

Agreement No. CE 76/2017 (HY)  
Upgrading of Remaining Sections of Kam Tin Road and Lam Kam Road

Environmental Impact Assessment Report –  
Executive Summary  
(Brief No: ESB-310/2018)



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*In association with ANewR Consulting Limited*

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**FIGURE**

**Figure 1.1**      **Project Location**

**Figure 2.1**      **CA Location**

**I.0 INTRODUCTION****I.1 Project Background**

In 2007, Transport Department (TD) and Highways Department (HyD) proposed to upgrade the remaining sections of Kam Tin Road and Lam Kam Road to 7.3m (“Original Scheme”), which did not cover the upgrading of the road section of Kam Tin Road between Tung Wui Road and Fan Kam Road to 10.3m wide.

An Environmental Impact Assessment (EIA) study brief (No. ESB-170/2007) was issued in October 2007 by the Director of Environmental Protection under the Environmental Impact Assessment Ordinance (EIAO).

Assessment on environmental impacts for the “Original Scheme” had been carried out. The EIA Report was approved by EPD on 26 June 2009. HyD then applied for Environmental Permit (EP) on 10 April 2012 and the EP (EP No. EP-439/2012) was granted by EPD on 7 May 2012. No upgrading works has been carried out after the issuance of EP in 2012.

According to the traffic survey under the traffic impact assessment (TIA) conducted by Civil Engineering and Development Department (CEDD) in November 2015 under Agreement No. CE 34/2014 (CE) “Site Formation and Infrastructure Works for the Initial Sites at Kam Tin South, Yuen Long – Investigation, Design and Construction”, the volume to capacity (v/c) ratio of the road section of Kam Tin Road between Tung Wui Road and Fan Kam Road has exceeded 1.2. Taking into account the TIA findings by CEDD, TD considers if the “Original Scheme” is to be implemented (i.e. upgrading the concerned road section of Kam Tin Road to a standard 7.3m wide carriageway), the v/c ratio would still be very close to 1.2 having regard to full population intake of the Kam Tin South Development in 2031. Therefore, TD determined that there was a need to upgrade the road section of Kam Tin Road between Tung Wui Road and Fan Kam Road to 10.3m wide (“New Scheme”) to bring down the v/c ratio below 1.0 to cater for the planned development.

The proposed upgrading works do not include any expressway, trunk road, primary distributor road or district distributor road, road or railway tunnel more than 800m in length between portals, and road or railway bridge more than 100m in length between abutments. As such, the project does not constitute Designated Project (DP) under Schedule 2 Part 1 Categories A1, A7 and A8 of the Environmental Impact Assessment Ordinance (EIAO) Cap. 499. However, the proposed upgrading works encroach upon existing conservation areas. Hence, the upgrading of remaining sections of Kam Tin Road and Lam Kam Road (which is hereafter referred to as the “Project”), is classified as Designated Project under Schedule 2 Part 1 Category Q.1 of the EIAO and it requires an environmental permit before works commencement.

The construction works are anticipated to commence in early 2021 with completion of the Project in mid-2025. However, the actual programme is subject to review depending on the progress of the Project.

Project profile of the Project (Register No. PP-571/2018) was submitted on 11 October 2018 for application for an EIA Study Brief. Subsequently, a Study Brief (Register No. ESB-310/2018) was issued by EPD on 22 November 2018.

**I.2 Purpose of this Executive Summary**

This Executive Summary (ES) summarizes the findings, recommendations and conclusions of the EIA Report for the Project.

**2.0 PROJECT DESCRIPTION****2.1 Objectives and Scope of Project**

The remaining unimproved sections of Kam Tin Road and Lam Kam Road are Kam Tin Road section between Tung Wui Road and Lam Kam Road; and Lam Kam Road section between Kam Tin Road and Kadoorie Farm. These remaining sections are single two-lanes carriageway with substandard width. Road safety problems are compounded by overtaken vehicular traffic, sharp bends, hidden accesses, sub-standard gradients, inadequate lateral clearance, frequent usage of heavy vehicles, insufficient pedestrian crossing facilities and insufficient bus laybys.

The Project is to upgrade the remaining sections of Kam Tin Road and Lam Kam Road to a standard width single two-lane carriageway, with the associated improvement of pedestrian facilities and provision of public transport laybys. *Figure 1.1* shows the location of the Project.

The total length of the remaining sections of Kam Tin Road and Lam Kam Road to be upgraded under the Project is approximately 5.3 km. The scope of the Project includes the following:

- (a) Upgrading of the remaining unimproved sections of Kam Tin Road (between Fan Kam Road and Lam Kam Road) and Lam Kam Road from a substandard single two-lane carriageway to a standard carriageway of at least 7.3m wide;
- (b) Upgrading of the road section of Kam Tin Road (between Tung Wui Road and Fan Kam Road) to 10.3m wide carriageway;
- (c) Provision of 2m wide footpaths on both sides (if site conditions do not allow, 2m wide footpath on one side will be acceptable) and associated improvement of pedestrian facilities, public transport laybys and right-turning lanes at major junctions at Kam Tin Road & Kam Tai Road and Kam Tin Road & Wang Toi Shan Shan Tsuen Road; and
- (d) Associated slope and drainage works, traffic aids and street lighting modification, landscaping works, etc. under the Project.

