

Population and Employment Statistics

Time Aspect

4.1 The 2003-based Territorial Population and Employment Data Matrices (TPEDM), which are the latest planning information released by PlanD at the time when this assessment was conducted, were used to compile the pollution loads from domestic, commercial and industrial activities. The TPEDM provides the projected population breakdown by Planning Vision and Strategy (PVS) zones for 2006, 2011 and 2016. For strategic planning purposes, two different scenarios of growth rate are postulated

for future population (2011 and 2016) under the 2003-based TPEPM. Scenario I assumed a total population of 7.57 million by 2016. Scenario II assumed a total population of 7.94 million by 2016, which represents about 5% increase in population on top of Scenario I. The population and employment projections for 2006 are only available for Scenario I.

4.2 Territorial population projections given by the Census & Statistics Department (C&SD) were used as the control totals for the TPEDM Scenario I. The TPEDM Scenario II was compiled for long-term planning purposes with no given territorial population as the control totals and was used in this EIA for conservative assessment.

4.3 The modeling work was carried out for two time horizons, namely 2011 and 2016 and the projected population data provided by PlanD at PVS zones are also available for 2011 and 2016. The population for 2011 and 2016 was calculated using the TPEDM Scenario II for 2011 and 2016.

Spatial Aspect

4.4 To facilitate the estimation of pollution loading, the population and employment data are required to be presented at the level of catchment areas shown in **Figure A-4-1** of this Appendix. However, the projected population from PlanD is provided in a much smaller scale at PVS zones. Population and employment data for each sewage catchment area were estimated by overlaying the PVS zones on top of the layout of the sewage catchment area for allocating the appropriate PVS zones to the sewage catchment area.

Data Manipulation

4.5 The TPEDM provides the number of usual residents, mobile residents and school places within the territory at PVS zones.

4.6 Employment population is divided by 12 job types under the TPEDM as listed below:

- J1 Manufacture
- J2 Electricity, gas & water
- J3 Transport, storage & communication
- J4 Wholesale and retail
- J5 Import & export
- J6 Financial, insurance, real estate & business services
- J7 Agriculture & fishery
- J8 Mining & quarrying
- J9 Construction
- J10 Restaurants, hotels & boarding houses
- J11 Community, social & personal services
- J12 Public administration

4.7 The population data from the TPEDM were manipulated and presented at the following categories:

- Residential population (by usual residents and mobile residents)
- Transient Population (by total employment number and total school places), where total employment =J1+J2+J3+J4+J5+J6+J7+J8+J9+J10+J11+J12
- Number of employees in commercial sector (by J2, J3, J4, J9, J10 & J11)
- Number of employees in manufacturing sector (=J1) by 6 sub-categories, namely food, textiles, leather, paper, manufacturing and machinery respectively.

4.8 The domestic pollution load to be generated from a catchment would be affected by the number of resident population and transient population within the catchment. The total employee number comprises 12 job types listed above. It is considered that commercial effluents are contributed from job J2 to J4 and J9 to J11. Industrial effluents are contributed from job type J1.

4.9 In order to provide a better estimation of pollution loads from industrial processes, the number of employees in manufacturing sector (J1) was further broken down into 6 sub-categories, namely food, textiles, leather, paper, manufacturing and machinery. Projected employment statistics are not available for these 6 sub-categories. It is noted that the size for each of these 6 sub-categories was estimated under the EPD Update Study. To estimate the size of these 6 sub-categories for this EIA, it is assumed that the share of each sub-category in the manufacturing sector provided in the Update Study would be the same as that for 2011 and 2016.

4.10 Relevant per head flow and load were assigned to residential, transient, commercial and industrial population to obtain the quantity and quality of total untreated wastewater by individual catchment areas. **Table A-4-8** to **Table A-4-12** shows the flow and load factors.

Table A-4-8 Domestic Flow and Load Factors for Resident Population

Description	Flow [1] (m^3/d/head) 2011	Flow [1] (m^3/d/head) 2016	SS [2]	BOD_5 [2]	TKN [2]	NH_3-N [2]	TP [3]	Cu [3]	*E. coli* [2]
			(all in g/d/head except *E.coli* in no./d/head)						
Usual residents									
Sandy Bay	0.35	0.35	40	42	8.5	5.0	1.33	0.0065	4.3E+10
Stanley, Discovery Bay	0.29	0.29	40	42	8.5	5.0	1.33	0.0065	4.3E+10
Shek O	0.35	0.35	40	42	8.5	5.0	1.33	0.0065	4.3E+10
Outlying Island, Sai Kung	0.27	0.27	40	42	8.5	5.0	1.33	0.0065	4.3E+10
Yuen Long, Mui Wo	0.25	0.25	40	42	8.5	5.0	1.33	0.0065	4.3E+10
Aberdeen, Wan Chai, North Lantau	0.23	0.23	40	42	8.5	5.0	1.33	0.0065	4.3E+10
Sha Tin, Tai Po	0.22	0.22	40	42	8.5	5.0	1.33	0.0065	4.3E+10
San Wai	0.23	0.23	40	42	8.5	5.0	1.33	0.0065	4.3E+10
Wah Fu, Shek Wu Hui, N	0.21	0.21	40	42	8.5	5.0	1.33	0.0065	4.3E+10
Northwest Kowloon, Tuen Mun, Central, North Point	0.2	0.2	40	42	8.5	5.0	1.33	0.0065	4.3E+10
Ap Lei Chau, Chai Wan, Shau Kei Wan, Central Kowloon, East Kowloon, Kwai Chung, Tsing Yi, Tseung Kwan O	0.19	0.19	40	42	8.5	5.0	1.33	0.0065	4.3E+10
Mobile residents	0.19		40	42	8.5	5.0	1.33	0.0065	4.3E+10

Source of reference:
1. Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (Version 1.0), EPD, March 2005
2. DSD Sewerage Manual
3. EPD Update Study

Table A-4-9 Domestic Flow and Load Factors for Transient Population

Description	Flow [1] (m^3/d/head)	SS [2]	BOD_5 [2]	TKN [2]	NH_3-N [2]	TP [3]	Cu [3]	*E. coli* [2]
		(all in g/d/head except *E.coli* in no./d/head)						
Employed population	0.08	34	34	6.7	4.0	1.06	0.0052	3.5E+10
Students	0.04	34	34	6.7	4.0	1.06	0.0052	3.5E+10

Source of reference:
1. Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (Version 1.0), EPD, March 2005
2. DSD Sewerage Manual
3. EPD Update Study

Table A-4-10 Flow and Load Factors for Commercial Activities

Description	Flow [1] (m^3/d/employee)	SS [2]	BOD_5 [2]	TKN [2]	NH_3-N [2]	TP [3]	*E.coli* [2]
		(all in g/d/head except *E.coli* in no./d/head)					
J2 Electricity Gas & Water	0.25	25	53	2.5	0.8	0.53	0
J3 Transport, Storage & Communication	0.1	25	53	2.5	0.8	0.53	0
J4 Wholesale & Retail	0.2	25	53	2.5	0.8	0.53	0
J9 Construction	0.15	25	53	2.5	0.8	0.53	0
J10 Restaurants & Hotels	1.5	25	53	2.5	0.8	0.53	0
J11 Community, Social & Personal Services	0.2	25	53	2.5	0.8	0.53	0

Source of reference:
1. Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (Version 1.0), EPD, March 2005
2. DSD Sewerage Manual
3. EPD Update Study

Table A-4-11 Flow Factors for Industrial Activities

Catchment	Flow [1] (m^3/d/employee)
J1 Manufacturing	
Hong Kong Island (except Aberdeen & Ap Lei Chau), San Po Kong	0.25
North West Kowloon	0.45
East Kowloon, Sha Tin, Lantau Island (except Mui Wo)	0.45
Central Kowloon, North District, Aberdeen, Ap Lei Chau	0.55
Tsuen Wan, Kwai Chung	0.65
Tai Po	0.75
Tuen Mun, Tseung Kwan O, Yau Tong, Cheung Chau, Mui Wo	1
Tsing Yi	1.5
Sai Kung, Yuen Long	2

Source of reference:
1. Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (Version 1.0), EPD, March 2005

Table A-4-12 Load Factors for Industrial Activities

Category	SS [1]	BOD_5 [1]	TKN [1]	NH_3-N [1]	Cu [1]	*E.coli* [1]
	(all in g/d/employee except *E.coli* in no./d/employee)					
J1 Manufacturing						
Food	502	713	39	0	0	0
Textiles	2095	3680	67	0	4.4	0
Leather	115	115	29	7	0.1	0
Paper	2228	2150	33	0	0	0
Manufacturing	355	931	0	0	2.4	0
Machinery	40	90	29	22	0.9	0

Source of reference:
1. EPD Update Study

4.11 Pollution load generation factors for OrthoP and silica are not available. The following assumptions were adopted for calculating OrthoP and silica loading in raw sewage.

- TP to OrthoP is 1.68 based on the actual measurements of raw sewage at Sha Tin STW and Yuen Long STW.
- The silica content is approximately 9 mg/l based on the actual measurements of raw sewage at Sha Tin STW.

5 CONCURRENT DISCHARGES FROM HATS AND OTHER MAJOR STW

5.1 Effluent discharges from the key STW within the modelling areas were considered separately. These key discharges include the effluent flow from SCISTW, PPSTW, SHWSTW, NWNT outfall, SHTSTW and THEES. The effluent concentrations assumed for these discharges are based on the information from recent EIA studies and actual measurements. The methodology for compiling the flow rates of these key STW is given below.

Flow Estimation for 2011 and 2016

5.2 For the purpose of water quality modelling, it was proposed to use the average flow calculated using the unit flow factors from the GESF [1] and the methodologies discussed in Section 3 and Section 4 for the discharge from SCISTW, PPSTW, SHWSTW, NWNT outfall, SHTSTW and THEES. The average flow used for these STW discharges had also taken into account the catchment inflow factors (P_{CIF}) from the GESF as shown in **Table A-4-13** below. Flow from relevant landfills and beach facilities as shown in **Table A-4-4** and **Table A-4-5** was also included in the flow estimation wherever applicable.

Table A-4-13 Catchment Inflow Factors from the GESF

Catchment	Catchment Inflow Factor
Central, North Point, Sandy Bay, Wan Chai, Wah Fu, Central Kowloon, Stanley, Yuen Long, San Wai, North District, Tai Po, North Lantau, Mui Wo	1.00
Chai Wan, Kwai Chung, Tsing Yi, East Kowloon, Tuen Mun	1.10
Sha Tin	1.15
Tseung Kwan O	1.20
Shau Kei Wan	1.25
Aberdeen, Ap Lei Chau, Northwest Kowloon, Sai Kung	1.30
Cheung Chau, Shek O	1.50

5.3 It was assumed that the sewage flow discharged from the catchments of HATS, PPSTW, SHWSTW, NWNT outfall, SHTSTW and THEES was 105% of the total estimated flow that would be generated in the catchment for conservative assessment. For example, as shown in **Table A-4-1**, 10% of the total sewage flow generated in the Wan Chai catchment would be lost to the storm. For the purpose of modelling, 95% of the total flow generated in the Wan Chai catchment was assumed for discharge to the SCISTW for treatment (i.e. 105% of the total flow was used). For regions outside the catchments of SCISTW, SHWSTW, PPSTW, NWNT outfall, SHTSTW and THEES, it was assumed that the total flow would remain 100%.

Flow Estimation for Ultimate Scenario

5.4 It was proposed to use the design plant capacity to calculate the loading discharged from the major STW for 2016 as shown below:

- PPSTW – 558,000 m^3/day
- SHWSTW – 168,937 m^3/day
- YLSTW – 70,000 m^3/day
- SWSTW – 246,000 m^3/day
- THEES – 470,000 m^3/day
- SCISTW – 2,800,000 m^3/day
- SHTSTW – 16,848 m^3/day

6 POINT SOURCE POLLUTION LOADS

6.1 The pollution loads from typhoon shelters, marine culture zones adopted in the EEFS are summarized in **Table A-4-14** and **Table A-4-15**. These pollution loads were included in the water quality model

[1] Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (Version 1.0), EPD, March 2005

under 2011 and 2016 for cumulative assessment. Loading from landfills and beaches that would not be connected to the STW is summarized in **Table A-4-16** and **Table A-4-17**.

Table A-4-14 Pollution Flows and Loads from Typhoon Shelter

Typhoon shelters	Flow (m^3/d)	BOD (g/d)	SS (g/d)	Org-N (g/d)	NH3-N (g/d)	*E.coli* (no./d)	Copper (g/d)	TP (g/d)	OrthoP (g/d)	Silicate (g/d)
Shau Kei Wan	149	41670	39686	3473	4961	4.27E+14	6	1320	785	1279
Sam Ka Tsuen	39	10803	10289	900	1286	1.11E+13	2	342	204	332
Kwun Tong	22	6055	5766	505	721	6.20E+12	1	192	114	186
Causeway Bay	179	50099	47714	4175	5964	5.13E+13	8	1586	944	1538
Yau Ma Tei	184	51643	49183	4304	6148	5.29E+13	8	1635	973	1586
Rambler Channel	36	10032	9554	836	1194	1.03E+13	2	318	189	308
Aberdeen	388	108746	103568	9062	12946	1.11E+14	17	3444	2050	3339
Tuen Mun	138	38643	36803	3220	4600	3.96E+13	6	1224	728	1186
Cheung Chau	166	46597	44378	3883	5547	4.77E+13	7	1476	878	1431
Shuen Wan (Yim Tin Tsai)	49	13712	13059	1143	1632	1.40E+13	2	434	258	421
Sai Kung	81	22794	21709	1899	2714	2.33E+13	4	722	430	700
Chai Wan	44	12347	11759	1029	1470	1.26E+13	2	391	233	379
To Kwa Wan	53	14840	14133	1237	1767	1.52E+13	2	470	280	456

Table A-4-15 Pollution Flows and Loads from Marine Culture Zone

Marine Culture Zone	BOD (g/d)	SS (g/d)	Org-N (g/d)	NH3-N (g/d)	TP (g/d)	OrthoP (g/d)
Sha Tau Kok	42806	124916	10569	38075	2038	1595
Ap Chau	999	2915	247	888	48	37
Kat O	7705	22485	1902	6854	367	287
O Pui Tong	25113	73284	6200	22338	1196	936
Sai Lau Kong	1712	4997	423	1523	82	64
Wong Wan	5351	15615	1321	4759	255	199
Tap Mun	17217	50244	4251	15315	820	642
Kau Lau Wan	2663	7773	658	2369	127	99
Sham Wan	42948	125333	10604	38202	2045	1600
Lo Fu Wat	1284	3747	317	1142	61	48
Yung Shue Au	81330	237341	20081	72343	3872	3031
Leung Shuen Wan	4114	12006	1016	3659	196	153
Tiu Cham Wan	4043	11798	998	3596	192	151
Tai Tau Chau	14934	43582	3687	13284	711	557
Kai Lung Wan	6432	18769	1588	5721	306	240
Kau Sai	10987	32062	2713	9773	523	409
Ma Nam Wat	9536	27829	2355	8482	454	355
Po Toi O	9084	26510	2243	8080	432	339
Po Toi	33579	97990	8291	29868	1599	1251
Sok Kwu Wan	25969	75783	6412	23099	1236	968
Lo Tik Wan	11011	32131	2719	9794	524	410
Ma Wan	50939	148650	12577	45310	2425	1898
Yim Tin Tsai	35552	103750	8778	31624	1693	1325
Cheung Sha Wan	19025	55518	4697	16922	906	709
Yim Tin Tsai (East)	35499	103750	4406	31754	1197	1051
Tung Lung Chau	18996	55518	2358	16992	640	562

Table A-4-16 Pollution Flows and Loads from Landfills

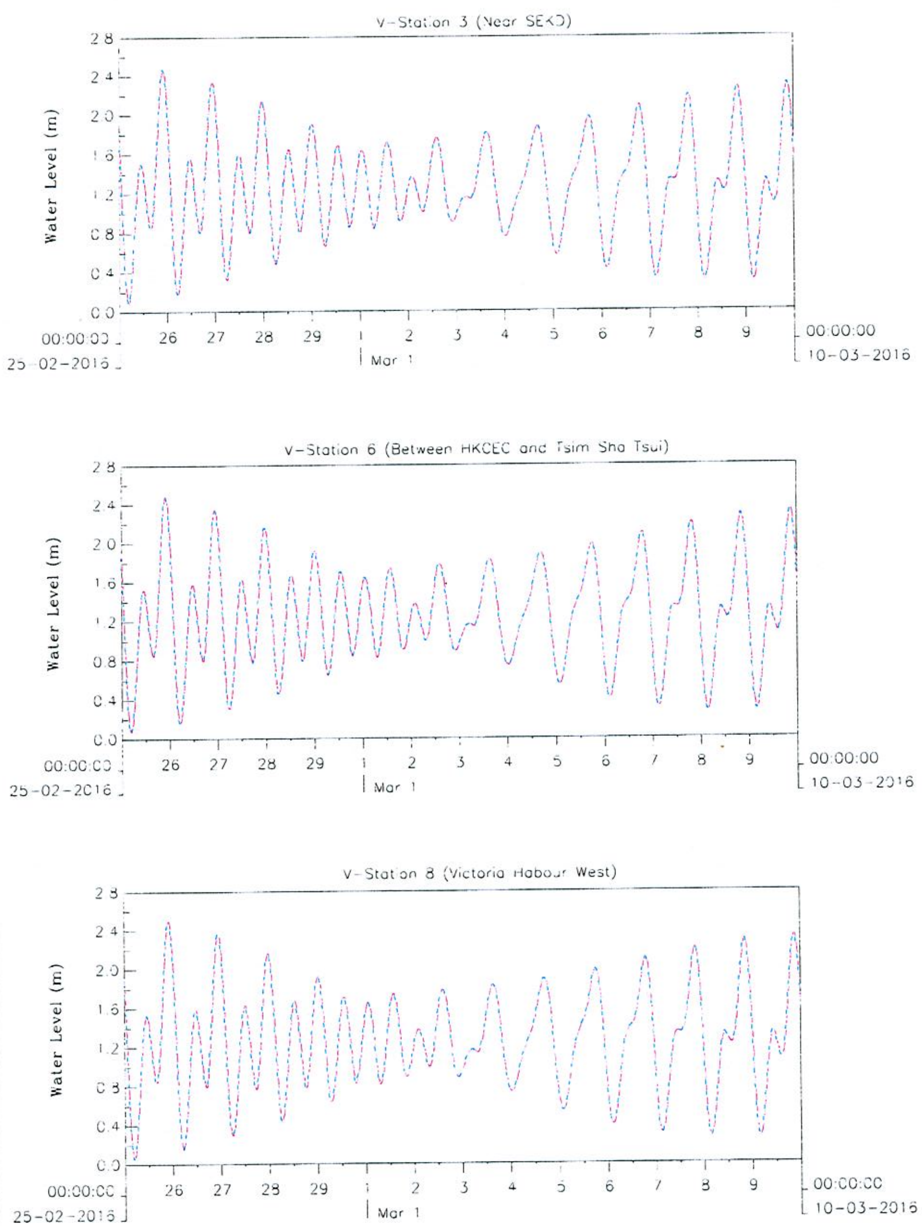
Landfill	Flow (m3/d)	BOD (kg/d)	SS (kg/d)	Org-N (kg/d)	NH_3-N (kg/d)	*E-Coli* (no./d)	Cu (g/d)
Shuen Wan Landfill Leachate seepage into coastal waters	50	10	10	10	90	3.48E+05	1

Table A-4-17 Pollution Flows and Loads from Beaches

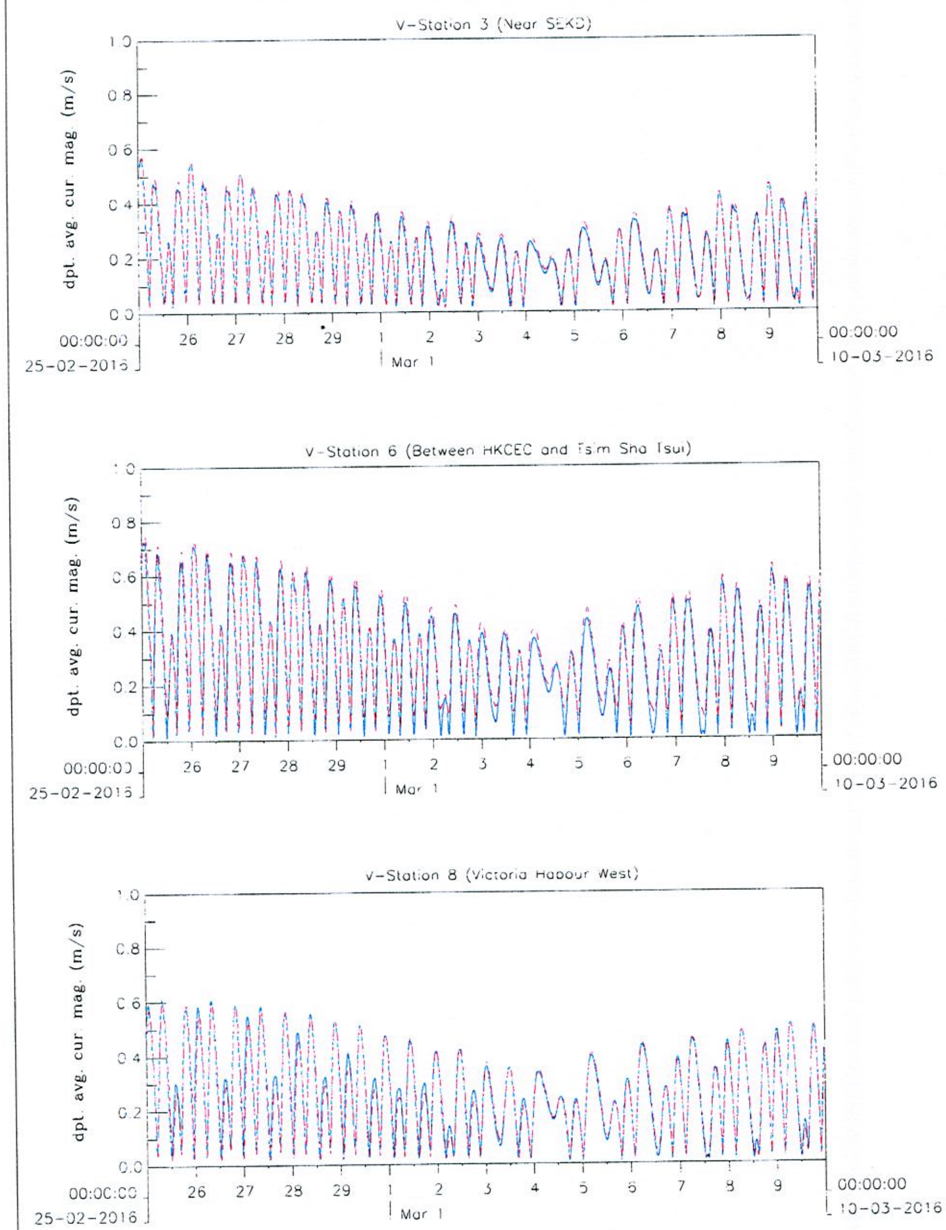
Gazetted Beach	Flow (m^3/d)	BOD (g/d)	SS (g/d)	Org-N (g/d)	NH_3-N (g/d)	*E.coli.* (no./d)	TP (g/d)	OrthoP (g/d)
Cheung Sha Lower	1	245	204	135	307	3.24E+12	70	42
Cheung Sha Upper	0	95	79	52	118	1.25E+12	27	16
Pui O	1	152	126	83	190	2.00E+12	43	26
Tong Fuk	1	188	156	103	234	2.48E+12	53	32
Hap Mun Bay	13	3204	2670	1757	4004	4.23E+13	912	543
Kiu Tsui	1	353	294	194	441	4.66E+12	100	60
Tung Wan, Ma Wan	2	485	404	266	607	6.40E+12	138	82
Clear Water Bay 1st	5	1340	1117	735	1675	1.77E+13	381	227
Clear Water Bay 2nd	46	11385	9487	6246	14231	1.50E+14	3240	1928

Appendix A.5a

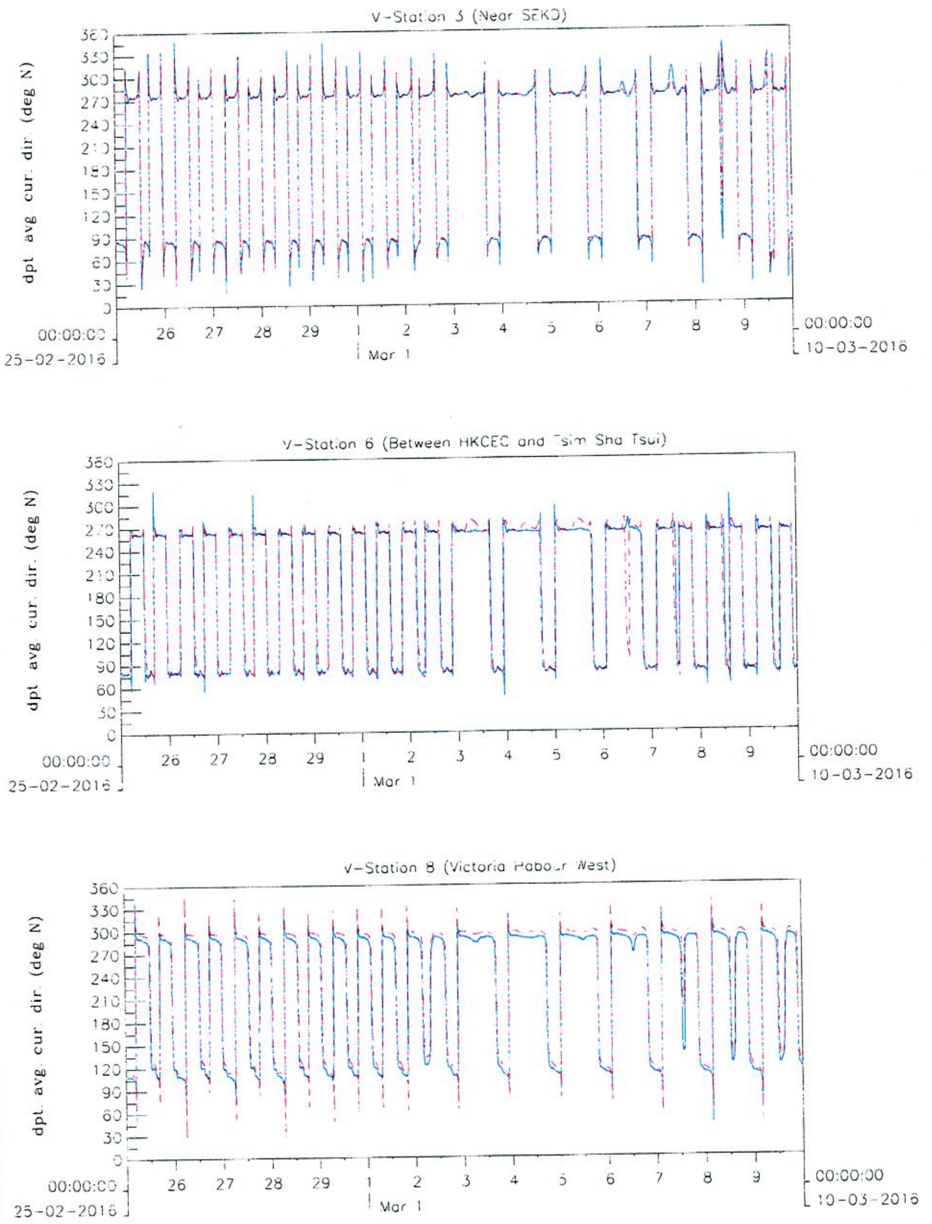
Model Performance Check – Dry Season



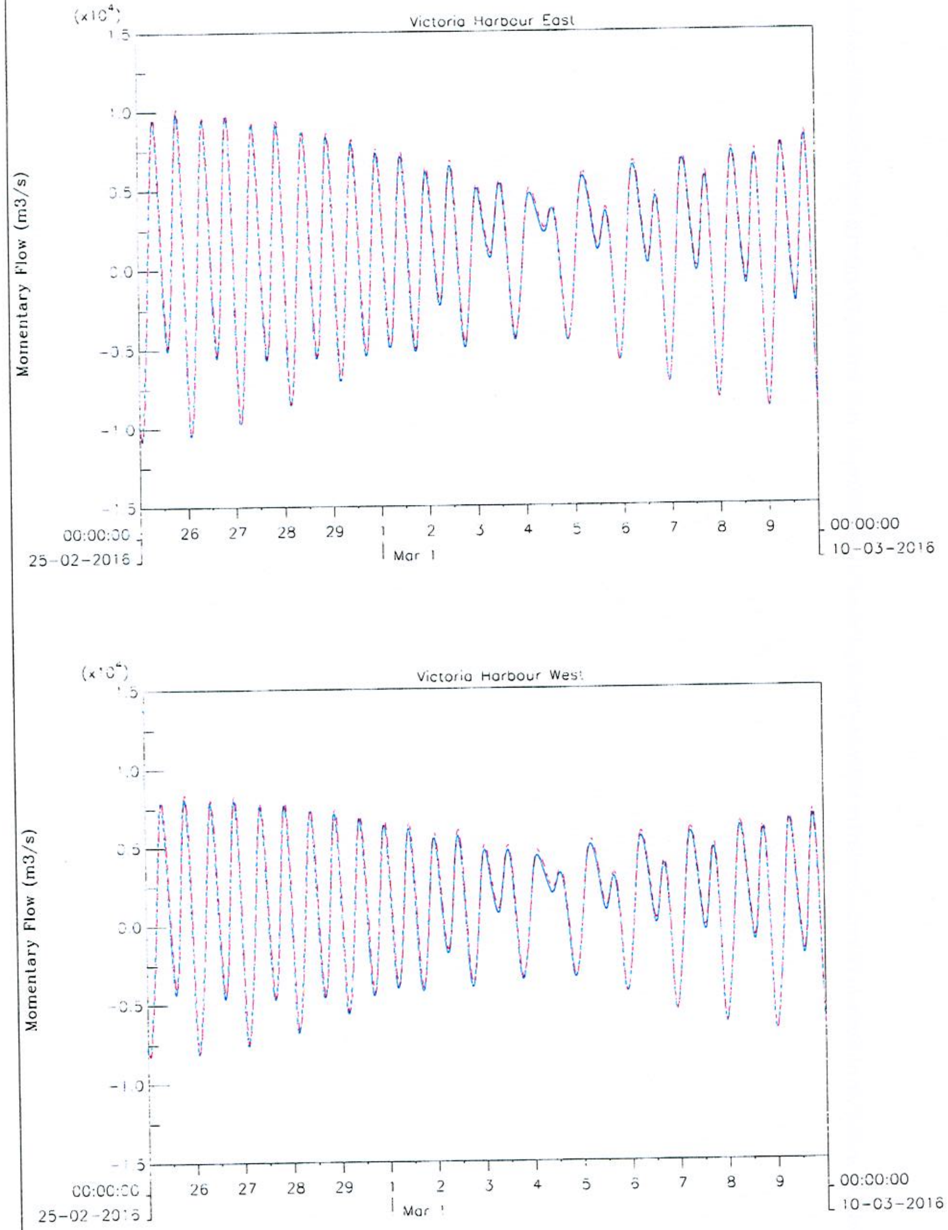
Agreement No. CE54/2001 (CE). Wan Chai Development Phase II: Planning & Engineering Review Water Level at Marine stations within Victoria Harbour Refined VH Model: dashed red; Original VH Model: blue	2016 Dry Season	Feb 2007
	Figure	
MAUNSELL	HD/Detailed/Check/Plot	MPC-Dry.ssn



Agreement No. CE54/2001 (CE). Wan Chai Development Phase II: Planning & Engineering Review Velocity at Marine stations within Victoria Harbour Refined VH Model: dashed red; Original VH Model: blue	2016 Dry Season	Feb 2007
	Figure	
MAUNSELL	HD/Detailed/Check/Plot	MPC-Dry.ssn



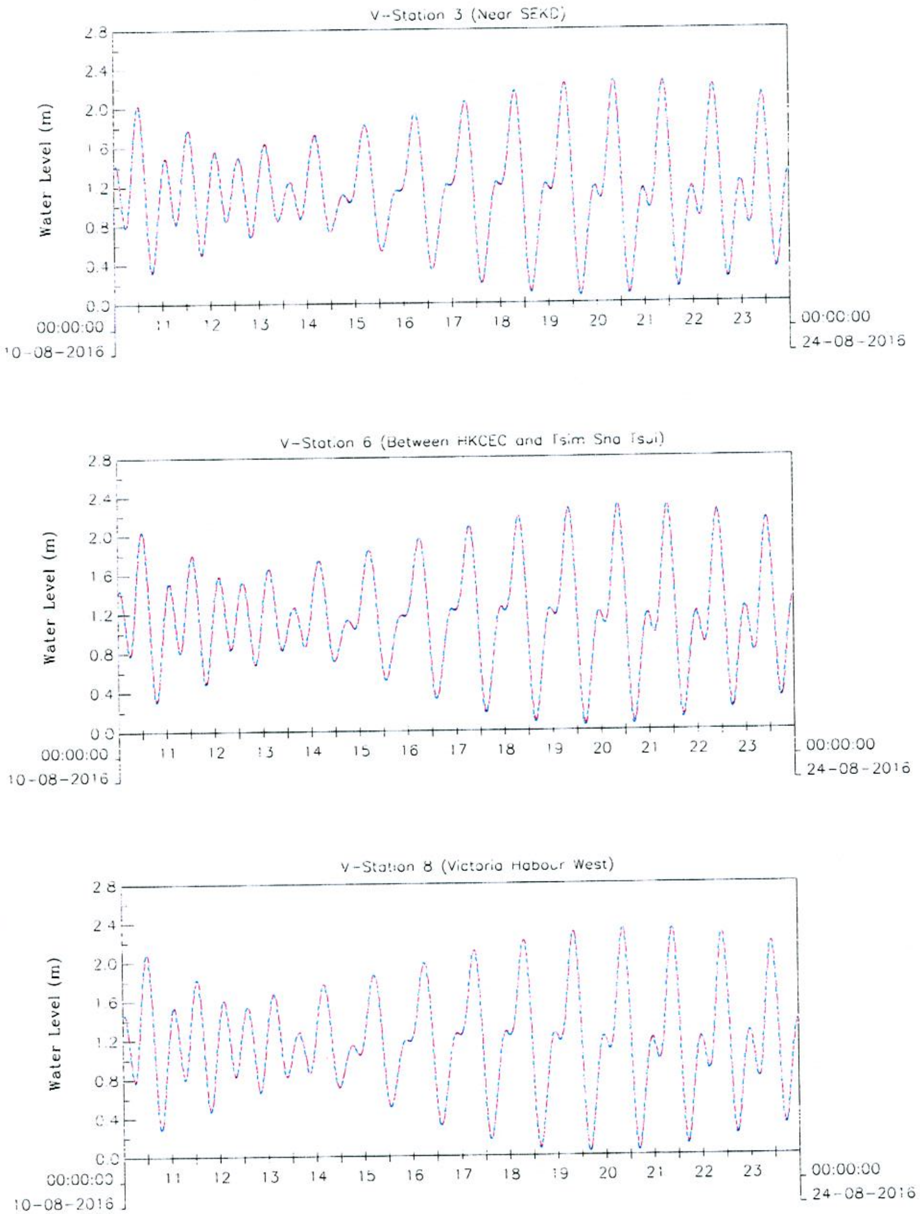
Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review Flow Direction at Marine stations within Victoria Harbour Refined VH Model: dashed red; Original VH Model: blue	2016 Dry Season / Feb 2007 Figure
MAUNSELL	HD/Detailed/Check/Plot / MPC-Dry.ssn



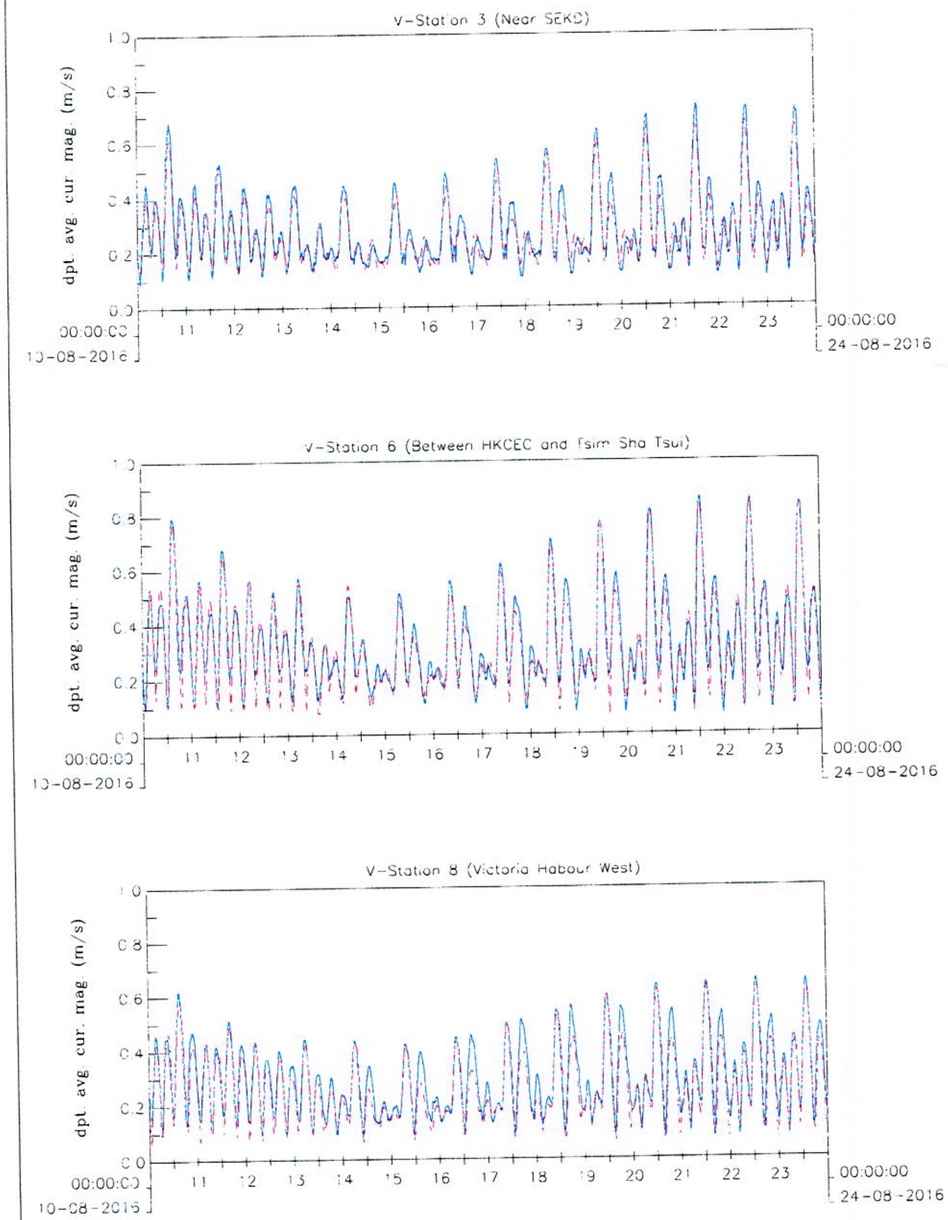
Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review Momentary Flow at Victoria Harbour East and West Refined VH Model: dashed red; Original VH Model: blue	2016 Dry Season / Feb 2007 Figure
MAUNSELL	HD/Detailed/Check/Plot / MPC-Dry.ssn

Appendix A.5b

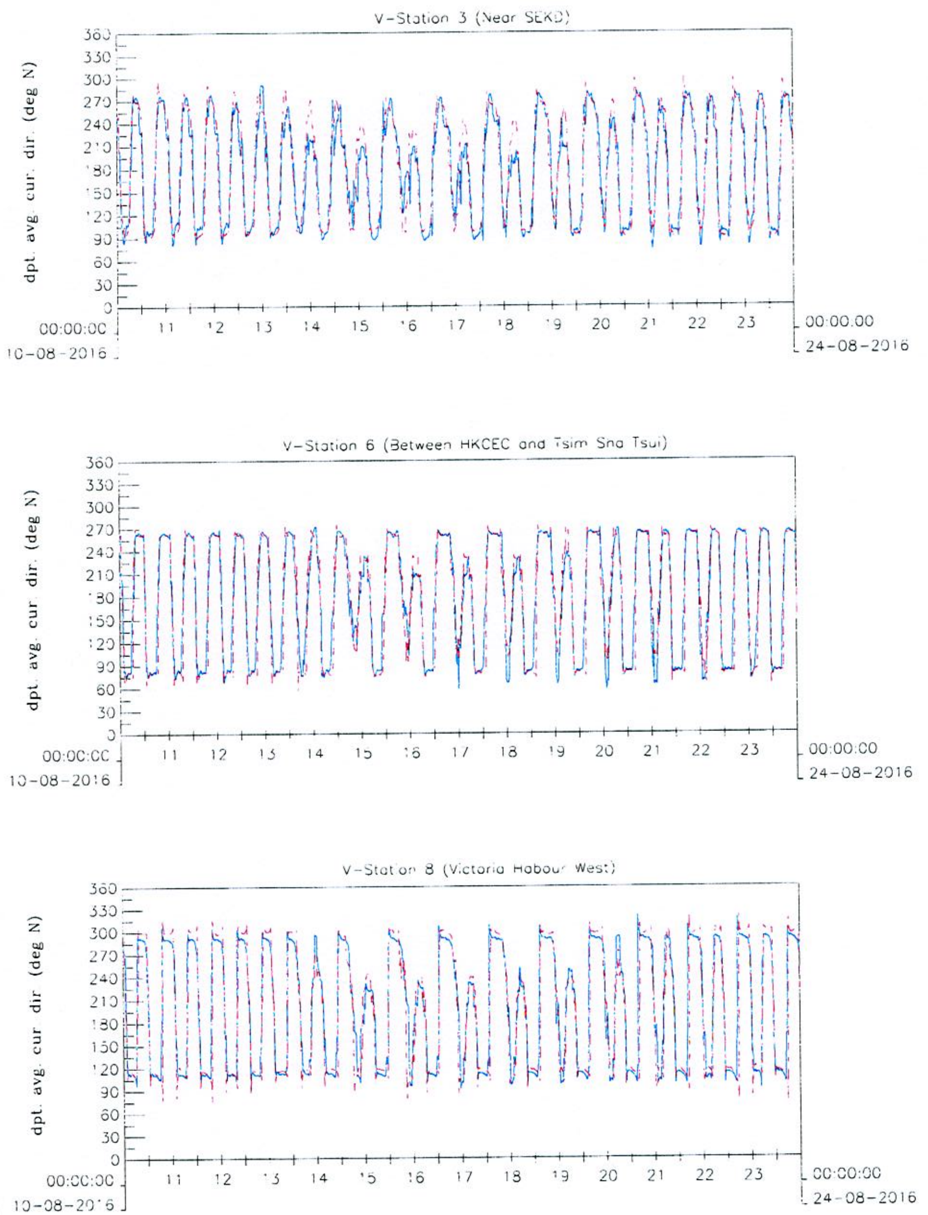
Model Performance Check – Wet Season



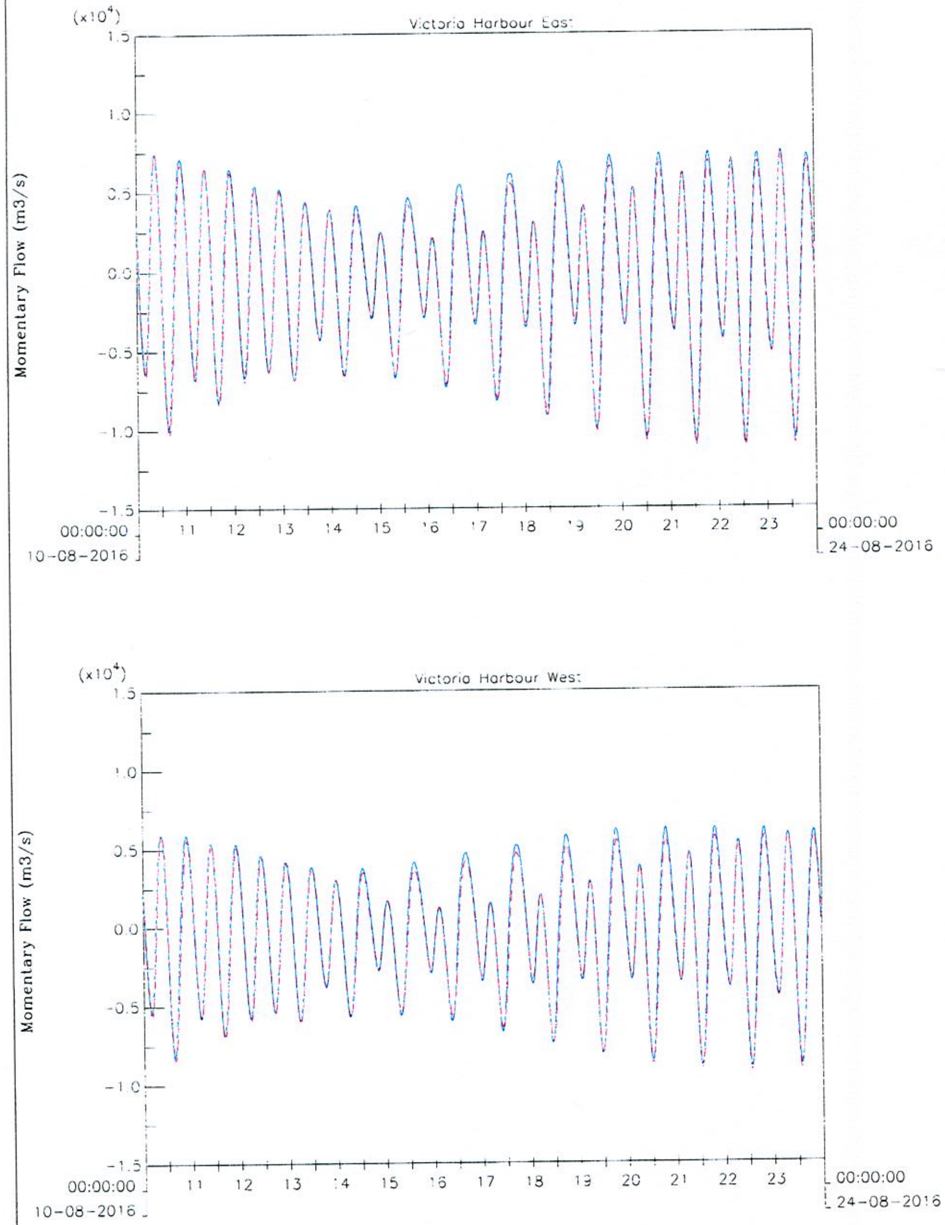
Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review Water Level at Marine stations within Victoria Harbour Refined VH Model: dashed red; Original VH Model: blue	2016 Wet Season	Feb 2007
	Figure	
MAUNSELL	HD/Detailed/Check/Plot	MPC-Wet.ssn



Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review Velocity at Marine stations within Victoria Harbour Refined VH Model: dashed red; Original VH Model: blue	2016 Wet Season	Feb 2007
	Figure	
MAUNSELL	HD/Detailed/Check/Plot	MPC-Wet.ssn



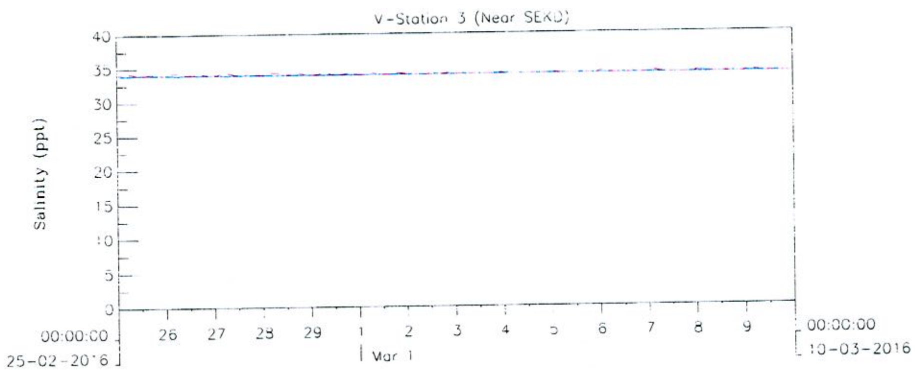
Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review Flow Direction at Marine stations within Victoria Harbour Refined VH Model: dashed red; Original VH Model: blue	2016 Wet Season Figure	Feb 2007
MAUNSELL	HD/Detailed/Check/Plot	MPC-Wet.ssn

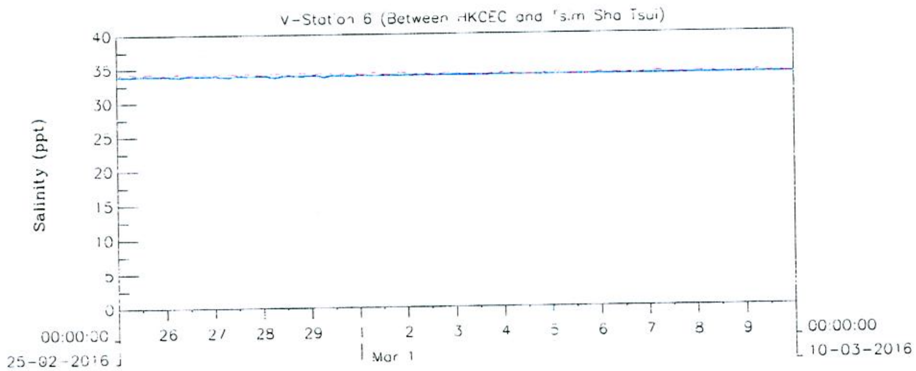


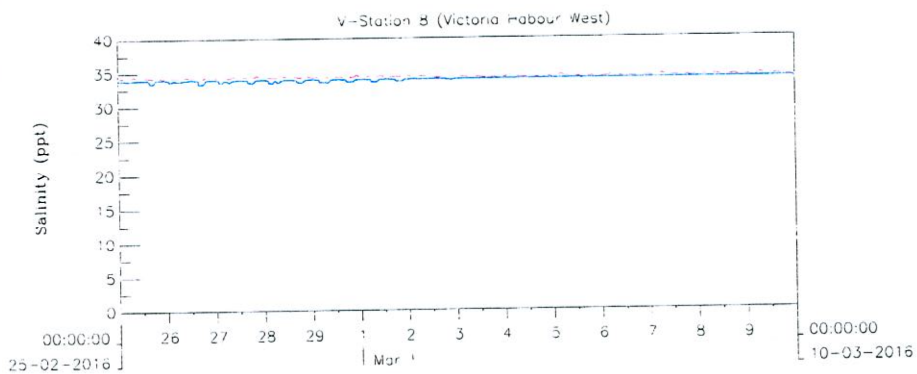
Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review Momentary Flow at Victoria Harbour East and West Refined VH Model: dashed red; Original VH Model: blue	2016 Wet Season Figure	Feb 2007
MAUNSELL	HD/Detailed/Check/Plot	MPC-Wet.ssn

Appendix A.6

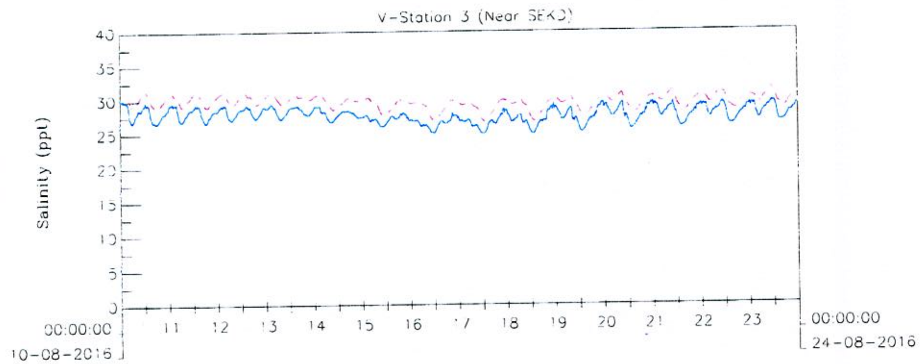
Comparison of Salinity Results

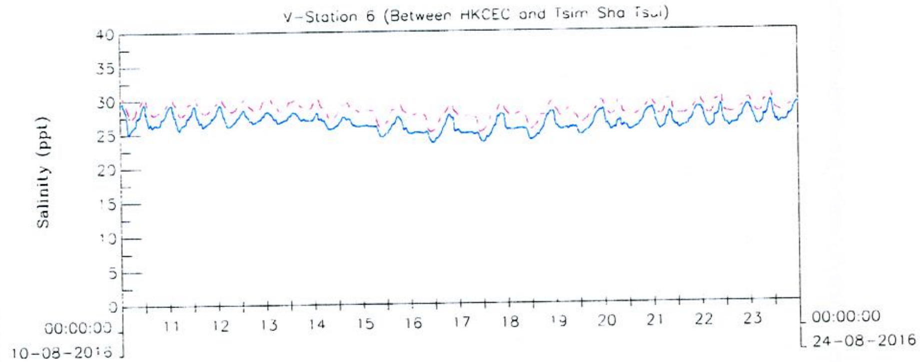


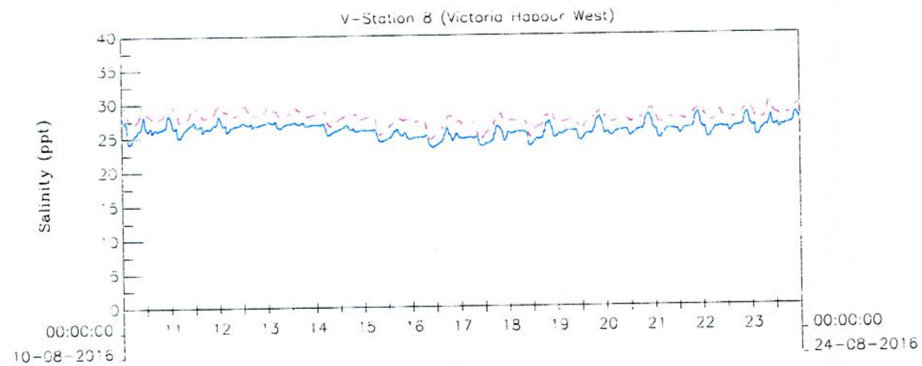




Agreement No. CE54/2001 (CE). Wan Chai Development Phase II: Planning & Engineering Review Surface Salinity at Marine stations within Victoria Harbour Refined VH Model: dashed red; Original VH Model: blue	2016 Dry Season	Feb 2007
	Figure	
MAUNSELL	HD/Detailed/Check/Plot	MPC-Dry.ssn







Agreement No. CE54/2001 (CE). Wan Chai Development Phase II: Planning & Engineering Review Surface Salinity at Marine stations within Victoria Harbour Refined VH Model: dashed red; Original VH Model: blue	2016 Wet Season	Feb 2007
	Figure	
MAUNSELL	HD/Detailed/Check/Plot	MPC-Wet.ssn

Annex I

Derivation of Heat Re-circulation Factor

Annex I Derivation of Heat Re-circulation Factor

It is assumed that all cooling water discharges have an excess temperature of 6°C with reference to the ambient water temperature. Theoretically, the potential short circuit problem of the recirculation of heated water to the cooling water intake should be taken into account by conducting a series of model runs. The first run should be simulated with an excess temperature of 6°C at the spent cooling water outfalls and the second run should be simulated with an excess temperature of 6°C plus the temperature elevation at the intakes predicted in the first-run. More simulations should be iterated with the temperature elevation at the intakes plus temperature at the outfall to reproduce the potential build-up of heat recirculation, until the results converge. Assuming that the temperature elevation at intake is proportional to that at cooling water discharge, the temperature elevation at intake can be derived as follows:

No. of model-run	Temperature of spent cooling water (°C)	Temperature elevation at intake (°C)
1	k	E
2	E+k	(E/k)x(k+E) = E[1+(E/k)]
3	E[1+(E/k)]	(E/k)xE[1+(E/k)] = E[1+(E/k)+(E/k)^2]
... ...	... ...	... ...
n	...	E[1+(E/k)+(E/k)^2+......+(E/k)$^{n-1}$]

Where:

Excess temperature of the cooling system = k (°C)

Mean temperature elevation at intake = E (°C)

The temperature elevation at intake for n-times simulation

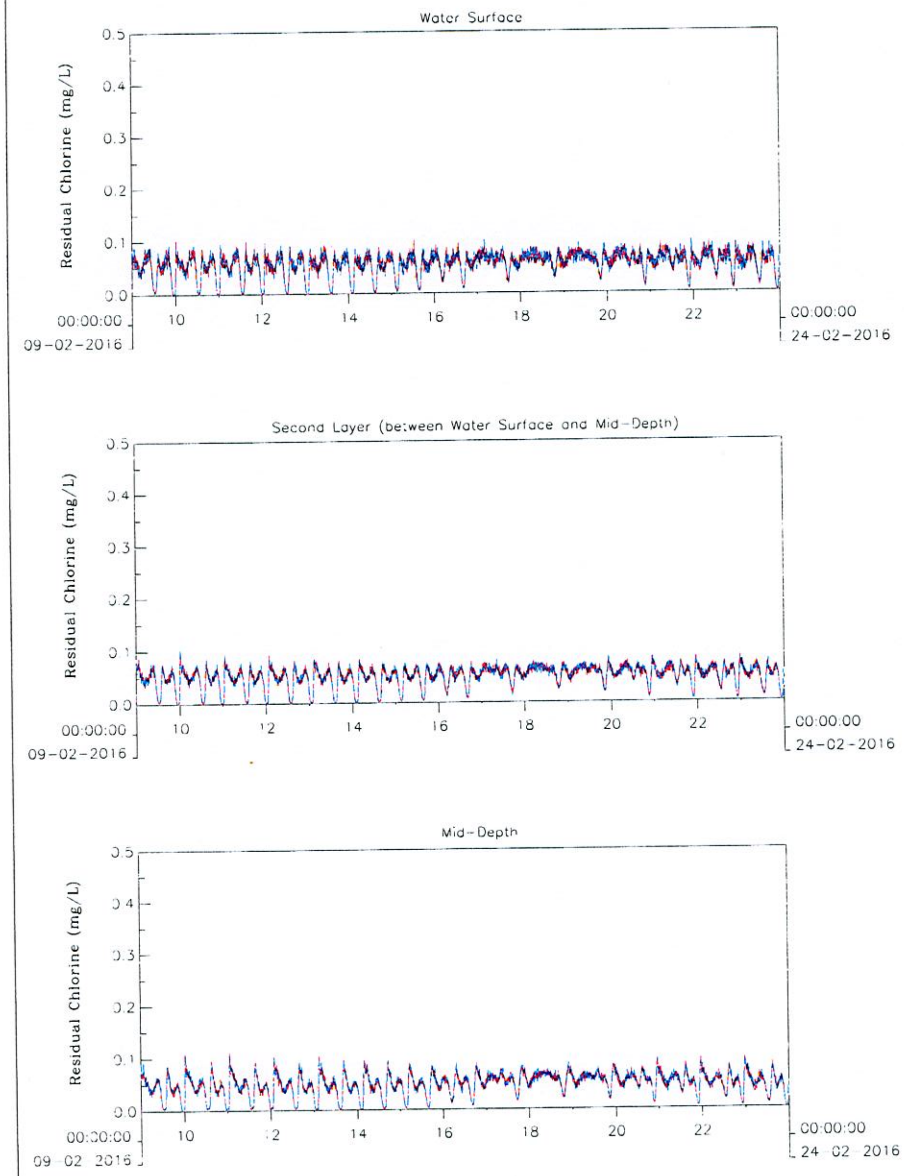
$=E[1+(E/k)+(E/k)^2+......+(E/k)^{n-1}] = E[1-(E/k)^n]/[1-(E/k)]$

For (E/k)<1 and when n tends to infinity, temperature elevation at intake would become E[1/(1-E/k)].

