

Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat)

Environmental Impact Assessment
Volume 1 – Main Text

Civil Engineering and Development Department

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ATKINS

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1. Introduction

1.1. Project Background

- 1.1.1. The Government has been incorporating provision of cycle tracks in the planning and development of New Towns. These cycle tracks have become attractions to the public for leisure or recreational purpose. To further enhance the recreational value of the cycle tracks and for better enjoyment of the public, the Government has pledged in the 2007-08 Policy Agenda to develop a comprehensive cycle track network in the New Territories for improving the quality of living. One of the backbone sections of the New Territories cycle track network is from Tsuen Wan to Tuen Mun.
- 1.1.2. In September 2008, Civil Engineering and Development Department (CEDD) engaged consultants to undertake the investigation and preliminary design of the proposed cycle track between Tsuen Wan and Tuen Mun under Agreement No. CE 9/2008 (HY). The preliminary design of the proposed works was substantially completed in December 2011.
- 1.1.3. The proposed cycle track was planned to be implemented in phases. In July 2012, under Agreement No. CE 3/2012 (HY), CEDD engaged consultants to carry out detailed design for the Advance Works section (from Tsing Tsuen Bridge to Bayview Garden at Tsuen Wan) and Stage 1 Works section (from Bayview Garden to Ting Kau), and review and investigate all the feasible alternative alignments for the Stage 2 Works section, which comprised Stage 2B Works (from So Kwun Wat to Ting Kau) and Stage 2A Works (from Tuen Mun to So Kwun Wat).
- 1.1.4. On 19 January 2017, Atkins China Limited (Atkins) was commissioned by CEDD to conduct the design and construction for the Stage 2A Works from Tuen Mun to So Kwun Wat under the Agreement No. CE36/2016(HY) entitled “Cycle Track Between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat) – Design and Construction” .
- 1.1.5. The Advance Works section in Tsuen Wan waterfront was completed and opened for public use in July 2021, whilst the design and implementation strategy for Stages 1 and 2B Works are currently under review with public consultation set to take place in early 2022. This EIA shall be focusing on the environmental impact assessment for Stage 2A works from Tuen Mun to So Kwun Wat.

1.2. Background of this EIA

- 1.2.1. In accordance with the requirements of Section 5(1)(a) of the Environmental Impact Assessment Ordinance (EIAO), CEDD submitted a Project Profile (No. PP-543/2016) to the Director of /Environmental Protection (DEP) to apply for an Environmental Impact Assessment (EIA) Study Brief on 15 August 2016. Pursuant to Section 5(7)(a) of the EIAO, the DEP issued to the Project Proponent (CEDD) an EIA Study Brief (No: ESB-295/2016 dated 27 September 2016) to carry out an EIA Study for the project titled “Cycle Track Between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat)” (the Project).
- 1.2.2. The location of the Project is shown in [Figure 1.1](#). The Project comprises construction and operation of a new cycle track at-grade or on bridge. Construction of the viaduct foundation (via bored piling works) will not involve open sea dredging, with materials excavated via double pile casing. Given that the piling and excavation works will take place less than 500m from the nearest boundary of an existing bathing beaches, the Project is a Designated Project by virtue of Item C.12, Part 1, Schedule 2 of the EIAO which specifies “*dredging operation less than 500m from the nearest boundary of an existing bathing beaches*”.

1.3. Objectives of the EIA Study

- 1.3.1. This EIA Study has been conducted to achieve specific objectives in the EIA Study Brief No. ESB-295/2016. These specific objectives are to:
- (i) Describe the Project and associated works together with the requirements and environmental benefits for carrying out the Project;

- (ii) Identify and describe the elements of community and environment likely to be affected by the Project and associated works and/or likely to cause adverse impacts to the Project, including both the natural and man-made environment and the associated environmental constraints;
- (iii) Identify and quantify emission sources and determine the significance of impacts on sensitive receivers and potential affected uses;
- (iv) Identify and quantify any potential losses or damage to flora, fauna and natural habitats;
- (v) Identify any adverse impacts on cultural heritage and to propose measures to mitigate these impacts;
- (vi) Propose the provision of infrastructure or mitigation measures to minimize pollution, environmental disturbance and nuisance during construction and operation of the Project;
- (vii) Investigate the feasibility, effectiveness and implications of the proposed mitigation measures;
- (viii) Identify, predict and evaluate the residual (i.e. after practicable mitigation) environmental impacts and the cumulative effects expected to arise during the construction and operational phases of the Project in relation to the sensitive receivers and potential affected uses;
- (ix) Identify, assess and specify methods, measures and standards, to be included in the detailed design, construction and operation of the Project which are necessary to mitigate these residual environmental impacts and cumulative effects and reduce them to acceptable levels;
- (x) Design and specify environmental monitoring and audit requirements; and
- (xi) Identify any additional studies necessary to implement the mitigation measures or monitoring and proposals recommended in the EIA report.

1.4. Structure of this EIA

1.4.1. The EIA Report is presented in the following sections:

Section 1 – Introduction

Section 2 – Project Description

Section 3 – Air Quality

Section 4 – Noise

Section 5 – Water Quality

Section 6 – Waste Management Implications

Section 7 – Land Contamination

Section 8 – Ecology

Section 9 – Fisheries

Section 10 – Landscape and Visual

Section 11 – Cultural Heritage

Section 12 – Environmental Monitoring and Audit Requirements

Section 13 – Implementation Schedule of Recommended Mitigation Measures

Section 14 – Summary and Conclusion

2. Project Description

2.1. Project Objectives

- 2.1.1. The objectives of the Project are to construct and operate a new two-way cycle track with a width of 4 metres as far as technically practicable, accompanied with footpath between Tuen Mun and So Kwun Wat as well as the provision of supporting facilities. The cycle track is intended primarily for recreational use and is thus considered a recreational development.

2.2. Need for the Project

- 2.2.1. This Project involves construction of a cycle track from Tuen Mun to So Kwun Wat, which is part of the cycle track backbone section from Tsuen Wan to Tuen Mun of the existing New Territories cycle track network. With the Project in place, more recreational opportunities would be created for the public to enjoy.

2.3. Project Location and Surrounding Environment

- 2.3.1. Starting from Kwun Tsing Road to Golden Beach Path, the cycle track would be constructed at-grade along the roadside footpath of Castle Peak Road – Castle Peak Bay. At Golden Beach Path junction, the cycle track would turn southwest and run along a footpath near Blessing Villa, then pass through an existing trail at the rear periphery of Cafeteria New Beach and Cafeteria Old Beach and several open spaces, where the viaduct section of the cycle track would be constructed on existing government waterfront between Cafeteria Old Beach and Kadoorie Beach. From Kadoorie Beach, where the viaduct section ends, the cycle track would run along Tsing Yan Street to join Castle Peak Road – Castle Peak Bay. From this point on to Hoi Wing Road, the cycle track would be constructed at-grade along the existing roadside footpath and planting areas of Castle Peak Road – Castle Peak Bay, resuming part of the Leisure and Cultural Services Department (LCSD)'s Ki Lun Kong Public Park and a land lot that is currently used as an open carpark under Short Term Tenancy (STT). From Ki Lun Kong Public Park to Hin Fat Lane, the cycle track would branch off and run on the STT land lot, existing roadside footpath, planting areas of Castle Peak Road – Castle Peak Bay and along and partly within LCSD's Tsing Sin Garden.

2.4. Project Scope

- 2.4.1. The scope of the Project comprises the following elements:
- i. Construction of new cycle tracks of about 3.6 km long from Hin Fat Lane and Hoi Wing Road at Tuen Mun to Kwun Tsing Road at So Kwun Wat with associated footpaths
 - ii. Construction of a marine cycle bridge with footpath of about 200 m long between Cafeteria Old Beach and Kadoorie Beach.
 - iii. Provision of cycle parking areas near Hin Fat Lane, Cafeteria Old Beach and Kwun Tsing Road.
- 2.4.2. The proposed cycle track design is in line with the requirements stipulated in the Transportation Planning and Design Manual (TPDM) published by Transportation Department (TD). The width of the proposed cycle track would be 4m in general, with some local sections less than 4m wide subject to terrain and other site constraints. The longitudinal gradient of the track would range from level to 4%, whilst 2m wide associated pedestrian footpaths would be introduced along most sections of the cycle track.

2.5. Scenarios With and Without the Project

Without Project

- 2.5.1. Without the Project, it is not possible to connect the cycle tracks between the western and eastern parts of the New Territories. Thus, a comprehensive cycle track network in the New Territories as pledged in the 2007-08 Policy Agenda cannot be achieved.

- 2.5.2. In the absence of the Project, the conditions of the existing beaches and coastal areas would remain unchanged. Without the cycle track section in the coastal area, cycling would not be allowed on the existing footpath along the beaches, making it difficult to cycle along the panoramic coastal areas safely.

With Project

- 2.5.3. With the Project, the existing cycle track in Tuen Mun of the cycle track network in the western part of the New Territories will connect to So Kwun Wat. Cyclists will be able to travel and cycle safely on the new cycle track. The Project can further enhance the recreational value of the cycle tracks for public enjoyment, promote safe riding, and develop a comprehensive cycle track network in the New Territories to foster a bicycle-friendly environment.
- 2.5.4. By implementing the Project, the safety level and cycle traffic of the section would be enhanced. Cyclists no longer need to ride on carriageway and the illegal act of riding bicycles on pedestrian footpath is expected to be eliminated. Moreover, an additional mode of commute would be provided to nearby residents, who can cycle to access Tuen Mun or even the rest of the sights along the New Territories cycle track network.

2.6. Consideration of Alternative Layouts, Alignment and Design

- 2.6.1. Detailed review on the proposed cycle track alignment options developed since the previous stage of the Project (i.e. project layout given in the EIA Study Brief as shown in [Figure 2.1](#)) has been carried out. As a result of the review, the entry/exit hub and resting stations originally proposed in the Project Proposal have been omitted from this Project and will be further considered in the later stage of the cycle track project.
- 2.6.2. The proposed alignment options have been assessed based on technical factors, visibility, constructability as well as practicality on maintenance and operation. The technical assessment criteria generally include civil works, highways structures, transport and traffic, geotechnical, environmental, maintenance and operations. Other aspects, including land use planning, cost and time, aesthetics and visual impacts and opinions from the concerned public stakeholders, had also been considered in determining the overall alignment.
- 2.6.3. Details of the original design and alternative options considered for the adopted cycle track alignment are described in the following sections (**Sections 2.6.4 to 2.6.18**).

Cycle track section between Kwun Tsing Road and Golden Beach Path

- 2.6.4. A resting station was originally proposed at an open area next to So Kwun Wat Road, as indicated in [Figure 2.1](#). After detailed review, it has been omitted from this Project and will be reviewed in the later stage of the cycle track project. A proposed cycle parking area will be provided near Kwun Tsing Road, which is a revised entry/exit point to the eastern end of the cycle track. Refer to [Figure 2.2.1](#) and **Table 2.6** for public consultation details.
- 2.6.5. Part of the proposed cycle track between Crossroads Foundation and Golden Beach Path has been reviewed and re-designed. As indicated in [Figure 2.1](#), the original alignment runs along the westbound lane of Castle Peak Road – Castle Peak Bay, passing by Hong Kong Gold Coast Phase 1, Monte Carlo Villas and Spring Seaview Terrace. The alternative alignment, which has been adopted in the latest design of the Project as indicated in [Figure 2.2.1](#), runs along the eastbound lane of Castle Peak Road – Castle Peak Bay and passes by Crossroad Foundations, Starfront Royale, TMTL518 development and Palm Beach. This design was adopted due to construction simplicity, better connectivity and avoidance of excessive civil construction works.

Cycle track section between Golden Beach Path and Cafeteria Old Beach

- 2.6.6. The original alignment would turn south towards the coastline via the existing open area between Monte Carlo Villas and Spring Seaview Terrace, with an optional resting station proposed near the Golden Beach Path outdoor car park along the route. The alignment then continues at-grade along the rear periphery of Cafeteria New Beach and Cafeteria Old Beach.
- 2.6.7. The revised alignment would turn southwest alongside Blessing Villa and then along the rear periphery of Cafeteria New Beach and Cafeteria Old Beach at-grade. This design was adopted due

to construction simplicity, better connectivity and avoidance of excessive civil construction works. In addition, the alternative alignment would require less land resumption whilst preserving the Golden Beach Path outdoor car park, which was the subject of public concern regarding its potential removal to accommodate the optional resting station (see **Table 2.4** for public consultation details).

- 2.6.8. In order to enhance convenience for cyclists to enjoy the nearby beach facilities, a cycle parking area has been proposed near Cafeteria Old Beach to provide parking spaces and replace the originally proposed optional resting station near the outdoor car park. The location of the cycle parking area is near the existing public toilet at Cafeteria Old Beach as indicated in [Figure 2.2.2](#), allowing cyclists to access the public toilet, barbecue site and store easily.

Cycle track section between Cafeteria Old Beach and Castle Peak Beach

- 2.6.9. The original design is to construct the route via at-grade roads along the rear periphery of Cafeteria Old Beach, Kadoorie Beach and Castle Peak Beach, with the coastal section of the track connecting Cafeteria Old Beach, Kadoorie Beach and Castle Peak Beach to be built on three viaduct sections. The first viaduct section would cross from Cafeteria Old Beach to Kadoorie Beach, with the second section going from Kadoorie Beach to Kadoorie Pier, and the final section continuing from Kadoorie Pier to the rear periphery of Castle Peak Beach. See [Figure 2.1](#).
- 2.6.10. An alternative option was considered during the design stage to construct the cycle track along Castle Peak Road – Castle Peak Bay. However, such a proposal was found infeasible due to lack of space for the footpath along Castle Peak Road – Castle Peak Bay, especially after the completion of Castle Peak Road Widening Works. Therefore, it was decided to construct the cycle track section via at-grade roads along the rear periphery of the beaches and via viaducts along the shoreline.
- 2.6.11. For the revised design, in order to minimize impacts to marine ecology, visual impacts brought to the existing beaches and smoothen the alignment to avoid splitting the beaches, the two viaduct sections from Kadoorie Beach to Castle Peak Beach via Kadoorie Pier have been avoided. Only the viaduct section between Cafeteria Old Beach and Kadoorie Beach will be built, which cannot be avoided due to lack of sufficient land space for the alignment to continue at-grade. After the viaduct section ends at the rear periphery of Kadoorie Beach, the alignment would continue at-grade along Tsing Yan Street and then turn west to join Castle Peak Road – Castle Peak Bay. The existing promenade at Castle Peak Beach will be modified to cater for the change in alignment. Refer to [Figure 2.2.3](#).
- 2.6.12. Furthermore, the remaining viaduct section between Cafeteria Old Beach and Kadoorie Beach has been moved further away from the beach shorelines, compared with the original design. For the sections where beach crossing is unavoidable (e.g. sections that connect the viaducts and the rear side of the beach), the viaduct would be aligned as close to the side edges of Cafeteria Old Beach and Kadoorie Beach as possible.
- 2.6.13. Pre-bored H-piles have been proposed as the foundation type for the bridge viaduct section. Removal of excavated material from the piling works will be made via double pile casing, thus avoiding the need for open sea dredging and minimizing sediment generation. Precast pile caps will then be installed onto the pile heads after the erection of the piles. The pier will be constructed on the pile caps. The deck structure will be constructed with box girder by cast-in-situ method with the aid of temporary steel working platforms. Finally, the railings will be installed, and surfacing will be constructed.

Cycle track section between Castle Peak Beach and Hoi Wing Road

- 2.6.14. In considering the interfacing issue with the future Tuen Mun Bypass Project, Highways Department (HyD) and Transport Department (TD) were consulted. As the open area near Hanford Garden would be occupied by the Tuen Mun Bypass Project, the proposed entry/exit hub at Hoi Wah Road as indicated in [Figure 2.1](#) has been removed from this Project.
- 2.6.15. The original at-grade cycle track alignment design along Sam Shing Street, as indicated in [Figure 2.1](#), had been reviewed. The existing priority junction at Sam Shing Street and Castle Peak Road – Castle Peak Bay outside Hanford Garden will need to be signalized to enable cyclists to safely cross the road. The alignment along Sam Shing Street outside Hanford Garden will also require the existing carriageway width to be narrowed from 10m to 7.3m, in order to free up space for the proposed cycle track along the southern kerb outside Sam Shing Estate. For the alternative subway option on Sam

Shing Street outside Hanford Garden, it will involve diversions of major stormwater drains, sewers, watermains, which will increase both construction time and cost.

- 2.6.16. In considering the cycle track alignment, the key is to ensure continuity and connectivity to the entire cycle track network from Tuen Mun to Tsuen Wan. In order to minimize impacts to marine ecology and visual impacts brought to Castle Peak Beach, the third viaduct section connecting Castle Peak Beach to Sam Shing Street has been removed in the revised design. The revised cycle track alignment would continue along Castle Peak Road– Castle Peak Bay up to Hoi Wing Road, where it would connect with the existing cycle track network at the junction of Hoi Wing Road and Hoi Wah Road. See [Figure 2.2.4](#) for details.

Cycle track section between Ki Lun Kong Public Park and Hin Fat Lane

- 2.6.17. A branch cycle track has been introduced from Ki Lun Kong Public Park to Hin Fat Lane, as indicated in [Figures 2.2.4 and 2.2.5](#), to provide better connectivity to the housing estates along the branch alignment, after receiving comments and recommendations from the public and the District Council members.
- 2.6.18. As part of the CEDD Contract No. CV/2021/01 “Site Formation and Infrastructure Works at Tuen Mun Central Phase 1 – Remaining Infrastructure Works”, as well as the construction of the public housing development at Hin Fat Lane by Hong Kong Housing Authority (HKHA), the section of Castle Peak Road – Castle Peak Bay between Tuen Hing Road and Hin Fat Lane would need to be widened, which would reduce the sideways width of the cycle track section. After reviewing the available space between the widened carriageway and the existing Tuen Mun Substation nearby, it was concluded that constructing cycle track along that section would be implausible. Therefore, the original cycle track section between Tuen Hing Road and Hin Fat Lane as indicated in [Figure 2.1](#) has been cancelled, and the end point of the current cycle track alignment would now be at Hin Fat Lane.
- 2.6.19. The originally proposed resting station near the Tuen Mun Substation on the south of Tuen Hing Road has therefore also been removed. It will be replaced by a cycle parking area at the revised end point of the cycle track at Hin Fat Lane, as indicated in [Figure 2.2.5](#).

2.7. Environmental Benefits and Achievements of the Project

- 2.7.1. The major environmental benefits of the adopted cycle track alignment, after consideration of various design options discussed in **Section 2.6** above, are summarized below and presented in **Table 2.1** according to the hierarchy of “Avoid, Minimize and Mitigate” for environmental protection.
- Avoidance of three marine viaduct sections and impact to marine quality during construction phase;
 - Avoidance of tree felling of plant species of conservation importance during construction phase;
 - Avoidance of open sea dredging during construction phase;
 - Minimization of impact to water quality during construction phase;
 - Minimization of impact to marine ecology and visual impacts during construction and operational phases;
 - Minimization of wastewater effluent discharge during construction and operational phases;
 - Minimize impact to air quality and noise by avoiding excessive civil construction works during construction phase;
 - Minimization of the footprint of the project; and
 - Mitigation measures implementation.

Table 2.1 Summary of Environmental Benefits for the Adopted Layout Design

Cycle Track Section	Environmental Benefits
Whole section	<p>Avoidance of tree felling of species of conservation importance during construction phase: The cycle track alignment has been designed to retain all tree species of conservation importance along the route.</p> <p>Minimization of wastewater effluent discharge during construction and operational phases: Sewage effluent from onsite workforce during construction and visitors to the cycle track during operational phase will be properly conveyed into designated sewage holding tanks and the existing sewerage system respectively.</p> <p>Minimize impact to air quality and noise by avoiding excessive civil construction works during construction phase: The cycle track alignment has been designed to avoid excessive civil construction works along the route in order to reduce impact to nearby air and noise sensitive receivers.</p> <p>Minimize the footprint of the Project: The cycle track alignment has been designed to minimize the overall Project footprint.</p>
Between Cafeteria Old Beach and Hoi Wing Road <u>(Section 2.6.9 – 2.6.16)</u>	<p>Avoidance of three marine viaduct sections and impact to marine water quality during construction phase: Three marine viaduct sections have been avoided, including: (i) two viaduct sections from Kadoorie Beach to Castle Peak Beach via Kadoorie Pier and (ii) one viaduct section connecting Castle Peak Beach and Sam Shing area. This will avoid impact to marine water quality during construction.</p> <p>Avoidance of open sea dredging during construction phase: Open sea dredging is not needed due to the use of pre-bored H-pile foundation type piles, thereby minimizing sediment release.</p> <p>Minimization of impact to water quality during construction phase: The use of precast pile caps, pre-bored H-pile foundation, controlled rate of pile construction and cage type silt curtains would minimize sediment generation and impact to water quality during construction of the marine viaduct.</p> <p>Minimization of impact to marine ecology and visual impacts during construction and operational phases: The avoidance of the three viaduct sections could minimize the impacts to marine ecology and visual impacts brought to the nearby visually sensitive receivers (VSRs).</p>

2.8. Project Implementation Programme

- 2.8.1. The construction is scheduled to commence in the 1st quarter of 2023 and will be completed by the 3rd quarter of 2026 tentatively. The construction schedule for different sections of the cycle track is shown in **Table 2.2** below.

Table 2.2 Tentative Project Construction Schedule

Cycle track sections	Scheduled construction period	
	Start	Completion
At-grade section from Kwun Tsing Road to Cafeteria Old Beach, from Kadoorie Beach to Hoi Wing Road / Hin Fat Lane	1 st quarter of 2023	3 rd quarter of 2026
Viaduct section from Cafeteria Old Beach to Kadoorie Beach	1 st quarter of 2023	3 rd quarter of 2026

- 2.8.2. It is anticipated that the construction would be carried out in different stages. As the sections containing viaducts would require a longer construction time, it is expected that the at-grade and viaduct sections would be constructed simultaneously in order to optimize the construction time.
- 2.8.3. The proposed cycle track would be maintained by HyD and managed by TD after commencement. The proposed cycle track could be opened in sections once the construction and inspection works on the specific section are completed.

2.9. Concurrent Projects

- 2.9.1. In order to assess the cumulative impacts, a review of best available information at the time of preparing this EIA report was conducted to identify concurrent projects in the vicinity that are undergoing planning, design, construction and/or operation within the same construction and/or operation period of the Project.
- 2.9.2. There are a number of concurrent projects identified in the vicinity of the Project which may bear potential direct / indirect / cumulative environmental impacts during the construction phase of the Project. They are:
- Agreement No. CE17/2013 (HY) – Widening of Castle Peak Road – Castle Peak Bay – Design and Construction, by Highways Department (HyD);
 - Project No. 426RO - District Open Space in Area 27 (Sam Shing), Tuen Mun, by Architectural Services Department (ASD);
 - Contract No. 20200312 - Construction of Public Housing Development at Hin Fat Lane, Tuen Mun, by Hong Kong Housing Authority (HKHA);
 - Contract No. CV/2021/01 - Site Formation and Infrastructure Works at Tuen Mun Central Phase 1 – Remaining Infrastructure Works, by CEDD;
 - Agreement No. C1501 - Tuen Mun South Extension, by MTR Corporation Limited (MTRC);
 - Agreement No. CE 11/2021 (HY) - Traffic Improvement Scheme in Tuen Mun – Widening and Addition of Slip Roads at Lung Fu Road / Tuen Mun Road / Wong Chu Road / Hoi Wing Road, by Highways Department (HyD); and
 - Tuen Mun Bypass, by HyD.
- 2.9.3. Under Public Works Programme (PWP) Item No. B811CL and Agreement No. CE57/2017(CE) “Site Formation and Infrastructure Works for Public Housing Developments at Tuen Mun Central – Investigation, Design and Construction”, CEDD will implement site formation and infrastructure works for the five proposed public housing developments in Tuen Mun Central. Of these five sites, the development at Hin Fat Lane is the only project in the vicinity of the Project area.

2.9.4. As mentioned in **Section 2.9.2**, the ongoing construction of the public housing development at Hin Fat Lane by the Hong Kong Housing Authority is expected to complete by 2024, whilst road improvement works at the junction of Castle Peak Road and Hin Fat Lane has commenced in August 2021, under CEDD Contract No. CV/2021/01 “Site Formation and Infrastructure Works at Tuen Mun Central Phase 1 – Remaining Infrastructure Works”. The improvement works are expected to last for 36 months. The tentative implementation programme of these concurrent projects is provided in **Table 2.3**.