**2.2 Encroachment of the Conservation Areas and Works adjacent to the Existing Watercourses**

The Project is a Designated Project (DP) since part of the proposed upgrading works encroaches upon the Conservation Area (CA) zoning as defined on relevant Outline Zoning Plans of Shek Kong Outline Zoning Plan (Plan no.: S/YL-SK/9) and Pat Heung Outline Zoning Plan (Plan no.: S/YL-PH/11). There are four encroachment areas which are shown in *Figures 2.1a to 2.1c*, and described below:

- CA at north of section between Chainage CHB 28+70 and CHB 30+10 of Kam Tin Road
- CA at south of section between Chainage CHB 44+30 to CHB 44+80 of Lam Kam Road
- CA at south of section between Chainage CHB 49+00 to CHB 52+30 of Lam Kam Road
- CA at north of section between Chainage CHB 50+20 to CHB 52+40 of Lam Kam Road

There are nine road sections which are adjacent to or even across the existing watercourses, the locations are shown below:

- Watercourse (channelized) at the western end of the project site along Tung Wui Road
- Watercourse (channelized) adjacent to north of section at Chainage CHA 6+40 of Kam Tin Road
- Watercourse (meander) adjacent to north of section between Chainage CHA 8+00 to CHA 9+10 of Kam Tin Road
- Watercourse (channelized) adjacent to north of section between Chainage CHA 14+30 to 14+40 of Kam Tin Road
- Watercourse (semi-natural) across road section between Chainage CHB 33+70 (north) and CHB 33+90 (south) of Kam Tin Road
- Watercourse (channelized) across road section between Chainage CHB 36+20 (north) to CHB 35+90 (south) of Kam Tin Road
- Watercourse (semi-natural) across road section between Chainage CHB 41+10 (north) to CHB



- 41+40 (south) of Lam Kam Road
- Watercourse (semi-natural) at road section between Chainage CHB 48+80 (north) to CHB 49+20 (south) of Lam Kam Road
- Watercourse (semi-natural) across road section at Chainage CHB 53+20 of Lam Kam Road

### **2.3 Construction Programme and Method**

The Project construction works are anticipated to commence in 2021 and for completion by 2025. The upgrading works are to be carried out by conventional method of open-cut excavation to minimize impact and ensure road safety to the existing traffic as concerned by the relevant authorities. The construction sequence is to shift in stages with two-way traffic maintained throughout the construction period.



## 3.0 SUMMARY OF KEY FINDINGS IN EIA STUDY

### 3.1 Approach to Environmental Impact Assessment

The EIA process refers to the environmental assessment to identify, assess and report the environmental impacts and benefits of the Project. It is consistent with the design process to identify the potential environmental effects of various design options, develop alternatives as well as mitigation measures to be incorporated into the design, construction and operation phases of the Project. Comment and advice obtained from the public have been considered and incorporated into the EIA process where appropriate. Potential environmental impacts are to be avoided, or to minimise or mitigate to acceptable levels, by the proposed suitable measures.

### 3.2 Air Quality

#### 3.2.1 Introduction

The air quality impacts during the construction and operational phases of the Project have been assessed and evaluated in accordance with the guidelines and criteria referred in Annexes 12 and 4 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) respectively. Reference has also been made to other standards for the control of air pollutants from a variety of stationary and mobile sources established under the Air Pollution Control Ordinance (Cap. 311).

#### 3.2.2 Construction Phase

Fugitive dust may be generated from works activities including site clearance, excavation, handling of construction materials, concrete breaking and from minor wind erosion. Each active construction activity location shall occupy about 50m in length of the Project alignment at any one time, and with a distance separation more than 600m between each location. The area of the work front would be about 500m<sup>2</sup> (10m x 50m). Given that each works area is small, dust impacts during the construction phases are anticipated to be minor with the adoption of mitigation measures stipulated in the Air Pollution Control (Construction Dust) Regulation. In addition, activities that may induce significant dust emissions such as extensive site formation and blasting are not required for the Project. As such, a quantitative dust impact assessment is not considered necessary.

Small amount of sulphur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>) and smoke shall be emitted from the diesel-powered construction equipment. Under normal operation, however, such properly maintained equipment shall not contribute any significant smoke or gaseous emissions. With the implementation of mitigation measures following the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation, emissions from construction equipment are considered relatively low and would not anticipate to cause adverse air quality impact.

It is expected that only minor local-scale dust impacts arising from the construction activities of the concurrent projects in the vicinity are anticipated with proper mitigation measures implemented on-site. As such, the cumulative dust impacts as a result of concurrent works within the assessment area are not expected as there is large distance separation between the Project Boundary and the concurrent projects; and provided that the recommended dust suppression measures are implemented.

Although no adverse construction phase air quality impacts are anticipated, a number of best practice measures have been recommended to ensure compliance with the Air Pollution Control (Construction Dust) Regulation. It is also recommended that construction phase EM&A should be conducted to ensure construction phase best practice measures are properly implemented and are effective.

No adverse residual impacts are anticipated during the construction phase.

**3.2.3 Operation Phase**

The air dispersion model CALINE4 was adopted to predict vehicle exhaust emissions from the Project and major surrounding roads. The 19<sup>th</sup> highest 1-hour average Nitrogen Dioxide (NO<sub>2</sub>), 10<sup>th</sup> highest daily average Respirable Suspended Particulates (RSP) and Fine Suspended Particulates (FSP), and annual average NO<sub>2</sub>, RSP and FSP concentrations at identified Air Sensitive Receivers (ASRs) were determined.

The predicted peak traffic flows in the year 2025 were adopted to represent the worst-case scenario. The emission model EMFAC-HK 4.1 was adopted to estimate the vehicle emission factors of Nitrogen Oxides (NO<sub>x</sub>), RSP and FSP.

The future year background concentrations are made reference to the EPD’s PATH-2016 modelling results. The PATH-2016 model results have been added to the sum of the CALINE4 model results to derive the short-term and long-term cumulative impacts at the ASRs.

Results indicate that the 19<sup>th</sup> highest 1-hour average NO<sub>2</sub>, 10<sup>th</sup> highest daily average RSP and FSP, and annual average NO<sub>2</sub>, RSP and FSP concentrations at all representative ASRs would comply with the AQOs. A summary of the predicted concentrations for key representative air pollutants is given below.

