

**Agreement No. CE 42/2008 (CE)
Tseung Kwan O – Lam Tin Tunnel and Associated Works – Investigation**

Environmental Impact Assessment Report

Executive Summary

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1 INTRODUCTION

1.1 Project Background

- 1.1.1 In 2002, Civil Engineering and Development Department (CEDD) commissioned an integrated planning and engineering study under Agreement No. CE 87/2001 (CE) “Further Development of Tseung Kwan O – Feasibility Study” (the “TKO Study”) to formulate a comprehensive plan for further development of TKO New Town. It recommended to further develop TKO to house a total population of 450,000 besides the district’s continuous commercial and industrial developments.
- 1.1.2 At present, the Tseung Kwan O Tunnel is the main connection between Tseung Kwan O (TKO) and other areas in the territory. To cope with the anticipated transport need, the TKO Study recommended the provision of Tseung Kwan O – Lam Tin Tunnel (TKO-LT Tunnel) and Cross Bay Link (CBL) to meet the long-term traffic demand between TKO and the external areas.
- 1.1.3 The TKO-LT Tunnel, together with the proposed Trunk Road T2 in Kai Tak Development (KTD) and Central Kowloon Route (CKR), will form Route 6 in the strategic road network. Route 6 will provide an east-west express link between Kowloon and TKO areas. Upon completion, this strategic route will also provide the necessary relief to the existing heavily trafficked road network in the central and eastern Kowloon areas, and reduce the related environmental impacts on these areas.
- 1.1.4 AECOM Asia Co. Ltd. was commissioned by CEDD to carry out the Environmental Impact Assessment (EIA) study on Tseung Kwan O – Lam Tin Tunnel and Association Works – Investigation (hereafter referred to as “the Project”).

1.2 Preferred Development Option

- 1.2.1 Various options and alternatives of project design have been reviewed and considered in the course of development and selection of the preferred option for the Project, taking into account of engineering feasibility, site constraints, and environmental aspects. Other factors, including geographical and geological consideration, interface with existing facilities, operational safety, flexibility and maintenance requirements, constructability, land acquisition and disruption to the community were also given due consideration in the selection process of alternative alignment for the Project.
- 1.2.2 The recommended preferred option is regarded as the most appropriate and balanced scheme, which can minimise the potential environmental impacts associated with the Project and achieve the needs of the Project:
- The recommended preferred option would avoid the clearance of vegetation on the disturbed woodland on the slope located between the Kwong Tin Estate and Lei Yue Mun Road, just north of Yau Tong Service Reservoir, reaching all the way to the southern region of On Tin Estate by relocating the tunnel portal to urbanized developed area with lower ecological value.
 - The option with minimal reclamation extent (approximately 3 ha) has been selected. Potential environmental impacts such as water quality, marine ecology, and waste associated with the reclamation works would be avoided or minimized.
 - The selected alignment option would avoid the direct impact and disturbance to the

natural habitats (rocky shore and stream) along the coastline of Chiu Keng Wan where fish of conservation interest (Philippine Neon Goby and Grass Puffer Fish) were previously recorded. With the natural coastline along Chiu Keng Wan preserved, there would be no blockage to the passage between the stream habitat and coastal water where potential migration of Philippine Neon Goby may occur.

- Section of Road P2 at the eastern side of Ocean Shores has been designed as depressed road covering with landscape deck to minimize potential environmental impacts on the nearby sensitive receivers.

1.2.3 The general layout plan of the Recommended Scheme is shown in **Figure 1.1**.

2 PROJECT DESCRIPTION

2.1 Project Scope

2.1.1 The outlined scope of the Project under this Assignment is to provide a highway connecting TKO at Po Shun Road in the east and Trunk Road T2 in the west with the associated interchange. It comprises the following key elements:

- (a) a dual two-lane highway approximately 4.2 km long. About 2.6 km of the highway is in the form of tunnel;
- (b) slip roads, depressed roads, viaducts, TKO Interchange, ventilation buildings, tunnel portal facilities and around 3 ha reclamation on TKO side;
- (c) slip roads, branch tunnels, viaducts, Lam Tin Interchange, tunnel portal facilities, ventilation and administration buildings on Kowloon side; and
- (d) the associated building, civil, structural, marine, electrical and mechanical, traffic control and surveillance system (TCSS), landscaping, and environmental protection mitigation works.

