

Highways Department

Tuen Mun Bypass

Executive Summary

Final | September 2023

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 287168

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1. Introduction

1.1 Project Background

- 1.1.1.1 The Government proposed the implementation of Tuen Mun Western Bypass (TMWB) and commenced the investigation and preliminary design for TMWB in 2008. Under the original transport infrastructures planning, the TMWB together with Tuen Mun-Chek Lap Kok Tunnel (TM-CLKT), which was commissioned in December 2020, were aimed to provide a direct north-south route linking Kong Sham Western Highway (KSWH), Northwest New Territories (NWNT), Tuen Mun River Trade Terminal, Hong Kong International Airport and the Hong Kong-Zhuhai-Macao Bridge Hong Kong Port.
- 1.1.1.2 To take forward TMWB, the Government consulted Tuen Mun District Council (TMDC) and Yuen Long District Council (YLDC) in July 2016 and September 2016 respectively. The District Council (DC) supported the implementation of TMWB in principle, but some members of TMDC expressed their concern that the connection at Tsing Tin Road might induce adverse air and noise impacts on the area near Kin Sang Estate, Tai Hing Estate and Tuen Mun Hospital. They also worried about unacceptable congestion at Tuen Mun Road (TMR) (Fu Tei Section) arising from the additional traffic to/from TMWB.
- 1.1.1.3 The Highways Department (HyD) then commenced a further investigation and preliminary design study for TMWB in October 2017. Taking into account the comments from TMDC, HyD deleted the connection at Tsing Tin Road for TMWB. Nonetheless, without this connection, the usage of TMWB, and volume/capacity ratio would drop significantly, making the proposed scheme of TMWB no longer effective in alleviating traffic congestion at TMR (Fu Tei and Town Centre Sections), Wong Chu Road and Lung Fu Road.
- 1.1.1.4 In the 2019 Policy Address, the Government announced that it would re-plan the coastal development of Tuen Mun West. As such, there is a genuine need to review the planning of the future strategic routes and connecting roads within Tuen Mun with a view to meeting the traffic demand of the potential developments in Tuen Mun West.
- 1.1.1.5 The Government subsequently proposed Tuen Mun Bypass (TMB), hereafter called “the Project”, as an alternative highway scheme, to replace the originally proposed TMWB. TMB will not only provide a direct north-south route linking TM-CLKT and Yuen Long Highway (near Lam Tei Quarry), but also further improve the traffic conditions of some local roads in Tuen Mun, including TMR (Fu Tei and Town Centre Sections), Wong Chu Road and Lung Fu Road, with some spare capacity to accommodate the traffic demand from the future developments in Tuen Mun West.
- 1.1.1.6 Some Legislative Council (LegCo) members and the TMDC members have all along expressed concern about the traffic congestion at TMR (Fu Tei and Town Centre Sections), Wong Chu Road and Lung Fu Road, particularly subsequent to the commissioning of TM-CLKT. Therefore, timely implementation of the Project is required.
- 1.1.1.7 HyD and Transport Department (TD) had introduced the proposal of replacing the TMWB by TMB at the meeting with the Traffic and Transport Committee (T&TC) of TMDC in February 2021 and April 2021. Both T&TC of TMDC supported implementation of the Project in lieu of the previously proposed TMWB.

1.2 The Project

1.2.1.1 The Project is to construct and operate TMB, a dual two-lane carriageway connecting TM-CLKT in the south and YLH and KSWH in the north. **Figure 1.1** shows the latest alignment and locations of the following key alignment:

- (i) Construction of a road tunnel of about 7.5 km long running through Tuen Mun and Tai Lam Country Park, linking the TM-CLKT and the YLH and KSWH;
- (ii) Construction of tunnel portals and associated facilities at Tuen Mun Area 40 and Lam Tei Quarry;
- (iii) Construction of viaducts / at-grade roads from the southern tunnel portal to the roads under planning near Lung Mun Road/Mong Fat Street, and TM-CLKT at Tuen Mun Area 40;
- (iv) Provision of associated ventilation buildings, administration building and other tunnel operation area;
- (v) Re-provision of facilities affected by the proposed works;
- (vi) Provision of possible adits and associated connection with existing roads;
- (vii) Construction of temporary explosive magazines in Lam Tei Quarry, Siu Lam and Pillar Point; and
- (viii) Associated geotechnical works, ground investigation (GI) works, drainage works, natural terrain hazard mitigation works, sewerage works, traffic aids, directional signs, street lightings, Traffic Control and Surveillance System, Electrical and Mechanical (E&M) works, environmental mitigation measures, landscaping works, and services systems for inspection, maintenance.

1.2.1.2 The EIA report has included locations of the proposed works area, temporary works area of the Project for supporting the construction of the Project based on the latest information at the time of writing. (See **Figure 1.1**)

1.3 Scope of this EIA Report

1.3.1.1 Pursuant to Section 5(7)(a) of the Environmental Impact Assessment Ordinance (EIAO), the Director of Environmental Protection (DEP) issued a Study Brief (SB) (No.: ESB-348/2021) dated 9 November 2021 for the EIA Study. This EIA Study focused on assessing the potential impacts associated with the construction and operation of the Project in accordance with the SB requirements.

1.3.1.2 The Project comprises the following Designated Projects (DPs) elements under Part I, Schedule 2 of the EIAO:

- Item A.1 – “A carriageway for motor vehicles that is an expressway, trunk road, primary distributor road or district distributor road”;
- Item A.7 – “A road tunnel or railway tunnel more than 800 m in length between portals”;
- Item K.10 – “A depot for the storage of, or a manufacturing plant for the manufacture of, explosives (as defined by section 2 of the Dangerous Goods Ordinance (Cap. 295)”;
- Item Q.1 – “All projects involving earthworks, dredging works and other building works partly or wholly in an existing country park”.

1.4 Purpose of this Executive Summary

- 1.4.1.1 This Executive Summary (ES) highlights the key information, findings, recommendations and conclusions for the TMB EIA Study.

2. Project Description

2.1 Purposes and Objectives of the Project

- 2.1.1.1 At present, connectivity between Northwest New Territories (NWNT) and Tuen Mun West (i.e. from Yuen Long and Tin Shui Wai heading to the Tuen Mun West and Tuen Mun – Chek Lap Kok Tunnel (TM-CLKT)) relies heavily on Tuen Mun Road (Fu Tei and Town Centre Sections), Wong Chu Road and Lung Fu Road. Subsequent to the commissioning of TM-CLKT, the vehicles commuting between NWNT and Lantau Island via TM-CLKT need to pass through the above-mentioned local roads in Tuen Mun, causing an increase in traffic loading to the concerned local roads. With the progressive implementation of various new development areas in NWNT such as Hung Shui Kiu/Ha Tsuen New Development Area and Yuen Long South Development, the traffic demand and loading may further increase.
- 2.1.1.2 TMB is proposed to enhance the strategic road network in NWNT. It will not only provide a direct north-south route linking TM-CLKT in the south and Yuen Long Highway (YLH) (near Lam Tei Quarry) and Kong Sham Western Highway (KSWH) in the north, but also further improve the traffic conditions of some local roads in Tuen Mun, including Tuen Mun Road (Fu Tei and Town Centre Sections), Wong Chu Road and Lung Fu Road, with some spare capacity to accommodate the traffic demand from the future developments in Tuen Mun West.
- 2.1.1.3 The northern portion of the Project connecting YLH and KSWH and the planned Lam Tei Tunnel of Route 11 are all located at Lam Tei Quarry Interchange (LTQI). Design coordination with Route 11 is required to achieve full integration of various highway schemes and best level of connectivity, including the possible connections to YLH (Tuen Mun Section).
- 2.1.1.4 The general layout plan of the Project is presented in **Figure 1.1**. It comprises the construction of a tunnel running underneath Tai Lam Country Park, Tuen Mun Typhoon Shelter and town centre of Tuen Mun. Within the Tai Lam Country Park, there is no other aboveground works including ground investigation (GI) works required for the underground tunnelling works.