Based on the above consideration, only one model simulation would be required and the resulted temperature elevation at intake can be factored up by [1/(1-E/k)] to account for the potential short circuit problem. Under the current EIA study, the maximum of the mean temperature elevations predicted amongst all the water intakes is conservatively used as the value of E for calculation of the recirculation factor [1/(1-E/k)].

Annex II

Spin-up Check Results for Residual Chlorine



Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review (Supplemental Agreement No.1)

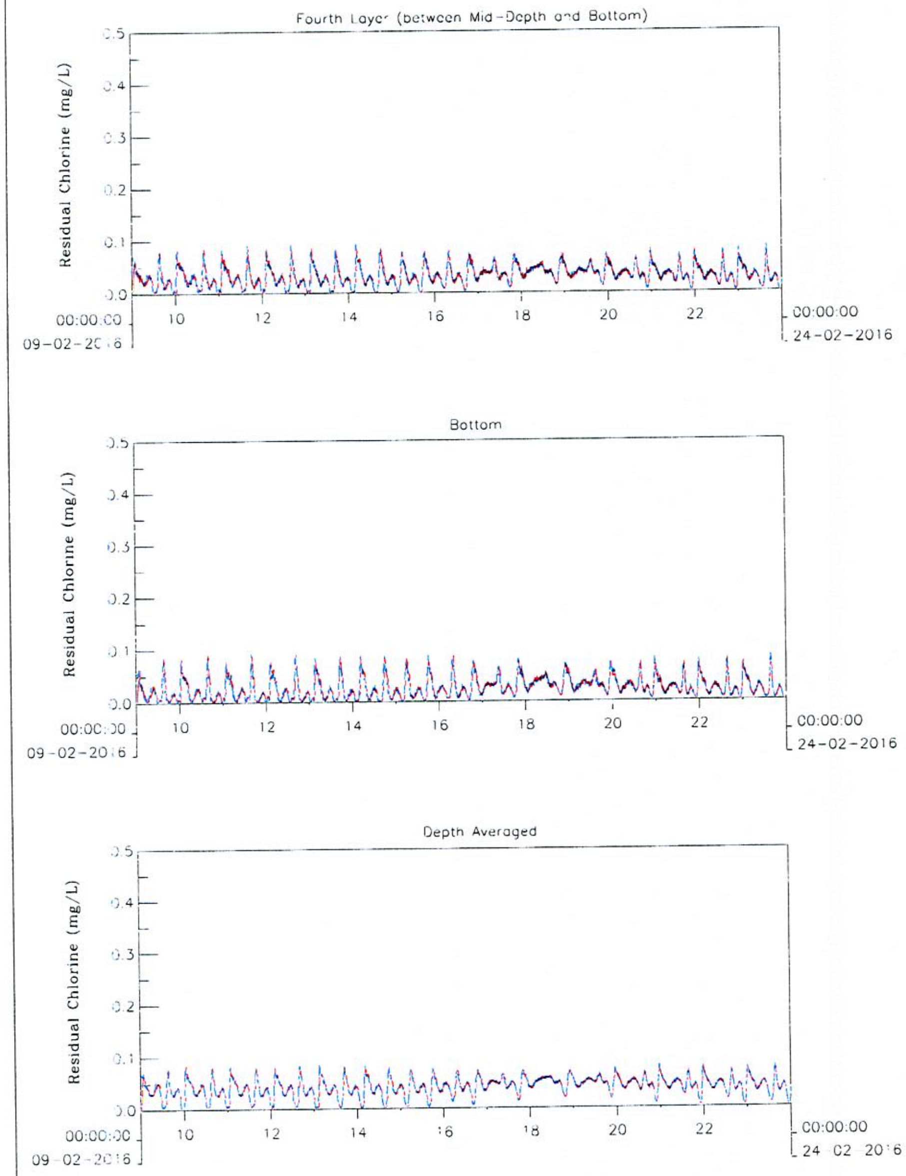
Residual Chlorine at Sun Hung Kai Centre Cooling Water Intake

Red: Spinup; Dashed Blue: Actual Simulation; Upper: Surface; Middle: 2nd layer; Bottom: Mid-depth

2016 Dry Season | Mar 2007

Figure 1

MAUNSELL | A01604/PT/Detailed/Plot | 2016Dry-SCheck.ssn



Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review (Supplemental Agreement No.1)

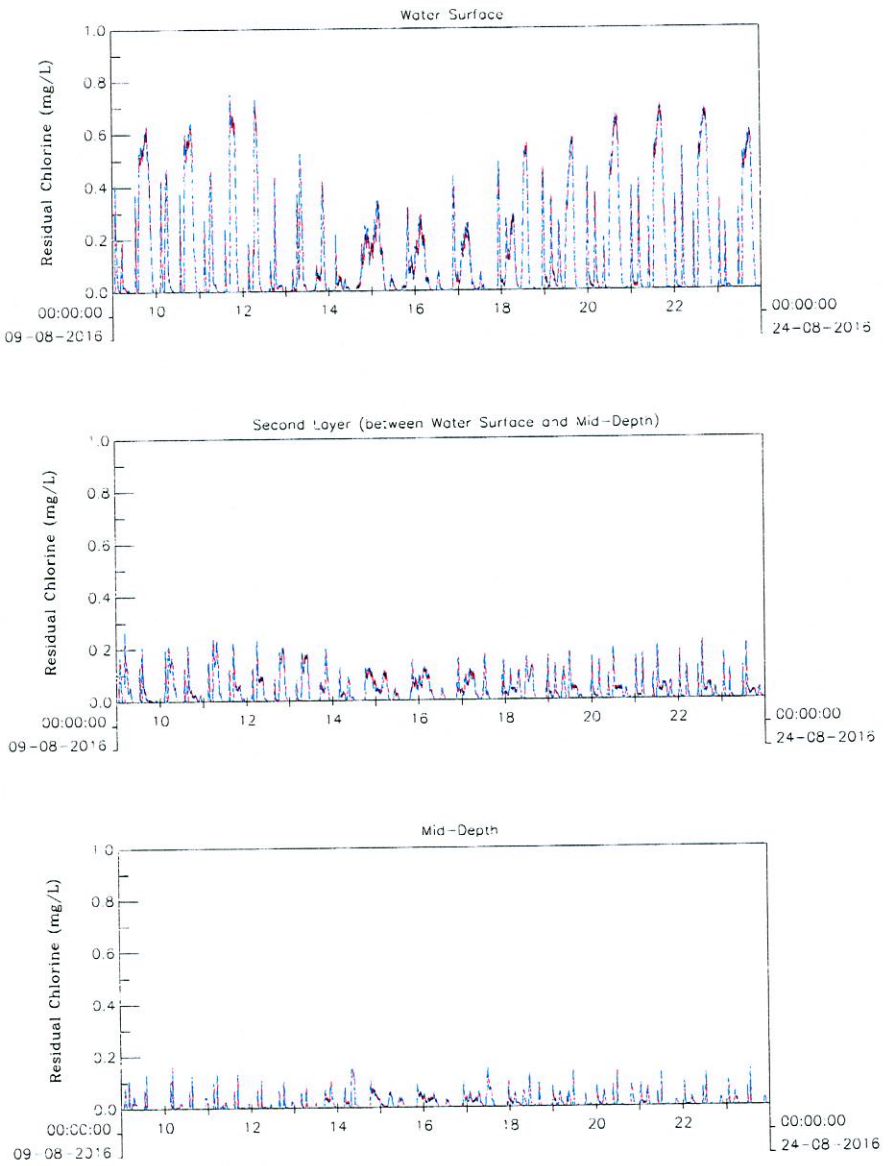
Residual Chlorine at Sun Hung Kai Centre Cooling Water Intake

Red: Spinup; Dashed Blue: Actual Simulation; Upper: 4th layer; Middle: Bottom; Bottom: Depth Averaged

2016 Dry Season | Mar 2007

Figure 2

MAUNSELL | A01604/PT/Detailed/Plot | 2016Dry-SCheck.ssn



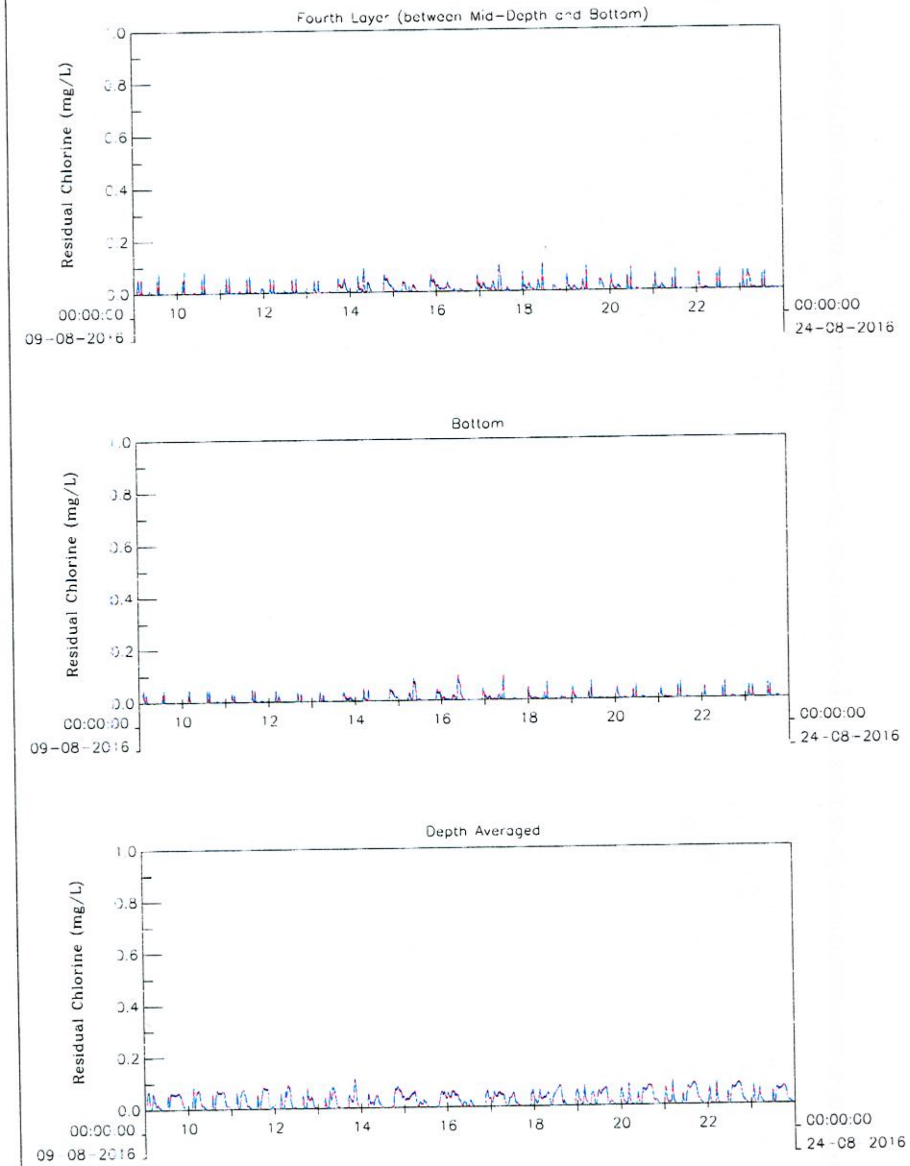
Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review (Supplemental Agreement No.1)

Residual Chlorine at Sun Hung Kai Centre Cooling Water Intake

Red: Spinup; Dashed Blue: Actual Simulation; Upper: Surface; Middle: 2nd layer; Bottom: Mid-depth

2016 Wet Season	Mar 2007
Figure 1	
A01604/PT/Detailed/Plot	2016Wet-SCheck.ssn

MAUNSELL



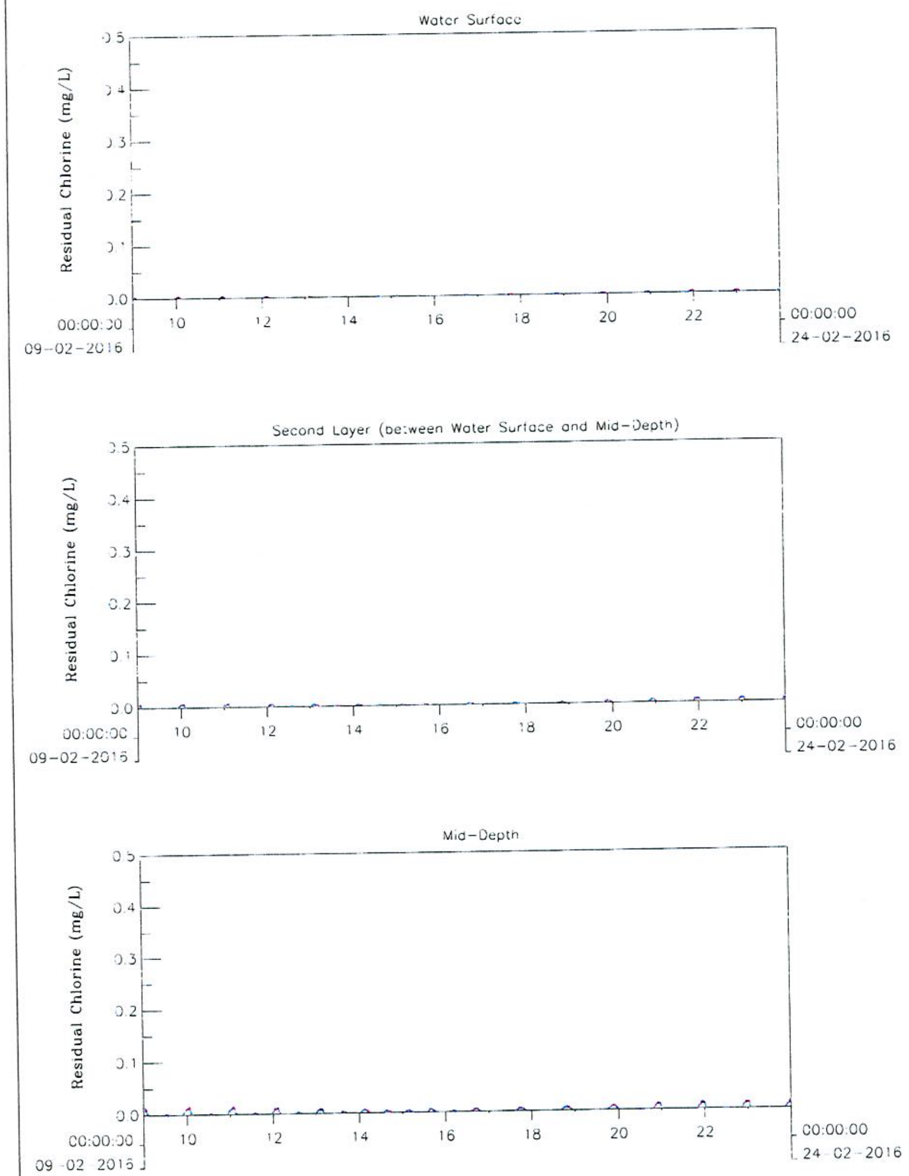
Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review (Supplemental Agreement No.1)

Residual Chlorine at Sun Hung Kai Centre Cooling Water Intake

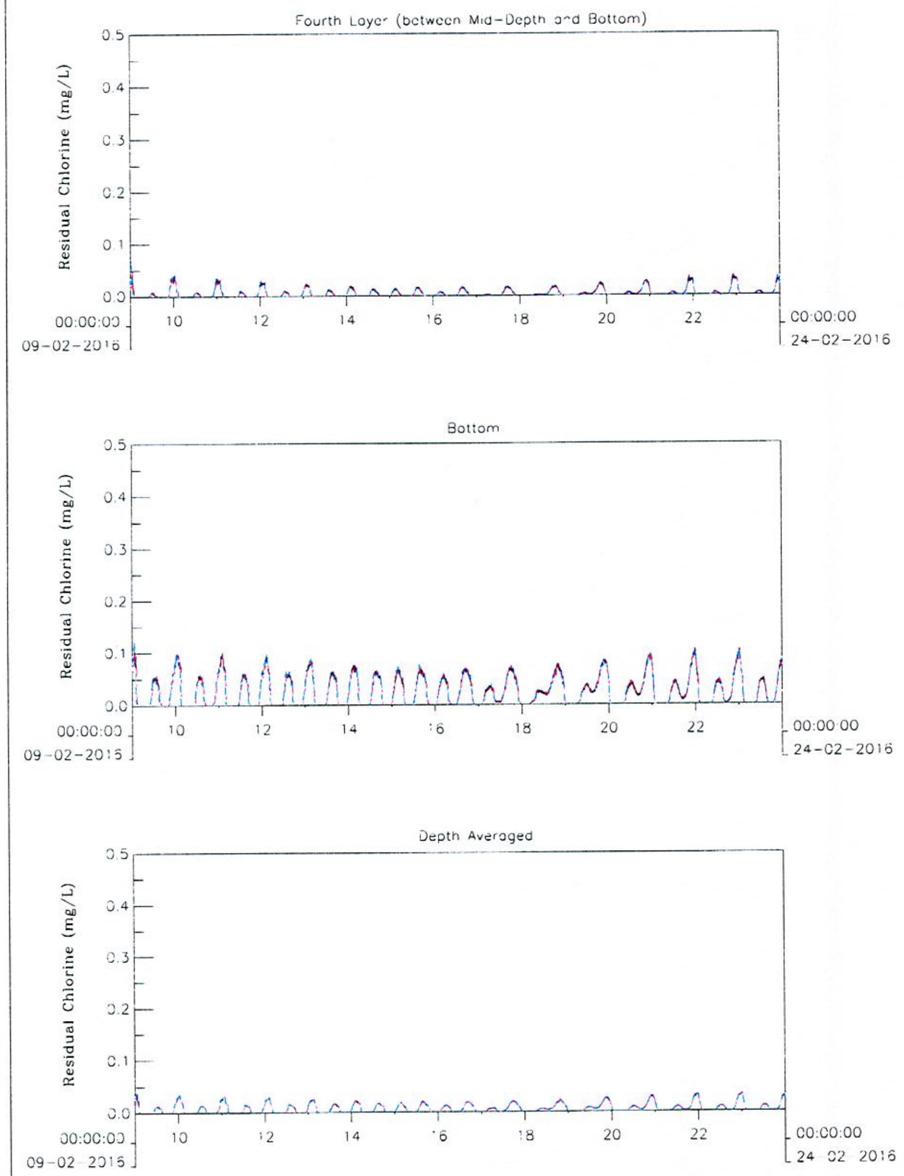
Red: Spinup; Dashed Blue: Actual Simulation; Upper: 4th layer; Middle: Bottom; Bottom: Depth Averaged

2016 Wet Season	Mar 2007
Figure 2	
A01604/PT/Detailed/Plot	2016Wet-SCheck.ssn

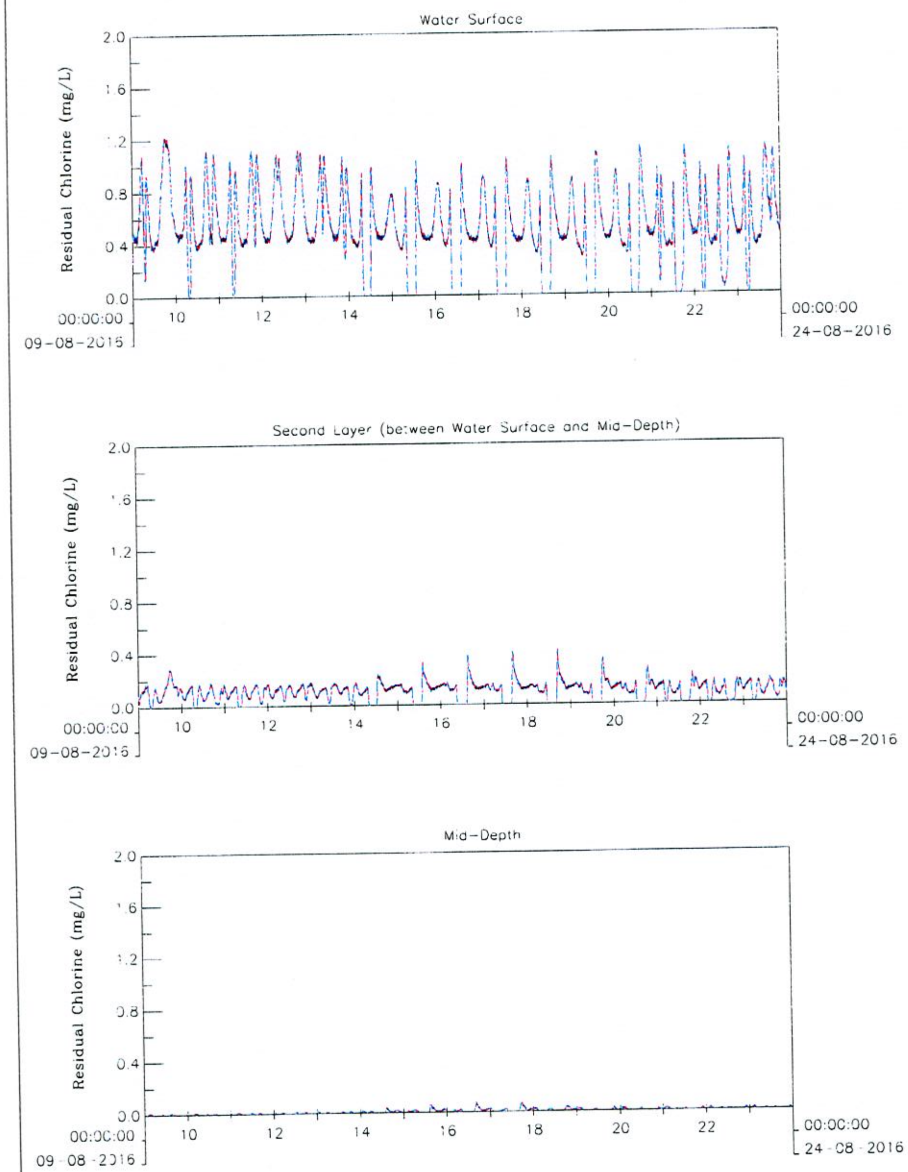
MAUNSELL



Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review (Supplemental Agreement No.1)	2016 Dry Season	Mar 2007
Residual Chlorine at Windsor House Cooling Water Intake Red: Spinup; Dashed Blue: Actual Simulation; Upper: Surface; Middle: 2nd layer; Bottom: Mid-depth	Figure 3	
MAUNSELL	A01604/PT/Detailed/Plot	2016Dry-SCheck.ssn



Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review (Supplemental Agreement No.1)	2016 Dry Season	Mar 2007
Residual Chlorine at Windsor House Cooling Water Intake Red: Spinup; Dashed Blue: Actual Simulation; Upper: 4th layer; Middle: Bottom; Bottom: Depth Averaged	Figure 4	
MAUNSELL	A01604/PT/Detailed/Plot	2016Dry-SCheck.ssn

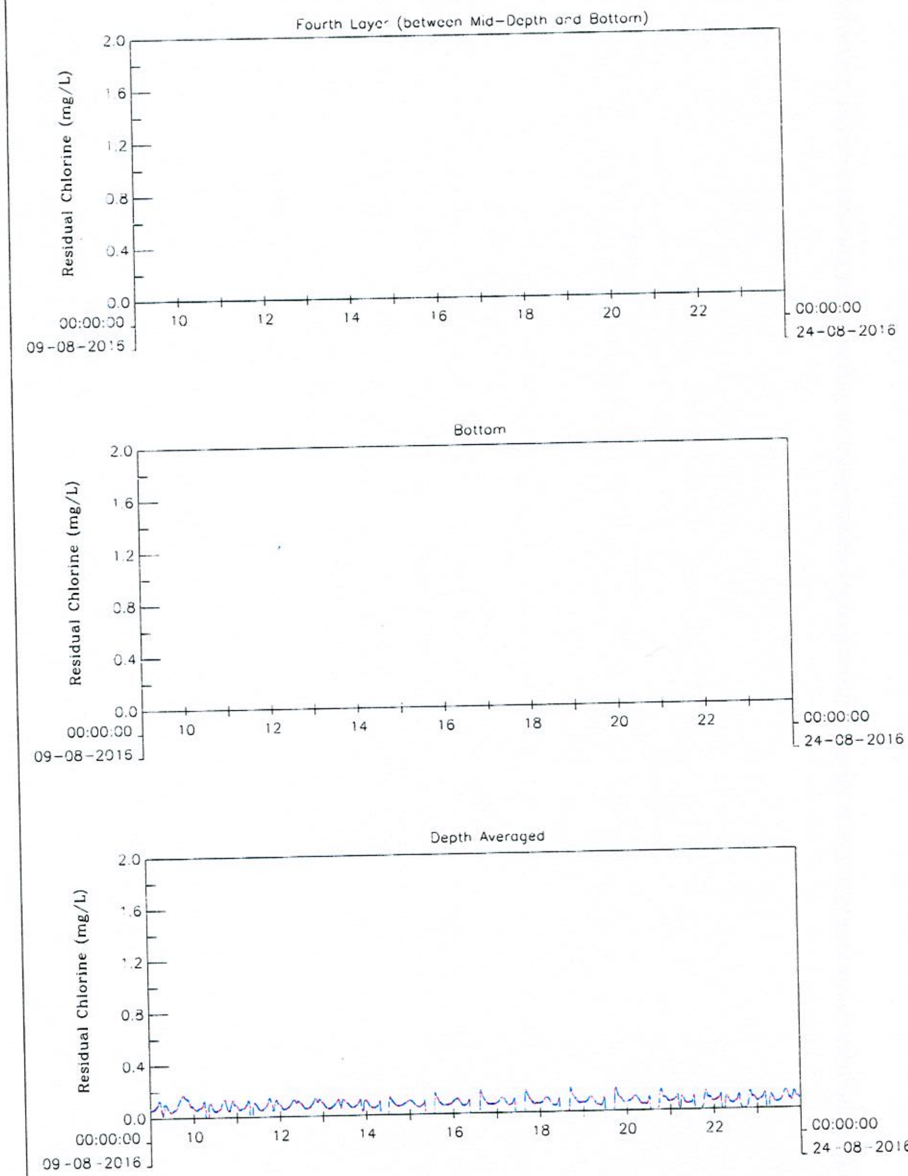


Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review (Supplemental Agreement No.1)

Residual Chlorine at Windsor House Cooling Water Intake

Rec: Spinup; Dashed Blue: Actual Simulation; Upper: Surface; Middle: 2nd layer; Bottom: Mid-depth

2016 Wet Season	Mar 2007	
Figure 3		
MAUNSELL	A01604/PT/Detailed/Plot	2016Wet-SCheck.ssn



Agreement No. CE54/2001 (CE), Wan Chai Development Phase II: Planning & Engineering Review (Supplemental Agreement No.1)

Residual Chlorine at Windsor House Cooling Water Intake

Rec: Spinup; Dashed Blue: Actual Simulation; Upper: 4th layer; Middle: Bottom; Bottom: Depth Averaged

2016 Wet Season	Mar 2007	
Figure 4		
MAUNSELL	A01604/PT/Detailed/Plot	2016Wet-SCheck.ssn

Annex III

Responses to Comment

Wan Chai Development Phase II and Central Wan Chai Bypass EIA Study

<u>Water Quality Impact Assessment Methodology</u>

Comments & Responses

Comments Received	Reference	Letter Date	Page No.
1. Environmental Protection Department	An(4) to EP2/H4/05 Pt.40	8 March 2007	1
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			

Wan Chai Development Phase II and Central Wan Chai Bypass EIA Study

Water Quality Impact Assessment Methodology

Comments & Responses

Comment from: Environmental Protection Department	Date: 8 March 07 Contact: Raymond L Y Lai
Comments	**Responses**
I refer to your letter under reference to seek our agreement on water quality impact assessment methodology as per the requirements in sections 3.4.7.6(g), 3.4.7.6(h), 3.4.7.7(f) and Appendix C of the ETA Study Brief (No. ESB-153/ 2006).	Noted.
Further to the working group meeting held on 6.12.06 among CEDD/Maunsell/EPD and our teleconversations to discuss your previous submissions of water quality impact assessment methodology. Although there are some improvements in the current submission, we note that the submission still requires some supplementary information/clarifications. Please see our technical advisory observations on your submission in Annex.	Noted.
We would like to reiterate that all discussions prior to formal submission under the EIAO shall not absolve the proponent from his responsibility under the EIAO.	Noted.
EPD's Technical Advisory Observations (1) para. 5.118, line 5 - What is the reason for the large difference in spin-up period between hydrodynamic and water quality simulation.	 The spin-up (8 days) of hydrodynamic simulation follows that adopted in the approved EPD Update Model and has been tested under the present EIA Study to be sufficient. For water quality simulation, pollution load discharges are included within the embayment areas (e.g. Causeway Bay Typhoon Shelter) and a longer spin-up of 45 days is required for the model to reach an equilibrium status. Spin-up of water quality simulation has also been tested under the present EIA study to be

<table>
<tr><td></td><td>sufficient. Text will be added in the EIA report to clarify</td></tr>
<tr><td>(2) Table 5.5 - The seawater abstraction rate for the Hong Kong Academy for Performing Arts is missing.</td><td>This table summarizes the information collected under the CFSWDII. The seawater abstraction rate of 3312 m^3 per hour will be inserted in revised text of the EIA report.</td></tr>
<tr><td>(3) para. 6.1.6, line 3 - The consultant give the derivation of the factor, [1(1-E/k)], and also check whether the expression is correct or not.</td><td>An appendix will be provided in the EIA report to show the derivation as follows:

"It is assumed that all cooling water discharges have an excess temperature of 6°C with reference to the ambient water temperature. Theoretically, the potential short circuit problem of the recirculation of heated water to the cooling water intake should be taken into account by conducting a series of model runs. The first run should be simulated with an excess temperature of 6°C at the spent cooling water outfalls and the second run should be simulated with an excess temperature of 6°C plus the temperature elevation at the intakes predicted in the first-run. More simulations should be iterated with the temperature elevation at the intakes plus temperature at the outfall to reproduce the potential build-up of heat recirculation, until the results converge. Assuming that the temperature elevation at intake is proportional to that at cooling water discharge, the temperature elevation at intake can be derived as follows:

<table>
<tr><th>No. of model-run</th><th>Temperature of spent cooling water (°C)</th><th>Temperature elevation at Intake (°C)</th></tr>
<tr><td>1</td><td>k</td><td>E</td></tr>
<tr><td>2</td><td>E+k</td><td>(E/k)x(k+E) = E[1+(E/k)]</td></tr>
<tr><td>3</td><td>E[1+(E/k)]</td><td>(E/k)xE[1+(E/k)] = E[1+(E/k)+$(E/k)^2$]</td></tr>
<tr><td>... ...</td><td>... ...</td><td>... ...</td></tr>
<tr><td>n</td><td>...</td><td>E[1+(E/k)+$(E/k)^2$+......+$(E/k)^{n-1}$]</td></tr>
</table>
Where:
Excess temperature of the cooling system = k (°C)
Mean temperature elevation at intake = E (°C)

The temperature elevation at intake for n-times simulation
$=E[1+(E/k)+(E/k)^2+......+(E/k)^{n-1}] = E[1-(E/k)^n]/[1-(E/k)]$

For (E/k)<1 and when n tends to infinity, temperature elevation at intake would become E[1/(1-E/k)].</td></tr>
</table>

<table>
<tr><td></td><td>Based on the above consideration, only one model simulation would be required and the resulted temperature elevation at intake can be factored up by [1/(1-E/k)] to account for the potential short circuit problem. Under the current EIA study, the maximum of the mean temperature elevations predicted amongst all the water intakes is conservatively used as the value of E for calculation of the recirculation factor [1/(1-E/k)]."</td></tr>
<tr><td>(4) para. 6.1.8 - According to the latest version of DELFT3D-PART manual (version 2.12), thin dams defined in DELFT3D-FLOW model are not recognized in the DELFT3D-PART model, i.e. particles will pass such a thin dam. The consultant should address whether this defect will have any impact on any of the modelling work in this study.</td><td>All kind of structures defined in Delft3D-FLOW affect the velocities. These affected velocities are recognized by Delft3D-PART. Furthermore, thin dams result in zero velocities. Thus, the potential impacts due to this defect should be small.

As mentioned in the methodology paper, Delft3D-PART is a proven model which has been successfully applied in a number of previous EIA studies in Hong Kong including the approved CFSWDII EIA, Northshore Lantau Development Feasibility Study (1) and the Theme Park Development at Penny's Bay EIA Study (2).</td></tr>
<tr><td>(5) para. 6.1.10, line 3 - How the consultant can ensure that a 30-day simulation period for DELFT3D-PART is sufficient to obtain the desired quasi-periodic evolution of residual chlorine simulated by particles?</td><td>Please note that the simulation period of 30 days for Delft3D-PART includes a spin-up period of 15 days and an actual simulation period of 15 days. In order to determine whether the simulation period is adequate, the time series plot of predicted residual chlorine are compared between the spin-up period and the actual simulation period at two locations (one at the Wan Chai waterfront and the other at the Causeway Bay typhoon shelter) (see attached figures). It was found that there is no significant difference in the model results for the 2 successive periods. Therefore, it is considered that the simulation period is acceptable.</td></tr>
<tr><td>(6) para. 6.1.11, line 2 - The consultant should clarify whether "6 minute time step" is the time step for saving model outputs or the time step for the numerical integration of particle trajectories. Also, what is the time step for saving model outputs from DELFT3D-FLOW (i.e. the so-called "com" files).</td><td>The time step used in Delft3D-PART for numerical simulation is 6 minutes.

Delft3D-PART makes use of the information on water flow derived from the Delft3D-FLOW model. Please note that a time step of 1 minute (for numerical simulation) and 6 minutes (for saving model outputs and "com" files) has been applied in the Delft3D-FLOW model.

Text will be added in the EIA report to clarify.</td></tr>
</table>

(1) Scott Wilson (Hong Kong) Ltd. (February 2000). Northshore Lantau Development Feasibility Study (Agreement No. CE 60/96), Final Environmental Impact Assessment Report.

(2) Scott Wilson (Hong Kong) Ltd. (February 2000). Construction of an International Theme Park in Penny's Bay of North Lantau and its Essential Associated Infrastructures, Final Environmental Impact Assessment Report.

(7) para, 7.1.30, 2nd bullet - Is there any reason to assume the grab dredger works 16 hours (instead of 12 hours or alike) per day?	The grab dredger is assumed to work over 16 hours per day in order to maintain the required works rates to meet the tight construction programme. Text will be added in the EIA report to clarify
(8) para. 7.1.33, line 7 - Is the assumption of dredging work for the cruise terminal at Kai Tak spread over 295 days (and the corresponding of dredging volume 3,600 m3/day) realistic? Compared with the dredging rate of 39,000 m3/day assumed in Scenario 2A (i.e. line 10, same para.), 3,600 m3/day is substantially smaller (by an order or magnitude).	There is a typo in this paragraph. The annual dredging volume should read "1,070,000 m^3" (not 10,700,000 m^3) (Reference: Page 3 of the Project Profile for Proposed Cruise Terminal at Kai Tak). Thus the corresponding dredging rate of 3,600 m^3 per day is correct. The worst-case dredging rate of 39,000 m^3/day assumed under Scenario 2A for WDII construction during 2008 has also been checked to be correct (refer to Table 5.10 of the methodology paper).
(9) para.. 10.1.5, last 3 lines - The consultant should justify why using the modelling output from Update Model (without the Project) to drive the Victoria Harbour Model (with the Project). This combination is inconsistent.	Model results conducted under the approved CFSWDII EIA indicated that the net effect of WDII reclamation on the flow regime would be localized within the Victoria Harbour. The CFSWDII EIA was based on a maximum possible extent of reclamation at Wan Chai and Causeway Bay. The current concept plan involves a lesser extent of reclamation and the associated effect on the overall flow in Victoria Harbour should be even smaller. The change of WDII coastline would have little influence at the open boundary in the far field outside the Victoria Harbour. Text will be added in the EIA report to clarify.
(10) para. 12.1.6 - The content of this paragraph is misleading. While the movement of particle is obtained by interpolating velocity field, the velocity field is calculated on the grid and hence its accuracy can significantly be influenced by the grid resolution.	The third and the fourth sentences of this paragraph will be removed.
(11) figure 5.13 - The consultant should double-check the coastline configuration around Tai Ho Wan and Siu Ho Wan of Landau Island,	As shown in Table 5.13, the coastline around north Lantau is based on the approved EIA report for "Northshore Lantau Development Feasibility Study" (EIAO Register No.:AEIAR-031/2000). It should be noted that Tai Ho Wan and Siu Ho Wan are outside the boundary of the detailed VH model in the far field. Possible change of coastline at these areas would unlikely affect the outcome of the water quality modelling. Text will be added in the EIA report to clarify
(12) Appendix AI - The model grid shown in Appendix 5.1-1 near the project area is not fine enough. The consultant should refine it.	It should be noted that the modelling works for this EIA are based on the same model grid as adopted under the approved CFSWDII where both the previous CFSWDII and the current EIA aimed to address the potential impacts of Wan Chai reclamation. As pointed out in S12.1.3 of the methodology paper, CFSWDII assumed that all the existing polluted storm outfalls and spent cooling water outfalls within the Causeway Bay typhoon shelter would be permanently

	decommissioned and these outfalls would be diverted outside the typhoon shelter. This is deviated from the current concept plan that these existing outfalls would remain inside the typhoon shelter and no outfall diversion would be provided. Hence, there would be a potential concern on the operational phase water quality in the embayment of typhoon shelter under the current Study. As mentioned in S12.1.3 of the methodology paper, the model grid has been refined under the present EIA with a higher resolution of 50 m x 50 m in the typhoon shelter and adjacent waters (as compared to the EIA SB requirement of 75 m x 75 m) to address the deviation from the approved CFSWDII. Therefore, the grid resolution as presented in Appendix A.1 of the methodology paper is considered sufficient.
(13) Table A-4-7 - It is advisable to adopt the updated findings of HATS EEFS for the treatment efficiency of CEPT (with and without disinfection).	Please refer to Table 5.14 of the methodology paper for the assumed effluent concentration for HATS which is based on the information provided in the Final Study Report of the EEFS.
(14) It is suggested to add a table summarizing all the scenarios and their significance in the report. The present way of presentation is somewhat confusing.	A summary table will be provided accordingly.
Minor Issues: (15) para. 6.1.6, line 2 - Does the background temperature refer to the sea or air temperature?	It refers to the sea water temperature. Text will be added in the EIA report to clarify
(16) para. 6.1.12, lines 3-4 - Explanation should be given for the large difference in the values of decay factor T90.	The adopted T90 factor is based on the assumption used under the approved EIA for Tai Po Sewage Treatment Works Stage V. Upon our review of relevant past EIA studies, this T90 factor is the most conservative value and was therefore applied to the model for conservative assessment. Text will be added in the EIA report to clarify. Footnote 2 of Table 5.8 will be amended as "Reference: Tai Po Sewage Treatment Works Stage V EIA Study"
(17) para. 6.1.13, line 3 - It should be remarked that 2,800,000 m3 per day is the design flow of HATS.	A remark will be added in the EIA report accordingly.
(18) para. 7.1.27, line 2 - Is there any reason why the consultant uses DELFT3D-PART, instead of the SED module in DELFT3D-WAQ?	Both Delft3D-PART and Delft3D-WAQ have pros and cons. As mentioned in our response in Item (4) above, Delft3D-PART is an

	approved model which has been used for sediment plume modelling under the CFS WDII EIA and other approved EIAs. Delft3D-PART is used under the current EIA which is consistent with the past approved CFSWDII studies.
(19) para. 7.1.35, line 1 - Does "depth-averaged" refer to the average over the water column or the sediment column? If it is the latter, what depth of sediment is assumed?	Based on the latest assessment approach, calculation of oxygen depletion (due to sediment plume) was performed using the highest level of 5-day SOD measured in the sediment samples collected during the SI for conservative predictions. Based on the SI results, the highest SOD was measured at the surface sub-sample of a station located within the HKCEC water channel. Details of the SI are given in the draft EIA report. This latest assessment approach has been reflected in the draft EIA report.
(20) para. 8.1.17-8.1.20 - The location of East Bridge, West Bridge and Seafront Promenade should be indicated in one of the relevant figures. Also, it is advisable to show the piling layout.	The relevant pile layouts will be included in the revised EIA as appendix.
(21) para. 11.1.4, line 1 - The consultant should remark that the readers should refer to Table A-4-1 for the location of catchments WCE and WCW.	A remark will be added accordingly.
(22) para. 12.1.3 - The consultant should give a more explicit description of the difference in the model implementation associated with the different way of outfall diversion assumed in CFSWDII EIA and the present study.	Please note that there would be no diversion of existing outfalls within the Causeway Bay typhoon shelter under the current EIA. Please also see our response in Item (12) above. On the other hand, the existing outfalls in Wan Chai and HKCEC areas would need to be extended to the new reclamation limit under the current Study which is similar to that assumed under the CFS WDII EIA.
(23) Appendix A-4, para 4.3, line 1 - It is not clear what the four time horizons are.	"**four** time horizons" should read "**two** time horizons"
(24) Table A-4-18 - Should read Table A-4-13. The ensuing table numbers should be adjusted accordingly.	The table number will be amended accordingly.

Annex 15.4

Prior Agreement on
Waste Management Implications
From EPD

Urgent by Fax

MEMO

From	Director of Environmental Protection	To	Project Manager/HKI&I, CEDD
Ref.	in EP2/H4/S3/15	(Attn.:	Mr. C. K. Lam)
Tel. No.	2835 1155	Your Ref.	in HKI 2/4/50 EI
Fax. No.	2591 0558	dated	11.6.07 Fax. No. 25775040
Date	12 June 2007	Total Pages	2

Environmental Impact Assessment Ordinance (EIAO)
Project Title: Wan Chai Development Phase II and Central-Wan Chai Bypass
EIA Study Brief No. 153/2006
Marine Site Investigation

I refer to your memo under reference on the above subject and a letter from your consultant, Maunsell (ref: 60017193/C/JEC705091) submitting the proposal on field investigation, sampling and chemical and biological laboratory tests for our agreement under Sections 3.4.7.7(I)(a) and 3.4.9.2(iii) of the EIA Study Brief No. ESB-153/2006. A letter from Maunsell (ref: 60017193/C/JEC705111) dated 11 May 207 to us copied to you further clarified that all reclamation areas are proposed to be fully dredged and thus potential generation of biogas underneath the reclamation area is unlikely an issue and investigation of potential biogas problem is considered not necessary with regard to Section 3.4.9.2(iv) of the EIA Study Brief.

2. Please be informed that after taking into the advice from our water quality and waste assessment teams, the submitted proposal is considered as acceptable. As such, agreements are hereby given under the following requirements of the captioned EIA Study Brief:

Reference in the Study Brief Stipulating the Requirements	**Description**
Section 3.4.7.7(I)(a)	Water Quality Impact Ranges of parameters to be analyzed; the number, location, depth of sediment, type and methods of sampling; sample preservation; and chemical laboratory test methods to be used
Section 3.4.9.2(iii)	Waste Management Implications Ranges of parameters to be analyzed; the number, type and methods of sampling; sample preservation; chemical and biological laboratory test methods to be used

3. Please note that above agreements are only for the concerned requirements under the EIA Study Brief and shall not prejudice the EPD's final decision on approval of the EIA report to be submitted under the EIAO. If there is any significant change in circumstances, project design/details or assessment methodology/assumptions, etc. CEDD and its consultant should review the situations; carry out necessary updating/revisions; and seek our advice whether further agreements under the EIA Study Brief are necessary.

4. You are also reminded that the requirements on documentations of key assessment assumptions, limitations of assessment methodologies and related prior agreement(s) with the DEP as stipulated under Section 3.4.14 of the EIA Study Brief.

(Victor YEUNG)
Senior Environmental Protection Officer
for Director of Environmental Protection

c.c.:

Maunsell	(Attn: Mr. Freeman Cheung	Fax:	28910305
	and Mr. Peter Check)	Fax:	26912649

c.c. internal: S(MA)5, E(RA)43, E(MA)31

MAUNSELL | AECOM

Maunsell Environmental Management Consultants Ltd
11/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong
茂盛環境管理顧問有限公司
香港新界沙田鄉事會路 138 號新城市中央廣場 2 座 11 樓
T +852 2893 1551 F +852 2891 0305 www.maunsell.aecom.com

Your Ref.:
Our Ref.: 60017193/C/JEC705111

A01604

FAXED
DATE: 11-5-07

By Fax (2591 0558) and Post

Environmental Protection Department
Metro Assessment Group
27th floor, Southorn Centre,
130 Hennessy Road,
Wan Chai, Hong Kong

Attn : Mr. Raymond Lai

11 May 2007

Dear Sir,

Wan Chai Development Phase II and Central-Wan Chai Bypass – EIA Study

Further to our letter dated 9 May 2006 (our ref. 60017193/C/JEC705091) on the field investigation, sampling and chemical and biological laboratory tests to characterize the marine sediment and the potential for the release of contaminants during dredging and our telecon this morning, we confirm that there is no need to carry out biogas investigation for the captioned EIA Study.

As clarified in our letter to EPD/MAG dated 2 February 2007 (our ref. A01604/C/JEC7020201), all reclamation areas are proposed to be fully dredged and thus potential generation of biogas underneath the reclamation area is not an issue. Thus investigation of potential biogas problem is not necessary with regard to Section 3.4.9.2 (iv) of the EIA Study Brief (ESB-153/2006).

Should you need any further clarification or information, please feel free to contact Ms Jane Carbray at 3105 8509. Thank you for your attention.

Yours faithfully
for and on behalf of
Maunsell Environmental
Management Consultants Ltd

Freeman Cheung
Executive Director

cc	CEDD – CK Lam	By fax (2577 5040)
	MCAL - Peter Cheek	By fax (26912649)

MAUNSELL | AECOM

Maunsell Environmental Management Consultants Ltd
11/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong
茂盛環境管理顧問有限公司
香港新界沙田鄉事會路138號新城市中央廣場2座11樓
T +852 2893 1551 F +852 2891 0305 www.maunsell.aecom.com

Your Ref.: An(4) to EP2/H4/05 Pt. 43
Our Ref.: 60017193/C/JEC705091

A01604

By Fax (2591 0558) and Post

Environmental Protection Department
Metro Assessment Group
27th floor, Southorn Centre,
130 Hennessy Road,
Wan Chai, Hong Kong

Attn : Mr. Raymond Lai

9 May 2007

Dear Sir,

Wan Chai Development Phase II and Central-Wan Chai Bypass – EIA Study

We refer to your letter ref. An(4) to EP2/H4/05 Pt. 43 dated 3 May 2007 and note that you have no major comment on our responses-to-comments with regard to the field investigation, sampling and chemical and biological laboratory tests to characterize the marine sediment and the potential for the release of contaminants during dredging as per the requirements in Section 3.4.7.7 (I) (a) and Section 3.4.9.2 (iii) of the EIA Study Brief (ESB-153/2006).

We note your minor comment on the proposed test of TBT and have addressed this comment in para. 3.20 of the revised survey proposal.

As requested we have incorporated our responses in the survey proposal and submit the revised survey proposal for your formal agreement. We should be grateful if you would confirm that the scope and methodology of the field investigations and laboratory tests for the water quality impact assessment and waste management implications assessment for the EIA Study is acceptable by 18 May 2007.

Should you need any further clarification or information, please feel free to contact Ms Jane Carbray at 3105 8509. Thank you for your attention.

Yours faithfully
for and on behalf of
Maunsell Environmental
Management Consultants Ltd

Freeman Cheung
Executive Director

cc	CEDD – CK Lam	By fax (2577 5040)
	MCAL - Peter Cheek	By fax (26912649)

The Government of the Hong Kong Special Administrative Region

Civil Engineering and Development Department

Supplemental Agreement No. 1
to
Agreement No. CE 54/2001 (CE)

Wan Chai Development Phase II
Planning and Engineering Review

SURVEY PROPOSAL

Maunsell Consultants Asia Ltd.

6 June 2006

TABLE OF CONTENTS

1. INTRODUCTION

Background

1.1 The Government commissioned a comprehensive feasibility study for Wan Chai Development Phase II (WDII) project (the "WDIICFS") in June 1999 and completed in August 2001. An Environmental Impact Assessment (EIA) Report for the WDII Study, which contained the environmental assessment of the proposed works, was approved under Environmental Impact Assessment Ordinance (EIAO) in 2001 (Application No. EIA-058/2001).

1.2 In March 2004, Civil Engineering and Development Department (CEDD) commissioned Maunsell Consultants Asia Limited (MCAL) to conduct a planning and engineering review (the "Review") of development and reclamation proposals for the WDII project in accordance with the judgment of the CFA in the judicial review on the decisions of the TPB in relation to the draft Wan Chai North OZP.

1.3 Under the Review, a Preferred Development Scheme for the Project was derived, taking account of a Trunk Road scheme with minimum reclamation necessary to meet the overriding need, in conformance with the Protection of the Harbour Ordinance. In reviewing the change of scope and extent of the Project from what was originally proposed under the WDIICFS, and which was covered by the approved EIA Report under the EIAO in 2001, the changes to the Project are confined to the nature and extent of the Trunk Road and associated ground level roads, and extent of reclamation. The original schemes for the cross-harbour water mains and the sewage outfall have not changed; the EIA assessments of the approved EIA Report therefore remain valid.

1.4 For the changes to the Project, a new EIA study will be required under the EIAO. Project profiles for the WDII Development and the Trunk Road (CWB and IECL) taking account of the changes will be submitted for application for EIA Study Briefs. The EIA study will be conducted according to the requirements stipulated in the EIA Study Briefs and the Technical Memorandum on EIA Process.

1.5 In view of the tight programme of the WDII project (commencement of construction expected in May 2008), the EIA study for the WDII Development and the Trunk Road will need to be completed in a fast-track manner (draft EIA Report to be completed in September 2006). Taking into consideration the changes in the extent and location of the reclamation areas, some of the data/results of the surveys conducted in the approved EIA Report may not be valid or sufficient. In addition, since this is a major project likely to be subject to intense public scrutiny, updating or additional surveys may be required. It should be noted that some of the surveys (e.g. sediment) will take time to arrange and complete and hence may result in a delay of the EIA study programme. To avoid the possible delay due to any updating or additional surveys, it is necessary to propose and defined the scopes and methodologies of the updating or additional surveys for agreement with EPD before the issue of the EIA Study Briefs by Director of Environmental Protection (DEP).

Purpose of this Proposal

1.6 The purpose of this proposal is to identify the previous surveys conducted in the approved EIA Report that are considered as invalid or insufficient, recommend any updated or new surveys that may be required for purpose of the current EIA study, and outline the requirements of the recommended survey.

2. IDENTIFICATION OF UPDATING/ADDITIONAL SURVEYS

Surveys Conducted in the EIA Study for WDII CFS

2.1 Under the previous EIA study for WDIICFS, the following surveys were conducted:

- Site investigations works for Phase I in February 2000 and Phase 2 in late September 2000;
- Short-term Air Quality Monitoring near Cross Harbour Tunnel (2001);
- Stormwater Flow and Pollutant Survey of Outfalls Entering Victoria Harbour (2000);
- Expedient Connection Survey, Supplementary Report for Section I of Works (2000).

2.2 Apart from the site investigation conducted in the previous EIA study for WDII FS, marine sediment site investigation was carried out in early 2003 under the WDII Design & Construction (D&C).

Identification of Updating/Additional Surveys

2.3 In view of the changes in the extent and location of the reclamation areas (including both permanent and temporary reclamation) and that the last marine site investigation was conducted in early 2003 (more than 3 years ago) and the stormwater flow and pollutants and expedient connection surveys were undertaken in 2000 (more than 6 years), it is considered necessary to carry out further SI and storm water pollution survey under the current EIA study. The results from the further SI would update the sediments quality data near the proposed dredging area as well as identify the sediments quality near the North Point Waterfront. Further storm water pollution survey is proposed to quantify the pollution loading discharged from the existing storm outfalls along the waterfronts of Wan Chai, Causeway Bay and North Point. The additional surveys for North Point is crucial for the current EIA Study as no reclamations and field works were proposed at North Point Waterfront in previous layouts.

2.4 For the short-term air quality monitoring near Cross Harbour Tunnel (CHT), the results obtained in the monitoring were adopted to define the NO_2/NOx ratio for the CHT portal and nearby existing roads and dilution factor at the air sensitive receivers (ASRs) in the vicinity of the CHT portal in the previous approved EIA Report. Comparing with the existing baseline environment, there may have changes in the traffic flow and the amount of vehicular traffic emissions, therefore, there is a need to conduct the short-term air quality monitoring near CHT again to update the data for calculation of the NO_2/NOx ratio and dilution factor which would be used for the air quality prediction in year 2027 in the current EIA study.

2.5 According to the latest Concept Plan for the WDII, the existing promenade along the shoreline of the Causeway Bay Typhoon Shelter (CBTS) will be retained. It is understood that odour from CBTS is an existing problem and may have potential impact on the future users of the promenade. In addition, odour issue is getting more concern as reflected in some other recent study such as Southeast Kowloon Development Comprehensive Planning and Engineering Review. The potential odour impact from CBTS on the future users of the promenade may need to be addressed. In order to quantify the potential odour impact, an odour survey comprising odour patrol and gaseous odour sampling and analysis exercises would be required.

3. OUTLINE OF PROPOSED ENVIRONMENTAL SURVEYS

3.1 Following the discussion in Section 2, the following surveys are proposed for the purpose of the EIA study:

- Marine site investigation;
- Storm water pollution survey;
- Short-term air quality monitoring near CHT; and
- Odour survey.

3.2 The scopes and methodologies of the above proposed surveys are outlined in the section below.

Marine Site Investigation

3.3 The objectives of the further marine SI are to:

- Update the current sediment quality at the proposed dredging site;
- Provide sufficient information for the water quality impact assessments on the release of contaminants during dredging operation for the Project; and
- Identify the sediment contamination within the dredged area and determine the environmental impacts associated with handling, transportation and disposal of the contaminated sediments.

Review of Sediments and Proposed Sampling Locations for Further SI

3.4 Five dredging areas are proposed for the current layout:

- Near HKCEC
- Wan Chai Waterfront
- PCWA basin
- CBTS
- North Point Waterfront

3.5 A total of forty-three (43) sampling locations are proposed for the reclamation site. The proposed locations generally follow the 100 x 100m grid sampling arrangement as far as feasible, except in the area to the west of the HKCEC Extension (refer to Section 3.8 below). At each sampling point, vertical profile of sediment shall be sampled by vibrocores and surface sediment collected by grab sampler. A grab sample shall also be collected from the EPD's routine sediment monitoring station PS6 at Port Shelter (850234E, 820057N) as the reference sediment sample.

3.6 The vibrocoring shall be terminated at 1.0m into the alluvium layer or at depth as instructed by the Engineer on site. The samples taken from the vibrocores shall be continuous. On recovery, the plastic liner tube holding the vibrocore sample shall be sub-sampled and cut on-site into 1m sections except the first one that should be (0.0 – 0.9m). The top levels of these sections shall be the seabed level, 0.9m down, 1.9m down, 2.9m down, and then every 3m until the end of the vibrocore.

<u>Near HKCEC</u>

3.7 The area joins the eastern boundary of Central Reclamation Phase III works and includes the HKCEC water channel. Permanent reclamations are proposed for the area and filling and dredging operations would be necessary. Based on the sediment assessments in the design and construction stage, category 'H' samples were recorded at nearly all of the sampling locations. The majority of the dredged sediments in the area were proposed for confined marine disposal (Type 2) and open sea disposal (dedicated sites) (Type 1). A small patch of sediments in the eastern portion of the area were proposed for Special Treatment/Disposal (Type 3).

3.8 Permission from WSD and MTRC to sample in this area to the west of the HKCEC Extension was not obtained, in view of this area falling within their waterworks reserve and MTR protection zone, respectively. MTRC also advised that anchoring is not permitted within 20m of their protection zone. A further constraint to sampling is the sloping seawall armour of the HKCEC extension. Therefore, sampling is only feasible at the sampling locations V06-6 and V06-1WB to the immediate west of the HKCEC Extension.

3.9 Four (4) sampling locations (V06-6 to V06-9) are permissible in the area and shown in Figure 6.1.

<u>Wan Chai Waterfront</u>

3.10 The area covers from east of HKCEC to west of ex-PCWA. The proposed permanent reclamations under the current Study are substantially smaller than the previous layout plan. Based on the sediment quality assessments in the design and construction stage, category 'H' sediments were found along the Waterfront, in particular the surface layer. The proposed disposal methods for the sediments were confined marine disposal (Type 2) / open sea disposal (Type 1).

3.11 Eight (8) sampling locations (V06-10 to V06-17) are proposed for the area and shown in Figure 6.1.

<u>PCWA Basin</u>

3.12 Temporary reclamation would be constructed for the cut & cover tunnel at the PCWA basin and dredging will likely be required for the temporary seawalls. Based on the sediment assessments in the design and construction stage, surface layer of the sampling locations are category 'H' sediments while the deeper layer are category 'L' sediments. Open sea disposal (Type 1) and confined marine disposal (Type 2) are proposed for the category L and category H sediments, respectively.