**Table 3.1 Summary of Predicted Concentrations for Key Representative Air Pollutants**

Air Pollutants	NO <sub>2</sub>		RSP		FSP		AQO Compliance
	19 <sup>th</sup> Highest 1-hour	Annual	10 <sup>th</sup> Highest Daily	Annual	10 <sup>th</sup> Highest Daily	Annual	
	<b>Criteria</b>	<b>200</b>	<b>40</b>	<b>100</b>	<b>50</b>	<b>75</b>	
<b>Concentrations (µg/m<sup>3</sup>)</b>	59 - 144	11 - 30	77 - 83	33 - 35	58 - 62	23 - 25	Yes

Results indicate that NO<sub>2</sub> is the most critical pollutant among the three pollutants as the 10<sup>th</sup> highest and annual RSP and FSP concentration are far below AQO emission limit.

The assessment results conclude that the predicted cumulative 1-hour average and annual average NO<sub>2</sub>, daily average and annual average RSP / FSP concentrations at representative ASRs would comply with the AQOs. Hence, no mitigation measures are required and no operation phase EM&A is recommended.





**3.3 Noise Impact**

**3.3.1 Introduction**

Noise impacts were assessed in accordance with Annexes 5 and 13 of the EIAO-TM. Existing, committed and planned Noise Sensitive Receivers (NSRs) in the assessment area have been identified and the potential noise impacts from the Project on these NSRs have been assessed.

**3.3.2 Construction Phase**

The use of powered mechanical equipment (PME) in daytime is expected to be the major noise source during the construction phase of the Project. No construction works are scheduled to be undertaken during noise control restricted hours of all days during the evening and night-time (i.e. 19:00-07:00 hours); and all time during Sundays and public holidays. No percussive piling works will be required within the proposed Project Boundary.

Construction noise associated with the use of PME for different stages of construction has been assessed. With the implementation of proposed mitigation measures including good site practices, use of quality powered mechanical equipment (QPME), use of temporary noise barrier, enclosure and/or noise insulation fabric to screen noise from relatively static PME and alternative quiet construction method, the predicted construction noise impact would be 43-75 dB(A) for existing NSRs. Hence, adverse construction noise impacts are not anticipated. Yet, EM&A has been proposed to ensure the implementation and effectiveness of the mitigation measures during the construction phase.

Construction noise impact arising from the Project can be properly mitigated by implementing the proposed noise mitigation measures. Adverse residual noise impacts are thus not anticipated.

**3.3.3 Operation Phase**

The road traffic noise levels have been predicted by the RoadNoise Model, based on the peak hour traffic flow of year 2040 adopted for the assessment. The road sections within 300m from the proposed Project Boundary have been included in the assessment. The traffic speed for all roads including Kam Tin Road and Lam Kam Road to be adopted in the road traffic noise model is 50kph and a section of Kam Tin Bypass (~40m in length within the assessment area) is 70kph. The existing roadside noise barriers along Kam Tin Bypass and Tung Wui Road have been included in the assessment. The road alignments, surrounding buildings and all other structures that could have noise screening have been inputted in the road traffic noise model.

Direct noise mitigation measures such as the use of low noise road surface (LNRS) and noise barrier are evaluated to minimize the operation noise impact. A total length of approximate 837m vertical noise barrier with maximum height of 5m along Kam Tin Road and maximum height of 3m along Lam Kam Road are recommended for the NSRs with exceedance in unmitigated scenario. LNRS with total length of approximate 2.1km would be applied on several road sections of Kam Tin Road.

A summary of the predicted road traffic noise impacts after implementation of mitigation measures is given below.

**Table 3.2 Summary of Predicted Road Traffic Noise Impacts**

Uses	Noise Criteria (L <sub>10</sub> (1 hour)), dB(A)	Predicted Maximum Noise Levels (L <sub>10</sub> (1 hour)), dB(A)
Place for Worship	65	74
Residential	70	64-82



After implementing direct noise mitigation measures, the predicted overall noise levels of some of the NSRs still exceed the noise criteria, which are not directly affected by the Project. Nevertheless, with the proposed direct mitigation measures, there will be 565 existing dwellings and 30 planned dwellings benefited, and 106 existing dwellings protected. As no representative existing NSRs would fall within all the three testing criteria, no indirect mitigation measures would be required.

The increase in road traffic noise level due to the Project is considered not significant (less than 1.0dB(A) increase in all NSRs) after implementation of noise mitigation measures when comparing to the without Project scenario. In fact, the mitigated road traffic noise levels with the Project at many NSRs are less than that of the without Project scenario.

Therefore, the residual road traffic noise impact of the Project is considered acceptable.



## **3.4 Water Quality**

### **3.4.1 Introduction**

The water quality impact assessment and evaluation have been conducted in accordance with the criteria and guidelines as presented in Annexes 6 and 14 of the EIAO-TM respectively.

The relevant primary legislation is the Water Pollution Control Ordinance (Cap. 358), the associated Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters; and the Water Quality Objectives (WQOs) for the Deep Bay Water Control Zone (WCZ) and the Tolo Harbour Supplementary WCZ.

Water courses within the Project Boundary comprise the channelized Kam Tin River and a number of natural streams near Kadoorie Experimental Farm, Ling Wan Monastery, Wong Chuk Yuen, Sheung Tsuen and Kam Tin Bypass with unpolluted and polluted sections. The Project falls within two water control zones, with the Kam Tin River and its tributaries carrying waters generally polluted by organic pollution to the west towards Inner Deep Bay, and with the clean tributaries of the Lam Tsuen River flowing west towards Tolo Harbour. It is noted that there is an encroachment of about 60m of the water gathering zone located at the eastern end of the Project.

These observations are consistent with EPD's latest water quality index classifying Lam Tsuen River as "Excellent" but Kam Tin River as "Bad" in 2017. Overall compliance with WQOs for Lam Tsuen River and Kam Tin River is 95% and 60% respectively.