Table 2.3 Potential Concurrent Projects

Potential Concurrent Projects	Scheduled construction period		Overlapping period with Cycle Track Project	Potential Cumulative Impacts
	Start	Completion		
Agreement No. CE17/2013(HY) – Widening of Castle Peak Road – Castle Peak Bay – Design and Construction, by HyD	4 th quarter of 2020	2 nd quarter of 2024	1 st quarter of 2023 to 2 nd quarter of 2024	Air Quality, Noise, Terrestrial Ecology
Project No. 426RO - District Open Space in Area 27 (Sam Shing), Tuen Mun, by ASD	End of 2020	2023	1 st quarter to 4 th quarter of 2023	Air Quality, Noise
Contract No. 20200312 - Construction of Public Housing Development at Hin Fat Lane, Tuen Mun, by HKHA	2020	2024	1 st quarter of 2023 to 4 th quarter of 2024	Air Quality, Noise
Contract No. CV/2021/01 - Site Formation and Infrastructure Works at Tuen Mun Central Phase 1 – Remaining Infrastructure Works, by CEDD	3 rd quarter of 2021	3 rd quarter of 2024	1 st quarter of 2023 to 3 rd quarter of 2024	Air Quality, Noise
Agreement No. C1501 - Tuen Mun South Extension, by MTRC	2023	2030	2023 to 3 rd quarter of 2026	Air Quality, Noise, Terrestrial Ecology
Agreement No. CE 11/2021 (HY) - Traffic Improvement Scheme in Tuen Mun – Widening and Addition of Slip Roads at Lung Fu Road / Tuen Mun Road / Wong Chu Road / Hoi Wing Road, by HyD	n/a	2031	Not known (no defined start date)	Air Quality, Noise
Tuen Mun Bypass, by HyD	n/a	2036	Not known (no defined start date)	Air Quality, Noise

2.9.5. Various cumulative impacts from different concurrent projects have been identified and detailed justifications on consideration of various cumulative environmental impacts from individual concurrent project are included in the corresponding technical sections of the EIA Report. The construction works shall be well coordinated with the concurrent projects to minimize the adverse effects brought to the vicinity.

2.10. Community Consultation

2.10.1. Project Profile No. PP-543/2016 was released to the public for comments in August 2016. The public offered their views during the 14-day public inspection period of the Project Profile. The key comments received are summarised in **Table 2.4**.

Table 2.4 Key Comments Received during Public Inspection Period of Project Profile

Key Issue	Public Comment	Action / Response
<p>Air Quality and Noise Impact</p>	<p>There were concerns about noise and air pollutions during the construction phase to a number of residential areas.</p> <p>Also, it was concerned that the proposed hub / resting stations / parking areas near residential areas might induce noise complaints from residents.</p>	<p>The air quality and noise impact during the construction phase have been assessed in the EIA, Chapter 3 and Chapter 4, respectively.</p> <p>Potential air quality impacts from the Project would mainly be related to emissions from construction activities. However, the construction works at each active work site are generally temporary, and the scale of the works will be in limited scale. With proper implementation of dust suppression measures as stipulated under Air Pollution Control (Construction Dust) Regulation and Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation, adverse air quality impacts are not expected to occur.</p> <p>The construction noise associated with the use of Quality Powered Mechanical Equipment (QPME) for different stages of construction has been assessed. With the implementation of practical mitigation measures including good site management practices, use of QPME, use of quieter equipment and construction method (e.g. non-explosive chemical expansion agent and hydraulic crusher), provision of temporary noise barriers and noise enclosures for PME, construction noise impacts at all NSRs would be controlled to an acceptable level.</p> <p>It should also be noted that the proposed entry/exit hub and resting stations have been removed from this Project.</p>
<p>Landscape and Visual Impact</p>	<p>There were comments that the footprint / width of the proposed cycle track shall be minimized to reduce impacts to adjacent landscape characters. It was suggested that cycle track with 3m width was sufficient for recreational use.</p> <p>There were also concerns about the potential visual impacts caused by the proposed viaducts since the Project Profile has not provided sufficient details.</p> <p>Instead of concrete tracks, the use of forest trails</p>	<p>The proposed cycle track design is in line with the requirements stipulated in the Transportation Planning and Design Manual (TPDM) published by TD. The proposed cycle track would be 4m wide in general, with some local sections being 3.5m wide subject to terrain and other site constraints. The longitudinal gradient of the proposed cycle track would range from level to 4%, and a 2m wide associate pedestrian footpaths would also be introduced along most sections of the cycle track.</p> <p>The footprint of the proposed cycle track has been minimized to reduce potential landscape and visual impacts while fulfilling the requirements stipulated in the TPDM at the same time.</p>

Key Issue	Public Comment	Action / Response
	commonly found in many other countries should be considered.	
Concurrent Projects	There were concerns about the cumulative impacts caused by the concurrent projects, particularly the Widening of Castle Peak Road – Castle Peak Bay.	<p>In order to assess the cumulative impacts, a review of best available information at the time of preparing this EIA Report has been conducted to identify concurrent projects in the vicinity that are undergoing planning, design, construction and/or operation within the same construction and/or operation period of the Project.</p> <p>Various cumulative impacts from different concurrent projects (see Table 2.3 for the details of potential concurrent projects), including the Widening of Castle Peak Road – Castle Peak Bay, have been identified and detailed justifications on consideration of various cumulative environmental impacts from individual concurrent project are included in the corresponding technical sections.</p>
Traffic and Transport Impact	<p>It was suggested that the cycle track should be connecting the existing cycle track and roads shared by cyclists.</p> <p>There were concerns about the potential traffic impacts caused by the proposed cycle track along Castle Peak Road – So Kwun Wat (near Aegean Coast).</p> <p>There were also concerns that the outdoor car parking space near Golden Beach Path would be removed due to the proposed construction of the cycle track resting station nearby.</p>	<p>As the proposed cycle track connects Hoi Wing Road to Castle Peak Road – So Kwun Wat, cyclists could travel from the existing New Territories cycle track network at Hoi Wing Road to Castle Peak Road – So Kwun Wat via the proposed cycle track.</p> <p>Regarding the concern on potential traffic impacts caused by the proposed cycle track near Aegean Coast, a comprehensive traffic impact assessment (TIA) has been carried out and concluded that the traffic impact brought by the cycle track would not be significant.</p> <p>Regarding the concern on the removal of the outdoor car parking spaces near Golden Beach Path, the current proposed alignment has been revised. The proposed resting station has been removed and therefore the concerned outdoor car parking spaces will no longer be affected.</p>

2.10.2. After the issue of EIA Study Brief ESB-295/2016 in September 2016, a number of consultations with stakeholders have been conducted to obtain their views for consideration in the design of the cycle track during the course of Agreement No.: CE36/2016(HY) – Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat Section) – Design and Construction. Details of these consultations are presented in **Table 2.5**.

Table 2.5 List of Community Consultations

Consultation Event	
1.	<u>Meeting with Aegean Coast Residents</u>
Date:	20 March 2017
Attendee:	Aegean Coast Resident, District Council Member – Chu Shun Nga, CEDD and Atkins
2.	<u>Tuen Mun District Council 2016-2017 Environment, Health and Regional Development Committee</u>
Date:	24 November 2017
Attendee:	District Council Members, CEDD and Atkins
3.	<u>Tuen Mun District Council 2018-2019 Environment, Health and Regional Development Committee</u>
Date:	23 November 2018
Attendee:	District Council Members, CEDD and Atkins
4.	<u>Site Meeting with Tuen Mun DC Members</u>
Date:	7 May 2021
Attendee:	District Council Members, CEDD and Atkins
5.	<u>Tuen Mun District Council 2021-2022 Commerce, Industry and Housing Committee</u>
Date:	14 May 2021
Attendee:	District Council Members, CEDD and Atkins
6.	<u>Site Meeting with Tuen Mun DC Members and Aquamarine residents</u>
Date:	27 May 2021
Attendee:	District Council Members, resident representatives, CEDD and Atkins
7.	<u>Site Meeting with Tuen Mun DC Members, Hanford Garden and Castle Peak Garden residents</u>
Date:	28 June 2021
Attendee:	District Council Members, resident representatives, CEDD and Atkins
8.	<u>Consultation Meeting with Hong Kong Gold Coast Phase 1 residents</u>
Date:	21 July 2021
Attendee:	Resident representatives, CEDD and Atkins
9.	<u>Tuen Mun District Council 2021-2022 Commerce, Industry and Housing Committee</u>
Date:	23 July 2021
Attendee:	District Council Members, CEDD and Atkins
10.	<u>Consultation Meeting with Aegean Coast Residents</u>
Date:	23 July 2021
Attendee:	Resident representatives, CEDD and Atkins
11.	<u>Consultation Meeting with Palm Beach Owners' Corporation (OC)</u>
Date:	2 September 2021
Attendee:	Representatives of the OC, CEDD and Atkins
12.	<u>Consultation Meeting with Palm Beach Residents</u>
Date:	1 November 2021
Attendee:	Resident representatives, CEDD and Atkins

2.10.3. The feedback received from the consultations has been considered during the design of the cycle track. The alignment, locations and arrangement of the pedestrian crossings and cycle parking areas

of the proposed cycle track have been reviewed and refined after considering the utilisation of land resources and opinions from the concerned public stakeholders. In general, the public are supportive of this Project. **Table 2.6** summarises the major opinions from the public.

Table 2.6 List of Public Opinions

Item	Public Opinion	Action or Response
1.	The resting station near Aegean Coast at Castle Peak Road – So Kwun Wat shall be omitted until there is a clearer programme for the next stage of works.	All entry/exit hubs and resting stations have been removed from this Project and will be further considered in subsequent stage(s) of the cycle track project.
2.	It was suggested to share the slow lane of Castle Peak Road – Castle Peak Bay with cyclists.	After consulting TD, due to the heavy traffic of this section of carriageway, bicycle riding is not encouraged. Moreover, to minimize the conflicts between bicycles and vehicles to act concert with the goal of the Widening of Castle Peak Road – Castle Peak Bay, which is to alleviate the traffic along the road, a separate cycle track proposed in this Project is suggested.
3.	There was concern that seawater might flood the viaduct and shoreline sections of the cycle track during high tides or storm surges. There may be potential conflicts between the cycle track and canoeing activities at Cafeteria Old Beach.	This concern has been taken into account to ensure the cycle track will not be flooded. There will be further liaison with the relevant departments on the arrangements to minimize the impact brought to the canoeing activities.
4.	Residents expressed concern on the visual impact, lighting and nuisance of the viaduct track section.	The level of the viaduct section is designed to minimize impacts on the residents. The lighting will be designed to point downward to minimize the nuisance brought to the residents.
5.	The residents suggested that the existing barbecue area near Kadoorie Beach shall be retained.	Barbecue pits will be provided at Kadoorie Beach after liaison with LCSD.
6.	The section near Alpine Garden was suggested to run along the roadside of Castle Peak Road in order to retain the existing footpath for daily access.	There will be footpath provided along the concerned alignment section.

3. Air Quality

3.1. Introduction

- 3.1.1. This section presents the assessment of air quality impacts based on the criteria and guidelines stated in Annex 4 and 12 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) and has covered the scope outlined in Section 3.4.4 of the EIA Study Brief No. ESB-295/2016.
- 3.1.2. The cycle tracks are not sources of air pollution and will not result in air quality impacts during the operation. No air quality impacts are expected to occur during operation of the cycle track and thus are not considered further.

3.2. Relevant Legislations, Standards & Guidelines

- 3.2.1. The criteria for evaluating air quality impacts and the guidelines for air quality assessment are laid out in Annex 4 and Annex 12 of the EIAO-TM. The principal legislation for the management of air quality in Hong Kong is the Air Pollution Control Ordinance (APCO) (Cap. 311).

Air Quality Objectives

- 3.2.2. The APCO provides a statutory framework for establishing the Air Quality Objectives (AQOs) and stipulating the anti-pollution requirements for air pollution sources. The AQOs stipulate concentration for a range of pollutants, of which fine suspended particulates (FSP) and respirable suspended particulates (RSP) are relevant to this study. **Table 3.1** summarizes the prevailing AQOs which have come into effect on 1 January 2022.

Table 3.1 Hong Kong Air Quality Objectives

Pollutant	Averaging time	Prevailing AQOs (effective 1 Jan 2022)	
		Concentration limit ($\mu\text{g}/\text{m}^3$) [i]	Number of exceedances allowed per year
Sulphur dioxide (SO_2)	10-minute	500	3
	24-hour	50	3
Respirable suspended particulates (RSP) [ii]	24-hour	100	9
	Annual	50	N/A
Fine suspended particulates (FSP) [iii]	24-hour	50	18 [iv]
	Annual	25	N/A
Nitrogen dioxide (NO_2)	1-hour	200	18
	Annual	40	N/A
Ozone (O_3)	8-hour	160	9
Carbon monoxide (CO)	1-hour	30000	0
	8-hour	10000	0
Lead (Pb)	Annual	0.5	N/A
Note: [i] All measurements of the concentration of gaseous air pollutants, i.e. sulphur dioxide, nitrogen dioxide, ozone and carbon monoxide, are to be adjusted to a reference temperature of 293 Kelvin and a reference pressure of 101.325 kilopascal. [ii] Respirable suspended particulates mean suspended particles in air with a nominal aerodynamic diameter of 10 μm or less. [iii] Fine suspended particulates mean suspended particles in air with a nominal aerodynamic diameter of 2.5 μm or less.			

[iv] The number of allowable exceedances is 18 for government projects, and 35 for non-government projects.

Air Pollution Control (Construction Dust) Regulation

3.2.3. The APCO's subsidiary regulation Air Pollution Control (Construction Dust) Regulation defines notifiable and regulatory works activities that are subject to construction dust control. Under the regulation, the notifiable work means:

- (a) site formation;
- (b) reclamation;
- (c) demolition of a building;
- (d) work carried out in any part of a tunnel that is within 100 m of any exit to the open air;
- (e) construction of the foundation of a building;
- (f) construction of the superstructure of a building; or
- (g) road construction work.

3.2.4. Under the regulation, the "regulatory work" means:

- (a) renovation carried out on the outer surface of the external wall or the upper surface of the roof of a building;
- (b) road opening or resurfacing work;
- (c) slope stabilization work; or
- (d) any work involving any of the following activities—
 - (i) stockpiling of dusty materials;
 - (ii) loading, unloading or transfer of dusty materials;
 - (iii) transfer of dusty materials using a belt conveyor system;
 - (iv) use of vehicles;
 - (v) pneumatic or power-driven drilling, cutting and polishing;
 - (vi) debris handling;
 - (vii) excavation or earth moving;
 - (viii) concrete production;
 - (ix) site clearance; or
 - (x) blasting.

3.2.5. Notifiable works require that advance notice of activities be given to Environmental Protection Department (EPD). The Regulation also requires the works contractor to ensure that both notifiable works and regulatory works will be conducted in accordance with the Schedule of the Regulation, which provides dust control and suppression measures.

Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation

3.2.6. The Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation controls emissions from non-road vehicles and regulated machines to be used in construction sites. The regulated machines must comply with the emission standards of Stage IIIA of the European Union (EU) or the equivalent, whilst non-road vehicles must comply with the prevailing emission standards for newly registered road vehicles. Upon confirmation of their compliance with emission requirement, EPD will issue them with an approval label.

Environmental Impact Assessment Ordinance (Cap. 499)

3.2.7. Annex 4 of EIAO-TM also stipulates a maximum hourly Total Suspended Particulate concentration of 500 microgrammes per cubic metre measured at 298K (25C) and 101.325 kPa (one atmosphere) at Air Sensitive Receiver for construction dust impact assessment.

3.3. Baseline Conditions

Existing Ambient Air Quality

- 3.3.1. The existing ambient air quality of the Study Area, i.e. within 500m from the boundary of the Project, (shown in [Figure 3.1](#)) is generally contributed by vehicular emissions from nearby road networks and marine vessels emissions from Castle Peak Bay. The baseline air quality of the Study Area has made reference to the air quality monitoring data from the EPD's Air Quality Monitoring Station (AQMS). The nearest EPD's AQMS to the Project site is the Tuen Mun AQMS, situated at Tuen Mun Public Library, No. 1 Tuen Hi Road, which is considered representative of the condition at the Project Site. The latest 5 years of air quality monitoring data from 2016 to 2020 at the Tuen Mun AQMS are summarised in [Table 3.2](#). The previous AQOs which were effective during 2014 to 2021, and hence prevailing during the air quality monitoring period of 2016 to 2020, are also included in the table for comparison.

Table 3.2 Air Quality Monitoring Data at Tuen Mun AQMS (2016 – 2020)

Pollutants	Parameter	Concentration ($\mu\text{g}/\text{m}^3$)					Prevailing AQOs during 2014-2021 ($\mu\text{g}/\text{m}^3$)
		2016	2017	2018	2019	2020	
SO ₂	4 th highest 10-minute	75	88	94	45	98	500
	4 th highest 24-hour	28	26	20	12	10	125
RSP (PM ₁₀)	10 th highest 24-hour	103	99	87	89	84	100
	Annual	44	43	42	41	34	50
FSP (PM _{2.5})	10 th highest 24-hour	63	65	53	53	47	75
	Annual	27	27	26	24	20	35
NO ₂	19 th highest 1-hour	167	188	177	166	166	200
	Annual	51	46	47	47	40	40
O ₃	10 th highest 8-hour	143	176	173	203	166	160
CO	Max. 1-hour	2050	1740	1900	2050	1650	30000
	Max. 8-hour	1843	1630	1666	1758	1513	10000

Note:

- The prevailing AQOs indicated here were effective during the air quality monitoring period of 2016 to 2020. This set of AQOs is expired on 1 January 2022.
- Data Source: EPD - Air Quality Reports - Annual Air Quality Monitoring Results (<http://www.aqhi.gov.hk/en/download/air-quality-reportse469.html>)
- Monitoring results exceeding the prevailing AQOs during the monitoring period are in bold and underlined.

- 3.3.2. Based on the monitoring data for Tuen Mun AQMS shown in [Table 3.2](#), exceedances in daily RSP, annual NO₂ and 8-hour O₃ concentrations were recorded in 2016, 2016 to 2019 and 2017 to 2020 respectively.

Predicted Background Air Quality

- 3.3.3. Background air quality has also been predicted based on hourly concentration data extracted from the EPD's Pollutants in the Atmosphere and their Transport over Hong Kong version 2.1 (PATH v2.1) model. The Study Area is covered by the PATH v2.1 Grids (21,39), (22,39), (20,40), (21,40), (20,41) and (21,41). [Table 3.3](#) provides a summary of the background levels from PATH v2.1, compared

against the prevailing AQOs which have come into effect on 1 January 2022. Given that construction of the Project is scheduled to last from the 1st quarter of 2023 until the 3rd quarter of 2026, the maximum predicted concentration data from the four future years available in PATH v2.1 (2022 to 2025) are presented for each pollutant. It can be seen that, apart from exceedances in background O₃ (for all 4 years of 2022-25), the predicted background air quality concentrations are lower than the prevailing AQOs.

Table 3.3 Background Concentrations from PATH v2.1 (Maximum from Year 2022-25)

Pollutants	Parameters	Concentration (µg/m ³) in PATH v2.1 for relevant grids						Prevailing AQOs (µg/m ³)
		(21,39)	(22,39)	(20,40)	(21,40)	(20,41)	(21,41)	
SO ₂	4 th highest 10-minute	107	83	78	76	78	75	500
	4 th highest 24-hour	13	12	13	12	12	12	50
RSP (PM ₁₀)	10 th highest 24-hour	68	70	70	69	72	68	100
	Annual	29	28	28	28	29	28	50
FSP (PM _{2.5})	19 th highest 24-hour	39	39	40	39	40	38	50
	Annual	16	16	16	16	16	16	25
NO ₂	19 th highest 1-hour	117	119	120	108	117	103	200
	Annual	34	31	31	27	28	22	40
O ₃	10 th highest 8-hour	<u>207</u>	<u>211</u>	<u>218</u>	<u>217</u>	<u>229</u>	<u>226</u>	160
CO	Max. 1-hour	935	930	935	934	940	933	30000
	Max. 8-hour	850	836	855	850	863	854	10000

Note:

1. Data Source: EPD Website (<https://path.epd.gov.hk/>).
2. Concentration values predicted to exceed the AQOs are bolded and underlined.
3. Conversion of 10-minute Average SO₂ concentration (1st highest hourly concentration x 2.45) is referenced from EPD's "Guidelines on the Estimation of 10-minute Average SO₂ Concentration for Air Quality in Hong Kong".
4. Concentration adjustments for RSP (daily, annual) and FSP (annual) are made in accordance with EPD's "Guidelines on Choice of Models and Model Parameters".
5. As per the EPD General Notice dated 2 July 2021, the number of allowable exceedances for 24-hour FSP is 18 for new government projects, and 35 for non-government projects.

3.4. Air Sensitive Receivers

- 3.4.1. In accordance with Annex 12 of the EIAO-TM, Air Sensitive Receivers (ASRs) include any domestic premises, hotel, hostel, hospital, clinic, nursery, temporary housing accommodation, school, educational institution, office, factory, shop, shopping centre, place of public worship, library, court of law, sports stadium or performing arts centre. Any other premises or place with which, in terms of duration or number of people affected, has a similar sensitivity to the air pollutants as the aforesaid premises and places would also be considered as a sensitive receiver.
- 3.4.2. The proposed cycle parking areas are only designed for the parking of bicycles and not for recreational use, with no provision of any resting area or facilities such as benches. Therefore, the parking areas are not considered to be ASRs since, in terms of duration or number of people affected, they do not have a similar sensitivity to air pollutants as the premises and places mentioned in section 3.4.1 or Annex 12 of the EIAO-TM.

3.4.3. In accordance with Section 3.4.4.2 of the EIA Study Brief No. ESB-295/2016, the Study Area covers an area of 500 m from the Project site. Within the Study Area, the ASRs that are closest to the Project site are anticipated to be the most affected and therefore considered the most representative ASRs for the worst-case scenario air quality impact assessment, whilst other ASRs located further away from these first-tier representative ASRs are expected to be less impacted. Representative existing and planned ASRs are summarized in **Table 3.4**. Locations of the representative ASRs are shown in [Figure 3.1](#).

Table 3.4 Representative Air Sensitive Receivers

ASR ID	Description	Uses	Distance from the Site Boundary (m)
ASR1	Aegean Coast Tower 8	Residential	34
ASR2	Tin Hau Temple	Place of Public Worship	25
ASR3	Gold Coast Tower 2	Residential	33
ASR4*	Starfront Royale Tower 2	Residential	5
ASR5	Spring Seaview Terrace Block A	Residential	36
ASR6	Golden Beach Office	Office	8
ASR7	Blessing Villa Block F	Residential	6
ASR8	Surfside	Residential	14
ASR9	Villa La Plage House 15	Residential	4
ASR10@	Barbecue Area near Aquamarine Garden	Recreational	within site boundary
ASR11	12 Aquamarine Garden	Residential	21
ASR12	6 Aquamarine Garden	Residential	31
ASR13A	Bayview Terrace Block 11	Residential	32
ASR13B	Pine Villas Block 2	Residential	36
ASR13C	Boulder Lodge Staff Quarter	Residential	12
ASR14	Castle Peak Bay Garden Block A	Residential	30
ASR15	Barbecue Area at Sam Shing Street	Recreational	37
ASR16	Palm Cove Tower 1	Residential	12
ASR17	The Salvation Army Sam Shing Nursery School	Educational Institution	29
ASR18	Hanford Garden Block 2	Residential	34
ASR19	Saint Temple	Place of Public Worship	43
ASR20	Hanford Garden Block 5	Residential	20
ASR21	Chung Sing Benevolent Society Mrs. Aw Boon Haw Secondary School	Educational Institution	64
ASR22	Tsing Sin Playground	Recreational	27
ASR23	Hoi Tak Garden Block 1	Residential	21
ASR24	JC Place Tower 2	Residential	32
ASR25@	Tsing Sin Garden	Recreational	within site boundary
ASR26*	Planned Public Housing Development at Hin Fat Lane	Residential	5
ASR27	Fu Hong Society Yau Chong Home	Hostel	6

ASR ID	Description	Uses	Distance from the Site Boundary (m)
ASR28	Tuen Mun Government Secondary School	Educational Institution	36
Note: ASR ID with * is planned ASR. ASR ID with @ will be temporarily closed during construction as the area will be used as construction site.			

3.4.4. There are no planned air sensitive receivers associated with the Project.

3.5. Impact Identification and Evaluation

Construction Phase

3.5.1. Potential air quality impacts during construction would generally be limited to fugitive dust emissions as air pollutions generated by equipment and transport of materials to site would be generally low. The construction of the at-grade cycle tracks would include site clearance such as vegetation removal, breaking up of hard ground and removal of the first 0.2m of topsoil. The cycle track sub-base will then be formed and compacted and applied with asphalt and rolled over to form the permanent surface. Afterwards, it will be fitted with railing, if applicable, and finally road markings will be applied.

3.5.2. The construction will involve works as listed below that could generate fugitive dusts:

- Site clearance;
- Material stockpiling, handling and transportation;
- Debris handling;
- Use of construction vehicles; and
- Excavation

3.5.3. All of these potential fugitive dust generating works are regulatory works defined under the Air Pollution Control (Construction Dust) Regulation. Appropriate dust suppression measures are required to be implemented under this regulation to adequately control dust to within an acceptable level.

3.5.4. Typically, contractor can clear an area of 40m long by 4m wide in a day. The daily generation of construction and demolition (C&D) materials would be about 32m³ in total and may require about 6 trips for removal by dump trucks. To minimize dust levels, working sections of the cycle track will be separated into multiple working areas and no adjacent sections will be worked simultaneously (e.g. separated by 300m between two sections). With suitable mitigation measures and good site practices detailed in **Section 3.6**, fugitive dust emission from the construction activities is expected to be readily controlled.

3.5.5. For the elevated section, construction of the bridge piers will be underwater thus fugitive dust generation is considered to be insignificant.

3.5.6. With the implementation of the dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation, Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation, Air Pollution Control (Fuel Restriction) Regulation, good site practices and the mitigation measures proposed in **Section 3.6**, adverse fugitive dust impacts during the construction phase are not expected to occur. The Contractor will be required to properly maintain the construction machinery in good condition to prevent exhaust emissions. Wherever possible, connection to the main power supply should be considered to minimize the need for use of diesel fuel generator.