3.13 Two (2) sampling locations (V06-18 and V06-19) are proposed for the area.

<u>CBTS</u>

3.14 Cut and cover tunnel is proposed across the CBTS and temporary reclamation will be required. It is likely that dredging for the temporary seawalls will be required. In comparison with the permanent reclamation in the previous design, the temporary reclamation will extend deeper into CBTS. Based on the sediment assessments carried out in the design and construction stage, a fair portion of the sampling locations were found to contain category 'H' sediments. Sediment disposal are a mixture of open sea disposal (Type 1), confined marine disposal (Type 2) and special disposal (Type 3).

3.15 Fifteen (15) sampling locations (V06-20 to V06-34) are proposed for the area.

<u>North Point Waterfront</u>

3.16 The proposed permanent reclamation extend from east of CBTS to near City Garden. Since reclamation was not proposed at North Point Waterfront in the previous design layouts, marine site investigations were not carried out in the area.

3.17 Six (6) sampling locations (V06-35 to V06-40) are proposed for the area and shown in Figure 6.1.

<u>Marine Area off CWBTS</u>

3.18 The area is tentative for the breakwater of the temporary re-provision of the typhoon shelter.

3.19 Eight (8) sampling locations (V06-41 to V06-48) are proposed for the area and shown in Figure 6.1.

Testing Parameters

3.20 The sediments collected using the 43 vibrocores from the SI works as well as the reference sample will subject to chemical screening (Tier II) in accordance with the ETWB TCW No. 34/2002 – Management of Dredged / Excavated Sediment. The testing parameters for the chemical screening are summarised in Table 1 below. Grab samples collected from the vibrocoring locations will be used for the testing of tributylin in interstitial water in view of the difficulty to extract sufficient interstitial water for the TBT analysis in the vibrocore samples to achieve the required detection limit, as was encountered in the EIA study for Wan Chai Development Phase II Comprehensive Feasibility Study.

3.21 Elutriate tests will be carried out on sediment samples collected from 10 representative vibrocore locations across the proposed dredging areas. These sampling locations are selected based on a review of the existing chemical testing data of the proposed dredging areas. The sampling locations represent locations where seriously contaminated sediment (i.e. Category H sediment with contaminant levels exceeding 10 times the LCEL) was identified under previous SI, and at other locations to ensure coverage of the proposed dredging areas. The following parameters will be carried out for the elutriate tests:

- Nine (9) heavy metals and metalloid including cadmium, chromium, copper, mercury, nickel, lead, zinc, silver and arsenic;

- Three (3) organic micro-pollutants including PCB, PAH, and TBT; and

- Total Kjeldahl Nitrogen (TKN), Nitrate-Nitrogen, Nitrite-Nitrogen, Ammonia-Nitrogen, Orthophosphate Phosphorus, Total Phosphorus and Chlorinated pesticides (Alpha-BHC; Beta BHC; Gamma BHC; Delta-BHC; Heptachlor; Aldrin; Heptachlor epoxide; Endosulfan 1; p, p'-DDT; p, p'-DDD; p, p'-DDE; Endosulfan sulfate).

Table 1 Testing Parameters for Chemical Screening (Tier II)

Parameters	Preparation Method[1] US EPA Method	Determination Method[1] US EPA Method
Metals (mg/kg dry wt.)		
Cadmium (Cd)	3050B	6020A or 7000A or 7131A
Chromium (Cr)	3050B	6010C or 7000A or 7190
Copper (Cu)	3050B	6010C or 7000A or 7210
Mercury (Hg)	7471A	7471A
Nickel (Ni)	3050B	6010C or 7000A or 7520
Lead (Pb)	3050B	6010C or 7000A or 7420
Silver (Ag)	3050B	6020A or 7000A or 7761
Zinc (Zn)	3050B	6010C or 7000A or 7950
Metalloid (mg/kg dry wt.)		
Arsenic (As)	3050B	6020A or 7000A or 7061A
Organic-PAHs (µg/kg dry wt.)		
Low Molecular Weight PAHs+	3550B or 3540C and 3630C	8260B or 8270C
High Molecular Weight PAHs++	3550B or 3540C and 3630C	8260B or 8270C
Organic-non-PAHs (µg/kg dry wt.)		
Total PCBs+++	3550B or 3540C and 3665A	8082
Organometallics (µg TBT/L in interstitial water)		
Tributyltin	Krone et al. (1989)* - GC/MS UNEP/IOC/IAEA**	Krone et al. (1989)* - GC/MS UNEP/IOC/IAEA**

Notes:
Source: ETWB TCW No. 34/2002 – Management of Dredged / Excavated Sediment
1. Other equivalent methods may be used subject to the approval of Director of Environmental Protection

+ Low molecular weight PAHs include acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene
++ High molecular weight PAHs include benzo[a]anthracene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, indeno[1,2,3-c,d]pyrene and benzo[g,h,i]perylene
+++ The reporting limit is for individual PCB congeners. Total PCBs include 2,4' diCB, 2,2',5 triCB, 2,4,4' triCB, 2,2',3,5' tetraCB, 2,2',5,5' tetraCB, 2,3',4,4' tetraCB, 3,3',4,4' tetraCB, 2,2',4,5,5' pentaCB, 2,3,3',4,4' pentaCB, 2,3',4,4',5 pentaCB, 3,3',4,4',5 pentaCB, 2,2',3,3',4,4' hexaCB, 2,2',3,4,4',5' hexaCB, 2,2',4,4',5,5' hexaCB, 3,3',4,4',5,5' hexaCB, 2,2',3,3',4,4',5 heptaCB, 2,2',3,4,4',5,5' heptaCB, 2,2',3,4',5,5',6 heptaCB (ref: the "summation" column of Table 9.3 of *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual (The Inland Testing Manual)* published by USEPA).
* Krone et al. (1989), A method for analysis of butyltin species and measurement of butyltins in sediment and English Sole livers from Puget Sound, Marine Environmental Research 27 (1989) 1-18. Interstitial water to be obtained by centrifuging the sediment and collecting the overlying water.
** UNEP/ICO/IAEA refers to IAEA's Marine Environment Laboratory reference methods. These methods are available free of charge from UNEP/Water or Marine Environmental Studies Laboratory at IAEA's Marine Environment Laboratory. Interstitial water to be obtained by centrifuging the sediment and collecting the overlying water.

3.22 For the elutriate tests, the preparation method "Evaluation of Dredged Material Proposed for Discharge in Waters in US – Testing Manual, Section 10.1.2" shall be followed. Sediment samples shall be mixed with seawater samples collected from the proposed dredging site and the solution shall be vigorously agitated during the tests to simulate the strong disturbance to the seabed sediment during dredging. Laboratory testing for the above proposed parameters (i.e. heavy metals, metalloid, organic micro-pollutants and nutrients) shall be carried out on the solution (elutriate). The analytical methods and reporting limits for the laboratory testing are shown in Table 2 below.

Table 2 Testing Methods and Reporting Limits for Elutriate

Parameters	Determination Method US EPA Method (unless specified otherwise)	Reporting Limit
Metals (µg/L)		
Cadmium (Cd)	6020A	0.2 µg/L
Chromium (Cr)	6020A	1 µg/L
Copper (Cu)	6020A	1 µg/L
Mercury (Hg)	6010B / APHA 3112B	0.1 µg/L
Nickel (Ni)	6020A	1 µg/L
Lead (Pb)	6020A	1 µg/L
Silver (Ag)	6020A	1 µg/L
Zinc (Zn)	6020A	10 µg/L
Metalloid (µg/L)		
Arsenic (As)	6020A	1 µg/L
Organic-PAHs (µg/L)		
Low Molecular Weight PAHs	3510C / 3630C / 8270C	0.2 µg/L
High Molecular Weight PAHs	8270C	
Organic-non-PAHs (µg/L)		
Total PCBs (as 18 cogeners)	3620B / 8082 / 8270	0.01 µg/L
Organometallics (µg TBT/L in interstitial water)		
Tributyltin	UNEP/IOC/IAEA**	0.015 µg TBT/L
Other Contaminants (as specified)		
Total Kjeldahl Nitrogen (TKN)	APHA 4500-N_{org} + NH_3C	0.1 mg N/L
Nitrate Nitrogen	APHA 4500-NO_3^- I	0.05 mg NO_3-N/L
Nitrite Nitrogen	APHA 4500-NO_2^- I	0.05 mg NO_2-N/L
Ammonia Nitrogen	APHA 4500-NH_3 H	0.1 mg NH_3-N/L
Orthophosphate Phosphorus (PO_4-P)	APHA 4500-P F	0.005 mg P/L
Total Phosphorus	APHA 4500-P B&E	0.02 mg-P/L
Chlorinated pesticides	3510C / 3620B / 8270C / 8081A	0.02 µg/L

Note:
** UNEP/ICO/IAEA refers to IAEA's Marine Environment Laboratory reference methods. These methods are available free of charge from UNEP/Water or Marine Environmental Studies Laboratory at IAEA's Marine Environment Laboratory. Interstitial water to be obtained by centrifuging the sediment and collecting the overlying water.

3.23 Sediment pore water (interstitial water) analyses will also be conducted on the sediment samples collected from the 10 representative vibrocore locations. Sediment samples will be centrifuged at 3000 rpm for 10 minutes followed by filtration. The analytical methods and reporting limits for the laboratory testing of the pore water/interstitial water are the same as for the analysis of elutriate samples and are shown in Table 2. Should it prove difficult to extract sufficient interstitial water from the vibrocore samples for analysis, then grab samples collected from the same location will be used for performing the analysis of sediment pore water.

3.24 In addition, 5-day sediment oxygen demand (SOD_5), total inorganic nitrogen and ammonia nitrogen shall be tested for the sediment samples collected at each of the 10 vibrocores subject to elutriate tests. The analytical methods and reporting limits for the laboratory testing are shown in Table 3 below.

Table 3 Testing Methods and Reporting Limits for Sediment Samples

Parameters	Determination Method	Reporting Limit
Total Inorganic Nitrogen	APHA 4500-NO_3^-E & APHA 4500-NH_3 H	1 mg-N/kg
Ammonia Nitrogen	APHA 4500-NH_3 H	1 mg NH_3-N/kg
Sediment Oxygen Demand (5-day)	In-house method	1mg/kg dry weight.

3.25 Biological screening (Tier III) maybe required subject to the findings of the chemical screening of the sediment samples in accordance with the ETWB TCW No. 34/2002. The testing parameters for biological screening are shown in Table 4 below.

Table 4 Testing Parameters for Biological Screening (Tier III)

Test Type	Species**	Reference Test Condition*
10-day burrowing amphipod toxicity test	*Ampelisca abdita*	USEPA (1994) / PSEP (1995)
	Leptocheirus plumulosus	USEPA (1994)
	Eohaustorius estuaries	USEPA (1994) / PSEP (1995)
20-day burrowing polychaete toxicity test	*Neanthes arenaceodentata*	PSEP (1995)
48-96 hour larvae (bivalve or echinoderm) toxicity test	Bivalve:	
	Mytilus spp.	PSEP (1995)
	Crassostrea gigas	PSEP (1995)
	Echinoderm:	
	Dendraster excentricus	PSEP (1995)
	Strongylocentrotus spp.	PSEP (1995)

Note:
Source: ETWB TCW No. 34/2002 – Management of Dredged / Excavated Sediment
* USEPA (1994) – Methods for assessing the toxicity of sediment-associated contaminants with estuarine and marine amphipods. Office of Research and Development. U.S. Environmental Protection Agency, Cincinnati, OH. EPA/600/R94/025; PSEP (Puget Sound Estuary Program) (1995) – Recommended guidelines for conducting laboratory bioassays on Puget Sound Sediments.
** One species will be selected from each test type.

3.26 For biological testing, sediment samples, including the reference sediment and composite samples shall be characterized by the testing laboratory for ancillary testing parameters such as porewater, salinity, ammonia, TOC, grain size and moisture content.

3.27 At this stage all reclamation areas are notionally fully dredged and thus potential generation of biogas underneath the reclamation area is not considered to be an issue. There is potentially an area next to CRIII that could conceivably have some sediment retained. As a back-up, sediment samples will be collected using one vibrocore (V06-1WB) in this area. The following tests will be carried out on the vibrocore samples:

- Total Organic Carbon (TOC)
- Sediment Oxygen Demand (SOD) (20-day)

3.28 The analytical methods and reporting limits are shown in Table 5 below.

Table 5 Testing Methods and Reporting Limits for Analysis of TOC and SOD in Sediment Samples for Biogas Risk Assessment (if necessary)

Parameters	Determination Method	Reporting Limit
Total Organic Carbon	USEPA 5310B modified	0.05 %
Sediment Oxygen Demand (20-day)	In-house method	1mg/kg dry weight.

3.29 In addition, one grab sample collected at the same sampling location as the vibrocore V06-1WB will be analyzed for carbon compound fractionation using Gas Chromatography – Flame Ionization Detector (GC-FID) in order to estimate the percentage of biodegradable TOC.

LEGEND:

- BOUNDARY OF STUDY AREA
- EXTENT OF RECLAMATION
- V06-41 PHASE 1 CHEMICAL/BIOLOGICAL SCREENING SAMPLING LOCATION
- V06-9W PHASE 1 ELUTRIATE TEST AND PORE WATER TEST SAMPLING LOCATION
- V06-12 PHASE 2 CHEMICAL/BIOLOGICAL SCREENING SAMPLING LOCATION
- V06-4W PHASE 2 ELUTRIATE TEST AND PORE WATER TEST SAMPLING LOCATION

PHASE 1 — CHEMICAL/BIOLOGICAL SCREENING

VIBROCORE NO.	EASTING	NORTHING
V06-7	835767	815930
V06-8	835869	815924
V06-9	835967	815933
V06-20	836960	815990
V06-21	836969	816047
V06-22	837069	816074
V06-23	836969	816110
V06-24	837073	816137
V06-25	837167	816179
V06-26	837247	816228
V06-27	837316	816302
V06-28	837389	816379
V06-29	837445	816455
V06-30	837301	816192
V06-31	837420	816269
V06-32	837453	816350
V06-33	837461	816235

PHASE 1 — CHEMICAL/BIOLOGICAL SCREENING

VIBROCORE NO.	EASTING	NORTHING
V06-34	837521	816322
V06-35	837497	816555
V06-36	837549	816619
V06-37	837629	816713
V06-38	837718	816789
V06-39	837775	816842
V06-40	837839	816903
V06-41	836959	816606
V06-42	837052	816635
V06-43	837174	816671
V06-44	837296	816703
V06-45	836971	816516
V06-46	837061	816559
V06-47	837184	816593
V06-48	837307	816626

PHASE 1 — ELUTRIATE TEST AND PORE WATER TEST FOR WATER QUALITY ASSESSMENT

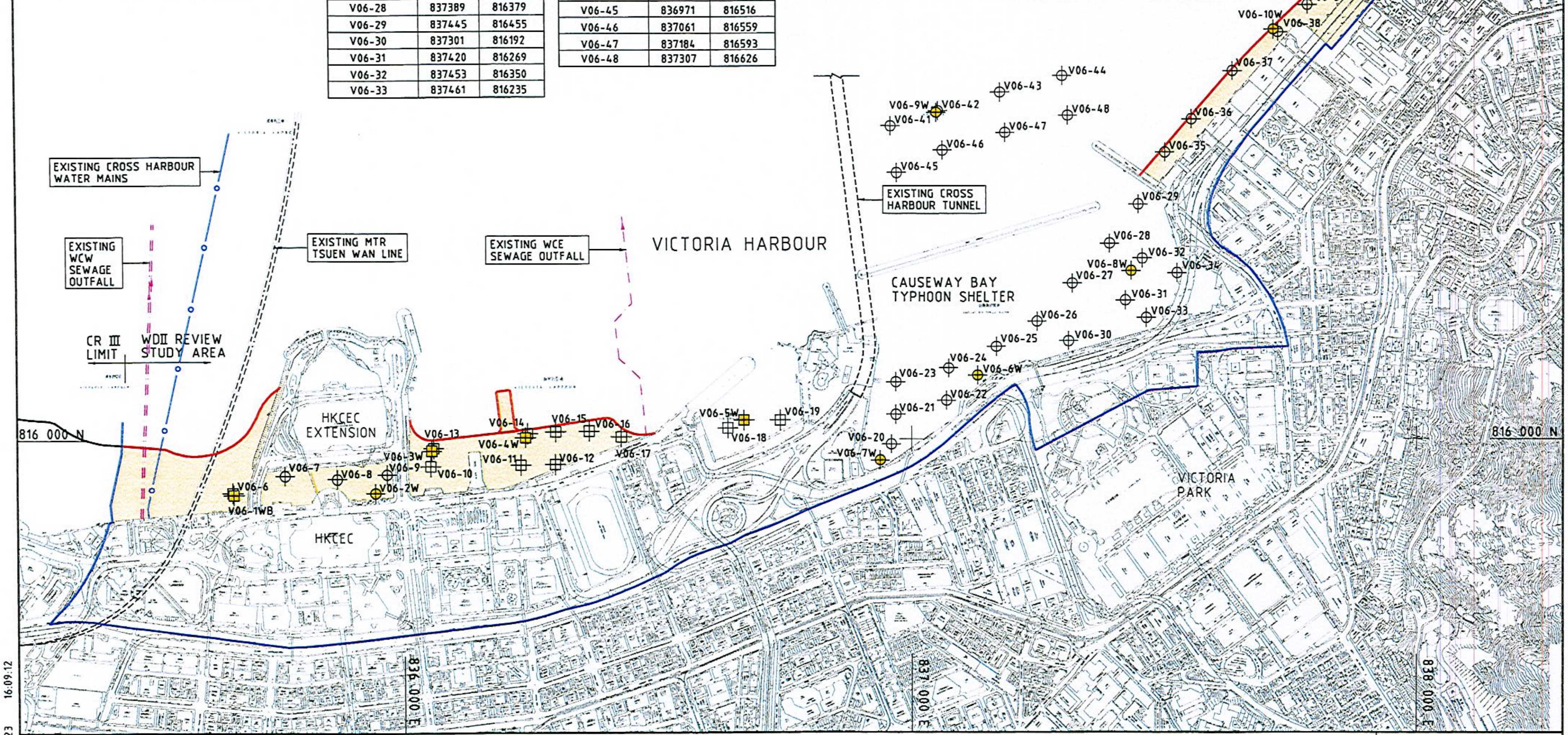
VIBROCORE NO.	EASTING	NORTHING
V06-2W	835944	815897
V06-6W	837130	816123
V06-7W	836938	815959
V06-8W	837431	816326
V06-9W	837049	816632
V06-10W	837709	816794

PHASE 2 — CHEMICAL/BIOLOGICAL SCREENING

VIBROCORE NO.	EASTING	NORTHING
V06-6	835665	815897
V06-10	836053	815948
V06-11	836231	815950
V06-12	836299	815951
V06-13	836059	815983
V06-14	836244	816011
V06-15	836300	816014
V06-16	836366	816015
V06-17	836429	816004
V06-18	836639	816021
V06-19	836742	816036

PHASE 2 — ELUTRIATE TEST AND PORE WATER TEST FOR WATER QUALITY ASSESSMENT

VIBROCORE NO.	EASTING	NORTHING
V06-1WB	835667	815893
V06-3W	836055	815978
V06-4W	836240	816003
V06-5W	836671	816036



MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

MARINE SEDIMENTS SAMPLING LOCATIONS

FIGURE 6.1

ATE: 2007-5-23 16:09:12

—> 6007193

MAUNSELL | AECOM

FAXED DATE: 5/2/07

Maunsell Environmental Management Consultants Ltd
11/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong

茂盛環境管理顧問有限公司
香港新界沙田鄉事會路 138 號新城市中央廣場 2 座 11 樓

T +852 2893 1551 F +852 2891 0305 www.maunsell.aecom.com

Your Ref.: -
Our Ref.: A01604/C/JEC7020201

By Fax (2591 0558) and Post

Environmental Protection Department
Metro Assessment Group
27th floor, Southorn Centre,
130 Hennessy Road,
Wan Chai, Hong Kong

Attn : Mr. Raymond Lai

2 February 2007

Dear Sir,

Supplemental Agreement No.1 to Agreement No. CE 54/2001 (CE)
Wan Chai Development Phase II - Planning and Engineering Review
Wan Chai Development Phase II and Central-Wan Chai Bypass – EIA Study

With regard to the assessment of potential water quality impact and waste management implications for the captioned EIA Study, we are writing to seek your agreement on the field investigation, sampling and chemical and biological laboratory tests to characterize the marine sediment and the potential for the release of contaminants during dredging as per the requirements in Section 3.4.7.7 (I) (a) and Section 3.4.9.2 (iii) of the EIA Study Brief (ESB-153/2006).

Original Survey Proposal

The details of the field investigation and laboratory tests to identify the sediment categories within the dredged area and to provide information for the water quality impact assessment on the release of contaminants during dredging operation were contained in the original Survey Proposal submitted to EPD by CEDD on 26 June 2006 by email. Our responses to the comments received from EPD on the Survey Proposal (your letter ref (24) in An(4) to EP2/H4/05 Pt. 39 dated 4 December 2006 refers) were submitted to EPD on 10 January 2007 (our letter ref A01604/C/JEC701101 refers) (see Attachment A). The revised pages of the Survey Proposal are attached, which incorporate these previous comments received from EPD (see Attachment B).

Subsequent Modifications to Survey

a) Permission to Sample in Area West of HKCEC Extension Not Obtained

As explained in our letter ref A01604/C/JEC611021 to EPD dated 2 November 2006, it was necessary to remove the vibrocore sampling locations V06-1 to V06-5 (proposed for chemical screening) and V06-2B (proposed for biogas risk assessment, if required) proposed in the Survey Proposal (as shown on the attached Figure 1) since permission from WSD and MTRC to sample in this area to the west of the HKCEC Extension was not obtained, in view of these sampling locations falling within their waterworks reserve and MTR protection zone, respectively. It was also necessary to revise sampling location V06-1WB to a position adjacent to V06-6, where sampling was permitted. The revised sampling locations in the area to the west of the HKCEC

Extension are shown on the attached Figure 6.2. With the removal of the 5 vibrocore sampling locations V06-1 to V06-5, the total number of vibrocore sampling locations for chemical/biological screening is 43. With the removal of the sampling location V06-2B, the number of vibrocore sampling locations proposed for the biogas risk assessment is one (i.e. V06-1WB).

b) No Need for Biogas Investigation

All reclamation areas are proposed to be fully dredged and thus potential generation of biogas underneath the reclamation area is not an issue. Thus investigation of potential biogas problem is not necessary with regard to Section 3.4.9.2 (iv) of the EIA Study Brief.

<u>Agreement Sought</u>

We should be grateful if you would confirm that the scope and methodology of the above field investigations and laboratory tests for the water quality impact assessment and waste management implications assessment for the EIA Study is acceptable by 16 February 2007.

Should you need any further clarification or information, please feel free to contact Ms Jane Carbray at 3105 8509 or Ms Amy Cheung at 3105 8504. Thank you for your kind attention.

Yours faithfully
for and on behalf of
Maunsell Environmental
Management Consultants Ltd

T. J. Cramp

Tim Cramp
Executive Director

cc	CEDD – CK Lam	By fax (2577 5040)
	MCAL - Peter Cheek	By fax (26912649)

Attachment A

MAUNSELL | AECOM

Maunsell Environmental Management Consultants Ltd
11/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong

[illegible]
[illegible]

T +852 [illegible] 1551 F +852 2691 0305 www.maunsell.aecom.com

FAXED
DATE: 10/1/07

Your Ref.: (24) in An(4) to EP2/H4/05 Pt. 39
Our Ref.: A01604/C/JEC701101

By Fax (2591 0558) and Post

Environmental Protection Department
Metro Assessment Group
27th floor, Southorn Centre,
130 Hennessy Road,
Wan Chai, Hong Kong

Attn : Mr. Raymond Lai

10 January 2007

Dear Sir,

Supplemental Agreement No.1 to Agreement No. CE 54/2001 (CE)
Wan Chai Development Phase II - Planning and Engineering Review
Wan Chai Development Phase II and Central-Wan Chai Bypass – EIA Study

With reference to EPD's technical advisory observations on the field investigation, sampling and chemical and biological laboratory tests to characterize the marine sediment and the potential for the release of contaminants during dredging as given in your letter ref (24) in An(4) to EP2/H4/05 Pt. 39 dated 4 December 2006, please find attached our responses to these observations.

Should you have any queries or need any further clarification, please feel free to contact Ms Jane Carbray at 3105 8509 or Ms Joanne Tsoi at 3105 8506.

Yours faithfully
for and on behalf of
Maunsell Environmental
Management Consultants Ltd

T. J. Cramp

Tim Cramp
Executive Director

cc CEDD – CK Lam By fax (2577 5040)
MCAL - Peter Cheek By fax (26912649)

Wan Chai Development Phase II and Central Wan Chai Bypass EIA Study

(Field investigation, sampling and chemical and biological laboratory tests
to characterize the marine sediment and
the potential for the release of contaminants during dredging)

Comments & Responses

Comments Received	Reference	Letter Date	Page No.
1. Environmental Protection Department	(24) in An(4) to EP2/H4/05 Pt.39	4 December 2006	1

Wan Chai Development Phase II and Central Wan Chai Bypass EIA Study

(Field investigation, sampling and chemical and biological laboratory tests

to characterize the marine sediment and

the potential for the release of contaminants during dredging)

Comments & Responses

Comment from: Environmental Protection Department	Date: 4 December 2006 Contact: Raymond L Y LAI
Comments	**Responses**
(1) Regarding the proposed reclamation site to the west of the HKCEC Extension, there is only one location for chemical/biological screening and one location for elutriate/pore water test. You stated in your covering letter that permission from WSD and MTRC was not obtained for sampling in the area. In view of the site scale and the sensitivity of the project, a single sampling point at the site is not considered sufficient. You should justify this argument by presenting the water works reserve and MTR protection zone and explore any possible sampling locations.	The WSD prohibition zone and MTR protection zone in the proposed reclamation area to the west of HKCEC Extension are shown on the attached figure. Permission to sample in these two zones was not obtained from WSD and MTRC for the present marine site investigation. In addition, MTRC advised that anchoring is not permitted within 20m of their protection zone and hence it was not possible to carry out sampling at the proposed location V06-2B. Samples could not be recovered from V06-3A and V06-3B due to the vibrocoring hitting the existing sloping seawall armour. The actual sampling location V06-1WB replaces the two originally proposed sampling locations V06-1WB and V06-2B. The area to the west of HKCEC Extension will be covered at the detailed design stage for the preparation of the Sediment Quality Report as required under ETWB TCW No. 34/2002.
(2) Table 2: the units of Reporting Limit of some of the testing parameters are not shown. The units should be added accordingly. It is presumed that the units should be "μg (microgramme) per litre" unless otherwise specified. Please clarify and confirm.	The units of reporting limit are indicated in the left column under parameters. The units are μg/L, except for "other contaminants" (i.e. Total Kjeldahl Nitrogen, Nitrate Nitrogen, Nitrite Nitrogen, Ammonia Nitrogen, Unionised Ammonia, Orthophosphate Phosphorus and Total Phosphorus) for which the unit specified is mg/L, and chorinated pesticides for which the unit is 0.02 μg/L for individual parameter. As per your request, we have added the units in the right column and the revised Table 2 is attached.

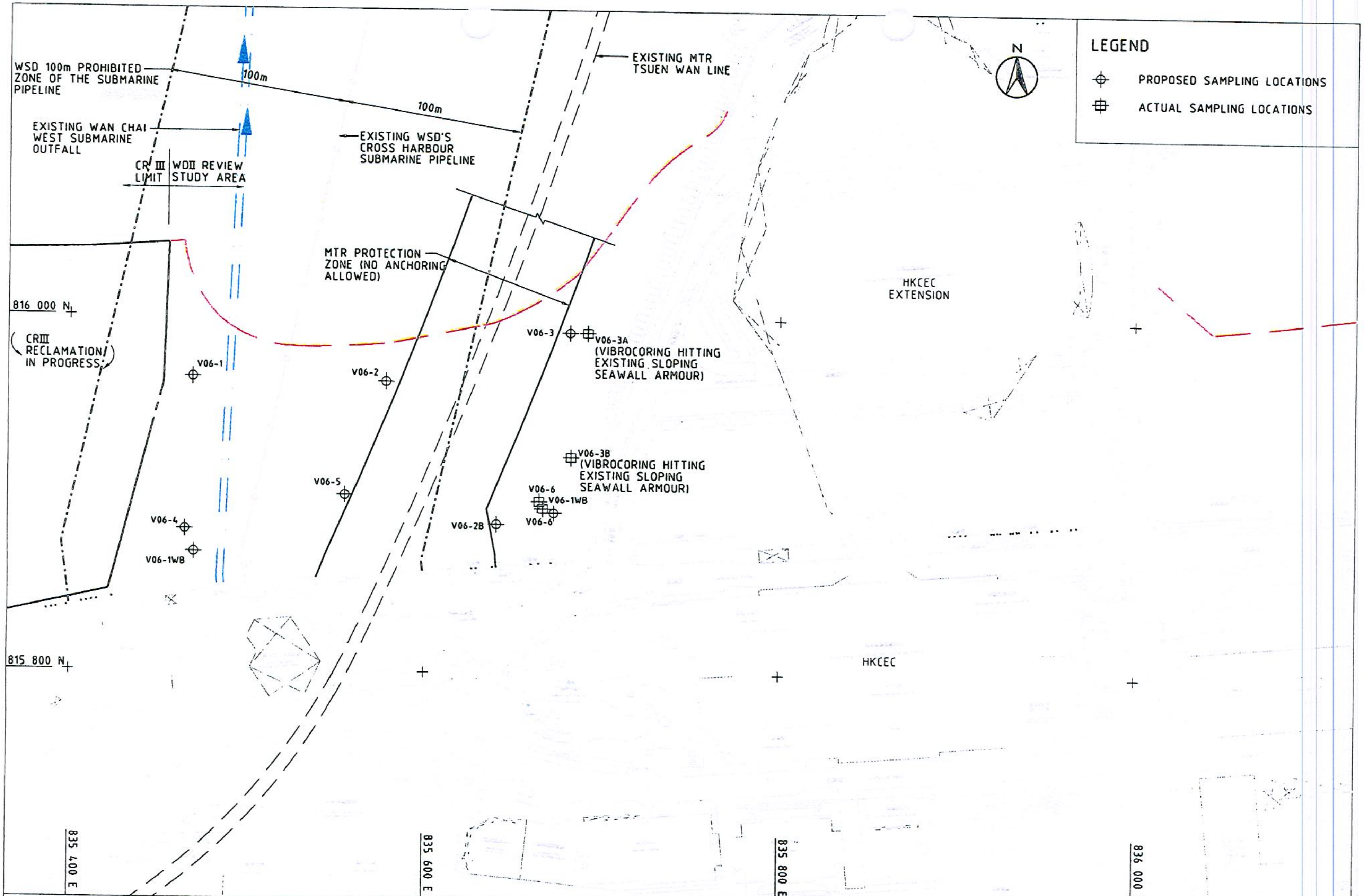
(3) The reporting limit for Chlorinated Pesticides (including 12 parameters) of 0.02 µg/l should be for individual parameter. Please clarify and confirm.	Please see above response regarding the reporting limit for chlorinated pesticides.
(4) It seems that there are some contradicted statements in your submission, e.g. your letter mentioned the revised sampling locations are shown in Figures 6.1 and 6.2 while in the paragraphs 3.8 and 3.10 of the proposal, both mentioned sampling locations are shown in Figure 1. Therefore, please double heck which figures are the latest one that should be referred to.	Figures 6.1 and 6.2 are the latest figures, as referenced in the covering letter. Figure 1 shows the original proposed sampling locations and was included in our submission to enable comparison between the original proposed sampling locations and the revised sampling locations (i.e. Figures 6.1 and 6.2).
(5) 3rd paragraph of your letter mentioned that sampling location V06-1 to V06-5 and V06-2B are removed. However, paragraph 3.8 of the proposal Is seemed stating that the sampling locations V06-1 to V06-5 would be retained (i.e. 9 no. of sampling location (V06-1 – V06-9)). Therefore, please double check this discrepancy and also do the same checking in other areas.	Explanation on the changes in the sampling locations are given in the covering letter since the pages of the Survey Proposal attached to the letter are referring to the submission made to EPD by CEDD on 26 June 2006 by email (a copy of these pages was attached for ease of reference), at which time it was not known that permission to sample would not be obtained in the area to the west of HKCEC Extension. The Survey Proposal contains the original proposed sampling locations for the marine site investigation.
Important Remarks: please be reminded that the observations above were made from EIA study perspective. If CEDD also want to make use of this survey proposal for the application of dumping permit under the Dumping At Sea Ordinance (DASO), please consult our colleagues in the Territorial Control Office (TCO) direct for any compliance issue with the DASO.	Noted.

Table 2 **Testing Methods and Reporting Limits for Elutriate**

Parameters	Determination Method *US EPA Method* *(unless specified otherwise)*	Reporting Limit
Metals (μg/L)		
Cadmium (Cd)	6020A	0.2 μg/L
Chromium (Cr)	6020A	1 μg/L
Copper (Cu)	6020A	1 μg/L
Mercury (Hg)	6010B / APHA 3112B	0.1 μg/L
Nickel (Ni)	6020A	1 μg/L
Lead (Pb)	6020A	1 μg/L
Silver (Ag)	6020A	1 μg/L
Zinc (Zn)	6020A	10 μg/L
Metalloid (μg/L)		
Arsenic (As)	6020A	1 μg/L
Organic-PAHs (μg/L)		
Low Molecular Weight PAHs	3510C / 3630C / 8270C	0.2 μg/L
High Molecular Weight PAHs	8270C	
Organic-non-PAHs (μg/L)		
Total PCBs (as 18 cogeners)	3620B / 8082 / 8270	0.01 μg/L
Organometallics (μg TBT/L in interstitial water)		
Tributyltin	UNEP/IOC/IAEA**	0.015 μg TBT/L
Other Contaminants (as specified)		
Total Kjeldahl Nitrogen (TKN)	APHA 4500-N_{org} + NH_3C	0.1 mg N/L
Nitrate Nitrogen	APHA 4500-NO_3^- I	0.05 mg NO_3-N/L
Nitrite Nitrogen	APHA 4500-NO_2^- I	0.05 mg NO_2-N/L
Ammonia Nitrogen	APHA 4500-NH_3 H	0.1 mg NH_3-N/L
Orthophosphate Phosphorus (PO_4-P)	APHA 4500-P F	0.005 mg P/L
Total Phosphorus	APHA 4500-P B&E	0.02 mg-P/L
Chlorinated pesticides	3510C / 3620B / 8270C / 8081A	0.02 μg/L

Note:

** UNEP/ICO/IAEA refers to IAEA's Marine Environment Laboratory reference methods. These methods are available free of charge from UNEP/Water or Marine Environmental Studies Laboratory at IAEA's Marine Environment Laboratory. Interstitial water to be obtained by centrifuging the sediment and collecting the overlying water.



MAUNSELL AECOM

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

MARINE SEDIMENT SAMPLING LAYOUT AT HKCEC WEST

SKETCH 329

P:\projects\97103\drawing\SKETCH\329\329.dgn

A3 SCALE 1:2000

329.dgn 2006-12-12 11:44:46

LEGEND:

- BOUNDARY OF STUDY AREA
- EXTENT OF RECLAMATION
- V06-41 — PHASE 1 CHEMICAL/BIOLOGICAL SCREENING SAMPLING LOCATION
- V06-9W — PHASE 1 ELUTRIATE TEST AND PORE WATER TEST SAMPLING LOCATION
- V06-12 — PHASE 2 CHEMICAL/BIOLOGICAL SCREENING SAMPLING LOCATION
- V06-4W — PHASE 2 ELUTRIATE TEST AND PORE WATER TEST SAMPLING LOCATION

PHASE 1 — CHEMICAL/BIOLOGICAL SCREENING

VIBROCORE NO.	EASTING	NORTHING
V06-7	835767	815930
V06-8	835869	815924
V06-9	835967	815933
V06-20	836960	815990
V06-21	836969	816047
V06-22	837069	816074
V06-23	836969	816110
V06-24	837073	816137
V06-25	837167	816179
V06-26	837247	816228
V06-27	837316	816302
V06-28	837389	816379
V06-29	837445	816455
V06-30	837301	816192
V06-31	837420	816269
V06-32	837453	816350
V06-33	837461	816235

PHASE 1 — CHEMICAL/BIOLOGICAL SCREENING

VIBROCORE NO.	EASTING	NORTHING
V06-34	837521	816322
V06-35	837497	816555
V06-36	837549	816619
V06-37	837629	816713
V06-38	837718	816789
V06-39	837775	816842
V06-40	837839	816903
V06-41	836959	816606
V06-42	837052	816635
V06-43	837174	816671
V06-44	837296	816703
V06-45	836971	816516
V06-46	837061	816559
V06-47	837184	816593
V06-48	837307	816626

PHASE 1 — ELUTRIATE TEST AND PORE WATER TEST FOR WATER QUALITY ASSESSMENT

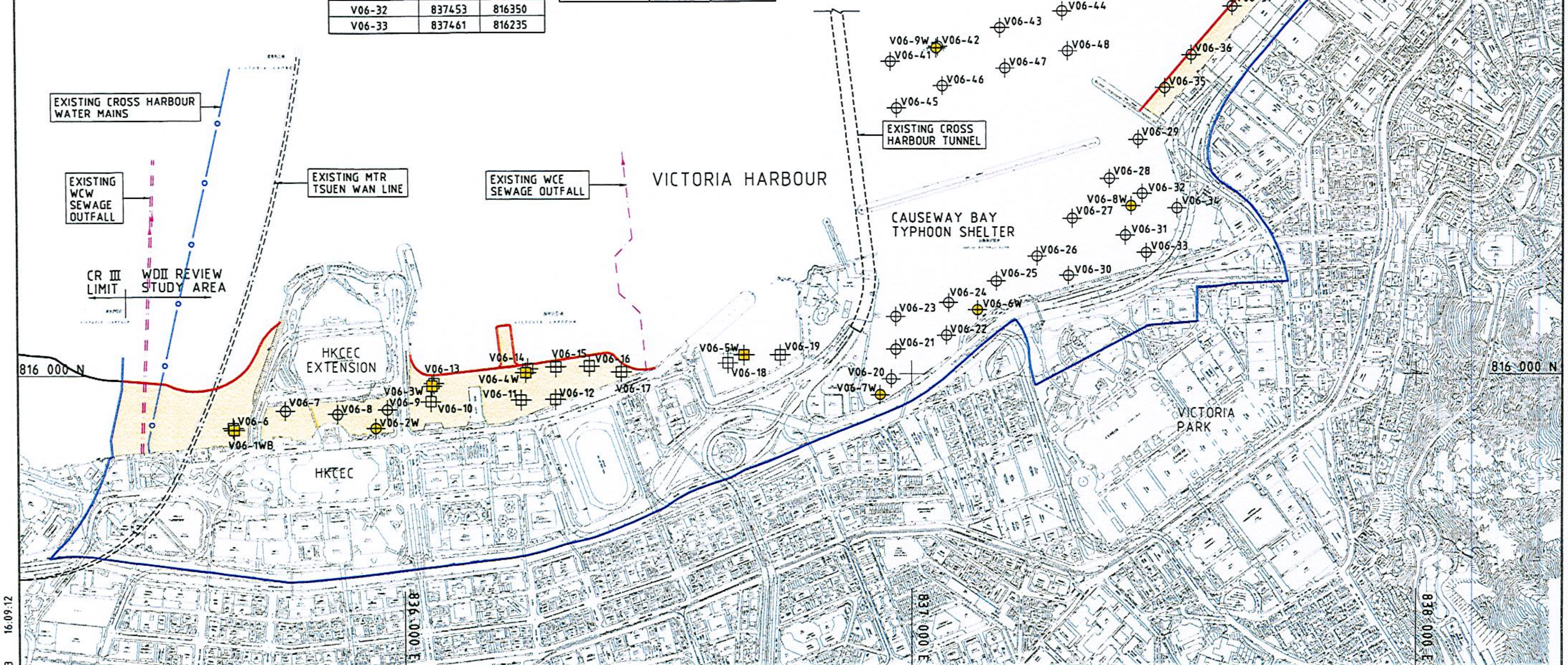
VIBROCORE NO.	EASTING	NORTHING
V06-2W	835944	815897
V06-6W	837130	816123
V06-7W	836938	815959
V06-8W	837431	816326
V06-9W	837049	816632
V06-10W	837709	816794

PHASE 2 — CHEMICAL/BIOLOGICAL SCREENING

VIBROCORE NO.	EASTING	NORTHING
V06-6	835665	815897
V06-10	836053	815948
V06-11	836231	815950
V06-12	836299	815951
V06-13	836059	815983
V06-14	836244	816011
V06-15	836300	816014
V06-16	836366	816015
V06-17	836429	816004
V06-18	836639	816021
V06-19	836742	816036

PHASE 2 — ELUTRIATE TEST AND PORE WATER TEST FOR WATER QUALITY ASSESSMENT

VIBROCORE NO.	EASTING	NORTHING
V06-1WB	835667	815893
V06-3W	836055	815978
V06-4W	836240	816003
V06-5W	836671	816036



WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

MARINE SEDIMENTS SAMPLING LOCATIONS

FIGURE 6.1 & 6.2

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

DATE: 2007-5-23 16:09:12

Attachment B

3. OUTLINE OF PROPOSED ENVIRONMENTAL SURVEYS

3.1 Following the discussion in Section 2, the following surveys are proposed for the purpose of the EIA study:

- Marine site investigation;
- Storm water pollution survey;
- Short-term air quality monitoring near CHT; and
- Odour survey.

3.2 The scopes and methodologies of the above proposed surveys are outlined in the section below.

Marine Site Investigation

3.3 The objectives of the further marine SI are to:

- Update the current sediment quality at the proposed dredging site;
- Provide sufficient information for the water quality impact assessments on the release of contaminants during dredging operation for the Project; and
- Identify the sediment contamination within the dredged area and determine the environmental impacts associated with handling, transportation and disposal of the contaminated sediments.

Review of Sediments and Proposed Sampling Locations for Further SI

3.4 Five dredging areas are proposed for the current layout:

- Near HKCEC
- Wan Chai Waterfront
- PCWA basin
- CBTS
- North Point Waterfront

3.5 A total of forty-eight (48) sampling locations are proposed for the reclamation site. The proposed locations generally follow the 100 x 100m grid sampling arrangement. At each sampling point, vertical profile of sediment shall be sampled by vibrocores and surface sediment collected by grab sampler. A grab sample shall also be collected from the EPD's routine sediment monitoring station PS6 at Port Shelter (850234E, 820057N) as the reference sediment sample.

3.6 The vibrocoring shall be terminated at 1.0m into the alluvium layer or at depth as instructed by the Engineer on site. The samples taken from the vibrocores shall be continuous. On recovery, the plastic liner tube holding the vibrocore sample shall be sub-sampled and cut on-site into 1m sections except the first one that should be (0.0 – 0.9m). The top levels of these sections shall be the seabed level, 0.9m down, 1.9m down, 2.9m down, and then every 3m until the end of the vibrocore.

Near HKCEC

3.7 The area joins the eastern boundary of Central Reclamation Phase III works and includes the HKCEC water channel. Permanent reclamations are proposed for the area and filling and dredging operations would be necessary. Based on the sediment assessments in the design and construction stage, category 'H' samples were recorded at nearly all of the sampling locations. The majority of the dredged sediments in the area were proposed for confined marine disposal (Type 2) and open sea disposal (dedicated sites) (Type 1). A small patch of sediments in the eastern portion of the area were proposed for Special Treatment/Disposal (Type 3).

3.8 Nine (9) sampling locations (V06-1 and V06-9), are proposed in the area and shown in Figure 1.

Wan Chai Waterfront

3.9 The area covers from east of HKCEC to west of ex-PCWA. The proposed permanent reclamations under the current Study are substantially smaller than the previous layout plan. Based on the sediment quality assessments in the design and construction stage, category 'H' sediments were found along the Waterfront, in particular the surface layer. The proposed disposal methods for the sediments were confined marine disposal (Type 2) / open sea disposal (Type 1).

3.10 Eight (8) sampling locations (V06-10 to V06-17) are proposed for the area and shown in Figure 1.

PCWA Basin

3.11 Temporary reclamation would be constructed for the cut & cover tunnel at the PCWA basin and dredging will likely be required for the temporary seawalls. Based on the sediment assessments in the design and construction stage, surface layer of the sampling locations are category 'H' sediments while the deeper layer are category 'L' sediments. Open sea disposal (Type 1) and confined marine disposal (Type 2) are proposed for the category L and category H sediments, respectively.

3.12 Two (2) sampling locations (V06-18 and V06-19) are proposed for the area.

CBTS

3.13 Cut and cover tunnel is proposed across the CBTS and temporary reclamation will be required. It is likely that dredging for the temporary seawalls will be required. In comparison with the permanent reclamation in the previous design, the temporary reclamation will extend deeper into CBTS. Based on the sediment assessments carried out in the design and construction stage, a fair portion of the sampling locations were found to contain category 'H' sediments. Sediment disposal are a mixture of open sea disposal (Type 1), confined marine disposal (Type 2) and special disposal (Type 3).

3.14 Fifteen (15) sampling locations (V06-20 to V06-34) are proposed for the area.

North Point Waterfront

3.15 The proposed permanent reclamation extend from east of CBTS to near City Garden. Since reclamation was not proposed at North Point Waterfront in the previous design layouts, marine site investigations were not carried out in the area.

3.16 Six (6) sampling locations (V06-35 to V06-40) are proposed for the area and shown in Figure 1.

Marine Area off CWBTS

3.17 The area is tentative for the breakwater of the temporary re-provision of the typhoon shelter.

3.18 Eight (8) sampling locations (V06-41 to V06-48) are proposed for the area and shown in Figure 1.

Testing Parameters

3.19 The sediments collected using the 48 vibrocores from the SI works as well as the reference sample will subject to chemical screening (Tier II) in accordance with the ETWB TCW No. 34/2002 – Management of Dredged / Excavated Sediment. The testing parameters for the chemical screening are summarised in Table 1 below. Grab samples collected from the vibrocoring locations will be used for the testing of tributylin in interstitial water in view of the difficulty to extract sufficient interstitial water for the TBT analysis in the vibrocore samples to achieve the required detection limit.

3.20 Elutriate tests will be carried out on sediment samples collected from 10 representative vibrocore locations across the proposed dredging areas. These sampling locations are selected based on a review of the existing chemical testing data of the proposed dredging areas. The sampling locations represent locations where seriously contaminated sediment (i.e. Category H sediment with contaminant levels exceeding 10 times the LCEL) was identified under previous SI, and at other locations to ensure coverage of the proposed dredging areas. The following parameters will be carried out for the elutriate tests:

- Nine (9) heavy metals and metalloid including cadmium, chromium, copper, mercury, nickel, lead, zinc, silver and arsenic;

- Three (3) organic micro-pollutants including PCB, PAH, and TBT; and

- Total Kjeldahl Nitrogen (TKN), Nitrate-Nitrogen, Nitrite-Nitrogen, Ammonia-Nitrogen, Orthophosphate Phosphorus, Total Phosphorus and Chlorinated pesticides (Alpha-BHC; Beta BHC; Gamma BHC; Delta-BHC; Heptachlor; Aldrin; Heptachlor epoxide; Endosulfan 1; p, p'-DDT; p, p'-DDD; p, p'-DDE; Endosulfan sulfate).

Table 1 Testing Parameters for Chemical Screening (Tier II)

Parameters	Preparation Method[1] *US EPA Method*	Determination Method[1] *US EPA Method*
Metals (mg/kg dry wt.)		
Cadmium (Cd)	3050B	6020A or 7000A or 7131A
Chromium (Cr)	3050B	6010C or 7000A or 7190
Copper (Cu)	3050B	6010C or 7000A or 7210
Mercury (Hg)	7471A	7471A
Nickel (Ni)	3050B	6010C or 7000A or 7520
Lead (Pb)	3050B	6010C or 7000A or 7420
Silver (Ag)	3050B	6020A or 7000A or 7761
Zinc (Zn)	3050B	6010C or 7000A or 7950
Metalloid (mg/kg dry wt.)		
Arsenic (As)	3050B	6020A or 7000A or 7061A
Organic-PAHs (μg/kg dry wt.)		
Low Molecular Weight PAHs+	3550B or 3540C and 3630C	8260B or 8270C
High Molecular Weight PAHs++	3550B or 3540C and 3630C	8260B or 8270C
Organic-non-PAHs (μg/kg dry wt.)		
Total PCBs+++	3550B or 3540C and 3665A	8082
Organometallics (μg TBT/L in interstitial water)		
Tributyltin	Krone et al. (1989)* - GC/MS UNEP/IOC/IAEA**	Krone et al. (1989)* - GC/MS UNEP/IOC/IAEA**

Notes:
Source: ETWB TCW No. 34/2002 – Management of Dredged / Excavated Sediment
1. Other equivalent methods may be used subject to the approval of Director of Environmental Protection
+ Low molecular weight PAHs include acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene
++ High molecular weight PAHs include benzo[a]anthracene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, indeno[1,2,3-c,d]pyrene and benzo[g,h,i]perylene
+++ The reporting limit is for individual PCB congeners. Total PCBs include 2,4' diCB, 2,2',5 triCB, 2,4,4' triCB, 2,2',3,5' tetraCB, 2,2',5,5' tetraCB, 2,3',4,4' tetraCB, 3,3',4,4' tetraCB, 2,2',4,5,5' pentaCB, 2,3,3',4,4' pentaCB, 2,3',4,4',5 pentaCB, 3,3',4,4',5 pentaCB, 2,2',3,3',4,4' hexaCB, 2,2',3,4,4',5' hexaCB, 2,2',4,4',5,5' hexaCB, 3,3',4,4',5,5' hexaCB, 2,2',3,3',4,4',5 heptaCB, 2,2',3,4,4',5,5' heptaCB, 2,2',3,4',5,5',6 heptaCB (ref: the "summation" column of Table 9.3 of *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual (The Inland Testing Manual)* published by USEPA).
* Krone et al. (1989), A method for analysis of butyltin species and measurement of butyltins in sediment and English Sole livers from Puget Sound, Marine Environmental Research 27 (1989) 1-18. Interstitial water to be obtained by centrifuging the sediment and collecting the overlying water.
** UNEP/ICO/IAEA refers to IAEA's Marine Environment Laboratory reference methods. These methods are available free of charge from UNEP/Water or Marine Environmental Studies Laboratory at IAEA's Marine Environment Laboratory. Interstitial water to be obtained by centrifuging the sediment and collecting the overlying water.

3.21 For the elutriate tests, the preparation method "Evaluation of Dredged Material Proposed for Discharge in Waters in US – Testing Manual, Section 10.1.2" shall be followed. Sediment samples shall be mixed with seawater samples collected from the proposed dredging site and the solution shall be vigorously agitated during the tests to simulate the strong disturbance to the seabed sediment during dredging. Laboratory testing for the above proposed parameters (i.e. heavy metals, metalloid, organic micro-pollutants and nutrients) shall be carried out on the solution (elutriate). The analytical methods and reporting limits for the laboratory testing are shown in Table 2 below.

Table 2 Testing Methods and Reporting Limits for Elutriate

Parameters	Determination Method *US EPA Method* *(unless specified otherwise)*	Reporting Limit
Metals (μg/L)		
Cadmium (Cd)	6020A	0.2 μg/L
Chromium (Cr)	6020A	1 μg/L
Copper (Cu)	6020A	1 μg/L
Mercury (Hg)	6010B / APHA 3112B	0.1 μg/L
Nickel (Ni)	6020A	1 μg/L
Lead (Pb)	6020A	1 μg/L
Silver (Ag)	6020A	1 μg/L
Zinc (Zn)	6020A	10 μg/L
Metalloid (μg/L)		
Arsenic (As)	6020A	1 μg/L
Organic-PAHs (μg/L)		
Low Molecular Weight PAHs	3510C / 3630C / 8270C	0.2 μg/L
High Molecular Weight PAHs	8270C	
Organic-non-PAHs (μg/L)		
Total PCBs (as 18 cogeners)	3620B / 8082 / 8270	0.01 μg/L
Organometallics (μg TBT/L in interstitial water)		
Tributyltin	UNEP/IOC/IAEA**	0.015 μg TBT/L
Other Contaminants (as specified)		
Total Kjeldahl Nitrogen (TKN)	APHA 4500-N_{org} + NH_3C	0.1 mg N/L
Nitrate Nitrogen	APHA 4500-NO_3^- I	0.05 mg NO_3-N/L
Nitrite Nitrogen	APHA 4500-NO_2^- I	0.05 mg NO_2-N/L
Ammonia Nitrogen	APHA 4500-NH_3 H	0.1 mg NH_3-N/L
Orthophosphate Phosphorus (PO_4-P)	APHA 4500-P F	0.005 mg P/L
Total Phosphorus	APHA 4500-P B&E	0.02 mg-P/L
Chlorinated pesticides	3510C / 3620B / 8270C / 8081A	0.02 μg/L

Note:
** UNEP/ICO/IAEA refers to IAEA's Marine Environment Laboratory reference methods. These methods are available free of charge from UNEP/Water or Marine Environmental Studies Laboratory at IAEA's Marine Environment Laboratory. Interstitial water to be obtained by centrifuging the sediment and collecting the overlying water.

3.22 Sediment pore water (interstitial water) analyses will also be conducted on the sediment samples collected from the 10 representative vibrocore locations. Sediment samples will be centrifuged at 3000 rpm for 10 minutes followed by filtration. The analytical methods and reporting limits for the laboratory testing of the pore water/interstitial water are the same as for the analysis of elutriate samples and are shown in Table 2. Should it prove difficult to extract sufficient interstitial water from the vibrocore samples for analysis, then grab samples collected from the same location will be used for performing the analysis of sediment pore water.

3.23 In addition, 5-day sediment oxygen demand (SOD_5), total inorganic nitrogen and ammonia nitrogen shall be tested for the sediment samples collected at each of the 10 vibrocores subject to elutriate tests. The analytical methods and reporting limits for the laboratory testing are shown in Table 3 below.

Table 3 Testing Methods and Reporting Limits for Sediment Samples

Parameters	Determination Method	Reporting Limit
Total Inorganic Nitrogen	APHA 4500-NO_3^-E & APHA 4500-NH_3 H	1 mg-N/kg
Ammonia Nitrogen	APHA 4500-NH_3 H	1 mg NH_3-N/kg
Sediment Oxygen Demand (5-day)	In-house method	1mg/kg dry weight.

3.24 Biological screening (Tier III) maybe required subject to the findings of the chemical screening of the sediment samples in accordance with the ETWB TCW No. 34/2002. The testing parameters for biological screening are shown in Table 4 below.

Table 4 Testing Parameters for Biological Screening (Tier III)

Test Type	Species**	Reference Test Condition*
10-day burrowing amphipod toxicity test	*Ampelisca abdita*	USEPA (1994) / PSEP (1995)
	Leptocheirus plumulosus	USEPA (1994)
	Eohaustorius estuaries	USEPA (1994) / PSEP (1995)
20-day burrowing polychaete toxicity test	*Neanthes arenaceodentata*	PSEP (1995)
48-96 hour larvae (bivalve or echinoderm) toxicity test	Bivalve:	
	Mytilus spp.	PSEP (1995)
	Crassostrea gigas	PSEP (1995)
	Echinoderm:	
	Dendraster excentricus	PSEP (1995)
	Strongylocentrotus spp.	PSEP (1995)

Note:
Source: ETWB TCW No. 34/2002 – Management of Dredged / Excavated Sediment
* USEPA (1994) – Methods for assessing the toxicity of sediment-associated contaminants with estuarine and marine amphipods. Office of Research and Development. U.S. Environmental Protection Agency, Cincinnati, OH. EPA/600/R94/025; PSEP (Puget Sound Estuary Program) (1995) – Recommended guidelines for conducting laboratory bioassays on Puget Sound Sediments.
** One species will be selected from each test type.

3.25 For biological testing, sediment samples, including the reference sediment and composite samples shall be characterized by the testing laboratory for ancillary testing parameters such as porewater, salinity, ammonia, TOC, grain size and moisture content.

3.26 At this stage all reclamation areas are notionally fully dredged and thus potential generation of biogas underneath the reclamation area is not considered to be an issue. There is potentially an area next to CRIII that could conceivably have some sediment retained. As a back-up, sediment samples will be collected using two vibrocores in this area. The following tests will be carried out on the vibrocore samples:

- Total Organic Carbon (TOC)
- Sediment Oxygen Demand (SOD) (20-day)

3.27 The analytical methods and reporting limits are shown in Table 5 below.

Table 5 Testing Methods and Reporting Limits for Analysis of TOC and SOD in Sediment Samples for Biogas Risk Assessment (if necessary)

Parameters	Determination Method	Reporting Limit
Total Organic Carbon	USEPA 5310B modified	0.05 %
Sediment Oxygen Demand (20-day)	In-house method	1mg/kg dry weight.

3.28 In addition, two grab samples collected at the same sampling locations as the vibrocores will be analyzed for carbon compound fractionation using Gas Chromatography – Flame Ionization Detector (GC-FID) in order to estimate the percentage of biodegradable TOC.