### **3.4.2 Construction Phase**

Potential water quality impact might be arisen from the associated construction works of road widening and improvement works such as retaining wall and geotechnical works. Key water pollution sources include:

- General construction activities and site runoff from wash water from dust suppression measures, vehicle wheel washing facilities and concrete casting;
- Surface runoff from rainfall and wind erosion of exposed surface areas and material stockpiles;
- Spillage of chemicals, lubrication oils, solvent and petroleum products;
- Sewage from the construction workforce; and
- Construction works in close proximity of nearby water bodies

Given both magnitude and duration of works and with the implementation of the mitigation measures during the construction phase, no significant water quality impacts are anticipated to be generated from the Project. The implementation of the mitigation measures shall be included to the works contracts. Regular site inspections are recommended during construction to ensure the measures are implemented properly.

### **3.4.3 Operation Phase**

Potential water quality impacts during the operation phase may be arisen from highway discharge. Material deposited and accumulated on the road surface, including dust / sediment, heavy metals and vehicle oil, will be washed from the carriageway during rainfall events into surface water drainage system and discharged to storm drains. In addition, there will be no sewage generation during the operation phase of the Project.

The drainage system along Kam Tin Road and Lam Kam Road will be properly planned and upgraded to cater for the road surface runoff from highway with increased capacity after road widening. With the mitigation measures mentioned in the EIA Report in place, no adverse residual water quality impacts are anticipated during the operation phase.



## 3.5 Waste Management Implication

### 3.5.1 Introduction

The criteria and guidelines for accessing waste management implications are outlined in Annexes 7 and 15 of the EIAO-TM respectively. Reference has also been made to the Waste Disposal Ordinance (Cap. 354) and subsidiary legislation, and relevant circulars issued by ETWB and the Development Bureau.

### 3.5.2 Construction Phase

The types of waste generated from the construction activities of the Project include:

- Construction and demolition (C&D) materials;
- Chemical waste; and
- General refuse

#### C&D Materials

C&D materials would be generated from the construction activities of the Project during the course of the works between Year 2021 and 2025. It is estimated that the total volume of the C&D materials generated from the Project would be approximately 42,320m<sup>3</sup>.

All C&D materials generated shall be sorted on site into inert portion "inert C&D materials" including soil, building debris, broken rock, concrete, etc., and the non-inert portion is the "C&D wastes" comprising timber, paper, plastics, general refuse etc. The inert C&D materials, the reusable and/or recyclable materials shall be recovered before disposal of the waste portion off site as a last resort. The surplus portion of the inert C&D materials may be transported to the public fill reception facility at Tuen Mun Area 38 for beneficial reuse, and the C&D wastes at North East New Territories (NENT) Landfill in Ta Kwu Ling. It is estimated that 32,970m<sup>3</sup> of inert C&D material (public fill) to be disposed of at public fill reception facility at Tuen Mun Area 38 for other beneficial uses, 2,690 m<sup>3</sup> of inert C&D material to be reused on-site, and 6,660 m<sup>3</sup> of non-inert C&D waste to be disposed of at NENT landfill.

Methods to minimise the generation of C&D material will be addressed during detail design and in planning of the construction works. A Waste Management System will be incorporated into the Waste Management Plan (WMP) to effectively manage and avoid/reduce/minimise the generation of C&D material during construction.

To prevent fly-tipping of C&D materials, a Trip Ticket System will be implemented to monitor C&D wastes from the Project, a truck carrying debris should first obtain a ticket on leaving the construction site, then dump the debris at the designated location and finally have the ticket stamped and returned to the construction site.

#### Chemical Waste

Construction plant and vehicle maintenance may generate a small amount of chemical wastes during construction works, such as cleaning fluids, solvents, lubrication oil and fuel.



The potential volume of chemical waste would be limited and anticipated in few cubic metres per month. The amount of chemical waste to be generated will be quantified in the site WMP to be prepared by the Contractor.

Materials classified as chemical wastes will require special handling and storage arrangements before removal for appropriate treatment at the Chemical Waste Treatment Centre (CWTC) or other licensed facilities. Wherever possible opportunities should be taken to reuse and recycle materials.

#### General Refuse

The workforce would generate refuse comprising food scraps, waste paper, empty containers, etc. Such refuse will be properly collected on-site and transfer to the nearby refuse collection point. Disposal of refuse at sites other than approved waste transfer or disposal facilities will be prohibited. Effective collection of site wastes will prevent waste materials being blown around by wind, or creating an odour nuisance or pest and vermin problem. Waste storage areas will be well maintained and cleaned regularly.

The maximum number of construction workers to be employed is estimated to be about 80 workers. Based on a generation rate of 0.65kg per worker per day, the maximum daily arising of general refuse during the construction period would be approximately 52kg and this waste can be effectively controlled by normal measures. With the implementation of good waste management practices at the site, adverse environmental impacts are not expected to arise from the storage, handling and transportation of workforce wastes.

With the implementation of the mitigation measures during the construction phase of the Project, no significant waste management impacts are anticipated. The implementation of the mitigation measures shall be included to the works contracts. Regular site inspections are recommended during construction to ensure the measures are implemented properly.

### **3.5.3 Operation Phase**

Upon Project operation phase, it is anticipated that major source of wastes would only be from roadside littering.

Roadside litters include food scraps, waste paper, empty containers, etc. Sufficient rubbish bins/recycling bins will be provided. Such refuse will be collected by Food and Environmental Hygiene Department or relevant departments for disposal.

It is expected that there would be limited quantities of waste to be generated from the operation phase of the Project. Waste monitoring and audit programme for the operation phase of the Project would not be required.



### 3.6 Ecology

#### 3.6.1 Introduction

The Ecological Impact Assessment was conducted following the criteria and guidelines for evaluating and assessing ecological impact as stated in Annexes 8 and 16 of the EIAO-TM respectively.

The assessment area for the purpose of terrestrial ecological assessment included all areas within 500m from the Project Boundary and the areas likely to be impacted by the Project. For aquatic ecology, the assessment area was the same as the water quality impact assessment, i.e. included 500m from the Project Boundary and covered the Deep Bay Water Control Zone.

A literature review and 9-month ecological field survey covering both dry and wet seasons have been conducted. It was determined that about 56% of the terrestrial assessment area is occupied by urbanised / disturbed (including roadside plantation), with the remainder comprising secondary woodland, (largely abandoned) agricultural land, shrubland/grassland, watercourses and artificial wetland. All these ecological resources identified have been mapped to form the habitat map.