Operational Phase

3.5.7. The Project is not an air polluting source. Thus, no adverse air quality impact is anticipated during the operational phase of the Project.

Cumulative Impacts

3.5.8. Concurrent projects located within the 500m of the Project have been identified. The key concurrent projects include:

1. Agreement No. CE17/2013(HY) – Widening of Castle Peak Road – Castle Peak Bay – Design and Construction, by Highways Department (HyD);
2. District Open Space in Area 27 (Sam Shing), Tuen Mun, by Architectural Services Department (ASD);
3. Construction of Public Housing Development at Hin Fat Lane, Tuen Mun, by Hong Kong Housing Authority (HKHA);
4. Contract No. CV/2021/01 - Site Formation and Infrastructure Works at Tuen Mun Central Phase 1 – Remaining Infrastructure Works, by CEDD; and
5. Traffic Improvement Scheme in Tuen Mun – Widening and Addition of Slip Roads at Lung Fu Road / Tuen Mun Road / Wong Chu Road / Hoi Wing Road, by Highways Department (HyD).

According to the information available at the time of preparing this EIA report and as shown in **Table 2.3**, the construction period for the first four projects is between 2020 and 2024. The fifth project, HyD's Traffic Improvement Scheme in Tuen Mun, has no scheduled start date for the works as it is still at the early feasibility study stage, whilst its tentative completion year is 2031.

3.5.9. Given the long project extent, the Project will be constructed in phases, and the construction activities will be implemented in separate sections (e.g. 300m between two active working sections) to avoid cumulative impacts due to concurrent works within the Project. The Contractor of this Project will also be required to closely liaise with the corresponding parties of the concurrent projects mentioned in **Section 3.5.8** to avoid construction works within 300m of each other. Should such works in close proximity be unavoidable, the corresponding parties shall work closely to schedule the construction works at different periods of the day to minimize concurrent works.

3.5.10. Given the adoption of careful scheduling and large separation distance between concurrent construction works, both within the Project itself and with other interfacing projects, cumulative construction dust impacts are not expected to occur.

3.6. Recommended Mitigation Measures

Construction Phase

3.6.1. To ensure that dust emissions are minimized during the construction phase of the Project, relevant dust control requirements stipulated in Air Pollution Control (Construction Dust) Regulation should be implemented. The following dust suppression measures are recommended to control the potential fugitive dust emissions during the construction phase of the Project.

- The works area for site clearance shall be sprayed with water before, during and after the operation so as to maintain the entire surface wet;
- Restricting heights from which materials are to be dropped, as far as practicable, to minimize the fugitive dust arising from unloading/ loading;
- Immediately before leaving a construction site, all vehicles shall be washed to remove any dusty materials from the bodies and wheels. However, all spraying of materials and surfaces should avoid excessive water usage;
- Where a vehicle leaving a construction site is carrying a load of dusty materials, the load shall be covered entirely by clean impervious sheeting to ensure that the dusty materials will not leak from the vehicle;
- Travelling speeds should be controlled to reduce traffic induced dust dispersion and re-suspension within the site from the operating haul trucks;
- Erection of hoarding of not less than 2.4 m high from ground level, where appropriate;
- Any stockpile of dusty materials shall be covered entirely by impervious sheeting; and/or placed in an area sheltered on the top and 4 sides;

- All dusty materials shall be sprayed with water or a dust suppression chemical immediately prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet.
- Non-road Mobile Machinery should be approved or exempted with a label issued by EPD. The label should be displayed at a conspicuous position of the machine or vehicle.
- The requirements stipulated in the Works Branch Development Bureau Technical Circular (Works) No. 8/2010 Enhanced Specification for Site Cleanliness and Tidiness should be followed as far as practicable to enhance the cleanliness and tidiness of construction sites.

Operational Phase

- 3.6.2. The Project is not an air polluting source. Thus, no adverse air quality impact is anticipated during the operational phase of the Project. No mitigation measures are expected to be required during operational phase.

3.7. Residual Impact

- 3.7.1. With proper implementation of the dust control measures and good site practices, no adverse residual air quality impact is anticipated during the construction phase and operational phase of the Project.

3.8. Environmental Monitoring and Audit Requirements

- 3.8.1. It is necessary to ensure proper implementation of the dust control measures as required under the Air Pollution Control (Construction Dust) Regulation. No specific construction dust monitoring is recommended as dust generated by the Project is expected to be minimal and works in any one segment of the cycle tracks will be relatively short in duration. However, weekly environmental site audits shall be undertaken during the construction stage to ensure proper implementation of air quality control measures.

- 3.8.2. Since no air quality impact is anticipated during the operational phase of the Project, monitoring and audit are not required for the operational phase.

3.9. Conclusion

- 3.9.1. Potential air quality impacts from the construction works for the Project would mainly be related to emissions from construction activities. The construction works at each active work site are generally temporary, and the scale of the works are in limited scale. With proper implementation of dust suppression measures as stipulated under Air Pollution Control (Construction Dust) Regulation and Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation, adverse air quality impacts are not expected to occur.

4. Noise

4.1. Introduction

4.1.1. This section presents the noise impact assessment based on the criteria and guidelines stated in Annex 5 and 13 of the EIAO-TM and has covered the scope outlined in Section 3.4.5 of the EIA Study Brief No. ESB-295/2016.

4.2. Relevant Legislations, Standards & Guidelines

Construction Activities during Normal Hours

4.2.1. Noise impacts arising from general construction activities other than percussive piling during the daytime period (0700-1900 hours of any day not being a Sunday or general holiday) shall be assessed against the noise standards stipulated under the EIAO-TM and are shown in **Table 4.1**.

Table 4.1 Noise Standards for Construction Activities during Daytime Period

Noise Sensitive Uses	0700 to 1900 hours on any day not being a Sunday or general holiday, $L_{eq(30\text{ min})}$, dB(A)
All domestic premises including temporary housing accommodation	75
Hotels and hostels	75
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	70 65 during examination
Note: 1) The above noise standards apply to uses which rely on opened windows for ventilation 2) The above standards shall be viewed as the maximum permissible noise levels assessed at 1m from the external façade 3) The above standards shall be met as far as possible. All practicable mitigation measures shall be exhausted and the residual impacts are minimized.	

Construction Activities during Restricted Hours

4.2.2. The Noise Control Ordinance (NCO) (Cap. 400) provides the statutory control on general construction works during restricted hours (i.e. 1900 to 0700 hours (of the next day) from Monday to Saturday and at any time on Sundays or general holidays). The use of Powered Mechanical Equipment (PME) for construction works during restricted hours would require a Construction Noise Permit (CNP). The Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW-TM) details the procedures adopted by Environmental Protection Department (EPD) for assessing such application. The granting of a CNP is subject to conditions stated in the CNP and it may be revoked at any time for failure to comply with the permit conditions.

4.2.3. The use of Specified PME (SPME) and/or the carrying out of Prescribed Construction Work (PCW) within a Designated Area (DA) under the NCO during the restricted hours are also prohibited without a CNP. The relevant technical details can be referred to Technical Memorandum on Noise from Construction Work in Designated Areas (DA-TM) under NCO.

Percussive Piling

4.2.4. Percussive piling is only permitted when the Authority has granted a CNP. Technical Memorandum on Noise from Percussive Piling (PP-TM) under the NCO sets out the requirements for working and determination of the permitted hours of operations for the CNP applications. The permitted hours of operations would be 3, 5 or 12 hours per day depending on the types of percussive piling and the predicted noise impact at NSRs.

- 4.2.5. No percussive piling is anticipated for the Project. Notwithstanding, should percussive piling be required, the requirements in PP-TM shall be followed.
- 4.2.6. Regardless of any description or assessment made in this EIA, in assessing an application for a CNP, the Authority will be guided by the relevant Technical Memoranda. The Authority will consider all the factors affecting their decision taking contemporary situations/ conditions into account. Nothing in this EIA Report shall pre-empt the Authority in making their decisions, and there is no guarantee that a CNP will be issued. If a CNP is to be issued, the Authority may include any conditions they consider appropriate and such conditions are to be followed while the works covered by the CNP are being carried out. Failing to do so may lead to cancellation of the permit and prosecution action under the NCO. Based on the current Project design detail, no construction works will be required during the restricted hours defined under the NCO. In case of any construction activities during restricted hours, it is the Contractor's responsibility to ensure compliance with the NCO and the relevant TMs. The Contractor will be required to submit CNP application to the Noise Control Authority and abide by any conditions stated in the CNP, should one be issued.

4.3. Existing Noise Environment

- 4.3.1. The proposed cycle track will generally be running along existing roads and partly located near shore of beaches. The existing noise environment of the Project area is dominated by road traffic noise from major roads, in particular the Castle Peak Road – Castle Peak Bay and Hoi Wing Road. Traffic noise at the background is also noticeable at the section near beaches.

4.4. Assessment Area and Noise Sensitive Receivers

- 4.4.1. The assessment area generally includes an area within 300m from the Project. Existing Noise Sensitive Receivers (NSRs) and planned/ committed noise sensitive uses identified on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans, Layout Plans and other relevant published land use plans, including plans and drawings published by the Lands Department and any land use and development applications approved by the Town Planning Board have been identified. **Table 4.2** summarises all identified NSRs within the assessment area and their locations are illustrated in [Figure 4.1](#). Photographs of existing of NSRs are provided in [Appendix 4-1](#).

Table 4.2 Identified NSRs within 300m from the Project Boundary

NSR ID	Description	Nature of Use
NSR001	Kwan Shing Tai Kung	Place of Public Worship
NSR002	So Kwun Tan	Residential
NSR003	Aegean Coast	Residential
NSR004	Creative Kindergarten (Aegean Coast)	Kindergarten
NSR005	PLK Women's Welfare Club Western District Fung Lee Pui Yiu Primary School	Educational Institution
NSR006	S.T.F.A. Lee Kam Primary School	Educational Institution
NSR007* [Note 1]	Crossroads Foundation	Office (Current) / Residential (Planned)
NSR008	Village House	Residential
NSR009	Tin Hau Temple	Place of Public Worship
NSR010	Hong Kong Gold Coast Phase 1	Residential
NSR011*	The Royale	Residential
NSR012	Harrow International School Hong Kong	Educational Institution
NSR013*	TMTL 518	Residential
NSR014	Palm Beach	Residential
NSR015	Monte Carlo Villas	Residential

NSR ID	Description	Nature of Use
NSR016	Spring Seaview Terrace	Residential
NSR017	The Bloomsway	Residential
NSR018	Chu Hai College (Student's Dormitory and Staff Quarters)	Residential
NSR019	Watervale House	Residential
NSR020	1 Mun Fat Lane	Residential
NSR021	2 Mun Fat Lane	Residential
NSR022	Tak Yuen	Residential
NSR023	6 Mun Fat Lane	Residential
NSR024	Surfside	Residential
NSR025	Blessing Villa	Residential
NSR026	Villa La Plage	Residential
NSR027	Tuen Mun Court	Residential
NSR028	Villa Cornwall	Residential
NSR029	The Cafeteria	Residential
NSR030	Seaview Garden	Residential
NSR032	Bayview Terrace	Residential
NSR033	Aquamarine Garden	Residential
NSR034	Tsing Yung Terrace	Residential
NSR035	Crown by the Sea	Residential
NSR036	South Crest	Residential
NSR037	Pine Villas	Residential
NSR038	Scenic Villa	Residential
NSR039	Verdant Villa	Residential
NSR040	Boulder Lodge	Residential
NSR041	Boulder Lodge Staff Quarter	Residential
NSR042	Tuen Mun Cornwall Elderly's Home	Residential Care Home for the Elderly
NSR043*	TMTL 516	Residential
NSR043A	Village House	Residential
NSR044	Castle Peak Bay Garden	Residential
NSR045	Dragon Inn Court	Residential
NSR046	Village Houses	Residential
NSR047	Dragon Villa	Residential
NSR048	Palm Cove	Residential
NSR049	The Salvation Army Sam Shing Nursery School	Nursery
NSR050	Castle Peak Sam Chau Ma Temple	Place of Public Worship
NSR051*	Planned Transitional Housing Development at Ex-Salvation Army Sam Shing Chuen Lau Ng Ying School Premises	Residential
NSR052	Regina Coeli Anglo-Chinese Kindergarten (Second Branch)	Kindergarten
NSR053	Sam Shing Estate	Residential
NSR053A	South Asian Lutheran Evangelical Mission Sam Shing Lutheran Church	Place of Public Worship
NSR054	Saint Temple	Place of Public Worship

NSR ID	Description	Nature of Use
NSR055	Hanford Garden	Residential
NSR056	Construction Industry Council Training Academy	Educational Institution
NSR057	Semple Memorial Secondary School	Educational Institution
NSR058	Tuen Mun Foursquare Gospel Church	Place of Public Worship
NSR059	Chung Sing Benevolent Society Mrs. Aw Boon Haw Secondary School	Educational Institution
NSR060	Siu Lun Court	Residential
NSR061	S.K.H. St. Peter's Church Castle Peak-Siu Lun Court Kindergarten	Kindergarten
NSR062	Pok Oi Hospital Tuen Mun Nursing Home	Clinic / Medical Uses
NSR063	Tsui Ning Garden	Residential
NSR064	Agnes English Kindergarten	Kindergarten
NSR065	Peace Evangelical Secondary School	Educational Institution
NSR066	Ching Chung Hau Po Woon Secondary School	Educational Institution
NSR067	The Sea Crest	Residential
NSR068	HK Christian Service Pui Oi School	Educational Institution
NSR069	Kam Fai Garden	Residential
NSR070	Harvest Garden	Residential
NSR071	Caritas Li Ka Shing Care and Attention Home	Residential Care Home for the Elderly
NSR072 [@]	The former Hong Kong Girl Guide Tuen Mun Campsite	Hostel
NSR073	Hoi Tak Garden	Residential
NSR074	JC Place	Residential
NSR075	TWGHs Tai Tung Pui Social Services Building	Clinic / Medical Uses
NSR076	Alpine Garden	Residential
NSR077	Rainbow Garden	Residential
NSR078	Handsome Court	Residential
NSR079	Hong King Garden	Residential
NSR080	PLK HKTA Yuen Yuen Primary School	Educational Institution
NSR081	Chi Lok Fa Yuen	Residential
NSR082	Jing Jing International Kindergarten	Kindergarten
NSR083	Mei Mun Alliance Church	Place of Public Worship
NSR084	Tuen Mun Christian Church	Place of Public Worship
NSR085	Evangelical Free Church of China (EFCC) Tuen Yan Church	Place of Public Worship
NSR086	Hope Mennonite Church	Place of Public Worship
NSR087	Shun Tak Fraternal Association Leung Kau Kui College	Educational Institution
NSR088	Lui Cheung Kwong Lutheran College	Educational Institution
NSR089	On Ting Estate	Residential
NSR090*	Planned Public Housing Development at Hin Fat Lane	Residential
NSR091	Come On Building	Residential
NSR092	Wealthy Jade Nursing Home (Come On) Limited	Residential Care Home for the Elderly
NSR093	Man Bo Building	Residential
NSR094	Lee Bo Building	Residential

NSR ID	Description	Nature of Use
NSR095	Lai Po Building	Residential
NSR096	Kai Hei Land Building	Residential
NSR097	Tuen King Building	Residential
NSR098	Yan On Home for Aged Limited	Residential Care Home for the Elderly
NSR099	Wah Lok Mansion	Residential
NSR100	Shun Fuk Home for Aged (Tuen Mun) Limited	Residential Care Home for the Elderly
NSR101	Tuen Mun Fa Yuen	Residential
NSR102	Siu On Court	Residential
NSR103	Fu Hong Society Yau Chong Home	Hostel
NSR104	Tuen Mun Government Secondary School	Educational Institution
NSR105	CMA Choi Cheung Kok Secondary School	Educational Institution
NSR106	YOT Madam Lau Wong Fat Primary School	Educational Institution
NSR107	Tseng Tau Sheung Tsuen	Residential
NSR108*	Planned Housing Sites at Tseng Tau Sheung Tsuen	Residential
NSR109	Villa Tiara	Residential
NSR110	Yan Oi Polyclinic	Clinic / Medical Uses
NSR111	New Town Mansion	Residential
NSR112	Waldorf Garden	Residential
NSR113	A.D. & F.D. of Pok Oi Hospital Mrs. Cheng Yam On School	Educational Institution
NSR114	Village House	Residential
NSR115	Goodview Garden	Residential
NSR116	Faraday House	Residential
NSR117	Elegant Villa	Residential

Note:
NSR ID with * is planned NSR.
NSR ID with @ is currently vacant.
[1] NSR007 (Crossroads Foundation) is currently an office use. It is under planning stage for re-development (R(B) zone in OZP No. S/TM/35). There is no detailed programme for the re-development during the preparation of this report. NSR007 is also regarded as a planned residential NSR.

Noise Assessment Points

4.4.2. For the purpose of construction noise assessment, representative first tier NSRs closest to the Project site have been selected as noise assessment points for predicting the noise impacts. These would represent the worst-case scenario in predicting noise impacts. Other NSRs further away from these first tier NSRs are expected to be less affected by comparison.

4.4.3. The selected representative noise assessment points are listed in **Table 4.3** and the locations are shown in **Figure 4.2.1 to Figure 4.2.10**. Separation distance between the selected representative noise assessment points and workfronts are also shown in **Figure 4.2.1 to Figure 4.2.10**.

Table 4.3 Selected Noise Assessment Points

Noise Assessment Point ID	Description	Nature of Use	Number of Storey	Noise Criteria, dB(A)
N001	Aegean Coast Tower 8	Residential	29	75
N002 ^[1]	Crossroads Foundation	Office	1	75
N003	Tin Hau Temple	Place of Public Worship	1	70 [#]
N004	Gold Coast Tower 4	Residential	25	75
N005*	Starfront Royale Tower 1	Residential	16	75
N006*	Starfront Royale Tower 2	Residential	18	75
N007*	Seacoast Royale Tower 3	Residential	18	75
N008	Monte Carlo Villas Block A6	Residential	2	75
N009	Palm Beach Block 1	Residential	14	75
N010*	TMTL 518 Tower 8	Residential	16	75
N011*	TMTL 518 Tower 1	Residential	17	75
N012A	Blessing Villa Block F	Residential	3	75
N012B	Blessing Villa Block F	Residential	3	75
N013	Surfside	Residential	2	75
N014A	Villa La Plage House 1	Residential	4 ^[2]	75
N014B	Villa La Plage House 1	Residential	4 ^[2]	75
N015A	Villa La Plage House 8	Residential	4 ^[2]	75
N015B	Villa La Plage House 8	Residential	4 ^[2]	75
N016A	Villa La Plage House 15	Residential	5 ^[2]	75
N016B	Villa La Plage House 15	Residential	5 ^[2]	75
N017A	Villa La Plage House 25	Residential	4 ^[2]	75
N017B	Villa La Plage House 25	Residential	4 ^[2]	75
N018	Village House	Residential	2	75
N019	12 Aquamarine Garden	Residential	2	75
N020	10 Aquamarine Garden	Residential	2	75
N021	3 Aquamarine Garden	Residential	2	75
N022	1 Aquamarine Garden	Residential	2	75
N023	Bayview Terrace Block 11	Residential	3	75
N024	Bayview Terrace Block 26	Residential	9	75
N025	Pine Villas Block 2	Residential	2	75
N026	Verdant Villa Block 2	Residential	10	75
N027	Boulder Lodge Staff Quarter	Residential	1	75
N028	Castle Peak Bay Garden Block B	Residential	4	75
N029	Palm Cove Tower 1	Residential	14	75
N030	Castle Peak Sam Chau Ma Temple	Place of Public Worship	1	70 [#]
N031	The Salvation Army Sam Shing Nursery School	Educational Institution	1	70 / 65 (exam)

Noise Assessment Point ID	Description	Nature of Use	Number of Storey	Noise Criteria, dB(A)
N032*	Planned Transitional Housing Development at Ex-Salvation Army Sam Shing Chuen Lau Ng Ying School Premises	Residential	7	75
N033	Chun Yu House	Residential	27	75
N034	Saint Temple	Place of Public Worship	1	70 [#]
N035	Hanford Garden Block 2	Residential	27	75
N036	Hanford Garden Block 4	Residential	27	75
N037	Hanford Garden Block 5	Residential	27	75
N038	Tuen Mun Foursquare Gospel Church	Place of Public Worship	1	70 [#]
N039	Harvest Garden Block 2	Residential	17	75
N040	Hoi Tak Garden Block 1	Residential	15	75
N041	TWGHs Tai Tung Pui Social Services Building	Clinic / Medical Uses	11	70 [#]
N042	Alpine Garden Block 1	Residential	15	75
N043	Handsome Court Block 9	Residential	17	75
N044	Handsome Court Block 1	Residential	17	75
N045	PLK HKTA Yuen Yuen Primary School	Educational Institution	7	70 / 65 (exam)
N046	Jing Jing International Kindergarten	Educational Institution	1	70 / 65 (exam)
N047*	Area 39 Public Housing	Residential	37	75
N048	Wealthy Jade Nursing Home (Come On) Limited	Home for the Aged	1	75
N049	Man Bo Building	Residential	24	75
N050	Fu Hong Society Yau Chong Home	Hostel	2	75

Note:

Construction noise criteria for Place of Public Worship and Clinic / Medical Uses is not specified in the EIAO-TM. A more stringent criterion of 70 dB(A) has been adopted as a conservative approach.

* is planned NSR.

[1] N002 (Crossroads Foundation) has been confirmed to be an office that relies on open window for ventilation by the Operator during site visit. It is under planning stage for re-development (R(B) zone in OZP No. S/TM/35). There is no detailed programme for the re-development during the preparation of this report. The selected location of noise assessment point is the nearest sensitive use (i.e. office) to the workfronts. As confirmed during site visit, the building located to the east of the selected noise assessment point is currently used for commercial purposes (i.e. restaurant and shop), which are not considered as noise sensitive uses.

[2] Total number of storey of the House, including B/F and the above-ground floors.

4.5. Identification of Sources of Construction Noise Impact

- 4.5.1. Based on the current Project design detail, no construction works will be required during the restricted hours defined under the NCO. The normal working hours of the construction of the Project will be between 0700 and 1900 hours from Monday to Saturday (except general holidays). Should restricted hours works be required, it will be subject to CNP application which will be assessed by the Noise Control Authority.

4.5.2. The main works items for the construction of Project include:

- Construction Activity 1 - Preparation and Construction Works related to the At-grade Section of the Cycle Track (including the cycle parking areas and the pedestrian footpaths)
 - Site clearance (including tree felling and transplanting)
 - Levelling / excavation works
 - Road breaking
 - Construction of drainage and utilities
 - Paving works
 - Demolition of boundary wall (for workfront 020 only)
- Construction Activity 2 - Slope Works (for workfronts 008, 009, 018, 019 and 030 only)
- Construction Activity 3 - Construction of viaduct / cycle bridge section
 - Mobilisation
 - Construction of temporary platform
 - Installation of cylindrical steel casings
 - Mobilisation, pre-drilling works, construction of piles
 - Removal of cylindrical steel casings
 - Installation of precast pile cap shell
 - Construction of pile cap
 - Installation / construction of superstructure
 - Removal of temporary platform
 - Fitting works, installation of utilities and drainage
 - Paving works
 - Beautification works

4.5.3. A preliminary inventory of powered mechanical equipment (PME) required for the construction activities has been developed by the Project Engineer team and is considered appropriate and practical for completing works within the proposed works programme. The construction plant inventory under the unmitigated and mitigated scenarios are provided in [Appendices 4-2](#) and [4-4](#) respectively. Whilst it is possible that the future appointed contractor may propose a different plant inventory, this assessment has been undertaken on the anticipated plant to allow early identification of any potential noise problem and to ensure there are practicable and sufficient noise mitigation measures that can be implemented to alleviate adverse noise impacts. The Contractor will be required to provide and implement sufficient direct noise mitigation measures based on the recommendation in this EIA to achieve acceptable noise levels on the nearby NSRs.

4.6. Assessment Methodology

4.6.1. The assessment on construction noise impact has followed the approach given in the EIAO Guidance Note No. 9/2010 "Preparation of Construction Noise Impact Assessment Under the Environmental Impact Assessment Ordinance" (GN 9/2010). Further, the assessment has been undertaken in accordance with the EIAO-TM Annex 13, and the guidelines given in GW-TM issued under the NCO, where appropriate. Where no sound power level ("SWL") can be found in the relevant TM, reference has been made to the list of SWLs of other commonly used PMEs or noise emission levels used in previous projects in Hong Kong.

4.6.2. In general, the assessment approach includes the following:

- Assume a typical project-specific equipment inventory for each works type together with the number and type of PME that are considered necessary for completing the works during the non-restricted hours;
- Obtain from GW-TM or other relevant sources the Sound Power Level (SWL) for each PME assumed in the equipment inventory and determine a reasonable percentage on-time within any 30 minutes;
- Select representative Noise Assessment Points for the construction noise impact assessment in **Table 4.3**;
- Calculate the unmitigated Predicted Noise Level ("PNL") and correct it for facade reflection to obtain the Corrected Noise Level ("CNL") at each floor of the NAP. Slant distance between NAP of each floor and the noise source considers the following parameters: NAP is 1.2m above floor

level, the source height is assumed 1.5m above ground level and all PME items are assumed to be located at the notional source positions;

- If necessary, re-select typical project-specific silenced equipment and other types of mitigation measures to address noise exceedance, e.g. noise barrier and calculate the mitigated noise impact; and
- Compare the mitigated CNL with the noise standards to determine acceptability and the need for further mitigation and determine the EM&A requirements.

