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16 CONCLUSIONS

16.1 Alternative Options

- 16.1.1 A number of site options were long-listed at the Site Selection Study for HKBCF in Mid 2007. As the Site Selection Study and then the Investigation Consultancy proceed, relevant factors or assessment results were revealed which rendered most of the site options not feasible. Eventually, only one site option (Option NECLK) locating the HKBCF in the water adjacent to the north-eastern side of the Airport Island was confirmed as viable.
- 16.1.2 With NECLK determined as the site location for HKBCF, three alignment options were considered for HKLR. Amongst the three alignment options, two of them were evaluated as not feasible. The only feasible option is an alignment in the form of a viaduct routed through the Airport Channel, referred to as Alignment Option (A).
- 16.1.3 It should also be noted that the originally proposed elevated viaduct form for the portion of HKLR under Alignment Option (A) at the waters off the south-eastern side of the Airport Island facing Tung Chung was revised to a tunnel cum at-grade road form in response to public concerns.

16.2 Construction Descriptions

- 16.2.1 The HZMB is targeted to be commissioned by 2015. To meet this target:
- (a) Construction of the HKLR will start in 2011, for completion in 2015, with a construction period of 4 years; *[At this stage, there is still some flexibility on the exact timing within 2011 for starting the construction of HKLR. However, it is patently desirable to start construction earlier, say in Early 2011, so as to alleviate the acuteness of criticality of construction works.]*
 - (b) Construction of the HKBCF will start in the 3rd quarter of 2010, for first phase completion by End 2015, and second (final) phase completion by End 2016. *[The construction of HKBCF will involve reclamation, including lengthy surcharge-periods, followed by land-works including buildings and infrastructures etc. It is anticipated that the overall construction period for HKBCF will be at least 6 years. Even if construction (reclamation work) can start as early as 2010 3rd quarter, overall completion of HKBCF cannot be achieved by 2015. The reclamation and the landworks for HKBCF will therefore need to be completed in phases, such that at least a part i.e. the first-phase of HKBCF (the extent of which and the facilities within which are adequate to handle the initial stage of the commissioned HZMB) will be completed by End 2015.]*

16.3 Air Quality Impact

- 16.3.1 Fugitive dust assessment for the construction phase has concluded that 8 times/day watering in all works areas would be required to control fugitive dust impact.
- 16.3.2 A quantitative air quality assessment has been conducted to assess the cumulative impacts from all neighbouring pollution sources. The PATH model has been adopted to simulate the regional air quality effects, which has included various pollution sources in the PRDEZ. For the emission inventory in Hong Kong, various sources have also been included in the PATH model, including the power stations, Chek Lap Kok International Airport, marine emission, roads.

- 16.3.3 For the roads in North Lantau and the airport island, the vehicular emission has been estimated by using a finer model EmFAC, whilst CALINE4 and ISCST3 models have been used to simulate the local dispersion. The output of PATH, CALINE and ISCST have been combined and compared against the Hong Kong Air Quality Objectives (HKAQO). The combined results indicate that the cumulative air quality impacts at the identified receivers would comply with the HKAQO and hence there would not be any residual impacts.

16.4 Noise Impact

- 16.4.1 Construction noise assessment has been conducted. Results indicate that the noise impacts after the implementation of good site practices, quiet plant and some mitigation measures (eg temporary noise barriers etc) would comply with the stipulated noise criteria. Residual construction noise impacts are not anticipated.
- 16.4.2 The road traffic noise caused by the project has been simulated using the latest traffic forecast. Results indicate that the cumulative traffic noise impacts on all the noise sensitive receivers would comply with the relevant criterion. Hence, mitigation measures are not required and there are no residual operational traffic noise impacts.
- 16.4.3 Fixed noise sources during the operation phase include sewerage treatment plant, electric power substations etc. All these facilities are located at more than 1km from all existing noise sensitive receivers and hence cumulative noise impacts are not anticipated.

16.5 Sediment Quality

- 16.5.1 A marine GI with sediment sampling and laboratory testing has been undertaken and analysed in accordance with the requirements in ETWB 34/2002. The quantity of sediment that needs to be disposed of (in open sea or in dedicated disposal sites) has also been estimated.

