Contents

Appendices

15. Conclusion

15.1 General

15.1.1.1 This Environmental Impact Assessment (EIA) Report has been prepared for Tuen Mun Bypass (the Project) in accordance with the requirements given in the EIA Study Brief (SB) (No.: ESB-348/2021) and the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM). Environmental assessment of the potential environmental impacts associated with the construction and operation of the Project has been conducted. Environmental issues covered in this EIA include:

- Air quality impact;
- Noise impacts
- Water quality impact;
- Waste management implication;
- Land contamination;
- Hazard to life;
- Landfill gas hazard;
- Ecological impact (terrestrial);
- Landscape and visual; and
- Impact on cultural heritage.

15.1.1.2 This section summaries the assessment results of each technical aspect and concludes the acceptability of the overall environmental performance of the Project.

15.1.1.3 The key assessment assumption, limitation of assessment methodologies and all related approach on assessment of different environmental aspects requiring agreements with Environmental Protection Department (EPD) are given in **Appendix 15.1**.

15.1.1.4 A summary of environmental impacts identified in this EIA is provided in **Appendix 15.2** and the conclusion of each technical aspect are described in the following sections.

15.2 Air Quality

15.2.1 Construction Phase

15.2.1.1 The air quality assessment studies the potential air quality impacts on Air Sensitive Receivers (ASRs) due to the construction and operation of the Project.

15.2.1.2 Potential construction dust impact would be generated from site clearance, soil excavation, backfilling, construction of tunnels, blasting works, 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 indicate 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 cages or mats, etc., adverse air quality impact during construction phase is not anticipated. Nevertheless, continuous dust monitoring is also proposed at comprehensive locations (i.e., closest ASRs in all directions) to ensure that there is no adverse dust impact on the nearby ASRs, and action plan is also proposed in case of exceedance of action and limit levels.

15.2.2 Operational Phase

15.2.2.1 A quantitative operational air quality assessment has been conducted taking into account the vehicular emission impacts associated with the Project and existing road network, and potential concurrent projects (including but not limited to induced traffic due to Route 11, etc.) within the assessment area. Cumulative impact from other contributions, including territory wide vehicular emission, power plants, marine emission, as well as regional emission from Pearl River Delta, have also been taken into account as background contribution. If there are 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, they will be properly designed 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). Further review of the layout and design of these TMB highway / tunnel operation and maintenance facilities will be conducted in Detailed Design Stage to re-affirm compliance of the AQOs. For the proposed satellite control building and FAIs for maintenance compound located within the exceedance zone at 1.5mAG, installation of air filtering system is recommended. The air filtering system and NO2 removal efficiency shall be further reviewed in Detailed Design Stage to re-affirm compliance of the AQOs.

15.3 Noise Impact

15.3.1.1 The noise assessment studies the potential noise impacts on Noise Sensitive Receivers (NSRs) due to the construction and operation of the Project.

15.3.2 Construction Noise

15.3.2.1 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, and it is considered that given the implementation of good site practices and mitigation measures, such as quieter construction method, quieter plant, silencer, movable noise barrier, noise enclosure / barrier, etc., adverse construction noise impact during construction phase is not anticipated.

15.3.2.2 Nevertheless, a Construction Noise Management Plan (CNMP) containing a quantitative construction noise impact assessment, the adopted quieter construction method(s) 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 tendering 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.

15.3.3 Road Traffic Noise

15.3.3.1 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.

15.3.4 Fixed Noise Sources

15.3.4.1 Potential fixed noise source impact would be generated from the ventilation shaft of ventilation buildings and mechanical system of the administration building in administration area, 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.

15.3.4.2 Nevertheless, 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 plant 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.

15.4 Water Quality Impact

15.4.1 Construction Phase

15.4.1.1 Potential water quality impact due to 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. 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.

15.4.2 Operational Phase

15.4.2.1 During the operational phase of the Project, the major sources of potential water quality impact include road and tunnel 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 of the Project.

15.5 Waste Management Implications

15.5.1 Construction Phase

15.5.1.1 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 devised 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.

15.5.2 Operational Phase

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

15.5.2.2 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.

15.6 Land Contamination

15.6.1.1 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, a total of nine areas were identified with potential land contamination concerns as documented in the Contamination Assessment Plan (CAP) prepared under this EIA.

15.6.1.2 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 area were inaccessible during the time of preparation of the CAP. It was also observed that all the potential contaminated area are in operation and infeasible to conduct SI and sampling works during 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. The 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.

15.6.1.3 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 (CAP-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).

15.6.1.4 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.

15.7 Hazard to Life

15.7.1 Construction Phase

15.7.1.1 The Project falls into consultation zone of a Potentially Hazardous Installations (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 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 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.

15.7.1.2 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.

15.7.1.3 A quantitative risk assessment (QRA) has been conducted for the transportation, overnight and use of explosives. The QRA has also considered other concurrent projects, such as Route 11 and Lam Tei Underground Quarry, 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. 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.

15.7.1.4 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.

15.7.2 Operational Phase

15.7.2.1 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.

15.8 Landfill Gas Hazard

15.8.1.1 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.

15.8.1.2 In general, underground rooms or void spaces should be avoided as far as practicable at the Administration Building, Maintenance Compound and temporary re-provisioning of Electrical and Mechanical Services Department (EMSD) 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.

15.9 Ecological Impact (Terrestrial)

15.9.1.1 The ecological impact assessment has been carried out based on findings from the literature reviews and the field surveys of conducted for six months covering both wet and dry seasons completed in 2022. According to the Project alignment, the Project will cause potential permanent habitat loss to mixed woodland (~2.2 ha), plantation (~3.1 ha), shrubland/grassland (~0.9 ha) and watercourse (~0.3 km).

15.9.1.2 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.

15.9.1.3 It is predicted that the impacts will mainly arise during the construction phase, as no major activities would be conducted during the operation phase that would affect the adjacent habitats.

15.9.1.4 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.

15.9.1.5 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.

15.10 Landscape and Visual Impacts

15.10.1.1 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.

15.10.1.2 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.

15.10.1.3 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.

15.10.1.4 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).

15.10.1.5 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).

15.10.1.6 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).

15.10.1.7 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).

15.10.1.8 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.

15.11 Cultural Heritage

15.11.1.1 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 measures 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 the course of works.

15.11.1.2 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.

15.11.1.3 A grade 2 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.

15.11.1.4 For operation phase, no adverse impact was identified, and no mitigation measure is required. And no adverse residual cultural heritage impact is anticipated.