4.6.3. Given the long project extent, the cycle track will be constructed in phases by sections. The construction activity will be confined to the site boundary and conducted in well-separated sections (e.g. at least 300m between two active working sections). Thus, cumulative noise impacts due to concurrent works at different active works sections of the cycle track are not expected to occur. The proposed working sections (workfronts) arrangement is illustrated in [Figure 4.3](#).

4.6.4. Active works location/workfront will be separated by 300m from each other. Different PME item groups and their sub-groups under each works activity will not be undertaken at the same time for each active works location/workfront. The construction plant inventory under the unmitigated and mitigated scenarios are provided in [Appendices 4-2](#) and [4-4](#) respectively.

4.7. Predicted Unmitigated Construction Noise Impact

4.7.1. The unmitigated construction noise impacts at the representative noise assessment points based on a theoretical worst case, i.e., assuming all PMEs for each works activity are operating concurrently, have been predicted and summarised in [Table 4.4](#). Details of the calculation of unmitigated construction noise impact are given in [Appendix 4-3](#).

Table 4.4 Maximum Predicted Construction Noise Level (Unmitigated)

Noise Assessment Point ID	Description	Predicted Unmitigated CNL, dB(A)	Noise Criteria, dB(A)	Noise Exceedance, dB(A)
N001	Aegean Coast Tower 8	75	75	-
N002 ^[1]	Crossroads Foundation	90	75	15
N003	Tin Hau Temple	78	70 [#]	8
N004	Gold Coast Tower 4	76	75	1
N005*	Starfront Royale Tower 1	88	75	13
N006*	Starfront Royale Tower 2	91	75	16
N007*	Seacoast Royale Tower 3	95	75	20
N008	Monte Carlo Villas Block A6	76	75	1
N009	Palm Beach Block 1	80	75	5
N010*	TMTL 518 Tower 8	90	75	15
N011*	TMTL 518 Tower 1	80	75	5
N012A	Blessing Villa Block F	82	75	7
N012B	Blessing Villa Block F	95	75	20
N013	Surfside	89	75	14
N014A	Villa La Plage House 1	91	75	16
N014B	Villa La Plage House 1	84	75	9
N015A	Villa La Plage House 8	96	75	21
N015B	Villa La Plage House 8	85	75	10
N016A	Villa La Plage House 15	93	75	18
N016B	Villa La Plage House 15	86	75	11
N017A	Villa La Plage House 25	92	75	17

Noise Assessment Point ID	Description	Predicted Unmitigated CNL, dB(A)	Noise Criteria, dB(A)	Noise Exceedance, dB(A)
N017B	Villa La Plage House 25	81	75	6
N018	Village House	84	75	9
N019	12 Aquamarine Garden	78	75	3
N020	10 Aquamarine Garden	78	75	3
N021	3 Aquamarine Garden	78	75	3
N022	1 Aquamarine Garden	78	75	3
N023	Bayview Terrace Block 11	76	75	1
N024	Bayview Terrace Block 26	74	75	-
N025	Pine Villas Block 2	76	75	1
N026	Verdant Villa Block 2	73	75	-
N027	Boulder Lodge Staff Quarter	86	75	11
N028	Castle Peak Bay Garden Block B	77	75	2
N029	Palm Cove Tower 1	82	75	7
N030	Castle Peak Sam Chau Ma Temple	103	70 [#]	33
N031	The Salvation Army Sam Shing Nursery School	77	70 / 65 (exam)	7 / 12 (exam)
N032*	Planned Transitional Housing Development at Ex-Salvation Army Sam Shing Chuen Lau Ng Ying School Premises	78	75	3
N033	Chun Yu House	74	75	-
N034	Saint Temple	73	70 [#]	3
N035	Hanford Garden Block 2	75	75	-
N036	Hanford Garden Block 4	82	75	7
N037	Hanford Garden Block 5	80	75	5
N038	Tuen Mun Foursquare Gospel Church	76	70 [#]	6
N039	Harvest Garden Block 2	76	75	1
N040	Hoi Tak Garden Block 1	80	75	5
N041	TWGHs Tai Tung Pui Social Services Building	68	70 [#]	-
N042	Alpine Garden Block 1	82	75	7
N043	Handsome Court Block 9	83	75	8
N044	Handsome Court Block 1	84	75	9
N045	PLK HKTA Yuen Yuen Primary School	71	70 / 65 (exam)	1 / 6 (exam)
N046	Jing Jing International Kindergarten	72	70 / 65 (exam)	2 / 7 (exam)
N047*	Area 39 Public Housing	83	75	8
N048	Wealthy Jade Nursing Home (Come On) Limited	77	75	2
N049	Man Bo Building	74	75	-
N050	Fu Hong Society Yau Chong Home	87	75	12
Note: * is planned NSR.				

Noise Assessment Point ID	Description	Predicted Unmitigated CNL, dB(A)	Noise Criteria, dB(A)	Noise Exceedance, dB(A)
<p># Construction noise criteria for Place of Public Worship and Clinic / Medical Uses is not specified in the EIAO-TM. A more stringent criterion of 70 dB(A) has been adopted as a conservative approach.</p> <p>[1] N002 (Crossroads Foundation) has been confirmed to be an office that relies on open window for ventilation by the Operator during site visit. It is under planning stage for re-development (R(B) zone in OZP No. S/TM/35). There is no detailed programme for the re-development during the preparation of this report. The selected location of noise assessment point is the nearest sensitive use (i.e. office) to the workfronts. As confirmed during site visit, the building located to the east of the selected noise assessment point is currently used for commercial purposes (i.e. restaurant and shop), which are not considered as noise sensitive uses.</p>				

4.7.2. The maximum predicted unmitigated construction noise level under the unmitigated scenario will range from 68 dB(A) to 103 dB(A) which would exceed the EIAO-TM noise standards by up to 33 dB(A).

4.7.3. In practice, the PME will progress along the working area of each works section. Thus, the worst case noise impact will happen when the PMEs are operating closest to the NSRs. Once the PMEs progress along the works alignment, the active working area will be further away from the NSRs, the noise impacts will be less.

4.8. Mitigation Measures

4.8.1. Good site practice and noise management can significantly reduce the impact of construction activities on nearby NSRs. The following mitigation measures should be followed during the construction phase:

- only well-maintained plants should be operated on-site and plants should be serviced regularly during the construction works;
- machines and plants that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;
- plants known to emit noise strongly in one direction should, where possible, be orientated to direct noise away from the NSRs;
- mobile plant should be sited as far away from NSRs as possible;
- material stockpiles and other structures should be effectively utilized, where practicable, to screen noise from on-site construction activities;
- contractor shall prepare their own Construction Noise Management Plan before construction commencement; and
- silencers or mufflers on construction equipment should be utilized where appropriate and should be properly maintained during the construction periods.

4.8.2. In view of the high noise exceedances at some NSRs due to the construction works, mitigation measures are considered to be implemented, which involves the adoption of quality PME, provision of temporary noise barrier and noise enclosure for PME, use of quieter equipment or construction method (e.g. non-explosive chemical expansion agent and hydraulic crusher), and good scheduling of works to avoid concurrent construction activities.

4.8.3. All of the proposed mitigation measures discussed in Section 4.8 have been confirmed with the Project Engineer to be practicable and feasible for the proposed construction works within the intended construction programme. It will also be stipulated in the Work Contract requiring the Contractor to implement the recommendations appropriately.

Use of Quieter PME

4.8.4. Quieter equipment shall be adopted as far as possible. Possible alternative quieter PME proposed for the works are listed in **Table 4.5**. Reference has been made to the quieter construction equipment items qualified under the Quality Powered Mechanical Equipment (QPME) system developed by EPD. These are quieter PMEs available in the local market. As confirmed by the Project Engineer, the proposed Quieter PMEs are technically feasible and practicable to replace the original PMEs for

the intended construction programme. The sound power level (SWL) of quieter PME's that are to be used for the works shall meet, or be lower than, the values in **Table 4.5**. The plant inventory for mitigated scenario is provided in [Appendix 4-4A](#).

Table 4.5 Quieter Equipment

PME	EPD QPME Reference	Sound Power Level dB(A)
Asphalt Paver	EPD-11257	104
Air Compressor, air flow > 10m ³ /min and ≤ 30m ³ /min	EPD-11174	98
Breaker, hand-held, mass > 10kg and < 20kg	EPD-06076	102
Excavator, mini-robot mounted	EPD-11413	92
Generator, Super Silenced	EPD-07364	90
Mobile Crane	EPD-06693	92
Road Roller	EPD-10665	94

Temporary Noise Barriers and Noise Enclosure for PME

- 4.8.5. Temporary noise barriers for PME are an effective means to alleviate the construction noise impacts. To effectively screen noise or block sightline from NSRs, temporary noise barriers should be located close to noisy plant/PME and be moved concurrently with the plant. Potential degradation of the noise performance due to sound passing around the ends of short straight barriers shall be considered. The proposed noise barriers shall be designed and constructed with sufficient length (e.g. at least five times greater than its height) or bent around the noise sources. The temporary noise barriers shall also be constructed with no openings and gaps at joints to avoid noise leakage. Besides, the proposed noise barriers shall have a minimum surface density of 10 kg/m² and fitted with appropriate absorptive material to minimize multiple reflections of noise due to confined space of the surroundings and the proposed barriers. The Contractor shall be responsible for the design and actual position of the movable noise barriers with due consideration given to the position and size of the PME, and the requirement of intercepting the line-of-sight from the NSRs to the PME, as well as ensuring that the barriers have no gaps and openings. The schematic diagram for typical temporary noise barrier is provided in [Appendix 4-6](#). It is anticipated that properly designed noise barriers would achieve a 5 dB(A) reduction for movable PME and a 10 dB(A) reduction for stationary PME with reference to GN 9/2010. The use of cantilevered top cover for the temporary noise barrier to provide screening benefits at upper floors shall be considered as appropriate.
- 4.8.6. Noise enclosure with a sufficient surface density of no less than 10 kg/m² is proposed to surround certain PME's. The internal wall of the enclosure should be lined with 50 mm of sound-absorbent material, or with 25 mm of similar material if mounted on battens. Without direct view of the noisy part of the enclosed PME from NSR, this design can achieve -10 dB(A) and -15 dB(A) reduction for stationary and static PME's respectively with reference to GN 9/2010. The schematic diagrams for typical construction noise enclosure for stationary and static PME's with reference to AEIAR-227/2020 and AEIAR-228/2021 respectively are provided in [Appendix 4-6](#).
- 4.8.7. The assumed noise reduction achieved by the temporary noise barrier and enclosure for certain PME's is summarised in **Table 4.6**.

Table 4.6 Summary of Movable Noise Barriers and Enclosures Adopted for PME's

PME	Noise Mitigation Measures	Assumed Noise Reduction, dB(A)
Air Compressor, air flow > 10m ³ /min and ≤ 30m ³ /min	Noise Enclosure	-15
Asphalt Paver	Movable Barrier	-5
Bar Bender and Cutter (electric)	Movable Barrier	-10
Breaker, hand-held, mass >10kg and < 20kg	Noise Enclosure	-10
Concrete Lorry Mixer	Movable Barrier	-5

PME	Noise Mitigation Measures	Assumed Noise Reduction, dB(A)
Concrete Pump, Stationary	Noise Enclosure	-15
Drill/Grinder, hand-held (electric)	Movable Barrier	-5
Dump Truck, 5.5 tonne < gross vehicle weight ≤ 38 tonne	Movable Barrier	-5
Excavator, mini-robot mounted	Movable Barrier	-5
Generator, super silenced	Noise Enclosure	-15
Hydraulic Crusher	Movable Barrier	-5
Jig-saw, hand-held, wood (electric)	Movable Barrier	-5
Lorry, with Crane/Grab, 5.5 tonne < gross vehicle weight ≤ 38 tonne	Movable Barrier	-5
Mobile Crane	Movable Barrier	-5
Poker, vibratory, hand-held (electric)	Movable Barrier	-5
Road Roller	Movable Barrier	-5
Saw, circular, wood	Movable Barrier	-5
Wire Saw	Movable Barrier	-5

Quieter Equipment or Construction Method

- 4.8.8. Despite using mitigation measures for PME (i.e. erecting temporary noise barrier for PME and using Quieter PMEs), the Contractor shall consider quieter construction methods or technologies to reduce the noise at its source if they are technically feasible and applicable for the proposed construction works. These include non-explosive chemical expansion agent, high pressure water jetting, hand-held concrete crusher, quieter type blade saw, quieter type wire saw / diamond wire saw and hydraulic crusher. Sound pressure levels of different quieter equipment or construction methods are listed in **Table 4.7**. To reduce the construction noise impact, quieter type wire saw and hydraulic crusher will be adopted by the Contractor for the demolition of boundary wall at workfront 020 as considered in the unmitigated scenario. Non-explosive chemical expansion agent will also be adopted to replace the use of circular wood saw as discussed in Section 4.9.3. Other quieter equipment / construction methods not adopted in the assessment shall be considered during the design, tendering and implementation stage of the construction works as appropriate.

Table 4.7 Sound Pressure Level of Quieter Equipment/Methods

Quieter Equipment / Construction Method	Sound Pressure Level in dB(A) at 7m from Equipment
Non-explosive Chemical Expansion Agent*	60 – 65
Hand-held Concrete Crusher	67 – 69
Quieter Type Wire Saw or Diamond Wire Saw*	76 – 81
Quieter Type Blade Saw	76 – 81
Hydraulic Crusher*	67 – 69
High Pressure Water Jetting	79
Note: * Quieter equipment / construction method to be adopted by the Contractor.	

4.9. Predicted Mitigated Construction Noise Impact

- 4.9.1. The maximum predicted construction noise levels under mitigated scenario at the representative noise assessment points have been calculated and the results are summarised in **Table 4.8** with details of the calculations given in [Appendix 4-5A](#).

Table 4.8 Maximum Predicted Construction Noise Level under Mitigated Scenario

Noise Assessment Point ID	Description	Predicted Mitigated CNL, dB(A)	Noise Criteria, dB(A)	Noise Exceedance, dB(A)
N001	Aegean Coast Tower 8	65	75	-
N002 ^[1]	Crossroads Foundation	80	75	5
N003	Tin Hau Temple	68	70 [#]	-
N004	Gold Coast Tower 4	66	75	-
N005*	Starfront Royale Tower 1	78	75	3
N006*	Starfront Royale Tower 2	81	75	6
N007*	Seacoast Royale Tower 3	85	75	10
N008	Monte Carlo Villas Block A6	66	75	-
N009	Palm Beach Block 1	70	75	-
N010*	TMTL 518 Tower 8	80	75	5
N011*	TMTL 518 Tower 1	70	75	-
N012A	Blessing Villa Block F	71	75	-
N012B	Blessing Villa Block F	84	75	9
N013	Surfside	78	75	3
N014A	Villa La Plage House 1	80	75	5
N014B	Villa La Plage House 1	73	75	-
N015A	Villa La Plage House 8	86	75	11
N015B	Villa La Plage House 8	75	75	-
N016A	Villa La Plage House 15	83	75	8
N016B	Villa La Plage House 15	76	75	1
N017A	Villa La Plage House 25	82	75	7
N017B	Villa La Plage House 25	71	75	-
N018	Village House	74	75	-
N019	12 Aquamarine Garden	68	75	-
N020	10 Aquamarine Garden	73	75	-
N021	3 Aquamarine Garden	73	75	-
N022	1 Aquamarine Garden	67	75	-
N023	Bayview Terrace Block 11	66	75	-
N024	Bayview Terrace Block 26	64	75	-
N025	Pine Villas Block 2	66	75	-
N026	Verdant Villa Block 2	63	75	-
N027	Boulder Lodge Staff Quarter	76	75	1
N028	Castle Peak Bay Garden Block B	67	75	-
N029	Palm Cove Tower 1	72	75	-
N030	Castle Peak Sam Chau Ma Temple	93	70 [#]	23
N031	The Salvation Army Sam Shing Nursery School	67	70 / 65 (exam)	2 during exam
N032*	Planned Transitional Housing Development at Ex-Salvation Army Sam Shing Chuen Lau Ng Ying School Premises	68	75	-

Noise Assessment Point ID	Description	Predicted Mitigated CNL, dB(A)	Noise Criteria, dB(A)	Noise Exceedance, dB(A)
N033	Chun Yu House	64	75	-
N034	Saint Temple	63	70 [#]	-
N035	Hanford Garden Block 2	65	75	-
N036	Hanford Garden Block 4	72	75	-
N037	Hanford Garden Block 5	69	75	-
N038	Tuen Mun Foursquare Gospel Church	66	70 [#]	-
N039	Harvest Garden Block 2	66	75	-
N040	Hoi Tak Garden Block 1	70	75	-
N041	TWGHs Tai Tung Pui Social Services Building	58	70 [#]	-
N042	Alpine Garden Block 1	72	75	-
N043	Handsome Court Block 9	73	75	-
N044	Handsome Court Block 1	74	75	-
N045	PLK HKTA Yuen Yuen Primary School	61	70 / 65 (exam)	-
N046	Jing Jing International Kindergarten	62	70 / 65 (exam)	-
N047*	Area 39 Public Housing	73	75	-
N048	Wealthy Jade Nursing Home (Come On) Limited	67	75	-
N049	Man Bo Building	64	75	-
N050	Fu Hong Society Yau Chong Home	77	75	2

Note:
 * is planned NSR.
 # Construction noise criteria for Place of Public Worship and Clinic / Medical Uses is not specified in the EIAO-TM. A more stringent criterion of 70 dB(A) has been adopted as a conservative approach.
 [1] N002 (Crossroads Foundation) has been confirmed to be an office that relies on open window for ventilation by the Operator during site visit. It is under planning stage for re-development (R(B) zone in OZP No. S/TM/35). There is no detailed programme for the re-development during the preparation of this report. The selected location of noise assessment point is the nearest sensitive use (i.e. office) to the workfronts. As confirmed during site visit, the building located to the east of the selected noise assessment point is currently used for commercial purposes (i.e. restaurant and shop), which are not considered as noise sensitive uses.

4.9.2. The predicted CNL at NSRs will comply with noise criteria except for Crossroads Foundation, Starfront Royale Tower 1 and 2, Seacoast Royale Tower 3, TMTL 518 Tower 8, Blessing Villa Block F, Surfside, Villa La Plage, Boulder Lodge Staff Quarter, Castle Peak Sam Chau Ma Temple and Fu Hong Society Yau Chong Home. Noise exceedances will be anticipated at these NSRs with PMEs operating at the same time. The maximum predicted CNLs at these NSRs are shown in **Table 4.8** and [Appendix 4-5A](#). For the Salvation Army Sam Shing Nursery School, the maximum predicted CNL is 67 dB(A) which exceeds the noise criterion during school examination by 2 dB(A).

4.9.3. In general, to reduce the noise impact on Crossroads Foundation, Starfront Royale Tower 1 and 2, Seacoast Royale Tower 3, TMTL 518 Tower 8, Blessing Villa Block F, Surfside, Villa La Plage, Boulder Lodge Staff Quarter, Castle Peak Sam Chau Ma Temple and Fu Hong Society Yau Chong Home, non-explosive chemical expansion agent and a concrete pump instead of circular wood saw and concrete lorry mixer, respectively, will be used during the construction of drainage and utilities, while the hand-held jigsaw will replace the circular wood saw for site clearance works. Hence, the maximum Sound Power Level from Construction Activity 1 will be reduced from 102 dB(A) to 100 dB(A), and the predicted noise levels at N027 Boulder Lodge Staff Quarter and N050 Fu Hong Society Yau Chong Home would comply with the noise criterion of 75 dB(A). The plant inventory and

construction noise assessment for N027 and N050 with incorporation of the above recommendation on the use of PME are provided in [Appendix 4-4B](#) and [Appendix 4-5B](#) respectively.

- 4.9.4. Due to site constraints, dump truck, lorry and concrete lorry mixer would not be able to access the site at workfronts 008 and 009. Similarly, as an additional mitigation measure to reduce the noise impact on Crossroads Foundation, Starfront Royale Tower 1 and 2, Seacoast Royale Tower 3, TMTL 518 Tower 8 and Villa La Plage, dump truck and lorry will be restricted from accessing workfronts 003, 004, 005, 006, 010, 011 and 012. Considering the inaccessible/restricted distance to the above workfronts is relatively short, only a concrete pump with noise enclosure will be required to replace the concrete lorry mixer. All transportation of materials, including the concrete, will be carried out by trolley with manpower. Hence, the maximum Sound Power Levels from Construction Activity 1 and 2 will be reduced to 96 dB(A) and 97 dB(A) respectively, as shown in [Appendix 4-4C](#). The predicted noise levels at N002 Crossroads Foundation, N005 Starfront Royale Tower 1, N006 Starfront Royale Tower 2, N010 TMTL 518 Tower 8, N013 Surfside, N014A Villa La Plage House 1 and N016B Villa La Plage House 15 would then comply with the noise criterion of 75 dB(A) as shown in [Appendix 4-5B](#).
- 4.9.5. Based on site survey, the G/F of Blessing Villa Block F will be completely blocked by boundary walls and will not have direct line-of-sight to the nearby Project workfronts (i.e. workfronts 008 and 009). Nevertheless, additional temporary noise barrier will be provided in front of the NSR so as to offer protection to the upper floors. For assessment purpose, a 10 dB(A) reduction is assumed for all movable PMEs for the G/F of N012B Blessing Villa Block F as shown in [Appendix 4-4D](#). Cross-sectional drawing to demonstrate the provision of the boundary wall and temporary noise barriers is provided in [Figure 4.4.1](#) for reference. To further reduce the noise impact on Blessing Villa Block F, the concrete pump will be placed at least 11.5m away so that it is excluded from the plant inventory as shown in [Appendix 4-4D](#) and [4-4E](#). With the above mitigation measures in place, the predicted noise levels at N012B would then comply with the noise criterion of 75 dB(A) as shown in [Appendix 4-5B](#).
- 4.9.6. For Seacoast Royale Tower 3 and Villa La Plage, Contractor shall erect substantial fixed barriers with a minimum surface density of 10 kg/m² and constructed with sufficient height and length to completely screen the PME to be used on the construction site such that none of the PME will be visible when viewed from any openings of the NSRs. The fixed noise barriers shall also be constructed with no openings and gaps at joints to avoid noise leakage. A plant inventory for N016A Villa La Plage House 15 and N017A Villa La Plage House 25 is shown in [Appendix 4-4F](#) and the cross-sectional drawings to demonstrate the provision of substantial fixed barriers in front of Seacoast Royale Tower 3 and Villa La Plage are provided in [Figures 4.4.2 to 4.4.5](#) for reference. To further reduce the noise impact, the concrete pump will be placed at least 7.5m away from Seacoast Royale Tower 3 and 26m away from Villa La Plage so that it is excluded from the plant inventory as shown in [Appendix 4-4G](#) (for G/F – UG/F of Seacoast Royale Tower 3 and Villa La Plage) and [Appendix 4-4E](#) (for 1/F – 19/F of Seacoast Royale Tower 3). With the above mitigation measures in place, the predicted noise levels at N015A (Villa La Plage House 8), N016A (Villa La Plage House 15) and N017A (Villa La Plage House 25) would comply with the noise criterion of 75 dB(A) as shown in [Appendix 4-5B](#).
- 4.9.7. For Castle Peak Sam Chau Ma Temple, the maximum predicted CNL is 93 dB(A) which exceeds the adopted conservative noise criterion of 70 dB(A). The critical construction activity resulting in exceedance of the 70 dB(A) criterion is mainly due to some PMEs operating in close proximity of the NSR. Additional temporary noise barriers shall be provided in front of Castle Peak Sam Chau Ma Temple to block the sightline to the adjacent workfront to alleviate the potential noise impact. Hence, the maximum Sound Power Level from Construction Activity 1 will be reduced to 95 dB(A) and the predicted CNL will be 86 dB(A). A plant inventory and construction noise assessment for N030 Castle Peak Sam Chau Ma Temple with incorporation of the above recommendations are provided in [Appendix 4-4H](#) and [Appendix 4-5B](#) respectively. Recommendation to further reduce the construction noise impact to Castle Peak Sam Chau Ma Temple is summarised in [Table 4.9](#) below. In any case, the Contractor shall establish a communication channel with the operator of Castle Peak Sam Chau Ma Temple and maintain liaison with the temple on the works schedule, in particular when the PMEs are unavoidably close to the temple, e.g. when the asphalt paver is operating at 30m or less away from the temple, the Contractor shall re-schedule the works when no ritual services are held in the temple, in collaboration with the temple operator. Nevertheless, the works near Castle Peak Sam Chau Ma Temple are expected to last only for a short period (~ 1 week). With continuous liaison, construction noise impacts on the temple are expected to be controlled to acceptable level.