LEGEND:

- BOUNDARY OF STUDY AREA
- EXTENT OF RECLAMATION
- V06-41 PHASE 1 CHEMICAL/BIOLOGICAL SCREENING SAMPLING LOCATION
- V06-9W PHASE 1 ELUTRIATE TEST AND PORE WATER TEST SAMPLING LOCATION
- V06-12 PHASE 2 CHEMICAL/BIOLOGICAL SCREENING SAMPLING LOCATION
- V06-4W PHASE 2 ELUTRIATE TEST AND PORE WATER TEST SAMPLING LOCATION

PHASE 1 — CHEMICAL/BIOLOGICAL SCREENING

VIBROCORE NO.	EASTING	NORTHING
V06-7	835767	815930
V06-8	835869	815924
V06-9	835967	815933
V06-20	836960	815990
V06-21	836969	816047
V06-22	837069	816074
V06-23	836969	816110
V06-24	837073	816137
V06-25	837167	816179
V06-26	837247	816228
V06-27	837316	816302
V06-28	837389	816379
V06-29	837445	816455
V06-30	837301	816192
V06-31	837420	816269
V06-32	837453	816350
V06-33	837461	816235

PHASE 1 — CHEMICAL/BIOLOGICAL SCREENING

VIBROCORE NO.	EASTING	NORTHING
V06-34	837521	816322
V06-35	837497	816555
V06-36	837549	816619
V06-37	837629	816713
V06-38	837718	816789
V06-39	837775	816842
V06-40	837839	816903
V06-41	836959	816606
V06-42	837052	816635
V06-43	837174	816671
V06-44	837296	816703
V06-45	836971	816516
V06-46	837061	816559
V06-47	837184	816593
V06-48	837307	816626

PHASE 1 — ELUTRIATE TEST AND PORE WATER TEST FOR WATER QUALITY ASSESSMENT

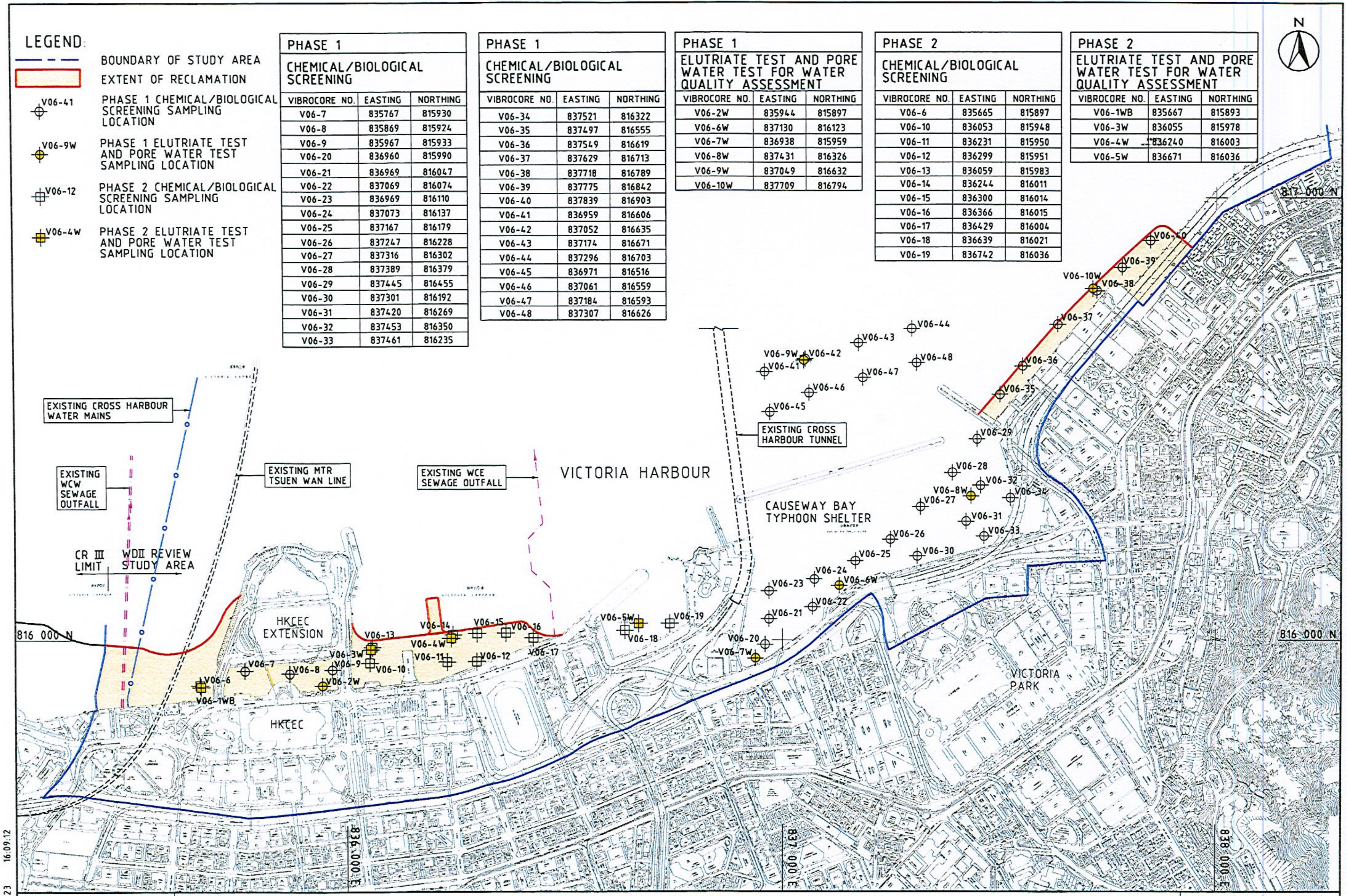
VIBROCORE NO.	EASTING	NORTHING
V06-2W	835944	815897
V06-6W	837130	816123
V06-7W	836938	815959
V06-8W	837431	816326
V06-9W	837049	816632
V06-10W	837709	816794

PHASE 2 — CHEMICAL/BIOLOGICAL SCREENING

VIBROCORE NO.	EASTING	NORTHING
V06-6	835665	815897
V06-10	836053	815948
V06-11	836231	815950
V06-12	836299	815951
V06-13	836059	815983
V06-14	836244	816011
V06-15	836300	816014
V06-16	836366	816015
V06-17	836429	816004
V06-18	836639	816021
V06-19	836742	816036

PHASE 2 — ELUTRIATE TEST AND PORE WATER TEST FOR WATER QUALITY ASSESSMENT

VIBROCORE NO.	EASTING	NORTHING
V06-1WB	835667	815893
V06-3W	836055	815978
V06-4W	836240	816003
V06-5W	836671	816036



MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

MARINE SEDIMENTS SAMPLING LOCATIONS

FIGURE 1

DATE: 2007-5-23 16:09:12

Annex 15.5

Prior Agreement on Land Contamination Impact Assessment From EPD

Urgent by Fax

MEMO

From	Director of Environmental Protection	To	Project Manager/HKI&I, CEDD
Ref.	(52) in EP2/H4/S3/15	(Attn.:	Mr. C. K. Lam)
Tel. No.	2835 1155	Your Ref.	in HKI 2/4/50 EI
Fax. No.	2591 0558	dated	7.3.07 Fax. No. 25775040
Date	21 March 2007	Total Pages	1

Environmental Impact Assessment Ordinance (EIAO)
Project Title: Wan Chai Development Phase II and Central-Wan Chai Bypass
EIA Study Brief No. 153/2006
Section 3.4.10.4 of the Study Brief – Contamination Assessment Plan (CAP)

I refer to your memo under reference and a letter from your consultant, Maunsell (ref: 60017193/C/YKT702061) submitting a revised contamination assessment plan (CAP) for the captioned EIA study for our agreement under Section 3.4.10.4 of the EIA Study Brief No. ESB-153/2006.

2. Please be informed that after taking into the advice from our waste assessment team, the revised CAP are considered as acceptable to fulfil the following requirements of the captioned EIA study brief:

Reference in the Study Brief Stipulating the Requirements	Description
Section 3.4.10.4	Agreement with the Director of Environmental Protection on the contamination assessment plan (CAP).

(Victor YEUNG)
Senior Environmental Protection Officer
for Director of Environmental Protection

c.c.:

Maunsell (Attn: Mr. Tim Cramp Fax: 28910305
and Mr. Peter Cheek) Fax: 26912649

c.c. internal: S(RA)4, S(MA)3

D:\EIAO_WDII CWB\CEDD_SB3.4.10.4 CAP agree.doc

Maunsell Environmental Management Consultants Ltd
11/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong
茂盛環境管理顧問有限公司
香港新界沙田鄉事會路 138 號新城市中央廣場 2 座 11 樓
T +852 2893 1551 F +852 2891 0305 www.maunsell.aecom.com

Our Ref.: 60017193/C/YKT702061

By Fax (2591 0558) and Post
Environmental Protection Department
Metro Assessment Group
27th floor, Southorn Centre,
130 Hennessy Road,
Wan Chai, Hong Kong

Attn : Mr. Raymond Lai

6 February 2007

Dear Sir,

Supplemental Agreement No.1 to Agreement No. CE 54/2001 (CE)
Wan Chai Development Phase II - Planning and Engineering Review
Wan Chai Development Phase II and Central-Wan Chai Bypass – EIA Study
(Contamination Assessment Plan Version 3)

With regard to the assessment of land contamination for the captioned EIA Study and further to our letter dated 10 January 2007 (ref.: A01604/C/YKT701101) on the Contamination Assessment Plan, we are pleased to enclose herewith the revised Contamination Assessment Plan (CAP) (Version 3) for your agreement as per the requirements in Section 3.4.10.4 of the EIA Study Brief (ESB-153/2006).

Please be informed that since our last submission, the following information are included in this CAP:

1. Aerial photographs in the period from 1924 – 1968
2. Responses from Site Owner on the Site Appraisal Checklist
3. Government Lease Records
4. Trial pit (TP1) is proposed as the sampling method at borehole location 'BH9' due to headroom constraint.

We should most appreciate if you would confirm that the CAP for the EIA Study is acceptable by 14 February 2007. Should you need any further clarification or information, please feel free to contact Mr Lawrence Tso at 3105 8567. Thank you for your kind attention.

Yours faithfully
for and on behalf of
Maunsell Environmental Management Consultants Ltd

T. J. Cramp

Tim Cramp
Executive Director

Encl.

cc	CEDD – CK Lam	By fax (2577 5040), w/o encl
	MCAL - Peter Cheek	By fax (26912649), w/o encl

Annex 15.6

Prior Agreement on Traffic Forecasts from Transport Department

運輸署
Transport Department

本署檔號 Our Ref. HR 171/70-30
來函檔號 Your Ref. CAKM:qc:97103/10.4-0764
電 話 Tel. 2829 5524
圖文傳真 Fax. 2824 0399

By Fax
(Fax: 2691 2649)

24 July 2007

Maunsell Consultants Asia Ltd.
8/F, Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road
Sha Tin, N.T., Hong Kong

(Attn.: Ms. Carmen Au)

Dear Sir/Madam,

Supplemental Agreement No.1 to Agreement No. CE 54/2001(CE)
Wan Chai Development Phase II – Planning and Engineering Review

Forecast Traffic Flow for Environmental Impact Assessment (EIA) for WDII & CWB

We refer to your letter dated 16 July 2007 regarding the submission of traffic forecast flow for the use in the WDII & CWB EIA.

Presuming that your submitted forecast traffic data and model splits for the modified road layout used the same approaches as for the original layout, we considered the submission in your captioned letter acceptable for the use in environmental impact assessments (EIA).

Yours faithfully,

(Ching LEUNG)
for Assistant Commissioner
for Transport / Urban

c.c.
PM/HKI&I, CEDD (Attn.: Mr. S.K. LAM) (Fax: 2577 5040)

MAUNSELL | AECOM

Maunsell Consultants Asia Ltd
8/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong
茂盛(亞洲)工程顧問有限公司
香港新界沙田鄉事會路 138 號新城市中央廣場第 2 座 8 樓
T +852 2605 6262 F +852 2691 2649 www.maunsell.aecom.com

Your Ref : HR171/70-30
Our Ref : CAKM:qc:97103/10.4-0764

By Fax (2824 0399) and Post

Senior Engineer/Housing & Planning
Traffic Engineer (HK) Division
Transport Department
37/F Immigration Tower
7 Gloucester Road
Wan Chai
Hong Kong

Attn: Mr. C.Y. Chan

16 July 2007

Dear Sir,

SA1 to Agreement No. CE54/2001(CE)
Wan Chai Development Phase II – Planning and Engineering Review

Forecast Traffic Flow for Environmental Impact Assessment (EIA) for Wan Chai Development Phase II and Central-Wan Chai Bypass Projects (WDII & CWB)

Further to your letter dated 25 April 2007 (as attached) which advised us that the submitted traffic forecast data, model splits and approaches as listed in you letter are considered appropriate for the environmental impact assessments (EIA), the road layout for Slip Road 8 and the associated connecting road networks have been modified to minimize the intrusion into the North Pavilion Garden of Victoria Park.

We submit herewith for your agreement the following forecast traffic flow for the use in the WDII & CWB EIA:-

1. Forecast traffic flow (2016 and 2031) for the scenario with the Trunk Road (see Attachment 1a and 1b).

2. Forecast hourly traffic flow for 24 hours (2016 and 2031) for the scenario with the Trunk road (see Attachment 2a and 2b).

3. Forecast hourly traffic flow speed for 24 hours (2016 and 2031) for the scenario with the Trunk Road (see Attachment 3a and 3b).

Figures 1, 2 and 3 showing the location index for the scenario with the Trunk Road are also attached for your reference with the forecast traffic data.

The submission in this letter shall supersede the previous submissions of forecast traffic data under letters dated 7 September 2006, 20 November 2006 and 12 April 2007 for all the scenarios with the Trunk Road.

Your response to this submission by 23 July 2007 would be most appreciated. Should you have any queries in this regard, please contact Mr. Samuel Sze at Tel. 3105 8619 or the undersigned.

Yours faithfully,

Carmen Au
Senior Engineer

Encl.

cc PM/HKI&I, CEDD – Mr. S.K. Lam / Mr. C.K. Lam - (w/e, by post)
ENSR – Attn: Mr. Freeman Cheung - (w/e, by internal mail)

+852 2802 4379

運輸署
Transport Department

By Fax 2691 2649 only
(2 Pages)

本署檔號 Our Ref. HR 171/70-30
來函檔號 Your Ref. PMC:CAKM:qc:97103/10.4-0706
電 話 Tel. 2829 5425
圖文傳真 Fax. 2824 0399

25 April, 2007

Maunsell Consultants Asia Ltd
8/F Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road
Shatin, Hong Kong

Attn: Mr. Peter Cheek

Dear Sirs,

SA1 to Agreement No. CE54/2001(CE)
Wan Chai WDII – Planning and Engineering Review
WDII and CWB Projects - Traffic Forecasts for EIA

I refer to your following submissions of various traffic forecasts prepared for the environmental impact assessments (EIA) of the WDII & CWB review:-

year	forecast scenario	MCAL reference
2008 (year at commencement)	without trunk road, in 6 classes	PMC:CAKM:qc:97103/10.4-0701 dated 4 April 2007 (data set) and PMC:CAKM:qc:97103/10.4-0706 dated 20 April 2007 (substantiations)
2016 (year at operation)	with trunk road, in 16 classes	PMC:CAKM:qc:97103/10.4-0704 dated 12 April 2007 (data set) and PMC:CAKM:qc:97103/10.4-0706 dated 20 April 2007 (substantiations)
2031 (15 years after opening)	with trunk road, in 6 classes and 16 classes	PMC:AWSY:qc:97103/10.4-0478 dated 7 September 2006 (data set) CAKM:AWSY:qc:97103/10.4-0517 dated 3 October 2006 (responses to comments) PMC:CAKM:qc:97103/10.4-0567 dated 20 November 2006 (6 classes)
2031(15 years after opening)	without trunk road, in 6 classes	PMC:CAKM:qc:97103/10.4-0701 dated 4 April 2007 (data set) and PMC:CAKM:qc:97103/10.4-0706 dated

Superseded

		20 April 2007 (substantiations)
2016	with trunk road, 16 vehicle classes, hourly flows	PMC:CAKM:qc:97103/10.4-0704 dated 12 April 2007 (data set) and PMC:CAKM:qc:97103/10.4-0706 dated 20 April 2007 (substantiations)
2031	with trunk road, 16 vehicle classes, hourly flows	PMC:CAKM:qc:97103/10.4-0704 dated 12 April 2007 (data set) and PMC:CAKM:qc:97103/10.4-0706 dated 20 April 2007 (substantiations)
2016	with trunk road, 16 vehicle classes, hourly flow speeds	PMC:CAKM:qc:97103/10.4-0704 dated 12 April 2007 (data set) and PMC:CAKM:qc:97103/10.4-0706 dated 20 April 2007 (substantiations)
2031	with trunk road, 16 vehicle classes, hourly flow speeds	PMC:CAKM:qc:97103/10.4-0704 dated 12 April 2007 (data set) and PMC:CAKM:qc:97103/10.4-0706 dated 20 April 2007 (substantiations)

Superseded

The above traffic forecast data, modal splits, and approaches are considered appropriate for the environmental impact assessments.

Whilst the above traffic forecasts are appropriate for the EIA, the TIA study for WDII and CWB projects being undertaken by the consultants is not required to cover the design year 2031. If it is required to assess the traffic impacts for year 2031, the traffic forecast data for year 2031 need to be reviewed taking account of the updated planning parameters.

Yours faithfully,

(CW CHENG)
for Assistant Commissioner
for Transport/ Urban

c.c.
PM/HKI&I, CEDD Attn. Mr. S. K. Lam / Mr. C. K. Lam Fax. 2577 5040

2016 EIA Traffic Flows by 16 Vehicle Classes

Link No	Total Vehicle	Motor Cycles	Petrol PC & LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC&LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV>3.5t	HGV<15t	HGV>15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
1	1728	7%	67%	16%	0%	4%	0%	0%	1%	0%	0%	0%	5%	0%	0%	0%	0%	100%
2	117	6%	63%	20%	0%	5%	0%	0%	2%	0%	0%	0%	4%	0%	0%	0%	0%	100%
3	714	4%	43%	43%	0%	3%	0%	0%	1%	1%	1%	1%	3%	0%	0%	0%	0%	100%
4	651	7%	67%	16%	0%	4%	0%	0%	1%	1%	0%	0%	4%	0%	0%	0%	0%	100%
5	718	4%	43%	43%	0%	4%	0%	0%	1%	1%	1%	0%	3%	0%	0%	0%	0%	100%
6	2798	4%	40%	42%	0%	6%	0%	0%	2%	1%	1%	1%	2%	0%	0%	1%	0%	100%
7	1561	4%	41%	36%	0%	5%	0%	0%	1%	4%	3%	3%	2%	0%	0%	1%	0%	100%
8	120	4%	44%	38%	0%	5%	0%	0%	2%	2%	2%	2%	1%	0%	0%	0%	0%	100%
9	34	4%	46%	38%	0%	5%	0%	0%	1%	2%	2%	2%	0%	0%	0%	0%	0%	100%
10	604	4%	46%	39%	0%	5%	0%	0%	2%	1%	1%	1%	1%	0%	0%	0%	0%	100%
11	517	4%	46%	39%	0%	5%	0%	0%	2%	1%	1%	1%	1%	0%	0%	0%	0%	100%
12	1944	4%	42%	36%	0%	5%	0%	0%	1%	2%	2%	1%	2%	0%	0%	3%	2%	100%
13	4485	3%	36%	40%	0%	6%	0%	0%	2%	1%	1%	2%	3%	0%	0%	4%	2%	100%
14	3168	3%	36%	39%	0%	5%	0%	0%	2%	1%	1%	2%	2%	0%	1%	4%	4%	100%
15	220	4%	36%	32%	0%	8%	0%	0%	2%	4%	4%	4%	2%	0%	0%	2%	2%	100%
16	356	3%	33%	23%	0%	3%	0%	0%	1%	13%	12%	12%	0%	0%	0%	0%	0%	100%
17	1269	5%	53%	28%	0%	4%	0%	0%	1%	2%	2%	2%	1%	0%	0%	1%	1%	100%
18	1378	4%	36%	37%	0%	8%	0%	0%	2%	3%	3%	3%	1%	0%	0%	2%	1%	100%
19	25	3%	33%	24%	0%	3%	0%	0%	1%	12%	12%	12%	0%	0%	0%	0%	0%	100%
20	2420	4%	43%	37%	0%	5%	0%	0%	1%	2%	2%	1%	1%	0%	0%	2%	2%	100%
21	2866	4%	38%	37%	0%	5%	0%	0%	2%	1%	1%	1%	2%	0%	1%	4%	4%	100%
22	3967	4%	44%	38%	0%	5%	0%	0%	2%	1%	1%	1%	1%	0%	0%	2%	1%	100%
23	2646	4%	40%	39%	0%	5%	0%	0%	2%	1%	1%	2%	2%	0%	0%	2%	2%	100%
24	1268	4%	37%	37%	0%	5%	0%	0%	2%	2%	2%	2%	3%	0%	0%	4%	2%	100%
25	326	4%	39%	24%	0%	3%	0%	0%	1%	0%	0%	0%	4%	0%	2%	13%	10%	100%
26	981	4%	36%	35%	0%	5%	0%	0%	1%	2%	2%	2%	5%	0%	1%	4%	3%	100%
27	195	4%	41%	25%	0%	4%	0%	0%	1%	0%	0%	0%	2%	0%	2%	12%	9%	100%
28	25	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	8%	52%	40%	100%
29	681	4%	38%	31%	0%	5%	0%	0%	2%	3%	2%	2%	3%	0%	1%	5%	4%	100%
30	2710	3%	33%	33%	0%	7%	0%	0%	2%	2%	2%	1%	1%	0%	1%	9%	6%	100%
31	1275	2%	25%	40%	0%	2%	0%	0%	0%	2%	2%	1%	1%	0%	2%	13%	10%	100%
32	1065	2%	24%	24%	0%	5%	0%	0%	2%	2%	2%	1%	1%	0%	3%	19%	15%	100%
33	833	2%	20%	33%	0%	2%	0%	0%	0%	2%	1%	1%	1%	0%	3%	20%	15%	100%
34	700	1%	6%	11%	0%	15%	0%	0%	5%	2%	2%	1%	2%	0%	4%	29%	22%	100%
35	453	1%	10%	13%	0%	11%	0%	0%	3%	3%	3%	2%	1%	0%	4%	28%	21%	100%
36	524	1%	6%	11%	0%	15%	0%	0%	5%	3%	3%	2%	3%	0%	4%	26%	21%	100%
37	552	1%	15%	18%	0%	7%	0%	0%	2%	3%	3%	3%	1%	0%	4%	24%	19%	100%
38	709	3%	28%	38%	0%	3%	0%	0%	1%	6%	6%	6%	2%	0%	1%	3%	3%	100%
39	366	3%	28%	34%	0%	7%	0%	0%	2%	4%	3%	3%	4%	0%	1%	6%	5%	100%
40	752	1%	7%	14%	0%	19%	0%	0%	6%	2%	1%	1%	2%	0%	4%	24%	19%	100%
41	573	2%	23%	28%	0%	10%	0%	0%	3%	4%	3%	3%	2%	0%	2%	11%	9%	100%
42	51	3%	32%	37%	0%	5%	0%	0%	1%	7%	7%	6%	2%	0%	0%	0%	0%	100%
43	12	3%	30%	33%	0%	13%	0%	0%	4%	3%	3%	2%	8%	1%	0%	0%	0%	100%
44	470	2%	23%	41%	0%	2%	0%	0%	1%	3%	2%	2%	0%	0%	2%	12%	10%	100%
45	670	3%	30%	39%	0%	3%	0%	0%	1%	3%	3%	2%	0%	0%	1%	9%	6%	100%
46	3497	4%	39%	34%	0%	5%	0%	0%	1%	3%	2%	2%	2%	0%	1%	4%	3%	100%
47	3861	4%	44%	38%	0%	5%	0%	0%	2%	2%	1%	1%	1%	0%	0%	1%	1%	100%
48	71	4%	40%	37%	0%	1%	0%	0%	0%	4%	4%	4%	6%	0%	0%	0%	0%	100%

2016 EIA Traffic Flows by 16 Vehicle Classes

Link No	Total Vehicle	Motor Cycles	Petrol PC & LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC & LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV >3.5t	HGV<15t	HGV>15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
49	1493	4%	40%	42%	0%	6%	0%	0%	2%	1%	1%	1%	2%	0%	0%	1%	0%	100%
50	271	4%	37%	35%	0%	2%	0%	0%	0%	5%	5%	4%	6%	0%	0%	1%	1%	100%
51	166	3%	33%	42%	0%	2%	0%	0%	0%	4%	3%	3%	9%	1%	0%	0%	0%	100%
52	775	4%	36%	34%	0%	2%	0%	0%	0%	5%	5%	4%	6%	1%	0%	2%	1%	100%
53	519	0%	5%	10%	0%	17%	0%	0%	5%	3%	2%	2%	3%	0%	4%	28%	21%	100%
54	746	2%	20%	25%	0%	9%	0%	0%	3%	4%	3%	3%	1%	0%	2%	16%	12%	100%
55	597	3%	29%	39%	0%	12%	0%	0%	3%	3%	3%	3%	1%	0%	0%	2%	2%	100%
56	239	3%	29%	35%	0%	8%	0%	0%	2%	7%	6%	6%	2%	0%	0%	1%	1%	100%
57	750	2%	19%	39%	0%	21%	0%	0%	6%	3%	3%	3%	1%	0%	0%	2%	1%	100%
58	567	3%	27%	49%	0%	8%	0%	0%	3%	4%	3%	3%	0%	0%	0%	0%	0%	100%
59	4064	4%	43%	12%	0%	9%	0%	0%	2%	5%	4%	4%	6%	1%	1%	5%	4%	100%
60	1313	6%	59%	14%	0%	8%	0%	0%	2%	2%	2%	1%	2%	0%	0%	2%	2%	100%
61	2772	5%	55%	13%	0%	8%	0%	0%	2%	2%	2%	2%	2%	0%	1%	4%	4%	100%
62	3645	6%	60%	15%	0%	8%	0%	0%	3%	2%	1%	1%	1%	0%	0%	2%	1%	100%
63	3645	6%	60%	15%	0%	8%	0%	0%	3%	2%	1%	1%	1%	0%	0%	2%	1%	100%
64	716	4%	44%	39%	0%	5%	0%	0%	2%	2%	2%	1%	1%	0%	0%	0%	0%	100%
65	900	5%	49%	33%	0%	4%	0%	0%	1%	2%	1%	1%	4%	0%	0%	0%	0%	100%
66	193	4%	45%	39%	0%	5%	0%	0%	2%	2%	1%	1%	1%	0%	0%	0%	0%	100%
67	1862	4%	45%	39%	0%	5%	0%	0%	2%	2%	1%	1%	1%	0%	0%	0%	0%	100%
68	508	2%	22%	19%	0%	7%	0%	0%	2%	10%	9%	9%	19%	1%	0%	0%	0%	100%
69	233	5%	47%	41%	0%	5%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	100%
70	402	4%	42%	37%	0%	13%	0%	0%	4%	0%	0%	0%	0%	0%	0%	0%	0%	100%
71	1413	3%	33%	29%	0%	11%	0%	0%	3%	4%	4%	4%	8%	1%	0%	0%	0%	100%
72	379	5%	54%	36%	0%	4%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	100%
73	1850	4%	38%	34%	0%	12%	0%	0%	4%	2%	1%	1%	3%	0%	0%	1%	0%	100%
74	792	5%	51%	34%	0%	4%	0%	0%	1%	1%	0%	0%	0%	0%	0%	2%	2%	100%
75	1850	4%	38%	34%	0%	12%	0%	0%	4%	2%	1%	1%	3%	0%	0%	1%	0%	100%
76	460	5%	50%	33%	0%	4%	0%	0%	1%	0%	0%	0%	0%	0%	0%	3%	3%	100%
77	84	4%	41%	36%	0%	13%	0%	0%	4%	1%	0%	0%	1%	0%	0%	0%	0%	100%
78	397	5%	46%	31%	0%	4%	0%	0%	1%	3%	2%	2%	6%	0%	0%	0%	0%	100%
79	641	4%	44%	43%	0%	4%	0%	0%	1%	1%	1%	0%	2%	0%	0%	0%	0%	100%
80	1095	4%	40%	42%	0%	7%	0%	0%	2%	1%	1%	0%	2%	0%	0%	1%	0%	100%
81	1193	4%	39%	34%	0%	13%	0%	0%	4%	1%	1%	1%	2%	0%	0%	1%	0%	100%
82	1068	5%	50%	34%	0%	4%	0%	0%	1%	1%	1%	1%	3%	0%	0%	0%	0%	100%
83	687	4%	37%	37%	0%	3%	0%	0%	1%	2%	2%	1%	6%	1%	0%	4%	2%	100%
84	1491	3%	36%	31%	0%	12%	0%	0%	3%	2%	2%	2%	4%	0%	0%	3%	2%	100%
85	614	5%	49%	32%	0%	4%	0%	0%	1%	1%	1%	1%	3%	0%	0%	2%	1%	100%
86	818	3%	34%	29%	0%	11%	0%	0%	3%	2%	2%	2%	5%	0%	1%	4%	4%	100%
87	57	3%	35%	23%	0%	3%	0%	0%	1%	0%	0%	0%	0%	0%	3%	18%	14%	100%
88	200	0%	5%	16%	0%	31%	1%	0%	8%	1%	1%	0%	0%	0%	3%	19%	15%	100%
89	39	4%	37%	31%	0%	12%	0%	0%	3%	3%	3%	2%	5%	0%	0%	0%	0%	100%
90	749	2%	19%	39%	0%	21%	0%	0%	6%	3%	3%	3%	1%	0%	0%	2%	1%	100%
91	567	3%	27%	50%	0%	8%	0%	0%	3%	3%	3%	3%	0%	0%	0%	0%	0%	100%
92	441	4%	41%	41%	0%	3%	0%	0%	1%	2%	1%	1%	6%	0%	0%	0%	0%	100%
93	734	4%	38%	40%	0%	6%	0%	0%	2%	2%	2%	2%	4%	0%	0%	0%	0%	100%
94	1102	5%	51%	12%	0%	7%	0%	0%	2%	2%	1%	1%	1%	0%	2%	9%	7%	100%
95	1030	5%	48%	12%	0%	6%	0%	0%	2%	3%	2%	2%	2%	0%	2%	9%	7%	100%
96	1110	5%	50%	12%	0%	7%	0%	0%	2%	2%	2%	1%	1%	0%	2%	9%	7%	100%

2016 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Total Vehicle	Motor Cycles	Petrol PC & LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC & LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV >3.5t	HGV<15t	HGV>15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
97	1361	5%	54%	13%	0%	7%	0%	0%	2%	2%	2%	2%	2%	0%	1%	6%	4%	100%
98	1495	4%	37%	32%	0%	12%	0%	0%	4%	2%	1%	1%	3%	0%	0%	2%	2%	100%
99	198	4%	45%	30%	0%	4%	0%	0%	1%	1%	1%	1%	3%	0%	1%	5%	4%	100%
100	47	4%	41%	49%	0%	3%	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%	100%
101	3763	5%	50%	28%	0%	3%	0%	0%	1%	4%	4%	4%	1%	0%	0%	0%	0%	100%
102	3103	6%	56%	24%	0%	4%	0%	0%	1%	2%	2%	1%	4%	0%	0%	0%	0%	100%
103	905	4%	38%	34%	0%	12%	0%	0%	4%	2%	2%	1%	3%	0%	0%	0%	0%	100%
104	1407	6%	61%	26%	0%	5%	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%	100%
105	1284	5%	55%	30%	0%	1%	0%	0%	0%	3%	3%	2%	1%	0%	0%	0%	0%	100%
106	3605	6%	63%	22%	0%	2%	0%	0%	2%	1%	1%	1%	2%	0%	0%	0%	0%	100%
107	5067	5%	51%	28%	0%	2%	0%	0%	1%	4%	4%	3%	2%	0%	0%	0%	0%	100%
108	3605	6%	63%	22%	0%	2%	0%	0%	2%	1%	1%	1%	2%	0%	0%	0%	0%	100%
109	4241	5%	52%	27%	0%	2%	0%	0%	1%	4%	4%	4%	1%	0%	0%	0%	0%	100%
110	235	4%	41%	23%	0%	7%	0%	0%	3%	1%	1%	1%	2%	0%	1%	9%	7%	100%
111	116	4%	40%	34%	0%	5%	0%	0%	1%	5%	4%	4%	3%	0%	0%	0%	0%	100%
112	415	5%	46%	27%	0%	3%	0%	0%	1%	3%	2%	2%	1%	0%	1%	5%	4%	100%
113	553	5%	50%	29%	0%	3%	0%	0%	1%	1%	1%	0%	2%	0%	1%	4%	3%	100%
114	1486	5%	51%	21%	0%	4%	0%	0%	1%	3%	3%	2%	6%	0%	0%	2%	2%	100%
115	1581	4%	37%	31%	0%	3%	0%	0%	1%	4%	4%	4%	2%	0%	1%	5%	4%	100%
116	806	4%	46%	36%	0%	3%	0%	0%	1%	1%	1%	1%	3%	0%	0%	2%	2%	100%
117	2151	5%	47%	32%	0%	4%	0%	0%	1%	1%	1%	1%	3%	0%	0%	3%	2%	100%
118	1345	5%	48%	31%	0%	5%	0%	0%	1%	1%	1%	2%	2%	0%	0%	2%	2%	100%
119	1078	4%	44%	37%	0%	4%	0%	0%	1%	2%	2%	1%	1%	0%	0%	2%	2%	100%
120	1365	4%	41%	23%	0%	5%	0%	0%	1%	2%	1%	1%	3%	0%	1%	10%	8%	100%
121	462	2%	22%	16%	0%	5%	0%	0%	1%	2%	1%	1%	4%	0%	4%	23%	19%	100%
122	554	5%	48%	27%	0%	5%	0%	0%	1%	1%	1%	1%	3%	0%	1%	4%	3%	100%
123	788	5%	47%	8%	0%	5%	0%	0%	2%	2%	1%	1%	2%	0%	2%	14%	11%	100%
124	1559	4%	36%	28%	0%	5%	0%	0%	1%	1%	1%	1%	4%	0%	1%	10%	8%	100%
125	1233	4%	39%	33%	0%	3%	0%	0%	1%	3%	3%	3%	1%	0%	1%	5%	4%	100%
126	1038	5%	47%	40%	0%	4%	0%	0%	1%	1%	1%	1%	0%	0%	0%	0%	0%	100%
127	3845	4%	38%	31%	0%	5%	0%	0%	2%	3%	3%	3%	5%	0%	0%	4%	2%	100%
128	995	4%	39%	11%	0%	5%	0%	0%	2%	7%	7%	6%	8%	1%	1%	5%	4%	100%
129	4399	3%	34%	24%	0%	8%	0%	0%	2%	5%	5%	5%	6%	0%	1%	4%	3%	100%
130	1326	4%	44%	39%	0%	5%	0%	0%	2%	2%	2%	1%	1%	0%	0%	0%	0%	100%
131	1375	4%	39%	37%	0%	5%	0%	0%	1%	3%	3%	2%	4%	0%	0%	1%	1%	100%
132	1519	6%	60%	14%	0%	8%	0%	0%	3%	2%	2%	2%	2%	0%	0%	1%	0%	100%
133	2057	6%	57%	14%	0%	8%	0%	0%	2%	3%	2%	2%	2%	0%	0%	2%	2%	100%
134	730	6%	61%	15%	0%	8%	0%	0%	3%	2%	2%	2%	1%	0%	0%	0%	0%	100%
135	1133	5%	53%	13%	0%	8%	0%	0%	2%	3%	3%	2%	2%	0%	1%	4%	4%	100%
136	1092	4%	45%	24%	0%	7%	0%	0%	2%	3%	3%	2%	5%	0%	0%	3%	2%	100%
137	1070	5%	56%	14%	0%	8%	0%	0%	2%	1%	1%	0%	2%	0%	1%	6%	4%	100%
138	785	6%	56%	13%	0%	8%	0%	0%	2%	3%	3%	3%	2%	0%	0%	2%	2%	100%
139	178	5%	47%	41%	0%	5%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	100%
140	6237	5%	48%	28%	0%	2%	0%	0%	1%	4%	4%	4%	1%	0%	0%	2%	1%	100%
141	5644	6%	58%	23%	0%	2%	0%	0%	1%	2%	1%	1%	3%	0%	0%	1%	1%	100%
142	893	4%	44%	38%	0%	5%	0%	0%	1%	3%	2%	2%	1%	0%	0%	0%	0%	100%
143	1086	4%	43%	38%	0%	5%	0%	0%	2%	3%	2%	2%	1%	0%	0%	0%	0%	100%
144	916	4%	41%	32%	0%	5%	0%	0%	2%	2%	2%	2%	6%	1%	0%	2%	1%	100%

2016 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Total Vehicle	Motor Cycles	Petrol PC & LGV	Taxi	Non-Franchised Buses <6.4t	Non-Franchised Buses 6.4-15t	Non-Franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC&LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV>3.5t	HGV<15t	HGV>15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
145	1453	6%	60%	7%	0%	5%	0%	0%	1%	3%	3%	2%	9%	1%	0%	2%	1%	100%
146	209	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	8%	52%	40%	100%
147	1158	4%	44%	20%	0%	5%	0%	0%	1%	1%	1%	1%	3%	0%	2%	10%	8%	100%
148	1716	4%	45%	24%	0%	5%	0%	0%	1%	2%	1%	1%	2%	0%	1%	8%	6%	100%
149	316	2%	17%	9%	0%	3%	0%	0%	1%	1%	0%	0%	1%	0%	5%	34%	27%	100%
150	804	5%	49%	28%	0%	3%	0%	0%	1%	2%	1%	1%	2%	0%	1%	4%	3%	100%
151	916	4%	39%	22%	0%	6%	0%	0%	2%	2%	1%	1%	3%	0%	2%	10%	8%	100%
152	273	1%	12%	7%	0%	2%	0%	0%	1%	1%	0%	0%	1%	0%	6%	39%	30%	100%
153	40	4%	43%	25%	0%	8%	0%	0%	2%	4%	3%	3%	7%	1%	0%	0%	0%	100%
154	1491	5%	48%	27%	0%	5%	0%	0%	1%	2%	2%	2%	5%	0%	0%	2%	1%	100%
155	1554	5%	47%	26%	0%	5%	0%	0%	1%	2%	2%	2%	5%	0%	0%	3%	2%	100%
156	606	5%	46%	26%	0%	8%	0%	0%	2%	1%	1%	1%	3%	0%	1%	3%	3%	100%
157	67	2%	17%	10%	0%	3%	0%	0%	1%	2%	1%	1%	3%	0%	5%	31%	24%	100%
158	332	4%	46%	25%	0%	5%	0%	0%	1%	2%	1%	1%	3%	0%	1%	6%	5%	100%
159	2098	4%	44%	34%	0%	5%	0%	0%	1%	2%	1%	1%	4%	0%	0%	2%	2%	100%
160	1347	5%	46%	35%	0%	5%	0%	0%	1%	1%	1%	1%	3%	0%	0%	1%	1%	100%
161	804	5%	49%	28%	0%	3%	0%	0%	1%	1%	1%	2%	2%	0%	1%	4%	3%	100%
162	841	4%	42%	31%	0%	5%	0%	0%	1%	2%	2%	1%	5%	0%	1%	3%	3%	100%
163	411	5%	46%	39%	0%	4%	0%	0%	1%	2%	2%	1%	0%	0%	0%	0%	0%	100%
164	289	2%	22%	48%	0%	1%	0%	0%	0%	4%	4%	4%	3%	0%	1%	6%	5%	100%
165	841	4%	42%	31%	0%	5%	0%	0%	1%	2%	2%	1%	5%	0%	1%	3%	3%	100%
166	667	4%	43%	35%	0%	4%	0%	0%	1%	2%	2%	1%	1%	0%	1%	3%	3%	100%
167	859	5%	49%	27%	0%	3%	0%	0%	1%	3%	2%	2%	2%	0%	0%	3%	3%	100%
168	1259	4%	44%	38%	0%	5%	0%	0%	2%	2%	2%	2%	1%	0%	0%	0%	0%	100%
169	893	4%	44%	38%	0%	5%	0%	0%	1%	3%	2%	2%	1%	0%	0%	0%	0%	100%
170	1016	4%	44%	39%	0%	5%	0%	0%	2%	2%	2%	1%	1%	0%	0%	0%	0%	100%
171	1913	5%	50%	24%	0%	5%	0%	0%	2%	3%	3%	2%	6%	0%	0%	0%	0%	100%
172	1444	5%	56%	13%	0%	8%	0%	0%	2%	1%	1%	0%	1%	0%	1%	7%	5%	100%
173	3299	5%	55%	13%	0%	8%	0%	0%	2%	2%	2%	1%	2%	0%	1%	5%	4%	100%
174	3220	4%	45%	16%	0%	7%	0%	0%	2%	4%	4%	4%	6%	0%	1%	4%	3%	100%
175	553	5%	50%	29%	0%	3%	0%	0%	1%	1%	1%	0%	2%	0%	1%	4%	3%	100%
176	1727	4%	44%	33%	0%	5%	0%	0%	1%	2%	2%	1%	4%	0%	0%	2%	2%	100%
177	221	5%	48%	28%	0%	3%	0%	0%	1%	1%	1%	0%	5%	0%	1%	4%	3%	100%
178	934	7%	76%	0%	0%	5%	0%	0%	2%	2%	2%	2%	3%	0%	0%	1%	0%	100%
179	90	7%	69%	13%	0%	5%	0%	0%	2%	1%	1%	0%	2%	0%	0%	0%	0%	100%
180	405	4%	38%	33%	0%	12%	0%	0%	4%	2%	2%	1%	4%	0%	0%	0%	0%	100%
181	602	5%	51%	34%	0%	5%	0%	0%	1%	1%	1%	0%	2%	0%	0%	0%	0%	100%
182	563	5%	48%	26%	0%	5%	0%	0%	1%	3%	2%	2%	7%	1%	0%	0%	0%	100%
183	164	5%	47%	25%	0%	5%	0%	0%	1%	3%	3%	2%	8%	1%	0%	0%	0%	100%
184	1096	4%	37%	31%	0%	6%	0%	0%	2%	4%	4%	4%	8%	1%	0%	0%	0%	100%
185	896	4%	43%	38%	0%	5%	0%	0%	2%	3%	2%	2%	1%	0%	0%	0%	0%	100%
186	736	3%	36%	31%	0%	12%	0%	0%	3%	3%	2%	2%	4%	0%	0%	2%	2%	100%
187	225	3%	30%	27%	0%	10%	0%	0%	3%	3%	3%	2%	6%	0%	1%	7%	5%	100%
188	481	4%	39%	35%	0%	12%	0%	0%	4%	2%	1%	1%	2%	0%	0%	0%	0%	100%
189	3350	5%	53%	31%	0%	2%	0%	0%	0%	2%	1%	1%	2%	0%	0%	2%	1%	100%
190	5248	3%	36%	40%	0%	6%	0%	0%	2%	2%	2%	1%	3%	0%	0%	3%	2%	100%
191	3050	3%	32%	31%	0%	7%	0%	0%	2%	3%	2%	2%	0%	0%	2%	9%	7%	100%
192	2014	3%	31%	35%	0%	5%	0%	0%	1%	1%	1%	1%	2%	0%	2%	10%	8%	100%

2016 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Total Vehicle	Motor Cycles	Petrol PC & LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC & LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV >3.5t	HGV<15t	HGV>15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
193	362	4%	38%	33%	0%	12%	0%	0%	4%	2%	2%	1%	3%	0%	0%	1%	0%	100%
194	1152	5%	52%	34%	0%	4%	0%	0%	1%	1%	1%	0%	2%	0%	0%	0%	0%	100%
195	282	3%	36%	31%	0%	12%	0%	0%	3%	1%	1%	0%	1%	0%	1%	6%	5%	100%
196	928	5%	46%	31%	0%	4%	0%	0%	1%	2%	2%	1%	5%	0%	0%	2%	1%	100%
197	1381	4%	39%	34%	0%	12%	0%	0%	4%	2%	1%	1%	3%	0%	0%	0%	0%	100%
198	80	4%	39%	41%	0%	7%	0%	0%	2%	2%	1%	1%	3%	0%	0%	0%	0%	100%
199	806	4%	46%	36%	0%	3%	0%	0%	1%	1%	1%	1%	3%	0%	0%	2%	2%	100%
200	758	6%	56%	13%	0%	8%	0%	0%	2%	4%	4%	3%	3%	0%	0%	1%	0%	100%
201	998	5%	55%	13%	0%	8%	0%	0%	2%	5%	4%	4%	3%	0%	0%	1%	0%	100%
202	605	4%	43%	37%	0%	5%	0%	0%	2%	3%	2%	2%	1%	0%	0%	1%	0%	100%
203	1556	3%	35%	33%	0%	5%	0%	0%	1%	2%	1%	1%	2%	0%	1%	9%	7%	100%
204	2328	4%	38%	32%	0%	3%	0%	0%	1%	4%	3%	3%	2%	0%	1%	5%	4%	100%
205	613	6%	56%	24%	0%	4%	0%	0%	1%	2%	2%	1%	3%	1%	0%	0%	0%	100%
206	828	5%	54%	30%	0%	1%	0%	0%	0%	3%	3%	3%	1%	0%	0%	0%	0%	100%
207	4814	6%	53%	22%	0%	4%	0%	0%	2%	2%	2%	2%	4%	1%	1%	1%	1%	100%
208	5472	5%	51%	28%	0%	0%	0%	0%	0%	4%	4%	4%	1%	0%	0%	2%	1%	100%
209	1011	4%	40%	31%	0%	5%	0%	0%	2%	2%	2%	2%	5%	0%	1%	3%	3%	100%
210	263	1%	9%	5%	0%	1%	0%	0%	1%	1%	1%	1%	1%	0%	6%	41%	32%	100%
211	1306	4%	40%	21%	0%	4%	0%	0%	1%	3%	2%	2%	4%	0%	1%	10%	8%	100%
212	1117	4%	40%	31%	0%	5%	0%	0%	2%	2%	2%	2%	5%	0%	1%	3%	3%	100%
213	263	1%	9%	5%	0%	1%	0%	0%	0%	1%	1%	1%	1%	0%	6%	42%	32%	100%
214	1417	4%	41%	22%	0%	4%	0%	0%	2%	2%	2%	2%	3%	1%	2%	9%	7%	100%
215	124	5%	47%	19%	0%	4%	0%	0%	1%	5%	5%	4%	9%	1%	0%	0%	0%	100%
216	368	5%	52%	28%	0%	0%	0%	0%	0%	5%	4%	4%	2%	0%	0%	0%	0%	100%
217	610	5%	56%	23%	0%	4%	0%	0%	1%	2%	2%	2%	4%	1%	0%	0%	0%	100%
218	855	5%	54%	29%	0%	1%	0%	0%	0%	4%	3%	3%	1%	0%	0%	0%	0%	100%

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No	Total Vehicle	Motor Cycles	Petrol PC & LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC&LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV >3.5t	HGV<15t	HGV>15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
1	2006	7%	67%	16%	0%	4%	0%	0%	1%	0%	0%	0%	5%	0%	0%	0%	0%	100%
2	137	6%	63%	20%	0%	5%	0%	0%	2%	0%	0%	0%	4%	0%	0%	0%	0%	100%
3	829	4%	43%	43%	0%	3%	0%	0%	1%	1%	1%	1%	3%	0%	0%	0%	0%	100%
4	756	7%	67%	16%	0%	4%	0%	0%	1%	0%	0%	1%	4%	0%	0%	0%	0%	100%
5	833	4%	44%	43%	0%	4%	0%	0%	1%	0%	1%	1%	2%	0%	0%	0%	0%	100%
6	3246	4%	40%	42%	0%	6%	0%	0%	2%	1%	1%	1%	3%	0%	0%	0%	0%	100%
7	1811	4%	41%	36%	0%	5%	0%	0%	1%	3%	3%	4%	2%	0%	0%	1%	0%	100%
8	139	4%	44%	38%	0%	5%	0%	0%	1%	2%	2%	2%	2%	0%	0%	0%	0%	100%
9	39	4%	45%	38%	0%	6%	0%	0%	2%	1%	2%	2%	0%	0%	0%	0%	0%	100%
10	701	4%	46%	39%	0%	5%	0%	0%	2%	1%	1%	1%	1%	0%	0%	0%	0%	100%
11	601	4%	46%	39%	0%	5%	0%	0%	2%	1%	1%	1%	1%	0%	0%	0%	0%	100%
12	2241	4%	42%	37%	0%	5%	0%	0%	1%	1%	2%	2%	2%	0%	0%	2%	2%	100%
13	5168	4%	36%	40%	0%	5%	0%	0%	1%	2%	2%	2%	3%	0%	0%	3%	2%	100%
14	3633	3%	36%	40%	0%	6%	0%	0%	2%	1%	1%	1%	2%	0%	1%	4%	3%	100%
15	252	4%	37%	33%	0%	8%	0%	0%	2%	3%	3%	4%	2%	0%	0%	2%	2%	100%
16	412	3%	34%	23%	0%	2%	0%	0%	1%	12%	12%	13%	0%	0%	0%	0%	0%	100%
17	1468	5%	53%	28%	0%	4%	0%	0%	1%	2%	2%	2%	1%	0%	0%	1%	1%	100%
18	1594	4%	36%	37%	0%	8%	0%	0%	2%	3%	3%	3%	1%	0%	0%	2%	1%	100%
19	30	3%	34%	23%	0%	2%	0%	0%	1%	12%	12%	13%	0%	0%	0%	0%	0%	100%
20	2794	4%	43%	37%	0%	5%	0%	0%	1%	1%	2%	2%	2%	0%	0%	2%	1%	100%
21	3287	4%	39%	38%	0%	5%	0%	0%	1%	1%	1%	1%	2%	0%	1%	4%	3%	100%
22	4585	4%	44%	38%	0%	5%	0%	0%	2%	1%	1%	1%	1%	0%	0%	2%	1%	100%
23	3059	4%	41%	39%	0%	5%	0%	0%	2%	1%	1%	2%	2%	0%	0%	2%	1%	100%
24	1462	4%	38%	37%	0%	5%	0%	0%	2%	2%	2%	2%	3%	0%	0%	3%	2%	100%
25	364	4%	40%	25%	0%	3%	0%	0%	1%	0%	0%	0%	4%	0%	2%	12%	9%	100%
26	1128	4%	37%	36%	0%	5%	0%	0%	1%	2%	2%	3%	4%	0%	0%	3%	3%	100%
27	218	4%	42%	26%	0%	4%	0%	0%	1%	0%	0%	0%	2%	0%	2%	11%	8%	100%
28	25	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	8%	52%	40%	100%
29	780	4%	39%	32%	0%	5%	0%	0%	1%	2%	2%	2%	3%	0%	1%	5%	4%	100%
30	3075	3%	34%	34%	0%	8%	0%	0%	2%	1%	2%	2%	0%	0%	1%	7%	6%	100%
31	1429	2%	26%	42%	0%	2%	0%	0%	0%	1%	2%	2%	1%	0%	2%	11%	9%	100%
32	1174	2%	26%	26%	0%	5%	0%	0%	1%	2%	2%	2%	1%	0%	3%	17%	13%	100%
33	916	2%	21%	35%	0%	2%	0%	0%	0%	1%	1%	1%	2%	0%	3%	18%	14%	100%
34	751	1%	6%	12%	0%	16%	0%	0%	4%	2%	2%	2%	3%	0%	4%	27%	21%	100%
35	453	1%	10%	13%	0%	11%	0%	0%	3%	2%	3%	3%	1%	0%	4%	28%	21%	100%
36	565	1%	6%	12%	0%	17%	0%	0%	5%	3%	3%	3%	3%	0%	4%	24%	19%	100%
37	599	2%	15%	19%	0%	7%	0%	0%	2%	3%	3%	4%	1%	0%	3%	23%	18%	100%
38	815	3%	28%	38%	0%	3%	0%	0%	1%	6%	6%	7%	2%	0%	0%	3%	3%	100%
39	417	3%	29%	35%	0%	7%	0%	0%	2%	3%	3%	3%	4%	0%	1%	6%	4%	100%
40	815	1%	8%	15%	0%	21%	0%	0%	6%	1%	1%	2%	1%	0%	3%	23%	18%	100%
41	645	2%	24%	29%	0%	11%	0%	0%	3%	3%	4%	4%	1%	0%	1%	10%	8%	100%
42	59	3%	33%	37%	0%	4%	0%	0%	1%	6%	7%	7%	2%	0%	0%	0%	0%	100%
43	14	3%	33%	36%	0%	11%	0%	0%	3%	2%	2%	3%	6%	1%	0%	0%	0%	100%
44	528	2%	24%	42%	0%	2%	0%	0%	1%	2%	2%	2%	1%	0%	2%	11%	9%	100%
45	760	3%	31%	40%	0%	3%	0%	0%	1%	2%	3%	3%	0%	0%	1%	7%	6%	100%
46	4013	4%	40%	35%	0%	5%	0%	0%	1%	2%	2%	2%	1%	0%	1%	4%	3%	100%
47	4469	4%	44%	38%	0%	5%	0%	0%	2%	1%	1%	2%	1%	0%	0%	1%	1%	100%
48	82	4%	40%	37%	0%	1%	0%	0%	0%	4%	4%	4%	6%	0%	0%	0%	0%	100%

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Total Vehicle	Motor Cycles	Petrol PC & LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC&LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV >3.5t	HGV<15t	HGV>15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
49	1732	4%	40%	42%	0%	6%	0%	0%	2%	1%	1%	1%	2%	0%	0%	1%	0%	100%
50	313	4%	38%	35%	0%	2%	0%	0%	0%	4%	4%	5%	6%	0%	0%	1%	1%	100%
51	193	3%	33%	42%	0%	2%	0%	0%	0%	3%	3%	4%	9%	1%	0%	0%	0%	100%
52	895	4%	36%	34%	0%	2%	0%	0%	0%	5%	5%	4%	6%	1%	0%	2%	1%	100%
53	519	0%	5%	10%	0%	17%	0%	0%	5%	2%	2%	3%	3%	0%	4%	28%	21%	100%
54	831	2%	21%	26%	0%	9%	0%	0%	3%	4%	4%	3%	1%	0%	2%	14%	11%	100%
55	690	3%	29%	40%	0%	12%	0%	0%	3%	3%	3%	2%	1%	0%	0%	2%	2%	100%
56	277	3%	29%	35%	0%	8%	0%	0%	2%	6%	6%	7%	2%	0%	0%	1%	1%	100%
57	867	2%	20%	40%	0%	21%	0%	0%	6%	3%	3%	3%	0%	0%	0%	1%	1%	100%
58	658	3%	27%	50%	0%	8%	0%	0%	2%	3%	3%	4%	0%	0%	0%	0%	0%	100%
59	4684	4%	44%	11%	0%	8%	0%	0%	2%	5%	5%	4%	6%	1%	1%	5%	4%	100%
60	1516	6%	60%	14%	0%	8%	0%	0%	2%	2%	2%	2%	1%	0%	0%	2%	1%	100%
61	3172	5%	56%	13%	0%	8%	0%	0%	2%	2%	2%	2%	2%	0%	1%	4%	3%	100%
62	4213	6%	60%	15%	0%	8%	0%	0%	3%	1%	1%	2%	1%	0%	0%	2%	1%	100%
63	4214	6%	60%	15%	0%	8%	0%	0%	3%	1%	1%	2%	1%	0%	0%	2%	1%	100%
64	833	4%	44%	39%	0%	5%	0%	0%	1%	2%	2%	2%	1%	0%	0%	0%	0%	100%
65	1044	5%	49%	33%	0%	4%	0%	0%	1%	1%	1%	2%	4%	0%	0%	0%	0%	100%
66	225	4%	45%	40%	0%	5%	0%	0%	2%	1%	1%	2%	0%	0%	0%	0%	0%	100%
67	2160	4%	45%	39%	0%	5%	0%	0%	2%	1%	1%	2%	1%	0%	0%	0%	0%	100%
68	590	2%	22%	19%	0%	8%	0%	0%	2%	9%	9%	9%	19%	1%	0%	0%	0%	100%
69	271	5%	47%	41%	0%	5%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	100%
70	467	4%	42%	37%	0%	13%	0%	0%	4%	0%	0%	0%	0%	0%	0%	0%	0%	100%
71	1640	3%	33%	29%	0%	11%	0%	0%	3%	4%	4%	4%	8%	1%	0%	0%	0%	100%
72	441	5%	54%	36%	0%	4%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	100%
73	2144	4%	38%	34%	0%	12%	0%	0%	4%	1%	1%	2%	3%	0%	0%	1%	0%	100%
74	914	5%	52%	34%	0%	4%	0%	0%	1%	0%	0%	0%	0%	0%	0%	2%	2%	100%
75	2144	4%	38%	34%	0%	12%	0%	0%	4%	1%	1%	2%	3%	0%	0%	1%	0%	100%
76	527	5%	50%	33%	0%	5%	0%	0%	1%	0%	0%	0%	0%	0%	0%	3%	3%	100%
77	98	4%	41%	36%	0%	13%	0%	0%	4%	0%	0%	1%	1%	0%	0%	0%	0%	100%
78	462	5%	46%	31%	0%	5%	0%	0%	1%	2%	2%	2%	6%	0%	0%	0%	0%	100%
79	744	4%	43%	43%	0%	4%	0%	0%	1%	1%	1%	0%	3%	0%	0%	0%	0%	100%
80	1269	4%	40%	42%	0%	7%	0%	0%	2%	1%	1%	0%	2%	0%	0%	1%	0%	100%
81	1383	4%	39%	35%	0%	13%	0%	0%	4%	1%	1%	1%	2%	0%	0%	0%	0%	100%
82	1240	5%	50%	33%	0%	5%	0%	0%	1%	1%	1%	1%	3%	0%	0%	0%	0%	100%
83	791	4%	37%	38%	0%	3%	0%	0%	1%	2%	2%	1%	6%	1%	0%	3%	2%	100%
84	1719	3%	36%	31%	0%	12%	0%	0%	3%	2%	2%	2%	5%	0%	0%	2%	2%	100%
85	709	5%	48%	33%	0%	4%	0%	0%	1%	1%	1%	1%	3%	0%	0%	2%	1%	100%
86	938	3%	35%	30%	0%	11%	0%	0%	3%	2%	2%	2%	5%	0%	1%	4%	2%	100%
87	64	4%	37%	25%	0%	2%	0%	0%	1%	0%	0%	0%	0%	0%	2%	16%	13%	100%
88	200	0%	5%	16%	0%	31%	1%	0%	8%	1%	1%	0%	0%	0%	3%	19%	15%	100%
89	46	3%	36%	30%	0%	12%	0%	0%	3%	3%	3%	3%	6%	1%	0%	0%	0%	100%
90	866	2%	20%	40%	0%	21%	0%	0%	6%	3%	3%	3%	0%	0%	0%	1%	1%	100%
91	658	3%	27%	50%	0%	8%	0%	0%	2%	3%	3%	4%	0%	0%	0%	0%	0%	100%
92	511	4%	41%	41%	0%	3%	0%	0%	1%	1%	1%	2%	6%	0%	0%	0%	0%	100%
93	851	4%	38%	40%	0%	6%	0%	0%	2%	2%	2%	2%	4%	0%	0%	0%	0%	100%
94	1248	5%	52%	12%	0%	7%	0%	0%	2%	2%	2%	2%	1%	0%	1%	8%	6%	100%
95	1167	5%	50%	12%	0%	6%	0%	0%	2%	2%	2%	3%	2%	0%	1%	8%	7%	100%
96	1259	5%	51%	12%	0%	7%	0%	0%	2%	2%	2%	2%	1%	0%	1%	8%	7%	100%