2.2 Project Programme

2.2.1 The Project construction works are anticipated to commence in early 2016 with completion of the Project by end 2020.

2.3 Need of the project

2.3.1 At present, the existing TKO Tunnel is the main connection between TKO and the urban areas of Kowloon and Hong Kong. Traffic congestions have already occurred during peak hours at TKO Tunnel. Its volume/capacity (v/c) ratio is around 1.14. It is envisaged that the congestion during peak hours at TKO Tunnel would worsen, with the v/c ratio and queue length (measured from toll plaza) of Kowloon-bound traffic during peak hours reaching 1.38 and 2.9 km respectively. The above data indicates that the traffic volume of the existing TKO Tunnel will continue to increase and its capacity would not be able to cope with the estimated traffic volume in year 2021.

2.3.2 The Legislative Council, Sai Kung District Council and the local community have been urging for early construction of TKO-LT Tunnel together with CBL such that these new roads will provide the much needed additional transport capacity to meet the anticipated future demand.

2.4 Benefit of the project

- 2.4.1 Traffic congestion is now common on many of the existing east-west surface routes. A new east-west traffic route is required to bypass these areas. Upon completion of Route 6, an alternative east-west traffic route across Kowloon will be provided to cope with new developments and relieve the existing heavily trafficked road network in central and eastern Kowloon areas. This will reduce journey time and numbers for vehicles and the associated environmental impact along the existing routes.
- 2.4.2 With the presence of TKO-LT Tunnel, some of the traffic will be attracted to use TKO-LT Tunnel. Traffic loading on Kwun Tong Bypass, Lei Yue Mun Road, TKO Tunnel Road and Wan Po Road will be reduced and the environmental impact due to traffic at these locations will also be reduced.
- 2.4.3 In addition, with the spare capacity of TKO Road resulting from the commissioning of TKO-LT Tunnel, TKO Road can cope with the future developments in Kwun Tong district, including the proposed housing development in the vicinity of Anderson Road.
- 2.4.4 After commissioning TKO-LT Tunnel and CBL, heavy trucks heading to TKO Area 137 from TKO Tunnel and Wan Po Road's section between TKO Tunnel and LOHAS Park which is adjacent to the densely populated area in TKO(South) will be diverted to TKO-LT Tunnel and CBL instead. Hence, the environmental impact created from the heavy trucks to TKO(South) shall be reduced.

2.5 Environmental friendly design

- 2.5.1 In order to preserve the environment in the vicinity of the project, environmental friendly designs are adopted in different locations as far as practical. The environmental friendly designs are summarized in the followings:

Road P2

- 2.5.2 In order to minimize the visual and noise impact to the nearby residential area, Road P2 will be in the form of depressed road such that the road level will be below ground and sea level.
- 2.5.3 A 200m long landscape deck will also be provided to cover the depressed road at the road section immediately next to Ocean Shores. The landscape deck connects the amenity areas on both sides of Road P2 and provide a convenient access to the footpath and cycle track along the waterfront.

Tseung Kwan O Section

- 2.5.4 A "Straight tunnel alignment without toll plaza option" is adopted for TKO Section. A straight tunnel alignment not only attains a good engineering design but also minimize the C&D material when compared with the S-curve tunnel from TKO study.
- 2.5.5 By omitting the toll plaza, the reclamation extent and the associated environmental impact such as water quality, marine ecology will be minimized.