The ecological survey programme covered terrestrial and aquatic habitats and important habitats within the assessment area from September 2018 to May 2019. The ecological surveys included habitat and vegetation, terrestrial mammal, birds, herpetofauna, dragonflies and butterflies, and aquatic fauna. Summary of ecological survey results is given below.

**Table 3.3 Summary of Ecological Survey Results**

Types	Total Number of Species Recorded within Assessment Area	Species of Conservation Importance Recorded within Assessment Area
Habitat and vegetation	183	<i>Aquilaria sinensis</i> , <i>Cibotium barometz</i>
Terrestrial mammal	5	Japanese Pipistrelle <i>Pipistrellus abramus</i> , Short-nosed Fruit Bat <i>Cynopterus sphinx</i> and Pallas's Squirrel <i>Callosciurus erythraeus</i>
Birds	37	Chinese Pond Heron <i>Ardeola bacchus</i> , Grey Heron <i>Ardea cinerea</i> , Little Egret <i>Egretta garzetta</i> , Black Kite <i>Milvus migrans</i> , Eastern Buzzard <i>Buteo japonicus</i> , Northern Lapwing <i>Vanellus vanellus</i> , Little Ringed Plover <i>Charadrius dubius</i> , Common Greenshank <i>Tringa nebularia</i> and White-shouldered Starling <i>Sturnia sinensis</i>
Herpetofauna	5 species of reptile 11 species of amphibian	Hong Kong Cascade Frog <i>Amolops hongkongensis</i> , Brown Wood Frog <i>Rana latouchii</i> , Chinese Bullfrog <i>Hoplobatrachus chinensis</i> and Hong Kong Newt <i>Paramesotriton hongkongensis</i>
Dragonflies	6	Nil
Butterflies	21	Small Cabbage White <i>Pieris rapae</i>
Aquatic fauna	16	Nil

#### 3.6.2 Construction Phase

Potential direct impacts due to proposed construction shall include habitat loss, fragmentation of natural habitats and influence on recognized sites of conservation importance and species of conservation importance.

The majority works of the Project will be located in the existing roads and the surrounding roadside plantation, resulting in only limited areas of habitat loss. Urbanized / disturbed area with roadside plantation will be the major habitat to be lost. Some construction works will be conducted in three



watercourses and secondary woodland within the Project Boundary. The direct impact due to habitat loss of agricultural land is considered insignificant, while for the urbanized/disturbed (including roadside plantation), semi-natural watercourses as well as secondary woodland is considered as minor. Due to the nature of works along the existing roads, no adverse ecological impact is anticipated from habitat fragmentation upon the proposed works.

Recognized sites of conservation importance within the assessment area include Conservation Areas, Lam Tsuen Country Park and Pat Heung Temple FSW. The country park and the FSW will not be affected directly due to the Project. The potential encroachment to Conservation Area due to the proposed works will be limited only to shotcreted slopes with common roadside trees, mixed woodland edge, and slopes covered with herbaceous plants with a few common trees and shrubs, which have relatively low ecological values. Hence, the ecological impacts to the Conservation Area are regarded as minor.

Given that protection measures shall be implemented to avoid any possible construction impacts upon the *Aquilaria sinensis* located next to the existing road, direct impacts to *Aquilaria sinensis* are considered minor. Bird species of conservation importance recorded within the Project Boundary are mobile species, direct impacts to them are not expected.

Indirect impacts due to disturbance from construction activities, changes in water quality, are considered as minor without mitigation measure.

Ecological monitoring is not considered necessary, although regular construction phase site inspections by an experienced ecologist are recommended to ensure proper implementation of mitigation measures.

### 3.6.3 Operation Phase

No increased traffic is expected during operation phase and no increased direct mortality of fauna due to road-kill is anticipated. Road traffic is the noise source to the nearby wildlife during project operation phase. Due to close proximity to road traffic and the existing level of disturbance along the roadside, wildlife use preference is given in areas more remote from the roadside. Besides, road traffic noise from the operation phase will not change significantly from existing conditions. As there will be no diversion and fragmentation of the watercourses, change in hydrology is not anticipated. Therefore, the operation phase impact is considered insignificant.



### **3.7 Land Contamination**

#### **3.7.1 Introduction**

Land contamination assessment has been conducted in accordance with Section 3 (Potential Contaminated Land Issues) of Annex 19 “Guidelines for Assessment of Impact on Sites of Cultural Heritage and Other Impacts” of the EIAO-TM.

#### **3.7.2 Land Contamination Assessment**

The land contamination assessment examined the potential contaminative land use within Project Boundary. The assessment involved desktop review, site surveys, the proposed environmental site investigation and their potential impacts to future land use.

A total of 44 potentially contaminated sites were identified, of which over 90% of the potentially contaminated sites are currently used as vehicle repairing/dismantling workshops and open storage area.

As all the sites are inaccessible, only preliminary site appraisal through peripheral site surveys was conducted. Land contamination causing insurmountable impacts would be unlikely due to the fact that potential contaminated area encroaching onto the Project boundary is small and there are proven and commonly adopted remediation methods to properly treat the contaminants potentially found in the site.

Site re-appraisal is required for the identified potentially contaminated sites as well as other areas within the Project Boundary to address any change in land use that may give rise to potential land contamination issues as soon as the sites become accessible and a supplementary Contamination Assessment Plan (CAP) should be submitted and endorsed by EPD before site investigation. A Contamination Assessment Report (CAR) which includes the site investigation sampling and testing results will be prepared for EPD's agreement upon completion of the site investigation. If contamination is identified, Remediation Action Plan (RAP) shall be also prepared and submitted to EPD for agreement prior to the commencement of the remediation works. Upon completion of the remediation, a Remediation Report (RR) shall be submitted to EPD for agreement. No construction works of site should be carried out prior to the agreement of the RR.