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No	Total Vehicle	Motor Cycles	Petrol PC &LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC&LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV>3.5t	HGV<15t	HGV>15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
97	1556	5%	54%	13%	0%	8%	0%	0%	2%	2%	2%	2%	2%	0%	1%	5%	4%	100%
98	1727	4%	37%	33%	0%	12%	0%	0%	4%	1%	1%	2%	3%	0%	0%	2%	1%	100%
99	227	4%	46%	31%	0%	3%	0%	0%	1%	1%	1%	1%	3%	0%	1%	5%	3%	100%
100	54	4%	40%	48%	0%	5%	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%	100%
101	4270	5%	50%	27%	0%	3%	0%	0%	1%	4%	4%	4%	1%	0%	0%	1%	0%	100%
102	3602	6%	56%	24%	0%	4%	0%	0%	1%	2%	2%	1%	4%	0%	0%	0%	0%	100%
103	1049	4%	38%	34%	0%	12%	0%	0%	3%	2%	2%	2%	3%	0%	0%	0%	0%	100%
104	1634	6%	61%	26%	0%	5%	0%	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	100%
105	1490	5%	55%	30%	0%	1%	0%	0%	0%	3%	3%	2%	1%	0%	0%	0%	0%	100%
106	4187	6%	63%	22%	0%	2%	0%	0%	1%	1%	1%	1%	2%	1%	0%	0%	0%	100%
107	5760	5%	51%	28%	0%	2%	0%	0%	1%	4%	4%	4%	1%	0%	0%	0%	0%	100%
108	4187	6%	63%	22%	0%	2%	0%	0%	1%	1%	1%	1%	2%	1%	0%	0%	0%	100%
109	4925	5%	52%	27%	0%	2%	0%	0%	1%	4%	4%	4%	1%	0%	0%	0%	0%	100%
110	265	4%	42%	24%	0%	7%	0%	0%	2%	1%	1%	1%	2%	0%	1%	8%	7%	100%
111	134	4%	40%	35%	0%	5%	0%	0%	1%	4%	4%	5%	2%	0%	0%	0%	0%	100%
112	474	5%	47%	27%	0%	3%	0%	0%	1%	2%	2%	2%	1%	0%	1%	5%	4%	100%
113	635	5%	51%	29%	0%	3%	0%	0%	1%	1%	1%	0%	2%	0%	1%	4%	2%	100%
114	1713	5%	50%	22%	0%	4%	0%	0%	1%	3%	3%	2%	6%	0%	0%	2%	2%	100%
115	1809	4%	37%	32%	0%	3%	0%	0%	1%	4%	4%	4%	2%	0%	1%	4%	4%	100%
116	835	4%	46%	36%	0%	3%	0%	0%	1%	1%	1%	1%	3%	0%	0%	2%	2%	100%
117	2482	5%	47%	33%	0%	4%	0%	0%	1%	1%	1%	1%	3%	0%	0%	2%	2%	100%
118	1647	5%	49%	31%	0%	4%	0%	0%	1%	1%	1%	2%	2%	0%	0%	2%	2%	100%
119	1241	4%	44%	37%	0%	4%	0%	0%	1%	2%	2%	2%	1%	0%	0%	2%	1%	100%
120	1542	4%	43%	24%	0%	5%	0%	0%	1%	1%	1%	1%	3%	0%	1%	9%	7%	100%
121	503	2%	24%	17%	0%	5%	0%	0%	1%	2%	2%	1%	4%	0%	3%	22%	17%	100%
122	637	5%	48%	27%	0%	5%	0%	0%	2%	1%	1%	2%	3%	0%	0%	3%	3%	100%
123	879	5%	49%	8%	0%	6%	0%	0%	2%	1%	1%	2%	2%	0%	2%	12%	10%	100%
124	1761	4%	37%	28%	0%	5%	0%	0%	1%	1%	1%	2%	4%	0%	1%	9%	7%	100%
125	1412	4%	39%	33%	0%	4%	0%	0%	1%	3%	3%	3%	1%	0%	1%	5%	3%	100%
126	1205	5%	47%	40%	0%	4%	0%	0%	1%	1%	1%	1%	0%	0%	0%	0%	0%	100%
127	4426	4%	38%	31%	0%	5%	0%	0%	2%	3%	3%	4%	5%	0%	0%	3%	2%	100%
128	1138	4%	40%	10%	0%	5%	0%	0%	1%	7%	7%	7%	8%	1%	1%	5%	4%	100%
129	5085	3%	35%	23%	0%	7%	0%	0%	2%	5%	5%	6%	6%	0%	1%	4%	3%	100%
130	1538	4%	44%	39%	0%	5%	0%	0%	1%	2%	2%	2%	1%	0%	0%	0%	0%	100%
131	1590	4%	39%	37%	0%	5%	0%	0%	1%	3%	3%	2%	4%	0%	0%	1%	1%	100%
132	1760	6%	60%	14%	0%	8%	0%	0%	3%	2%	2%	2%	2%	0%	0%	1%	0%	100%
133	2374	6%	57%	14%	0%	8%	0%	0%	2%	2%	2%	3%	2%	0%	0%	2%	2%	100%
134	849	6%	61%	15%	0%	8%	0%	0%	3%	2%	2%	2%	1%	0%	0%	0%	0%	100%
135	1301	5%	53%	13%	0%	8%	0%	0%	2%	3%	3%	3%	2%	0%	1%	4%	3%	100%
136	1258	4%	45%	24%	0%	7%	0%	0%	2%	3%	3%	2%	5%	0%	0%	3%	2%	100%
137	1224	6%	57%	14%	0%	8%	0%	0%	2%	1%	1%	0%	2%	0%	1%	5%	3%	100%
138	907	6%	56%	13%	0%	8%	0%	0%	3%	3%	3%	3%	2%	0%	0%	2%	1%	100%
139	207	5%	47%	41%	0%	5%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	100%
140	7208	5%	48%	28%	0%	2%	0%	0%	1%	4%	4%	4%	1%	0%	0%	2%	1%	100%
141	6535	6%	58%	23%	0%	2%	0%	0%	1%	1%	1%	2%	3%	0%	0%	1%	1%	100%
142	1039	4%	43%	38%	0%	5%	0%	0%	2%	2%	2%	3%	1%	0%	0%	0%	0%	100%
143	1261	4%	43%	38%	0%	5%	0%	0%	2%	2%	2%	3%	1%	0%	0%	0%	0%	100%
144	1058	4%	41%	32%	0%	5%	0%	0%	2%	2%	2%	2%	6%	1%	0%	2%	1%	100%

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No	Total Vehicle	Motor Cycles	Petrol PC & LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC&LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV>3.5t	HGV<15t	HGV>15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
145	1683	6%	60%	7%	0%	5%	0%	0%	1%	3%	3%	3%	9%	1%	0%	1%	1%	100%
146	209	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	8%	52%	40%	100%
147	1308	4%	45%	21%	0%	5%	0%	0%	1%	1%	1%	2%	3%	0%	1%	9%	7%	100%
148	1952	4%	46%	24%	0%	5%	0%	0%	1%	1%	1%	2%	3%	0%	1%	7%	5%	100%
149	332	2%	18%	11%	0%	3%	0%	0%	1%	0%	0%	1%	1%	0%	5%	33%	25%	100%
150	923	5%	50%	29%	0%	2%	0%	0%	1%	1%	1%	2%	2%	0%	1%	4%	2%	100%
151	1033	4%	39%	23%	0%	7%	0%	0%	2%	1%	1%	2%	3%	0%	1%	9%	8%	100%
152	282	1%	13%	7%	0%	2%	0%	0%	1%	0%	0%	1%	1%	0%	6%	38%	30%	100%
153	47	4%	44%	26%	0%	7%	0%	0%	2%	4%	4%	3%	6%	0%	0%	0%	0%	100%
154	1724	5%	49%	27%	0%	5%	0%	0%	1%	2%	2%	2%	5%	0%	0%	1%	1%	100%
155	1792	5%	47%	26%	0%	5%	0%	0%	1%	2%	2%	3%	5%	0%	0%	2%	2%	100%
156	696	5%	47%	27%	0%	8%	0%	0%	2%	1%	1%	1%	2%	0%	0%	3%	3%	100%
157	70	2%	19%	11%	0%	3%	0%	0%	1%	1%	1%	2%	3%	0%	4%	30%	23%	100%
158	380	4%	46%	26%	0%	5%	0%	0%	1%	1%	1%	2%	3%	0%	1%	6%	4%	100%
159	2420	4%	44%	34%	0%	5%	0%	0%	1%	1%	1%	2%	4%	0%	0%	2%	2%	100%
160	1559	5%	46%	35%	0%	5%	0%	0%	1%	1%	1%	1%	3%	0%	0%	1%	1%	100%
161	923	5%	50%	29%	0%	2%	0%	0%	1%	1%	1%	2%	2%	0%	1%	3%	3%	100%
162	966	4%	42%	30%	0%	5%	0%	0%	1%	2%	2%	2%	5%	0%	1%	3%	3%	100%
163	476	5%	46%	39%	0%	4%	0%	0%	1%	1%	1%	2%	1%	0%	0%	0%	0%	100%
164	323	2%	22%	51%	0%	1%	0%	0%	0%	2%	2%	3%	3%	0%	1%	7%	6%	100%
165	966	4%	42%	30%	0%	5%	0%	0%	1%	2%	2%	2%	5%	0%	1%	3%	3%	100%
166	765	4%	43%	36%	0%	4%	0%	0%	1%	2%	2%	1%	1%	0%	0%	3%	3%	100%
167	987	5%	50%	27%	0%	3%	0%	0%	1%	2%	2%	3%	2%	0%	0%	3%	2%	100%
168	1464	4%	44%	38%	0%	5%	0%	0%	2%	2%	2%	2%	1%	0%	0%	0%	0%	100%
169	1039	4%	43%	38%	0%	5%	0%	0%	2%	2%	2%	3%	1%	0%	0%	0%	0%	100%
170	1179	4%	44%	39%	0%	5%	0%	0%	1%	2%	2%	2%	1%	0%	0%	0%	0%	100%
171	2222	5%	50%	24%	0%	5%	0%	0%	1%	3%	3%	3%	6%	0%	0%	0%	0%	100%
172	1644	6%	56%	13%	0%	8%	0%	0%	2%	1%	1%	0%	1%	0%	1%	6%	5%	100%
173	3775	5%	56%	13%	0%	8%	0%	0%	2%	2%	2%	1%	2%	0%	1%	5%	3%	100%
174	3697	4%	46%	16%	0%	7%	0%	0%	2%	4%	4%	4%	6%	0%	1%	4%	2%	100%
175	635	5%	51%	29%	0%	3%	0%	0%	1%	1%	1%	0%	2%	0%	1%	4%	2%	100%
176	1993	4%	44%	34%	0%	5%	0%	0%	1%	1%	1%	2%	4%	0%	0%	2%	2%	100%
177	253	5%	49%	28%	0%	3%	0%	0%	1%	1%	1%	0%	5%	0%	1%	4%	2%	100%
178	1084	7%	76%	0%	0%	5%	0%	0%	2%	2%	2%	2%	3%	0%	0%	1%	0%	100%
179	105	7%	68%	13%	0%	5%	0%	0%	2%	1%	1%	1%	2%	0%	0%	0%	0%	100%
180	471	4%	38%	33%	0%	12%	0%	0%	4%	2%	2%	1%	4%	0%	0%	0%	0%	100%
181	698	5%	51%	34%	0%	5%	0%	0%	1%	1%	1%	0%	2%	0%	0%	0%	0%	100%
182	655	5%	48%	26%	0%	5%	0%	0%	1%	2%	2%	3%	7%	1%	0%	0%	0%	100%
183	193	5%	47%	25%	0%	5%	0%	0%	1%	3%	3%	2%	8%	1%	0%	0%	0%	100%
184	1293	4%	37%	30%	0%	7%	0%	0%	2%	4%	4%	4%	7%	1%	0%	0%	0%	100%
185	1039	4%	43%	38%	0%	5%	0%	0%	2%	2%	2%	3%	1%	0%	0%	0%	0%	100%
186	851	3%	36%	31%	0%	12%	0%	0%	3%	2%	2%	3%	5%	0%	0%	2%	1%	100%
187	257	3%	31%	27%	0%	10%	0%	0%	3%	3%	3%	3%	6%	0%	1%	6%	4%	100%
188	559	4%	39%	35%	0%	12%	0%	0%	4%	1%	1%	2%	2%	0%	0%	0%	0%	100%
189	3872	5%	53%	31%	0%	2%	0%	0%	0%	1%	1%	2%	2%	0%	0%	2%	1%	100%
190	6048	3%	36%	40%	0%	6%	0%	0%	2%	2%	2%	1%	3%	0%	0%	3%	2%	100%
191	3450	3%	33%	32%	0%	7%	0%	0%	2%	2%	2%	3%	0%	0%	1%	8%	7%	100%
192	2275	3%	32%	36%	0%	5%	0%	0%	1%	1%	1%	1%	2%	0%	1%	9%	8%	100%

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No	Total Vehicle	Motor Cycles	Petrol PC &LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC&LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV>3.5t	HGV<15t	HGV>15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
193	420	4%	37%	34%	0%	12%	0%	0%	3%	2%	2%	2%	3%	0%	0%	1%	0%	100%
194	1337	5%	52%	34%	0%	4%	0%	0%	1%	1%	1%	0%	2%	0%	0%	0%	0%	100%
195	322	3%	36%	32%	0%	12%	0%	0%	3%	1%	1%	0%	1%	0%	1%	6%	4%	100%
196	1073	5%	46%	31%	0%	4%	0%	0%	1%	2%	2%	1%	5%	0%	0%	2%	1%	100%
197	1602	4%	39%	34%	0%	12%	0%	0%	4%	1%	1%	2%	3%	0%	0%	0%	0%	100%
198	93	4%	39%	42%	0%	7%	0%	0%	2%	1%	1%	1%	3%	0%	0%	0%	0%	100%
199	835	4%	46%	36%	0%	3%	0%	0%	1%	1%	1%	1%	3%	0%	0%	2%	2%	100%
200	879	6%	56%	13%	0%	8%	0%	0%	2%	4%	4%	3%	3%	0%	0%	1%	0%	100%
201	1157	5%	55%	13%	0%	8%	0%	0%	2%	4%	4%	5%	3%	0%	0%	1%	0%	100%
202	708	4%	43%	37%	0%	5%	0%	0%	2%	2%	2%	3%	1%	0%	0%	1%	0%	100%
203	1765	3%	36%	34%	0%	5%	0%	0%	1%	1%	1%	2%	2%	0%	1%	8%	6%	100%
204	2664	4%	39%	33%	0%	3%	0%	0%	1%	3%	3%	3%	1%	0%	1%	5%	4%	100%
205	710	6%	56%	24%	0%	4%	0%	0%	1%	2%	2%	1%	4%	0%	0%	0%	0%	100%
206	959	6%	54%	30%	0%	0%	0%	0%	0%	3%	3%	3%	1%	0%	0%	0%	0%	100%
207	5569	5%	54%	23%	0%	4%	0%	0%	1%	2%	2%	2%	4%	1%	0%	1%	1%	100%
208	6322	5%	51%	28%	0%	0%	0%	0%	0%	4%	4%	4%	1%	0%	0%	2%	1%	100%
209	1164	4%	40%	31%	0%	5%	0%	0%	2%	2%	2%	2%	6%	0%	0%	3%	3%	100%
210	272	1%	10%	6%	0%	2%	0%	0%	0%	1%	1%	0%	2%	0%	6%	40%	31%	100%
211	1476	4%	41%	22%	0%	4%	0%	0%	1%	2%	2%	3%	4%	0%	1%	9%	7%	100%
212	1286	4%	41%	32%	0%	5%	0%	0%	1%	2%	2%	2%	5%	1%	0%	3%	3%	100%
213	272	1%	10%	6%	0%	2%	0%	0%	0%	1%	1%	0%	2%	0%	6%	40%	31%	100%
214	1604	4%	42%	23%	0%	4%	0%	0%	2%	2%	2%	2%	3%	1%	1%	8%	7%	100%
215	143	5%	47%	20%	0%	3%	0%	0%	1%	5%	5%	4%	9%	1%	0%	0%	0%	100%
216	429	5%	52%	28%	0%	1%	0%	0%	0%	4%	4%	5%	1%	0%	0%	0%	0%	100%
217	707	5%	56%	23%	0%	4%	0%	0%	1%	2%	2%	2%	4%	1%	0%	0%	0%	100%
218	993	5%	54%	30%	0%	1%	0%	0%	0%	3%	3%	3%	1%	0%	0%	0%	0%	100%

2016 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Total Vehicle 0030-0130	Total Vehicle 0130-0230	Total Vehicle 0230-0330	Total Vehicle 0330-0430	Total Vehicle 0430-0530	Total Vehicle 0530-0630	Total Vehicle 0630-0730	Total Vehicle 0730-0830	Total Vehicle 0830-0930	Total Vehicle 0930-1030	Total Vehicle 1030-1130	Total Vehicle 1130-1230	Total Vehicle 1230-1330	Total Vehicle 1330-1430	Total Vehicle 1430-1530	Total Vehicle 1530-1630	Total Vehicle 1630-1730	Total Vehicle 1730-1830	Total Vehicle 1830-1930	Total Vehicle 1930-2030	Total Vehicle 2030-2130	Total Vehicle 2130-2230	Total Vehicle 2230-2330	Total Vehicle 2330-0030
1	540	351	243	189	189	324	621	1485	1728	1674	1593	1593	1539	1458	1539	1539	1539	1485	1431	1323	1215	1188	1134	918
2	37	24	16	13	13	22	42	101	117	113	108	108	104	99	104	104	104	101	97	90	82	80	77	62
3	223	145	100	78	78	134	257	614	714	692	658	658	636	602	636	636	636	614	591	547	502	491	469	379
4	203	132	92	71	71	122	234	559	651	631	600	600	580	549	580	580	580	559	539	498	458	448	427	346
5	224	146	101	79	79	135	258	617	718	696	662	662	639	606	639	639	639	617	595	550	505	494	471	381
6	874	568	393	306	306	525	1006	2405	2798	2711	2579	2579	2492	2361	2492	2492	2492	2405	2317	2142	1967	1924	1836	1486
7	488	317	220	171	171	293	561	1341	1561	1512	1439	1439	1390	1317	1390	1390	1390	1341	1293	1195	1098	1073	1024	829
8	38	24	17	13	13	23	43	103	120	116	111	111	107	101	107	107	107	103	99	92	84	83	79	64
9	11	7	5	4	4	6	12	29	34	33	31	31	30	29	30	30	30	29	28	26	24	23	22	18
10	189	123	85	66	66	113	217	519	604	585	557	557	538	510	538	538	538	519	500	462	425	415	396	321
11	162	105	73	57	57	97	186	444	517	501	477	477	460	436	460	460	460	444	428	396	364	355	339	275
12	608	395	273	213	213	365	699	1671	1944	1883	1792	1792	1731	1640	1731	1731	1731	1671	1610	1488	1367	1337	1276	1033
13	1402	911	631	491	491	841	1612	3854	4485	4345	4135	4135	3994	3784	3994	3994	3994	3854	3714	3434	3154	3083	2943	2383
14	990	644	446	347	347	594	1139	2723	3168	3069	2921	2921	2822	2673	2822	2822	2822	2723	2624	2426	2228	2178	2079	1683
15	69	45	31	24	24	41	79	189	220	213	203	203	196	186	196	196	196	189	182	168	155	151	144	117
16	111	72	50	39	39	67	128	306	356	345	328	328	317	300	317	317	317	306	295	273	250	245	234	189
17	397	258	178	139	139	238	456	1091	1269	1229	1170	1170	1130	1071	1130	1130	1130	1091	1051	972	892	872	833	674
18	431	280	194	151	151	258	495	1184	1378	1335	1270	1270	1227	1163	1227	1227	1227	1184	1141	1055	969	947	904	732
19	8	5	4	3	3	5	9	21	25	24	23	23	22	21	22	22	22	21	21	19	18	17	16	13
20	756	492	340	265	265	454	870	2080	2420	2344	2231	2231	2155	2042	2155	2155	2155	2080	2004	1853	1702	1664	1588	1286
21	896	582	403	313	313	537	1030	2463	2866	2776	2642	2642	2553	2418	2553	2553	2553	2463	2373	2194	2015	1970	1881	1523
22	1240	806	558	434	434	744	1426	3409	3967	3843	3657	3657	3533	3347	3533	3533	3533	3409	3285	3037	2789	2727	2603	2107
23	827	537	372	289	289	496	951	2274	2646	2563	2439	2439	2357	2233	2357	2357	2357	2274	2191	2026	1860	1819	1736	1406
24	396	258	178	139	139	238	456	1090	1268	1228	1169	1169	1129	1070	1129	1129	1129	1090	1050	971	892	872	832	674
25	102	66	46	36	36	61	117	280	326	316	301	301	290	275	290	290	290	280	270	250	229	224	214	173
26	307	199	138	107	107	184	353	843	981	950	904	904	874	828	874	874	874	843	812	751	690	674	644	521
27	61	40	27	21	21	37	70	168	195	189	180	180	174	165	174	174	174	168	161	149	137	134	128	104
28	8	5	4	3	3	5	9	22	25	25	23	23	23	21	23	23	23	22	21	19	18	17	17	13
29	213	138	96	74	74	128	245	585	681	660	628	628	607	575	607	607	607	585	564	521	479	468	447	362
30	847	550	381	296	296	508	974	2329	2710	2625	2498	2498	2414	2287	2414	2414	2414	2329	2244	2075	1905	1863	1778	1440
31	398	259	179	139	139	239	458	1096	1275	1235	1175	1175	1136	1076	1136	1136	1136	1096	1056	976	896	877	837	677
32	333	216	150	116	116	200	383	915	1065	1032	982	982	949	899	949	949	949	915	882	815	749	732	699	566
33	260	169	117	91	91	156	299	716	833	807	768	768	742	703	742	742	742	716	690	638	586	573	547	443
34	219	142	98	77	77	131	252	602	700	678	645	645	623	591	623	623	623	602	580	536	492	481	459	372
35	141	92	64	50	50	85	163	389	453	439	417	417	403	382	403	403	403	389	375	347	318	311	297	240
36	164	106	74	57	57	98	188	450	524	508	483	483	467	442	467	467	467	450	434	401	368	360	344	278
37	173	112	78	60	60	104	198	474	552	535	509	509	492	466	492	492	492	474	457	423	388	380	362	293
38	222	144	100	78	78	133	255	609	709	687	654	654	631	598	631	631	631	609	587	543	499	487	465	377
39	114	74	51	40	40	69	132	315	366	355	337	337	326	309	326	326	326	315	303	280	257	252	240	194
40	235	153	106	82	82	141	270	646	752	729	693	693	670	635	670	670	670	646	623	576	529	517	494	400
41	179	116	81	63	63	107	206	492	573	555	528	528	510	483	510	510	510	492	475	439	403	394	376	304
42	16	10	7	6	6	10	18	44	51	49	47	47	45	43	45	45	45	44	42	39	36	35	33	27
43	4	2	2	1	1	2	4	10	12	12	11	11	11	10	11	11	11	10	10	9	8	8	8	6
44	147	95	66	51	51	88	169	404	470	455	433	433	419	397	419	419	419	404	389	360	330	323	308	250
45	209	136	94	73	73	126	241	576	670	649	618	618	597	565	597	597	597	576	555	513	471	461	440	356
46	1093	710	492	382	382	656	1257	3005	3497	3388	3224	3224	3115	2951	3115	3115	3115	3005	2896	2677	2459	2404	2295	1858
47	1207	784	543	422	422	724	1388	3318	3861	3740	3559	3559	3439	3258	3439	3439	3439	3318	3197	2956	2715	2654	2534	2051
48	22	14	10	8	8	13	26	61	71	69	65	65	63	60	63	63	63	61	59	54	50	49	47	38
49	467	303	210	163	163	280	537	1283	1493	1446	1376	1376	1330	1260	1330	1330	1330	1283	1236	1143	1050	1026	980	793
50	85	55	38	30	30	51	97	233	271	263	250	250	241	229	241	241	241	233	224	207	191	186	178	144
51	52	34	23	18	18	31	60	143	166	161	153	153	148	140	148	148	148	143	137	127	117	114	109	88
52	242	157	109	85	85	145	279	666	775	751	714	714	690	654	690	690	690	666	642	593	545	533	509	412
53	162	105	73	57	57	97	186	446	519	503	478	478	462	438	462	462	462	446	430	397	365	357	341	276
54	233	152	105	82	82	140	268	641	746	723	688	688	664	629	664	664	664	641	618	571	525	513	490	396
55	187	121	84	65	65	112	215	513	597	578	550	550	532	504	532	532	532	513	494	457	420	410	392	317
56	75	49	34	26	26	45	86	205	239	232	220	220	213	202	213	213	213	205	198	183	168	164	157	127
57	234	152	105	82	82	141	270	645	750	727	691	691	668	633	668	668	668	645	621	574	527	516	492	398
58	177	115	80	62	62	106	204	487	567	549	523	523	505	478	505	505	505	487	470	434	399	390	372	301
59	1270	825	571	444	444	762	1460	3492	4064	3937	3746	3746	3619	3429	3619	3619	3619	3492	3365	3111	2857	2794	2667	2159
60	410	267	185	144	144	246	472	1128	1313	1272	1210	1210	1169	1108	1169	1169	1169	1128	1087	1005	923	903	862	698

2016 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Total Vehicle 0030-0130	Total Vehicle 0130-0230	Total Vehicle 0230-0330	Total Vehicle 0330-0430	Total Vehicle 0430-0530	Total Vehicle 0530-0630	Total Vehicle 0630-0730	Total Vehicle 0730-0830	Total Vehicle 0830-0930	Total Vehicle 0930-1030	Total Vehicle 1030-1130	Total Vehicle 1130-1230	Total Vehicle 1230-1330	Total Vehicle 1330-1430	Total Vehicle 1430-1530	Total Vehicle 1530-1630	Total Vehicle 1630-1730	Total Vehicle 1730-1830	Total Vehicle 1830-1930	Total Vehicle 1930-2030	Total Vehicle 2030-2130	Total Vehicle 2130-2230	Total Vehicle 2230-2330	Total Vehicle 2330-0030
61	866	563	390	303	303	520	996	2382	2772	2685	2555	2555	2469	2339	2469	2469	2469	2382	2295	2122	1949	1906	1819	1472
62	1139	740	513	399	399	683	1310	3132	3645	3531	3360	3360	3246	3075	3246	3246	3246	3132	3019	2791	2563	2506	2392	1936
63	1139	740	513	399	399	683	1310	3132	3645	3531	3360	3360	3246	3075	3246	3246	3246	3132	3019	2791	2563	2506	2392	1936
64	224	145	101	78	78	134	257	615	716	694	660	660	638	604	638	638	638	615	593	548	503	492	470	380
65	281	183	127	98	98	169	323	773	900	872	830	830	802	759	802	802	802	773	745	689	633	619	591	478
66	60	39	27	21	21	36	69	166	193	187	178	178	172	163	172	172	172	166	160	148	136	133	127	103
67	582	378	262	204	204	349	669	1600	1862	1804	1717	1717	1658	1571	1658	1658	1658	1600	1542	1426	1309	1280	1222	989
68	159	103	71	56	56	95	183	437	508	492	468	468	452	429	452	452	452	437	421	389	357	349	333	270
69	73	47	33	25	25	44	84	200	233	226	215	215	208	197	208	208	208	200	193	178	164	160	153	124
70	126	82	57	44	44	75	144	345	402	389	371	371	358	339	358	358	358	345	333	308	283	276	264	214
71	442	287	199	155	155	265	508	1214	1413	1369	1303	1303	1258	1192	1258	1258	1258	1214	1170	1082	994	971	927	751
72	118	77	53	41	41	71	136	326	379	367	349	349	338	320	338	338	338	326	314	290	266	261	249	201
73	578	376	260	202	202	347	665	1590	1850	1792	1705	1705	1648	1561	1648	1648	1648	1590	1532	1416	1301	1272	1214	983
74	248	161	111	87	87	149	285	681	792	767	730	730	705	668	705	705	705	681	656	606	557	545	520	421
75	578	376	260	202	202	347	665	1590	1850	1792	1705	1705	1648	1561	1648	1648	1648	1590	1532	1416	1301	1272	1214	983
76	144	93	65	50	50	86	165	395	460	446	424	424	410	388	410	410	410	395	381	352	323	316	302	244
77	26	17	12	9	9	16	30	72	84	81	77	77	75	71	75	75	75	72	70	64	59	58	55	45
78	124	81	56	43	43	74	143	341	397	385	366	366	354	335	354	354	354	341	329	304	279	273	261	211
79	200	130	90	70	70	120	230	551	641	621	591	591	571	541	571	571	571	551	531	491	451	441	421	341
80	342	222	154	120	120	205	394	941	1095	1061	1009	1009	975	924	975	975	975	941	907	838	770	753	719	582
81	373	242	168	130	130	224	429	1025	1193	1156	1100	1100	1063	1007	1063	1063	1063	1025	988	913	839	820	783	634
82	334	217	150	117	117	200	384	918	1068	1035	985	985	951	901	951	951	951	918	884	818	751	734	701	567
83	215	140	97	75	75	129	247	590	687	666	633	633	612	580	612	612	612	590	569	526	483	472	451	365
84	466	303	210	163	163	280	536	1281	1491	1444	1375	1375	1328	1258	1328	1328	1328	1281	1235	1142	1048	1025	978	792
85	192	125	86	67	67	115	221	528	614	595	566	566	547	518	547	547	547	528	508	470	432	422	403	326
86	256	166	115	89	89	153	294	703	818	792	754	754	729	690	729	729	729	703	677	626	575	562	537	435
87	18	12	8	6	6	11	20	49	57	55	53	53	51	48	51	51	51	49	47	44	40	39	37	30
88	63	41	28	22	22	38	72	172	200	194	184	184	178	169	178	178	178	172	166	153	141	138	131	106
89	12	8	5	4	4	7	14	34	39	38	36	36	35	33	35	35	35	34	32	30	27	27	26	21
90	234	152	105	82	82	140	269	644	749	726	690	690	667	632	667	667	667	644	620	573	527	515	492	398
91	177	115	80	62	62	106	204	487	567	549	523	523	505	478	505	505	505	487	470	434	399	390	372	301
92	138	90	62	48	48	83	158	379	441	427	407	407	393	372	393	393	393	379	365	338	310	303	289	234
93	229	149	103	80	80	138	264	631	734	711	677	677	654	619	654	654	654	631	608	562	516	505	482	390
94	344	224	155	121	121	207	396	947	1102	1068	1016	1016	981	930	981	981	981	947	913	844	775	758	723	585
95	322	209	145	113	113	193	370	885	1030	998	950	950	917	868	917	917	917	885	853	789	724	708	676	547
96	347	225	156	121	121	208	399	954	1110	1075	1023	1023	989	937	989	989	989	954	919	850	780	763	728	590
97	425	276	191	149	149	255	489	1170	1361	1318	1255	1255	1212	1148	1212	1212	1212	1170	1127	1042	957	936	893	723
98	467	304	210	164	164	280	537	1285	1495	1448	1378	1378	1331	1261	1331	1331	1331	1285	1238	1145	1051	1028	981	794
99	62	40	28	22	22	37	71	170	198	192	183	183	176	167	176	176	176	170	164	152	139	136	130	105
100	15	10	7	5	5	9	17	40	47	46	43	43	42	40	42	42	42	40	39	36	33	32	31	25
101	1176	764	529	412	412	706	1352	3234	3763	3645	3469	3469	3351	3175	3351	3351	3351	3234	3116	2881	2646	2587	2469	1999
102	970	630	436	339	339	582	1115	2667	3103	3006	2861	2861	2764	2618	2764	2764	2764	2667	2570	2376	2182	2133	2036	1648
103	283	184	127	99	99	170	325	778	905	877	834	834	806	764	806	806	806	778	749	693	636	622	594	481
104	440	286	198	154	154	264	506	1209	1407	1363	1297	1297	1253	1187	1253	1253	1253	1209	1165	1077	989	967	923	747
105	401	261	181	140	140	241	461	1103	1284	1244	1184	1184	1144	1083	1144	1144	1144	1103	1063	983	903	883	843	682
106	1127	732	507	394	394	676	1296	3098	3605	3492	3323	3323	3211	3042	3211	3211	3211	3098	2985	2760	2535	2478	2366	1915
107	1583	1029	713	554	554	950	1821	4354	5067	4908	4671	4671	4513	4275	4513	4513	4513	4354	4196	3879	3563	3483	3325	2692
108	1127	732	507	394	394	676	1296	3098	3605	3492	3323	3323	3211	3042	3211	3211	3211	3098	2985	2760	2535	2478	2366	1915
109	1325	861	596	464	464	795	1524	3645	4241	4108	3910	3910	3777	3578	3777	3777	3777	3645	3512	3247	2982	2916	2783	2253
110	73	48	33	26	26	44	84	202	235	228	217	217	209	198	209	209	209	202	195	180	165	162	154	125
111	36	24	16	13	13	22	42	100	116	112	107	107	103	98	103	103	103	100	96	89	82	80	76	62
112	130	84	58	45	45	78	149	357	415	402	383	383	370	350	370	370	370	357	344	318	292	285	272	220
113	173	112	78	60	60	104	199	475	553	536	510	510	493	467	493	493	493	475	458	423	389	380	363	294
114	464	302	209	163	163	279	534	1277	1486	1440	1370	1370	1323	1254	1323	1323	1323	1277	1231	1138	1045	1022	975	789
115	494	321	222	173	173	296	568	1359	1581	1532	1457	1457	1408	1334	1408	1408	1408	1359	1309	1210	1112	1087	1038	840
116	252	164	113	88	88	151	290	693	806	781	743	743	718	680	718	718	718	693	667	617	567	554	529	428
117	672	437	302	235	235	403	773	1849	2151	2084	1983	1983	1916	1815	1916	1916	1916	1849	1781	1647	1512	1479	1412	1143
118	420	273	189	147	147	252	483	1156	1345	1303	1240	1240	1198	1135	1198	1198	1198	1156	1114	1030	946	925	883	715
119	337	219	152	118	118	202	387	926	1078	1044	994	994	960	910	960	960	960	926	893	825	758	741	707	573
120	427	277	192	149	149	256	491	1173	1365	1322	1258	1258	1216	1152	1216	1216	1216	1173	1130	1045	960	938	896	725

2016 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Total Vehicle 0030-0130	Total Vehicle 0130-0230	Total Vehicle 0230-0330	Total Vehicle 0330-0430	Total Vehicle 0430-0530	Total Vehicle 0530-0630	Total Vehicle 0630-0730	Total Vehicle 0730-0830	Total Vehicle 0830-0930	Total Vehicle 0930-1030	Total Vehicle 1030-1130	Total Vehicle 1130-1230	Total Vehicle 1230-1330	Total Vehicle 1330-1430	Total Vehicle 1430-1530	Total Vehicle 1530-1630	Total Vehicle 1630-1730	Total Vehicle 1730-1830	Total Vehicle 1830-1930	Total Vehicle 1930-2030	Total Vehicle 2030-2130	Total Vehicle 2130-2230	Total Vehicle 2230-2330	Total Vehicle 2330-0030
121	144	94	65	51	51	87	166	397	462	448	426	426	411	390	411	411	411	397	383	354	325	318	303	245
122	173	113	78	61	61	104	199	476	554	537	511	511	493	467	493	493	493	476	459	424	390	381	364	294
123	246	160	111	86	86	148	283	677	788	763	726	726	702	665	702	702	702	677	653	603	554	542	517	419
124	487	317	219	171	171	292	560	1340	1559	1510	1437	1437	1388	1315	1388	1388	1388	1340	1291	1194	1096	1072	1023	828
125	385	250	173	135	135	231	443	1060	1233	1194	1137	1137	1098	1040	1098	1098	1098	1060	1021	944	867	848	809	655
126	324	211	146	114	114	195	373	892	1038	1006	957	957	924	876	924	924	924	892	860	795	730	714	681	551
127	1202	781	541	421	421	721	1382	3304	3845	3725	3545	3545	3424	3244	3424	3424	3424	3304	3184	2944	2704	2643	2523	2043
128	311	202	140	109	109	187	357	855	995	964	917	917	886	839	886	886	886	855	824	762	699	684	653	528
129	1375	894	619	481	481	825	1581	3780	4399	4262	4055	4055	3918	3712	3918	3918	3918	3780	3643	3368	3093	3024	2887	2337
130	414	269	186	145	145	249	477	1140	1326	1285	1222	1222	1181	1119	1181	1181	1181	1140	1098	1015	932	912	870	704
131	430	279	193	150	150	258	494	1182	1375	1332	1268	1268	1225	1160	1225	1225	1225	1182	1139	1053	967	945	902	730
132	475	309	214	166	166	285	546	1305	1519	1472	1400	1400	1353	1282	1353	1353	1353	1305	1258	1163	1068	1044	997	807
133	643	418	289	225	225	386	739	1768	2057	1993	1896	1896	1832	1736	1832	1832	1832	1768	1703	1575	1446	1414	1350	1093
134	228	148	103	80	80	137	262	627	730	707	673	673	650	616	650	650	650	627	605	559	513	502	479	388
135	354	230	159	124	124	213	407	974	1133	1098	1045	1045	1009	956	1009	1009	1009	974	939	868	797	779	744	602
136	341	222	154	119	119	205	392	938	1092	1058	1007	1007	973	921	973	973	973	938	904	836	768	751	717	580
137	334	217	150	117	117	201	385	920	1070	1037	986	986	953	903	953	953	953	920	886	819	752	736	702	568
138	245	159	110	86	86	147	282	675	785	760	724	724	699	662	699	699	699	675	650	601	552	540	515	417
139	56	36	25	19	19	33	64	153	178	172	164	164	159	150	159	159	159	153	147	136	125	122	117	95
140	1949	1267	877	682	682	1169	2241	5360	6237	6042	5750	5750	5555	5262	5555	5555	5555	5360	5165	4775	4385	4288	4093	3313
141	1764	1146	794	617	617	1058	2028	4850	5644	5468	5203	5203	5027	4762	5027	5027	5027	4850	4674	4321	3968	3880	3704	2998
142	279	181	126	98	98	167	321	767	893	865	823	823	795	753	795	795	795	767	740	684	628	614	586	474
143	339	221	153	119	119	204	390	933	1086	1052	1001	1001	967	916	967	967	967	933	899	831	764	747	713	577
144	286	186	129	100	100	172	329	787	916	887	844	844	816	773	816	816	816	787	759	701	644	630	601	487
145	454	295	204	159	159	272	522	1249	1453	1408	1339	1339	1294	1226	1294	1294	1294	1249	1203	1112	1022	999	954	772
146	65	42	29	23	23	39	75	180	209	202	193	193	186	176	186	186	186	180	173	160	147	144	137	111
147	362	235	163	127	127	217	416	995	1158	1122	1068	1068	1031	977	1031	1031	1031	995	959	887	814	796	760	615
148	536	349	241	188	188	322	617	1475	1716	1662	1582	1582	1528	1448	1528	1528	1528	1475	1421	1314	1207	1180	1126	912
149	99	64	44	35	35	59	114	272	316	306	291	291	281	267	281	281	281	272	262	242	222	217	207	168
150	251	163	113	88	88	151	289	691	804	779	741	741	716	678	716	716	716	691	666	616	565	553	528	427
151	286	186	129	100	100	172	329	787	916	887	844	844	816	773	816	816	816	787	759	701	644	630	601	487
152	85	55	38	30	30	51	98	235	273	264	252	252	243	230	243	243	243	235	226	209	192	188	179	145
153	13	8	6	4	4	8	14	34	40	39	37	37	36	34	36	36	36	34	33	31	28	28	26	21
154	466	303	210	163	163	280	536	1281	1491	1444	1375	1375	1328	1258	1328	1328	1328	1281	1235	1142	1048	1025	978	792
155	486	316	219	170	170	291	558	1335	1554	1505	1433	1433	1384	1311	1384	1384	1384	1335	1287	1190	1093	1068	1020	826
156	189	123	85	66	66	114	218	521	606	587	559	559	540	511	540	540	540	521	502	464	426	417	398	322
157	21	14	9	7	7	13	24	58	67	65	62	62	60	57	60	60	60	58	55	51	47	46	44	36
158	104	67	47	36	36	62	119	285	332	322	306	306	296	280	296	296	296	285	275	254	233	228	218	176
159	656	426	295	229	229	393	754	1803	2098	2032	1934	1934	1869	1770	1869	1869	1869	1803	1737	1606	1475	1442	1377	1115
160	421	274	189	147	147	253	484	1158	1347	1305	1242	1242	1200	1137	1200	1200	1200	1158	1115	1031	947	926	884	716
161	251	163	113	88	88	151	289	691	804	779	741	741	716	678	716	716	716	691	666	616	565	553	528	427
162	263	171	118	92	92	158	302	723	841	815	775	775	749	710	749	749	749	723	696	644	591	578	552	447
163	128	83	58	45	45	77	148	353	411	398	379	379	366	347	366	366	366	353	340	315	289	283	270	218
164	90	59	41	32	32	54	104	248	289	280	266	266	257	244	257	257	257	248	239	221	203	198	189	153
165	263	171	118	92	92	158	302	723	841	815	775	775	749	710	749	749	749	723	696	644	591	578	552	447
166	208	135	94	73	73	125	240	573	667	646	615	615	594	563	594	594	594	573	552	511	469	459	438	354
167	268	174	121	94	94	161	309	738	859	832	792	792	765	725	765	765	765	738	711	658	604	591	564	456
168	393	256	177	138	138	236	452	1082	1259	1220	1161	1161	1121	1062	1121	1121	1121	1082	1043	964	885	866	826	669
169	279	181	126	98	98	167	321	767	893	865	823	823	795	753	795	795	795	767	740	684	628	614	586	474
170	318	206	143	111	111	191	365	873	1016	984	937	937	905	857	905	905	905	873	841	778	714	699	667	540
171	598	389	269	209	209	359	687	1644	1913	1853	1764	1764	1704	1614	1704	1704	1704	1644	1584	1465	1345	1315	1255	1016
172	451	293	203	158	158	271	519	1241	1444	1399	1331	1331	1286	1218	1286	1286	1286	1241	1196	1106	1015	993	948	767
173	1031	670	464	361	361	619	1186	2835	3299	3196	3041	3041	2938	2784	2938	2938	2938	2835	2732	2526	2320	2268	2165	1753
174	1006	654	453	352	352	604	1157	2767	3220	3119	2968	2968	2868	2717	2868	2868	2868	2767	2667	2465	2264	2214	2113	1711
175	173	112	78	60	60	104	199	475	553	536	510	510	493	467	493	493	493	475	458	423	389	380	363	294
176	540	351	243	189	189	324	621	1484	1727	1673	1592	1592	1538	1457	1538	1538	1538	1484	1430	1322	1214	1187	1133	917
177	69	45	31	24	24	41	79	190	221	214	204	204	197	186	197	197	197	190	183	169	155	152	145	117
178	292	190	131	102	102	175	336	803	934	905	861	861	832	788	832	832	832	803	773	715	657	642	613	496
179	28	18	13	10	10	17	32	77	90	87	83	83	80	76	80	80	80	77	75	69	63	62	59	48
180	127	82	57	44	44	76	146	348	405	392	373	373	361	342	361	361	361	348	335	310	285	278	266	215

2016 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Total Vehicle 0030-0130	Total Vehicle 0130-0230	Total Vehicle 0230-0330	Total Vehicle 0330-0430	Total Vehicle 0430-0530	Total Vehicle 0530-0630	Total Vehicle 0630-0730	Total Vehicle 0730-0830	Total Vehicle 0830-0930	Total Vehicle 0930-1030	Total Vehicle 1030-1130	Total Vehicle 1130-1230	Total Vehicle 1230-1330	Total Vehicle 1330-1430	Total Vehicle 1430-1530	Total Vehicle 1530-1630	Total Vehicle 1630-1730	Total Vehicle 1730-1830	Total Vehicle 1830-1930	Total Vehicle 1930-2030	Total Vehicle 2030-2130	Total Vehicle 2130-2230	Total Vehicle 2230-2330	Total Vehicle 2330-0030
181	188	122	85	66	66	113	216	517	602	583	555	555	536	508	536	536	536	517	499	461	423	414	395	320
182	176	114	79	62	62	106	202	484	563	545	519	519	501	475	501	501	501	484	466	431	396	387	369	299
183	51	33	23	18	18	31	59	141	164	159	151	151	146	138	146	146	146	141	136	126	115	113	108	87
184	342	223	154	120	120	205	394	942	1096	1062	1010	1010	976	925	976	976	976	942	908	839	771	753	719	582
185	280	182	126	98	98	168	322	770	896	868	826	826	798	756	798	798	798	770	742	686	630	616	588	476
186	230	150	104	81	81	138	265	633	736	713	679	679	656	621	656	656	656	633	610	564	518	506	483	391
187	70	46	32	25	25	42	81	193	225	218	207	207	200	190	200	200	200	193	186	172	158	155	148	120
188	150	98	68	53	53	90	173	413	481	466	443	443	428	406	428	428	428	413	398	368	338	331	316	256
189	1047	680	471	366	366	628	1204	2879	3350	3245	3088	3088	2984	2827	2984	2984	2984	2879	2774	2565	2355	2303	2198	1780
190	1640	1066	738	574	574	984	1886	4510	5248	5084	4838	4838	4674	4428	4674	4674	4674	4510	4346	4018	3690	3608	3444	2788
191	953	620	429	334	334	572	1096	2621	3050	2955	2812	2812	2716	2573	2716	2716	2716	2621	2526	2335	2145	2097	2002	1620
192	629	409	283	220	220	378	724	1731	2014	1951	1857	1857	1794	1699	1794	1794	1794	1731	1668	1542	1416	1385	1322	1070
193	113	74	51	40	40	68	130	311	362	351	334	334	322	305	322	322	322	311	300	277	255	249	238	192
194	360	234	162	126	126	216	414	990	1152	1116	1062	1062	1026	972	1026	1026	1026	990	954	882	810	792	756	612
195	88	57	40	31	31	53	101	242	282	273	260	260	251	238	251	251	251	242	234	216	198	194	185	150
196	290	189	131	102	102	174	334	798	928	899	856	856	827	783	827	827	827	798	769	711	653	638	609	493
197	432	281	194	151	151	259	496	1187	1381	1338	1273	1273	1230	1165	1230	1230	1230	1187	1144	1057	971	949	906	734
198	25	16	11	9	9	15	29	69	80	78	74	74	71	68	71	71	71	69	66	61	56	55	53	43
199	252	164	113	88	88	151	290	693	806	781	743	743	718	680	718	718	718	693	667	617	567	554	529	428
200	237	154	107	83	83	142	272	651	758	734	698	698	675	639	675	675	675	651	627	580	533	521	497	403
201	312	203	140	109	109	187	359	858	998	967	920	920	889	842	889	889	889	858	827	764	702	686	655	530
202	189	123	85	66	66	113	217	520	605	586	557	557	538	510	538	538	538	520	501	463	425	416	397	321
203	486	316	219	170	170	292	559	1337	1556	1507	1434	1434	1386	1313	1386	1386	1386	1337	1289	1191	1094	1070	1021	827
204	728	473	327	255	255	437	837	2001	2328	2255	2146	2146	2073	1964	2073	2073	2073	2001	1928	1782	1637	1601	1528	1237
205	192	125	86	67	67	115	220	527	613	594	565	565	546	517	546	546	546	527	508	469	431	421	402	326
206	259	168	116	91	91	155	298	712	828	802	763	763	737	699	737	737	737	712	686	634	582	569	543	440
207	1504	978	677	527	527	903	1730	4137	4814	4664	4438	4438	4287	4062	4287	4287	4287	4137	3987	3686	3385	3310	3159	2557
208	1710	1112	770	599	599	1026	1967	4703	5472	5301	5045	5045	4874	4617	4874	4874	4874	4703	4532	4190	3848	3762	3591	2907
209	316	205	142	111	111	190	363	869	1011	979	932	932	900	853	900	900	900	869	837	774	711	695	663	537
210	82	53	37	29	29	49	95	226	263	255	242	242	234	222	234	234	234	226	218	201	185	181	173	140
211	408	265	184	143	143	245	469	1122	1306	1265	1204	1204	1163	1102	1163	1163	1163	1122	1082	1000	918	898	857	694
212	349	227	157	122	122	209	401	960	1117	1082	1030	1030	995	942	995	995	995	960	925	855	785	768	733	593
213	82	53	37	29	29	49	95	226	263	255	242	242	234	222	234	234	234	226	218	201	185	181	173	140
214	443	288	199	155	155	266	509	1218	1417	1373	1306	1306	1262	1196	1262	1262	1262	1218	1173	1085	996	974	930	753
215	39	25	17	14	14	23	45	107	124	120	114	114	110	105	110	110	110	107	103	95	87	85	81	66
216	115	75	52	40	40	69	132	316	368	357	339	339	328	311	328	328	328	316	305	282	259	253	242	196
217	191	124	86	67	67	114	219	524	610	591	562	562	543	515	543	543	543	524	505	467	429	419	400	324
218	267	174	120	94	94	160	307	735	855	828	788	788	761	721	761	761	761	735	708	655	601	588	561	454

2031 EIA Traffic Flows by 16 Vehicle Classes

LinkNo.	Total Vehicle 0030-0130	Total Vehicle 0130-0230	Total Vehicle 0230-0330	Total Vehicle 0330-0430	Total Vehicle 0430-0530	Total Vehicle 0530-0630	Total Vehicle 0630-0730	Total Vehicle 0730-0830	Total Vehicle 0830-0930	Total Vehicle 0930-1030	Total Vehicle 1030-1130	Total Vehicle 1130-1230	Total Vehicle 1230-1330	Total Vehicle 1330-1430	Total Vehicle 1430-1530	Total Vehicle 1530-1630	Total Vehicle 1630-1730	Total Vehicle 1730-1830	Total Vehicle 1830-1930	Total Vehicle 1930-2030	Total Vehicle 2030-2130	Total Vehicle 2130-2230	Total Vehicle 2230-2330	Total Vehicle 2330-0030
1	627	407	282	219	219	376	721	1724	2006	1943	1849	1849	1787	1693	1787	1787	1787	1724	1661	1536	1410	1379	1316	1066
2	43	28	19	15	15	26	49	118	137	133	126	126	122	116	122	122	122	118	113	105	96	94	90	73
3	259	168	117	91	91	155	298	712	829	803	764	764	738	699	738	738	738	712	687	635	583	570	544	440
4	236	154	106	83	83	142	272	650	756	732	697	697	673	638	673	673	673	650	626	579	532	520	496	402
5	260	169	117	91	91	156	299	716	833	807	768	768	742	703	742	742	742	716	690	638	586	573	547	443
6	1014	659	456	355	355	609	1167	2790	3246	3145	2992	2992	2891	2739	2891	2891	2891	2790	2688	2485	2282	2232	2130	1724
7	566	368	255	198	198	340	651	1556	1811	1754	1670	1670	1613	1528	1613	1613	1613	1556	1500	1387	1273	1245	1188	962
8	43	28	20	15	15	26	50	119	139	135	128	128	124	117	124	124	124	119	115	106	98	96	91	74
9	12	8	5	4	4	7	14	34	39	38	36	36	35	33	35	35	35	34	32	30	27	27	26	21
10	219	142	99	77	77	131	252	602	701	679	646	646	624	591	624	624	624	602	581	537	493	482	460	372
11	188	122	85	66	66	113	216	516	601	582	554	554	535	507	535	535	535	516	498	460	423	413	394	319
12	700	455	315	245	245	420	805	1926	2241	2171	2066	2066	1996	1891	1996	1996	1996	1926	1856	1716	1576	1541	1471	1191
13	1615	1050	727	565	565	969	1857	4441	5168	5007	4764	4764	4603	4361	4603	4603	4603	4441	4280	3957	3634	3553	3392	2746
14	1135	738	511	397	397	681	1306	3122	3633	3519	3349	3349	3236	3065	3236	3236	3236	3122	3009	2782	2554	2498	2384	1930
15	79	51	35	28	28	47	91	217	252	244	232	232	224	213	224	224	224	217	209	193	177	173	165	134
16	129	84	58	45	45	77	148	354	412	399	380	380	367	348	367	367	367	354	341	315	290	283	270	219
17	459	298	206	161	161	275	528	1262	1468	1422	1353	1353	1307	1239	1307	1307	1307	1262	1216	1124	1032	1009	963	780
18	498	324	224	174	174	299	573	1370	1594	1544	1469	1469	1420	1345	1420	1420	1420	1370	1320	1220	1121	1096	1046	847
19	9	6	4	3	3	6	11	26	30	29	28	28	27	25	27	27	27	26	25	23	21	21	20	16
20	873	568	393	306	306	524	1004	2401	2794	2707	2576	2576	2488	2357	2488	2488	2488	2401	2314	2139	1965	1921	1834	1484
21	1027	668	462	360	360	616	1181	2825	3287	3184	3030	3030	2927	2773	2927	2927	2927	2825	2722	2517	2311	2260	2157	1746
22	1433	931	645	501	501	860	1648	3940	4585	4442	4227	4227	4084	3869	4084	4084	4084	3940	3797	3510	3224	3152	3009	2436
23	956	621	430	335	335	574	1099	2629	3059	2963	2820	2820	2724	2581	2724	2724	2724	2629	2533	2342	2151	2103	2007	1625
24	457	297	206	160	160	274	525	1256	1462	1416	1348	1348	1302	1234	1302	1302	1302	1256	1211	1119	1028	1005	959	777
25	114	74	51	40	40	68	131	313	364	353	336	336	324	307	324	324	324	313	301	279	256	250	239	193
26	353	229	159	123	123	212	405	969	1128	1093	1040	1040	1005	952	1005	1005	1005	969	934	864	793	776	740	599
27	68	44	31	24	24	41	78	187	218	211	201	201	194	184	194	194	194	187	181	167	153	150	143	116
28	8	5	4	3	3	5	9	22	25	25	23	23	23	21	23	23	23	22	21	19	18	17	17	13
29	244	158	110	85	85	146	280	670	780	756	719	719	695	658	695	695	695	670	646	597	548	536	512	414
30	961	625	432	336	336	577	1105	2643	3075	2979	2835	2835	2739	2595	2739	2739	2739	2643	2546	2354	2162	2114	2018	1634
31	447	290	201	156	156	268	514	1228	1429	1384	1317	1317	1273	1206	1273	1273	1273	1228	1183	1094	1005	982	938	759
32	367	238	165	128	128	220	422	1009	1174	1137	1082	1082	1046	991	1046	1046	1046	1009	972	899	825	807	770	624
33	286	186	129	100	100	172	329	787	916	887	844	844	816	773	816	816	816	787	759	701	644	630	601	487
34	235	153	106	82	82	141	270	645	751	728	692	692	669	634	669	669	669	645	622	575	528	516	493	399
35	141	92	64	50	50	85	163	389	453	439	417	417	403	382	403	403	403	389	375	347	318	311	297	240
36	177	115	79	62	62	106	203	486	565	547	521	521	503	477	503	503	503	486	468	433	397	388	371	300
37	187	122	84	66	66	112	215	515	599	580	552	552	533	505	533	533	533	515	496	459	421	412	393	318
38	255	166	115	89	89	153	293	700	815	790	751	751	726	688	726	726	726	700	675	624	573	560	535	433
39	130	85	59	46	46	78	150	358	417	404	384	384	371	352	371	371	371	358	345	319	293	287	274	222
40	255	166	115	89	89	153	293	700	815	790	751	751	726	688	726	726	726	700	675	624	573	560	535	433
41	202	131	91	71	71	121	232	554	645	625	595	595	574	544	574	574	574	554	534	494	454	443	423	343
42	18	12	8	6	6	11	21	51	59	57	54	54	53	50	53	53	53	51	49	45	41	41	39	31
43	4	3	2	2	2	3	5	12	14	14	13	13	12	12	12	12	12	12	12	11	10	10	9	7
44	165	107	74	58	58	99	190	454	528	512	487	487	470	446	470	470	470	454	437	404	371	363	347	281
45	238	154	107	83	83	143	273	653	760	736	701	701	677	641	677	677	677	653	629	582	534	523	499	404
46	1254	815	564	439	439	752	1442	3449	4013	3888	3699	3699	3574	3386	3574	3574	3574	3449	3323	3072	2822	2759	2634	2132
47	1397	908	628	489	489	838	1606	3841	4469	4329	4120	4120	3980	3771	3980	3980	3980	3841	3701	3422	3142	3072	2933	2374
48	26	17	12	9	9	15	29	70	82	79	76	76	73	69	73	73	73	70	68	63	58	56	54	44
49	541	352	244	189	189	325	622	1488	1732	1678	1597	1597	1543	1461	1543	1543	1543	1488	1434	1326	1218	1191	1137	920
50	98	64	44	34	34	59	112	269	313	303	289	289	279	264	279	279	279	269	259	240	220	215	205	166
51	60	39	27	21	21	36	69	166	193	187	178	178	172	163	172	172	172	166	160	148	136	133	127	103
52	280	182	126	98	98	168	322	769	895	867	825	825	797	755	797	797	797	769	741	685	629	615	587	475
53	162	105	73	57	57	97	186	446	519	503	478	478	462	438	462	462	462	446	430	397	365	357	341	276
54	260	169	117	91	91	156	299	714	831	805	766	766	740	701	740	740	740	714	688	636	584	571	545	441
55	216	140	97	75	75	129	248	593	690	668	636	636	615	582	615	615	615	593	571	528	485	474	453	367
56	87	56	39	30	30	52	100	238	277	268	255	255	247	234	247	247	247	238	229	212	195	190	182	147
57	271	176	122	95	95	163	312	745	867	840	799	799	772	732	772	772	772	745	718	664	610	596	569	461
58	206	134	93	72	72	123	236	565	658	637	607	607	586	555	586	586	586	565	545	504	463	452	432	350
59	1464	951	659	512	512	878	1683	4025	4684	4538	4318	4318	4172	3952	4172	4172	4172	4025	3879	3586	3293	3220	3074	2488
60	474	308	213	166	166	284	545	1303	1516	1469	1398	1398	1350	1279	1350	1350	1350	1303	1255	1161	1066	1042	995	805