2.2 Benefit of the Project

- 2.2.1.1 With the growing long-term traffic demand of the NWNT and Lantau, the Project forming part of the strategic road network, could support the developments in the vicinity, shorten the travelling time between the NWNT and North Lantau upon completion and improve the traffic conditions of local roads in Tuen Mun.
- 2.2.1.2 For the longer-term vision, the Project is to provide transport capacity that is interconnected with other strategic routes under planning such as Route 11 that together seek to strengthen transport links across the Greater Bay Area. The Project will provide a direct route between NWNT and the Hong Kong – Zhuhai-Macao Bridge, the Hong Kong International Airport and North Lantau. It will also enable transport capacity to be released to support future developments in Tuen Mun West.

2.3 Consideration of “With” and “Without” Project Scenarios

2.3.1 Consideration of “With” Project Scenario

2.3.1.1 The Project would improve the traffic conditions of some strategic and local roads in Tuen Mun including Tuen Mun Road, Wong Chu Road, Lung Fu Road and Lung Mun Road and would be beneficial to the resilience of transport system as it provides more connections in key junctions, providing convenient alternative routes. By optimising the alignment of the Project, it does not only save the travelling time of road users, but also minimise energy consumption and environmental impact to the surrounding area.

2.3.2 Consideration of “Without” Project Scenario

2.3.2.1 At present, the vehicles commuting between NWNT and Lantau Island via TM-CLKT will rely heavily on the key local roads including Tuen Mun Road (Fu Tei and Town Centre Sections), Wong Chu Road and Lung Fu Road. Taken into account the relevant interfacing existing and planned works including the Hung Shui Kiu /Ha Tsuen New Development Area, Yuen Long South Development Area, and other housing projects in Tuen Mun, the traffic flow is expected to increase in the future. Although there will be interim measures including extension works of major roads in Tuen Mun, the traffic condition will be further deteriorated where traffic congestion problems are identified in long term without TMB (i.e. overloaded junctions and road links). As such, traffic impact and the associated environmental impacts are expected to increase for the “Without” Project Scenario.

2.4 Consideration of Alternatives / Options

2.4.1.1 Several alternatives/options were developed during the preliminary design stage. The preferred scheme for the Project to be taken forward for design and construction was selected according to various engineering and environmental factors.

2.4.1.2 Options were studied for the design of the Project, including alignment, interchange and portals, ventilation buildings, magazine sites and barging facilities. A summary of the key considerations for the selected option on the alignment and design of the Project is presented in **Table 2.1** below.

Table 2.1 Summary of the key considerations for preferred option for project elements

Preferred Option	Key Considerations
Preliminary Alignment (Option 1 is selected)	<ul style="list-style-type: none">• Avoid aboveground impact on Tai Lam Country Park.• Further away from the Tuen Mun town centre and encroached fewer residential blocks
Alignment at Sub-area (near Wu Shan Road) (Option A2 is selected)	<ul style="list-style-type: none">• There are minimal conflicts between the alignment and existing structure and geotechnical complex area. Still, the alignment runs underneath the Consultation Zone (CZ) of ExxonMobil LPG Storage Installation at Tuen Mun Area 44. Careful planning and risk assessment are therefore required during detailed design stage.

Preferred Option	Key Considerations
	<ul style="list-style-type: none"> • The alignment locates within underneath the CZ of the ExxonMobil LPG Storage Installation at Tuen Mun Area 44, which is a Potentially Hazardous Installation (PHI), at more than 30m from the storage. Tunnelling using TBM could avoid blasting in the vicinity of this PHI. Transportation routes for the explosives for the drill-and-blast sections in other areas could also avoid the CZ of the PHI. Individual risk contour and societal risk of this LPG storage installation would be the same as that predicted in the approved EIA report of Tuen Mun South Extension (see details in Section 8 of EIA report). • The alignment is close to various existing and planned housing site, and it requires close liaison with nearby stakeholders.
Alignment at Sub-area (at Sam Shing Estate) (Option B2 is selected)	<ul style="list-style-type: none"> • Tunnel construction beneath rockhead, comparatively with higher constructability. • It passes beneath one residential zone (Sam Shing Estate) and has less implications to the residential zone and requires close liaison with stakeholders.
Alignment at Sub-area (near Lam Tei Irrigation Reservoir) (Option C3 is selected)	<ul style="list-style-type: none"> • Tunnel construction beneath rockhead, comparatively with higher constructability. • It is furthest away from Lam Tei Irrigation Reservoir, risk to the dam of the Lam Tei Irrigation Reservoir is still considerable low. • It is closer to Route 11 tunnel portal, allows an integrated site formation for tunnel portal of TMB and Route 11. • Aboveground works in Tai Lam Country Park is avoided. • Potential groundwater infiltration, lead to potential drawdown of surface water bodies and groundwater. Impact can be managed by good practices and mitigation measures.
Southern Interchange and Portal (Option S3 is selected)	<ul style="list-style-type: none"> • Provision of balance between clearance to sewage culvert and clearance to underpass. • Preserve existing footbridge and bridge, demolition works are avoided. • Encroachment to Tuen Mun Area 46 has been minimised. • Embed to future Lung Mun Road upgrading at roundabout. • Sufficient tunnel portal weaving length, sufficient length for placement of directional sign. • Buses using the Project can use bus-bus interchange. • Permanent relocation of the existing Electrical and Mechanical Services Department (EMSD) Tuen Mun Vehicle Servicing Station is required; temporary re-provisioning may also be required.

Preferred Option	Key Considerations
Northern Portal (Option N3 is selected)	<ul style="list-style-type: none"> • The tunnel portals are placed furthest away from the dam of Lam Tei Irrigation Reservoir with lower construction risk comparatively. • No encroachment of the tunnel portal to Tai Lam Country Park. • With separate distance from air and noise sensitive receiver. • No Additional land requirement would result in disturbance near Lam Tei Irrigation Reservoir and Lam Tei Quarry.
Middle Ventilation Building (MVB) (Alternative Scheme 2 is selected)	<ul style="list-style-type: none"> • No reclamation required for shaft excavation, and hence associated impacts on water quality, marine ecology and fisheries are not anticipated. • Site formation is required, adit but no carven construction is required. • Decoupling of MVB construction and tunnelling works: parallel activities without interface. Allow enhancement programme and decrease risk. • Visual impact caused by to MVB half-submerged structure at Wah Fat Playground area. • Smaller underground excavation volumes and less C&D materials are expected compared to other options. • Aboveground works located further away from Tai Lam Country Park compared to other options. • More flexibility and easier for replacement/ easier planning and logistic support for the installation of the MEP plants for an aboveground building during operation. • Smaller fan pressure loss and less energy consumption as long ventilation adit is omitted. • Direct Emergency Vehicle Access to the MVB and direct route to reach the Ultimate Place of Safety during operation.
South Ventilation Building (SVB) (Alternative Scheme 2 is selected)	<ul style="list-style-type: none"> • It is located right above the TM-CLKT, with a low clearance with it, which can be managed by applying the appropriate mitigation measures • Close to the existing pylons on the hillside, which can be managed by applying the appropriate mitigation measures • Ventilation shaft further up from ground level with less impact on the nearby air quality sensitive receivers, future users and operators • This scheme is located further north, which makes it possible to have sufficient distance between the Project portal and TM-CLKT portal for a better connectivity, avoiding traffic weaving.