16.6 Waste Management

- 16.6.1 The quantity and timing for the generation of waste during the construction phase have been estimated. Measures including reusing excavated materials for reclamation, recycling excavated bituminous material etc, are devised in the construction methodology to minimise the surplus materials to be disposed off-site. The annual disposal quantities for construction & demolition materials and their disposal methods have also been assessed. Measures have also been recommended for the Contractor to implement during the construction period to minimise waste generation and any off-site disposal.
- 16.6.2 The types and quantities of waste that would be generated during the operation phase have been assessed. Recommendations have been made to ensure proper treatment and proper disposal of these wastes.

16.7 Water Quality Impact

- 16.7.1 A quantitative water quality model has been set up to assess the potential impacts that dredging may cause on the neighbouring water quality sensitive receivers. Results indicate that, with the implementation of good implementation sequence and mitigation measures, the suspended solids would comply with requirements specified in the Water Quality Objectives. There would not be residual water quality impacts during the construction phase.

- 16.7.2 The HKLR Contractor will also be required to implement good site practices as stipulated in ProPECC Note 5/93 “Drainage Plan subject to Comment by the Environmental Protection Department”, ProPECC Note 1/94 “Construction Site Drainage” and “Recommended Pollution Control Clauses for Construction Contracts” in order to control the construction site discharges.
- 16.7.3 During the operation phase, hydrodynamic study also confirms that there would be insignificant impacts on Tai Ho Bay and other aquatic ecological sensitive receivers.

16.8 Ecological Impact

- 16.8.1 The Project has avoided direct impacts on recognised sites of conservation importance (e.g. SSSIs, Country Parks and Marine Parks), and other ecological sensitive areas (e.g. mudflats, mangroves, nursery sites of horseshoe crabs and woodland with Romer’s Frog record on Scenic Hill).
- 16.8.2 The majority of the HKLR and the entire HKBCF would be on newly reclaimed area or piers in sea areas. Less than 1 ha of grassland / shrubland in Scenic Hill will be affected by the tunnel portal of HKLR. As the grassland / shrubland are of low ecological value and the affected area size is very small, the impacts on the habitat area considered insignificant and no mitigation is required. Apart from Scenic Hill, no other identified terrestrial ecological sensitive area in the vicinity of the Projects.
- 16.8.3 The waters to the west of the Airport feature two areas of dolphin-conservation importance, viz the Sha Chau/Lung Kwu Chau Marine Park, and the waters near Tai O Peninsula to Fan Lau. The HKLR alignment passes between the two high dolphin-density areas. Impacts to Chinese White Dolphins (CWD) along this alignment can be expected to be less significant than if the alignment is to pass directly through either of the high dolphin-density areas.
- 16.8.4 The construction and operation of the HKLR would cause marine habitat loss and potential water quality impacts, but the reclaimed area is not highly used by dolphins and is of very low coverage of common gorgonians. A well-planned program of mitigation activities should be able to avoid most of the potential impacts to the CWD. Dolphins monitoring during construction will be thoroughly implemented. As a precautionary measure, a pre-construction dive survey would be conducted to identify any coral colonies suitable for translocation.
- 16.8.5 The construction and operation of the HKBCF would cause marine habitat loss and potential water quality impacts. The permanent loss of CWD habitat is a moderate impact requiring mitigation. To enhance the CWD habitat, the Administration has made a firm commitment to seek to designate the Brothers Islands as a marine park in accordance with the statutory process stipulated in the Marine Parks Ordinance. The designation of the proposed marine park would proceed after the completion of these projects. The Administration’s commitment to the marine park and subjecting it to control and management in accordance with the Marine Parks Ordinance as well as the Marine Parks and Marine Reserves Regulations would significantly help conserve the CWD, and hence serves as an effective mitigation measure for the loss of CWD habitat arising from these projects. With this committed measure, the residual impact (and cumulative impact) to CWD, in terms of permanent habitat loss, would therefore be acceptable.
- 16.8.6 It is proposed that new Artificial Reefs (ARs) will be installed, not only to replace the existing ARs inside Marine Exclusion Area, but also to serve as an enhancement measures. The volume of ARs to be installed will therefore be greater than that of the existing ARs.