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Total Vehicle 0030-0130	Total Vehicle 0130-0230	Total Vehicle 0230-0330	Total Vehicle 0330-0430	Total Vehicle 0430-0530	Total Vehicle 0530-0630	Total Vehicle 0630-0730	Total Vehicle 0730-0830	Total Vehicle 0830-0930	Total Vehicle 0930-1030	Total Vehicle 1030-1130	Total Vehicle 1130-1230	Total Vehicle 1230-1330	Total Vehicle 1330-1430	Total Vehicle 1430-1530	Total Vehicle 1530-1630	Total Vehicle 1630-1730	Total Vehicle 1730-1830	Total Vehicle 1830-1930	Total Vehicle 1930-2030	Total Vehicle 2030-2130	Total Vehicle 2130-2230	Total Vehicle 2230-2330	Total Vehicle 2330-0030
61	991	644	446	347	347	595	1140	2726	3172	3073	2924	2924	2825	2676	2825	2825	2825	2726	2627	2428	2230	2181	2081	1685
62	1317	856	592	461	461	790	1514	3621	4213	4081	3884	3884	3752	3555	3752	3752	3752	3621	3489	3226	2962	2896	2765	2238
63	1317	856	593	461	461	790	1514	3621	4214	4082	3885	3885	3753	3556	3753	3753	3753	3621	3490	3226	2963	2897	2765	2239
64	260	169	117	91	91	156	299	716	833	807	768	768	742	703	742	742	742	716	690	638	586	573	547	443
65	326	212	147	114	114	196	375	897	1044	1011	962	962	930	881	930	930	930	897	865	799	734	718	685	555
66	70	46	32	25	25	42	81	193	225	218	207	207	200	190	200	200	200	193	186	172	158	155	148	120
67	675	439	304	236	236	405	776	1856	2160	2093	1991	1991	1924	1823	1924	1924	1924	1856	1789	1654	1519	1485	1418	1148
68	184	120	83	65	65	111	212	507	590	572	544	544	525	498	525	525	525	507	489	452	415	406	387	313
69	85	55	38	30	30	51	97	233	271	263	250	250	241	229	241	241	241	233	224	207	191	186	178	144
70	146	95	66	51	51	88	168	401	467	452	431	431	416	394	416	416	416	401	387	358	328	321	306	248
71	513	333	231	179	179	308	589	1409	1640	1589	1512	1512	1461	1384	1461	1461	1461	1409	1358	1256	1153	1128	1076	871
72	138	90	62	48	48	83	158	379	441	427	407	407	393	372	393	393	393	379	365	338	310	303	289	234
73	670	436	302	235	235	402	771	1843	2144	2077	1977	1977	1910	1809	1910	1910	1910	1843	1776	1642	1508	1474	1407	1139
74	286	186	129	100	100	171	328	785	914	885	843	843	814	771	814	814	814	785	757	700	643	628	600	486
75	670	436	302	235	235	402	771	1843	2144	2077	1977	1977	1910	1809	1910	1910	1910	1843	1776	1642	1508	1474	1407	1139
76	165	107	74	58	58	99	189	453	527	511	486	486	469	445	469	469	469	453	436	403	371	362	346	280
77	31	20	14	11	11	18	35	84	98	95	90	90	87	83	87	87	87	84	81	75	69	67	64	52
78	144	94	65	51	51	87	166	397	462	448	426	426	411	390	411	411	411	397	383	354	325	318	303	245
79	233	151	105	81	81	140	267	639	744	721	686	686	663	628	663	663	663	639	616	570	523	512	488	395
80	397	258	178	139	139	238	456	1091	1269	1229	1170	1170	1130	1071	1130	1130	1130	1091	1051	972	892	872	833	674
81	432	281	194	151	151	259	497	1189	1383	1340	1275	1275	1232	1167	1232	1232	1232	1189	1145	1059	972	951	908	735
82	388	252	174	136	136	233	446	1066	1240	1201	1143	1143	1104	1046	1104	1104	1104	1066	1027	949	872	853	814	659
83	247	161	111	87	87	148	284	680	791	766	729	729	704	667	704	704	704	680	655	606	556	544	519	420
84	537	349	242	188	188	322	618	1477	1719	1665	1585	1585	1531	1450	1531	1531	1531	1477	1424	1316	1209	1182	1128	913
85	222	144	100	78	78	133	255	609	709	687	654	654	631	598	631	631	631	609	587	543	499	487	465	377
86	293	191	132	103	103	176	337	806	938	909	865	865	835	791	835	835	835	806	777	718	660	645	616	498
87	20	13	9	7	7	12	23	55	64	62	59	59	57	54	57	57	57	55	53	49	45	44	42	34
88	63	41	28	22	22	38	72	172	200	194	184	184	178	169	178	178	178	172	166	153	141	138	131	106
89	14	9	6	5	5	9	17	40	46	45	42	42	41	39	41	41	41	40	38	35	32	32	30	24
90	271	176	122	95	95	162	311	744	866	839	798	798	771	731	771	771	771	744	717	663	609	595	568	460
91	206	134	93	72	72	123	236	565	658	637	607	607	586	555	586	586	586	565	545	504	463	452	432	350
92	160	104	72	56	56	96	184	439	511	495	471	471	455	431	455	455	455	439	423	391	359	351	335	271
93	266	173	120	93	93	160	306	731	851	824	785	785	758	718	758	758	758	731	705	652	598	585	558	452
94	390	254	176	137	137	234	449	1073	1248	1209	1151	1151	1112	1053	1112	1112	1112	1073	1034	956	878	858	819	663
95	365	237	164	128	128	219	419	1003	1167	1131	1076	1076	1039	985	1039	1039	1039	1003	966	893	821	802	766	620
96	393	256	177	138	138	236	452	1082	1259	1220	1161	1161	1121	1062	1121	1121	1121	1082	1043	964	885	866	826	669
97	486	316	219	170	170	292	559	1337	1556	1507	1434	1434	1386	1313	1386	1386	1386	1337	1289	1191	1094	1070	1021	827
98	540	351	243	189	189	324	621	1484	1727	1673	1592	1592	1538	1457	1538	1538	1538	1484	1430	1322	1214	1187	1133	917
99	71	46	32	25	25	43	82	195	227	220	209	209	202	192	202	202	202	195	188	174	160	156	149	121
100	17	11	8	6	6	10	19	46	54	52	50	50	48	46	48	48	48	46	45	41	38	37	35	29
101	1334	867	600	467	467	801	1535	3670	4270	4137	3936	3936	3803	3603	3803	3803	3803	3670	3536	3269	3002	2936	2802	2268
102	1126	732	507	394	394	675	1294	3095	3602	3489	3321	3321	3208	3039	3208	3208	3208	3095	2983	2758	2533	2476	2364	1914
103	328	213	148	115	115	197	377	901	1049	1016	967	967	934	885	934	934	934	901	869	803	738	721	688	557
104	511	332	230	179	179	306	587	1404	1634	1583	1506	1506	1455	1379	1455	1455	1455	1404	1353	1251	1149	1123	1072	868
105	466	303	210	163	163	279	535	1280	1490	1443	1374	1374	1327	1257	1327	1327	1327	1280	1234	1141	1048	1024	978	792
106	1308	850	589	458	458	785	1505	3598	4187	4056	3860	3860	3729	3533	3729	3729	3729	3598	3467	3206	2944	2879	2748	2224
107	1800	1170	810	630	630	1080	2070	4950	5760	5580	5310	5310	5130	4860	5130	5130	5130	4950	4770	4410	4050	3960	3780	3060
108	1308	850	589	458	458	785	1505	3598	4187	4056	3860	3860	3729	3533	3729	3729	3729	3598	3467	3206	2944	2879	2748	2224
109	1539	1000	693	539	539	923	1770	4232	4925	4771	4540	4540	4386	4155	4386	4386	4386	4232	4079	3771	3463	3386	3232	2616
110	83	54	37	29	29	50	95	228	265	257	244	244	236	224	236	236	236	228	219	203	186	182	174	141
111	42	27	19	15	15	25	48	115	134	130	124	124	119	113	119	119	119	115	111	103	94	92	88	71
112	148	96	67	52	52	89	170	407	474	459	437	437	422	400	422	422	422	407	393	363	333	326	311	252
113	198	129	89	69	69	119	228	546	635	615	585	585	566	536	566	566	566	546	526	486	446	437	417	337
114	535	348	241	187	187	321	616	1472	1713	1659	1579	1579	1526	1445	1526	1526	1526	1472	1419	1312	1204	1178	1124	910
115	565	367	254	198	198	339	650	1555	1809	1752	1668	1668	1611	1526	1611	1611	1611	1555	1498	1385	1272	1244	1187	961
116	261	170	117	91	91	157	300	718	835	809	770	770	744	705	744	744	744	718	691	639	587	574	548	444
117	776	504	349	271	271	465	892	2133	2482	2404	2288	2288	2211	2094	2211	2211	2211	2133	2055	1900	1745	1706	1629	1319
118	515	335	232	180	180	309	592	1415	1647	1596	1518	1518	1467	1390	1467	1467	1467	1415	1364	1261	1158	1132	1081	875
119	388	252	175	136	136	233	446	1066	1241	1202	1144	1144	1105	1047	1105	1105	1105	1066	1028	950	873	853	814	659
120	482	313	217	169	169	289	554	1325	1542	1494	1422	1422	1373	1301	1373	1373	1373	1325	1277	1181	1084	1060	1012	819

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Total Vehicle 0030-0130	Total Vehicle 0130-0230	Total Vehicle 0230-0330	Total Vehicle 0330-0430	Total Vehicle 0430-0530	Total Vehicle 0530-0630	Total Vehicle 0630-0730	Total Vehicle 0730-0830	Total Vehicle 0830-0930	Total Vehicle 0930-1030	Total Vehicle 1030-1130	Total Vehicle 1130-1230	Total Vehicle 1230-1330	Total Vehicle 1330-1430	Total Vehicle 1430-1530	Total Vehicle 1530-1630	Total Vehicle 1630-1730	Total Vehicle 1730-1830	Total Vehicle 1830-1930	Total Vehicle 1930-2030	Total Vehicle 2030-2130	Total Vehicle 2130-2230	Total Vehicle 2230-2330	Total Vehicle 2330-0030
121	157	102	71	55	55	94	181	432	503	487	464	464	448	424	448	448	448	432	417	385	354	346	330	267
122	199	129	90	70	70	119	229	547	637	617	587	587	567	537	567	567	567	547	528	488	448	438	418	338
123	275	179	124	96	96	165	316	755	879	852	810	810	783	742	783	783	783	755	728	673	618	604	577	467
124	550	358	248	193	193	330	633	1513	1761	1706	1623	1623	1568	1486	1568	1568	1568	1513	1458	1348	1238	1211	1156	936
125	441	287	199	154	154	265	507	1213	1412	1368	1302	1302	1258	1191	1258	1258	1258	1213	1169	1081	993	971	927	750
126	377	245	169	132	132	226	433	1036	1205	1167	1111	1111	1073	1017	1073	1073	1073	1036	998	923	847	828	791	640
127	1383	899	622	484	484	830	1591	3804	4426	4288	4080	4080	3942	3734	3942	3942	3942	3804	3665	3389	3112	3043	2905	2351
128	356	231	160	124	124	213	409	978	1138	1102	1049	1049	1013	960	1013	1013	1013	978	942	871	800	782	747	604
129	1589	1033	715	556	556	953	1827	4370	5085	4926	4688	4688	4529	4290	4529	4529	4529	4370	4211	3893	3575	3496	3337	2701
130	481	312	216	168	168	288	553	1322	1538	1490	1418	1418	1370	1298	1370	1370	1370	1322	1274	1178	1081	1057	1009	817
131	497	323	224	174	174	298	571	1366	1590	1540	1466	1466	1416	1342	1416	1416	1416	1366	1317	1217	1118	1093	1043	845
132	550	358	248	193	193	330	633	1513	1760	1705	1623	1623	1568	1485	1568	1568	1568	1513	1458	1348	1238	1210	1155	935
133	742	482	334	260	260	445	853	2040	2374	2300	2189	2189	2114	2003	2114	2114	2114	2040	1966	1818	1669	1632	1558	1261
134	265	172	119	93	93	159	305	730	849	822	783	783	756	716	756	756	756	730	703	650	597	584	557	451
135	407	264	183	142	142	244	468	1118	1301	1261	1200	1200	1159	1098	1159	1159	1159	1118	1078	996	915	895	854	691
136	393	256	177	138	138	236	452	1081	1258	1219	1160	1160	1120	1061	1120	1120	1120	1081	1042	963	885	865	826	668
137	383	249	172	134	134	230	440	1052	1224	1186	1128	1128	1090	1033	1090	1090	1090	1052	1014	937	861	842	803	650
138	283	184	128	99	99	170	326	779	907	879	836	836	808	765	808	808	808	779	751	694	638	624	595	482
139	65	42	29	23	23	39	74	178	207	201	191	191	184	175	184	184	184	178	171	158	146	142	136	110
140	2253	1464	1014	788	788	1352	2590	6194	7208	6983	6645	6645	6420	6082	6420	6420	6420	6194	5969	5519	5068	4956	4730	3829
141	2042	1327	919	715	715	1225	2349	5616	6535	6331	6024	6024	5820	5514	5820	5820	5820	5616	5412	5003	4595	4493	4289	3472
142	325	211	146	114	114	195	373	893	1039	1007	958	958	925	877	925	925	925	893	860	795	731	714	682	552
143	394	256	177	138	138	236	453	1084	1261	1222	1162	1162	1123	1064	1123	1123	1123	1084	1044	965	887	867	828	670
144	331	215	149	116	116	198	380	909	1058	1025	975	975	942	893	942	942	942	909	876	810	744	727	694	562
145	526	342	237	184	184	316	605	1446	1683	1630	1552	1552	1499	1420	1499	1499	1499	1446	1394	1289	1183	1157	1104	894
146	65	42	29	23	23	39	75	180	209	202	193	193	186	176	186	186	186	180	173	160	147	144	137	111
147	409	266	184	143	143	245	470	1124	1308	1267	1206	1206	1165	1104	1165	1165	1165	1124	1083	1001	920	899	858	695
148	610	397	275	214	214	366	702	1678	1952	1891	1800	1800	1739	1647	1739	1739	1739	1678	1617	1495	1373	1342	1281	1037
149	104	67	47	36	36	62	119	285	332	322	306	306	296	280	296	296	296	285	275	254	233	228	218	176
150	288	187	130	101	101	173	332	793	923	894	851	851	822	779	822	822	822	793	764	707	649	635	606	490
151	323	210	145	113	113	194	371	888	1033	1001	952	952	920	872	920	920	920	888	855	791	726	710	678	549
152	88	57	40	31	31	53	101	242	282	273	260	260	251	238	251	251	251	242	234	216	198	194	185	150
153	15	10	7	5	5	9	17	40	47	46	43	43	42	40	42	42	42	40	39	36	33	32	31	25
154	539	350	242	189	189	323	620	1482	1724	1670	1589	1589	1535	1455	1535	1535	1535	1482	1428	1320	1212	1185	1131	916
155	560	364	252	196	196	336	644	1540	1792	1736	1652	1652	1596	1512	1596	1596	1596	1540	1484	1372	1260	1232	1176	952
156	218	141	98	76	76	131	250	598	696	674	642	642	620	587	620	620	620	598	576	533	489	479	457	370
157	22	14	10	8	8	13	25	60	70	68	65	65	62	59	62	62	62	60	58	54	49	48	46	37
158	119	77	53	42	42	71	137	327	380	368	350	350	338	321	338	338	338	327	315	291	267	261	249	202
159	756	492	340	265	265	454	870	2080	2420	2344	2231	2231	2155	2042	2155	2155	2155	2080	2004	1853	1702	1664	1588	1286
160	487	317	219	171	171	292	560	1340	1559	1510	1437	1437	1388	1315	1388	1388	1388	1340	1291	1194	1096	1072	1023	828
161	288	187	130	101	101	173	332	793	923	894	851	851	822	779	822	822	822	793	764	707	649	635	606	490
162	302	196	136	106	106	181	347	830	966	936	891	891	860	815	860	860	860	830	800	740	679	664	634	513
163	149	97	67	52	52	89	171	409	476	461	439	439	424	402	424	424	424	409	394	364	335	327	312	253
164	101	66	45	35	35	61	116	277	323	313	298	298	287	272	287	287	287	277	267	247	227	222	212	171
165	302	196	136	106	106	181	347	830	966	936	891	891	860	815	860	860	860	830	800	740	679	664	634	513
166	239	155	108	84	84	143	275	657	765	741	705	705	681	645	681	681	681	657	634	586	538	526	502	406
167	308	200	139	108	108	185	355	848	987	956	910	910	879	833	879	879	879	848	817	756	694	679	648	524
168	458	297	206	160	160	275	526	1258	1464	1418	1350	1350	1304	1235	1304	1304	1304	1258	1212	1121	1029	1007	961	778
169	325	211	146	114	114	195	373	893	1039	1007	958	958	925	877	925	925	925	893	860	795	731	714	682	552
170	368	239	166	129	129	221	424	1013	1179	1142	1087	1087	1050	995	1050	1050	1050	1013	976	903	829	811	774	626
171	694	451	312	243	243	417	799	1910	2222	2153	2048	2048	1979	1875	1979	1979	1979	1910	1840	1701	1562	1528	1458	1180
172	514	334	231	180	180	308	591	1413	1644	1593	1516	1516	1464	1387	1464	1464	1464	1413	1361	1259	1156	1130	1079	873
173	1180	767	531	413	413	708	1357	3244	3775	3657	3480	3480	3362	3185	3362	3362	3362	3244	3126	2890	2654	2595	2477	2005
174	1155	751	520	404	404	693	1329	3177	3697	3581	3408	3408	3293	3119	3293	3293	3293	3177	3062	2831	2599	2542	2426	1964
175	198	129	89	69	69	119	228	546	635	615	585	585	566	536	566	566	566	546	526	486	446	437	417	337
176	623	405	280	218	218	374	716	1713	1993	1931	1837	1837	1775	1682	1775	1775	1775	1713	1650	1526	1401	1370	1308	1059
177	79	51	36	28	28	47	91	217	253	245	233	233	225	213	225	225	225	217	210	194	178	174	166	134
178	339	220	152	119	119	203	390	932	1084	1050	999	999	965	915	965	965	965	932	898	830	762	745	711	576
179	33	21	15	11	11	20	38	90	105	102	97	97	94	89	94	94	94	90	87	80	74	72	69	56
180	147	96	66	52	52	88	169	405	471	456	434	434	419	397	419	419	419	405	390	361	331	324	309	250

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No	Total Vehicle 0030-0130	Total Vehicle 0130-0230	Total Vehicle 0230-0330	Total Vehicle 0330-0430	Total Vehicle 0430-0530	Total Vehicle 0530-0630	Total Vehicle 0630-0730	Total Vehicle 0730-0830	Total Vehicle 0830-0930	Total Vehicle 0930-1030	Total Vehicle 1030-1130	Total Vehicle 1130-1230	Total Vehicle 1230-1330	Total Vehicle 1330-1430	Total Vehicle 1430-1530	Total Vehicle 1530-1630	Total Vehicle 1630-1730	Total Vehicle 1730-1830	Total Vehicle 1830-1930	Total Vehicle 1930-2030	Total Vehicle 2030-2130	Total Vehicle 2130-2230	Total Vehicle 2230-2330	Total Vehicle 2330-0030
181	218	142	98	76	76	131	251	600	698	676	643	643	622	589	622	622	622	600	578	534	491	480	458	371
182	205	133	92	72	72	123	235	563	655	635	604	604	583	553	583	583	583	563	542	501	461	450	430	348
183	60	39	27	21	21	36	69	166	193	187	178	178	172	163	172	172	172	166	160	148	136	133	127	103
184	404	263	182	141	141	242	465	1111	1293	1253	1192	1192	1152	1091	1152	1152	1152	1111	1071	990	909	889	848	687
185	325	211	146	114	114	195	373	893	1039	1007	958	958	925	877	925	925	925	893	860	795	731	714	682	552
186	266	173	120	93	93	160	306	731	851	824	785	785	758	718	758	758	758	731	705	652	598	585	558	452
187	80	52	36	28	28	48	92	221	257	249	237	237	229	217	229	229	229	221	213	197	181	177	169	137
188	175	114	79	61	61	105	201	480	559	542	515	515	498	472	498	498	498	480	463	428	393	384	367	297
189	1210	787	545	424	424	726	1392	3328	3872	3751	3570	3570	3449	3267	3449	3449	3449	3328	3207	2965	2723	2662	2541	2057
190	1890	1229	851	662	662	1134	2174	5198	6048	5859	5576	5576	5387	5103	5387	5387	5387	5198	5009	4631	4253	4158	3969	3213
191	1078	701	485	377	377	647	1240	2965	3450	3342	3180	3180	3073	2911	3073	3073	3073	2965	2857	2641	2426	2372	2264	1833
192	711	462	320	249	249	427	818	1955	2275	2204	2097	2097	2026	1920	2026	2026	2026	1955	1884	1742	1600	1564	1493	1209
193	131	85	59	46	46	79	151	361	420	407	387	387	374	354	374	374	374	361	348	322	295	289	276	223
194	418	272	188	146	146	251	480	1149	1337	1295	1233	1233	1191	1128	1191	1191	1191	1149	1107	1024	940	919	877	710
195	101	65	45	35	35	60	116	277	322	312	297	297	287	272	287	287	287	277	267	247	226	221	211	171
196	335	218	151	117	117	201	386	922	1073	1039	989	989	956	905	956	956	956	922	889	822	754	738	704	570
197	501	325	225	175	175	300	576	1377	1602	1552	1477	1477	1427	1352	1427	1427	1427	1377	1327	1227	1126	1101	1051	851
198	29	19	13	10	10	17	33	80	93	90	86	86	83	78	83	83	83	80	77	71	65	64	61	49
199	261	170	117	91	91	157	300	718	835	809	770	770	744	705	744	744	744	718	691	639	587	574	548	444
200	275	178	124	96	96	165	316	755	879	851	810	810	783	741	783	783	783	755	728	673	618	604	577	467
201	362	235	163	127	127	217	416	995	1157	1121	1067	1067	1031	977	1031	1031	1031	995	958	886	814	796	760	615
202	221	144	100	77	77	133	254	608	708	686	652	652	630	597	630	630	630	608	586	542	498	487	464	376
203	552	359	248	193	193	331	634	1517	1765	1710	1627	1627	1572	1489	1572	1572	1572	1517	1462	1351	1241	1213	1158	938
204	833	541	375	291	291	500	957	2289	2664	2581	2456	2456	2373	2248	2373	2373	2373	2289	2206	2040	1873	1832	1748	1415
205	222	144	100	78	78	133	255	610	710	688	655	655	632	599	632	632	632	610	588	544	499	488	466	377
206	300	195	135	105	105	180	345	824	959	929	884	884	854	809	854	854	854	824	794	734	674	659	629	509
207	1740	1131	783	609	609	1044	2001	4786	5569	5395	5134	5134	4960	4699	4960	4960	4960	4786	4612	4264	3916	3829	3655	2959
208	1976	1284	889	691	691	1185	2272	5433	6322	6124	5828	5828	5631	5334	5631	5631	5631	5433	5235	4840	4445	4346	4149	3359
209	364	236	164	127	127	218	418	1000	1164	1128	1073	1073	1037	982	1037	1037	1037	1000	964	891	818	800	764	618
210	85	55	38	30	30	51	98	234	272	264	251	251	242	230	242	242	242	234	225	208	191	187	179	145
211	461	300	208	161	161	277	530	1268	1476	1430	1361	1361	1315	1245	1315	1315	1315	1268	1222	1130	1038	1015	969	784
212	402	261	181	141	141	241	462	1105	1286	1246	1186	1186	1145	1085	1145	1145	1145	1105	1065	985	904	884	844	683
213	85	55	38	30	30	51	98	234	272	264	251	251	242	230	242	242	242	234	225	208	191	187	179	145
214	501	326	226	175	175	301	576	1378	1604	1554	1479	1479	1429	1353	1429	1429	1429	1378	1328	1228	1128	1103	1053	852
215	45	29	20	16	16	27	51	123	143	139	132	132	127	121	127	127	127	123	118	109	101	98	94	76
216	134	87	60	47	47	80	154	369	429	416	395	395	382	362	382	382	382	369	355	328	302	295	282	228
217	221	144	99	77	77	133	254	608	707	685	652	652	630	597	630	630	630	608	585	541	497	486	464	376
218	310	202	140	109	109	186	357	853	993	962	915	915	884	838	884	884	884	853	822	760	698	683	652	528

2016 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Speed Limit (km/hr)	Road Type	Speed (km/hr) 0030-0130	Speed (km/hr) 0130-0230	Speed (km/hr) 0230-0330	Speed (km/hr) 0330-0430	Speed (km/hr) 0430-0530	Speed (km/hr) 0530-0630	Speed (km/hr) 0630-0730	Speed (km/hr) 0730-0830	Speed (km/hr) 0830-0930	Speed (km/hr) 0930-1030	Speed (km/hr) 1030-1130	Speed (km/hr) 1130-1230	Speed (km/hr) 1230-1330	Speed (km/hr) 1330-1430	Speed (km/hr) 1430-1530	Speed (km/hr) 1530-1630	Speed (km/hr) 1630-1730	Speed (km/hr) 1730-1830	Speed (km/hr) 1830-1930	Speed (km/hr) 1930-2030	Speed (km/hr) 2030-2130	Speed (km/hr) 2130-2230	Speed (km/hr) 2230-2330	Speed (km/hr) 2330-0030
1	50	6	50	50	50	50	50	50	50	44	42	42	43	43	43	44	43	43	43	44	50	50	50	50	50	50
2	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
3	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
4	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
5	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
6	50	6	50	50	50	50	50	50	50	37	33	34	35	35	36	37	36	36	36	37	37	39	40	40	41	44
7	70	7	70	70	70	70	70	70	70	70	69	69	70	70	70	70	70	70	70	70	70	70	70	70	70	70
8	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
9	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
10	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
11	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
12	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
13	70	7	70	70	70	70	70	70	70	69	66	67	68	68	68	69	68	68	68	69	69	70	70	70	70	70
14	70	7	70	70	70	70	70	70	70	70	68	69	70	70	70	70	70	70	70	70	70	70	70	70	70	70
15	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
16	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
17	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
18	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
19	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
20	70	7	70	70	70	70	70	70	70	63	59	60	61	61	62	63	62	62	62	63	63	65	67	67	68	70
21	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
22	70	7	70	70	70	70	70	70	70	59	54	55	57	57	58	59	58	58	58	59	60	62	64	64	65	69
23	70	7	70	70	70	70	70	70	70	68	65	66	67	67	67	68	67	67	67	68	69	70	70	70	70	70
24	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
25	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
26	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
27	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
28	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
29	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
30	50	6	50	50	50	50	50	50	50	43	41	42	42	42	43	44	43	43	43	43	44	50	50	50	50	50
31	50	6	50	50	50	50	50	50	50	60	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
32	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
33	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
34	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
35	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
36	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
37	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
38	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
39	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
40	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
41	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
42	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
43	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
44	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
45	50	6	50	50	50	50	50	50	50	50	43	43	44	44	50	50	50	50	50	50	50	50	50	50	50	50
46	70	7	70	70	70	70	70	70	70	61	56	57	59	59	60	61	60	60	60	61	62	63	65	66	67	70
47	70	7	70	70	70	70	70	70	70	70	69	69	70	70	70	70	70	70	70	70	70	70	70	70	70	70
48	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
49	50	6	50	50	50	50	50	50	50	43	41	42	43	43	43	44	43	43	43	43	44	50	50	50	50	50
50	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
51	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
52	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
53	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
54	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
55	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
56	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
57	50	6	50	50	50	50	50	50	50	40	38	38	39	39	40	41	40	40	40	40	41	42	43	43	44	50
58	50	6	50	50	50	50	50	50	50	44	42	43	43	43	44	50	44	44	44	44	50	50	50	50	50	50
59	70	7	70	70	70	70	70	70	70	66	63	64	65	65	66	67	66	66	66	66	67	69	70	70	70	70
60	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
61	70	7	70	70	70	70	70	70	70	59	55	56	57	57	58	60	58	58	58	59	60	62	64	65	66	70
62	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
63	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
64	50	6	50	50	50	50	50	50	50	44	42	42	43	43	44	44	44	44	44	44	50	50	50	50	50	50
65	50	6	50	50	50	50	50	50	50	41	39	39	40	40	40	41	40	40	40	41	41	43	44	44	50	50
66	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50

2016 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Speed Limit (km/hr)	Road Type	Speed (km/hr) 0030-0130	Speed (km/hr) 0130-0230	Speed (km/hr) 0230-0330	Speed (km/hr) 0330-0430	Speed (km/hr) 0430-0530	Speed (km/hr) 0530-0630	Speed (km/hr) 0630-0730	Speed (km/hr) 0730-0830	Speed (km/hr) 0830-0930	Speed (km/hr) 0930-1030	Speed (km/hr) 1030-1130	Speed (km/hr) 1130-1230	Speed (km/hr) 1230-1330	Speed (km/hr) 1330-1430	Speed (km/hr) 1430-1530	Speed (km/hr) 1530-1630	Speed (km/hr) 1630-1730	Speed (km/hr) 1730-1830	Speed (km/hr) 1830-1930	Speed (km/hr) 1930-2030	Speed (km/hr) 2030-2130	Speed (km/hr) 2130-2230	Speed (km/hr) 2230-2330	Speed (km/hr) 2330-0030
67	50	6	50	50	50	50	50	50	50	50	44	44	50	50	50	50	50	50	50	50	50	50	50	50	50	50
68	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
69	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
70	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
71	50	6	50	50	50	50	50	50	50	41	39	39	40	40	41	41	41	41	41	41	42	43	44	44	50	50
72	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
73	50	6	50	50	50	50	50	50	50	41	38	39	39	39	40	41	40	40	40	41	41	42	43	44	44	50
74	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
75	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
76	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
77	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
78	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
79	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
80	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
81	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
82	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
83	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
84	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
85	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
86	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
87	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
88	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
89	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
90	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
91	50	6	50	50	50	50	50	50	50	44	42	43	43	43	44	50	44	44	44	44	50	50	50	50	50	50
92	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
93	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
94	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
95	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
96	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
97	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
98	50	6	50	50	50	50	50	50	50	40	38	38	39	39	40	41	40	40	40	40	41	42	43	43	44	50
99	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
100	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
101	80 (70)*	7	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	62	58	59	60	60	61	62	61	61	61	62	63	64	66	67	68	80 (70)
102	80 (70)*	7	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	66	63	63	65	65	65	66	65	65	65	66	67	68	80 (70)	80 (70)	80 (70)	80 (70)
103	50	6	50	50	50	50	50	50	50	41	38	39	40	40	40	41	40	40	40	41	41	42	44	44	50	50
104	50	6	50	50	50	50	50	50	50	36	33	34	35	35	36	37	36	36	36	36	37	39	40	40	41	44
105	50	6	50	50	50	50	50	50	50	43	40	41	42	42	42	43	42	42	42	43	43	44	50	50	50	50
106	80 (70)*	7	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	63	59	60	61	61	62	63	62	62	62	63	64	65	67	68	68	80 (70)
107	80 (70)*	7	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	61	57	58	60	60	61	62	61	61	61	61	62	64	66	67	67	80 (70)
108	80 (70)*	7	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	63	59	60	61	61	62	63	62	62	62	63	64	65	67	68	68	80 (70)
109	80 (70)*	7	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	59	54	55	56	56	58	59	58	58	58	59	60	62	64	64	65	69
110	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
111	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
112	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
113	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
114	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
115	50	6	50	50	50	50	50	50	50	50	44	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
116	50	6	50	50	50	50	50	50	50	50	43	43	44	44	50	50	50	50	50	50	50	50	50	50	50	50
117	50	6	50	50	50	50	50	50	50	41	39	39	40	40	40	41	40	40	40	41	42	43	44	44	50	50
118	50	6	50	50	50	50	50	50	50	50	43	43	44	44	50	50	50	50	50	50	50	50	50	50	50	50
119	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
120	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
121	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
122	50	6	50	50	50	50	50	50	50	50	42	43	44	44	44	50	44	44	44	50	50	50	50	50	50	50
123	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
124	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
125	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
126	50	6	50	50	50	50	50	50	50	34	31	32	33	33	34	35	34	34	34	34	35	37	38	39	39	43
127	70	7	70	70	70	70	70	70	70	67	63	64	65	65	66	67	66	66	66	67	67	69	70	70	70	70
128	70	7	70	70	70	70	70	70	70	70	69	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
129	50	6	50	50	50	50	50	50	50	43	41	41	42	42	42	43	42	42	42	43	43	44	50	50	50	50
130	50	6	50	50	50	50	50	50	50	34	30	31	32	32	33	34	33	33	33	34	35	36	38	38	39	42
131	50	6	50	50	50	50	50	50	50	31	28	28	30	30	31	32	31	31	31	31	32	34	36	36	37	41
132	50	6	50	50	50	50	50	50	50	31	26	28	29	29	30	31	30	30	30	31	32	33	35	36	37	40

2016 EIA Traffic Flows by 16 Vehicle Classes

Link No	Speed Limit (km/hr)	Road Type	Speed (km/hr) 0030-0130	Speed (km/hr) 0130-0230	Speed (km/hr) 0230-0330	Speed (km/hr) 0330-0430	Speed (km/hr) 0430-0530	Speed (km/hr) 0530-0630	Speed (km/hr) 0630-0730	Speed (km/hr) 0730-0830	Speed (km/hr) 0830-0930	Speed (km/hr) 0930-1030	Speed (km/hr) 1030-1130	Speed (km/hr) 1130-1230	Speed (km/hr) 1230-1330	Speed (km/hr) 1330-1430	Speed (km/hr) 1430-1530	Speed (km/hr) 1530-1630	Speed (km/hr) 1630-1730	Speed (km/hr) 1730-1830	Speed (km/hr) 1830-1930	Speed (km/hr) 1930-2030	Speed (km/hr) 2030-2130	Speed (km/hr) 2130-2230	Speed (km/hr) 2230-2330	Speed (km/hr) 2330-0030
133	70	7	70	70	70	70	70	70	70	64	61	62	63	63	64	65	64	64	64	64	65	67	68	69	70	70
134	50	6	50	50	50	50	50	50	50	44	42	42	43	43	43	44	43	43	43	44	44	50	50	50	50	50
135	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
136	50	6	50	50	50	50	50	50	50	42	40	41	41	41	42	43	42	42	42	42	43	44	50	50	50	50
137	50	6	50	50	50	50	50	50	50	38	35	36	37	37	37	38	37	37	37	38	39	40	41	42	42	50
138	50	6	50	50	50	50	50	50	50	34	31	31	33	33	33	35	33	33	33	34	35	37	38	39	39	42
139	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
140	70	7	70	70	70	70	70	70	70	56	51	52	53	53	55	56	55	55	55	56	57	59	61	62	63	67
141	70	7	70	70	70	70	70	70	70	59	54	55	57	57	58	59	58	58	58	59	60	62	64	64	65	69
142	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
143	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
144	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
145	50	6	50	50	50	50	50	50	50	32	28	29	30	30	31	32	31	31	31	32	33	34	36	37	37	41
146	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
147	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
148	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
149	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
150	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
151	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
152	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
153	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
154	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
155	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
156	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
157	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
158	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
159	50	6	50	50	50	50	50	50	50	38	36	36	37	37	38	39	38	38	38	38	39	40	42	42	43	50
160	50	6	50	50	50	50	50	50	50	37	34	35	36	36	37	38	37	37	37	37	38	39	41	41	42	50
161	50	6	50	50	50	50	50	50	50	50	43	43	44	44	50	50	50	50	50	50	50	50	50	50	50	50
162	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
163	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
164	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
165	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
166	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
167	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
168	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
169	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
170	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
171	50	6	50	50	50	50	50	50	50	50	44	44	50	50	50	50	50	50	50	50	50	50	50	50	50	50
172	70	7	70	70	70	70	70	70	70	70	68	69	70	70	70	70	70	70	70	70	70	70	70	70	70	70
173	70	7	70	70	70	70	70	70	70	54	48	50	51	51	53	54	53	53	53	54	55	57	60	60	62	66
174	70	7	70	70	70	70	70	70	70	55	49	51	52	52	53	55	53	53	53	55	56	58	60	61	62	67
175	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
176	50	6	50	50	50	50	50	50	50	42	39	40	40	40	41	42	41	41	41	42	42	43	44	50	50	50
177	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
178	50	6	50	50	50	50	50	50	50	40	38	38	39	39	40	41	40	40	40	40	41	42	43	43	44	50
179	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
180	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
181	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
182	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
183	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
184	50	6	50	50	50	50	50	50	50	38	35	35	36	36	37	38	37	37	37	38	38	40	41	41	42	50
185	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
186	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
187	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
188	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
189	70	7	70	70	70	70	70	70	70	70	67	68	69	69	69	70	69	69	69	70	70	70	70	70	70	70
190	70	7	70	70	70	70	70	70	70	69	66	67	68	68	69	70	69	69	69	69	70	70	70	70	70	70
191	50	6	50	50	50	50	50	50	50	50	44	44	50	50	50	50	50	50	50	50	50	50	50	50	50	50
192	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
193	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
194	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
195	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
196	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
197	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
198	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50

2016 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Speed Limit (km/hr)	Road Type	Speed (km/hr) 0030-0130	Speed (km/hr) 0130-0230	Speed (km/hr) 0230-0330	Speed (km/hr) 0330-0430	Speed (km/hr) 0430-0530	Speed (km/hr) 0530-0630	Speed (km/hr) 0630-0730	Speed (km/hr) 0730-0830	Speed (km/hr) 0830-0930	Speed (km/hr) 0930-1030	Speed (km/hr) 1030-1130	Speed (km/hr) 1130-1230	Speed (km/hr) 1230-1330	Speed (km/hr) 1330-1430	Speed (km/hr) 1430-1530	Speed (km/hr) 1530-1630	Speed (km/hr) 1630-1730	Speed (km/hr) 1730-1830	Speed (km/hr) 1830-1930	Speed (km/hr) 1930-2030	Speed (km/hr) 2030-2130	Speed (km/hr) 2130-2230	Speed (km/hr) 2230-2330	Speed (km/hr) 2330-0030
199	50	6	50	50	50	50	50	50	50	50	43	43	44	44	50	50	50	50	50	50	50	50	50	50	50	50
200	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
201	70	7	70	70	70	70	70	70	70	70	69	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
202	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
203	70	7	70	70	70	70	70	70	70	63	60	61	62	62	63	64	63	63	63	63	64	66	68	68	69	70
204	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
205	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
206	50	6	50	50	50	50	50	50	50	50	43	43	44	44	44	50	44	44	44	50	50	50	50	50	50	50
207	70	7	70	70	70	70	70	70	70	63	59	60	61	61	62	63	62	62	62	63	64	65	67	68	68	70
208	70	7	70	70	70	70	70	70	70	59	55	56	57	57	58	60	58	58	58	59	60	62	64	65	66	70
209	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
210	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
211	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
212	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
213	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
214	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
215	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
216	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
217	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
218	50	6	50	50	50	50	50	50	50	44	42	43	43	43	44	44	44	44	44	44	50	50	50	50	50	50

Note:
* With reference to Road Traffic Ordinance, for any road with design speed limit of 70kph or above, the maximum speed limit for medium goods vehicles, heavy goods vehicles and buses shall be limited to 70kph as shown in brackets.
In order words, the speeds of medium goods vehicles, heavy goods vehicles and buses from the traffic modelled speed or 70kph, whichever is lower, will be adoped.

Road Type Road Type
2 Rural Road A
3 Rural Trunk Road
4 Urban Local Distributer
5 Urban District Distributer
6 Urban Primary Distributer
7 Urban Trunk Road

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Speed Limit (km/hr)	Road Type	Speed (km/hr) 0030-0130	Speed (km/hr) 0130-0230	Speed (km/hr) 0230-0330	Speed (km/hr) 0330-0430	Speed (km/hr) 0430-0530	Speed (km/hr) 0530-0630	Speed (km/hr) 0630-0730	Speed (km/hr) 0730-0830	Speed (km/hr) 0830-0930	Speed (km/hr) 0930-1030	Speed (km/hr) 1030-1130	Speed (km/hr) 1130-1230	Speed (km/hr) 1230-1330	Speed (km/hr) 1330-1430	Speed (km/hr) 1430-1530	Speed (km/hr) 1530-1630	Speed (km/hr) 1630-1730	Speed (km/hr) 1730-1830	Speed (km/hr) 1830-1930	Speed (km/hr) 1930-2030	Speed (km/hr) 2030-2130	Speed (km/hr) 2130-2230	Speed (km/hr) 2230-2330	Speed (km/hr) 2330-0030
1	50	6	50	50	50	50	50	50	50	42	40	40	41	41	41	42	41	41	41	42	42	43	50	50	50	50
2	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
3	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
4	50	6	50	50	50	50	50	50	50	50	44	44	50	50	50	50	50	50	50	50	50	50	50	50	50	50
5	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
6	50	6	50	50	50	50	50	50	50	33	30	31	32	32	33	34	33	33	33	33	34	36	38	38	39	42
7	70	7	70	70	70	70	70	70	70	69	66	66	67	67	68	69	68	68	68	69	69	70	70	70	70	70
8	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
9	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
10	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
11	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
12	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
13	70	7	70	70	70	70	70	70	70	66	63	63	65	65	65	66	65	65	65	66	67	68	70	70	70	70
14	70	7	70	70	70	70	70	70	70	69	66	66	67	67	68	69	68	68	68	69	69	70	70	70	70	70
15	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
16	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
17	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
18	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
19	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
20	70	7	70	70	70	70	70	70	70	59	54	55	57	57	58	59	58	58	58	59	60	62	64	64	65	69
21	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
22	70	7	70	70	70	70	70	70	70	54	49	50	52	52	53	55	53	53	53	54	56	58	60	61	62	67
23	70	7	70	70	70	70	70	70	70	65	62	62	64	64	64	66	64	64	64	65	66	68	69	69	70	70
24	50	6	50	50	50	50	50	50	50	50	44	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
25	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
26	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
27	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
28	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
29	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
30	50	6	50	50	50	50	50	50	50	42	39	40	41	41	41	42	41	41	41	42	42	43	44	50	50	50
31	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
32	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
33	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
34	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
35	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
36	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
37	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
38	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
39	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
40	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
41	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
42	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
43	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
44	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
45	50	6	50	50	50	50	50	50	50	43	41	42	42	42	43	43	43	43	43	43	44	50	50	50	50	50
46	70	7	70	70	70	70	70	70	70	57	52	53	55	55	56	57	56	56	56	57	58	60	62	63	64	68
47	70	7	70	70	70	70	70	70	70	69	66	67	68	68	68	69	68	68	68	69	70	70	70	70	70	70
48	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
49	50	6	50	50	50	50	50	50	50	41	39	40	40	40	41	42	41	41	41	41	42	43	44	50	50	50
50	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
51	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
52	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
53	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
54	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
55	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
56	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
57	50	6	50	50	50	50	50	50	50	38	35	36	37	37	37	38	37	37	37	38	39	40	41	41	42	50
58	50	6	50	50	50	50	50	50	50	42	40	40	41	41	42	42	42	42	42	42	43	44	50	50	50	50
59	70	7	70	70	70	70	70	70	70	63	60	60	62	62	63	64	63	63	63	63	64	66	68	68	69	70
60	50	6	50	50	50	50	50	50	50	50	44	44	50	50	50	50	50	50	50	50	50	50	50	50	50	50
61	70	7	70	70	70	70	70	70	70	55	50	51	53	53	54	56	54	54	54	55	56	59	61	61	63	67
62	70	7	70	70	70	70	70	70	70	70	67	68	69	69	69	70	69	69	69	70	70	70	70	70	70	70
63	70	7	70	70	70	70	70	70	70	70	67	68	69	69	69	70	69	69	69	70	70	70	70	70	70	70
64	50	6	50	50	50	50	50	50	50	42	40	40	41	41	42	42	42	42	42	42	43	44	50	50	50	50
65	50	6	50	50	50	50	50	50	50	39	36	36	37	37	38	39	38	38	38	39	39	40	42	42	43	50
66	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Speed Limit (km/hr)	Road Type	Speed (km/hr) 0030-0130	Speed (km/hr) 0130-0230	Speed (km/hr) 0230-0330	Speed (km/hr) 0330-0430	Speed (km/hr) 0430-0530	Speed (km/hr) 0530-0630	Speed (km/hr) 0630-0730	Speed (km/hr) 0730-0830	Speed (km/hr) 0830-0930	Speed (km/hr) 0930-1030	Speed (km/hr) 1030-1130	Speed (km/hr) 1130-1230	Speed (km/hr) 1230-1330	Speed (km/hr) 1330-1430	Speed (km/hr) 1430-1530	Speed (km/hr) 1530-1630	Speed (km/hr) 1630-1730	Speed (km/hr) 1730-1830	Speed (km/hr) 1830-1930	Speed (km/hr) 1930-2030	Speed (km/hr) 2030-2130	Speed (km/hr) 2130-2230	Speed (km/hr) 2230-2330	Speed (km/hr) 2330-0030
67	50	6	50	50	50	50	50	50	50	44	42	42	43	43	43	44	43	43	43	44	50	50	50	50	50	50
68	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
69	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
70	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
71	50	6	50	50	50	50	50	50	50	39	36	37	38	38	38	39	38	38	38	39	39	41	42	42	43	50
72	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
73	50	6	50	50	50	50	50	50	50	38	35	36	37	37	37	38	37	37	37	38	39	40	41	42	42	50
74	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
75	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
76	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
77	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
78	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
79	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
80	50	6	50	50	50	50	50	50	50	50	44	44	50	50	50	50	50	50	50	50	50	50	50	50	50	50
81	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
82	50	6	50	50	50	50	50	50	50	50	44	44	50	50	50	50	50	50	50	50	50	50	50	50	50	50
83	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
84	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
85	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
86	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
87	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
88	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
89	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
90	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
91	50	6	50	50	50	50	50	50	50	42	40	40	41	41	42	42	42	42	42	42	43	44	50	50	50	50
92	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
93	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
94	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
95	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
96	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
97	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
98	50	6	50	50	50	50	50	50	50	38	35	36	37	37	37	38	37	37	37	38	39	40	41	42	42	50
99	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
100	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
101	80 (70)*	7	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	58	54	55	56	56	57	59	57	57	57	58	59	61	64	64	65	69
102	80 (70)*	7	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	63	59	60	61	61	62	63	62	62	62	63	64	65	67	68	68	80 (70)
103	50	6	50	50	50	50	50	50	50	38	36	36	37	37	38	39	38	38	38	38	39	40	42	42	43	50
104	50	6	50	50	50	50	50	50	50	33	30	30	32	32	33	34	33	33	33	33	34	36	37	38	39	42
105	50	6	50	50	50	50	50	50	50	40	38	38	39	39	40	41	40	40	40	40	41	42	43	43	44	50
106	80 (70)*	7	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	59	54	55	57	57	58	59	58	58	58	59	60	62	64	64	65	80 (70)
107	80 (70)*	7	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	58	53	54	56	56	57	59	57	57	57	58	59	61	63	64	65	69
108	80 (70)*	7	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	59	54	55	57	57	58	59	58	58	58	59	60	62	64	64	65	80 (70)
109	80 (70)*	7	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	80 (70)	54	49	50	52	52	53	55	53	53	53	54	55	58	60	61	62	66
110	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
111	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
112	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
113	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
114	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
115	50	6	50	50	50	50	50	50	50	50	42	43	43	43	44	50	44	44	44	50	50	50	50	50	50	50
116	50	6	50	50	50	50	50	50	50	50	42	43	43	43	44	50	44	44	44	50	50	50	50	50	50	50
117	50	6	50	50	50	50	50	50	50	39	36	37	37	37	38	39	38	38	38	39	39	41	42	42	43	50
118	50	6	50	50	50	50	50	50	50	42	40	40	41	41	42	42	42	42	42	42	43	44	50	50	50	50
119	50	6	50	50	50	50	50	50	50	50	44	44	50	50	50	50	50	50	50	50	50	50	50	50	50	50
120	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
121	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
122	50	6	50	50	50	50	50	50	50	43	40	41	42	42	42	43	42	42	42	43	43	44	50	50	50	50
123	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
124	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
125	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
126	50	6	50	50	50	50	50	50	50	31	27	28	29	29	30	31	30	30	30	31	32	34	35	36	37	40
127	70	7	70	70	70	70	70	70	70	64	60	61	62	62	63	64	63	63	63	64	65	66	68	68	69	70
128	70	7	70	70	70	70	70	70	70	70	67	68	68	68	69	70	69	69	69	70	70	70	70	70	70	70
129	50	6	50	50	50	50	50	50	50	41	38	39	40	40	40	41	40	40	40	41	41	42	44	44	50	50
130	50	6	50	50	50	50	50	50	50	30	26	27	29	29	29	31	29	29	29	30	31	33	35	35	36	40
131	50	6	50	50	50	50	50	50	44	28	20	22	24	24	26	28	26	26	26	28	29	31	33	33	34	38
132	50	6	50	50	50	50	50	50	44	27	17	19	22	22	25	27	25	25	25	27	28	30	32	33	34	38

2031 EIA Traffic Flows by 16 Vehicle Classes

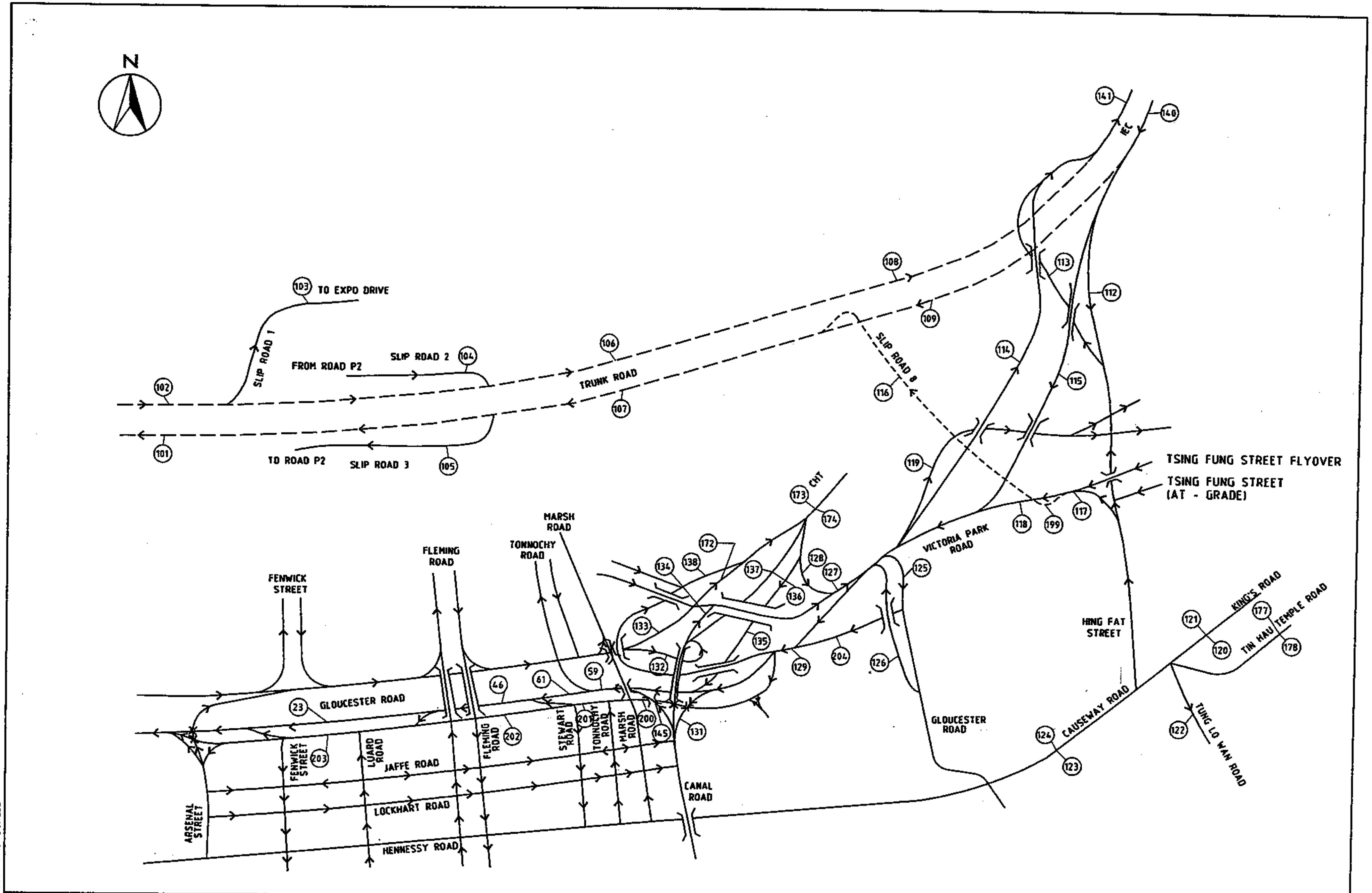
Link No.	Speed Limit (km/hr)	Road Type	Speed (km/hr) 0030-0130	Speed (km/hr) 0130-0230	Speed (km/hr) 0230-0330	Speed (km/hr) 0330-0430	Speed (km/hr) 0430-0530	Speed (km/hr) 0530-0630	Speed (km/hr) 0630-0730	Speed (km/hr) 0730-0830	Speed (km/hr) 0830-0930	Speed (km/hr) 0930-1030	Speed (km/hr) 1030-1130	Speed (km/hr) 1130-1230	Speed (km/hr) 1230-1330	Speed (km/hr) 1330-1430	Speed (km/hr) 1430-1530	Speed (km/hr) 1530-1630	Speed (km/hr) 1630-1730	Speed (km/hr) 1730-1830	Speed (km/hr) 1830-1930	Speed (km/hr) 1930-2030	Speed (km/hr) 2030-2130	Speed (km/hr) 2130-2230	Speed (km/hr) 2230-2330	Speed (km/hr) 2330-0030
133	70	7	70	70	70	70	70	70	70	61	57	58	59	59	60	61	60	60	60	61	62	64	66	66	67	70
134	50	6	50	50	50	50	50	50	50	42	39	40	41	41	41	42	41	41	41	42	42	43	50	50	50	50
135	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
136	50	6	50	50	50	50	50	50	50	40	38	38	39	39	40	40	40	40	40	40	41	42	43	43	44	50
137	50	6	50	50	50	50	50	50	50	36	32	33	34	34	35	36	35	35	35	36	36	38	39	40	40	43
138	50	6	50	50	50	50	50	50	50	31	27	28	29	29	30	31	30	30	30	31	32	34	35	36	37	40
139	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
140	70	7	70	70	70	70	70	70	70	51	45	46	48	48	50	51	50	50	50	51	52	55	57	58	59	65
141	70	7	70	70	70	70	70	70	70	54	49	50	52	52	53	55	53	53	53	54	55	58	60	61	62	67
142	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
143	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
144	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
145	50	6	50	50	50	50	50	50	44	28	20	22	25	25	27	29	27	27	27	28	29	31	33	34	35	39
146	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
147	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
148	50	6	50	50	50	50	50	50	50	50	43	44	50	50	50	50	50	50	50	50	50	50	50	50	50	50
149	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
150	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
151	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
152	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
153	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
154	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
155	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
156	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
157	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
158	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
159	50	6	50	50	50	50	50	50	50	36	33	33	34	34	35	36	35	35	35	36	37	38	39	40	41	43
160	50	6	50	50	50	50	50	50	50	34	31	32	33	33	34	35	34	34	34	34	35	37	38	39	39	43
161	50	6	50	50	50	50	50	50	50	43	41	41	42	42	43	43	43	43	43	43	44	50	50	50	50	50
162	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
163	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
164	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
165	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
166	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
167	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
168	50	6	50	50	50	50	50	50	50	50	44	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
169	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
170	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
171	50	6	50	50	50	50	50	50	50	44	42	42	43	43	43	44	43	43	43	44	44	50	50	50	50	50
172	70	7	70	70	70	70	70	70	70	69	66	67	68	68	68	69	68	68	68	69	69	70	70	70	70	70
173	70	7	70	70	70	70	70	70	70	49	41	44	46	46	48	50	48	48	48	49	50	53	56	57	58	63
174	70	7	70	70	70	70	70	70	70	50	43	45	47	47	49	51	49	49	49	50	51	54	57	57	59	64
175	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
176	50	6	50	50	50	50	50	50	50	39	37	37	38	38	39	40	39	39	39	39	40	41	42	43	43	50
177	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
178	50	6	50	50	50	50	50	50	50	38	35	36	37	37	37	38	37	37	37	38	39	40	41	41	42	50
179	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
180	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
181	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
182	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
183	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
184	50	6	50	50	50	50	50	50	50	34	31	32	33	33	34	35	34	34	34	34	35	37	38	39	39	43
185	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
186	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
187	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
188	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
189	70	7	70	70	70	70	70	70	70	67	64	65	66	66	67	68	67	67	67	67	68	70	70	70	70	70
190	70	7	70	70	70	70	70	70	70	67	63	64	65	65	66	67	66	66	66	67	67	69	70	70	70	70
191	50	6	50	50	50	50	50	50	50	44	42	42	43	43	43	44	43	43	43	44	50	50	50	50	50	50
192	50	6	50	50	50	50	50	50	50	50	44	44	50	50	50	50	50	50	50	50	50	50	50	50	50	50
193	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
194	50	6	50	50	50	50	50	50	50	50	43	43	44	44	50	50	50	50	50	50	50	50	50	50	50	50
195	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
196	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
197	50	6	50	50	50	50	50	50	50	50	43	43	44	44	50	50	50	50	50	50	50	50	50	50	50	50
198	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Speed Limit (km/hr)	Road Type	Speed (km/hr) 0030-0130	Speed (km/hr) 0130-0230	Speed (km/hr) 0230-0330	Speed (km/hr) 0330-0430	Speed (km/hr) 0430-0530	Speed (km/hr) 0530-0630	Speed (km/hr) 0630-0730	Speed (km/hr) 0730-0830	Speed (km/hr) 0830-0930	Speed (km/hr) 0930-1030	Speed (km/hr) 1030-1130	Speed (km/hr) 1130-1230	Speed (km/hr) 1230-1330	Speed (km/hr) 1330-1430	Speed (km/hr) 1430-1530	Speed (km/hr) 1530-1630	Speed (km/hr) 1630-1730	Speed (km/hr) 1730-1830	Speed (km/hr) 1830-1930	Speed (km/hr) 1930-2030	Speed (km/hr) 2030-2130	Speed (km/hr) 2130-2230	Speed (km/hr) 2230-2330	Speed (km/hr) 2330-0030
199	50	6	50	50	50	50	50	50	50	50	42	43	43	43	44	50	44	44	44	50	50	50	50	50	50	50
200	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
201	70	7	70	70	70	70	70	70	70	69	67	67	68	68	69	70	69	69	69	69	70	70	70	70	70	70
202	70	7	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
203	70	7	70	70	70	70	70	70	70	60	56	57	58	58	59	61	59	59	59	60	61	63	65	66	67	70
204	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
205	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
206	50	6	50	50	50	50	50	50	50	43	40	41	42	42	42	43	42	42	42	43	43	44	50	50	50	50
207	70	7	70	70	70	70	70	70	70	59	54	55	57	57	58	59	58	58	58	59	60	62	64	65	66	70
208	70	7	70	70	70	70	70	70	70	55	50	51	53	53	54	56	54	54	54	55	56	59	61	62	63	67
209	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
210	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
211	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
212	50	6	50	50	50	50	50	50	50	50	43	44	50	50	50	50	50	50	50	50	50	50	50	50	50	50
213	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
214	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
215	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
216	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
217	50	6	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
218	50	6	50	50	50	50	50	50	50	42	40	40	41	41	42	42	42	42	42	42	43	44	50	50	50	50

Note:
* With reference to Road Traffic Ordinance, for any road with design speed limit of 70kph or above, the maximum speed limit for medium goods vehicles, heavy goods vehicles and buses shall be limited to 70kph as shown in brackets.
In order words, the speeds of medium goods vehicles, heavy goods vehicles and buses from the traffic modelled speed or 70kph, whichever is lower, will be adoped.