Preferred Option	Key Considerations
	<ul style="list-style-type: none"> The scheme is located further north, which improves the connectivity with the existing Lung Mun Road and especially the accessibility from and to the existing bus stop. Closer to the tunnel portal and minimize ventilation adit length, which results in smaller fan pressure.
<p>North Ventilation Building (NVB) (Alternative Scheme 1 is selected)</p>	<ul style="list-style-type: none"> Reduce the need to undergo significant rock cut compared to other options and less C&D materials are expected. Furthest away from the Tai Lam Country Park boundary, Avoid disturbance of habitat at the NVB, as it is located at the existing cut at Lam Tei Quarry. Additional land requirement would result in disturbances near Lam Tei Irrigation Reservoir and Lam Tei Quarry.
<p>Magazine Site - Locations at Lam Tei Quarry, Siu Lam and Pillar Point</p>	<ul style="list-style-type: none"> The proposed magazine site at Siu Lam utilise the historical magazine for Express Rail Link project. Utilised the location at Pillar Point has been carried out of the previous study. Utilised disturbed / development area to avoid further site formation works. Locations selected are generally disturbed/ developed area, minimised loss of natural habitat during construction of the magazine. The locations of the three proposed magazine sites are generally located in the remote area with low density of receptors, the selected locations ensure that the magazines serve the work faces closest to the magazine to reduce the risk to public safety as low as reasonably practicable. Located in government lands.
<p>Barging Facilities at TMB-CLKT Northern Landfall</p>	<ul style="list-style-type: none"> The barging facility is located at the existing waterfront/ seawall of the east side of TM-CLKT Northern Landfall. No additional marine construction work is required to set up the barging points such as provision of temporary of breakwater.

2.4.2 Consideration for Construction Methodology

2.4.2.1 As part of the selection process, various construction methodologies have also been reviewed in order to determine the most effective means and environmentally friendly construction method(s). The review has considered environmental benefits, engineering feasibility, site conditions and programme aspects.

Tunnel Works

2.4.2.2 Tunnelling by the use of drill-and-blast / drill-and-break and Tunnel Boring Machine (TBM) methods have been considered. The drill-and –blast/drill-and-break method is recommended for the section underneath Tai Lam Country Park as it is a more efficient underground tunnelling method in hard rock conditions as expected in Tai Lam Country

Park, drill-and-break method is proposed for section under the Water Supplies Department (WSD) tunnel and between MVB and Sam Shing Estate. Alternative tunnelling methods, including the use of TBM in Tai Lam Country Park were duly explored but considered not suitable from the engineering perspective. TBM method is suitable for fractured rock / mixed ground condition, therefore, it is not recommended for tunnelling in hard rock granite at Tai Lam Country Park. TBM method is recommended for southern tunnelling sections at Sam Shing Estate to Pillar Point.

2.4.2.3 Underground tunnelling within Tai Lam Country Park could potentially induce groundwater infiltration, which might lead to potential drawdown of surface water bodies and groundwater. Such impacts could be managed by implementing good practices and water control strategies such as including probing ahead, pre-grouting and posting grouting. Drill-and-blast/drill-and-break tunnel section would be in granite and with sufficient depth below ground, together with the good practices and mitigation measures, adverse impact on the change in groundwater table would be insignificant. As a precautionary measures, monitoring programme will be implemented to monitor the mitigation measures on groundwater infiltration within Tai Lam Country Park.

2.4.2.4 For the tunnel section underneath Tuen Mun Typhoon Shelter and Tuen Mun Town Centre, TBM method is recommended in terms of environmental impacts and engineering aspects. It avoids marine works such as temporary reclamation and dredging works, also avoids major environmental impacts on water quality, fisheries, and marine ecology, disposal of marine sediment at Tuen Mun Typhoon Shelter.

Ventilation Buildings, Administration Building and Satellite Control Building

2.4.2.5 The Project's Ventilation Buildings, Administration Building and Satellite Control Building will be constructed by typical reinforced concrete construction method which includes i) formwork and falsework erection, ii) rebar fixing, iii) concrete pouring and curing, and iv) formwork striking and back propping. Superstructures will adopt bottom-up construction. Construction of ground floor slabs, beams, columns and walls will be carried out from the lowest level and process upwards to roof level. No percussive piling is envisaged under the construction scheme.

Middle Ventilation Building at Wah Fat Playground Works Area

2.4.2.6 A temporary adit for the Works Area at Wah Fat Playground will be constructed by drill-and-break Tunnel for the first 50 meters, then drill-and-blast for the remaining part. Site formation will be carried out at the works area at Wah Fat Playground for MVB construction, the basement structure of the building will be constructed first, followed by the above ground structure of approximately 45m x 40m x 19m tall. The ventilation shafts connecting the basement of the MVB and the logistic caverns will be constructed via raised boring.

2.4.2.7 In addition, all the aboveground construction works at Wah Fat Playground works area will be carried out within noise enclosure. In order to reduce construction noise impacts on the noise sensitive receivers (NSRs), temporary full noise enclosure is recommended to be installed before the commencement of the construction or as early as possible. It is recommended to complete the installation of the full noise enclosure prior to the bulk excavation for MVB so that most of the noise generated by the bulk excavation would be

well contained. This temporary noise enclosure should be decommissioned only when most of the back filling works are completed.

TBM Launching and Retrieval Points

- 2.4.2.8 The Southern Portal will be constructed first to provide a vertical face for TBM launching from surface at the Southern Portal. The TBM will then be retrieved via a TBM dismantling chamber. A drill-and-blast / drill-and-break tunnel will be constructed from the Wah Fat works area towards the Tuen Mun Typhoon Shelter. The exact location of the TBM dismantling chamber is flexible subject to the actual construction programme. The TBM dismantling chamber will then be constructed by drill-and-blast / drill-and-break. No noise enclosure for the TBM dismantling operations is required as, all TBM dismantling operations will be enclosed within the underground dismantling chamber. All the TBM pieces will be transported from the underground dismantling chamber to Wah Fat Playground works area through the adit as mentioned in **Section 2.4.2.6**.
- 2.4.2.9 In order to reduce construction noise impacts on the NSRs, it is also recommended to install a temporary full noise enclosure to cover the temporary adit portal and spoil storage area, leaving mucking outs as the only openings for conveying spoil / transporting machinery etc during daytime period. Where practicable, the openings of these mucking outs should be facing towards existing terrain instead of the existing NSRs. The mucking outs should also be closed during evening, night-time and restricted periods to minimise noise emanating out.