## **3.8 Landscape and Visual**

### **3.8.1 Introduction**

In accordance with the criteria and guidelines stated in Annexes 10 and 18 of the EIAO-TM and EIAO Guidance Note No. 8/2010 “Preparation of Landscape and Visual Impact Assessment (LVIA) under the EIAO”, the landscape and visual impacts during the construction and operation phases are assessed. The assessment area for the landscape impact assessment includes areas within 100m from Project Boundary while the assessment area for the visual impact assessment is defined by the visual envelope.

Landscape mitigation measures have been recommended to ameliorate the potential landscape and visual impacts and ensure that the implementation the Project will fit into the existing landscape and visual context. These measures include the careful design of the engineering measures to minimize the potential impacts upon the existing landscape resources and the visual amenity for both nearby residents, vehicle travelers and pedestrians. This includes retaining existing trees which are located along the road and are important to both landscape context of the road corridor, and providing a screening effect of the road in views from adjacent Visually Sensitive Receivers (VSRs). Another important aspect of the landscape mitigation approach is the compensatory planting of trees where practicable to further restore and enhance the landscape setting and visual amenity of the road and its ecological value.

### **3.8.2 Impact on Planning and Development Control Framework**

The Project will partially encroach upon the land use zonings Kam Tin North OZP (S/YL-KTN/9), Kam Tin South OZP (S/YL-KTS/15), Pat Heung OZP (S/YL-PH/11), Shek Kong OZP (S/YL-SK/9) and Lam Tsuen OZP (No. S/NE-LT/11) as discussed in the LVIA including Village Type Development (V), Residential Group C 2 (R(C)2), Residential Group D (R(D)), Open Space (O), Government, Institution or Community (G/IC), Other Specified Uses (OU), Conservation Area (CA), Conservation Area (CA(1)), Open Storage (OS), Agriculture (AGR), Industrial Group D I(D) and Green Belt (GB).

The Project will not directly affect CA and GB. However, the Project will lead to the limited loss of area from this zone due to the widening of the carriageway, the provision of pedestrian footpath for land use zonings including V, R(C)2, R(D), O, G/IC, OS, AGR, OU and I(D). The road is designed for the convenience and road safety of local residence and the general public, thus the Project is compatible to the existing and planned land uses and planning framework. The proposed mitigation measures including roadside planting, compensatory tree planting and an integrated design approach will further allow for landscape and visual integration of the Project within a largely rural/ semi-rural landscape.

### **3.8.3 Landscape Impacts**

#### *Landscape Resources*

As the construction works of the Project will be mainly carried out adjacent to the existing roads, the predicted residual impacts on the majority of the landscape resources within the assessment area will be slight to negligible within the construction phase and Day 1 of operation phase and mitigated to be negligible as the works at Year 10 as the mitigation measures mature. These include, LR6 Developed Rural Land, LR7 Grassland/Shrubland Mosaic, LR8 Modified Watercourses, LR9 Open Spaces and Sports Fields. There would be moderate to slight impacts for LR1 Major Road Corridor, LR2 Agricultural Fields, LR4 Residential Settlements, LR5 Hillside and Mixed Woodland during construction phase and at Day 1 of operation phase although these impacts would be mitigated to slight at Year 10. The loss of LR3 Roadside Plantation is significant during the construction phase but mitigated to slight during operation phase after implementing mitigation measures.



### *Landscape Character Areas*

The landscape of the assessment area is characterized by a combination of lowland residential settlements which consist of both private residences and village settlements, abandoned agricultural fields, open storage areas, which are further surrounded by upland areas with wooded hill slopes giving way to shrub and coarse grassland. The Project have sought to preserve and where possible enhance the landscape character of the road corridor through the careful design (and implementation) of the upgrading works. This includes the preservation of existing trees, the compensatory planting of new trees for trees that have been fell, the design of new engineering structures which are designed to have an enhanced aesthetic appearance compared to the existing structures.

The potential impacts on LCA1 Pang Ka Tsuen Lowland Rural and Low-rise Residential Landscape, LCA2 Kam Tin Lowland Rural Landscape and LCA10 Kwun Yam Shan Miscellaneous Rural Fringe Landscape would be slight during the construction stage but further be mitigated to negligible at Year 10 during the operation stage with the growth to maturity of the proposed mitigation planting.

The potential impacts on LCA3 Shek Kong Barracks Landscape (Shek Kong), LCA4 Kam Tin Modified Water Course Landscape, LCA5 Shek Kong Lowland Rural Landscape, LCA6 Lam Tsuen Country Park Hillside Landscape, LCA7 Sheung Tsuen Lowland Rural Landscape, LCA8 Shek Kong Barracks Landscape (Shek Kong Tsuen), LCA9 Kwun Yam Shan Upland and Hillside Landscape, LCA12 Wang Toi Shan Village Landscape is slight during the construction stage and operation stage as these LCAs are adjacent to the Project.

The potential impacts on LCA11 Kam Tin Road and Lam Kam Road Corridor would be significant during the construction stage due to the direct impacts along the full length of the road from the Project. With the implementation of mitigation measures including the proposed roadside tree planting, these impacts would be reduced to moderate during the operational phase of the Project.

### *Impact on Existing Trees*

A preliminary tree survey was undertaken and a total of 2049 trees, which include 1199 roadside trees and 850 trees in two tree groups, is recorded within the Project Boundary.

With respect to the latest available engineering information, a total number of 1250 trees of no direct conflict with the Project works would be retained. After considerations of the latest condition of the tree including both size, health, form, amenity value, as well as chance of survival after transplanting, 43 trees are considered to be suitable for transplanting and 756 trees would require felling for the implementation of the Project.

The design of the proposed engineering works has been carefully considered to retain as many of the existing trees as possible. Most of the trees found were planted ornamental plant and fast-growing exotic species and none of them were recorded as listed or qualified to be registered in the Register of Old and Valuable Trees. The tree loss will be compensated through the planting and growth to maturity of not less than 756 heavy standard trees (with a DBH not less than 10cm) would be required for compensation in 1:1 ratio.