Road Type Road Type
2 Rural Road A
3 Rural Trunk Road
4 Urban Local Distributer
5 Urban District Distributer
6 Urban Primary Distributer
7 Urban Trunk Road



MAUNSELL

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

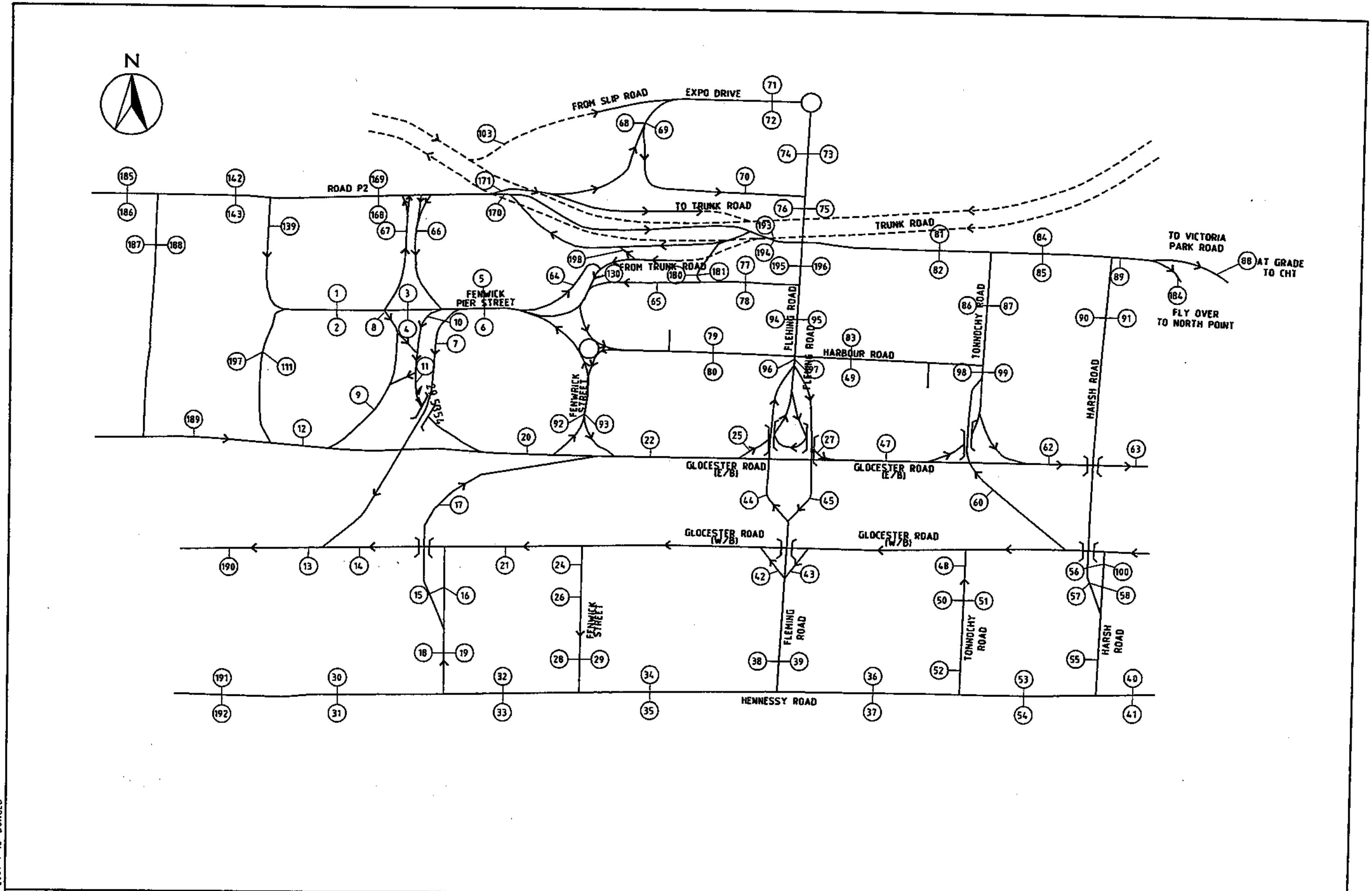
LOCATION INDEX FOR 2016 AND 2031 EIA TRAFFIC FORECAST

FIGURE 1

(SHEET 1 OF 3)

PLOT DATE: 2007-7-16 DONGLB

(SZD) q:\projects\traffic\9710303\Drawing\EIA-EMFAC\V2\FIG 1.dgn



MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

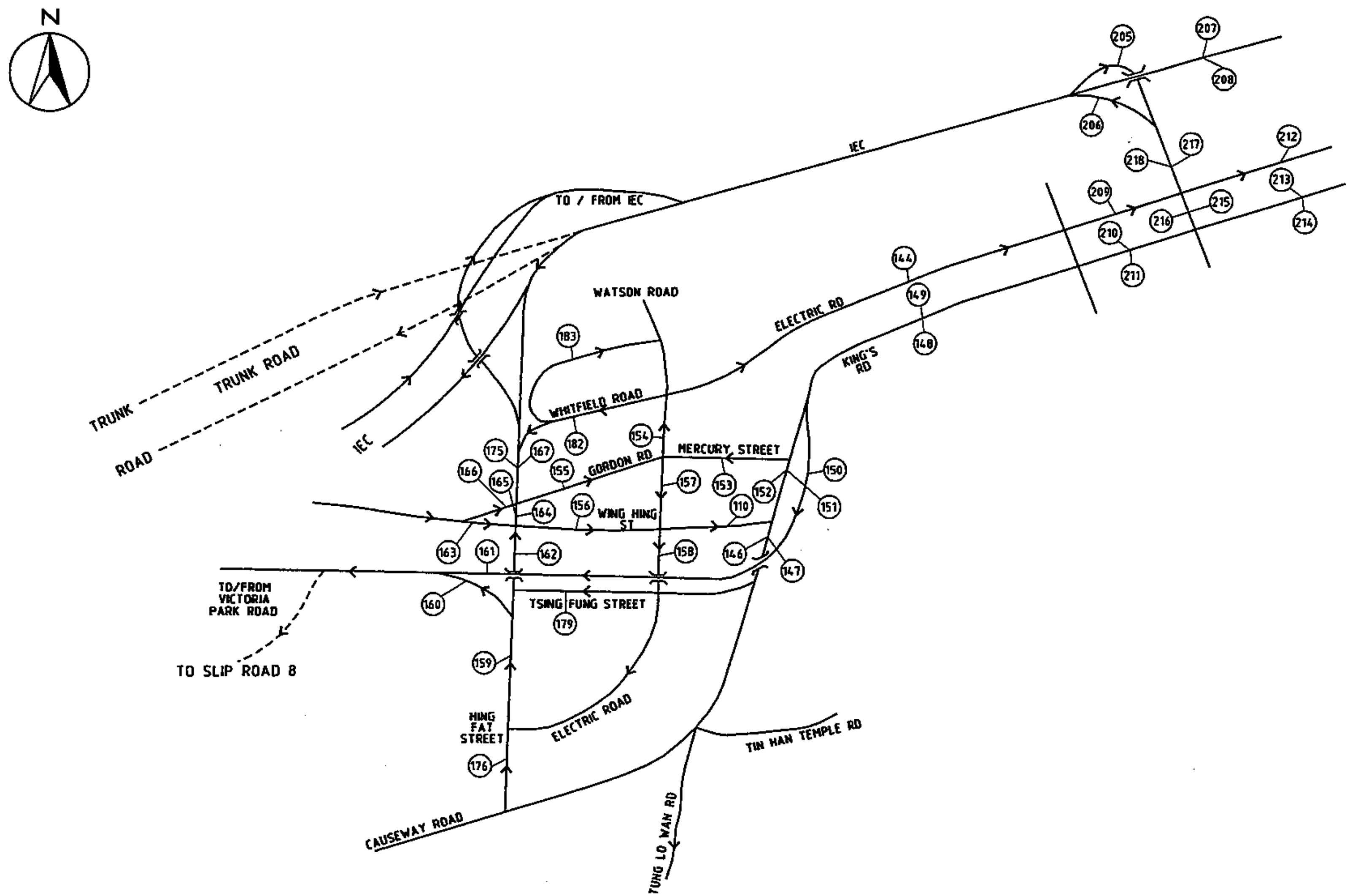
LOCATION INDEX FOR 2016 AND 2031 EIA TRAFFIC FORECAST

(SHEET 2 OF 3)

FIGURE 2

PLOT DATE: 2007-7-16 DONGLB

[SZ0] q:\projects\traffic\9710303\Drawing\EIA-EMFAC\V2\FIG 2.dgn



MAUNSELL AECOM Maunsell Consultants Asia Ltd	WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW LOCATION INDEX FOR 2016 AND 2031 EIA TRAFFIC FORECAST (SHEET 3 OF 3)	FIGURE 3

PLOT DATE: 2007-7-16 DONGLB

1SZ01 q:\projects\traffic\9710303\Drawing\EIA-EMFAC\V2\FIG 3.dgn

Maunsell Consultants Asia Ltd
8/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong
茂盛(亞洲)工程顧問有限公司
香港新界沙田鄉事會路 138 號新城市中央廣場第 2 座 8 樓
T +852 2605 6262 F +852 2691 2649 www.maunsell.aecom.com

Your Ref : HR171/70-30
Our Ref : PMC:CAKM:qc:97103/10.4-0706

Urgent, By Fax (2824 0399) and By Hand

Senior Engineer/Housing & Planning
Traffic Engineer (HK) Division
Transport Department
37/F Immigration Tower
7 Gloucester Road
Wan Chai, Hong Kong

Attn: Mr. C.Y. Chan

20 April 2007

Dear Sir,

SA1 to Agreement No. CE54/2001(CE)
Wan Chai Development Phase II – Planning and Engineering Review

Forecast Traffic Flow for Environmental Impact Assessment (EIA) for Wan Chai Development Phase II and Central-Wan Chai Bypass Projects (WDII & CWB)

Further to our letters dated 4 and 12 April 2007, we submit herewith "Supplementary Information on Traffic Forecast for WDII & CWB EIA" to further elaborate the methodology and the process in establishing the additional forecast traffic data submitted.

Your response by 25 April 2007 to this letter, together with our previous letters dated 4 and 12 April 2007, would be most appreciated. Should you have any queries in this regard, please contact Mr. Samuel Sze at Tel. 3105 8619, Ms. Carmen Au at Tel. 2685 6211 or the undersigned.

Yours faithfully,

Peter Cheek
Associate

Encl.

cc PM/HKI&I, CEDD – Mr. S.K. Lam / Mr. C.K. Lam (Fax: 2577 5040)
MEMCL – Attn: Mr. Freeman Cheung (Fax: 2891 0305)

SA1 to Agreement No. CE54/2001 (CE)
Wan Chai Development Phase II – Planning and Engineering Review

Supplementary Information on Traffic Forecast for the Environmental Impact Assessment (EIA) for Wan Chai Development Phase II & Central-Wan Chai Bypass Projects (WDII&CWB)

1 BACKGROUND

1.1 In assessment of the environmental impact arising from the proposed Trunk Road, the peak hourly traffic flows (2031) with 6 vehicles classes have been submitted to Transport Department (TD) on 7 September 2006 and received no objection to the use of the above submitted forecast traffic flows (2031) for the environmental impact assessment of the captioned project on the dated 5 October 2006.

1.2 Subsequent to the above assessment, the use of a new model, EMFAC-HK model, is required in the Study Brief for the WDII&CWB EIA issued on 21 September 2006 for estimating vehicular emission with reference to EPD's Guideline on Modelling Vehicle Emissions. The above approved traffic flows (2031) of the 6 vehicle classes have been further broken down into 16 vehicle classes for carrying out this new model in estimating vehicle emissions. The general approach and the results of 16 vehicle classes have been submitted on 20 November 2006. In the letter dated 24 November 2006, TD advised that they have no objection to the use of the submitted forecast traffic flows (2031), which have been broken down into 16 vehicle classes, for the environmental impact assessment.

1.3 In addition to the forecast traffic flow (2031) in 16 vehicle classes, other forecast traffic data has been used during the course of the EIA assessment for calculation of vehicle emission, sensitivity testing and justification for assessment methodologies, etc. These data have been submitted on the letter dated 4 April 2007 and 12 April 2007, including forecast traffic flow for three additional scenarios, hourly traffic flow for 24 hours and hourly traffic flow speed for 24 hours.

1.4 This paper is prepared to set out the methodology and the process in establishing these additions forecast traffic data.

2 OVERVIEW

2.1 There are three addition scenarios were established for the purpose of the WDII&CWB EIA. These three scenarios are shown in the following:-

- Forecast traffic flow (2008) in 6 vehicle classes for the scenario before commencement of the project (i.e. without the Trunk Road)
- Forecast traffic flow (2031) in 6 vehicle classes for the scenario without the Trunk Road
- Forecast traffic flow (2016) in 16 vehicle classes for the scenario with the Trunk Road

2.2 Apart from above traffic flow, other traffic data have been used for calculation of vehicle emission which including the following:-

- Forecast hourly traffic flow for 24 hours (2016 and 2031) for the scenario with the Trunk Road
- Forecast hourly traffic flow speed for 24 hours (2016 and 2031) for the scenario with the Trunk Road

3 METHODOLOGY

3.1 The methodology for each scenario is demonstrated in the following steps. As an example, three locations of each scenario have been selected and their corresponding calculations, following the methodology, are presented in **Table 1** to **Table 3**.

Forecast traffic flow (2008) in 6 vehicle classes for the scenario without the Trunk Road

3.2 Step 1: The 2004 base year traffic model have been adopted as a background traffic model flow which have been submitted on the dated 9 August 2004 and agreed as per letter dated 17 August 2004. Both letters have been attached in **Annex 1** for reference. The traffic model flow has been shown in term of passenger car unit (PCU) per hour to present each road link.

3.3 Step 2: The percentage of vehicle types was derived according to the traffic counts survey. The model traffic flows were split into different vehicle classes based on the percentage of vehicle type obtained from traffic survey. This approach have been agreed as per letters dated 5 October 2006 and 24 November 2006 for breaking down the year 2031 traffic flow with Trunk Road into 6 vehicle classes and 16 vehicle classes. Both letters have been attached in **Annex 2** for reference.

3.4 Step 3: The model flows in PCU were converted to vehicle (VEH) using predefined conversion factors derived from the TPDM recommendation. The PCU factor for car, taxi, SPB, LGV, HGV and PT are 1.00, 1.00, 2.00, 1.50, 2.25 and 3.00 respectively.

3.5 Step 4: The year 2008 traffic flows will be developed by applying an annual growth factor derived from the TPEDM planning data. The annual growth factor 1% per year has been applied to the base year 2004 traffic flow as shown in Step 3. This set of annual growth factor has also been adopted in the Submission by TD to the Expert Panel. Section Two of Appendix 3 of this submission to the Expert Panel is extracted and attached in **Annex 3** for easy reference.

3.6 Step 5: The various type of 6 vehicle classes were calculated based on the result of Step 4.

Forecast traffic flow (2031) in 6 vehicle classes for the scenario without the Trunk Road

3.7 Step 1: The 2016 traffic model without Trunk Road has been adopted as a background traffic model flow which has been shown in the Submission to the Expert Panel. The traffic model flow has been shown in term of passenger car unit (PCU) per hour to present each road link.

3.8 Step 2: The percentage of vehicle types was derived according to the traffic counts survey. The model traffic flows were split into different vehicle classes based on the percentage of vehicle type obtained from traffic survey. This approach have been agreed as per letters dated 5 October 2006 and 24 November 2006 for breaking down the year 2031 traffic flow with Trunk Road into 6 vehicle classes and 16 vehicle classes.

3.9 Step 3: The model flows in PCU were converted to vehicle (VEH) using predefined conversion factors derived from the TPDM recommendation. The PCU factor for car, taxi, SPB, LGV, HGV and PT are 1.00, 1.00, 2.00, 1.50, 2.25 and 3.00 respectively.

3.10 Step 4: The year 2031 traffic flows will be developed by applying an annual growth factor derived from the TPEDM planning data. The annual growth factor 1% per year has been applied to the base year 2004 traffic flow as shown in Step 3. This set of annual growth factor has also been adopted in the Submission to Expert Panel, Section two of Appendix 3.

3.11 Step 5: The various type of 6 vehicle classes were calculated based on the result of Step 4.

Forecast traffic flow (2016) in 16 vehicle classes for the scenario with the Trunk Road

3.12 Step 1: The 2016 traffic model with Trunk Road has been adopted as a background traffic model flow which has been shown on the Expert Panel Paper. The traffic model flow has been shown in term of passenger car unit (PCU) per hour to present each road link.

3.13 Step 2: The percentage of vehicle types was derived according to the traffic counts survey. The model traffic flows were split into different vehicle classes based on the percentage of vehicle type obtained from traffic survey. This approach have been agreed as per letters dated 5 October 2006 and 24 November 2006 for breaking down the year 2031 traffic flow with Trunk Road into 6 vehicle classes and 16 vehicle classes.

3.14 Step 3: The model flows in PCU were converted to vehicle (VEH) using predefined conversion factors derived from the TPDM recommendation. The PCU factor for car, taxi, SPB, LGV, HGV and PT are 1.00, 1.00, 2.00, 1.50, 2.25 and 3.00 respectively.

3.15 Step 4: The various type of 6 vehicle classes were calculated based on the result of Step 3.

3.16 Step 5: Further break down the traffic flows of the 6 vehicle classes into 16 vehicle classes based on the reference Table 4.4 (Registration and Licensing of Vehicles by Fuel Type) of the Transport Monthly Digest (May 2006) and the definition as shown on "The Annual Traffic Census 2005 – Appendix F Vehicle Classification System".

3.17 Step 6: The various type of 16 vehicle classes were calculated based on the result of Step 5.

Forecast hourly traffic flow for 24 hours (2016 and 2031) for the scenario with the Trunk Road

3.18 The forecast vehicle flows on every hour per day within the study area is estimated with reference to the Annual Traffic Census 2005. The major cordon station Gloucester Road (No. 1028) has been selected for representing the hourly profile within the study area and calculating the 24-hour traffic flows in year 2016 and 2031 for the scenario with the Trunk Road.

Forecast hourly traffic flow speed for 24 hours (2016 and 2031) for the scenario with the Trunk Road

3.19 The forecast vehicle travel speed on every hour per day within the study area has been estimated with reference to the Speed Flow curve assumption which has been used in CTS traffic model. These Speed Flow curve equation have been taken in account of road type, lane capacity and free flow speed.

Table 1 - Forecast traffic flow (2008) in 6 vehicle classes for the scenario before commencement of the projec

Step 1: Traffic Model Flow in year 2004 pcu per hour

Location No	Road Name	Total PCU	PV PCU	GV PCU	PT PCU
46	Gloucester Road-WB	6140	4596	692	852
47	Gloucester Road-EB	5800	5140	399	261
120	King's Road-WB	2230	1261	171	798

Step 2: Breaking Down into 6 vehicle classes pcu per hour

Location No	Road Name	Total PCU	Car PCU	Taxi PCU	SPB PCU	LGV PCU	HGV PCU	PT PCU
46	Gloucester Road-WB	6140	2225	1761	610	548	144	852
47	Gloucester Road-EB	5800	2488	1970	682	315	84	261
120	King's Road-WB	2230	710	362	189	63	108	798

Step 3: Convert to vehicle per hour

Location No	Road Name	Total VEH	Car VEH	Taxi VEH	SPB VEH	LGV VEH	HGV VEH	PT VEH
46	Gloucester Road-WB	5004	2225	1761	305	365	64	284
47	Gloucester Road-EB	5133	2488	1970	341	210	37	87
120	King's Road-WB	1522	710	362	94	42	48	266

Step 4: Factor up to year 2008 vehicle per hour

Location No	Road Name	Total VEH	Car VEH	Taxi VEH	SPB VEH	LGV VEH	HGV VEH	PT VEH
46	Gloucester Road-WB	5196	2315	1833	317	380	67	284
47	Gloucester Road-EB	5338	2589	2050	355	219	38	87
120	King's Road-WB	1574	739	377	98	44	50	266

Step 5: Calculate the percentage of different vehicle classes

Location No	Road Name	Total Veh	Car%	Taxi%	SPB%	LGV%	HGV%	PT%	Total%
46	Gloucester Road-WB	5196	45%	36%	6%	7%	1%	5%	100%
47	Gloucester Road-EB	5338	48%	38%	7%	4%	1%	2%	100%
120	King's Road-WB	1574	47%	24%	6%	3%	3%	17%	100%

Table 2 - Forecast traffic flow (2031) in 6 vehicle classes for the scenario without the Trunk Road

Step 1: Traffic Model Flow in year 2016 pcu per hour without the Trunk Road

Location No.	Road Name	Total PCU	PV PCU	GV PCU	PT PCU
46	Gloucester Road-WB	7200	5518	830	852
47	Gloucester Road-EB	5916	5248	407	261
120	King's Road-WB	2784	1748	238	798

Step 2: Breaking Down into 6 vehicle classes pcu per hour

Location No.	Road Name	Total PCU	Car PCU	Taxi PCU	SPB PCU	LGV PCU	HGV PCU	PT PCU
46	Gloucester Road-WB	7200	2671	2115	732	657	173	852
47	Gloucester Road-EB	5916	2541	2011	696	321	86	261
120	King's Road-WB	2784	985	503	260	89	149	798

Step 3: Convert to vehicle per hour

Location No.	Road Name	Total VEH	Car VEH	Taxi VEH	SPB VEH	LGV VEH	HGV VEH	PT VEH
46	Gloucester Road-WB	5951	2671	2115	366	438	77	284
47	Gloucester Road-EB	5239	2541	2011	348	214	38	87
120	King's Road-WB	2009	985	503	130	59	66	266

Step 4: Factor up to year 2031 vehicle per hour without the Trunk Road

Location No.	Road Name	Total VEH	Car VEH	Taxi VEH	SPB VEH	LGV VEH	HGV VEH	PT VEH
46	Gloucester Road-WB	6862	3101	2455	425	508	89	284
47	Gloucester Road-EB	6069	2950	2335	404	249	44	87
120	King's Road-WB	2290	1144	584	151	68	77	266

Step 5: Calculate the percentage of different vehicle classes

Location No.	Road Name	Total Veh	Car%	Taxi%	SPB%	LGV%	HGV%	PT%	Total%
46	Gloucester Road-WB	6862	45%	37%	6%	7%	1%	4%	100%
47	Gloucester Road-EB	6069	49%	38%	7%	4%	1%	1%	100%
120	King's Road-WB	2290	49%	26%	7%	3%	3%	12%	100%

Table 3 - Forecast traffic flow (2016) in 16 vehicle classes for the scenario with the Trunk Road

Step 1: Traffic Model Flow in year 2016 pcu per hour

Location No	Road Name	Total PCU	PV PCU	GV PCU	PT PCU
20	Gloucester Road-EB	2860	2326	246	288
102	Trunk Road-EB	3500	2992	508	0
126	Causeway Bay Flyover	1115	1054	61	0

Step 2: Breaking Down into 6 vehicle classes pcu per hour

Location No	Road Name	Total PCU	Car PCU	Taxi PCU	SPB PCU	LGV PCU	HGV PCU	PT PCU
20	Gloucester Road-EB	2860	1126	892	308	194	52	288
102	Trunk Road-EB	3500	1920	736	336	240	268	0
126	Causeway Bay Flyover	1115	535	411	108	50	11	0

Step 3: Convert to vehicle per hour

Location No	Road Name	Total VEH	Car VEH	Taxi VEH	SPB VEH	LGV VEH	HGV VEH	PT VEH
20	Gloucester Road-EB	2420	1126	892	154	129	23	96
102	Trunk Road-EB	3103	1920	736	168	160	119	0
126	Causeway Bay Flyover	1038	535	411	54	33	5	0

Step 4: Calculate the percentage of different vehicle classes

Location No	Road Name	Total Veh	Car%	Taxi%	SPB%	LGV%	HGV%	PT%	Total%
20	Gloucester Road-EB	2420	47%	37%	6%	5%	1%	4%	100%
102	Trunk Road-EB	3103	62%	24%	5%	5%	4%	0%	100%
126	Causeway Bay Flyover	1038	52%	40%	5%	3%	0%	0%	100%

Step 5: Breaking Down into 16 vehicle classes vehicle per hour

Location No	Road Name	Total Veh	Motor Cycles	Petrol PC & LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC & LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV >3.5t	HGV <15t	HGV >15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses
20	Gloucester Road-EB	2420	101	1036	895	0	112	2	0	31	40	40	40	22	2	8	50	39
102	Trunk Road-EB	3103	172	1752	745	0	120	2	0	33	52	52	52	115	9	0	0	0
126	Causeway Bay Flyover	1038	48	492	415	0	40	1	0	11	10	10	10	0	0	0	0	0

Step 6: Calculate the percentage of different vehicle classes

Location No	Road Name	Total Veh	Motor Cycles	Petrol PC & LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC & LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV >3.5t	HGV <15t	HGV >15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses
20	Gloucester Road-EB	2420	4%	43%	37%	0%	5%	0%	0%	1%	2%	2%	1%	1%	0%	0%	2%	2%
102	Trunk Road-EB	3103	6%	56%	24%	0%	4%	0%	0%	1%	2%	2%	1%	4%	0%	0%	0%	0%
126	Causeway Bay Flyover	1038	5%	47%	40%	0%	4%	0%	0%	1%	1%	1%	1%	0%	0%	0%	0%	0%

ANNEX 1

Maunsell Consultants Asia Ltd
茂盛(亞洲)工程顧問有限公司

8/F., Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road
Sha Tin, N.T., Hong Kong

香港新界沙田鄉事會路 138 號
新城市中央廣場第 2 座 8 樓

Tel (852) 2605 6262
Fax (852) 2691 2649
www.maunsell.com.hk

Maunsell

10 AUG 2004

Your Ref :
Our Ref : PMC:tkk:97103/10.1-0082

9th August 2004

DISTRIBUTION

By Hand

FILE

Dear Sirs,

Supplemental Agreement No. 1 to Agreement No. CE54/2001(CE)
Wan Chai Development Phase II - Planning and Engineering Review
Traffic Model Calibration & Validation

Following circulation on 23rd June 2004 of the Working Paper on Traffic Model Calibration and Validation (Revision A), under the captioned assignment, we now enclose the final version of this working paper. The paper has been revised to incorporate comments and discussions on the previous version, and a table of responses to comments is included as an appendix. We also enclose, for Transport Department's reference, an annex of Supplementary Information: Details of Survey Data.

This base year (2004) model will now be used to forecast traffic conditions under future year scenarios in Wan Chai North, and to confirm the configuration of the Trunk Road.

Yours faithfully,
for MAUNSELL CONSULTANTS ASIA LTD

(Peter Cheek)

Encl.

bcc PMC } (w/1 copy)
TTG – Charles So } (w/2 copies)

運輸署
Transport Department

本署檔號 Our Ref. HR 171/70-30
來函檔號 Your Ref. PMC:tkk:97103/10.1-0082
電 話 Tel. ~~2829~~ 2294 2600
圖文傳真 Fax. 2824 0399

Urgent By FAX Only

(Fax: 2691 2649)

17 August 2004

Maunsell Consultants Asia Ltd.
8/F, Grand Central Plaza, Tower 2,
138 Shatin Rural Committee Road,
Sha Tin, N.T., Hong Kong.
(Attn.: Mr. Peter CHEEK)

Dear Mr. CHEEK,

Supplemental Agreement No. 1 to Agreement No. CE 54/2001(CE)
Wan Chai Development Phase II (WDII) – Planning and Engineering Review
Working Paper on Traffic Model Calibration & Validation (Final Version)

Your above quoted letter dated 9 August 2004 enclosing the captioned working paper (Final Version) refers.

We have no adverse comment to the captioned working paper (Final Version), subjected to satisfactory clarification on the derivation of the observed PCUs in the Screenline Links and Junctions Validation Summaries (Appendix C and D) from the Traffic Survey Data.

Yours faithfully,

(W. HONG)
for Assistant Commissioner
for Transport / Urban

c.c.

PM/HKI&I, CEDD	(Attn.: Mr. Bosco CHAN)	(Fax: 2577 5040)
CE/TP, TD	(Attn.: Mr. Isaac LO)	(Fax: 2802 2673)
E/HP2, TE/HK		

C:\EHP2\WD2\20040817 - Maunsell - Traffic Model Calibration & Validation (Final Version).doc

ANNEX 2

運輸署
Transport Department

本署檔號 Our Ref. HR 171/70-30
來函檔號 Your Ref. CAKM:AWSY:qc:97103/10.4-0517
電 話 Tel. 2829 5524
圖文傳真 Fax. 2824 0399

By Fax and Post
(Fax: 2691 2649)

5 October 2006

Maunsell Consultants Asia Ltd.
8/F, Grand Central Plaza, Tower 2,
138 Shatin Rural Committee Road,
Sha Tin, N.T., Hong Kong.

(Attn.: Ms Carmen Au)

Dear Ms Au,

Supplemental Agreement No.1 to Agreement No. CE 54/2001(CE)
Wan Chai Development Phase II (WDII) – Planning and Engineering Review

Forecast Traffic Flow (2031) for Environmental Review

We refer to your letter dated 3 October 2006 regarding your response to comment.

Considering your response to comments and to the understanding that your traffic forecast flow for 2031 submitted on 7 September 2006 would only be applied for the Environmental Review but not for traffic study, we have no objection to your use of such traffic forecast flow figures for the Environmental Review purpose.

Yours faithfully,

(Chiny LEUNG)
for Assistant Commissioner
for Transport / Urban

c.c.
PM/HKI&I, CEDD (Attn.: Mr. S.K. LAM) (Fax: 2577 5040)

市區(香港)分區辦事處
Urban Regional Office (Hong Kong)
香港灣仔告士打道七號入境事務大樓三十七樓
37th Floor Immigration Tower 7 Gloucester Road Wan Chai Hong Kong
網址 Web Site: http://www.td.gov.hk/

運輸署
Transport Department

本署檔號 Our Ref. HR 171/70-30
來函檔號 Your Ref. PMC:CAKM:qc:97103/10.4-0567
電話 Tel. 2829 5524
圖文傳真 Fax. 2824 0399

By Fax:
(Fax: 2691 2649)

24 November 2006

Maunsell Consultants Asia Ltd.
8/F, Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road
Sha Tin, N.T., Hong Kong

(Attn.: Mr. Peter Cheek)

Dear Mr. Cheek,

Supplemental Agreement No.1 to Agreement No. CE 54/2001(CE)
Wan Chai Development Phase II (WDII) – Planning and Engineering Review

Forecast Traffic Flow (2031) for Environmental Impact Assessment

We refer to your letter dated 20 November 2006 regarding your model split from 6 vehicle classes into 16 vehicle classes.

We have no objection to your approach in breaking down the vehicles into 16 vehicle classes for the use in the Environmental Impact Assessment.

Yours faithfully,

(Chipy LEUNG)
for Assistant Commissioner
for Transport / Urban

c.c.
PM/HKI&I, CEDD (Attn.: Mr. S.K. LAM) (Fax: 2577 5040)

市區(香港)分區辦事處
Urban Regional Office (Hong Kong)
香港灣仔告士打道七號入境事務大樓三十七樓
37th Floor Immigration Tower 7 Gloucester Road Wan Chai Hong Kong
網址 Web Site: http://www.td.gov.hk/

ANNEX 3

Modelling Technique and Input Assumptions Adopted in Recent Re-run of CTS-3 Model

1 Modelling Technique

The Comprehensive Transport Studies (CTS) aim to provide a framework for which Government can develop a balanced transport strategy to facilitate the mobility of people and goods of Hong Kong in an environmentally sustainable manner. The CTS model is based on assumptions on land use planning, economic growth, vehicle fleet size and the road network information. The model is calibrated using field traffic survey data. It is used to forecast future demands on the transport system of Hong Kong. The CTS model simulates both passenger and vehicle movements in Hong Kong and identifies constraints in the road network system.

2 Population and Employment

The population and employment adopted are shown in **Table 1**.

Table 1 : Population and Employment

POPULATION (in thousands)

Year	2002	2003	2016	Average annual growth rate
District				2002-2016[1]
HK Island	1,311	1,273	1,302	0.0%
Kowloon	2,078	2,067	2,468	1.2%
New Territories	3,460	3,505	4,177	1.4%
Territory Total	6,849	6,845	7,947	1.1%[2]

EMPLOYMENT (in thousands)

Year	2002	2003	2016	Average annual growth rate
District				2002-2016[3]
HK Island	991	935	1,037	0.3%
Kowloon	1,104	1,063	1,256	1.0%
New Territories	1,078	1,009	1,362	1.7%
Territory Total	3,172	3,007	3,655	1.0%

[1] Year 2003 was affected by SARS and hence Year 2002 instead of Year 2003 was used as the base for the growth rate.

[2] As a comparison, the average population growth rate was 0.8% per annum from 1996 to 2004 based on C&SD statistics.

[3] Year 2003 was affected by SARS and hence Year 2002 instead of Year 2003 was used as the base for the growth rate.

Maunsell Consultants Asia Ltd
8/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong
茂盛(亞洲)工程顧問有限公司
香港新界沙田鄉事會路 138 號新城市中央廣場第 2 座 8 樓
T +852 2605 6262 F +852 2691 2649 www.maunsell.aecom.com

Your Ref : HR171/70-30
Our Ref : PMC:CAKM:qc:97103/10.4-0701

By Fax (2824 0399) and Post

Senior Engineer/Housing & Planning
Traffic Engineer (HK) Division
Transport Department
37/F Immigration Tower
7 Gloucester Road
Wan Chai
Hong Kong

Attn: Mr. C.Y. Chan

4 April 2007

Dear Sir,

SA1 to Agreement No. CE54/2001(CE)
Wan Chai Development Phase II – Planning and Engineering Review

Forecast Traffic Flow for Environmental Impact Assessment (EIA) for Wan Chai Development Phase II and Central-Wan Chai Bypass Projects (WDII & CWB)

Further to your letters dated 24 November 2006 and 5 October 2006 which advised us that your office have no objection to the use of the submitted forecast traffic flows for the captioned project, we have received comments in the 1st ESMG meeting held on 21 March 2007 that the descriptions in these letters have to be specific for the "Environmental Impact Assessment for Wan Chai Development Phase II & Central-Wan Chai Bypass projects". The relevant letters have been attached herewith for your easy reference.

In addition to the forecast traffic flow (2031) submitted and agreed in the above letters, we submit for your agreement the following forecast traffic flow for the use in the WDII & CWB EIA:-

1. Forecast traffic flow (2031) for scenario without the Trunk Road
2. Forecast traffic flow (2008) for the scenario before commencement of the project (i.e. without the Trunk Road)

We would be grateful if you would also confirm that the above traffic forecasts are acceptable for use in the EIA.

For the avoidance of doubt and in response to EPD's comment on the adequacy of the earlier letters in respect of the EIA requirements, we would be grateful if TD could re-issue a letter confirming TD's agreement on the traffic forcasts for the EIA studies as a consolidated reply in respect of these traffic data for use in the WDII & CWB EIA.

Your response by 13 April 2007 would be most appreciated. Should you have any queries in this regard, please contact Ms. Carmen Au at Tel. 2685 6211 or the undersigned.

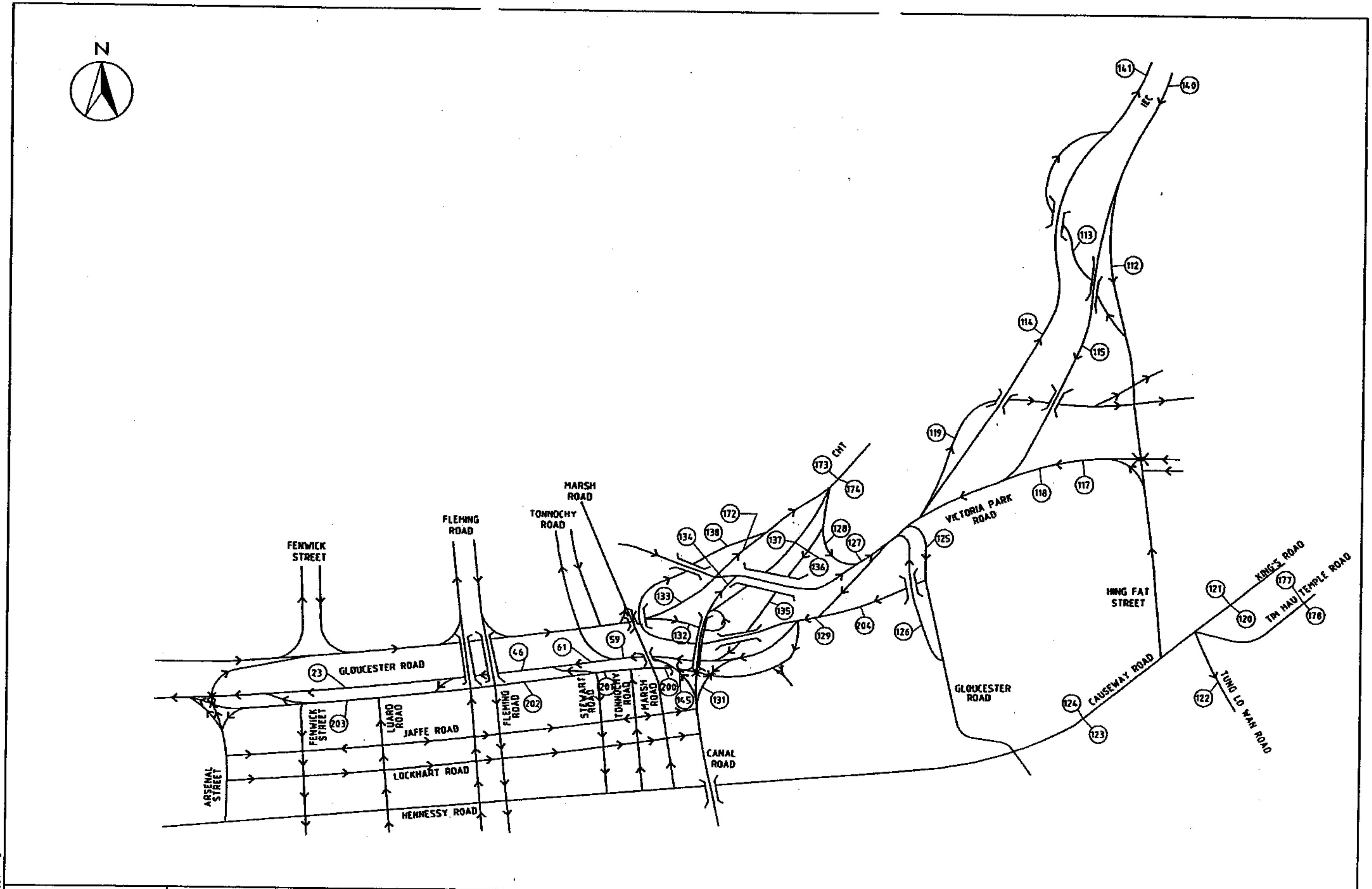
Yours faithfully,

p.p.

Peter Cheek
Associate

Encl.

cc PM/HKI&I, CEDD – Mr. S.K. Lam / Mr. C.K. Lam (Fax: 2577 5040)
MEMCL – Attn: Mr. Freeman Cheung (Fax: 2891 0305)



MAUNSELL AECOM

Maunsell Consultants Asia Ltd

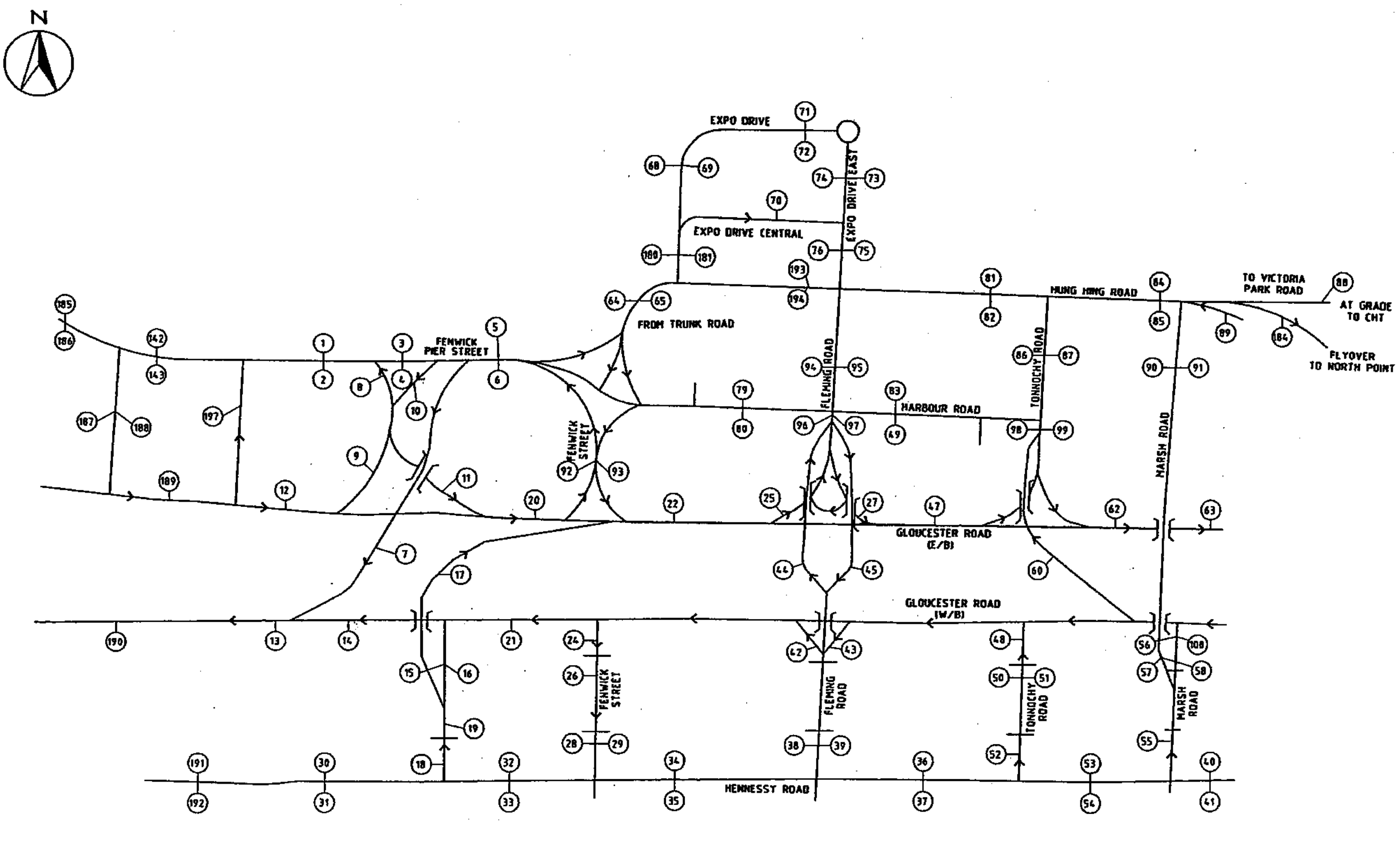
WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

LOCATION INDEX FOR 2008 AND 2031 WITHOUT TRUNK ROAD TRAFFIC FORECAST

FIGURE 1

PLOT DATE: 2007-4-3

1SZ01 q:\projects\traffic\9710303\Drawing\EIA-EMFAC\FIG 1.dgn



MAUNSELL | AECOM

Traffic Consultants Ltd

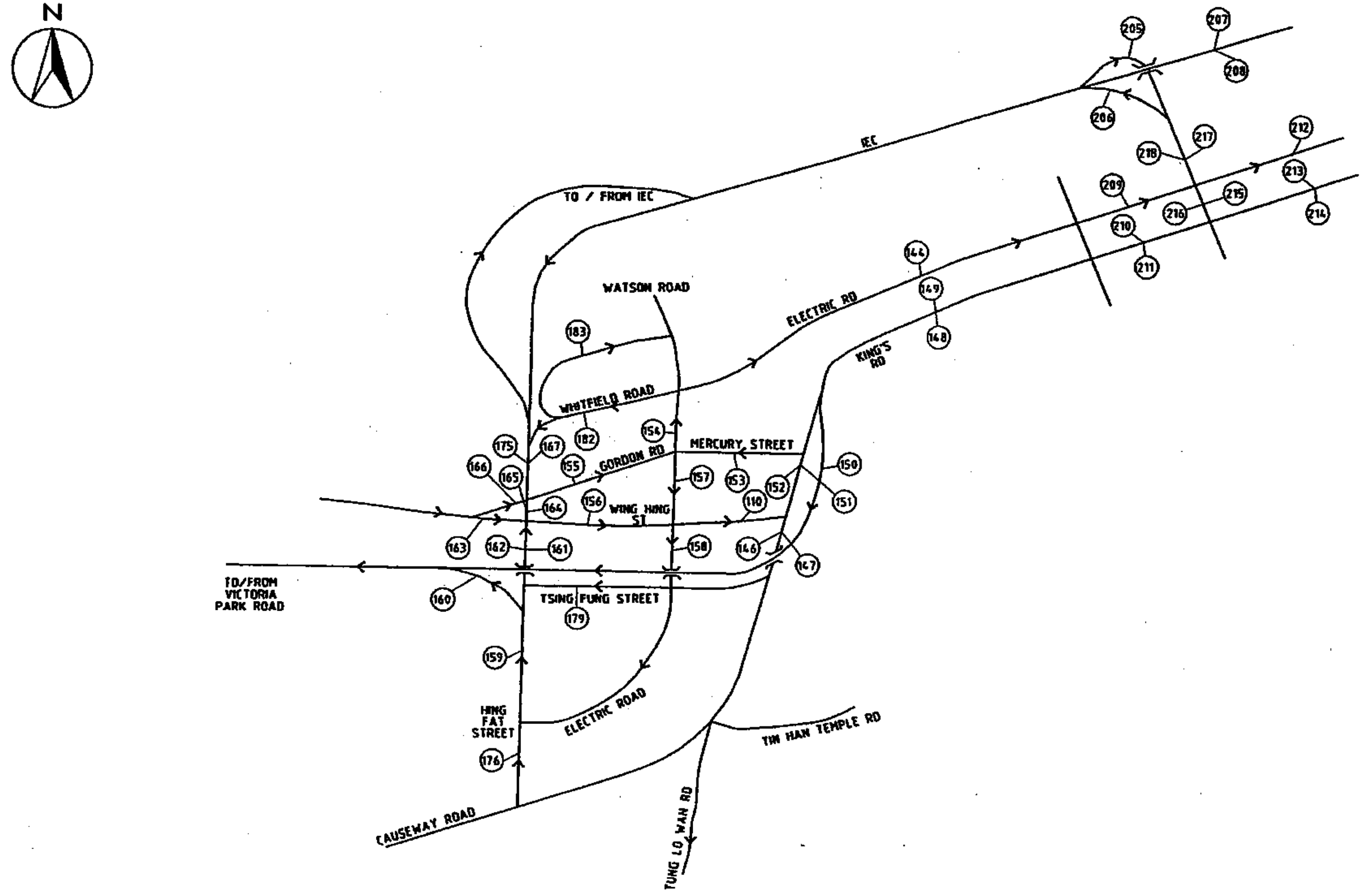
WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

LOCATION INDEX FOR 2008 AND 2031 WITHOUT TRUNK ROAD TRAFFIC FORECAST

FIGURE 2

PLOT DATE: 2007-4-3

IS201 q:\projects\traffic\9710303\Drawing\EIA-EMFAC\FIG 2.dgn



WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

LOCATION INDEX FOR 2008 AND 2031 WITHOUT TRUNK ROAD TRAFFIC FORECAST

FIGURE 3

MAUNSELL | AECOM

PLOT DATE: 2007-4-3

IS701 q:\projects\traffic\9710303\Drawing\EIA-EMFAC\FIG 3 dgn

2008 without WDII EIA Traffic Flows

Link No.	Total (Veh/Hr)	Car%	Taxi%	SPB%	LGV%	HGV%	PT%	Total%
1	1044	74%	16%	5%	0%	5%	0%	100%
2	272	69%	20%	7%	0%	4%	0%	100%
3	1062	47%	43%	5%	2%	3%	0%	100%
4	273	73%	16%	5%	2%	4%	0%	100%
5	1068	47%	43%	4%	3%	3%	0%	100%
6	1607	44%	42%	8%	3%	2%	1%	100%
7	762	45%	35%	6%	10%	2%	2%	100%
8	48	48%	38%	6%	6%	2%	0%	100%
9	46	50%	39%	7%	4%	0%	0%	100%
10	592	49%	40%	7%	3%	1%	0%	100%
11	592	50%	39%	7%	3%	1%	0%	100%
12	3711	47%	37%	6%	5%	2%	3%	100%
13	5825	40%	41%	7%	5%	3%	4%	100%
14	5319	40%	41%	8%	4%	2%	5%	100%
15	24	25%	21%	8%	8%	0%	38%	100%
16	432	37%	23%	4%	36%	0%	0%	100%
17	1356	58%	28%	5%	6%	1%	2%	100%
18	1386	40%	37%	11%	8%	1%	3%	100%
19	62	37%	23%	3%	37%	0%	0%	100%
20	4289	47%	37%	8%	5%	1%	2%	100%
21	5170	43%	39%	7%	4%	2%	5%	100%
22	5643	49%	38%	7%	3%	1%	2%	100%
23	3781	45%	39%	7%	4%	2%	3%	100%
24	1127	41%	37%	7%	6%	3%	6%	100%
25	481	47%	27%	5%	0%	4%	17%	100%
26	1182	40%	36%	7%	7%	4%	6%	100%
27	138	39%	22%	4%	0%	2%	33%	100%
28	25	0%	0%	0%	0%	0%	100%	100%
29	1020	43%	32%	6%	8%	4%	7%	100%
30	2922	37%	34%	9%	5%	0%	15%	100%
31	1043	25%	37%	2%	5%	1%	30%	100%
32	920	23%	21%	6%	5%	1%	44%	100%
33	805	22%	33%	2%	4%	1%	38%	100%
34	589	5%	9%	16%	4%	2%	64%	100%
35	508	11%	13%	14%	8%	1%	53%	100%
36	497	6%	11%	19%	8%	2%	54%	100%
37	482	18%	20%	10%	11%	1%	40%	100%
38	568	26%	32%	4%	16%	2%	20%	100%
39	273	22%	23%	6%	7%	3%	39%	100%
40	627	7%	12%	20%	3%	1%	57%	100%
41	456	23%	26%	12%	9%	1%	29%	100%
42	41	37%	36%	5%	20%	2%	0%	100%
43	31	35%	35%	13%	10%	7%	0%	100%
44	713	28%	45%	3%	7%	1%	16%	100%
45	421	30%	34%	3%	7%	0%	26%	100%
46	5196	45%	36%	6%	7%	1%	5%	100%
47	5338	48%	38%	7%	4%	1%	2%	100%
48	18	44%	39%	0%	11%	6%	0%	100%
49	1378	43%	42%	8%	3%	2%	2%	100%
50	173	42%	36%	2%	14%	6%	0%	100%
51	96	37%	43%	2%	9%	9%	0%	100%
52	612	40%	33%	2%	14%	7%	4%	100%
53	568	5%	10%	22%	7%	3%	53%	100%
54	621	21%	23%	11%	9%	1%	35%	100%
55	595	32%	39%	15%	9%	1%	4%	100%
56	50	30%	32%	8%	18%	2%	10%	100%
57	722	21%	39%	27%	9%	1%	3%	100%
58	350	30%	49%	11%	10%	0%	0%	100%
59	6828	41%	17%	10%	16%	6%	9%	100%
60	2179	8%	29%	13%	19%	13%	18%	100%
61	4650	57%	12%	9%	14%	3%	5%	100%
62	4915	67%	15%	11%	4%	1%	2%	100%
63	4945	67%	15%	11%	4%	1%	2%	100%
64	518	49%	38%	7%	5%	1%	0%	100%
65	1230	54%	33%	5%	4%	4%	0%	100%
68	45	24%	20%	9%	27%	20%	0%	100%
69	112	52%	41%	7%	0%	0%	0%	100%
70	365	46%	37%	17%	0%	0%	0%	100%
71	45	24%	20%	9%	27%	20%	0%	100%
72	50	58%	36%	6%	0%	0%	0%	100%
73	56	25%	21%	9%	2%	2%	41%	100%
74	123	44%	28%	4%	0%	0%	24%	100%
75	408	40%	32%	15%	4%	3%	6%	100%
76	122	45%	27%	4%	0%	0%	24%	100%
79	836	47%	43%	5%	2%	3%	0%	100%
80	866	44%	42%	8%	2%	2%	2%	100%

Link No.	Total (Veh/Hr)	Car%	Taxi%	SPB%	LGV%	HGV%	PT%	Total%
81	992	43%	34%	17%	3%	2%	1%	100%
82	1245	55%	33%	6%	3%	3%	0%	100%
83	578	40%	37%	4%	5%	7%	7%	100%
84	1819	39%	31%	16%	6%	4%	4%	100%
85	696	55%	33%	6%	3%	3%	0%	100%
86	1482	37%	31%	15%	7%	5%	5%	100%
87	177	58%	35%	5%	1%	1%	0%	100%
88	200	5%	16%	40%	2%	0%	37%	100%
89	40	39%	33%	15%	8%	5%	0%	100%
90	631	21%	40%	27%	9%	0%	3%	100%
91	324	30%	50%	10%	10%	0%	0%	100%
92	333	45%	41%	4%	4%	6%	0%	100%
93	327	42%	40%	8%	6%	4%	0%	100%
94	1855	61%	13%	10%	4%	1%	11%	100%
95	1160	54%	12%	9%	7%	2%	16%	100%
96	1620	58%	13%	9%	7%	1%	12%	100%
97	1321	58%	13%	9%	6%	2%	12%	100%
98	2054	41%	33%	16%	4%	3%	3%	100%
99	171	55%	34%	5%	3%	3%	0%	100%
100	50	44%	48%	6%	2%	0%	0%	100%
110	646	49%	25%	10%	3%	2%	11%	100%
112	674	54%	28%	4%	7%	1%	6%	100%
113	816	56%	30%	4%	2%	2%	6%	100%
114	4052	42%	29%	8%	12%	7%	2%	100%
115	5412	53%	28%	3%	13%	1%	3%	100%
117	1591	49%	35%	4%	4%	3%	5%	100%
118	1591	49%	35%	4%	4%	3%	5%	100%
119	1241	48%	37%	5%	5%	1%	4%	100%
120	1574	47%	24%	6%	3%	3%	17%	100%
121	215	0%	0%	0%	1%	0%	99%	100%
122	838	54%	27%	7%	3%	4%	5%	100%
123	909	54%	9%	8%	4%	2%	23%	100%
124	1036	35%	24%	5%	4%	3%	29%	100%
125	983	42%	32%	4%	9%	1%	12%	100%
126	959	52%	40%	5%	3%	0%	0%	100%
127	6276	43%	31%	7%	10%	5%	4%	100%
128	1057	43%	10%	7%	21%	9%	10%	100%
129	8657	38%	24%	9%	16%	6%	7%	100%
131	1511	43%	37%	6%	8%	4%	2%	100%
132	1124	66%	14%	10%	6%	2%	2%	100%
133	3736	66%	14%	11%	5%	2%	2%	100%
134	1316	67%	15%	11%	6%	1%	0%	100%
135	994	58%	13%	9%	8%	2%	10%	100%
136	1155	49%	24%	9%	8%	5%	5%	100%
137	593	56%	12%	9%	2%	1%	20%	100%
138	1040	62%	14%	10%	9%	2%	3%	100%
140	6086	53%	28%	3%	12%	1%	3%	100%
141	4868	44%	29%	8%	10%	6%	3%	100%
142	7	29%	14%	0%	0%	0%	57%	100%
143	278	48%	38%	6%	7%	1%	0%	100%
144	1003	45%	32%	7%	6%	7%	3%	100%
145	1007	65%	7%	7%	8%	10%	3%	100%
146	181	0%	0%	0%	0%	0%	100%	100%
147	1637	52%	22%	6%	3%	3%	14%	100%
148	1544	48%	24%	6%	4%	2%	16%	100%
149	321	19%	10%	4%	1%	1%	65%	100%
150	472	51%	26%	3%	4%	2%	14%	100%
151	1152	45%	23%	9%	4%	3%	16%	100%
152	275	13%	7%	3%	1%	1%	75%	100%
153	41	49%	24%	10%	10%	7%	0%	100%
154	1458	53%	27%	6%	6%	5%	3%	100%
155	1625	53%	26%	6%	7%	5%	3%	100%
156	1181	47%	36%	6%	5%	0%	6%	100%
157	88	43%	22%	6%	8%	7%	14%	100%
158	369	55%	28%	7%	4%	3%	3%	100%
159	1630	48%	33%	6%	4%	4%	5%	100%
160	1003	49%	39%	4%	3%	3%	2%	100%
161	116	52%	34%	2%	9%	3%	0%	100%
162	913	55%	20%	9%	5%	4%	7%	100%
163	375	47%	36%	5%	4%	1%	7%	100%
164	922	48%	36%	6%	6%	0%	4%	100%
165	913	55%	20%	9%	5%	4%	7%	100%
166	866	49%	38%	5%	5%	1%	2%	100%
167	1506	55%	28%	4%	7%	2%	4%	100%
172	1319	59%	13%	10%	2%	1%	15%	100%
173	2952	58%	13%	10%	5%	2%	12%	100%
174	3206	50%	17%	8%	12%	5%	8%	100%