Re-provisioning Works

- 2.4.2.10 Some existing facilities will be affected during construction stage, temporary re-provisioning of the associated facilities will be required (i.e. basketball court, public toilet and carparking area and EMSD Servicing Centre). As the facilities are temporary in nature and will be reinstated in original status, the site formation works, demolition works and associated civil and superstructure works will be kept minimal. Associated civil and superstructure works include foundation, building works, paving, underground utilities installation etc.

Integrated Design and Construction with Route 11 Project

- 2.4.2.11 The design and construction of TMB has been considered in an integrated manner with Route 11 project, taking into account the existing topography to minimize the slope cutting. For example, closer spacing of portals and shared use of some operation roads for the two projects will reduce the land required and hence open cutting. The site formation at the northern portal area would be accommodating both TMB and Route 11 project, which means the newly formed platform would allow portal construction for both projects, adequate administration and operation area for both projects. This would maximize the usable area, thus minimizing encroaching into natural hillsides and minimizing total volume of rock cut. The site formation work for TMB is also planned to be undertaken together with that for Route 11, which will minimise site formation extent due to the clearance requirement or works area for separate construction, and in turn the generation of excavated materials.

Adoption of Steeper Slope Angle

2.4.2.12 The site formation would adopt steeper slope angle to prevent significant excavation at the natural hillside. To ensure the slope stability, various slope stabilization measures would be adopted to prevent slope failure, such as construction of drain holes and installation of rock anchor. The steeper slope cut angle could minimize the total amount of excavation spoil generated.

Adoption of Excavation and Lateral Support (ELS)

2.4.2.13 ELS system instead of open cut excavation is proposed to be adopted for excavation works at the existing ground. The ELS system could provide lateral support to the cut slope, and it would facilitate the construction of pile caps, basement and underground structures. By making good use of the ELS, the excavation could be minimized by eliminating the excavation of slope that runs up the sides of the required excavation area.

2.5 Tackling Environmental Challenges

2.5.1.1 Due considerations have been given in formulating the design of the Project to overcome environmental challenges encountered. The hierarchy of “Avoid, Minimize and Mitigate” has been adopted during the process to protect the environment as much as practicable. The key design considerations to tackle all the environmental challenges are summarised in **Table 2.2**.

Table 2.2 Key design considerations and the associated environmental benefits

Design Considerations	Key Design Considerations and the Associated Environmental Benefits
Avoidance of Aboveground Works within Country Park	<ul style="list-style-type: none">• No aboveground works within Tai Lam Country Park. Only tunnelling works and part of temporary underground adit at the Wah Fat Works Area would be carried out underneath Tai Lam Country Park. No aboveground works within the Tai Lam Country Park boundary;• No direct loss of aboveground natural habitats and resources within Tai Lam Country Park boundary; and• After considering the latest geological information at Tai Lam Country Park, it has been determined that the most suitable construction method for these tunnel sections is drill-and-blast. Alternative tunnelling methods, including the use of TBM in Tai Lam Country Park were duly explored but considered not suitable from the engineering perspective.
Avoidance of Marine Works	<ul style="list-style-type: none">• Avoid reclamation and the associated dredging works within Tuen Mun Typhoon Shelter have been totally avoided; and

Design Considerations	Key Design Considerations and the Associated Environmental Benefits
	<ul style="list-style-type: none"> • Avoid the disturbance of seabed, marine habitat loss and generation and disposal of marine sediment.
Minimisation of Potential Water Drawdown in Tai Lam Country Park	<ul style="list-style-type: none"> • Good practices and water control strategies such as including probing ahead, pre-grouting and posting grouting will be implemented to minimize adverse impact. As a precautionary measures, monitoring programme will be implemented to monitor the mitigation measures on groundwater infiltration within Tai Lam Country Park; and • Drill-andblast/drill-and-break tunnel section would be in granite and with sufficient depth below ground, together with the good practices and mitigation measures, adverse impact on the change in groundwater table would be insignificant.
Minimisation of Air Quality Impact	<ul style="list-style-type: none"> • Adopt mitigation measures for fugitive dust such as regular spray, exposed earth surface covered by tarpaulins, standard wheel washing facilities at the construction site exits, vehicle washing at the exit of the barging facility with the provision of vehicle washing facilities; • Provision of 3-side with top cover and spraying system at unloading points at the barging facility; • Blasting to be carried out in a fully enclosed environment; • Avoid using exempted Non-Road Mobile Machinery (NRMM) where practicable; • Site hoardings of not less than 2.4m high should be provided as far as practicable along the site boundary with provision for public crossing. Taller site hoardings may be considered for ASRs in close vicinity to the site boundary, subject to actual site constrains and detailed design. Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period; • Connect construction plant and equipment to mains electricity supply and avoid use of diesel generators and diesel-powered equipment as far as practicable to minimize air quality impact arising from construction machinery; • Close the impermeable blast covers at tunnel portals prior to blasting works in order to ensure blasting works in a fully enclosed environment; • The engine of the barge shall be switched-off during berthing as far as practicable. Provision of on-shore power supply shall also be considered

Design Considerations	Key Design Considerations and the Associated Environmental Benefits
	<p>wherever possible to minimize air quality impact from the marine vessels, with consideration of actual site constraints or circumstances to be further reviewed during detail design stage;</p> <ul style="list-style-type: none"> • Dust filtering system shall be installed at the exhausts of the tunnel; • Close liaison between the contractors of other concurrent projects and the Project would be maintained to minimise dusty activities to be conducted concurrently as far as practicable; • During the subsequent design stage and the operational stage, the ventilation engineer should conduct adaptive reviews on the ventilation scheme covering different periods of a day, taking into account the contemporary circumstance such as latest traffic forecast, traffic composition, update on the ambient air quality, etc., and then review and update the air quality assessment as necessary to demonstrate full compliance of the AQO. These adaptive reviews would allow the designer and operator to optimize the operation of the ventilation system without compromising the compliance of AQO; and • Proper design of any planned air sensitive uses within the satellite control building and operation area in Lam Tei, and maintenance compound and training ground and supporting area in Pillar Point such that any openings, openable windows, and/or FAIs will be located and avoided from the predicted exceedance zone at 1.5mAG. (e.g. by provision of fixed glazed window or blank facades, and FAIs to be located away or proposed air sensitive uses outside the exceedance zone, or installation of air filtering system at FAIs if located within predicted exceedance zone at 1.5mAG). Further review of the layout and design of these TMB highway / tunnel operation and maintenance facilities in Detailed Design Stage to ensure compliance of the AQOs.
Minimisation of Noise Impact	<ul style="list-style-type: none"> • Adopt noise mitigation measures such as use of Quality Powered Mechanical Equipment (QPME) and/or quieter mechanical equipment, quieter construction methods, temporary/ moveable noise enclosure will be considered during construction; and • Install temporary full enclosure at the temporary adit portal, spoil storage area and excavation area of MVB at Wah Fat Playground to minimise construction noise impacts on the NSRs.