Table 4.9 Recommendation for Works near Castle Peak Sam Chau Ma Temple

Recommendation	PME
Operate the PME at least 30m away from the NSR and provided with movable noise barrier in between.	- Dump Truck (5.5 tonne < gross vehicle weight ≤ 38 tonne)
Place the PME at least 30m away from the NSR and provided with noise enclosure.	- Air Compressor, air flow > 10m ³ /min and ≤ 30m ³ /min - Generator, super silenced - Concrete Pump, stationary
Maintain liaison with the temple operator on works schedule; Provided with movable noise barrier in between.	- Asphalt Paver - Drill/grinder, hand-held (electric) - Jig-saw, hand-held, wood (electric) - Excavator, mini-robot mounted - Mobile Crane - Lorry, with crane/grab, 5.5 tonne < gross vehicle weight ≤ 38 tonne - Road Roller - Poker, vibratory, hand-held (electric)
Maintain liaison with the temple operator on works schedule; Provided with noise enclosure.	- Breaker, hand-held, mass >10kg and < 20kg
Maintain liaison with the temple operator on works schedule; Use of quieter construction method	- Non-explosive Chemical Expansion Agent

- 4.9.8. For the Salvation Army Sam Shing Nursery School, the prediction result indicated that no exceedance is anticipated during non-examination period, while up to 2 dB(A) noise exceedance is expected to occur if works are to be conducted during the examination period for the Salvation Army Sam Shing Nursery School. As precautionary measures, terms will be specified in the contractual documents requiring Contractor to liaise with the school's management for the schedule of construction works, to avoid carrying out noisy construction activities during examination period.
- 4.9.9. In view of the works areas being located in close proximity to the densely populated areas, the Contractor will be required to submit a Construction Noise Management Plan (CNMP) to EPD for approval prior to the commencement of construction of the Project. The CNMP shall be prepared with reference to Section 8 and Annex 21 of the EIAO-TM as well as this EIA report and EM&A manual during the design, tendering and implementation stage. The CNMP shall be checked independently and endorsed by the Project Engineer and CEDD to ensure that the proposals are practicable and could be effectively implemented on site before submission of the CNMP to EPD. Details on the use of plants and equipment, their on-time percentages and the adoption of noise mitigation measures for the construction phase shall be clearly provided in the CNMP, demonstrating that the construction works to be undertaken will comply with all prevailing environmental standards and requirements. All noise mitigation measures implemented shall be properly maintained during construction of the Project.
- 4.9.10. With the adequate use of mitigation measures and construction works arrangement, adverse noise impacts are expected to be alleviated. All of the proposed mitigation measures discussed in Section 4.9 have been confirmed with the Project Engineer to be practicable and feasible for the proposed construction works within the intended construction programme. It will also be stipulated in the Work Contract requiring the Contractor to implement the above recommendation appropriately.

4.10. Cumulative Impacts

- 4.10.1. Concurrent projects located within the 300m of the Project have been identified. The key concurrent projects include HyD's Widening of Castle Peak Road – Castle Peak Bay, Traffic Improvement Scheme in Tuen Mun; ASD's District Open Space in Area 27 (Sam Shing), Tuen Mun; HKHA's Construction of Public Housing Development at Hin Fat Lane, Tuen Mun; MTRC's Tuen Mun South Extension; HyD's Tuen Mun Bypass and, CEDD's Site Formation and Infrastructure Works for Public Housing Developments at Tuen Mun Central. According to the information available at the time of preparing this EIA report, the construction period for the concurrent projects mentioned above is between 2020 and 2036, whilst for the Traffic Improvement Scheme in Tuen Mun, there is no scheduled start date for the works as it is still at early feasibility study stage. Tentative completion of this Traffic Improvement Scheme in Tuen Mun is 2031.
- 4.10.2. Given the long project extent, the Project will be constructed in phases, and the construction activities of the cycle tracks Project will be implemented in separated sections (e.g. 300m between two active working sections) to avoid cumulative impacts due to concurrent works of this Project. The Contractor of this Project will liaise with the corresponding parties of the concurrent projects to schedule their works avoiding concurrent works within 300m of these other projects as far as possible. Given that there will be no complicated and large-scale civil works to be carried out under this Project, it will take relatively short time to complete corresponding construction works for a workforce. Scheduling of works to avoid cumulative construction noise impacts with other projects having less than 300m separation distance is considered feasible. Considering that careful scheduling of the construction works will have taken place, cumulative construction noise impacts are not expected to occur. The above arrangement shall be included in the work contracts to ensure proper implementation and execution by the future Contractor.

4.11. Evaluation of Residual Construction Noise Impacts

- 4.11.1. With the implementation of the proposed mitigation measures described above, the predicted construction noise levels at the representative NSRs would comply with the relevant criteria. Therefore, residual construction noise impacts are not anticipated.

4.12. Environmental Monitoring and Audit Requirements

- 4.12.1. In order to ensure that the nearby NSRs will not be subject to unacceptable construction noise impact, an Environmental Monitoring and Audit (EM&A) programme is recommended. The recommended mitigation measures, monitoring procedures and locations are presented in detail in the EM&A Manual. This will facilitate the Contractor to have early warning and undertake the necessary actions to reduce noise emissions at specific areas.

4.13. Conclusion

- 4.13.1. The noise impact that could arise from daytime construction activities of the Project has been assessed. Whilst the Contractor may prefer to use different types and numbers of PME, the preliminary construction plant inventory is considered representative and provides a noise impact scenario of reference value. With the implementation of practical mitigation measures including good site management practices, use of QPME, use of noise barrier and enclosure, and adoption of quieter equipment / construction method, construction noise impacts at all NSRs would be controlled to acceptable level. Continuous liaison with stakeholders shall be maintained in order to schedule the works to avoid impacts on the Castle Peak Sam Chau Ma Temple during ritual services. With the recommended mitigation measures in place, construction noise impacts on all representative NSRs would comply with the relevant criteria.

5. Water Quality

5.1. Introduction

- 5.1.1. This section presents the assessment of water quality impacts based on the criteria and guidelines stated in Annex 6 and 14 of the EIAO-TM and has covered the scope outlined in Section 3.4.6 of the EIA Study Brief No. ESB-295/2016.
- 5.1.2. This section identifies and evaluates the potential water quality impacts that are likely to arise during the construction and operational phases of the Project.

5.2. Relevant Legislations, Standards and Guidelines

Water Pollution Control Ordinance

- 5.2.1. The entire Hong Kong waters are divided into ten Water Control Zones (WCZs) and four supplementary WCZs under the Water Pollution Control Ordinance (WPCO) (CAP 358). Each WCZ has a designated set of statutory Water Quality Objectives (WQOs) designed to protect the inland and/ or marine environment and its users. The Project is considered to be located within the North Western WCZ and **Table 5.1** summarizes the corresponding WQOs for this WCZ.

Table 5.1 Water Quality Objectives for North Western Water Control Zone

Parameters	Objectives	Sub-Zone
Offensive Odour, Tints	Not to be present	Whole zone (including North Western Supplementary Zone)
Visible foam, oil scum, litter	Not to be present	Whole zone (including North Western Supplementary Zone)
Dissolved Oxygen (DO) within 2 m of the seabed	Not less than 2.0 mg/L for 90% of samples	Marine waters (including North Western Supplementary Zone)
Depth-averaged DO	Not less than 4.0 mg/L	Tuen Mun (A), Tuen Mun (B) and Tuen Mun (C) Subzones, Water Gathering Ground Subzones and other inland waters
	Not less than 4.0 mg/L for 90 % sample	Marine waters (including North Western Supplementary Zone)
pH	To be in the range of 6.5 – 8.5, change due to human activity not to exceed 0.2	Marine waters (including North Western Supplementary Zone), excepting Bathing Beach Subzones
	To be in the range of 6.5 – 8.5	Tuen Mun (A), Tuen Mun (B) and Tuen Mun (C) Subzones and Water Gathering Ground Subzones
	To be in the range of 6.0 – 9.0	Other inland waters
	To be in the range of 6.0 – 9.0 for 95% samples	Bathing Beach Subzones
Salinity	Change due to human activity not to exceed 10% of ambient	Whole zone
Temperature	Change due to human activity not to exceed 2°C	Whole zone (including North Western Supplementary Zone)

Parameters	Objectives	Sub-Zone
Suspended solids (SS)	Not to raise the ambient level by 30% caused by human activity	Marine waters (including North Western Supplementary Zone)
	Not to cause the annual median to exceed 20 mg/L	Tuen Mun (A), Tuen Mun (B) and Tuen Mun (C) Subzones and Water Gathering Ground Subzones
	Not to cause the annual median to exceed 25 mg/L	Other inland waters
Unionized Ammonia (UIA)	Annual mean not to exceed 0.021 mg/L as unionized form	Whole zone (including North Western Supplementary Zone)
Nutrients	Shall not cause excessive algal growth	Marine waters (including North Western Supplementary Zone)
Total Inorganic Nitrogen (TIN)	Annual mean depth-averaged inorganic nitrogen not to exceed 0.3 mg/L	Castle Peak Bay Subzone
	Annual mean depth-averaged inorganic nitrogen not to exceed 0.5 mg/L	Marine waters (including North Western Supplementary Zone), excepting Castle Peak Bay Subzone
Bacteria	Not exceed 610 per 100ml, calculated as the geometric mean of all samples collected in one calendar year	Secondary Contact Recreation Subzones and North Western Supplementary Zone
	Should be less than 1 per 100 ml, calculated as the running median of the most recent 5 consecutive samples taken between 7 and 21 days.	Tuen Mun (A) and Tuen Mun (B) Subzones and Water Gathering Ground Subzones
	Not exceed 1000 per 100 ml, calculated as the running median of the most recent 5 consecutive samples taken between 7 and 21 days	Tuen Mun (C) Subzone and other inland waters
	Not exceed 180 per 100 ml, calculated as the geometric mean of all samples collected from March to October inclusive. Samples should be taken at least 3 times in one calendar month at intervals of between 3 and 14 days.	Bathing Beach Subzones
Colour	Not to exceed 30 Hazen units	Tuen Mun (A) and Tuen Mun (B) Subzones and Water Gathering Ground Subzones
	Not to exceed 50 Hazen units	Tuen Mun (C) Subzone and other inland waters
5-Day Biochemical Oxygen Demand (BOD5)	Not to exceed 3 mg/L	Tuen Mun (A), Tuen Mun (B) and Tuen Mun (C) Subzones and Water Gathering Ground Subzones
	Not to exceed 5 mg/L	Other inland waters
Chemical Oxygen Demand (COD)	Not to exceed 15 mg/L	Tuen Mun (A), Tuen Mun (B) and Tuen Mun (C) Subzones and Water Gathering Ground Subzones
	Not to exceed 30 mg/L	Other inland waters
Toxins	Should not cause a risk to any beneficial uses of the aquatic environment	Whole zone (including North Western Supplementary Zone)

Parameters	Objectives	Sub-Zone
	Waste discharge shall not cause the toxins in water significant to produce toxic carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole zone (including North Western Supplementary Zone)
Phenol	Quantities shall not sufficient to produce a specific odour or more than 0.05 mg/L as C6 H5OH	Bathing Beach Subzones
Turbidity	Shall not reduce light transmission substantially from the normal level	Bathing Beach Subzones

Technical Memorandum for Effluents Discharged into Drainage and Sewerage System Inland and Coastal Waters (TM-DSS)

- 5.2.2. Apart from the WQOs, Section 21 of the WPCO also specifies the limits to control the physical, chemical and microbial quality of effluents into foul sewers, storm water drains, inland and coastal waters under the Technical Memorandum Standards for Effluents Discharged into Drainage and Sewerage System Inland and Coastal Waters (TM-DSS).
- 5.2.3. All discharges are subject to licensing control except domestic sewage discharged to communal sewers and unpolluted water into storm water drains, river courses and water bodies. Most storm water drains discharge directly into inland or coastal waters. The Authority will not normally allow effluent to storm water drains unless the effluent standards will be same as the downstream environmental waters.

Assessment Criteria for Corals

- 5.2.4. The assessment criteria for corals will be based on both the sedimentation rate of SS and WQO for SS.
- 5.2.5. Regarding the studies by Pastorok and Bilyard (1985) and Hawker and Connell (1992) for the impact on coral reef communities, the recommended limiting sedimentation rate for providing sufficient protection and avoiding unacceptable impacts to corals is less than 0.1 kg/m²/day. This criterion will be used in this study to assess the impacts on corals due to any potential bored pile installation works that may disturb the seabed, where necessary.
- 5.2.6. The WQO for SS specifies that human activity or waste discharges shall not raise the ambient SS level by 30% and shall not affect marine aquatic communities. The ambient SS concentrations at each of the Water Sensitive Receivers (WSRs) will be determined using the latest field/observed data collected at the Environmental Protection Department (EPD)'s routine marine water monitoring stations located near the WSRs. The level of increase in SS due to the Project will be predicted by appropriate mathematical methods.

Assessment Criteria for Dredging Activities

- 5.2.7. The piles for the marine section of the cycle bridge section will adopt a pre-bored H-pile foundation type. Thus, the Project will not envisage open sea dredging is required. However, this understanding is subject to the borehole information and final detailed design (including envisaged construction sequence). For conservative assessment purpose, the water quality impact of bore piling works was assessed using the sediment loss rate of a closed grab dredger. It should be noted that the actual water quality impact by bore piling of the Project will be much smaller than that of closed grab dredger. In case potential dredging works are involved, the WQOs for SS and Dissolved Oxygen (DO) for the concerned WCZs will be applied (shown in **Table 5.2**).

Table 5.2 WQOs for SS and DO for North Western WCZ under Dredging Activities

Water Quality Parameter	WQO	Remarks
Depth-averaged Dissolved Oxygen	≥ 4 mg/L for 90% of samples for marine waters	Marine waters (including North Western Supplementary Zone)
Bottom Dissolved Oxygen within 2m of the Seabed	≥ 2 mg/L for 90% of samples for marine waters	Marine waters (including North Western Supplementary Zone)
Suspended Solids	Waste discharge not to raise the natural ambient level by 30% nor cause the accumulation of SS which may adversely affect aquatic communities for marine waters	Marine waters (including North Western Supplementary Zone)

Assessment Criteria for Contaminants Released from Marine Sediment

- 5.2.8. There are no existing legislative standards or guidelines in Hong Kong for individual heavy metals and micro-organic pollutants (PCBs, PAHs and TBT) in marine waters. Relevant international standards/guidelines will be reviewed and adopted as the assessment criteria. The international standards/guidelines include the UK Water Quality Standards^{1,2}, Australian Water Quality Guidelines, USEPA Criterion and other relevant research studies.

Professional Persons Environmental Consultative Committee Practice Notes (ProPECC PN 1/94 & ProPECC PN 5/93)

- 5.2.9. The Professional Persons Environmental Consultative Committee Practice Notes (ProPECC PN 1/94) on Construction Site Drainage provides guidelines for the handling and disposal of construction discharges. It is applicable to this Project for the control of site runoff and wastewater generated during the construction phase. In addition, the ProPECC PN 5/93 provides guidelines on drainage plans submitted to the Building Authority which are referred to the EPD for comment whenever there is a concern for pollution control. The EPD has, based on experience of the common problems found in the drainage submissions, prepared this practice note for reference by Authorised Persons (APs) in preparing drainage plans. It is also applicable to the Project for the control of designs on drainage systems.
- 5.2.10. The assessment will follow the Practice Notes to recommend mitigation measures to minimize the potential water quality impacts arising from the construction and operational phases.

Hong Kong Planning Standards and Guidelines (HKPSG)

- 5.2.11. Chapter 9 of the Hong Kong Planning Standards and Guidelines (HKPSG) outlines environmental requirements that need to be considered in land use planning. The recommended guidelines, standards and guidance cover the selection of suitable locations for the developments and sensitive uses, provision of environmental facilities, and design, layout, phasing and operational controls to minimize adverse environmental impacts. It also lists out environmental factors influencing land use planning and recommend buffer distances for land uses.

5.3. Study Area & Water Sensitive Receivers (WSRs)

- 5.3.1. As shown in [Figure 5.1](#), the study area for the water quality impact assessment is within 500m from the proposed Project site boundary and the proposed cycle track alignment. The Project is located within the North Western Water Control Zone (WCZ). A number of beaches, streams, marina and typhoon shelter have been identified as Water Sensitive Receivers (WSRs) within the 500m Water

¹ <http://www.environmentlaw.org.uk/rte.asp?id=291>

² https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/307788/river-basin-planning-standards.pdf

Quality Study Area and listed in **Table 5.3**. Locations of the representative WSRs are shown in [Figure 5.1](#).

Table 5.3 Representative Water Sensitive Receivers (WSRs)

WSR ID	WSR Description	Nature of Use
B7	Golden Beach	Gazetted beach
B8	Cafeteria New Beach	Gazetted beach
B9	Cafeteria Old Beach	Gazetted beach
B10	Kadoorie Beach	Gazetted beach
B11	Castle Peak Beach	Gazetted beach
M1	Marina at Hong Kong Gold Coast	Marina
TS1	Tuen Mun Typhoon Shelter	Typhoon Shelter
S1	Stream at So Kwun Wat	Stream
-	Water Gathering Ground	Water Supply
-	Secondary Contact Recreation Subzone	-
-	Coral Community	-

5.3.2. There are no seawater and cooling water intakes identified within the 500m Study Area. The nearest seawater intake is located at Tuen Mun Promenade, to the west of Ferry Pier (Reference: *EIA of Expansion of Hong Kong International Airport into a Three-Runway System*) which is located beyond the 500m Study Area. As depicted in the later section, the predicted elevated SS concentration would disappear rapidly after 20m away from the piling work source even without silt-curtain. With the installation of silt-curtain, it would be shortened to 5m away from the piling source. To this end, the assessment area will not be extended to include Butterfly Beach which is located further away beyond the 500m from the Project area.

5.4. Baseline Conditions

Beach Water Quality

5.4.1. There are six gazetted beaches in Tuen Mun District that EPD have carried out routine monitoring of beach water quality. These include Butterfly Beach, Castle Peak Beach, Kadoorie Beach, Cafeteria Old Beach, Cafeteria New Beach and Golden Beach. Five of these gazetted beaches, namely Castle Peak Beach, Kadoorie Beach, Cafeteria Old Beach, Cafeteria New Beach and Golden Beach are in the study area.

5.4.2. The physicochemical water quality data (pH, salinity, turbidity, temperature, dissolved oxygen), and key bacteriological water quality indicator *E.coli*, have been obtained from Annual Beach Water Quality Reports published by EPD, presented in **Table 5.4**. Under the EPD's Beach Grading System, all gazetted beaches are classified into four grades (i.e. Good, Fair, Poor and Very Poor) by calculating the geometric mean *E. coli* level. The six gazetted beaches in Tuen Mun District are all classified as "Fair" in the Past Annual Rank from 2019 to 2020.

Table 5.4 Annual Geometric Mean of *E.coli* Levels of Beaches in Tuen Mun District

Beach	<i>E.coli</i> counts per 100mL											
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Cafeteria New	309	100	60	51	104	62	80	54	70	120	68	48
Cafeteria Old	435	138	58	57	125	74	76	61	81	150	67	45
Castle Peak	332	199	57	58	105	58	64	80	90	139	64	47
Golden	352	98	44	50	87	66	84	46	62	117	87	63

Kadoorie	290	130	109	68	120	114	160	98	117	118	101	87
Beach	<i>E.coli</i> counts per 100mL											
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Cafeteria New	38	31	27	47	50	31	30	38	31	18	40	37
Cafeteria Old	46	34	29	48	39	45	41	70	50	30	64	53
Castle Peak	35	63	49	48	78	91	71	106	65	70	128	112
Golden	42	37	26	62	45	39	31	45	37	22	41	45
Kadoorie	48	45	37	40	52	37	29	48	31	28	52	55

Source: Beach Water Quality in Hong Kong 2020 Report Published By EPD

Typhoon Shelter Water Quality

- 5.4.3. EPD has carried out routine monitoring of marine water quality at Tuen Mun Typhoon Shelter, namely NT1. Water quality monitoring data has been obtained from Annual Marine Water Quality Reports published by EPD and summarised in **Table 5.5**.
- 5.4.4. Since there is no bacteriological WQO laid down for typhoon shelters because their beneficial uses are mainly for mooring of vessels, the status of compliance with the WQOs for stations in typhoon shelters were checked mainly with the DO, TIN and NH₃-N. Regarding these WQO parameters in 2020, the DO and NH₃-N WQO were fully complied with at Tuen Mun Typhoon Shelter.
- 5.4.5. The TIN level, however, could not meet the WQO under the influence of high background level in the Pearl River Estuary. The water quality of Tuen Mun has been improving in general during the last decade.

Table 5.5 Water Quality Monitoring Results at Tuen Mun Typhoon Shelter (2016 – 2020)

Parameter	2016	2017	2018	2019	2020	Average
Temperature (°C)	24.1	24.1	23.9	25.3	26.1	24.7
	(16.8-28.3)	(17.8-28.2)	(16.4 - 28.5)	(18.5 - 31.9)	(20.9 - 29.8)	
Salinity (ppt)	23.9	25.7	26.6	26.2	26.1	25.7
	(13.3-29.8)	(13.9-32.1)	(18.1 - 31.4)	(17.0 - 32.3)	(16.8 - 31.7)	
Dissolved Oxygen (mg/L) (Depth-average)	5.6	6.1	6.0	6.3	6.4	6.1
	(4.1-7.1)	(5.0-8.1)	(4.3 - 7.2)	(4.5 - 8.2)	(4.8 - 8.2)	
Dissolved Oxygen (mg/L) (Bottom)	NA	5.6	6	6.2	6.1	6.0
	NA	(4.6-7.0)	(4.3 - 7.2)	(4.2 - 8.1)	(4.8 - 9.1)	
pH	7.8	7.8	7.9	8.1	8.0	7.9
	(7.5-8.3)	(7.6-8.2)	(7.6 - 8.3)	(7.9 - 8.7)	(7.7 - 8.3)	
Secchi Disc Depth (m)	2.0	2.1	2.3	2.3	1.8	2.1
	(1.5-3.0)	(2.0-2.5)	(2.0 - 2.6)	(1.8 - 3.4)	(1.6 - 1.9)	
Turbidity (NTU)	13.5	4.3	6.2	7.7	5.4	7.4
	(1.1 - 51.0)	(3.4-5.5)	(1.6 - 9.9)	(1.3 - 22.7)	(3.3 - 7.5)	
Suspended Solids (mg/L)	7.5	8.3	11.3	11.8	12.1	10.2
	(1.3 - 15.0)	(4.0-22.0)	(6.1 - 21.5)	(3.2 - 19.5)	(4.4 - 21.0)	
5-day Biochemical Oxygen Demand (mg/L)	0.8	0.6	1.1	0.9	1.1	0.9
	(0.3 - 1.2)	(<0.1-0.9)	(0.4 - 1.9)	(0.3 - 2.4)	(0.5 - 3.0)	
Ammonia Nitrogen (mg/L)	0.160	0.096	0.103	0.073	0.110	0.108
	(0.100-0.290)	(0.068-0.140)	(0.042-0.175)	(0.036-0.130)	(0.055 - 0.195)	

Parameter	2016	2017	2018	2019	2020	Average
Unionised Ammonia (mg/L)	0.005	0.003	0.004	0.006	0.005	0.005
	(0.002-0.011)	(0.002-0.006)	(0.002-0.007)	(0.001-0.020)	(0.002 - 0.007)	
Nitrite Nitrogen (mg/L)	0.056	0.062	0.072	0.047	0.062	0.060
	(0.021-0.099)	(0.012-0.170)	(0.021-0.275)	(0.017-0.135)	(0.022 - 0.135)	
Nitrate Nitrogen (mg/L)	0.570	0.428	0.399	0.318	0.384	0.420
	(0.240-1.100)	(0.100-0.920)	(0.125-0.865)	(0.057-0.420)	(0.150 - 0.580)	
Total Inorganic Nitrogen (mg/L)	0.79	0.59	0.57	0.44	0.56	0.59
	(0.39 - 1.31)	(0.22 - 1.09)	(0.20 - 1.19)	(0.13 - 0.62)	(0.29 - 0.69)	
Total Kjeldahl Nitrogen (mg/L)	0.34	0.40	0.34	0.48	0.43	0.40
	(0.16 - 0.54)	(0.14 - 0.84)	(0.19 - 0.63)	(0.25 - 0.68)	(0.28 - 0.68)	
Total Nitrogen (mg/L)	0.97	0.89	0.81	0.85	0.88	0.88
	(0.64 - 1.55)	(0.53 - 1.22)	(0.45 - 1.33)	(0.70 - 1.01)	(0.59 - 1.03)	
Orthophosphate Phosphorus (mg/L)	0.034	0.022	0.016	0.016	0.014	0.020
	(0.004-0.056)	(0.003-0.042)	(0.008-0.032)	(0.004-0.034)	(0.012 - 0.015)	
Total Phosphorus (mg/L)	0.09	0.08	0.04	0.04	0.06	0.06
	(0.05 - 0.15)	(0.04 - 0.13)	(0.03 - 0.06)	(0.03 - 0.06)	(0.05 - 0.07)	
Silica (as SiO ₂) (mg/L)	3.85	2.73	1.90	1.14	2.28	2.38
	(1.20 - 8.40)	(0.23 - 7.30)	(0.54 - 6.50)	(0.25 - 1.90)	(0.51 - 4.25)	
Chlorophyll-a (µg/L)	2.9	3.0	8.2	7.8	7.9	6.0
	(1.0 - 8.7)	(1.0 - 8.2)	(1.1 - 32.5)	(0.8 - 22.0)	(1.1 - 33.0)	
<i>E.coli</i> (count/100mL)	220	280	370	140	110	224
	(16 - 35000)	(71 - 900)	(50 - 4500)	(46 - 850)	(12 - 730)	
Fecal Coliforms (count/100mL)	780	1300	2200	410	850	1108
	(35 - 140000)	(210 - 6000)	(270 - 30000)	(120 - 3400)	(110 - 18000)	

Note: NA (Not Applicable) indicates the measurement was not made due to shallow water.