Link No.	Total (Veh/Hr)	Car%	Taxi%	SPB%	LGV%	HGV%	PT%	Total%
175	816	56%	30%	4%	2%	2%	6%	100%
176	1369	47%	33%	6%	4%	4%	6%	100%
177	90	47%	24%	3%	2%	4%	20%	100%
178	748	83%	0%	7%	6%	3%	1%	100%
179	286	75%	14%	7%	2%	2%	0%	100%
180	186	42%	33%	16%	5%	4%	0%	100%
181	98	56%	35%	5%	2%	2%	0%	100%
182	731	53%	26%	6%	7%	8%	0%	100%
183	164	52%	25%	6%	8%	9%	0%	100%
184	1220	40%	30%	9%	11%	8%	2%	100%
185	47	47%	38%	6%	7%	2%	0%	100%
186	42	40%	33%	14%	8%	5%	0%	100%
187	7	15%	14%	14%	0%	0%	57%	100%
188	236	43%	35%	17%	3%	2%	0%	100%
189	4994	59%	31%	2%	4%	2%	2%	100%
190	7444	39%	41%	8%	5%	3%	4%	100%
191	4038	36%	33%	9%	8%	0%	14%	100%
192	1379	31%	31%	5%	2%	2%	29%	100%
193	443	41%	34%	16%	6%	3%	0%	100%
194	1299	57%	34%	5%	2%	2%	0%	100%
197	955	43%	34%	16%	4%	3%	0%	100%
200	904	62%	13%	10%	11%	3%	1%	100%
201	993	60%	13%	10%	13%	3%	1%	100%
202	985	47%	37%	6%	7%	1%	1%	100%
203	2615	41%	36%	7%	4%	2%	10%	100%
204	2188	42%	32%	4%	10%	2%	10%	100%
205	513	62%	24%	5%	5%	4%	1%	100%
206	721	59%	30%	1%	9%	1%	0%	100%
207	4355	42%	30%	8%	11%	7%	3%	100%
208	5366	52%	28%	3%	12%	1%	3%	100%
209	940	44%	31%	6%	6%	6%	7%	100%
210	260	9%	5%	2%	2%	2%	81%	100%
211	1077	42%	20%	5%	6%	4%	23%	100%
212	1038	44%	31%	7%	5%	6%	7%	100%
213	260	9%	5%	2%	2%	2%	81%	100%
214	1164	43%	21%	5%	6%	4%	21%	100%
215	114	52%	19%	4%	14%	11%	0%	100%
216	341	57%	28%	1%	13%	1%	1%	100%
217	564	61%	23%	5%	6%	4%	1%	100%
218	790	59%	29%	1%	10%	1%	0%	100%

2031 without WDII EIA Traffic Flows

Link No.	Total (Veh/Hr)	Car%	Taxi%	SPB%	LGV%	HGV%	PT%	Total%
1	1606	74%	16%	5%	0%	5%	0%	100%
2	18	66%	22%	6%	0%	6%	0%	100%
3	1744	47%	43%	5%	2%	3%	0%	100%
4	175	73%	16%	5%	1%	5%	0%	100%
5	1755	47%	43%	5%	2%	3%	0%	100%
6	2648	44%	42%	8%	3%	2%	1%	100%
7	1992	45%	36%	6%	10%	2%	1%	100%
8	52	48%	38%	6%	6%	2%	0%	100%
9	53	48%	38%	8%	6%	0%	0%	100%
10	484	50%	39%	7%	3%	1%	0%	100%
11	524	50%	39%	7%	3%	1%	0%	100%
12	5483	47%	38%	7%	5%	1%	2%	100%
13	8218	41%	41%	7%	5%	3%	3%	100%
14	6682	40%	41%	8%	5%	2%	4%	100%
15	70	37%	29%	10%	10%	1%	13%	100%
16	455	37%	23%	3%	37%	0%	0%	100%
17	1249	58%	28%	5%	6%	1%	2%	100%
18	940	39%	37%	10%	8%	1%	5%	100%
19	79	37%	23%	3%	37%	0%	0%	100%
20	6000	47%	38%	7%	5%	1%	2%	100%
21	6559	44%	39%	7%	4%	2%	4%	100%
22	6601	48%	39%	7%	3%	1%	2%	100%
23	5450	44%	40%	7%	5%	2%	2%	100%
24	1898	42%	37%	7%	7%	3%	4%	100%
25	618	50%	28%	5%	0%	4%	13%	100%
26	1281	41%	36%	7%	7%	4%	5%	100%
27	45	0%	0%	0%	0%	0%	100%	100%
28	25	0%	0%	0%	0%	0%	100%	100%
29	920	43%	32%	6%	8%	3%	8%	100%
30	2115	35%	31%	9%	5%	0%	20%	100%
31	1399	28%	42%	2%	5%	1%	22%	100%
32	1225	28%	26%	7%	6%	1%	32%	100%
33	1132	26%	39%	2%	5%	1%	27%	100%
34	862	8%	14%	24%	7%	3%	44%	100%
35	563	11%	13%	14%	8%	1%	53%	100%
36	715	9%	15%	26%	11%	3%	36%	100%
37	918	22%	25%	11%	13%	1%	28%	100%
38	943	32%	38%	4%	19%	2%	5%	100%
39	556	33%	35%	9%	11%	4%	8%	100%
40	926	10%	17%	29%	5%	2%	37%	100%
41	1109	28%	32%	15%	12%	1%	12%	100%
42	54	35%	37%	6%	20%	2%	0%	100%
43	31	35%	35%	13%	10%	7%	0%	100%
44	875	29%	47%	3%	7%	1%	13%	100%
45	1281	36%	43%	4%	8%	0%	9%	100%
46	6862	45%	37%	6%	7%	1%	4%	100%
47	6069	49%	38%	7%	4%	1%	1%	100%
48	106	43%	37%	2%	12%	6%	0%	100%
49	1685	44%	42%	8%	3%	2%	1%	100%
50	186	41%	34%	3%	13%	6%	3%	100%
51	9	34%	44%	0%	11%	11%	0%	100%
52	768	40%	34%	2%	14%	7%	3%	100%
53	617	5%	10%	22%	7%	3%	53%	100%
54	1312	26%	30%	14%	12%	1%	17%	100%
55	721	32%	40%	15%	9%	1%	3%	100%
56	28	29%	28%	7%	18%	0%	18%	100%
57	452	20%	40%	27%	9%	0%	4%	100%
58	749	30%	49%	11%	10%	0%	0%	100%
59	8346	44%	16%	10%	15%	7%	7%	100%
60	1868	66%	14%	11%	5%	1%	3%	100%
61	6527	65%	14%	10%	6%	2%	3%	100%
62	5300	67%	15%	11%	4%	1%	2%	100%
63	5300	67%	15%	11%	4%	1%	2%	100%
64	1340	49%	38%	7%	5%	1%	0%	100%
65	2068	54%	33%	5%	4%	4%	0%	100%
68	266	24%	19%	10%	27%	20%	0%	100%
69	252	52%	41%	7%	0%	0%	0%	100%
70	484	46%	37%	17%	0%	0%	0%	100%
71	266	25%	19%	9%	27%	20%	0%	100%
72	441	59%	36%	5%	0%	0%	0%	100%
73	955	41%	33%	16%	4%	3%	3%	100%
74	914	57%	34%	5%	0%	0%	4%	100%
75	955	41%	33%	16%	4%	3%	3%	100%
76	404	54%	33%	5%	0%	0%	8%	100%
79	1032	47%	43%	5%	2%	3%	0%	100%
80	958	44%	42%	9%	2%	2%	1%	100%

Link No.	Total (Veh/Hr)	Car%	Taxi%	SPB%	LGV%	HGV%	PT%	Total%
81	1613	43%	35%	17%	3%	2%	0%	100%
82	1518	55%	33%	6%	3%	3%	0%	100%
83	1053	42%	38%	4%	5%	7%	4%	100%
84	2605	40%	32%	15%	6%	4%	3%	100%
85	616	54%	32%	5%	3%	3%	3%	100%
86	1872	38%	31%	15%	7%	5%	4%	100%
87	45	34%	20%	2%	0%	0%	44%	100%
88	200	5%	16%	40%	2%	0%	37%	100%
89	46	39%	30%	15%	9%	7%	0%	100%
90	420	21%	39%	26%	9%	0%	5%	100%
91	603	30%	50%	10%	10%	0%	0%	100%
92	1118	45%	41%	4%	4%	6%	0%	100%
93	460	42%	40%	8%	6%	4%	0%	100%
94	1970	61%	13%	10%	5%	1%	10%	100%
95	1351	56%	12%	9%	7%	2%	14%	100%
96	1934	60%	13%	10%	6%	1%	10%	100%
97	1961	60%	13%	10%	7%	2%	8%	100%
98	2522	41%	34%	16%	4%	3%	2%	100%
99	267	52%	31%	4%	3%	3%	7%	100%
100	54	44%	48%	6%	2%	0%	0%	100%
110	769	52%	27%	10%	3%	2%	6%	100%
112	1066	56%	28%	4%	7%	1%	4%	100%
113	1553	58%	31%	4%	2%	2%	3%	100%
114	4971	42%	31%	8%	11%	7%	1%	100%
115	6132	52%	28%	3%	13%	1%	3%	100%
117	1658	51%	34%	3%	4%	3%	5%	100%
118	1658	51%	34%	3%	4%	3%	5%	100%
119	902	48%	36%	5%	5%	1%	5%	100%
120	2290	49%	26%	7%	3%	3%	12%	100%
121	677	31%	20%	7%	6%	5%	31%	100%
122	1139	54%	28%	7%	3%	4%	4%	100%
123	1279	58%	9%	9%	4%	3%	17%	100%
124	2578	44%	30%	7%	3%	4%	12%	100%
125	1520	44%	33%	5%	9%	1%	8%	100%
126	1456	52%	40%	5%	3%	0%	0%	100%
127	7393	43%	32%	7%	10%	5%	3%	100%
128	1167	44%	10%	7%	21%	9%	9%	100%
129	9350	39%	24%	9%	16%	6%	6%	100%
131	2037	44%	37%	6%	8%	4%	1%	100%
132	861	65%	14%	10%	6%	2%	3%	100%
133	4380	66%	14%	11%	5%	2%	2%	100%
134	1159	67%	15%	11%	6%	1%	0%	100%
135	1334	58%	13%	10%	9%	2%	8%	100%
136	1194	49%	24%	9%	8%	5%	5%	100%
137	1232	64%	14%	10%	2%	1%	9%	100%
138	978	63%	13%	10%	9%	2%	3%	100%
140	7198	53%	28%	3%	12%	1%	3%	100%
141	6524	46%	31%	7%	9%	6%	2%	100%
142	440	47%	38%	7%	7%	1%	0%	100%
143	647	48%	38%	6%	7%	1%	0%	100%
144	1058	45%	32%	7%	6%	7%	3%	100%
145	1722	66%	7%	7%	8%	10%	2%	100%
146	209	0%	0%	0%	0%	0%	100%	100%
147	2052	53%	23%	6%	4%	3%	11%	100%
148	1952	50%	24%	6%	4%	3%	13%	100%
149	332	20%	11%	4%	1%	1%	63%	100%
150	652	53%	28%	3%	4%	2%	10%	100%
151	1286	46%	24%	9%	4%	3%	14%	100%
152	282	14%	7%	3%	1%	1%	74%	100%
153	47	48%	26%	9%	11%	6%	0%	100%
154	1775	54%	27%	6%	6%	5%	2%	100%
155	1843	52%	26%	6%	7%	5%	4%	100%
156	992	45%	34%	8%	7%	1%	5%	100%
157	88	27%	14%	3%	6%	5%	45%	100%
158	174	44%	22%	5%	3%	3%	23%	100%
159	2446	48%	34%	6%	4%	4%	4%	100%
160	746	49%	39%	4%	2%	3%	3%	100%
161	260	52%	35%	2%	8%	3%	0%	100%
162	2072	52%	29%	7%	4%	4%	4%	100%
163	338	51%	39%	5%	4%	1%	0%	100%
164	914	44%	33%	7%	8%	2%	6%	100%
165	2072	52%	29%	7%	4%	4%	4%	100%
166	564	46%	35%	5%	5%	1%	8%	100%
167	1674	55%	28%	4%	7%	3%	3%	100%
172	1541	61%	13%	10%	2%	1%	13%	100%
173	3751	62%	13%	10%	5%	1%	9%	100%
174	3695	50%	16%	9%	12%	6%	7%	100%

Link No.	Total (Veh/Hr)	Car%	Taxi%	SPB%	LGV%	HGV%	PT%	Total%
175	1553	58%	31%	4%	2%	2%	3%	100%
176	2293	49%	34%	6%	4%	4%	3%	100%
177	252	53%	29%	4%	2%	5%	7%	100%
178	1080	83%	0%	7%	6%	3%	1%	100%
179	372	75%	14%	7%	2%	2%	0%	100%
180	556	42%	33%	16%	5%	4%	0%	100%
181	247	56%	34%	6%	2%	2%	0%	100%
182	633	53%	26%	6%	7%	8%	0%	100%
183	193	52%	25%	6%	8%	9%	0%	100%
184	1707	40%	31%	11%	11%	8%	0%	100%
185	739	48%	38%	6%	7%	1%	0%	100%
186	93	28%	23%	11%	4%	3%	31%	100%
187	147	31%	24%	12%	8%	5%	20%	100%
188	932	44%	35%	16%	3%	2%	0%	100%
189	7687	60%	31%	2%	4%	2%	1%	100%
190	9343	40%	41%	8%	5%	3%	3%	100%
191	2476	33%	30%	8%	7%	0%	22%	100%
192	2451	36%	37%	6%	3%	2%	16%	100%
193	726	41%	34%	16%	5%	3%	1%	100%
194	1818	57%	34%	5%	2%	2%	0%	100%
197	1620	43%	34%	16%	4%	3%	0%	100%
200	1137	62%	13%	10%	11%	3%	1%	100%
201	1161	60%	13%	10%	13%	3%	1%	100%
202	1412	48%	38%	6%	7%	1%	0%	100%
203	3141	42%	37%	7%	4%	2%	8%	100%
204	3024	43%	33%	4%	10%	2%	8%	100%
205	708	62%	24%	5%	5%	4%	0%	100%
206	958	59%	30%	1%	9%	1%	0%	100%
207	5816	44%	32%	7%	10%	6%	2%	100%
208	6240	52%	28%	3%	12%	1%	3%	100%
209	1164	44%	31%	7%	6%	6%	6%	100%
210	272	11%	6%	2%	2%	2%	78%	100%
211	1476	45%	22%	6%	7%	4%	17%	100%
212	1286	45%	32%	7%	6%	6%	6%	100%
213	272	11%	6%	2%	2%	2%	78%	100%
214	1603	46%	23%	6%	6%	4%	16%	100%
215	143	52%	20%	4%	14%	10%	0%	100%
216	429	57%	28%	1%	13%	1%	1%	100%
217	707	61%	23%	5%	6%	4%	0%	100%
218	993	59%	30%	1%	10%	1%	0%	100%

+ 852 2511 5392

運輸署
Transport Department

本署檔號 Our Ref.	HR 171/70-30
來函檔號 Your Ref.	PMC:CAKM:qc:97103/10.4-0567
電話 Tel. 2829	5524
圖文傳真 Fax. 2824 0399	

By Fax:
(Fax: 2691 2649)

24 November 2006

Maunsell Consultants Asia Ltd.
8/F, Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road
Sha Tin, N.T., Hong Kong

(Attn.: Mr. Peter Cheek)

Dear Mr. Cheek,

Supplemental Agreement No.1 to Agreement No. CE 54/2001(CE)
Wan Chai Development Phase II (WDII) – Planning and Engineering Review

Forecast Traffic Flow (2031) for Environmental Impact Assessment

We refer to your letter dated 20 November 2006 regarding your model split from 6 vehicle classes into 16 vehicle classes.

We have no objection to your approach in breaking down the vehicles into 16 vehicle classes for the use in the Environmental Impact Assessment.

Yours faithfully,

(Chippy LEUNG)
for Assistant Commissioner
for Transport / Urban

c.c.
PM/HKI&I, CEDD (Attn.: Mr. S.K. LAM) (Fax: 2577 5040)

市區(香港)分區辦事處
Urban Regional Office (Hong Kong)
香港灣仔告士打道七號入境事務大樓三十七樓
37th Floor Immigration Tower 7 Gloucester Road Wan Chai Hong Kong
網址 Web Site: http://www.td.gov.hk/

運輸署
Transport Department

本署檔號 Our Ref. HR 171/70-30
來函檔號 Your Ref. CAKM:AWSY:qc:97103/10.4-0517
電話 Tel. 2829 5524
圖文傳真 Fax. 2824 0399

By Fax and Post
(Fax: 2691 2649)

5 October 2006

Maunsell Consultants Asia Ltd.
8/F, Grand Central Plaza, Tower 2,
138 Shatin Rural Committee Road,
Sha Tin, N.T., Hong Kong.

(Attn.: Ms Carmen Au)

Dear Ms Au,

Supplemental Agreement No.1 to Agreement No. CE 54/2001(CE)
Wan Chai Development Phase II (WDII) – Planning and Engineering Review

Forecast Traffic Flow (2031) for Environmental Review

We refer to your letter dated 3 October 2006 regarding your response to comment.

Considering your response to comments and to the understanding that your traffic forecast flow for 2031 submitted on 7 September 2006 would only be applied for the Environmental Review but not for traffic study, we have no objection to your use of such traffic forecast flow figures for the Environmental Review purpose.

Yours faithfully,

(Chiny LEUNG)
for Assistant Commissioner
for Transport / Urban

c.c.
PM/HKI&I, CEDD (Attn.: Mr. S.K. LAM) (Fax: 2577 5040)

市區(香港)分區辦事處
Urban Regional Office (Hong Kong)
香港灣仔告士打道七號入境事務大樓三十七樓
37th Floor Immigration Tower 7 Gloucester Road Wan Chai Hong Kong
網址 Web Site: http://www.td.gov.hk/

MAUNSELL | AECOM

Maunsell Consultants Asia Ltd
8/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., Hong Kong
茂盛(亞洲)工程顧問有限公司
香港新界沙田鄉事會路 138 號新城市中央廣場第 2 座 8 樓
T +852 2605 6262 F +852 2691 2649 www.maunsell.aecom.com

Your Ref : HR171/70-30
Our Ref : PMC:CAKM:qc:97103/10.4-0567

By Fax (2824 0399) and Post

FILED 21.11.06

Senior Engineer/Housing & Planning
Traffic Engineer (HK) Division
Transport Department
37/F Immigration Tower
7 Gloucester Road
Wan Chai, Hong Kong

Attn: Mr. C.Y. Chan

20 November 2006

Dear Sir,

Supplemental Agreement No. 1 to Agreement No. CE54/2001(CE)
Wan Chai Development Phase II – Planning and Engineering Review
Forecast Traffic Flow (2031) for Environmental Impact Assessment

Thank you for your prompt response given under above-referenced letter dated 5 October 2006 which advises us that your office have no objection to the use of the submitted forecast traffic flows (2031) for the Environmental Review of the captioned project, with traffic flows broken down into 6 vehicle classes.

Further to the above letter, we submit herewith the attached forecast traffic flows, which are obtained by further breaking down the approved traffic flows of the 6 vehicle classes into 16 vehicle classes for carrying out a new model for vehicle emissions, i.e. the EMFAC-HK model for estimating vehicular tailpipe emission of RSP, NO, CO and VOCs according to EPD's Guideline on Modelling Vehicle Emissions.

Reference has been made to Table 4.4 (Registration and Licensing of Vehicles by Fuel Type) of the Transport Monthly Digest (May 2006) and the the definition as shown on "The Annual Traffic Census 2005 - Appendix F Vehicle Classification System" for further breaking those vehicle classes that have been grouped together in the previous 6 vehicle classes.

We should be grateful if you would confirm us that the above approach is acceptable by 27 November 2006.

Yours faithfully

P.P. [signature]

Peter Cheek
Associate

Encl

cc PM/HKI&I, CEDD – Mr. S.K. Lam (Fax: 2577 5040)
MEMCL – Mr. Tim Cramp (Fax: 2891 0305)

APPENDIX F

VEHICLE CLASSIFICATION SYSTEM

Motor Cycle	-	Any motor-propelled 2- or 3-wheeled vehicle with or without a sidecar.
Private Car	-	A motor vehicle constructed or adapted for use solely for the carriage of a driver and not more than 7 passengers and their personal effects but does not include an invalid carriage, motor cycle, motor tricycle or taxi.
Taxi	-	A passenger carrying vehicle registered as 'Taxi' under the classes of vehicle specified in the Road Traffic Ordinance (Cap. 374). Such vehicle can be readily distinguished from private car by the presence of an illuminated sign and markings as specified in the Road Traffic (Construction and Maintenance of Vehicles) Regulations.
Private Light Bus (Formerly called Passenger Van)	-	A passenger carrying vehicle registered as 'Private Light Bus' under the classes of vehicle specified in Cap. 374. It has a carrying capacity (including driver) not exceeding 17 seats.
Public Light Bus	-	A passenger carrying vehicle registered as 'Public Light bus' under the classes of vehicle specified in Cap. 374. It has a carrying capacity (including driver) of 17 seats. It includes RMB and GMB.
Light Goods Vehicle	-	A lorry or a goods van registered as 'goods vehicle' under the classes of vehicle specified in Cap. 374 having a permitted gross vehicle weight not exceeding 5.5 tonnes.
Medium / Heavy Goods Vehicle	-	A lorry having a permitted gross vehicle weight exceeding 5.5 tonnes. It also includes specialized vehicles such as fire engines, refuse and military trucks, containers, petrol tankers and other similar vehicles.
Non-franchised Bus	-	A passenger carrying vehicle with a capacity (including driver) exceeding 17 seats, not including franchised buses operated by New World First Bus Services Ltd., Citybus Ltd., Kowloon Motor Bus Co., (1933), Long Win Bus Co., Ltd. or New Lantao Bus Co. (1973) Ltd.
Franchised Bus (S.D.)	-	A single-decked bus operated by New World First Bus Services Ltd., Citybus Ltd., Kowloon Motor Bus Co., (1933), Long Win Bus Co., Ltd. or New Lantao Bus Co.

(1973) Ltd.

Franchised Bus (D.D.)	-	A double-decked bus operated by New World First Bus Services Ltd., Citybus Ltd., Kowloon Motor Bus Co., (1933), Long Win Bus Co., Ltd. or New Lantao Bus Co. (1973) Ltd.
Tram	-	Trams operated by the Hongkong Tramways Ltd.
Commercial Vehicle	-	This category includes all medium/heavy goods vehicles, non-franchised buses and franchised buses as defined above.

表 4.4　：按燃料種類劃分的車輛登記及發牌ゑ，數字 (2006年5月)

Table 4.4 : Registration and Licensing of Vehicles by Fuel Type (May 2006)

2006/05

		汽油 Petrol		柴油 Diesel		電力 Electric		石油氣 LP Gas		其他 (1) Others (1)		總數 Total	
		登記總數 Registered	已領牌總數 Licensed	登記總數 Registered	已領牌總數 Licensed	登記總數 Registered	已領牌總數 Licensed	登記總數 Registered	已領牌總數 Licensed	登記總數 Registered	已領牌總數 Licensed	登記總數 Registered	已領牌總數 Licensed
電單車 (無邊卡) Motor Cycle (Solo)		46 721	34 641	1	1	7	5	0	0	1	1	46 730	34 648
電單車 (連邊卡) Motor Cycle (Comb)		40	30	0	0	0	0	0	0	0	0	40	30
機動三輪車 Motor Tricycle		2	2	0	0	0	0	0	0	0	0	2	2
私家車 Private Car		388 000	352 214	2 204	1 913	7	5	0	0	7	7	390 218	354 139
的士 (市區) Taxi (Urban)		0	0	2	2	0	0	15 248	15 243	0	0	15 250	15 245
的士 (新界) Taxi (NT)		0	0	3	2	0	0	2 835	2 735	0	0	2 838	2 737
的士 (大嶼山) Taxi (Lantau)		0	0	0	0	0	0	50	50	0	0	50	50
九巴 KMB	單層 SD	0	0	156	155	0	0	0	0	0	0	156	155
	雙層 DD	0	0	3 894	3 889	0	0	0	0	0	0	3 894	3 889
城巴 Citybus	單層 SD	0	0	94	92	0	0	0	0	0	0	94	92
	雙層 DD	0	0	819	818	0	0	0	0	0	0	819	818
新巴 NWFB	單層 SD	0	0	36	36	0	0	0	0	0	0	36	36
	雙層 DD	0	0	670	658	0	0	0	0	0	0	670	658
龍運巴士 LWB	單層 SD	0	0	9	8	0	0	0	0	0	0	9	8
	雙層 DD	0	0	139	138	0	0	0	0	0	0	139	138
新大嶼山巴士 NLB	單層 SD	0	0	83	83	0	0	0	0	0	0	83	83
	雙層 DD	0	0	0	0	0	0	0	0	0	0	0	0
九廣鐵路巴士 KCRC Bus	單層 SD	0	0	26	26	0	0	0	0	0	0	26	26
	雙層 DD	0	0	81	80	0	0	0	0	0	0	81	80
非專營公共巴士 Non-franchised Public Bus	單層 SD	0	0	6 903	6 713	3	1	0	0	0	0	6 906	6 714
	雙層 DD	0	0	124	116	0	0	0	0	0	0	124	116
私家巴士 Private Bus	單層 SD	0	0	453	440	1	1	0	0	0	0	454	441
	雙層 DD	0	0	35	35	0	0	0	0	0	0	35	35

表 4.4 (續)
Table 4.4 (cont'd)

2006/05

	汽油 Petrol		柴油 Diesel		電力 Electric		石油氣 LP Gas		其他 [1] Others [1]		總數 Total	
	登記總數 Registered	已領牌總數 Licensed	登記總數 Registered	已領牌總數 Licensed	登記總數 Registered	已領牌總數 Licensed	登記總數 Registered	已領牌總數 Licensed	登記總數 Registered	已領牌總數 Licensed	登記總數 Registered	已領牌總數 Licensed
公共小型巴士 Public Light Bus	0	0	1 941	1 941	0	0	2 409	2 409	0	0	4 350	4 350
私家小型巴士 Private Light Bus	5	5	1 746	1 718	1	1	140	137	0	0	1 892	1 861
輕型貨車 Light Goods Vehicle	2 692	2 175	73 005	66 790	4	4	0	0	0	0	75 701	68 969
中型貨車 Medium Goods Vehicle	0	0	42 915	39 170	0	0	0	0	0	0	42 915	39 170
重型貨車 Heavy Goods Vehicle	0	0	3 509	3 110	0	0	0	0	0	0	3 509	3 110
特別用途車輛 Special Purpose Vehicle	94	82	842	767	49	42	115	102	18	16	1 118	1 009
總數 [2] Total [2]	437 554	389 149	139 690	128 701	72	59	20 797	20 676	26	24	598 139	538 609

註： 月底數字

(1) 包括各種其發動機爲「混合式引擎」、「渦輪引擎」、「燃油電池車」等的車輛，它們的燃料種類不能進一步被劃分。

(2) 不包括政府車輛。

SD - 單層

DD - 雙層

資料來源：牌照電腦計劃、牌照事務及檢控部

Notes : Figures refer to end of the month.

(1) Including various vehicles with power plants such as hybrid engine, turbine engine, fuel cell vehicle etc. of which fuel type cannot be further classified.

(2) Excluding Government Vehicles.

SD - Single Deck

DD - Double Deck

Source : VALID, Licensing & Prosecution Division

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Total Vehicle	Motor Cycles	Petrol PC & LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC&LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV >3.5t	HGV <15t	HGV >15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
1	2006	7%	67%	16%	0%	4%	0%	0%	1%	0%	0%	0%	5%	0%	0%	0%	0%	100%
2	137	6%	63%	20%	0%	5%	0%	0%	2%	0%	0%	0%	4%	0%	0%	0%	0%	100%
3	829	4%	43%	43%	0%	3%	0%	0%	1%	1%	1%	1%	3%	0%	0%	0%	0%	100%
4	756	7%	67%	16%	0%	4%	0%	0%	1%	0%	0%	1%	4%	0%	0%	0%	0%	100%
5	833	4%	44%	43%	0%	4%	0%	0%	1%	0%	1%	1%	2%	0%	0%	0%	0%	100%
6	3246	4%	40%	42%	0%	6%	0%	0%	2%	1%	1%	1%	3%	0%	0%	0%	0%	100%
7	1811	4%	41%	36%	0%	5%	0%	0%	1%	3%	3%	4%	2%	0%	0%	1%	0%	100%
8	139	4%	44%	38%	0%	5%	0%	0%	1%	2%	2%	2%	2%	0%	0%	0%	0%	100%
9	39	4%	45%	38%	0%	6%	0%	0%	2%	1%	2%	2%	0%	0%	0%	0%	0%	100%
10	701	4%	46%	39%	0%	5%	0%	0%	2%	1%	1%	1%	1%	0%	0%	0%	0%	100%
11	601	4%	46%	39%	0%	5%	0%	0%	2%	1%	1%	1%	1%	0%	0%	0%	0%	100%
12	2241	4%	42%	37%	0%	5%	0%	0%	1%	1%	2%	2%	2%	0%	0%	2%	2%	100%
13	5168	4%	36%	40%	0%	5%	0%	0%	1%	2%	2%	2%	3%	0%	0%	3%	2%	100%
14	3633	3%	36%	40%	0%	6%	0%	0%	2%	1%	1%	1%	2%	0%	1%	4%	3%	100%
15	252	4%	37%	33%	0%	8%	0%	0%	2%	3%	3%	4%	2%	0%	0%	2%	2%	100%
16	412	3%	34%	23%	0%	2%	0%	0%	1%	12%	12%	13%	0%	0%	0%	0%	0%	100%
17	1468	5%	53%	28%	0%	4%	0%	0%	1%	2%	2%	2%	1%	0%	0%	1%	1%	100%
18	1594	4%	36%	37%	0%	8%	0%	0%	2%	3%	3%	3%	1%	0%	0%	2%	1%	100%
19	30	3%	34%	23%	0%	2%	0%	0%	1%	12%	12%	13%	0%	0%	0%	0%	0%	100%
20	2794	4%	43%	37%	0%	5%	0%	0%	1%	1%	2%	2%	2%	0%	0%	2%	1%	100%
21	3287	4%	39%	38%	0%	5%	0%	0%	1%	1%	1%	1%	2%	0%	1%	4%	3%	100%
22	4585	4%	44%	38%	0%	5%	0%	0%	2%	1%	1%	1%	1%	0%	0%	2%	1%	100%
23	3059	4%	41%	39%	0%	5%	0%	0%	2%	1%	1%	2%	2%	0%	0%	2%	1%	100%
24	1462	4%	38%	37%	0%	5%	0%	0%	2%	2%	2%	2%	3%	0%	0%	3%	2%	100%
25	364	4%	40%	25%	0%	3%	0%	0%	1%	0%	0%	0%	4%	0%	2%	12%	9%	100%
26	1128	4%	37%	36%	0%	5%	0%	0%	1%	2%	2%	3%	4%	0%	0%	3%	3%	100%
27	218	4%	42%	26%	0%	4%	0%	0%	1%	0%	0%	0%	2%	0%	2%	11%	8%	100%
28	25	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	8%	52%	40%	100%
29	780	4%	39%	32%	0%	5%	0%	0%	1%	2%	2%	2%	3%	0%	1%	5%	4%	100%
30	3075	3%	34%	34%	0%	8%	0%	0%	2%	1%	2%	2%	0%	0%	1%	7%	6%	100%
31	1429	2%	26%	42%	0%	2%	0%	0%	0%	1%	2%	2%	1%	0%	2%	11%	9%	100%
32	1174	2%	26%	26%	0%	5%	0%	0%	1%	2%	2%	2%	1%	0%	3%	17%	13%	100%
33	916	2%	21%	35%	0%	2%	0%	0%	0%	1%	1%	1%	2%	0%	3%	18%	14%	100%
34	751	1%	6%	12%	0%	16%	0%	0%	4%	2%	2%	2%	3%	0%	4%	27%	21%	100%
35	453	1%	10%	13%	0%	11%	0%	0%	3%	2%	3%	3%	1%	0%	4%	28%	21%	100%
36	565	1%	6%	12%	0%	17%	0%	0%	5%	3%	3%	3%	3%	0%	4%	24%	19%	100%
37	599	2%	15%	19%	0%	7%	0%	0%	2%	3%	3%	4%	1%	0%	3%	23%	18%	100%
38	815	3%	28%	38%	0%	3%	0%	0%	1%	6%	6%	7%	2%	0%	0%	3%	3%	100%
39	417	3%	29%	35%	0%	7%	0%	0%	2%	3%	3%	3%	4%	0%	1%	6%	4%	100%
40	815	1%	8%	15%	0%	21%	0%	0%	6%	1%	1%	2%	1%	0%	3%	23%	18%	100%
41	645	2%	24%	29%	0%	11%	0%	0%	3%	3%	4%	4%	1%	0%	1%	10%	8%	100%
42	59	3%	33%	37%	0%	4%	0%	0%	1%	6%	7%	7%	2%	0%	0%	0%	0%	100%
43	14	3%	33%	36%	0%	11%	0%	0%	3%	2%	2%	3%	6%	1%	0%	0%	0%	100%
44	528	2%	24%	42%	0%	2%	0%	0%	1%	2%	2%	2%	1%	0%	2%	11%	9%	100%
45	760	3%	31%	40%	0%	3%	0%	0%	1%	2%	3%	3%	0%	0%	1%	7%	6%	100%
46	4013	4%	40%	35%	0%	5%	0%	0%	1%	2%	2%	2%	1%	0%	1%	4%	3%	100%
47	4469	4%	44%	38%	0%	5%	0%	0%	2%	1%	1%	2%	1%	0%	0%	1%	1%	100%
48	82	4%	40%	37%	0%	1%	0%	0%	0%	4%	4%	4%	6%	0%	0%	0%	0%	100%
49	1732	4%	40%	42%	0%	6%	0%	0%	2%	1%	1%	1%	2%	0%	0%	1%	0%	100%

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No	Total Vehicle	Motor Cycles	Petrol PC & LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC&LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV >3.5t	HGV <15t	HGV >15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
50	313	4%	38%	35%	0%	2%	0%	0%	0%	4%	4%	5%	6%	0%	0%	1%	1%	100%
51	193	3%	33%	42%	0%	2%	0%	0%	0%	3%	3%	4%	9%	1%	0%	0%	0%	100%
52	895	4%	36%	34%	0%	2%	0%	0%	0%	5%	5%	4%	6%	1%	0%	2%	1%	100%
53	519	0%	5%	10%	0%	17%	0%	0%	5%	2%	2%	3%	3%	0%	4%	28%	21%	100%
54	831	2%	21%	26%	0%	9%	0%	0%	3%	4%	4%	3%	1%	0%	2%	14%	11%	100%
55	690	3%	29%	40%	0%	12%	0%	0%	3%	3%	3%	2%	1%	0%	0%	2%	2%	100%
56	277	3%	29%	35%	0%	8%	0%	0%	2%	6%	6%	7%	2%	0%	0%	1%	1%	100%
57	867	2%	20%	40%	0%	21%	0%	0%	6%	3%	3%	3%	0%	0%	0%	1%	1%	100%
58	658	3%	27%	50%	0%	8%	0%	0%	2%	3%	3%	4%	0%	0%	0%	0%	0%	100%
59	4684	4%	44%	11%	0%	8%	0%	0%	2%	5%	5%	4%	6%	1%	1%	5%	4%	100%
60	1516	6%	60%	14%	0%	8%	0%	0%	2%	2%	2%	2%	1%	0%	0%	2%	1%	100%
61	3172	5%	56%	13%	0%	8%	0%	0%	2%	2%	2%	2%	2%	0%	1%	4%	3%	100%
62	4213	6%	60%	15%	0%	8%	0%	0%	3%	1%	1%	2%	1%	0%	0%	2%	1%	100%
63	4214	6%	60%	15%	0%	8%	0%	0%	3%	1%	1%	2%	1%	0%	0%	2%	1%	100%
64	833	4%	44%	39%	0%	5%	0%	0%	1%	2%	2%	2%	1%	0%	0%	0%	0%	100%
65	1044	5%	49%	33%	0%	4%	0%	0%	1%	1%	1%	2%	4%	0%	0%	0%	0%	100%
66	225	4%	45%	40%	0%	5%	0%	0%	2%	1%	1%	2%	0%	0%	0%	0%	0%	100%
67	2160	4%	45%	39%	0%	5%	0%	0%	2%	1%	1%	2%	1%	0%	0%	0%	0%	100%
68	590	2%	22%	19%	0%	8%	0%	0%	2%	9%	9%	9%	19%	1%	0%	0%	0%	100%
69	271	5%	47%	41%	0%	5%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	100%
70	467	4%	42%	37%	0%	13%	0%	0%	4%	0%	0%	0%	0%	0%	0%	0%	0%	100%
71	1640	3%	33%	29%	0%	11%	0%	0%	3%	4%	4%	4%	8%	1%	0%	0%	0%	100%
72	441	5%	54%	36%	0%	4%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	100%
73	2144	4%	38%	34%	0%	12%	0%	0%	4%	1%	1%	2%	3%	0%	0%	1%	0%	100%
74	914	5%	52%	34%	0%	4%	0%	0%	1%	0%	0%	0%	0%	0%	0%	2%	2%	100%
75	2144	4%	38%	34%	0%	12%	0%	0%	4%	1%	1%	2%	3%	0%	0%	1%	0%	100%
76	527	5%	50%	33%	0%	5%	0%	0%	1%	0%	0%	0%	0%	0%	0%	3%	3%	100%
77	98	4%	41%	36%	0%	13%	0%	0%	4%	0%	0%	1%	1%	0%	0%	0%	0%	100%
78	462	5%	46%	31%	0%	5%	0%	0%	1%	2%	2%	2%	6%	0%	0%	0%	0%	100%
79	744	4%	43%	43%	0%	4%	0%	0%	1%	1%	1%	0%	3%	0%	0%	0%	0%	100%
80	1269	4%	40%	42%	0%	7%	0%	0%	2%	1%	1%	0%	2%	0%	0%	1%	0%	100%
81	1383	4%	39%	35%	0%	13%	0%	0%	4%	1%	1%	1%	2%	0%	0%	0%	0%	100%
82	1240	5%	50%	33%	0%	5%	0%	0%	1%	1%	1%	1%	3%	0%	0%	0%	0%	100%
83	791	4%	37%	38%	0%	3%	0%	0%	1%	2%	2%	1%	6%	1%	0%	3%	2%	100%
84	1719	3%	36%	31%	0%	12%	0%	0%	3%	2%	2%	2%	5%	0%	0%	2%	2%	100%
85	709	5%	48%	33%	0%	4%	0%	0%	1%	1%	1%	1%	3%	0%	0%	2%	1%	100%
86	938	3%	35%	30%	0%	11%	0%	0%	3%	2%	2%	2%	5%	0%	1%	4%	2%	100%
87	64	4%	37%	25%	0%	2%	0%	0%	1%	0%	0%	0%	0%	0%	2%	16%	13%	100%
88	200	0%	5%	16%	0%	31%	1%	0%	8%	1%	1%	0%	0%	0%	3%	19%	15%	100%
89	46	3%	36%	30%	0%	12%	0%	0%	3%	3%	3%	3%	6%	1%	0%	0%	0%	100%
90	866	2%	20%	40%	0%	21%	0%	0%	6%	3%	3%	3%	0%	0%	0%	1%	1%	100%
91	658	3%	27%	50%	0%	8%	0%	0%	2%	3%	3%	4%	0%	0%	0%	0%	0%	100%
92	511	4%	41%	41%	0%	3%	0%	0%	1%	1%	1%	2%	6%	0%	0%	0%	0%	100%
93	851	4%	38%	40%	0%	6%	0%	0%	2%	2%	2%	2%	4%	0%	0%	0%	0%	100%
94	1248	5%	52%	12%	0%	7%	0%	0%	2%	2%	2%	2%	1%	0%	1%	8%	6%	100%
95	1167	5%	50%	12%	0%	6%	0%	0%	2%	2%	2%	3%	2%	0%	1%	8%	7%	100%
96	1259	5%	51%	12%	0%	7%	0%	0%	2%	2%	2%	2%	1%	0%	1%	8%	7%	100%
97	1556	5%	54%	13%	0%	8%	0%	0%	2%	2%	2%	2%	2%	0%	1%	5%	4%	100%
98	1727	4%	37%	33%	0%	12%	0%	0%	4%	1%	1%	2%	3%	0%	0%	2%	1%	100%

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Total Vehicles	Motor Cycles	Petrol PC & LGV	Taxi	Non-franchise Buses <6.4t	Non-franchise Buses 6.4-15t	Non-franchise Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC & LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV >3.5t	HGV <15t	HGV >15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
99	227	4%	46%	31%	0%	3%	0%	0%	1%	1%	1%	1%	3%	0%	1%	5%	3%	100%
100	54	4%	40%	48%	0%	5%	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%	100%
101	4262	5%	50%	28%	0%	3%	0%	0%	1%	4%	4%	4%	1%	0%	0%	0%	0%	100%
102	3602	6%	56%	24%	0%	4%	0%	0%	1%	2%	2%	1%	4%	0%	0%	0%	0%	100%
103	1049	4%	38%	34%	0%	12%	0%	0%	3%	2%	2%	2%	3%	0%	0%	0%	0%	100%
104	1634	6%	61%	26%	0%	5%	0%	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	100%
105	1490	5%	55%	30%	0%	1%	0%	0%	0%	3%	3%	2%	1%	0%	0%	0%	0%	100%
106	4187	6%	63%	22%	0%	2%	0%	0%	1%	1%	1%	1%	2%	1%	0%	0%	0%	100%
107	5752	5%	51%	28%	0%	2%	0%	0%	1%	4%	4%	4%	1%	0%	0%	0%	0%	100%
108	4187	6%	63%	22%	0%	2%	0%	0%	1%	1%	1%	1%	2%	1%	0%	0%	0%	100%
109	4917	5%	52%	27%	0%	2%	0%	0%	1%	4%	4%	4%	1%	0%	0%	0%	0%	100%
110	265	4%	42%	24%	0%	7%	0%	0%	2%	1%	1%	1%	2%	0%	1%	8%	7%	100%
111	134	4%	40%	35%	0%	5%	0%	0%	1%	4%	4%	5%	2%	0%	0%	0%	0%	100%
112	635	5%	48%	28%	0%	3%	0%	0%	1%	2%	2%	2%	1%	0%	1%	4%	3%	100%
113	635	5%	51%	29%	0%	3%	0%	0%	1%	1%	1%	0%	2%	0%	1%	4%	2%	100%
114	1713	5%	50%	22%	0%	4%	0%	0%	1%	3%	3%	2%	6%	0%	0%	2%	2%	100%
115	1656	4%	37%	31%	0%	3%	0%	0%	1%	4%	4%	4%	2%	0%	1%	5%	4%	100%
116	835	4%	46%	36%	0%	3%	0%	0%	1%	1%	1%	1%	3%	0%	0%	2%	2%	100%
117	701	5%	50%	29%	0%	2%	0%	0%	1%	1%	1%	1%	2%	0%	1%	4%	3%	100%
118	1884	4%	45%	37%	0%	2%	0%	0%	1%	2%	2%	1%	2%	0%	0%	2%	2%	100%
119	1241	4%	44%	37%	0%	4%	0%	0%	1%	2%	2%	2%	1%	0%	0%	2%	1%	100%
120	1542	4%	43%	24%	0%	5%	0%	0%	1%	1%	1%	1%	3%	0%	1%	9%	7%	100%
121	503	2%	24%	17%	0%	5%	0%	0%	1%	2%	2%	1%	4%	0%	3%	22%	17%	100%
122	637	5%	48%	27%	0%	5%	0%	0%	2%	1%	1%	2%	3%	0%	0%	3%	3%	100%
123	879	5%	49%	8%	0%	6%	0%	0%	2%	1%	1%	2%	2%	0%	2%	12%	10%	100%
124	1761	4%	37%	28%	0%	5%	0%	0%	1%	1%	1%	2%	4%	0%	1%	9%	7%	100%
125	1412	4%	39%	33%	0%	4%	0%	0%	1%	3%	3%	3%	1%	0%	1%	5%	3%	100%
126	1205	5%	47%	40%	0%	4%	0%	0%	1%	1%	1%	1%	0%	0%	0%	0%	0%	100%
127	4426	4%	38%	31%	0%	5%	0%	0%	2%	3%	3%	4%	5%	0%	0%	3%	2%	100%
128	1138	4%	40%	10%	0%	5%	0%	0%	1%	7%	7%	7%	8%	1%	1%	5%	4%	100%
129	5085	3%	35%	23%	0%	7%	0%	0%	2%	5%	5%	6%	6%	0%	1%	4%	3%	100%
130	1538	4%	44%	39%	0%	5%	0%	0%	1%	2%	2%	2%	1%	0%	0%	0%	0%	100%
131	1590	4%	39%	37%	0%	5%	0%	0%	1%	3%	3%	2%	4%	0%	0%	1%	1%	100%
132	1760	6%	60%	14%	0%	8%	0%	0%	3%	2%	2%	2%	2%	0%	0%	1%	0%	100%
133	2374	6%	57%	14%	0%	8%	0%	0%	2%	2%	2%	3%	2%	0%	0%	2%	2%	100%
134	849	6%	61%	15%	0%	8%	0%	0%	3%	2%	2%	2%	1%	0%	0%	0%	0%	100%
135	1301	5%	53%	13%	0%	8%	0%	0%	2%	3%	3%	3%	2%	0%	1%	4%	3%	100%
136	1258	4%	45%	24%	0%	7%	0%	0%	2%	3%	3%	2%	5%	0%	0%	3%	2%	100%
137	1224	6%	57%	14%	0%	8%	0%	0%	2%	1%	1%	0%	2%	0%	1%	5%	3%	100%
138	907	6%	56%	13%	0%	8%	0%	0%	3%	3%	3%	3%	2%	0%	0%	2%	1%	100%
139	207	5%	47%	41%	0%	5%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	100%
140	7208	5%	48%	28%	0%	2%	0%	0%	1%	4%	4%	4%	1%	0%	0%	2%	1%	100%
141	6535	6%	58%	23%	0%	2%	0%	0%	1%	1%	1%	2%	3%	0%	0%	1%	1%	100%
142	1039	4%	43%	38%	0%	5%	0%	0%	2%	2%	2%	3%	1%	0%	0%	0%	0%	100%
143	1261	4%	43%	38%	0%	5%	0%	0%	2%	2%	2%	3%	1%	0%	0%	0%	0%	100%
144	1058	4%	41%	32%	0%	5%	0%	0%	2%	2%	2%	2%	6%	1%	0%	2%	1%	100%
145	1683	6%	60%	7%	0%	5%	0%	0%	1%	3%	3%	3%	9%	1%	0%	1%	1%	100%
146	209	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	8%	52%	40%	100%
147	1308	4%	45%	21%	0%	5%	0%	0%	1%	1%	1%	2%	3%	0%	1%	9%	7%	100%

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No	Total Vehicle	Motor Cycles	Petrol PC & LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4t-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC & LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV >3.5t	HGV <15t	HGV >15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
148	1952	4%	46%	24%	0%	5%	0%	0%	1%	1%	1%	2%	3%	0%	1%	7%	5%	100%
149	332	2%	18%	11%	0%	3%	0%	0%	1%	0%	0%	1%	1%	0%	5%	33%	25%	100%
150	923	5%	50%	29%	0%	2%	0%	0%	1%	1%	1%	2%	2%	0%	1%	4%	2%	100%
151	1033	4%	39%	23%	0%	7%	0%	0%	2%	1%	1%	2%	3%	0%	1%	9%	8%	100%
152	282	1%	13%	7%	0%	2%	0%	0%	1%	0%	0%	1%	1%	0%	6%	38%	30%	100%
153	47	4%	44%	26%	0%	7%	0%	0%	2%	4%	4%	3%	6%	0%	0%	0%	0%	100%
154	1724	5%	49%	27%	0%	5%	0%	0%	1%	2%	2%	2%	5%	0%	0%	1%	1%	100%
155	1792	5%	47%	26%	0%	5%	0%	0%	1%	2%	2%	3%	5%	0%	0%	2%	2%	100%
156	696	5%	47%	27%	0%	8%	0%	0%	2%	1%	1%	1%	2%	0%	0%	3%	3%	100%
157	70	2%	19%	11%	0%	3%	0%	0%	1%	1%	1%	2%	3%	0%	4%	30%	23%	100%
158	380	4%	46%	26%	0%	5%	0%	0%	1%	1%	1%	2%	3%	0%	1%	6%	4%	100%
159	2116	4%	44%	34%	0%	5%	0%	0%	1%	1%	1%	2%	4%	0%	0%	2%	2%	100%
160	799	4%	45%	39%	0%	3%	0%	0%	1%	1%	1%	0%	3%	0%	0%	2%	1%	100%
161	1183	4%	42%	41%	0%	2%	0%	0%	1%	2%	2%	1%	2%	0%	0%	2%	1%	100%
162	958	5%	49%	21%	0%	7%	0%	0%	2%	2%	2%	3%	5%	0%	0%	2%	2%	100%
163	476	5%	46%	39%	0%	4%	0%	0%	1%	1%	1%	2%	1%	0%	0%	0%	0%	100%
164	581	4%	43%	31%	0%	6%	0%	0%	2%	3%	3%	2%	2%	0%	0%	2%	2%	100%
165	958	5%	49%	21%	0%	7%	0%	0%	2%	2%	2%	3%	5%	0%	0%	2%	2%	100%
166	765	4%	43%	36%	0%	4%	0%	0%	1%	2%	2%	1%	1%	0%	0%	3%	3%	100%
167	1252	5%	50%	28%	0%	3%	0%	0%	1%	2%	2%	3%	2%	0%	0%	2%	2%	100%
168	1464	4%	44%	38%	0%	5%	0%	0%	2%	2%	2%	2%	1%	0%	0%	0%	0%	100%
169	1039	4%	43%	38%	0%	5%	0%	0%	2%	2%	2%	3%	1%	0%	0%	0%	0%	100%
170	1179	4%	44%	39%	0%	5%	0%	0%	1%	2%	2%	2%	1%	0%	0%	0%	0%	100%
171	2222	5%	50%	24%	0%	5%	0%	0%	1%	3%	3%	3%	6%	0%	0%	0%	0%	100%
172	1644	6%	56%	13%	0%	8%	0%	0%	2%	1%	1%	0%	1%	0%	1%	6%	5%	100%
173	3775	5%	56%	13%	0%	8%	0%	0%	2%	2%	2%	1%	2%	0%	1%	5%	3%	100%
174	3697	4%	46%	16%	0%	7%	0%	0%	2%	4%	4%	4%	6%	0%	1%	4%	2%	100%
175	635	5%	51%	29%	0%	3%	0%	0%	1%	1%	1%	0%	2%	0%	1%	4%	2%	100%
176	1993	4%	44%	34%	0%	5%	0%	0%	1%	1%	1%	2%	4%	0%	0%	2%	2%	100%
177	253	5%	49%	28%	0%	3%	0%	0%	1%	1%	1%	0%	5%	0%	1%	4%	2%	100%
178	1084	7%	76%	0%	0%	5%	0%	0%	2%	2%	2%	2%	3%	0%	0%	1%	0%	100%
179	254	7%	68%	14%	0%	5%	0%	0%	1%	1%	1%	1%	2%	0%	0%	0%	0%	100%
180	471	4%	38%	33%	0%	12%	0%	0%	4%	2%	2%	1%	4%	0%	0%	0%	0%	100%
181	698	5%	51%	34%	0%	5%	0%	0%	1%	1%	1%	0%	2%	0%	0%	0%	0%	100%
182	655	5%	48%	26%	0%	5%	0%	0%	1%	2%	2%	3%	7%	1%	0%	0%	0%	100%
183	193	5%	47%	25%	0%	5%	0%	0%	1%	3%	3%	2%	8%	1%	0%	0%	0%	100%
184	1293	4%	37%	30%	0%	7%	0%	0%	2%	4%	4%	3%	7%	1%	0%	0%	0%	100%
185	1039	4%	43%	38%	0%	5%	0%	0%	2%	2%	2%	3%	1%	0%	0%	0%	0%	100%
186	851	3%	36%	31%	0%	12%	0%	0%	3%	2%	2%	3%	5%	0%	0%	2%	1%	100%
187	257	3%	31%	27%	0%	10%	0%	0%	3%	3%	3%	3%	6%	0%	1%	6%	4%	100%
188	559	4%	39%	35%	0%	12%	0%	0%	4%	1%	1%	2%	2%	0%	0%	0%	0%	100%
189	3872	5%	53%	31%	0%	2%	0%	0%	0%	1%	1%	2%	2%	0%	0%	2%	1%	100%
190	6048	3%	36%	40%	0%	6%	0%	0%	2%	2%	2%	1%	3%	0%	0%	3%	2%	100%
191	3450	3%	33%	32%	0%	7%	0%	0%	2%	2%	2%	3%	0%	0%	1%	8%	7%	100%
192	2275	3%	32%	36%	0%	5%	0%	0%	1%	1%	1%	1%	2%	0%	1%	9%	8%	100%
193	420	4%	37%	34%	0%	12%	0%	0%	3%	2%	2%	2%	3%	0%	0%	1%	0%	100%
194	1337	5%	52%	34%	0%	4%	0%	0%	1%	1%	1%	0%	2%	0%	0%	0%	0%	100%
195	322	3%	36%	32%	0%	12%	0%	0%	3%	1%	1%	0%	1%	0%	1%	6%	4%	100%
196	1073	5%	46%	31%	0%	4%	0%	0%	1%	2%	2%	1%	5%	0%	0%	2%	1%	100%

2031 EIA Traffic Flows by 16 Vehicle Classes

Link No.	Total Vehicle	Motor Cycles	Petrol PC & LGV	Taxi	Non-franchised Buses <6.4t	Non-franchised Buses 6.4-15t	Non-franchised Buses >15t	Public Light Buses <3.5t	Public Light Buses >3.5t	Diesel PC&LGV <2.5t	Diesel LGV 2.5-3.5t	Diesel LGV>3.5t	HGV<15t	HGV>15t	Single Deck Franchised Buses	Double Deck Franchised Buses	Public Light Buses	Total
197	1602	4%	39%	34%	0%	12%	0%	0%	4%	1%	1%	2%	3%	0%	0%	0%	0%	100%
198	93	4%	39%	42%	0%	7%	0%	0%	2%	1%	1%	1%	3%	0%	0%	0%	0%	100%
199	613	4%	45%	39%	0%	3%	0%	0%	1%	1%	1%	0%	3%	0%	0%	2%	1%	100%
200	879	6%	56%	13%	0%	8%	0%	0%	2%	4%	4%	3%	3%	0%	0%	1%	0%	100%
201	1157	5%	55%	13%	0%	8%	0%	0%	2%	4%	4%	5%	3%	0%	0%	1%	0%	100%
202	708	4%	43%	37%	0%	5%	0%	0%	2%	2%	2%	3%	1%	0%	0%	1%	0%	100%
203	1765	3%	36%	34%	0%	5%	0%	0%	1%	1%	1%	2%	2%	0%	1%	8%	6%	100%
204	2664	4%	39%	33%	0%	3%	0%	0%	1%	3%	3%	3%	1%	0%	1%	5%	4%	100%
205	710	6%	56%	24%	0%	4%	0%	0%	1%	2%	2%	1%	4%	0%	0%	0%	0%	100%
206	959	6%	54%	30%	0%	0%	0%	0%	0%	3%	3%	3%	1%	0%	0%	0%	0%	100%
207	5569	5%	54%	23%	0%	4%	0%	0%	1%	2%	2%	2%	4%	1%	0%	1%	1%	100%
208	6322	5%	51%	28%	0%	0%	0%	0%	0%	4%	4%	4%	1%	0%	0%	2%	1%	100%
209	1164	4%	40%	31%	0%	5%	0%	0%	2%	2%	2%	2%	6%	0%	0%	3%	3%	100%
210	272	1%	10%	6%	0%	2%	0%	0%	0%	1%	1%	0%	2%	0%	6%	40%	31%	100%
211	1476	4%	41%	22%	0%	4%	0%	0%	1%	2%	2%	3%	4%	0%	1%	9%	7%	100%
212	1286	4%	41%	32%	0%	5%	0%	0%	1%	2%	2%	2%	5%	1%	0%	3%	3%	100%
213	272	1%	10%	6%	0%	2%	0%	0%	0%	1%	1%	0%	2%	0%	6%	40%	31%	100%
214	1604	4%	42%	23%	0%	4%	0%	0%	2%	2%	2%	2%	3%	1%	1%	8%	7%	100%
215	143	5%	47%	20%	0%	3%	0%	0%	1%	5%	5%	4%	9%	1%	0%	0%	0%	100%
216	429	5%	52%	28%	0%	1%	0%	0%	0%	4%	4%	5%	1%	0%	0%	0%	0%	100%
217	707	5%	56%	23%	0%	4%	0%	0%	1%	2%	2%	2%	4%	1%	0%	0%	0%	100%
218	993	5%	54%	30%	0%	1%	0%	0%	0%	3%	3%	3%	1%	0%	0%	0%	0%	100%