Design Considerations	Key Design Considerations and the Associated Environmental Benefits
Minimisation of the C&D Material & Risk if Unauthorised Filling Activities	<ul style="list-style-type: none"> • Segregate C&D materials from other wastes to avoid contamination and ensure acceptability at PFRFs or reclamation sites; • Carry out on-site sorting; • Make provisions in the Contract documents to allow and promote the use of recycled aggregates where appropriate; • Implement a trip-ticket system for each works contract in accordance with DEVB TC(W) No. 6/2010 to ensure that the disposal / handling of C&D materials is properly documented and verified, so as to avoid the illegal dumping and landfilling of C&D materials; and • All dump trucks and vessels engaged on site should be equipped with Global Positioning System (GPS) or equivalent automatic system for real time tracking and monitoring of their travel routings and parking locations to prohibit illegal dumping and landfilling of C&D materials.
Minimisation of Cultural Heritage Impact	<ul style="list-style-type: none"> • Avoid the three Sites of Archaeological Interest (SAIs), namely Shek Kok Tsui, Fu Tei Ha and So Kwu Wat and will not be impacted; • Any vibration and building movement induced from the proposed works will be strictly monitored to ensure no disturbance and physical damages made to the heritage sites during the course of works; and • Avoided direct impact on the Built Heritage at the former Girl Guide Associate Campsite, no excavation works will be carried out and existing building structures will not be demolished or removed but only require some necessary restoration/ refurbishment/ repair.

2.6 Proposed Alignment and Development Scheme

2.6.1.1 Considering all the environmental constraints identified and engineering/ operational requirements, the design team has developed the preliminary design for the Project, with the key elements summarized in the **Table 2.3** below. **Figure 1.1** shows all the key elements of the Project.

Table 2.3 Key elements of the Project

Key Element	Locations	Description
Drill-and-Blast / Drill-and-Break Tunnelling	• Between Tai Lam Country Park and Tuen Mun Typhoon	• Tunnel section underneath Tai Lam Country Park would be in granite. The depth of this tunnel section would vary between 43 – 465m

Key Element	Locations	Description
	Shelter	below local ground.
Tunnel Boring Machine Tunnelling	<ul style="list-style-type: none"> Between Tuen Mun Typhoon Shelter and Pillar Point 	<ul style="list-style-type: none"> The section within Tuen Mun Typhoon Shelter would be approximately 10 – 60m underneath seabed. The section from Tuen Mun Area 44 to Pillar Point would be land based and would be approximately 10 – 60m below local ground.
Portal and Interchange	<ul style="list-style-type: none"> Northern Portal at Lam Tei Quarry Southern Interchange and Portal at TM-CLKT and Lung Mun Road 	<ul style="list-style-type: none"> Aboveground road structure and link road.
Ventilation Buildings (Tunnel Operation Area)	<ul style="list-style-type: none"> NVB: at Lam Tei Quarry 	<ul style="list-style-type: none"> A building structure with main roof level at approximately 21m above ground level. Other structures, such as E&M plant, lift shaft structure, ancillary features, water tanks, etc. are located above the main roof. Exhaust discharge from louver of the M&E plant room above the roof.
	<ul style="list-style-type: none"> MVB: at Wah Fat Playground 	<ul style="list-style-type: none"> A building structure with the main roof level at approximately 19m above ground level. Exhaust discharge from wall louver of the E&M plant room at the top floor. Other structures, such as E&M plant, lift shaft structure, ancillary features, water tanks, etc. are located above the main roof.
	<ul style="list-style-type: none"> SVB: at hillside of TM-CLKT northbound. 	<ul style="list-style-type: none"> A building structure with the main roof level at approximately 24m above ground level. Exhaust discharge from wall louver of the E&M plant room at the top floor. Other structures, such as E&M plant, lift shaft structure, ancillary features, water tanks, etc. are located above the main roof.
Highway / Tunnel Operation Area (including satellite control building, administration building, maintenance compound, recovery/supporting area and other highway / tunnel	<ul style="list-style-type: none"> Satellite control building at the northern portal 	<ul style="list-style-type: none"> An aboveground building structure.
	<ul style="list-style-type: none"> Administration building and maintenance compound at the southern interchange 	<ul style="list-style-type: none"> Ann aboveground building structure.
	<ul style="list-style-type: none"> Recovery area, training ground and other supporting area for highway / tunnel operation at the 	<ul style="list-style-type: none"> At-grade area for tunnel operation.

Key Element	Locations	Description
operation areas in Lam Tei)	southern interchange	
	<ul style="list-style-type: none"> Highway / tunnel operation area at the northern portal in Lam Tei 	<ul style="list-style-type: none"> At-grade area for tunnel operation.
Proposed Works Area	<ul style="list-style-type: none"> Wah Fat Playground Works Area 	<ul style="list-style-type: none"> Construction site of MVB and site for TBM retrieval points and storage spoils and construction material.
	<ul style="list-style-type: none"> Area at the former Girl Guide Association (GGA) Campsite for site office or other project uses 	<ul style="list-style-type: none"> The site was established in late 1950s. Some restoration and repair of building will be carried for site office and other project uses. No demolition and removal of structures at the area.
	<ul style="list-style-type: none"> Temporary works area at Tuen Mun West (near Mong Fat Street) 	<ul style="list-style-type: none"> Storage of construction materials and equipment, spoil storage area, slurry treatment plant and site office
Barging Point Facilities	<ul style="list-style-type: none"> East side TM-CLKT Northern Landfall vertical seawall. 	<ul style="list-style-type: none"> 4 berths for delivery of construction waste/material. Barging points facilities for marine delivery, storage construction material, spoil storage area and site office.
Proposed Works Area for Re-provision of affected facilities	<ul style="list-style-type: none"> Temporary re-provisioning of basketball court and public toilet at the carpark near Sam Shing Hui (KW carpark) 	<ul style="list-style-type: none"> The Wah Fat Playground would be used at construction works area for MVB construction. The affected basketball court and public toilet at Wah Fat Playground would be temporary re-provided. After the completion of construction works, the Wah Fat Playground will be re-instated with more spacious area. The temporary basketball court and public toilet will be demolished.
	<ul style="list-style-type: none"> Temporary re-provisioning of carparking area at the existing parking lots and open area with planters in Fung On Street. 	<ul style="list-style-type: none"> Proposed works area for re-provisioning of temporary carparking area. After the reinstatement of KW carpark, the works area at Fung On Street will be reinstated.
	<ul style="list-style-type: none"> Temporary re-provisioning of EMSD vehicle servicing centre at the former TM-CKLT 	<ul style="list-style-type: none"> The southern interchange will encroach into the existing EMSD Tuen Mun Vehicle Servicing Station and temporary re-provisioning will be required.

Key Element	Locations	Description
	Site Office	
Three magazines (for shared use with Route 11)	<ul style="list-style-type: none"> At Lam Tei Quarry (underground), Pillar Point and Siu Lam 	<ul style="list-style-type: none"> Storage of explosives.

Note:

[1] Roof level refers to the approximate main roof finish floor level, excluding any M&E plant, lift shaft structure, ancillary features, water tanks, etc. above the main roof.

2.7 Tentative Construction Programme

2.7.1.1 A summary of the key construction works programme is given in **Table 2.4**. The construction phase of the Project will commence in 2025 Q2 and complete in 2033 Q3.