## **3.8.4 Visual Impacts**

Given the scale and nature of the Project, the quality and extent of existing views to the adjacent VSRs would be subject to slight adverse impact. It should be noted that for many of the village settlements and residential developments, the views of the Project are limited to properties on the periphery of the settlement. Views from inner houses of the settlements would be blocked by surrounding properties and vegetation at the edge of the village settlements. Thus, the two key



groups which would experience the main impacts would be vehicle travellers and pedestrians using the road alignment and residential properties which are directly adjacent to the main engineering works which include widening of road, construction of noise barriers and slope works.

For vehicle travellers and pedestrians, they would have ‘moderate’ mitigated impacts during the operational phase at Day 1 and Year 10 (when the tree and shrub planting have matured). Although the mitigation measures would allow for improvement and softening of the Project, the impacts would persist. However, it should be noted that the visual amenity for these VSRs are characterized by the structures of the existing road, thus changes to the visual amenity are not significant.

For residential VSRs, the mitigated impacts are also considered to be moderate during construction phase and Day 1 and Year 10 of the operation phase. It should be noted that these impacts represent the worst-case scenario for these VSRs located at the periphery of the settlements and that their view is characterized by Kam Tin and Lam Kam Roads.

For other VSRs, which are occupational, trail walkers and recreation users, the mitigated impacts would be slight and negligible during Day 1 and Year 10 of the operation phase. This is due to the restricted nature of the upgrading proposals and the roadside character of the existing view and having a small part of the scheme being visible to them.

### 3.8.5 Residual Impacts

#### *Residual Landscape Impact*

Despite careful planning, the proposals will also affect a number of trees and so a comprehensive tree planting scheme is proposed to not only compensate for the loss of existing vegetation, but also designed to enhance the landscape and visual amenity of the road corridor. Given a combination of the nature of the existing condition of the road corridor and the proposed mitigation measures, it is considered that the road widening Project will not cause a permanent impact to landscape character and resources and thus the residual impact is acceptable with mitigation measures implemented.

#### *Residual Visual Impact*

The Project will have a low level of disturbance to the visual context and visual amenity available to the VSRs as they are largely screened from the VSRs, however mitigation measures including pleasing design of noise barriers, appropriate treatment of retaining walls and slopes and roadside planting will further enhance the visual amenity. Thus, it is considered that the residual visual impact will be acceptable with appropriate mitigation measures implemented.

**4.0 SUMMARY OF ENVIRONMENTAL OUTCOMES****4.1 Introduction**

Assessments of the potential environmental impacts associated with the construction and operation phases of the Project in various technical aspects have been conducted. The environmental aspects covered in this EIA study include:

- Air Quality Impact
- Noise Impact
- Water Quality Impact
- Waste Management Implications
- Ecological Impact
- Land Contamination
- Landscape and Visual Impact

Avoidance of environmental impacts has been one of the key considerations throughout the entire project development and design. The key environmental problems that have been avoided and any sensitive areas protected are summarised in below sections.

**4.2 Summary of Environmental Impacts Avoided and Environmental Sensitive Areas Protected***Air Quality Impact*

Fugitive dust impact from construction works activities can be minimized with proper implementation of mitigation measures. The population protected by the mitigation measures includes all ASRs within 500m from Project Boundary, which include residents, place for worship, offices, parks and elderly centre along Kam Tin Road and Lam Kam Road. Cumulative air quality impact arising from the vehicular emissions at representative ASRs would comply with Air Quality Objectives.

*Noise Impact*

All representative existing NSRs identified within 300m from Project Boundary can be protected from the construction noise of PME with proper implementation of mitigation measures. The protected NSRs includes residents, place for worship and elderly centre along Kam Tin Road and Lam Kam Road. Direct noise mitigation measures such as LNRS and vertical noise barrier are evaluated to minimize the operation noise impact from road traffic. The benefited NSRs includes residents and planned residential areas, place for worship and elderly centre along Kam Tin Road and Lam Kam Road.

*Water Quality Impact*

Major impact to Water Sensitive Receivers will be site runoff, which can be minimised with proper implementation of mitigation measures. The protected environmental sensitive areas include water gathering ground from eastern end of the Project, local streams near Kadoorie Experimental Farm, Ling Wan Monastery, Wong Chuk Yuen, Sheung Tsuen and Kam Tin Bypass; nullah near Wang Toi Shan Hung Mo Tam, Shek Kong Barracks and the channelized Kam Tin River.

*Ecological Impact*

Disturbance from construction activities to nearby habitats and site runoff during construction phase can be minimised for the sensitive areas, such as nearby waterbodies, natural habitats and wildlife, with proper implementation of mitigation measures.



### Land Contamination

Site re-appraisal is required for the identified potentially contaminated sites as well as other areas within the Project Boundary to address any change in land use that may give rise to potential land contamination issues as soon as the sites become accessible. A supplementary CAP should be submitted and endorsed by EPD before site investigation and a CAR should be prepared for EPD's agreement upon completion of the site investigation. If contamination was identified, RAP shall be also prepared and submitted to EPD for agreement prior to the commencement of the remediation works. Upon completion of the remediation, a Remediation Report (RR) shall be submitted to EPD for agreement.

### Landscape and Visual Impact

Based on the preliminary tree survey conducted, it is estimated that 1250 trees will be retained, 43 trees will be transplanted and 756 trees will be felled. Due to the scope of works, the trees of direct conflict with the Project are mainly located alongside of Kam Tin Road and Lam Kam Road. The tree loss will be compensated through the planting and growth to maturity of not less than 756 heavy standard trees (with a DBH not less than 10cm) would be required for compensation in 1:1 ratio.

Summaries of environmental impacts, assessment methodologies, assumptions and limitations are given in *Appendix 13.1 and 13.2* of the EIA Report.