Lam Tin Interchange

- 2.5.6 Two options: Tunnel Option and Depressed Road Option were formed under this Project and the Tunnel Option has been adopted. In the Tunnel Option, the main carriageway and most of the slip roads are located below the existing ground level such that the carriageways could be ‘hidden’ from the nearby residential area as far as possible.
- 2.5.7 An integrated design with noise shelter comprising a landscape deck and light green-coloured noise enclosures will be provided along the main carriageway as noise and visual impact alleviation measures and flooding preventive measures taking into account of the deep carriageway alignment.
- 2.5.8 Together with the green terrace roofs upon the tunnel facilities, shrubs and trees will be planted at the landscape deck and the adjacent area to provide a green environment at the interchange.
- 2.5.9 To further minimize the noise impact and light nuisance, some part of the slip roads are constructed in tunnel form.

Cha Kwo Ling Section

- 2.5.10 The Tunnel Option as mentioned in paragraph 2.5.6 will avoid clearance of any building structures in Cha Kwo Ling Village (CKLV). The current alignment will avoid running beneath Tin Hau Temple or former Four Hills Public School in the village.
- 2.5.11 Mechanical breaking method or other non-blasting methods will be deployed for constructing the tunnel at this section such that the potential impacts on the village’s residents and building structures in the construction phase will be minimized.

3 KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

3.1 Air Quality Impact

Construction Phase

- 3.1.1 Potential air quality impacts from the construction works would be mainly due to construction dust from excavation, materials handling, filling activities and wind erosion. With the implementation of recommended dust suppression measures including watering eight times a day on active works areas, exposed areas and paved haul roads; enclosing the unloading process at barging point by a 3-sided screen with top tipping hall and provision of water spraying and flexible dust curtains; and mitigation measures specified in the *Air Pollution Control (Construction Dust) Regulation* and EM&A programme, the predicted dust impact on air sensitive receivers would comply with the dust criteria as stipulated in EIAO-TM and AQO.

Operation Phase

- 3.1.2 For the operation phase, cumulative air quality impact arising from the Project was assessed using air quality model. The following were included in the assessment:
- Background pollution levels based on Year 2020 PATH model provided by EPD;
 - Vehicle emissions from open road sections of the existing and planned new roads (including Trunk Road T2 and CBL) within 500m Study Area with the incorporation of the proposed vertical barriers, semi-enclosures and full enclosures;
 - Portal emissions from the proposed TKO-LT Tunnel, tunnel of Trunk Road T2 and Eastern Harbour Crossing (EHC);
 - Portal emissions from the proposed landscape decks/full enclosures on Lam Tin Interchange and landscape deck on Road P2; and
 - Emissions from TKO-LT Tunnel, Trunk Road T2 and EHC ventilation buildings.
- 3.1.3 Air quality modelling took into account the effect of the recommended roadside noise barriers, semi-enclosures and landscape decks. Results showed that all the air sensitive receivers in the vicinity of the Project would comply with the EPD Air Quality Objectives.
- 3.1.4 The predicted air pollutants concentrations inside the TKO-LT Tunnel, proposed full enclosures and under the landscape decks would comply with the EPD Tunnel Air Quality Guidelines. Thus, no mitigation measures are required.

3.2 Noise Impact

Construction Phase

- 3.2.1 This assessment examined the construction noise impacts of the Project, taking into account other concurrent projects. The predicted unmitigated noise levels would range from 54 to 87 dB(A) at the representative noise sensitive receivers (NSRs). To mitigate the noise impact, quiet powered mechanical equipment, movable barriers, temporary barriers and all other possible mitigation measures have been proposed and exhausted in order to minimize the impact. The noise level at the NSRs selected for construction noise impact assessment (except Kei Faat Primary School) would not exceed the construction noise standard. The affected Kei Faat Primary School has been noise insulated with air conditioners. It is recommended that the particularly noisy construction activities should be scheduled to avoid examination periods of this NSR as far as practicable.
- 3.2.2 Ground-borne construction noise impacts pertinent to the use of breaker, drill rig and pile rig were also found to comply with relevant criteria. No adverse ground-borne construction noise impacts were predicted.
- 3.2.3 During the actual construction period, as much as practically possible should be done to reduce the construction noise, and on-going liaison with all concerned parties and site monitoring should also be conducted during the course of the construction period.
- 3.2.4 A construction noise EM&A programme is recommended to check the compliance of the noise criteria during normal daytime working hours.