Marine Water Quality

5.4.6. EPD have carried out routine monitoring of marine water quality in the North-Western Water Control Zone. Water quality monitoring data has been obtained from Annual Marine Water Quality Reports published by EPD. The water quality monitoring data of NM2 (which is closest to the study area) from 2016 to 2020 are summarised in **Table 5.6**.

Table 5.6 Water Quality Monitoring Data of NM2 from 2016 to 2020

Parameter	2016	2017	2018	2019	2020	Average
Temperature (°C)	23.6	24.0	23.8	24.9	25.9	24.4
	(15.6-28.7)	(17.4-29.6)	(16.7-28.2)	(18.6-31.7)	(20.5-29.4)	
Salinity (ppt)	26.0	26.8	29.2	27.7	26.6	27.3
	(15.9-30.2)	(18.1-32.9)	(24.3-32.3)	(18.4-33.4)	(19.8-31.6)	
Dissolved Oxygen (mg/L) (Depth-average)	5.8	5.8	5.9	5.9	5.8	5.8
	(4.0-8.2)	(4.6-7.8)	(4.3-7.4)	(4.4-7.9)	(4.7-7.2)	
Dissolved Oxygen (mg/L) (Bottom)	5.5	5.5	5.7	5.8	5.6	5.6
	(3.7-8.3)	(2.5-7.7)	(3.1-7.5)	(3.5-7.6)	(4.0-7.5)	
pH	7.9	7.8	8.0	8.0	7.9	7.9
	(7.4-8.3)	(7.6-8.3)	(7.7-8.2)	(7.6-8.7)	(7.7-8.1)	

Parameter	2016	2017	2018	2019	2020	Average
Secchi Disc Depth (m)	2.6	2.6	2.7	2.3	2.1	2.5
	(2.0-4.0)	(1.9-3.1)	(2.0-3.6)	(1.7-4.3)	(1.7-2.6)	
Turbidity (NTU)	66.2	5.5	4.9	5.0	4.3	17.2
	(1.1-744.7)	(3.1-12.3)	(1.7-8.0)	(0.6-15.3)	(1.9-7.8)	
Suspended Solids (mg/L)	6.7	9.5	9.0	11.6	7.1	8.8
	(1.5-18.7)	(3.1-35.7)	(3.0-18.7)	(4.1-21.0)	(2.4-12.7)	
5-day Biochemical Oxygen Demand (mg/L)	0.7	0.6	0.7	0.7	0.6	0.7
	(0.3-1.5)	(<0.1-1.3)	(0.2-1.5)	(0.3-1.3)	(0.3-1.0)	
Ammonia Nitrogen (mg/L)	0.114	0.092	0.080	0.070	0.076	0.086
	(0.053-0.273)	(0.014-0.187)	(0.006-0.133)	(0.031-0.130)	(0.031-0.177)	
Unionised Ammonia (mg/L)	0.003	0.003	0.003	0.003	0.003	0.003
	(0.001-0.010)	(<0.001-0.007)	(<0.001-0.005)	(0.001-0.009)	(0.001-0.007)	
Nitrite Nitrogen (mg/L)	0.058	0.079	0.061	0.050	0.077	0.065
	(0.019-0.096)	(0.017-0.173)	(0.013-0.130)	(0.012-0.133)	(0.023-0.150)	
Nitrate Nitrogen (mg/L)	0.434	0.440	0.282	0.298	0.469	0.385
	(0.183-0.893)	(0.117-1.127)	(0.076-0.480)	(0.058-0.483)	(0.157-0.757)	
Total Inorganic Nitrogen (mg/L)	0.61	0.61	0.42	0.42	0.62	0.54
	(0.34-1.04)	(0.20-1.33)	(0.16-0.60)	(0.13-0.61)	(0.28-0.90)	
Total Kjeldahl Nitrogen (mg/L)	0.36	0.33	0.36	0.39	0.32	0.35
	(0.14-0.54)	(0.15-0.67)	(0.18-0.81)	(0.09-0.75)	(0.07-0.62)	
Total Nitrogen (mg/L)	0.85	0.85	0.70	0.74	0.87	0.80
	(0.42-1.22)	(0.45-1.50)	(0.37-1.04)	(0.44-1.05)	(0.57-1.08)	
Orthophosphate Phosphorus (mg/L)	0.029	0.026	0.018	0.016	0.022	0.022
	(0.004-0.054)	(0.007-0.040)	(0.002-0.035)	(0.007-0.032)	(0.015-0.033)	
Total Phosphorus (mg/L)	0.10	0.07	0.03	0.04	0.08	0.06
	(0.04-0.14)	(0.04-0.13)	(0.03-0.04)	(0.02-0.07)	(0.03-0.24)	
Silica (as SiO ₂) (mg/L)	2.72	2.52	1.31	1.66	2.59	2.16
	(1.10-5.73)	(0.33-5.50)	(0.34-2.47)	(0.23-3.33)	(0.54-4.27)	
Chlorophyll-a (µg/L)	3.0	1.4	3.5	4.5	3.8	3.2
	(0.5-13.3)	(0.6-3.3)	(0.5-19.7)	(0.4-11.1)	(0.5-22.3)	
<i>E.coli</i> (count/100mL)	35	48	54	41	36	43
	(5-70)	(6-370)	(3-660)	(2-420)	(13-140)	
Fecal Coliforms (count/100mL)	79	110	120	85	87	96
	(7-190)	(12-1500)	(12-1100)	(8-760)	(24-590)	

5.4.7. In 2020, the North Western WCZ attained an overall WQO compliance rate of 67%. Compliance rates for the DO and NH₃-N WQOs are 100%. As observed in previous years, the relatively higher TIN levels in the WCZ in 2020 were likely attributed to the high background level of the Pearl River discharges, and some local discharges and surface run-offs from both the Northwest New Territories and North Lantau.

River Water Quality

5.4.8. Routine monitoring of river quality in Hong Kong is also carried out by EPD. Tuen Mun River is the identified river near the Project site and the water quality of Tuen Mun River has been reviewed from the “River Water Quality in Hong Kong in 2020” published by EPD. According to the report, Tuen Mun River’s overall compliance rate was 84% in 2020. In terms of Water Quality Index (WQI) grading, five of the 6 monitoring stations (TN2, TN3, TN4, TN5 and TN6) situated from the middle to lower sections of the river maintained “Good” WQI grading whilst the upstream monitoring station (TN1) was recorded “bad” grading in 2020 mainly due to discharges from unsewered rural areas. The water quality monitoring data of Tuen Mun River at downstream station TN6 from 2016 to 2020 are summarized in **Table 5.7**.

Table 5.7 Water Quality Monitoring Data for Tuen Mun River (TN6) from 2016 to 2020

Parameter	2016	2017	2018	2019	2020	Average
Dissolved Oxygen (mg/L)	5.3	5.7	5.4	5.1	4.9	5.3
	(3.7 - 7.1)	(4.3 - 7.2)	(3.3 - 6.8)	(2.9 - 6.3)	(3.3 - 9.1)	
pH	7.2	7.6	7.4	7.2	7.6	7.4
	(7.1 - 7.7)	(7.4 - 8.0)	(7.2 - 7.7)	(6.7 - 7.7)	(6.2 - 8.4)	
Suspended Solids (mg/L)	3.0	5.8	5.6	4.1	6.7	5.0
	(<1 - 11)	(1.4 - 16.0)	(2.4 - 14.0)	(2.0 - 8.8)	(2.6 - 19.0)	
5-day Biochemical Oxygen Demand (mg/L)	2.0	2.2	2.5	2.1	3.1	2.4
	(<1 - 4)	(0.3 - 3.5)	(1.2 - 4.4)	(0.6 - 3.6)	(2.1 - 6.8)	
Chemical Oxygen Demand (mg/L)	11	11	12	13	12	12
	(7 - 21)	(2 - 20)	(6 - 21)	(5 - 20)	(4 - 35)	
Oil & Grease (mg/L)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	(<0.5 - 0.6)	(<0.5 - <0.5)	(<0.5 - <0.5)	(<0.5 - <0.5)	(<0.5 - <0.5)	
<i>E.coli</i> (counts/100mL)	8200	6100	11000	4600	3400	6660
	(<10 - 210000)	(260 - 120000)	(1400 - 160000)	(800 - 50000)	(10 - 55 000)	
Faecal Coliforms (counts/100ml)	55000	32000	62000	35000	36000	44000
	(1100 - 1000000)	(630 - 950000)	(6900 - 950000)	(7000 - 180000)	(490 - 630 000)	
Ammonia-nitrogen (mg/L)	0.61	0.45	0.48	0.50	0.47	0.50
	(0.29 - 0.78)	(0.240 - 0.690)	(0.200 - 1.100)	(0.280 - 0.730)	(0.110 - 1.000)	
Nitrate-nitrogen (mg/L)	0.41	0.43	0.53	0.37	0.35	0.42
	(0.13 - 0.81)	(0.160 - 0.920)	(0.150 - 0.870)	(0.140 - 0.550)	(0.120 - 0.700)	
Total Kjeldahl Nitrogen (mg/L)	0.79	0.62	0.79	1.20	0.95	0.87
	(0.34 - 1.50)	(0.45 - 1.00)	(0.50 - 1.80)	(0.68-2.30)	(0.27 - 1.70)	
Ortho-phosphate Phosphorus (mg/L)	0.040	0.036	0.048	0.030	0.035	0.038
	(0.02 - 0.08)	(<0.002 - 0.079)	(0.012 - 0.090)	(<0.002 - 0.051)	(0.017 - 0.054)	
Total Phosphorus (mg/L)	0.11	0.09	0.08	0.08	0.11	0.09
	(0.07 - 0.18)	(0.05 - 0.14)	(0.04 - 0.16)	(0.04 - 0.15)	(0.05 - 0.19)	
Sulphide (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	(<0.02 - 0.03)	(<0.02 - <0.02)	(<0.02 - <0.02)	(<0.02 - <0.02)	(<0.02 - 0.02)	
Aluminum (ug/L)	61	58	53	<50	<50	57
	(<50 - 132)	(<50 - 158)	(<50 - 149)	(<50 - 121)	(<50 - 254)	

Parameter	2016	2017	2018	2019	2020	Average
Cadmium (ug/L)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	(<0.1 - 0.2)	(<0.1 - <0.1)	(<0.1 - 0.1)	(<0.1 - 0.1)	(<0.1 - <0.1)	
Chromium (ug/L)	<1	1	2	2	2	2
	(<1 - 2)	(<1 - 5)	(1 - 4)	(<1 - 4)	(<1 - 3)	
Copper (ug/L)	3	5	4	4	5	4
	(2 - 7)	(2 - 10)	(3 - 13)	(3 - 7)	(2 - 7)	
Lead (ug/L)	<1	<1	<1	<1	<1	<1
	(<1 - 3)	(<1 - 2)	(<1 - <1)	(<1 - 1)	(<1 - <1)	
Zinc (ug/L)	22	21	12	15	11	16
	(11 - 40)	(18 - 34)	(<10 - 33)	(10 - 29)	(<10 - 27)	
Flow (L/s)	NM	NM	NM	NM	NM	NM
	NM	NM	NM	NM	NM	

Note: NM indicates no measurement taken.

Supplementary Water Quality Baseline Survey

- 5.4.9. As supplementary data to the published information, field surveys at the nearshore of the Project area have been carried out to obtain the current baseline water quality data. There is an existing stream at So Kwun Wat, near the eastern end of the proposed cycle track. The cycle track will not run across or encroach into this existing stream at So Kwun Wat. Field survey data are collected for reference. The baseline water quality monitoring locations are indicated in [Figure 5.1](#) and described in [Table 5.8](#).

Table 5.8 Baseline Water Quality Monitoring Locations

Monitoring Location ID	Description	Waterbody
SKWS1	Upstream at the existing stream near So Kwun Wat	Stream course
SKWS2	Downstream at the existing stream near So Kwun Wat	Stream course
CPBS1	Nearshore at Castle Peak Beach	Beach
CPBS2	Nearshore at Kadoorie Beach	Beach
CPBS3	Nearshore at Cafeteria Old Beach	Beach

- 5.4.10. Monitoring samplings were carried out three times per week for two consecutive weeks in dry season and wet season. The interval between two consecutive samplings was not at least 36 hours. The complete record of in-situ monitoring and laboratory analysis results are provided in [Appendix 5-2](#). A summary of the in-situ baseline water quality monitoring results is given in [Table 5.9](#) (wet season) and [Table 5.10](#) (dry season), respectively. The summary of the laboratory analysis of baseline water quality survey results is presented in [Table 5.11](#) (wet season) and [Table 5.12](#) (dry season), respectively.

Table 5.9 Summary of In-situ Water Quality Monitoring Results for Wet Season

Monitoring Station	pH			Temperature (°C)			Dissolved Oxygen (mg/L)			Turbidity (NTU)			Salinity (ppt)		
	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min
WQOs (Marine Water)	To be in the range of 6.0 – 9.0 for 95% samples			Change due to human activity not to exceed 2 degree			Not less than 4.0 mg/L			Shall not reduce light transmission substantially from the normal level			Change due to human activity not to exceed 10% of ambient		
WQOs (River Water)	6.0-9.0			Change due to human activity not to exceed 2 degree			Not less than 4.0 mg/L			-			Change due to human activity not to exceed 10% of ambient		
CPBS1	8.3	8.6	8.0	29.7	31.3	27.9	5.73	6.30	5.21	8.14	10.05	5.67	22.18	23.84	17.60
CPBS2	8.4	8.6	8.1	30.0	31.6	29.1	5.71	6.29	5.25	10.47	17.10	6.29	22.48	23.71	19.52
CPBS3	8.4	8.7	8.2	30.5	31.9	29.2	6.02	6.61	5.59	14.08	23.90	3.96	22.44	23.66	18.60
SKWS1	8.4	9.0	8.1	29.6	32.8	27.1	5.43	5.64	5.18	33.16	151.90	5.96	2.73	6.47	0.53
SKWS2	8.3	8.5	8.1	30.8	35.0	27.2	5.83	6.32	5.09	19.54	44.90	6.75	15.24	27.30	3.20

Table 5.10 Summary of In-situ Water Quality Monitoring Results for Dry Season

Monitoring Station	pH			Temperature (°C)			Dissolved Oxygen (mg/L)			Turbidity (NTU)			Salinity (ppt)		
	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min
WQOs (Marine Water)	To be in the range of 6.0 – 9.0 for 95% samples			Change due to human activity not to exceed 2 degree			Not less than 4.0 mg/L			Shall not reduce light transmission substantially from the normal level			Change due to human activity not to exceed 10% of ambient		
WQOs (River Water)	6.0-9.0			Change due to human activity not to exceed 2 degree			Not less than 4.0 mg/L			-			Change due to human activity not to exceed 10% of ambient		
CPBS1	8.0	8.2	7.3	27.6	30.8	25.8	6.86	8.21	5.57	8.84	13.70	0.80	26.99	32.59	20.55
CPBS2	8.1	8.3	7.8	27.6	30.3	26.2	7.14	8.05	5.58	16.88	25.90	2.64	27.85	32.48	20.61
CPBS3	8.1	8.3	7.9	28.0	30.9	26.2	7.09	7.85	5.80	15.77	30.40	6.65	28.45	32.70	20.83
SKWS1	7.7	8.4	7.4	27.3	29.7	25.9	5.99	6.81	4.38	13.51	61.50	2.70	6.87	18.24	0.07
SKWS2	8.0	8.2	7.8	28.0	30.8	26.6	6.61	8.08	4.76	19.87	48.00	7.34	18.77	30.87	0.14

Table 5.11 Summary of Laboratory Analysis Results for Wet Season

Parameter		Monitoring Station				
		CPBS1	CPBS2	CPBS3	SKWS1	SKWS2
Suspended Solids (mg/L)	Mean	24	15	10	32	40
	Max	110	27	18	140	168
	Min	6	9	5	5	6
Unionised Ammonia (mg/L)	Mean	0.003	0.002	0.002	0.034	0.015
	Max	0.007	0.003	0.003	0.058	0.020
	Min	0.001	0.001	0.001	0.014	0.008
Ammonia Nitrogen (mg/L)	Mean	0.05	0.04	0.04	0.29	0.22
	Max	0.08	0.06	0.05	0.6	0.3
	Min	0.02	0.02	0.02	0.16	0.13
Nitrite Nitrogen (mg/L)	Mean	0.14	0.14	0.14	0.09	0.08
	Max	0.17	0.19	0.2	0.12	0.13
	Min	0.12	0.1	0.1	0.07	0.05

Parameter		Monitoring Station				
		CPBS1	CPBS2	CPBS3	SKWS1	SKWS2
Nitrate Nitrogen (mg/L)	Mean	0.95	0.81	0.85	1.07	0.83
	Max	2.2	1	1.1	1.9	1.1
	Min	0.67	0.66	0.66	0.83	0.65
<i>E.coli</i> (CFU /100mL)	Geo-Mean	713	48	36	13216	17609
	Max	9700	690	830	43000	86000
	Min	26	5	3	3100	2200
5-day Biochemical Oxygen Demand (mg/L)	Mean	<3	<3	3	3.3	3
	Max	<3	<3	3.5	5	3.5
	Min	<3	<3	<3	<3	<3
Chemical Oxygen Demand (mg/L)	Mean	188	183	174	39	72
	Max	220	230	230	77	170
	Min	150	120	120	12	13
Total Kjeldahl Nitrogen (mg/L)	Mean	0.18	0.22	0.23	0.67	0.55
	Max	0.29	0.40	0.45	1.30	0.80
	Min	0.07	0.11	0.15	0.50	0.40
Total Phosphorus (mg/L)	Mean	0.06	0.07	0.06	0.18	0.15
	Max	0.08	0.09	0.07	0.37	0.23
	Min	0.04	0.04	0.04	0.11	0.11
Ortho-phosphate Phosphorus (mg/L)	Mean	0.05	0.08	0.06	0.14	0.15
	Max	0.05	0.08	0.06	0.18	0.20
	Min	0.05	0.07	0.05	0.11	<0.10
Chromium (µg/L)	Mean	1.08	1.00	1.67	1.33	1.67
	Max	1.00	1.00	2.00	2.00	2.00
	Min	1.00	1.00	1.67	<1	<1
Nickel (µg/L)	Mean	1.92	1.50	1.75	1.00	1.91
	Max	2.00	2.00	2.00	1.00	9.00
	Min	1.00	1.00	1.00	<1	1.00
Copper (µg/L)	Mean	5.00	2.75	9.89	4.42	29.67
	Max	18.00	15.00	70.00	6.00	84.00
	Min	5.00	1.00	1.00	3.00	2.00
Zinc (µg/L)	Mean	4.56	3.71	8.63	9.83	40.00
	Max	11.00	10.00	46.00	19.00	130.00
	Min	1.00	2.00	1.00	2.00	5.00
Arsenic (µg/L)	Mean	2.08	2.00	2.08	1.00	1.50
	Max	3.00	2.00	3.00	1.00	3.00
	Min	2.00	2.00	2.00	<1	<1
Silver (µg/L)	Mean	<1	<1	<1	<1	<1
	Max	<1	<1	<1	<1	<1
	Min	<1	<1	<1	<1	<1
Cadmium (µg/L)	Mean	<1	<1	<1	<1	<1
	Max	<1	<1	<1	<1	<1
	Min	<1	<1	<1	<1	<1
Mercury (µg/L)	Mean	<1	<1	<1	<1	<1
	Max	<1	<1	<1	<1	<1
	Min	<1	<1	<1	<1	<1

Parameter		Monitoring Station				
		CPBS1	CPBS2	CPBS3	SKWS1	SKWS2
Lead (µg/L)	Mean	<1	<1	1.25	<1	1.17
	Max	<1	<1	4.00	<1	3.00
	Min	<1	<1	<1	<1	<1

Table 5.12 Summary of Laboratory Analysis Results for Dry Season

Parameter		Monitoring Station				
		CPBS1	CPBS2	CPBS3	SKWS1	SKWS2
Suspended Solids (mg/L)	Mean	14	31	19	12	14
	Max	33	50	35	25	32
	Min	6	14	4	7	6
Unionised Ammonia (mg/L)	Mean	<0.020	<0.020	<0.020	<0.020	0.023
	Max	<0.020	<0.020	<0.020	<0.020	0.04
	Min	<0.020	<0.020	<0.020	<0.020	<0.020
Ammonia Nitrogen (mg/L)	Mean	0.04	0.03	<0.02	0.21	0.1
	Max	0.09	0.03	<0.02	0.26	0.18
	Min	<0.02	<0.02	<0.02	0.11	<0.02
Nitrite Nitrogen (mg/L)	Mean	0.06	0.05	0.06	0.07	0.06
	Max	0.14	0.09	0.12	0.09	0.09
	Min	0.02	0.02	0.01	0.03	0.03
Nitrate Nitrogen (mg/L)	Mean	0.17	0.19	0.18	0.93	0.36
	Max	0.47	0.17	0.48	1.27	0.54
	Min	0.05	0.1	0.1	0.53	0.19
<i>E.coli</i> (CFU /100mL)	Geo-Mean	177	18	17	2167	1070
	Max	2700	150	170	4400	2800
	Min	3	2	2	380	120
5-day Biochemical Oxygen Demand (mg/L)	Mean	<3	<3	<3	<3	<3
	Max	<3	<3	<3	3.5	3
	Min	<3	<3	<3	<3	<3
Chemical Oxygen Demand (mg/L)	Mean	285	225	298	116	316
	Max	400	320	500	190	470
	Min	<120	<120	<120	51	<120
Total Kjeldahl Nitrogen (mg/L)	Mean	0.24	0.25	0.23	0.49	0.38
	Max	0.4	0.4	0.3	0.7	0.7
	Min	0.1	0.2	0.1	0.4	0.1
Total Phosphorus (mg/L)	Mean	0.07	0.06	0.06	0.15	0.09
	Max	0.16	0.11	0.09	0.19	0.13
	Min	0.03	0.04	0.04	0.11	0.05
Ortho-phosphate Phosphorus (mg/L)	Mean	0.05	0.05	0.05	0.12	0.07
	Max	0.07	0.07	0.06	0.16	0.11
	Min	0.03	0.03	0.03	0.09	0.04
Chromium (µg/L)	Mean	<1	<1	<1	<1	<1
	Max	<1	<1	<1	<1	1
	Min	<1	<1	<1	<1	<1

Parameter		Monitoring Station				
		CPBS1	CPBS2	CPBS3	SKWS1	SKWS2
Nickel (µg/L)	Mean	1.5	3.89	2.36	3.25	6.67
	Max	4	12	7	10	17
	Min	<1	<1	<1	<1	<1
Copper (µg/L)	Mean	8.33	11.95	13.87	15.63	15.31
	Max	35	35	45	34	59
	Min	<1	<1	2	2	3
Zinc (µg/L)	Mean	10.05	12.09	11.81	34	33.31
	Max	34	37	42	81	64
	Min	<1	<1	1	9	14
Arsenic (µg/L)	Mean	2.04	2	2	<1	1.81
	Max	3	2	2	1	2
	Min	2	2	2	<1	1
Silver (µg/L)	Mean	<1	<1	<1	<1	<1
	Max	<1	<1	<1	<1	<1
	Min	<1	<1	<1	<1	<1
Cadmium (µg/L)	Mean	<1	<1	<1	1.97	2
	Max	<1	<1	<1	9	3
	Min	<1	<1	<1	<1	<1
Mercury (µg/L)	Mean	<1	<1	<1	<1	<1
	Max	<1	<1	<1	<1	<1
	Min	<1	<1	<1	<1	<1
Lead (µg/L)	Mean	2.4	2.39	1.86	1.38	<1
	Max	5	6	4	4	<1
	Min	<1	<1	<1	<1	<1

5.5. Identification of Water Quality Impact

- 5.5.1. The Project may potentially give rise to water quality impacts during the construction phase.
- 5.5.2. One section of channelised watercourse of about 240m in the Cafeteria Old Beach will be decked over due to the development of the cycle track alignment, which would generate more surface runoff. As no water flow or aquatic life were observed in this section even in the wet season, the potential water quality impact due to loss of watercourse is not anticipated with mitigation measures in place.
- 5.5.3. For the construction of land-based section of cycle track the primary sources of potential impacts to water quality will be from pollutants in site run-off, which may enter surface waters directly or enter storm drains discharging into these waters. The primary pollutant will be mainly suspended solids. Spillage and runoff from the surface construction machinery during rainy conditions may release oil and lubricants to the environment if surface runoff is not adequately controlled.
- 5.5.4. The potential impacts of land-based construction activities on water quality can be readily controlled by appropriate on-site measures. These measures will be sufficient to control/prevent impacts to the water sensitive receivers in the vicinity of the works area and downstream.
- 5.5.5. The key concern during construction phase is the piling works for cycle bridge (marine viaduct) section of the cycle track. Regarding the marine viaduct structure, land access is limited. Hence, marine access, for example, the use of barge, will be considered. Pre-bored H-pile is recommended to be adopted for the foundation of the marine viaduct structure. The construction sequence of the marine viaduct structure is summarised below:

- i. Barge/Giken plant/Mobile crane to be used for construction of temporary platform (pipe pile as foundation and sheet pile as deck);
- ii. Insert double casing and construct pre-bored H piles;
- iii. Insert precast shell for pile cap construction, then rebar fixing and cast pile cap;
- iv. Use precast element for pier construction or cast in-situ;
- v. The deck structure will be constructed with box girder by cast-in-situ method with the aid of temporary steel working platforms;
- vi. Erect the permanent formwork for slab construction; and
- vii. Construct surfacing and railing.