Table 2.4 Tentative construction programme of the Project

Description	Tentative Construction Programme
Re-provisioning works of affected facilities (at KW Carpark and Fung On Street)	2025 Q2 to 2025 Q4
Site formation works, construction northern and southern portal, and underground magazine site	2025 Q2 to 2027 Q2
TBM and drill-and-blast/drill-and-break Tunnelling Works, building works, tunnel operation area, road connecting to TM-CLKT.	2026 Q2 to 2031 Q3
Route-wide tunnel E&M works, thermal barrier, tunnel cladding, route-wide TCSS works and testing and commissioning for TMB.	2027 Q3 to 2033 Q3

3. Summary of Environmental Impact Assessment

3.1 Air Quality Impact

3.1.1 Construction Phase

3.1.1.1 Potential construction dust impact would be generated from site clearance, soil excavation, backfilling, reclamation, construction of tunnels, blasting, barging facilities, and construction vessels, etc. during construction phase of the Project. A comprehensive review has been conducted on the monitoring data for similar infrastructure projects and the construction dust impact assessment indicates that given the implementation of good site practices and mitigation measures, such as regular watering, implementation of vehicle washing facilities at the construction site exits, tunnel blasting in a fully enclosed environment, and open blasting with blast screens, cages or mats, etc., adverse air quality impact during construction phase is not anticipated. Nevertheless, continuous dust monitoring is also proposed at representative locations (i.e. the closest air sensitive receivers (ASRs) in all directions) to ensure that there is no adverse dust impact on the nearby ASRs.

3.1.2 Operational Phase

3.1.2.1 Cumulative air quality impact during operational phase arising from the operation of the Project, concurrent projects and other emission sources such as vehicular emission from open roads, emission from public transport interchanges and heavy goods vehicle / coach parkings, industrial emissions and marine emission within 500m study area has been assessed for the operation phase of the Project at the worst Year 2048 for Respirable Suspended Particulates (RSP), Fine Suspended Particulates (FSP) and Nitrogen Oxides (NO_x) with respect to vehicular emission, which has the highest vehicular emission burden within 15 years after commencement of the Project for RSP, FSP and NO_x. The results concluded that the predicted cumulative Nitrogen Dioxide (NO₂), RSP and FSP concentration at all ASRs would comply with AQO. No adverse air quality impact is anticipated arising from the operation of the Project. The Proposed TMB highway / tunnel operation and maintenance facilities (i.e. the northern ventilation building, satellite control building and operation area in Lam Tei, as well as maintenance compound and training ground and supporting area in Pillar Point) would partially fall within the potential exceedance zone at 1.5mAG. These facilities shall be properly designed such that any openings, openable windows, and/or fresh air intakes will be located and avoided from the predicted exceedance zone at 1.5mAG (or installation of air filtering system at fresh air intakes if located within predicted exceedance zone at 1.5mAG). Further review of the layout and design of operation area will be conducted in Detailed Design Stage to re-affirm compliance of the AQOs.

3.2 Noise Impact

3.2.1 Construction Noise Impact

3.2.1.1 Potential construction noise impact would be generated from the use of PME during construction phase of the Project. A review has been conducted on the construction methodology. Temporary noise enclosures have been proposed for the temporary adit portal and spoil storage area at Wah Fat Playground works area and the excavation area

for middle ventilation building, in view of the close proximity to nearby noise sensitive receivers. Also, with the implementation of good site practices and mitigation measures, such as quieter plant/methods (e.g. non-percussive construction methods, silent press-in piler, etc.), silencer, movable noise barrier, noise enclosure / barrier, etc., adverse construction noise impact during construction phase is not anticipated.

- 3.2.1.2 A Construction Noise Management Plan (CNMP) containing a quantitative construction noise impact assessment, the adopted quieter construction method and equipment, noise mitigation measures and the construction noise impact monitoring and audit programme will be submitted to the EPD with reference to the updated and identified plant inventories once available and in any case before the tender invitation and commencement of the project construction, and if there is any change to the construction noise mitigation measures recommended in the CNMP, an updated CNMP shall be submitted one month before the implementation of such change.

3.2.2 Road Traffic Noise Impact

- 3.2.2.1 A quantitative road traffic noise impact assessment has been conducted for planned, existing and committed noise sensitive uses. No adverse road traffic noise impact due to the Project is anticipated.

3.2.3 Fixed Noise Sources Impact

- 3.2.3.1 Potential fixed noise source impact would be generated from the ventilation shaft of ventilation buildings, mechanical ventilation system of the administration buildings and satellite control building, and maintenance compound. A review has been conducted on the design of these fixed noise sources and it is considered that given the implementation of good design and mitigation measures, such as quieter plant, silencer, barriers, enclosures, etc., adverse fixed noise source impact during operational phase is not anticipated.

- 3.2.3.2 A Fixed Noise Source Management Plan (FNMP) containing the quantitative fixed noise sources impact assessment, noise mitigation measures, and fixed noise sources impact monitoring and audit programme will be submitted to the EPD with reference to the updated and identified inventories and utilization schedule once available and in any case before tendering and commencement of implementation of the Project. If there is any change to the specifications of the planned fixed noise sources, layout design, operation modes, mitigation measures, or any other factors that would have implications on the fixed noise sources impact as concluded in the FNMP, an updated FNMP shall be submitted to the EPD no later than one month before the implementation of any such change.

3.3 Water Quality Impact

3.3.1 Construction Phase

- 3.3.1.1 Given that all marine works have been avoided, potential water quality impact due to land-based construction works has been reviewed. The potential sources of water quality impact during the construction phase are mainly from operation of temporary barging point and land-based construction activities including construction runoff, tunnelling and underground works, buildings construction, sewage from the workforce, construction works in close proximity of inland water, groundwater from contaminated areas and

contaminated site run-off, diversion of watercourses and accidental spillage. The TMB tunnelling across the Tuen Mun Typhoon Shelter will pass through the bedrock layer, which will not disturb on the waterbodies or seabed. Therefore, adverse water quality on marine waterbodies is not anticipated. With the mitigation measures such as Best Management Practices (BMPs) and water control strategies during tunnelling and underground works, adverse impacts are not anticipated during construction phase.

3.3.2 Operational Phase

3.3.2.1 During the operational phase of the Project, the major sources of potential water quality impact include road runoff discharged from paved roads and developments proposed under the Project including the sewage generated by the proposed satellite control building and administration buildings, and wastewater generated from washing and maintenance operations. However, with proper implementation of recommended mitigation measures and best practices, adverse water quality impacts are not anticipated during the operational phase.

3.4 Waste Management Implications

3.4.1 Construction Phase

3.4.1.1 Potential waste management implications from the generation of waste during the construction phase have been evaluated. General mitigation measures of good site practices, waste management measures and strategic mitigation measures, including the opportunity for on-site sorting, reusing C&D materials, etc., are recommended to minimise the surplus materials to be disposed. Recommendations have been made for implementation by the Contractor during the construction period to minimise waste generation and off-site disposal.

3.4.2 Operational Phase

3.4.2.1 The types of waste that would be generated during the operational phase have also been assessed. Recommendations have been made to ensure proper treatment and disposal of these wastes. Appropriate waste collectors would be employed to handle general refuse, chemical waste generated during operation phase respectively.

3.4.2.2 With the implementation of the recommended waste management measures and good site practices, unacceptable waste management implications would not be anticipated for construction and operation phase.

3.5 Land Contamination

3.5.1.1 Site appraisals, in the form of desktop review and site walkovers, were conducted under this EIA, to identify any current / historical potentially contaminating and uses within the Project Area. Based on the findings of site appraisals, potential land contaminated areas were identified as documented in the Contamination Assessment Plan (CAP) prepared under this EIA.