Operation Phase

- 3.2.5 The potential road traffic noise impacts have been assessed based on the worst case traffic flows in 2036. Without any noise mitigation measures in place, the predicted noise levels at the NSRs would range from 31 to 79 dB(A). Practicable traffic noise mitigation measures are therefore formulated for the NSRs with predicted noise levels exceeding the EIAO-TM traffic noise criteria.
- 3.2.6 With the proposed noise barriers, semi-enclosures, full-enclosures and low noise surfacing applied on roads in place, the predicted overall noise levels at some of the NSRs would still exceed the noise limit. For these NSRs, the predicted traffic noise level due to the road sections within the Project does not exceed (i.e. new road) the criteria by 1.0 dB(A) or more. The 'New' road noise contribution to the overall traffic noise level would be less than 1.0 dB(A) and the 'New' road noise levels at these NSRs would all be below criterion. It should be noted that such noise exceedances at the representative NSRs are due to the existing roads. Nevertheless, there will be an overall reduction of noise brought about by the project, which may be considered an environmental benefit.
- 3.2.7 Operation noise impacts from fixed plant noise sources such as tunnel ventilation shafts & pumping stations can be effectively mitigated by implementing noise control treatment at source during the design stage and adverse residual operation noise impacts are not anticipated.

3.3 Water Quality Impact

Construction Phase

- 3.3.1 The water quality impacts during the marine construction works were quantitatively assessed by numerical modelling. It is predicted that, with the implementation of the recommended mitigation measures, there would be no unacceptable water quality impacts due to the construction of the Project and due to the cumulative effects from other concurrent marine construction activities. Potential water quality impact could be further minimized for all marine works to adopt the environmental friendly construction methods as far as possible including the use of cofferdams to cover the construction area to separate the construction works from the sea. A water quality monitoring and audit programme will be implemented to ensure the effectiveness of the proposed water quality mitigation measures.
- 3.3.2 The key issue from the land-based construction activities would be the potential water quality impact due to the release of sediment-laden water from surface works areas and discharge of construction site effluent. Minimisation of water quality deterioration could be achieved through implementing adequate mitigation measures. Regular site inspections should be undertaken routinely to inspect the construction activities and works areas in order to ensure the recommended mitigation measures are properly implemented.

Operational Phase

- 3.3.3 Water quality modelling results indicated that no significant change in hydrodynamic regime would be expected. No significant change in water quality regime, which associated with the hydrodynamic impact, is anticipated. Therefore no adverse hydrodynamic and water quality impacts are expected.

3.4 Ecological Impact

- 3.4.1 There is no recognized terrestrial/marine site of conservation interest (e.g. as Country Parks, Sites of Special Scientific Interest, Coastal Protection Areas, Conservation Areas, Marine Parks) within the assessment area. The ecological resources identified included mixed woodland, disturbed woodland, grassland/shrubland mosaic, village/orchard, plantation, pond/stream, natural rocky shore, sandy shore, artificial seawall, hard substrata subtidal habitat, soft substrate subtidal habitat and pelagic subtidal habitat. Of which, hard substrata subtidal habitat has moderate and low to moderate ecological value. Fifteen hard coral, two black coral and 17 octocoral species were recorded within and in vicinity of marine works area. The remaining habitats were of low to low to moderate value.
- 3.4.2 Potential direct impacts on significant ecological resources of conservation importance (e.g. natural coastline along Chiu Keng Wan, natural coral communities with moderate to high ecological value on western coast of Junk Bay, coral recipient sites for translocation under other development projects, natural streams, and potential habitats of Philippine Neon Goby and Grassy Puffer Fish) has been avoided or minimized in the alignment option selection process.
- 3.4.3 The land-based construction works would cause a loss of approximately 3.8 ha of vegetated habitats (grassland/shrubland mosaic and plantation) with low and low to moderate ecological value. The associated flora and fauna recorded from these affected habitats are predominantly common and widespread species in Hong Kong. Terrestrial ecological impacts arising from the Project are considered low.
- 3.4.4 Reclamation works and bridge piers would result in the loss of 3.6 ha of subtidal habitat. Additionally, 19 ha of this same habitat would be lost temporarily due to marine construction works during construction phase. Existing artificial seawall of 540 m at TKO would be lost to reclamation works, however the reclaimed area would provide a surplus of 310 m of the same habitat. Direct impact on sparse coverage (<1%) of coral community would be minimized through coral translocation measures as far as possible.
- 3.4.5 Potential indirect impact due to change in water quality resulting from the proposed marine works and reclamation would be temporary and localized. Possible mitigation measures for water quality impact, such as the deployment of silt curtains around the active stone column installation points, opening of newly installed seawall and marine works area would serve to protect nearby marine ecological resources. With the proper implementation of appropriate mitigation measures, the potential impact on marine ecology due to water quality deterioration would be acceptable.