5.5.6. Illustration of marine-based bored-pile Installation is shown in **Image 5.1**.

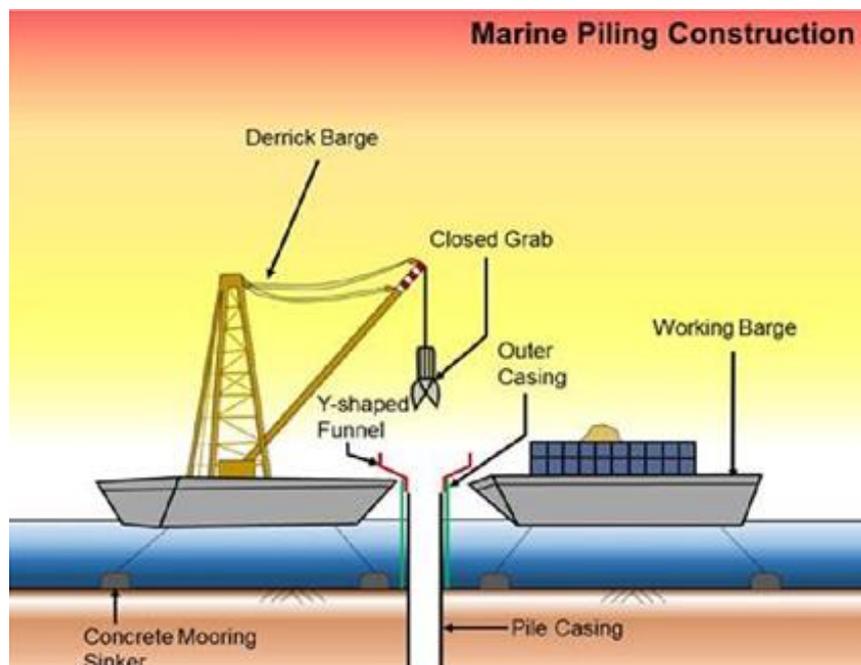


Image 5.1 Marine-based Bored-pile Installation

5.5.7. The potential water quality issues associated with marine-based bored piling works include:

- Suspended solids (SS) and fine material may be generated as a result of both the bored pile installation and drilling process, which will need to be pumped to a support barge for disposal. There is potential for leakage of water and sediments from barges;
- A casing must be driven into the seabed to support the boring equipment which may disturb the seabed and cause SS release; and
- Casings removal from the marine seabed.

5.5.8. In summary, potential sources of water quality impacts associated with the construction of the Project include:

- Dispersion of sediment and fine material due to bored pile installation and drilling process;
- Release of contaminants from the marine sediment due to bored pile installation, drilling process, and casings removal;
- Construction site runoff from site surface, earth working and stockpiles;
- Sewage effluent from on-site construction workforce;
- General construction activities; and

- Chemical spillages from oil, solvents and other chemicals.

5.5.9. Potential water quality impacts associated with the operational phase include:

- Water quality impacts due to wastewater (i.e. sewage effluent from visitors) arising from operation of the Project; and
- Likely change of flow and regime, hydrology, sediment erosion and deposition patterns, morphological change of seabed.

5.6. Evaluation of Water Quality Impact

Construction Site Runoff

5.6.1. During periods of heavy rain, site runoff would wash away soil particles and the runoff is generally characterized by high concentrations of SS. Release of uncontrolled site runoff would increase the SS levels and turbidity in the nearby water environment and the identified WSR.

5.6.2. It is important that proper site practice and good site management are adhered to in accordance with *ProPECC PN 1/94 Construction Site Drainage* to prevent run-off with high level of SS from entering the surrounding waters. With the implementation of appropriate measures to control run-off and drainage from the construction site (such as provision of silt traps), disturbance of water bodies would be avoided and deterioration in water quality would be minimal.

Sewage Effluent from On-Site Workforce

5.6.3. During construction, sewage will be generated from on-site workforce sanitary facilities. Portable chemical toilets should be provided on-site for collection and temporary storage of sewage. The collected sewage should be collected by a licensed waste collector for off-site disposal of at sewage treatment plants. No sewage discharge on site is anticipated during construction phase. No adverse water quality impacts from the workforce sewage are anticipated to occur.

General Construction Activities

5.6.4. Land-based construction works have the potential to cause water pollution and there are various types of construction activities that may generate wastewater. These include general cleaning and polishing, wheel washing and dust suppression. These types of wastewater would contain high concentrations of suspended solids (SS). Water quality impacts could also result from the accumulation of solid and liquid waste such as packaging and construction materials, and sewage effluent from the construction work force involved with the construction works.

5.6.5. Provided that site drainage would be well maintained and good construction practices would be observed in accordance with *ProPECC PN 1/94 Construction Site Drainage* such that litter, fuel and solvents are managed, stored and handled properly, the effects on water quality from general construction activities are expected to be minimal.

Accidental Spillage of Chemicals

5.6.6. Accidental spillage of chemicals used in the works areas may contaminate the surface soils. The contaminated soil particles may be washed away by construction site runoff or storm runoff causing water pollution. Provided that mitigation measures are properly implemented to minimize and control accidental spillage, no adverse impact on the identified WSRs is anticipated.

5.6.7. The Code of Practice on Packaging, Labelling and Storage of Chemical Wastes published under the Waste Disposal Ordinance should be used as a guideline for handling chemical wastes. Chemical wastes should be disposed of following the rules stipulated in the Waste Disposal Ordinance.

5.6.8. With effective control through good operation and management practices, no adverse impacts to water quality are anticipated to occur due to accidental spillage of chemicals from construction activities.

Release of Suspended Sediment during Piling Works at Marine Viaduct Section

- 5.6.9. The key water quality concerns will be the disturbance of the bottom sediment from piling works for the cycle track viaduct section, causing an increase in suspended solid levels. Methodology of the assessment of the associated water quality impacts is provided in [Appendix 5-1](#).
- 5.6.10. The piles for the marine viaduct section are to be bored, thus the Project would not envisage open sea dredging is required. Though no open sea marine dredging works would be envisaged, for conservative assessment purpose, the water quality impact of bored piling works has been assessed using the sediment loss rate of a closed grab dredger. However, the actual water quality impact by bored piling of the Project will be much smaller than that of marine dredging works by closed grab dredger.
- 5.6.11. As the rate of sediment release is expected to be low and in small scale and given the shallow marine water environment in the vicinity of Castle Peak Bay, a near field model of sediment dispersion is adopted to predict such sediment concentration (*R E Wilson. A Model for the Estimation of the Concentrations and Spatial Extent of Suspended Sediment Plumes. Estuarine and Marine Coastal Science (1979), Vol 9, pp 65-78*).
- 5.6.12. This model is considered appropriate for the calculation of suspended sediment concentration because the equation is based on a continuous line source of sediment, which is a reasonable approximation of the loss of sediment to suspension during bored pile works. It is appropriate for areas where the tidal current is uni-directional for each phase of the tidal cycle (i.e. the ebb and flood phases). This method is applicable for suspended sediment plumes for length no greater than the maximum tidal excursion.
- 5.6.13. The tidal excursion calculation is according to the following equation:

$$\textit{Tidal Excursion} = \textit{Maximum Speed} \times \textit{Period} \times \frac{2}{\pi}$$

- 5.6.14. At Castle Peak Bay, maximum tidal current speed may go up to 0.6 m/s (*Update on Cumulative Water Quality and hydrological Effect of Coastal Developments and Upgrading of Assessment Tool Study, 1998*), and a representative period for each phase of the tidal cycle in Hong Kong is 6 hours. The tidal excursion is thus calculated to be 8.25 km and hence this approach shall be considered appropriate because of the low rate of sediment release and thus the expected limited extent of the plumes, which will certainly be within the tidal excursion.
- 5.6.15. The formula for estimating the concentration of suspended solids (SS) at a certain distance from the piling work source is:

$$C(x) = \frac{q}{\omega \times x \times D \times \sqrt{\pi}}$$

- Where C(x) = Concentration of suspended solids at distance from the source (kg/m³)
- q = Sediment Release Rate (kg/s)
- D = Water Depth (m)
- x = Distance from source (m)
- ω = Diffusion velocity (m/s)

- 5.6.16. The use of the above equation is limited to situations where the value of γ, as defined by the following equation, is small and where ω / u is also small.

$$\gamma = W * t / D$$

where **W** = settling velocity of suspended sediment;
t = time;
D = water depth

- 5.6.17. The sediments suspended by the dredging / filling operations may be split into a fine fraction and a coarse fraction. The fine fraction is assumed to remain in suspension indefinitely, which is based on the fact that the settling velocity for the sediment particles according to Stokes Law is offset by local turbulence. The value of settling velocity, **W**, for the coarse fraction of the sediment (based on the Stokes Law) would depend on the sediment particle size. The value for **t** will be taken to be half of the tidal period, which may be taken to be the time between the ebb and flood phases of the tidal cycle. In Hong Kong this is the greatest for the ebb phase of a spring tide where the time from high water to low water could be up to 8 hours. The value of γ is therefore subject to the sediment particle size. In case the diameter of the coarse fraction of the sediment is small and the calculated value of γ is also small, the sediment plume dispersion formula as described above would be considered valid to provide a reasonable estimation of the extent of the sediment dispersion plume. However, if the diameter of the coarse fraction of the sediment is large and the calculated value of γ is also large, the formula would tend to give an overestimation of the extent of the sediment plume and hence, a conservative prediction would be provided.
- 5.6.18. As described in s.5.6.14, the maximum tidal current speed may go up to 0.6 m/s in the vicinity of the viaduct section, the value of ω / u (where ω is the diffusion velocity and u is the current speed) is calculated to be 0.0167, which is considered to be small and the use of the sediment plume dispersion formula is considered valid.
- 5.6.19. The following formula is to be used to determine the potential Dissolved Oxygen Depletion:

$$DO_{dep} = C \times SOD_{20} \times K \times 10^{-6}$$

Where DO_{dep} = Dissolved oxygen depletion (mg/L)

C = SS elevation (mg/L)

SOD_{20} = Maximum 20-day sediment oxygen demand (mg/kg)

K = daily oxygen uptake factor

- 5.6.20. Due to the lack of SOD_{20} information for the Project area, a desktop study has been conducted. In the EIA of *Expansion of Hong Kong International Airport into a Three-Runway System*, sediment sampling and testing was undertaken in December 2012 for the proposed submarine cable diversion alignment and the field joint location. The highest SOD measured in the sediment samples collected from the 21 sampling locations along the proposed submarine cable alignment and field joint location was 2,230 mg/kg. Quoted from EIA of *Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities*, in section 9.8.4.11, an SOD of 15,000 mg/kg has been taken with reference to EPD Marine Monitoring data as a suitably representative value for sediments in the North-Western Waters region. For conservative assessment, the SOD_{20} of 15,000 mg/kg was used in this EIA. K value of 1.0 was used in the above EIA and was therefore also adopted in this EIA.
- 5.6.21. The construction of pre-bored pile (600* H-Pile) will be standard method. Based on the rate of constructing a pile is 15m/day and 2 piles will be constructed per day, the sediment volume generation is calculated to be $\pi \left(\frac{0.6}{2}\right)^2 \times 15 \times 2 = 8.48 \text{ m}^3/\text{day}$.
- 5.6.22. To quantify the rate of sediment loss into the water column, relevant study reports were reviewed: 1) *Contaminated Spoil Management Study (MacDonald, 1991)*; 2) *EIA: Dredging an Area of Kellett Bank for Reprovisioning of Six Government Mooring Buoys - Working Paper on Design Scenarios (ERM, 1997)*; 3) *EIA: Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities (2009)*. The reports indicated that sediment loss is at a rate of 20~25 kg/m³ for areas with significant

amounts of debris on the sea bed, and of 12~18 kg/m³ for areas where debris is less likely to hinder the operations. For conservative assessment purpose, the highest sediment loss rate 25 kg/m³ is adopted. Consequently, the sediment release rate into the water column was estimated to be $\frac{8.48m^3/day \times 25kg/m^3}{43200s} = 0.005kg/s$ with use of closed grab dredgers only (without mitigation measures, etc., without silt-curtain).

- 5.6.23. Suspended solids are expected to be reduced by approximately 75% with the incorporation of silt curtains (reference: Mott MacDonald (1991). Contaminated Spoil Management Study, Final Report, Volume 1, for EPD, October 1991). Therefore, the sediment release rate into the water column is estimated to be $\frac{8.48m^3/day \times 25kg/m^3}{43200s} \times (1 - 75\%) = 0.0012kg/s$.
- 5.6.24. Based on the latest available information 'Electronic Navigational Chart' from the Marine Department, the average water depth taken at the project area is 3m. The diffusion velocity that represents the reduction in the centre-line concentration due to lateral spreading, as proposed in Wilson's paper is 0.01m/s.
- 5.6.25. The equation used in this model is appropriate for areas where the tidal current is uni-directional for each phase of the tidal cycle (i.e., the ebb and flood phases), which is the case at the Project area where the tidal current is also uni-directional for each phase of the tidal cycle. This method is applicable for suspended sediment plumes for length no greater than the maximum tidal excursion. The validity of the sediment plume dispersion formula has been described in s.5.6.11 to s.5.6.18. The elevation/increment of SS concentrations at different distance from the piling source was predicted. The water depth is not simply the minimum depth at piling working location, but the average depth along the uni-directional tidal excursion near the project marine waters.
- 5.6.26. The predicted allowable increase in suspended solids (SS elevation) should be less than 30% of the ambient concentration of SS at all times. The nearest baseline water quality monitoring location is CPBS2. The monitoring results of suspended solids concentration at CPBS2 are taken as the baseline. During the wet season, the mean SS concentration at CPBS2 is 15.0 mg/L and the 30% allowance is 4.50 mg/L. During the dry season, the mean SS concentration at CPBS2 is 31.0 mg/L and the 30% allowance is 9.30 mg/L. The predicted elevation in SS concentration and dissolved oxygen depletion at distances from the piling source are presented in **Table 5.13** and **Table 5.14**.
- 5.6.27. The predicted elevated SS concentration shows that the non-compliance would disappear rapidly after 20m away from the piling work source without silt-curtain during the wet season. During the dry season, due to the relatively high background SS concentration, a shorter non-compliance distance would be predicted, which is within 10m. Upon installation of silt-curtain, the non-compliance would disappear after 5m away from the bore piling work source during the wet season, and after 2m during the dry season. Small sections of the viaduct will be encroached into two WSRs (B9 Cafeteria Old Beach and B10 Kadoorie Beach). However, the max non-compliance zone of SS concentration will be within 5m from the nearest piling work source and the beach users will be restricted from entering the piling works area, and thus, the water quality impact to the visitors of beaches shall be avoided. In addition, since the water quality impact of bored piling works has been assessed using the sediment loss rate of a closed grab dredger, the actual water quality impact by bored piling of the Project will be much smaller. And, for conservative purpose, the highest sediment loss rate 25 kg/m³ was adopted, the actual impact would not last long. Moreover, apart from B9 Cafeteria Old Beach and B10 Kadoorie Beach, the nearest WSR (Castle Peak Beach and Coral Community to the west of Kadoorie Beach) is more than 200m away from piling source, while other identified WSRs are located further away. It is therefore concluded that no significant impact would be anticipated at all the identified WSRs.

Table 5.13 Predicted Elevation in Suspended Solids Concentration and Dissolved Oxygen Depletion at Distances from Piling Source (Wet Season)

Distance (m)	Predicted SS Elevation (mg/L)	Predicted SS Elevation (mg/L)	Dissolved Oxygen Depletion (mg/L)	Dissolved Oxygen Depletion (mg/L)	Resultant Dissolved Oxygen (mg/L)	Resultant Dissolved Oxygen (mg/L)
	(without mitigation)	(with mitigation of 75% reduction)	(without mitigation)	(with mitigation of 75% reduction)	(without mitigation)	(with mitigation of 75% reduction)
1	<u>92.32</u>	<u>23.08</u>	1.38	0.35	4.33	5.36
2	<u>46.16</u>	<u>11.54</u>	0.69	0.17	5.02	5.54
3	<u>30.77</u>	<u>7.69</u>	0.46	0.12	5.25	5.59
4	<u>23.08</u>	<u>5.77</u>	0.35	0.09	5.36	5.62
5	<u>18.46</u>	<u>4.62</u>	0.28	0.07	5.43	5.64
10	<u>9.23</u>	2.31	0.14	0.03	5.57	5.68
12	<u>7.69</u>	1.92	0.12	0.03	5.59	5.68
14	<u>6.59</u>	1.65	0.10	0.02	5.61	5.69
15	<u>6.15</u>	1.54	0.09	0.02	5.62	5.69
20	<u>4.62</u>	1.15	0.07	0.02	5.64	5.69
25	3.69	0.92	0.06	0.01	5.65	5.70
30	3.08	0.77	0.05	0.01	5.66	5.70
35	2.64	0.66	0.04	0.01	5.67	5.70
100	0.92	0.23	0.01	0.00	5.70	5.71

Note: 1) underlined value indicates exceeding WQOs (30% of ambient SS is 4.50mg/L during wet season)
2) background DO concentration is 5.71mg/L during wet season.

Table 5.14 Predicted Elevation in Suspended Solids Concentration and Dissolved Oxygen Depletion at Distances from Piling Source (Dry Season)

Distance (m)	Predicted SS Elevation (mg/L)	Predicted SS Elevation (mg/L)	Dissolved Oxygen Depletion (mg/L)	Dissolved Oxygen Depletion (mg/L)	Resultant Dissolved Oxygen (mg/L)	Resultant Dissolved Oxygen (mg/L)
	(without mitigation)	(with mitigation of 75% reduction)	(without mitigation)	(with mitigation of 75% reduction)	(without mitigation)	(with mitigation of 75% reduction)
1	<u>92.32</u>	<u>23.08</u>	1.38	0.35	5.76	6.79
2	<u>46.16</u>	<u>11.54</u>	0.69	0.17	6.45	6.97
3	<u>30.77</u>	7.69	0.46	0.12	6.68	7.02
4	<u>23.08</u>	5.77	0.35	0.09	6.79	7.05
5	<u>18.46</u>	4.62	0.28	0.07	6.86	7.07
10	9.23	2.31	0.14	0.03	7.00	7.11
12	7.69	1.92	0.12	0.03	7.02	7.11
14	6.59	1.65	0.10	0.02	7.04	7.12
15	6.15	1.54	0.09	0.02	7.05	7.12
20	4.62	1.15	0.07	0.02	7.07	7.12
25	3.69	0.92	0.06	0.01	7.08	7.13
30	3.08	0.77	0.05	0.01	7.09	7.13
35	2.64	0.66	0.04	0.01	7.10	7.13
100	0.92	0.23	0.01	0.00	7.13	7.14

Note: 1) underlined value indicates exceeding WQOs (30% of ambient SS is 9.30mg/L during dry season)
2) background DO concentration is 7.14mg/L during dry season.

Dissolved Oxygen Depletion during Piling Works at Marine Viaduct Section

5.6.28. The predicted DO depletion and resultant DO at distances from piling source are presented in **Table 5.13** and **Table 5.14**. The baseline water quality monitoring results at CPBS2 indicated the DO at the viaduct section is 5.71mg/L during wet season, while 7.14mg/L during dry season. The predicted

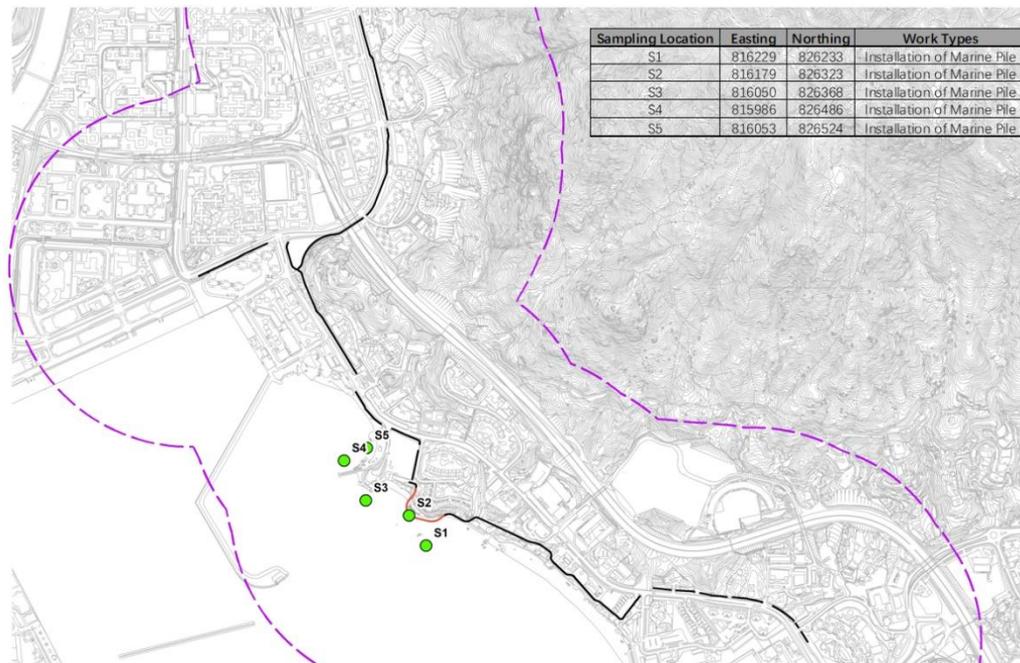
results indicate that even without any mitigation measures (silt curtain), the resultant DO concentrations are still higher than 4 mg/L (WQOs) for the depth-averaged DO WQO.

5.6.29. Upon implementation of mitigation measures, no non-compliance of DO concentration will be occurred after 1m from the bore piling work source. While small section of the viaduct will be encroached into two WSRs (B9 Cafeteria Old Beach and B10 Kadoorie Beach), no adverse impact is anticipated due to the restriction of entering piling works area by beach users. It is therefore concluded that no significant Dissolved Oxygen Depletion would occur at all the identified WSRs during both the dry and wet seasons, respectively.

Release of Contaminants during Piling Works at Viaduct Section

5.6.30. Effects of release of contaminants into the ambient marine water during bore piling works were assessed as well in this study. The results from the laboratory test of elutriate samples were used to evaluate the number of contaminants that could be released into the water column. An elutriate test was conducted to investigate the possible release of contaminants from sediments.

5.6.31. Sampling locations for the elutriate test are illustrated in diagram below, and the test results at location S1, S3, S4, S5 are summarized in **Table 5.15** (detailed lab testing results are provided in [Appendix 5-3](#)). The sampling at location S2 was not available due to the presence of boulders and the barge cannot access that location.