3.5.1.2 Site investigation (SI), sampling and laboratory analysis plan, targeting the potential contamination area and hotspots identified within the Assessment Area is recommended in the CAP. Some potential contaminated areas were inaccessible during the time of

preparation of the CAP. It was also observed that all the potential contaminated areas were in operation and infeasible to conduct SI and sampling works during the EIA stage. Therefore, prior to the development of these areas, site re-appraisal of the whole Project Areas should be carried out in order to address any new contamination issues caused by the (i) changes in operation of the identified potentially contaminated site and (ii) changes in land use within the Project Area. Supplementary CAP(s), incorporating the findings of the site re-appraisal and the updated sampling and testing strategy, should be prepared and submitted to EPD for agreement prior to the commencement of SI works.

- 3.5.1.3 SI works shall then be conducted according to the supplementary CAP(s). Upon the completion of SI works. Contamination Assessment Report (CAR) shall be prepared and submitted to EPD for agreement. If land contamination is identified based on the SI results, a combined CAR-Remediation Action Plan (CAR-RAP) for formulating necessary remedial measures shall also be submitted to the EPD for agreement. Any identified contaminated soil and groundwater should be treated according to the RAP(s) to be approved by EPD and Remediation Report(s) (RR(s)) should be submitted to EPD for agreement after the completion of the remediation works. No development works at the contaminated areas shall be commenced prior to EPD's agreement of the RR(s).
- 3.5.1.4 With the implementation of the recommended further works mentioned above, any soil/groundwater contamination would be identified and properly treated prior to the construction works. No insurmountable land contamination impacts to the Project are therefore anticipated.

3.6 Hazard to Life

3.6.1 Construction Phase

- 3.6.1.1 The Project falls into consultation zone of a Potentially Hazardous Installation (PHI) (i.e. ExxonMobil LPG Storage Installation located at Tuen Mun Area 44). Nevertheless, the tunnel alignment of the Project is located at more than 30m under this PHI. Also, the tunnel alignment of the Project is located at about 30m under the LPG storage installation at Sam Shing Estate. Tunnelling using Tunnelling Boring Machine (TBM) is adopted for constructing the tunnel section close to these LPG storage installations, such that at-grade construction activities and any blasting works in their vicinity have been avoided. In addition, with reference to monitoring of other similar project, no ground settlements would be expected for these two LPG storage installations. Moreover, monitoring and mitigations measures would be proposed to control the ground vibration or ground settlement induced by TMB tunnelling. Hence, potential risk during construction phase is not envisaged.
- 3.6.1.2 Drill-and-blast works are required for the tunnel construction and some of the slope works. According to the latest design, overnight storage of explosives on site is required. Three temporary explosive magazines at Lam Tei, Siu Lam and Pillar Point have been proposed, which would be share-used with Route 11.
- 3.6.1.3 A quantitative risk assessment (QRA) has been conducted for the transportation, overnight storage and use of explosives. The QRA has also considered other concurrent projects, such as Route 11 and Lam Tei Underground Quarrying, for the cumulative impacts. The assessment results show that the societal risk for the overnight storage and transport of explosives as well as the use of explosives lie within the "ALARP" region. For individual

risk, compliance is anticipated. A detailed ALARP assessment has been conducted. Mitigation measures and best practices, such as provision of dedicated training programme and implementation of emergency response and training, have been recommended to minimize the risk even further.

- 3.6.1.4 A Hazard Management Plan would be formulated with a view to aligning the understanding of the risk of the three concurrent projects (Route 11, TMB and Lam Tei Underground Quarrying (LTUQ)). The measures stipulated in the Hazard Management Plan shall include, but not limited to, the adjustment of the blasting schedules of the three projects to minimize the potential cumulative impact, provision of common trainings and drills to the workforce of all the three projects, etc.

3.6.2 Operational Phase

- 3.6.2.1 The Project falls into consultation zone of a PHI (i.e. ExxonMobil LPG Storage Installation located at Tuen Mun Area 44). Also, the Project is located at some distance from the LPG storage installation at Sam Shing Estate. However, section of the Project in proximity of these LPG storage installations is in form of tunnel, the population induced from the tunnel is all located in a confined space underground and hence, would not be affected by the hazardous events from these LPG storage installations. Hence, potential risk during operational phase is not envisaged and thus monitoring and audit are not required.

3.7 Landfill Gas Hazard

- 3.7.1.1 A qualitative assessment on potential hazards associated with landfill gas migration from the Pillar Point Valley Landfill (PPVL) to the proposed Project site has been carried out. PPVL is considered as a “medium” source of gas migration due to the landfill condition with the implementation of multiple landfill gas controls. The source-pathway-target analysis shows that landfill gas risk posed by the PPVL to the Project is “medium” during construction phase and “low to high” during operation phase.
- 3.7.1.2 In general, underground rooms or void spaces within the Consultation Zone should be avoided as far as practicable at the Administration Building, Maintenance Compound and temporary re-provisioning of EMSD vehicle servicing centre of the site within Consultation Zone. Other precautionary and protection measures during design, construction and operation phases of the Project have been recommended for elements within the Consultation Zone. It is expected that with the proposed precautionary measures in place, the potential risk of landfill gas migration to the respective targets will be minimal.

3.8 Ecological Impact (Terrestrial)

- 3.8.1.1 The ecological impact assessment has been carried out based on findings from the literature reviews and the field surveys conducted for six months covering both wet and dry seasons completed in 2022. According to the Project alignment and elements, the Project will cause potential habitat loss in mixed woodland (~2.2 ha), plantation (~3.1 ha), shrubland/grassland (~0.9 ha), watercourse (~0.3 km).
- 3.8.1.2 Majority of the identified impacts are considered to be low in the absence of mitigation

measures. However, the potential impact on direct loss of mixed woodland and watercourses and direct ecological impact on flora and fauna species of conservation importance as low to moderate. Necessary mitigation measures and ecological monitoring programme were proposed.

- 3.8.1.3 It is predicted that the impacts will mainly arise during the construction phase, as no activity would be conducted during the operational phase that would affect the adjacent habitats.
- 3.8.1.4 Direct impacts on aboveground habitats in sites of conservation importance such as Tai Lam Country Park are avoided while potential indirect impacts and groundwater drawdown resulting from the tunnelling works will be suitably mitigated and monitored during both the construction and operational stages.
- 3.8.1.5 With the implementation of proposed mitigation measures, adverse residual impacts from the Project on the ecological resources within and in the vicinity of the Project Area during construction and operation phases would not be anticipated. The residual impact of the loss is therefore considered to be minor and acceptable.