3.5 Fisheries Impact

- 3.5.1 A review on existing information on commercial fisheries resources and fishing operations within the surrounding waters has been undertaken. No important spawning or nursery grounds were identified within or in the vicinity of the proposed marine works area, while the nearest Fish Culture Zone (FCZ) (Tung Lung Chau FCZ) is located approximately 5 km from the proposed marine works area.
- 3.5.2 The importance of captured fisheries resources in the area of the proposed reclamation and bridge piers within Junk Bay WCZ is identified as low in terms of both production weight and value. Fish fry production is not expected to be affected within Junk Bay and Victoria Harbour due to the proposed works.

3.5.3 The Project would cause about 3.6 ha permanent loss and 19 ha temporary loss of fishing area in inner Junk Bay due to the proposed reclamation and bridge construction. Considering the generally low importance of the fishing area in inner Junk Bay as compared to the Hong Kong fishery and the low production at this area, the direct impact of the Project on fisheries resources and operations would be regarded as low.

3.5.4 No significant indirect impacts due to deterioration of water quality are expected. However, mitigation measures for water quality impact, such as the deployment of silt curtains around the active stone column installation points, opening of newly installed seawall and marine works area would still be implemented to protect fisheries resources. No operational phase impacts are expected.

3.6 Waste Management

Construction Phase

3.6.1 Different types of waste generated from the Project during the construction phase are likely to include Construction and Demolition (C&D) materials from demolition, excavation and site formation works, excavated sediment, general refuse from workforce, and chemical waste from the maintenance of equipment. During the operation phase, the major types of waste would be general refuse from staff and office activities and chemical waste from maintenance activities.

3.6.2 Approximately 4,170,420 m³ of inert materials and 83,000 m³ of non-inert materials would be generated during the construction phase of the Project. 814,600 m³ of inert material would be reused in the reclamation while the remaining would be recycled or disposed off-site. Non-inert waste will be recycled as far as possible before disposed to landfill. Opportunities in minimisation of generation and maximisation of reuse would be continually investigated during the detailed design and construction phases. The other materials would be disposed of to designated outlets. Provided that these wastes are handled, transported and disposed of using approved methods and that the recommended good site practices are strictly followed, adverse environmental impacts would not be anticipated.

3.6.3 The total volume of excavated sediment generated from the Project is estimated to be approximately 19,360 m³. The sediment will be reused as filling material. Approximately 17,450 m³ of sediment is considered below the RBRGs. It is anticipated that the reuse of these sediments will not lead to land contamination. 1,910m³ of sediment exceeds the RBRG for lead. The reuse of cement stabilized sediment and adoption of RBRGs to assess stabilized sediment have been proposed in the current C&DMMP. Marine Fill Committee has no adverse comment on the current C&DMMP. It should be noted that stabilized sediment will be reuse in project only and will not dispose in public fill. However, cement stabilization will immobilize metal contaminants and is capable to treat the exceedance on lead.