16.9 Fisheries Impact

- 16.9.1 The construction and operation of HKLR and HKBCF would cause temporary and permanent fishing ground losses, but the loss area is not significant compared with the available fishing ground in Hong Kong waters. For the cumulative fishing ground loss, temporary loss of fishing ground during construction is small as the different potentially concurrent projects would not be constructed/operated at the same time. The cumulative permanent loss of sea area from these projects and other concurrent projects is also insignificant compared with the available fishing ground in Hong Kong waters.
- 16.9.2 Further, the areas to be reclaimed are not of high fisheries production rate, whilst the water quality impacts during construction could be mitigated. Except the Artificial Reefs (ARs) inside Marine Exclusion Zone, impacts on other fisheries sensitive receivers, such as the nearby fish and shrimp spawning ground, have been assessed and considered as acceptable.
- 16.9.3 Based on the water quality impact assessment, with the implementation of mitigation measures, there would not be significant residual water quality impacts from HKLR, HKBCF and other concurrent projects during the construction phase. During the operation phase, taking into account of concurrent projects, there would be minor changes in water quality, all of which comply with Water Quality Objectives. Other than the ARs inside Marine Exclusion Zone, impacts on the fish and shrimp spawning ground in North Lantau waters and Tung Chung Bay (i.e. the next nearest sites of fisheries sensitive receivers) are assessed and considered as not significant; impacts on other more distant sites (eg. Ma Wan FCZ) would be even less.
- 16.9.4 Reprovision of ARs will be implemented as a mitigation measure for the existing ARs inside Marine Exclusion Zone. Additional volume of ARs will also be deployed as an additional enhancement measure for fisheries resources. A well-planned program of water quality protection activities should enable avoidance of most of these potential impacts to fisheries and mariculture. Besides water quality monitoring, no specific fisheries monitoring programme would be required.
- 16.9.5 In addition, to enhance the Chinese White Dolphins (CWD) habitat, the Administration has made a firm commitment to seek to designate the Brothers Islands as a marine park in accordance with the statutory process stipulated in the Marine Parks Ordinance. The designation of the proposed marine park would proceed after the completion of these projects. With the establishment of the new marine park and implementation of management measures, the fisheries resource of the area will be better managed and together with the other ecological enhancement measures, will enhance the long-term sustainability of the fisheries industry in the area.

16.10 Cultural Heritage Impact

Terrestrial Archaeology

- 16.10.1 All the bridge structure would totally avoid the Sha Lo Wan (West) Archaeological Site during both the construction and operation phases. Hence, there will be no direct impacts. Mitigation measures are not required and there are no residual impacts.
- 16.10.2 As a precautionary measure, periodic monitoring of construction works should be conducted to ensure the avoidance of any impacts on the Sha Lo Wan (West) Archaeological Site. Access to the said archaeological site for works area and storage of construction equipment is not allowed.

Built Heritage

- 16.10.3 The project would not affect any built heritage in the vicinity. Mitigation measures are therefore not required and there are no residual impacts on built heritage.

Marine Archaeology

- 16.10.4 A literature review has concluded that there are no known marine archaeological sites within the project area which is located along an artificial shoreline. Geophysical survey and subsequent diver survey (conducted by a marine archaeologist) have also confirmed that the proposed reclamation and road works is unlikely to have adverse impacts on marine archaeology.

16.11 Hazard to life

- 16.11.1 For HKLR, the alignment would run close to the existing and planned fuel tank farms near Scenic Hill. A quantitative risk assessment has therefore been conducted as per the technical requirements in the TM-EIAO.
- 16.11.2 The level of risk for the construction and operational phases of HKLR has been quantified and demonstrated to be within the acceptable region of the Hong Kong Risk Guidelines. Good practice during both the construction and operational phases have been recommended.