3.9 Landscape and Visual Impacts

- 3.9.1.1 Potential landscape and visual impacts during construction and operation phases have been minimized through careful consideration of alternatives to minimize direct conflict with the Tai Lam Country Park, minimization of works areas, and incorporation of aesthetic external designs and appropriate landscape and visual treatments along the TMB.
- 3.9.1.2 A tree group survey has been carried out to assess the general tree condition and to identify any Trees of Particular Interest (TPIs) within and near the proposed limit of works. Among the estimated 6208 nos. of existing trees (including an estimated 6207 nos. of trees in tree groups and 1 no. of TPI, excluding common undesirable species) within the tree survey boundary 3083 nos. of existing trees would be retained and protected. An estimated 342 nos. of affected trees, mostly recent plantings associated with TMCLKL, are considered suitable for transplanting. An estimated 2783 nos. of affected trees (including 1 no. of TPI, namely a *Ficus elastica* with DBH of over 1m, is recorded within EMSD Tuen Mun Vehicle Servicing Station) would be removed due to low “Suitability for Transplanting” as assessed at this stage. Since most of the affected individual trees are located either on natural terrain or engineered slopes and in mature size, their survival rate after transplanting is low and not feasible for transplanting. In this connection, tree removal is proposed with compensatory planting. To achieve a compensatory ratio of not less than 1:1 in terms of number of trees to be removed, at least 2783 nos. of compensatory trees are required. Tree Preservation and Removal Proposals including compensation planting scheme shall be submitted in accordance with DEVB TC(W) No. 4/2020 - Tree Preservation.
- 3.9.1.3 There is no Registered OVT within the proposed limit of works. Meanwhile, 1 no. of Tree of Particular Interest (TPI) would inevitably be affected and proposed to be removed.
- 3.9.1.4 It is predicted that in year 10 of operation, there will be **Slight** adverse residual impacts after mitigation for LR-PP2 (Plantations in Pillar Point), LR-PP4 (Shrublands in Pillar

Point), LR-TM2 (Plantations in Tuen Mun), LR-LT2 (Plantations in Lam Tei), LCA-TM2 (Tuen Mun Upland Fringe Landscape) and LCA-LT4 (Lam Tei Upland Landscape).

- 3.9.1.5 It is predicted that in year 10 of operation there would be **Insubstantial** residual impact on: LR-PP10 (Seawater Body in Pillar Point), LR-PP11 (Developed Area in Pillar Point), LR-TM1 (Secondary Woodland in Tuen Mun), LR-TM11 (Developed Area in Tuen Mun), LR-TM13 (Playground in Wah Fat Street), LR-LT1 (Secondary Woodlands in Lam Tei), LR-LT7 (Watercourses in Lam Tei), LR-LT11 (Developed Area in Lam Tei), LR-NL2 (Plantations in Northern Landfall), LR-NL10 (Seawater Body at Northern Landfall), LR-NL11 (Developed Area in Northern Landfall), LCA-PP2 (Pillar Point Upland Fringe Landscape), LCA-PP10 (Lung Mun Road Highway Corridor Landscape), LCA-PP12 (Pillar Point Mixed Modern Institutional Urban Landscape), LCA-PP13 (Pillar Point Mixed Modern Industrial Urban Landscape), LCA-TM4 (Tuen Mun Upland Landscape), LCA-TM11 (Tuen Mun Residential Urban Landscape), LCA-LT2 (Lam Tei Upland Fringe Landscape), LCA-LT3 (Lam Tei Rural Landscape), LCA-NL8 (Northern Landfall Maritime Landscape), LCA-NL10 (Northern Landfall Highway Corridor Landscape) and LCA-NL13 (Northern Landfall Mixed Modern Industrial Urban Landscape).
- 3.9.1.6 There would be **Slight** adverse residual visual impacts in Year 10 of the operational phase after mitigation for VSR-TM1 (Residents of Alpine Garden, Rainbow Garden, Kam Fai Garden, Harvest Garden and Hoi Tak Garden), VSR-TM9 (Recreational Users of Wah Fat Garden), VSR-TM10 (Travelers of Wah Fat Street), and VSR-PP1 (Vehicle Travelers at Lung Mun Road).
- 3.9.1.7 The remaining VSRs will be subject to an **Insubstantial** residual impact in Year 10 of the operational phase after mitigation, namely, VSR-TM2 (Residents of Seaview Garden), VSR-TM3 (Residents of Pearl Island Garden), VSR-TM4 (Visitors at Tuen Mun Promenade), VSR-TM5 (Visitors at Hong Kong Gold Coast Dolphin Square), VSR-TM6 (Maritime Travelers to / from Tuen Mun Ferry Terminal), VSR-TM7 (Vehicle Travelers at Tuen Mun Road), VSR-TM8 (Recreational Users of Tsing Sin Playground), VSR-TM11 (Hikers of MacLehose Trail Section 10), VSR-TM12 (Visitors of Sam Shing Temple in Castle Peak Road – Castle Peak Bay), VSR-PP2 (Workers at EMSD Tuen Mun Vehicle Servicing Station and DSD Pillar Point STW), VSR-PP3 (Workers at River Trade Terminal), VSR-PP4 (Workers at Tuen Mun Area 40), VSR-PP6 (Recreational Users of Butterfly Beach Park), VSR-NL1 (Workers and Travelers at Hong Kong International Airport), VSR-NL2 (Travelers at Hong Kong Boundary Crossing Facilities), VSR-NL3 (Workers and Future Residents at MTR Siu Ho Wan Depot), VSR-LT1 (Residents of Lo Fu Hang), VSR-LT2 (Vehicle Travellers on Yuen Long Highway (Eastbound)), VSR-LT3 (Trail Walkers on Fu Tei Country Trail and Lam Tei Irrigation Reservoir), VSR-LT4 (Visitor of Nam On Fat Tong in Fu Fuk Road), VSR-LT5 (Recreational users of Fuk Hang Tsuen Basketball Court), and VSR-LT6 (Travelers of Fuk Hang Tsuen Road).
- 3.9.1.8 In accordance with the criteria and guidelines for evaluating and assessing impacts as state in Annex 10, Clause 1.1(c) of the EIAO-TM, overall, it is considered that the residual landscape and visual impacts of the proposed development are **acceptable with mitigation** during the construction and operational phases.

3.10 Cultural Heritage

- 3.10.1.1 The three Sites of Archaeological Interest, namely Shek Kok Tsui, Fu Tei Ha and So Kwu Wat are avoided and will not be impacted, and the works area of the Project is considered

to have no archaeological potential. Therefore, no adverse archaeological impact due to the proposed works is anticipated. No mitigation measure is required. As a precautionary measure, the project proponent and his/her contractor are required to inform Antiquities and Monuments Office (AMO) immediately when any antiquities or supposed antiquities under the Antiquities and Monuments Ordinance (Cap. 53) are discovered during works.

- 3.10.1.2 Desktop review identified no declared or proposed monuments, sites/ buildings/ structures in the new list of proposed grading items, and Government historic sites identified by AMO in the cultural heritage assessment area.
- 3.10.1.3 A grade 2 historic building (GB-02) is located about 49m from the nearby works area for re-provisioning of facilities. Built heritage items BH-02 and BH-03 are located next to works area. Potential vibration impact may be a concern due to vibration generation activities in the works area. Special attention should be paid to design proposal, method of works and choice of machinery should be targeted to minimize adverse impacts to the GB-02, BH-02 and BH-03. Any vibration and building movement induced from the proposed works should be strictly monitored to ensure no physical damages made to the heritage sites during the course of works. Monitoring proposal for the GB-02, including checkpoint locations, installation details, response actions for each of the Alert/ Alarm/ Action (3As) levels and frequency of monitoring should be submitted for AMO's consideration.
- 3.10.1.4 For operational phase, no adverse impact was identified, and no mitigation measure is required. And no adverse residual cultural heritage impact is anticipated.