3.6.4 All sediment can be reused as filling material on-site after cement stabilization. However, stabilized materials from 1,910m³ of sediment with RBRG exceedance on lead have to comply with UTS and UCS. Final disposal/treatment on the 1,910m³ sediment has to be agreed with DEP.

3.6.5 Alternatively, excavated sediment can be treated with marine disposal. Based on the results of the chemical and biological screening, approximately 9,600 m³ of sediment is suitable for Type 1 – Open Sea Disposal, 60m³ of sediment is suitable for Type 1 – Open Sea Disposal (Dedicated Sites), 7,790 m³ of sediment requires Type 2 – Confined Marine Disposal and 1,910 m³ of

sediment requires Type 3 – Special Treatment/Disposal in accordance with *ETWB TC(W) No. 34/2002 - Management of Dredged/Excavated Sediment*.

- 3.6.6 The final determination of the appropriate disposal options, routing and the allocation of a permit to dispose of material at a designated site shall be determined in accordance with ETWB TC(W) No. 34/2002. Three types of disposal options for excavated sediments were stipulated in the ETWB TC(W) No. 34/2002: Type 1 – Open Sea Disposal or Open Sea Disposal in Dedicated Sites, Type 2 – Confined Marine Disposal and Type 3 – Special Treatment / Disposal. For Type 3 disposal, the Project Proponent shall be responsible for identifying and agreeing with the DEP the most appropriate treatment and/or disposal arrangement. The determination of the appropriate disposal options shall be based on the sediment classification and if necessary, the biological screening results.
- 3.6.7 Mitigation measures are recommended in this EIA to minimise potential environmental impacts associated with handling and disposal of different wastes arising from the Project. Provided that the recommended mitigation measures are properly followed, adverse environmental impacts would not be expected from the Project.

3.7 Impact on Cultural Heritage

- 3.7.1 Based on the baseline review of marine archaeology and the marine geophysical survey results, no objects of archaeological interest have been identified within the proposed marine works area of the Project. Therefore, no adverse impact is anticipated during either the construction or operation phase of the Project.
- 3.7.2 No direct impact on the identified historical buildings/ structures is expected since all of them are located outside the site boundary of the Project. Nevertheless, since Cha Kwo Ling Tin Hau Temple is located less than 100m from the works area of the Project, it may be indirectly impacted by dust and vibration due to the nearby construction activities. To prevent damage to Cha Kwo Ling Tin Hau temple and its fung Shui rocks (Child-given rocks) during the construction phase, a temporarily fenced-off buffer zone (Rocks buffer zone is 5 m from the edge of Rocks and 15m from the edge of Rocks alter) with allowance for public access (minimum 1 m) should be provided around the temple and the fung shui rocks. The open yard in front of the temple should be kept as usual for annual Tin Hau festival.
- 3.7.3 Such mitigation measures should be consulted with Cha Kwo Ling Villagers during the detailed design stage and before construction stage. Monitoring of vibration impacts should be carried out when the construction works are less than 100m from the temple. A maximum ppv at 5mm/s is widely adopted in other EIA studies on similar buildings, and is consider appropriate for this building. Tilting and settlement monitoring should be applied on the Cha Kwo Ling Tin Hau Temple as well. A proposal with details for the mitigation measures and monitoring of impacts on built heritage shall be submitted to AMO for comments before commencement of work.

3.8 Landscape and Visual Impacts

Landscape Impacts

- 3.8.1 Following mitigation, residual impacts to Landscape Resources at TKO at Year 10 of the Operation Phase will be **Slight** for the sea water body of Junk Bay (**TKO-LR1**), natural rocky shore along Chiu Keng Wan Coastline (**TKO-LR2**), amenity/ roadside planting on modified slopes along Road D4 (Po Yap Road and Chui Ling Road) and P2 (Po Shun Road) (**TKO-**

LR3D) and grassland/ shrubland mosaic at Chiu Keng Wan Shan (**TKO-LR5A**). This will be due to the effects of mature mitigation planting on the reclamation, bridge viaducts and tunnel portal slopes the integration of the TKO Interchange into the TKO new town extension. All impacts to other identified Landscape Resources will be **Insubstantial**. For a full list of these Landscape Resources, please refer to paragraph 10.9.2 to 10.9.7 and Table 10.6.3 of Chapter 10 of the EIA.