16.12 Landscape and Visual Impacts

- 16.12.1 The major residual impacts are due to the proposed reclamation works for formation of HKBCF and at-grade HKLR along the southeast coast of Airport Island. The major impact would be induced on landscape resources of coastal water and inshore and offshore water landscape characters at the southwest, south and east of Hong Kong International Airport. Those impacts would result in direct loss of those LCAs and LRs. However, the quantity of loss of the seawater resources and characters is relatively small in comparison to the large extent of adjacent seawater landscape resource / character within inshore and offshore of Airport Island.
- 16.12.2 The semi-natural rocky shoreline along the southeast shoreline of Airport Island will also be affected by the proposed reclamation for the at-grade section of HKLR. The extent of the proposed reclamation for accommodating HKLR has been minimized. It would however result in a loss of this rocky shoreline. Mitigation measures to adopt natural rock armours and re-use the existing natural rocks in the construction of the new seawall together with introduction of native seashore planting will somewhat reduce the impacts on the shoreline. The mitigation measures will improve the visual quality of the newly formed shoreline.
- 16.12.3 Other landscape impacts are vegetation loss at Scenic Hill due to construction of the HKLR tunnel portal and to roadside landscaped areas are considered slight to moderate and would be largely mitigated by tree preservation measures and compensatory planting and enhancement landscaping. Therefore, residual impact is considered negligible after the re-instated vegetation has matured.
- 16.12.4 Total 32 VSRs are categorized in term of their proximity of locations and similarity of influence of local immediate visual screen. The properties of VSRs include urban and rural residential areas, industrial, leisure and traffic. The visual impacts on VSRs for local residents are resulted as various depending on the distance between the project and such VSRs, the population of such VSRs and blockage of view potentially.
- 16.12.5 Transport facilities for the proposed development are also a significant source of impact to VSRs. Relatively higher visual impacts induced are concentrated on the VSRs for residents of existing and future residential areas.

- 16.12.6 Regarding the potential residual visual impacts associated with HKLR, there would be moderate level of impacts to the rural residential VSRs in Tai O, Sham Wat Wan, San Shek Wan, Sha Lo Wan and San Tau during construction and operation phases. The distance between HKLR and these residential VSRs is shorter than that of other VSRs. This is because HKLR is aligned to prevent disturbing the existing Touch-down Zone of Southern Runway of Hong Kong International Airport in order to maintain aviation safety. The remaining potential residual visual impacts result in slight to moderate impacts during construction phase and from negligible to moderate during operation phase.
- 16.12.7 HKLR adopts a section of tunnel in the vicinity of Tung Chung urban area, and the tunnel effectively reduces the level of potential residual visual impact to the VSRs located in the urban residential areas.
- 16.12.8 Regarding the potential residual visual impacts by HKBCF, they are slight and negligible during construction and operation phases due to the integration of HKBCF and the Airport in view of their similarity in appearance. The amenity value of alternative views from the VSRs is high after the erection of HKBCF and HKLR. Proper mitigation measures (e.g. aesthetic engineering and architectural design on structural forms and building facade, optimum greening treatment – rooftop and at-grade level and so on, for enhancing the aesthetics of HKBCF and HKLR during the detailed design stage) would further minimise any potential visual impacts.
- 16.12.9 In conclusion, the potential landscape and visual impacts can be effectively reduced by implementing the proposed mitigation measures during construction and operation phases. The overall residual impacts are considered as “acceptable with mitigation measures” after implementing the mitigation measures.

16.13 Environmental Monitoring and Audit Requirements

- 16.13.1 It is recommended to implement an Environmental Monitoring and Audit (EM&A) programme throughout the entire construction period to monitor the environmental impacts on the neighbouring sensitive receivers regularly.
- 16.13.2 An EM&A Manual has been prepared as a standalone document to specify the monitoring requirements, timeframe and responsibilities for the implementation of the environmental mitigation measures identified in the EIA process.
- 16.13.3 An Environmental Mitigation Implementation Schedule is included in the EM&A Manual to summarise all the measures, the implementation location, timeframe, agency etc.

16.14 Recommendations

- 16.14.1 With the adoption of the recommended integrated and mitigation measures and the protection of the above sensitive receivers, the project is not predicted to result in any adverse residual environmental impacts. The project would fully comply with all environmental regulations and standards prevailing in Hong Kong.