## **4.3 Summary of Alternative Development Options and Mitigation Measures**

The proposed works aim to upgrading the existing sub-standard road to a standard road. Alternative options have been considered in terms of the following aspects:

- Alignment;
- Design;
- Construction method; and
- Construction sequence.

For alignment and design alternatives, the proposed work is aimed to upgrade the existing sub-standard road to a standard road. The road sections of Kam Tin Road and Lam Kam Road to be upgraded are rural roads which are serving many existing roadside developments. To minimize the impacts to the existing roadside developments, the proposed road alignment thus follows closely with the existing alignment. The proposed alignment is designed according to the principle of minimizing land resumption and environmental impacts. Constructing a new road and/or off-line realigning road will not be one of optimum and feasible options, especially constructing a new road, which would incur additional land resumption and bring undesirable impacts to the environment during and after the new road construction. Thus, it is considered that such alternative alignment and design for the road sections of Kam Tin Road and Lam Kam Road should not be pursued.

For construction methods and sequence of construction works alternatives, the existing Kam Tin Road and Lam Kam Road are the main roads to Yuen Long, Fanling and Tai Po for the residents in Kam Tin. In order to minimize the traffic impact during implementation of Temporary Traffic Arrangement (TTA), the upgrading of at-grade road sections is a straight forward construction process that will not involve complicated construction sequences. Typical work fronts of maximum 50m in length would be implemented at minimum 600m separation simultaneously along Kam Tin Road and Lam Kam Road in stages, i.e. lane by lane. Conventional construction method of open-cut excavation should be adopted on the upgrading works of existing rural roads in Kam Tin area.

In view of the existing heavy traffic and potential traffic congestion during peak hours, using this construction method, although involves a longer construction period, less complicated scheme of traffic diversion and less disturbance to the existing roadside developments would be expected. In addition, the number of trees to be affected and temporary land resumption required facilitating the



temporary traffic diversion could be minimized using this construction method. In conclusion, the above proposed construction method and sequence of works are considered to be the most cost effective causing least adverse impact to the traffic and public.

In addition, the following measures have also been taken to minimise the environmental impacts.

Road section between Chainage CHB 43+90 and CHB 49+30 of Lam Kam Road

- Option A is to widen the carriageway northwards to minimize encroachment of two CA zones while Option B is to widen southwards. The sections forming the two alternative options are reviewed and made a detailed comparison, Option A is adopted as the preferred option. A brief summary of the assessment findings is described below:

i. The preferred option reduced the encroachment of CA zones, resulting in only slight encroachment of the two CA zones at south of section from CHB 44+30 to CHB 44+80 and CHB 49+00 to CHB 49+30 of Lam Kam Road. However, the concerned CA zones are at the woodland edge and partly shotcreted respectively, and hence the potential impact to habitat loss/vegetation clearance is considered to be low. Detailed ecological impact assessment is in Section 7 of EIA study report.

ii. Apart from less CA encroachment, another advantage of the preferred option is the need to resume relatively small area of private land.

Road section between Chainage CHB 48+00 and CHB 48+80 of South of Lam Kam Road

- The southern footway is proposed to be cut back in order to preserve the existing road side trees thereat.

Road section between Chainage CHB 49+10 and CHB 50+20 of Lam Kam Road

- The preferred option upgrades the carriageway and the footway, but the carriageway shall not follow the existing alignment and shift northwards. Such arrangement is to minimize the extent of CA encroachment at south of section between CHB 49+10 and CHB 50+20 of Lam Kam Road. Besides, considering that extensive geotechnical works will be required for providing the concerned southern footway, such arrangement can reduce waste, noise, air quality, landscape and visual impacts.

The sections of Kam Tin Road and Lam Kam Road to be upgraded are rural roads serving many road side residence and developments. Hence, the proposed road alignment follows closely with the existing alignment as far as practical. In addition, the proposed road alignment is designed based on the principle of minimising land resumption and environmental impacts. Two options have been proposed for the upgrading works.

Among the two options proposed, Option A is selected as it will cause less impact on local community, and involve in smaller scale construction works, which leads to smaller environmental impact during construction phase. Although Option A will slightly encroach on CA, the concerned area is a paved footway with isolated trees, and hence the potential impact to habitat loss/vegetation clearance is considered to be low.

#### **4.4 Summary of Key Public Concerns and Responses**

During the course of the EIA study, comments obtained from consultations with green groups and members of the public have been duly revisited and were incorporated in the design and construction phases of the Project where appropriate.

Meetings presenting the Project were held with the Rural Committee (RC) of Kam Tin and Pat Heung in April and May 2019. The Project was also presented during the meetings held with Traffic & Transportation Committee (T&TC) of Yuen Long District Council and Tai Po District Council in July 2019. Both RC and T&TC members supported the proposed Project.

**5.0 ENVIRONMENTAL MONITORING AND AUDIT**

An Environmental Monitoring and Audit (EM&A) programme has been formulated for the Project which is a Designated Project listed under Schedule 2 of the EIAO. The EM&A requirements are specified and detailed in the separate EM&A Manual.

The EM&A programme will provide management actions to check the effectiveness of the recommended mitigation measures and compliance with relevant statutory criteria, thereby ensuring the environmental acceptability of the construction and operation phases of the Project.

**6.0 CONCLUSION**

This EIA Study has demonstrated the overall environmental acceptability of road upgrading works of Kam Tin Road and Lam Kam Road, in accordance with the Study Brief (Register No. ESB-310/2018) and the EIAO-TM. The findings of the EIA provided information on the nature and extent of the environmental impacts likely to arise from the construction and operation phases of the Project. This EIA has, where appropriate, identified mitigation measures to ensure compliance with environmental legislation and standards.

Overall, the EIA Study has predicted that the Project, with the implementation of the mitigation measures, would be environmentally acceptable with no adverse impacts on the population and environmentally sensitive resources.

The schedule of implementation of the proposed mitigation measures has been provided in the EIA Report. An EM&A programme has also been recommended to monitor and ensure the effectiveness of the proposed mitigation measures.