- 3.8.2 For the Junk Bay Inshore Water Landscape Character Area (**TKO-LCA1**), the residual impact will be **Moderate** at Year 10 of the Operation Phase following mitigation. For the Chiu Keng Wan Coastal Upland and Hillside Landscape (**TKO-LCA3**), the residual impact at Year 10 will be **Slight**. For all the other Landscape Character Areas, the residual impacts will be **Insubstantial**. For a full list and description of the Landscape Character Areas, please refer to paragraph 10.9.8 to 10 and Table 10.6.3 of the EIA.
- 3.8.3 Following mitigation, residual impacts to Landscape Resources at Lam Tin at Year 10 of the Operation Phase will be **Moderate** for amenity/ roadside planting/ vegetation on modified slopes at the former Quarry (**LT-LR8B**) due to the impact of the Lam Tin Interchange. The reduced impact at Year 10 will be due to the maturing tree, shrub and climber planting. Following mitigation, all residual impacts to other identified Landscape Resources will be **Insubstantial**. For a full list and description of these Landscape Resources, please refer to paragraph 10.9.11 to 13 and Table 10.6.4 of Chapter 10 of the EIA.
- 3.8.4 Following mitigation, residual impacts to Landscape Character Areas at Lam Tin at Year 10 of the Operation Phase will be **Slight** for the former Quarry Landscape – Occupied (**LT/LCA9**) due to the impact of the Lam Tin Interchange. This will be primarily due to the effects of the maturing tree, shrub and climber planting. All impacts to other identified Landscape Character Areas will be **Insubstantial**. For a full list and description of these Landscape Character Areas, please refer to paragraph 10.9.14 to 15 and Table 10.6.4 in Chapter 10 of the EIA.

Visual Impacts

- 3.8.5 The primary VSRs will be the surrounding existing and planned residential blocks which will experience elevated views and the users of the planned waterfront and open space facilities. It is considered that the highest residual visual impacts to existing VSRs will be **Moderate** after mitigation at Year 10 of the Operation Phase due to the effects of mature mitigation planting on the reclamation and viaducts and the integration of the TKO Interchange into the TKO new town extension. All remaining impacts to other identified existing VSRs at Year 10 of the Operation Phase following mitigation will be **Slight/Moderate, Slight** or **Insubstantial**. The visual impacts to the existing VSRs are reduced during the Operational Phase due to the visual mitigation measures and the obstruction by planned development on the TKO reclamation.
- 3.8.6 Following mitigation, residual visual impacts to existing and planned VSRs at TKO at Year 10 of the Operation Phase will be **Moderate** for residents in CDA development in Area 86/LOHAS Park (**TKO-CDA1B**), users of planned Open Space at TKO Area 68 (**TKO-O3**), existing residents of Ocean Shores Phases I to III (**TKO-R3**), and residents in the most southerly high-rise developments on the TKO reclamation due to the clear unobstructed views over the TKO interchange (**TKO-R14d, 14e and 14f**).
- 3.8.7 Residual visual impacts to existing and planned VSRs at TKO at Year 10 will be **Slight/Moderate** for the seaborne leisure travellers in Junk Bay (**TKO-T1**) and Lei Yue Mun and Tathong Channel (**TKO-T2**), the workers in planned TKO Industrial Estate Extension

(**TKO-OU1B**), the planned recreational facilities at TKO Stage I Landfill, Area 77 (**TKO-REC7**), the pedestrians on footpath link from Ocean Shores to Junk Bay Permanent Chinese Cemetery (**TKO-T5**) and the travellers on new Southern Footbridge crossing the Eastern Channel (**TKO-T7**).

- 3.8.8 All other existing or planned VSRs will experience **Slight** or **Insubstantial** visual impacts following mitigation at Year 10 of the Operation Phase. For a full list of these VSRs, please refer to paragraph 10.9.16 to 43 and Table 10.7.1 of Chapter 10 of the EIA.
- 3.8.9 The primary visual impacts at Lam Tin come from the construction of the Lam Tin Interchange within the Cha Kwo Ling quarry area. The existing quarry walls provide a high degree of visual containment and the replacement of existing trees impacted during construction with mitigation planting will reduce the degree of visual impact. The principal VSRs are the surrounding high rise residential blocks which define the ZVI to the west, north and east and these will experience **Moderate** residual visual impacts during Year 10 of the Operation Phase due to the implementation of mitigation planting in and around Lam Tin Interchange and on the fringes of the quarry. In addition, the replacement of the existing quarry with poor visual attributes with a visually dynamic interchange and more structured greening will reduce the net visual impacts.
- 3.8.10 Residual visual impacts at Year 10 of the Operation Phase will be **Moderate** for residents of Ping Tin Estate and Hong Ngar Court (**LT-R3**), Yau Lai Estate (**LT-R4A**), at Cha Kwo Ling housing developments west of interchange (**LT-R9B**), Kwong Tin Estate and Hong Pak Court (**LT-R11**), Yau Tong Bay CDA Development (**LT-CDA1**).
- 3.8.11 Residual visual impacts at Year 10 of the Operation Phase will be **Slight** for staff and pupils of schools east of EHC (**LT-GIC2**), residents in Yau Tong - The Canaryside and The Spectacle (**LT-R5**), users of Yau Tong Road Playground (**LT-O1**), users of public open space on promenade (**LT-O5**) and the planned open space north west of Lam Tin Interchange (**LT-O6**).
- 3.8.12 All residual impacts to other identified VSRs at Year 10 following mitigation will be **Insubstantial**. For a full list of these VSRs, please refer to paragraph 10.9.44 to 54 and Table 10.7.2 of Chapter 10 of the EIA.
- 3.8.13 In conclusion, in accordance to the criteria and guidelines for evaluating and assessing impacts as stated in Annex 10 and 18 of the TM- EIAO, overall, it is considered that the residual landscape and visual impacts of the proposed TKO-LT are **acceptable with mitigation** during the construction and operation phases.

3.9 Landfill Gas Hazard

- 3.9.1 The landfill gas hazard assessment shows that the overall level of landfill gas risk posed by the Sai Tso Wan Landfill onto the Lam Tin Interchange section and related tunnel facilities of the Project would be categorised as “**Medium**”.
- 3.9.2 Appropriate precautionary measures have been proposed to minimize the landfill gas risk for the proposed project site during the construction and operational phases. In particular, it is noted that landfill gas membrane should be installed at the tunnels, underground structures, and basement & ground floor of the buildings within the Consultation Zone of the Sai Tso Wan Landfill. Routine monitoring is recommended as a precautionary measure.
- 3.9.3 Provided that all the recommended precautionary measures are implemented properly, the safety of all personnel and general public (i.e. passengers of vehicles using the TKO-LT Tunnel)

presence at the proposed Project site would be safeguarded and there would be no adverse impact anticipated on the feasibility of the proposed Project.

3.10 Hazard to Life

3.10.1 Since no overnight storage of explosive on site is required for the construction of the Project, no adverse impact from the Project is expected.

3.11 Environmental Monitoring and Audit

3.11.1 Environmental monitoring and audit (EM&A) requirements have been specified in an EM&A Manual. The EM&A Manual contains full details of proposed baseline and compliance monitoring programmes, as well as performance specifications, audit requirements and monitoring procedures.

4 OVERALL CONCLUSION

4.1.1 The findings of this EIA have provided information on the nature and extent of environmental impacts likely to arise from the construction and operation of the Project. The EIA has, where appropriate, identified mitigation measures to ensure compliance with environmental legislation and standards.

4.1.2 Overall, the EIA Report concludes that the Project would be environmentally acceptable with the implementation of the proposed mitigation measures for the construction and operation phases. An environmental monitoring and audit programme has been recommended to ensure the effectiveness of recommended mitigation measures.