Sampling Locations for Elutriate Testing

Table 5.15 Summary of Elutriate Test Results at Sampling Locations

Location	Sampling Depth (m)	Metal Concentration (µg/L)									Organic Compounds Concentration (µg/L)			Inorganic Nonmetallic Parameters				
		Ag	Cd	Cu	Ni	Pb	Zn	Cr	As	Hg	Total PCBs	Low M.W. PAHs	TBT	Ammonia as N	Nitrite as N	Nitrate as N	TIN	UIA ⁽⁷⁾
Water Quality Standards		2.3 ⁽²⁾	2.5 ⁽²⁾	5 ⁽²⁾	30 ⁽²⁾	25 ⁽²⁾	40 ⁽²⁾	15 ⁽²⁾	25 ⁽²⁾	0.3 ⁽²⁾	0.03 ⁽³⁾	3.0 ⁽⁴⁾	0.1 ⁽⁵⁾	-	-	-	0.5 ⁽⁶⁾	0.021
S1 (Composite)	All Depth	<1.0	<0.1	<1.0	1.7	<1.0	<1.0	<1.0	1	<0.5	<0.01	<2.2	<0.015	0.21	<0.05	0.23	0.49	0.017
S1 (Blank)	All Depth	<1.0	<0.1	<1.0	1.3	<1.0	<1.0	<1.0	2	<0.5	<0.01	<2.2	<0.015	0.11	<0.05	0.25	0.41	0.014
S3 (Composite)	All Depth	<1.0	<0.1	<1.0	1.8	<1.0	<1.0	<1.0	3	<0.5	<0.01	<2.2	<0.015	0.15	<0.05	0.35	<u>0.55</u>	0.019

Location	Sampling Depth (m)	Metal Concentration (µg/L)									Organic Compounds Concentration (µg/L)			Inorganic Nonmetallic Parameters				
		Ag	Cd	Cu	Ni	Pb	Zn	Cr	As	Hg	Total PCBs	Low M.W. PAHs	TBT	Ammonia as N	Nitrite as N	Nitrate as N	TIN	UIA ⁽⁷⁾
Water Quality Standards		2.3 ⁽²⁾	2.5 ⁽²⁾	5 ⁽²⁾	30 ⁽²⁾	25 ⁽²⁾	40 ⁽²⁾	15 ⁽²⁾	25 ⁽²⁾	0.3 ⁽²⁾	0.03 ⁽³⁾	3.0 ⁽⁴⁾	0.1 ⁽⁵⁾	-	-	-	0.5 ⁽⁶⁾	0.021
S3 (Blank)	All Depth	<1.0	<0.1	<1.0	1.6	<1.0	<1.0	1.5	2	<0.5	<0.01	<2.2	<0.015	0.06	<0.05	0.37	0.48	0.017
S4 (Composite)	All Depth	<1.0	<0.1	<1.0	1.4	<1.0	<1.0	6	<0.5	<0.01	<2.2	<0.015	0.47	<0.05	0.36	<u>0.88</u>	0.031	
S4 (Blank)	All Depth	<1.0	<0.1	<1.0	1.9	<1.0	<1.0	1.0	2	<0.5	<0.01	<2.2	<0.015	0.02	<0.05	0.35	0.42	0.015
S5 (Composite)	All Depth	<1.0	<0.1	<1.0	1.8	<1.0	<1.0	2	<0.5	<0.01	<2.2	<0.015	0.02	<0.05	0.44	<u>0.51</u>	0.018	
S5 (Blank)	All Depth	<1.0	<0.1	<1.0	2.3	<1.0	<1.0	2	<0.5	<0.01	<2.2	<0.015	<0.01	<0.05	0.44	0.49	0.017	

Notes:

- Underlined value indicates exceedance of the Water Quality Standard.
- UK Water Quality Standard.
- USEPA Salt Water Criteria.
- Australian Water Quality Guidelines for Fresh and Marine Waters.
- Michael H. Salazar and Sandra M. Salazar (1996). "Mussels as Bioindicators: Effects of TBT on Survival, Bioaccumulation, and Growth under Natural Conditions" in Organotin, edited by M. A. Champ and P. F. Seligman. Chapman & Hall, London.
- WQO for North Western WCZ and North Western Supplementary.
- UIA (reference: *i) Bower C.E. and Bidwell J.P. (1978), Ionization of ammonia in seawater: Effect of temperature, pH and salinity. J. Fish. Res. Board Can. Vol.35, pp.1012-1016; ii) K., Russo R.C. & et. al. (1975), Aqueous ammonia equilibrium calculations: effect of pH and temperature. J. Fish. Res. Board Can. Vol.32, pp.2379-2383.*) is derived by calculation:

SALTWATER FORMULAS

Un-ionized Ammonia in Saltwater

$$f_{NH_3} = \frac{1}{1 + 10^{[pK_a + 0.0324(298-T) + \frac{(0.0415)P}{T} - pH]}}$$

where,

f_{NH_3} = fraction of un-ionized ammonia

$$I = \frac{19.9273 \times S}{1000 - 1.005109 \times S} \quad (\text{from EPA 1989, formula 5, p. 2})^1$$

$$pK_a = 9.245 + 0.116 \times I$$

S = salinity (ppt)

T = temperature (°K)

P = pressure (assumed to be 1 atm)

- 5.6.32. As there is no existing local legislation to stipulate the standards or guidelines for individual heavy metal contents in the Hong Kong marine waters, the water quality standards presented in **s. 5.2.8** were used for the assessment. The same standards were also adopted in other EIA studies including the EIA study for Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction Kai Tak Development.
- 5.6.33. As shown in **Table 5.15**, concentrations of heavy metals and organic compounds from the elutriate test are all below the respective standards and do not show any levels higher than the blank sample. Adverse water quality impacts from the release of organic compounds and heavy metals are unlikely to occur during piling works on marine viaduct section.

- 5.6.34. The exceedance of TIN level at S3, S4 and S5 is because high levels of background TIN were likely attributed to the higher background level of Pearl River. The required dilution factor, which enables TIN at S4 (0.88 mg/L) to be compliant with WQO (0.5 mg/L), was calculated to be 1.76. Desktop reviews were conducted to determine the related dilution factor:
- CE 83/2001 (DS) Peng Chau Sewage Treatment Works Upgrade – Investigation, Design and Construction: The dilution factor 98 was achieved with downstream distance 4m at low velocity during wet season. The dilution factor 219.2 was achieved with downstream distance 5 m at low velocity during dry season.
 - Agreement No. CE 20/2005(DS), Review Report on EIA Study: The dilution factor at a distance of 300m was from 2,284 to 2,908 for ambient velocity from 0.05 m/s to 0.5 m/s.
- 5.6.35. Thus, it is considered that the required dilution factor of 1.76 to meet the WQO could be easily achieved, in a very short distance from piling source (less than 2m). It is concluded that no significant adverse impact would be caused due to TIN concentration.
- 5.6.36. The required dilution factor, which enables UIA at location of S4 (0.031 mg/L) to be compliant with WQO (0.021 mg/L), was calculated to be 1.48. Similarly, it's considered that the required dilution factor to meet the WQO could be very easily achieved in a short distance from piling source (less than 2m).

Operational Phase

- 5.6.37. During the operational phase, runoff from the cycle track will be conveyed into designated drainage systems. Silt trap/interceptor would be provided and maintained in the designated drainage systems to minimize water quality impact arising from surface runoff. The wastewater (i.e., sewage effluent from visitors) arising will be collected by existing sewerage pipeline of public toilets in the vicinity of the proposed cycle track. Therefore, adverse impact on water quality during operational phase is not anticipated.
- 5.6.38. The water gathering ground is approximately 300m away from the proposed cycle track ([Figure 5.1](#)). The impact on water gathering ground is not anticipated.
- 5.6.39. The viaduct section is approximately 210m in length in total. There will be 3 piles at on each pier. For conservative assessment purpose, it is assumed the pier interval would be 20m. The estimated number of piers would be 11. The total area of bore pile is $\pi\left(\frac{0.6m}{2}\right)^2 \times 3 \times \frac{210m}{20m} = 8.9m^2$. As shown in [Figure 5.1](#), within the assessment area (500m buffer zone), the nearshore marine water near Kadoorie Beach is approximate 356,059 m². The total bore piles area only takes 0.003% of nearshore marine water of Kadoorie Beach. The flow regime would not be anticipated to be changed under such circumstance.
- 5.6.40. As illustrated in the approved EIA for HATS 2A (EIAO Register No.: AEIAR-121/2008), the major pollution loads comprise of pollution from Tuen Mun typhoon shelter, and the rainfall related load via storm systems. The HATS 2A EIA also mentioned that the sewerage system would receive pollution loads from landfills and beaches (Butterfly, Castle Peak, Kadoorie, New Cafeteria, Old Cafeteria, Golden Beach). The pollution load collected from the captioned beaches are conveyed to the Pillar Point STW ultimately.
- 5.6.41. For the pollution load from Tuen Mun Typhoon Shelter (T1 indicated as below), as showed in the HATS 2A EIA, the pollution flow was projected as 138 m³/d and the BOD load was 38.6 kg/d accordingly. The pollution load from Tuen Mun Typhoon Shelter remained stable among the projection year 2014, 2021 and ultimate. The projection from HATS 2A EIA indicated that no major pollution load would be increased in the future.
- 5.6.42. For the rainfall related pollution load inventory, the projected methodology was based on the long-term rainfall data and catchment coverage information. The pollution loading complied was then distributed to appropriate discharge point (i.e., culverts, outfalls, rivers and nullahs). It is assumed that the rainfall related loading is evenly distributed amongst the major storm water discharge points within the catchment. Take the TM1 as example, the rainfall related pollution BOD load showed only 5% increase (2021 versus 2014) due to landuse change (more impermeable coverage due to development). However, the proposed cycle track will not incur significant landuse change, as

compared to the Tuen Mun Catchment level. It is therefore concluded that the proposed cycle track works will not further limit the assimilative capacity in Tuen Mun Typhoon Shelter.

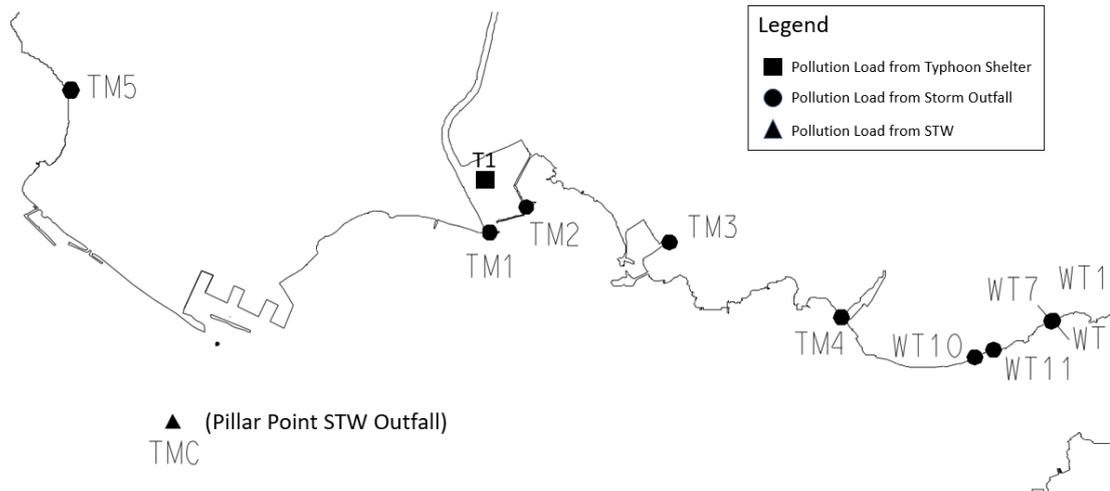


Illustration of Pollution Load – compiled from HATS 2A EIA Report

- 5.6.43. The total bore piles area only takes 0.003% of nearshore marine water of Kadoorie Beach. The flow regime would not be anticipated to be changed under such circumstance. Since no new pollution outfall will be anticipated under the Project, the potential impact to the assimilative capacity at the beaches is not anticipated.
- 5.6.44. With the installation of the drainage system and implementation of administrative measures such as regular cleaning of cycle track surface, maintenance of silt trap, etc., no additional mitigation measures are required during operational phase.

5.7. Mitigation Measures

Construction Phase

Piling Works at Marine Viaduct Section

- 5.7.1. In order to alleviate potential water quality impacts from the construction of marine viaduct section, the following mitigation measures are recommended:
 - The rate of constructing a pile is 15 m/day and 2 piles will be constructed per day; the diameter of pile is 600mm; the working hours shall be 12 hours per day from 07:00 to 19:00.
 - Cage type silt curtains (i.e. size adjustable to suit environmental condition) must be deployed with an efficiency of 75% or higher for reduction of sediment release from the bored pile installation. The engineer will review using higher efficiency silt curtain in later stage.
 - Restrict beach users from entering the piling works area.
 - Maintain close liaison with LCSD on construction works schedule of marine viaduct during swimming season from March to October.
 - No more than 1/3 of the bathing area (for each beach) shall be closed and only one side of the beach (for each beach) shall be occupied during the construction.
 - Contingency plan setup with LCSD on alert beach users if there are unpredicted sediment suspension.

Construction Site Runoff

- 5.7.2. The practices outlined in ProPECC PN 1/94 Construction Site Drainage are recommended to be adopted to minimize potential water quality impacts from construction site runoff and other construction activities. Design of mitigation measures should be submitted by the Contractor to the

Engineer for approval. The Contractor should obtain valid discharge license under the Water Pollution Control Ordinance and the discharge should comply with the terms and conditions stipulated in the license.

- 5.7.3. The mitigation measures should cover, but not limited to the following Best Management Practices:
- No construction site discharge will be allowed within 100m of the boundaries of a gazetted beach in any direction, including rivers, streams and storm drains.
 - Sand/silt removal facilities such as sand traps, silt traps and sediment basins should be provided to remove sand/silt particles from runoff to meet the requirements of the Technical Memorandum standards under the WPCO. The design of silt removal facilities should be based on the guidelines provided in ProPECC PN 1/94. All drainage facilities and erosion and sediment control structures should be inspected monthly and maintained to ensure proper and efficient operation at all times and particularly during rainstorms.
 - Work programmes should be designed to minimize the size of work areas to minimize the soil exposure soil and reduce the potential for increased siltation and runoff.
 - Boundaries of earthworks should be marked and surrounded by dykes or embankments for flood protection, as necessary.
 - Silt removal facilities, channels and manholes should be maintained and cleaned regularly to ensure the proper function.
 - Water pumped out from excavations should be discharged into silt removal facilities.
 - Careful programming of the works to minimize soil excavation during the rainy season; If excavation of soil cannot be avoided during the wet season (April to September), exposed slope surfaces should be covered by a tarpaulin or other means. Other measures that need to be implemented before, during, and after rainstorms are summarized in ProPECC PN 1/94.
 - Earthwork surfaces should be well compacted and the subsequent permanent work or surface protection should be carried out immediately after the final surfaces are formed.
 - Open stockpiles of construction materials on site should be covered with tarpaulin or similar fabric during rainstorms.
 - Wastewater generated from the washing down of mixer trucks and drum mixers and similar equipment should wherever practicable be recycled. The discharge of wastewater should be kept to a minimum.
 - To prevent pollution from wastewater overflow, the pump sump of any water recycling system should be provided with an on-line standby pump of adequate capacity and with automatic alternating devices.

Sewage Effluent from on-site Workforce

- 5.7.4. Portable chemical toilets and sewage holding tanks should be provided for handling the construction sewage generated by the workforce. A licensed contractor should be employed to provide appropriate and adequate portable toilets to cater populations and be responsible for appropriate disposal and maintenance.
- 5.7.5. Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the nearby environment during the construction phase of the Project. Regular environmental audit on the construction site should be conducted to provide an effective control of any malpractices and achieve continual improvement of environmental performance on site. It is anticipated that sewage generation during the construction phase of the Project would not cause water quality impact after undertaking all required measures.
- 5.7.6. With good control of domestic sewage, unacceptable water quality impacts from the workforce sewage are not anticipated to occur.

General Construction Activities

- 5.7.7. Good site practices should be adopted to clean the rubbish and litter on construction sites to avoid the rubbish, debris and litter from entering to nearby water bodies. It is recommended to clean the construction sites on a regular basis.

- 5.7.8. Wastewater generated from the washing down of mixer trucks and drum mixers and similar equipment should wherever practicable be recycled. The discharge of wastewater should be kept to a minimum.
- 5.7.9. To prevent pollution from wastewater overflow, the pump sump of any water recycling system should be provided with an on-line standby pump of adequate capacity and with automatic alternating devices.
- 5.7.10. Under normal circumstances, surplus wastewater may be discharged into foul sewers after treatment in silt removal and pH adjustment facilities (to within the pH range of 6 to 10). Disposal of wastewater into stormdrains will require more elaborate treatment. Surface run-off should be segregated from the concreting works area as much as possible, and diverted to the stormwater drainage system. Surface run-off contaminated by materials during concreting works should be adequately treated before disposal into stormwater drains.

Accidental Spillage of Chemicals

- 5.7.11. Illegal disposal of chemicals should be strictly prohibited. Registration to EPD as a CWP (Chemical Waste Producers) is required if chemical wastes are generated and need to be disposed of. Disposal of chemical wastes should be carried out in compliance with the Waste Disposal Ordinance (WDO). The Code of Practice on Packaging, Labelling and Storage of Chemical Wastes published under the WDO should be used as a guideline for handling chemical wastes.
- 5.7.12. Oils and fuels should only be used and stored in designated areas which have pollution prevention facilities. To prevent spillage of fuels and solvents to any nearby storm water drains, fall tanks and storage areas should be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank. The bund should be drained of rainwater after a rain event.

Operational Phase

- 5.7.13. The ProPECC PN 5/93 is applicable to the Project during the operational phase. Runoff from the cycle track will be conveyed into designated drainage systems. Silt trap/interceptor would be provided and maintained in the designated drainage systems to minimize water quality impact arising from surface runoff. The wastewater (i.e., sewage effluent from visitors) arising will be properly conveyed into existing sewerage system. The administrative measures such as regular cleaning of cycle track surface, maintenance of silt trap, etc. would be in place. Therefore, adverse impact on water quality during operational phase is not anticipated.

5.8. Evaluation of Residual Impacts

- 5.8.1. With implementation of recommended mitigation measures during both construction and operational phases, it is anticipated that unacceptable residual impact on water quality would not arise.

5.9. Environmental Monitoring and Audit Requirement

- 5.9.1. Monitoring and auditing for marine water quality during construction would be necessary. A monitoring and audit programme aims to ensure that the released SS concentrations from the piling activities at marine viaduct sections would not adversely affect the water sensitive receivers.
- 5.9.2. This monitoring programme would be used to assess the effectiveness of mitigation measures during construction. If the monitoring results indicate that the piling activities have resulted in exceedance of the predicted elevated SS concentrations even after the implementation of the recommended mitigation measures, the construction programme should be carefully reviewed to reduce the impact.
- 5.9.3. Details of the recommended water quality monitoring requirements and regular audit during construction phase are included in the separated EM&A Manual.

5.10. Conclusion

Construction Phase

- 5.10.1. The proposed piling activities at marine viaduct sections may cause dispersion of sediment and fine material due to bored pile installation and drilling process, with possible consequences of reducing dissolved oxygen levels. The elevated SS concentration shows that the non-compliance would disappear rapidly after 5m away from the piling work source with mitigation measures. The prediction indicates the suspended solids release during piling works would not have significant adverse impact to nearby WSRs. It is concluded that no significant Dissolved Oxygen Depletion would occur at all the identified WSRs during both the dry and wet seasons, respectively. The release of organic compounds, heavy metals and nutrients during piling was predicted to be negligible.
- 5.10.2. Site runoff, general construction activities, sewage arising from the workforce, and spillage of chemicals are not expected to cause adverse water quality impacts, provided that proper mitigation measures are implemented.

Operational Phase

- 5.10.3. The ProPECC PN 5/93 is applicable to the Project during the operational phase. Runoff from the cycle track will be conveyed into designated drainage systems. Silt trap/interceptor would be provided and maintained in the designated drainage systems to minimize water quality impact arising from surface runoff. The wastewater (i.e., sewage effluent from visitors) arising will be properly conveyed into existing sewerage system. The administrative measures such as regular cleaning of cycle track surface, maintenance of silt trap, etc. would be in place. Therefore, adverse impact on water quality during operational phase is not anticipated.

6. Waste Management Implications

6.1. Introduction

- 6.1.1. This section presents the waste management implications of the Project based on the criteria and guidelines stated in Annex 7 and Annex 15 of the EIAO-TM and has covered the scope outlined in Section 3.4.7 of the EIA Study Brief No. ESB-295/2016.
- 6.1.2. This section identifies the types of wastes that are likely to be generated during the construction and operational phases of the Project and evaluates the potential environmental impacts that may result from these wastes. The primary waste arising will be generated during the construction phase. During the operational phase, only general refuse will be expected. Mitigation measures and good site practices, including waste handling, storage and disposal, are recommended with reference to the legislation and guidelines that are relevant to waste management and disposal.

6.2. Relevant Legislations, Standards & Guidelines

- 6.2.1. In carrying out this assessment, reference has been made to the following relevant Hong Kong legislation governing waste management and disposal:
- The Waste Disposal Ordinance (WDO) (Cap. 354) and subsidiary legislation such as the Waste Disposal (Chemical Waste) (General) Regulation that set out requirements for the storage, handling and transportation of various types of waste;
 - Dumping at Sea Ordinance (Cap. 466);
 - Land (Miscellaneous Provisions) Ordinance (Cap. 28); and
 - Public Health and Municipal Services Ordinance (Cap. 132) – Public Cleansing and Prevention of Nuisances Regulation – control of disposal of general refuse.
- 6.2.2. Other relevant documents and guidelines that are applicable to waste management and disposal in Hong Kong include:
- Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992)
 - Development Bureau Technical Circular (DB TC) (Works) No. 6/2010 Trip Ticket System for Disposal of Construction and Demolition Materials;
 - DB TC (Works) No. 8/2010, Enhanced Specification for Site Cleanliness and Tidiness;
 - Environment, Transport and Works Bureau (ETWB) Technical Circular (Works) No. 19/2005, Environmental Management on Construction Sites;
 - ETWB Technical Circular (Works) No. 22/2003 and 22/2003A, Additional Measures to Improve Site Cleanliness and Control Mosquito Breeding on Construction Sites;
 - ETWB Technical Circular (Works) No. 34/2002, Management of Dredged/Excavated Sediment;
 - Works Bureau TC No. 2/93, Public Dumps;
 - Works Bureau TC No. 2/93B, Public Filling Facilities; and
 - Project Administration Handbook for Civil Engineering Works, 2020

Waste Management

- 6.2.3. The Waste Disposal Ordinance (WDO) prohibits the unauthorised disposal of wastes. Construction waste is defined as any substance, matter or thing that is generated from construction work and abandoned, whether or not it has been processed or stockpiled before being abandoned, but does not include any sludge, screenings or matter removed in or generated from any desludging, desilting or dredging works. Under the WDO, wastes can be disposed of only at designated waste disposal facilities.
- 6.2.4. Under the WDO, the Waste Disposal (Chemical Waste) (General) Regulation provides regulations for chemical waste control, and administers the possession, storage, collection, transport and disposal of chemical wastes. EPD has also issued a guideline document, the Code of Practice on the

Packaging, Labelling and Storage of Chemical Wastes (1992), which details how the Contractor should comply with the regulation if chemical wastes are produced.

- 6.2.5. Public Cleansing and Prevention of Nuisances Regulation provides control on illegal tipping of wastes on unauthorised (unlicensed) sites.

Construction and Demolition (C&D) Materials

- 6.2.6. The current policy related to the disposal of C&D materials is documented in the Works Branch Technical Circular No. 2/93, 'Public Dumps'. Construction and demolition materials that are wholly inert, namely public fill, should not be disposed of to landfill, but taken to public filling areas, which usually form part of reclamation schemes. The Land (Miscellaneous Provisions) Ordinance requires that dumping licenses be obtained by individuals or companies who deliver public fill to public filling areas. The Civil Engineering & Development Department (CEDD) issues the license under delegated powers from the Director of Lands.
- 6.2.7. Under the Waste Disposal (Charges for Disposal of Construction Waste) Regulation, construction waste delivered to a landfill for disposal must not contain more than 50% by weight of inert material. Construction waste delivered to a sorting facility for disposal must contain more than 50% by weight of inert material, and construction waste delivered to a public fill reception facilities for disposal must consist entirely of inert material.
- 6.2.8. The ETWB TC(W) No. 19/2005 "Environmental Management on Construction Sites" includes procedures on waste management requiring contractors to reduce the C&D materials to be disposed of during the course of construction. According to the Project Administration Handbook for Civil Engineering Works, 2020 Edition Section 4.1.3, "Construction and Demolition Materials", submission of C&D Materials Management Plan (C&DMMP) is not required for project which generates less than 50,000 m³ of C&D materials including rock or which requires imported fill less than 50,000 m³. Under ETWB TC(W) No. 19/2005, the Contractor is required to prepare and implement an Environmental Management Plan (EMP) and the Waste Management Plan (WMP) becomes part of the EMP. The EMP with Waste Management Plan will be submitted to Architect/ Engineer for approval before construction works.

Chemical Waste

- 6.2.9. Under the Waste Disposal (Chemical Waste) (General) Regulations, all producers of chemical waste must register with EPD and treat their wastes, either utilising on-site plant licensed by EPD, or arranging for a licensed collector to transport the wastes to a licensed disposal facility. The regulation also prescribes the requirements of storage facilities to be provided on site, including labelling and warning signs, and requires the preparation of written procedures and training to deal with emergencies such as spillages, leakages or accidents arising from the storage of chemical wastes.

6.3. Waste Generation and Potential Impacts

Construction Phase

- 6.3.1. The construction activities to be carried out for the Project will result in the generation of a variety of wastes which can be divided into distinct categories based on their composition and ultimate method of disposal. The identified waste types include:
- Construction and Demolition (C&D) materials;
 - Chemical waste; and
 - General refuse.
- 6.3.2. No marine sediment is anticipated from the Project. Ground investigation record in the vicinity indicated that no marine sediment is anticipated within the viaduct section, for which foundation excavation is required. Location plan of ground investigation record is provided in [Figure 6.1](#) and ground investigation record in the vicinity is provided in [Appendix 6-1](#).

6.3.3. The nature of each type of waste arising, and an evaluation of the potential environmental impacts associated with these waste arisings are provided below.

Construction and Demolition Material

6.3.4. Construction and demolition (C&D) material would be generated from the construction of cycle track and associated works as below:

- Construction of cycling bridge;
- Building works; and
- Cycle track.

6.3.5. The C&D materials that are generated will be reused on site as far as practicable. The volume of the inert C&D materials has been estimated by the Project design consultant to be approximately 5289 m³ of which 617 m³ would be reused on site, 4,672 m³ would be disposed of at public fill reception facilities for reuse in future. Inert C&D material would be reused on-site as far as practicable before exporting off-site for reuse at other concurrent projects or delivered to Public Fill Reception Facilities for beneficial use in other projects. Public Fill Reception Facilities for receiving surplus inert C&D materials will be assigned by CEDD Public Fill Committee at a later stage. It is anticipated that inert C&D materials from the Project will be disposed of at Tuen Mun Area Area 38 (TM38) Fill Bank, which is closest to the Project Area.

6.3.6. Reusable materials (metal, paper, etc) should be separated and recycled as far as practicable. Upon exhaustion of reuse/ recycling effort, 48 m³ of non-inert C&D materials would be disposed of to designated landfill. Landfill for disposal of non-inert C&D materials will be assigned by EPD at a later stage. It is anticipated that non-inert C&D materials from the Project will be disposed of at West New Territories (WENT) Landfill, which is closest to the Project Area. The estimated quantities of C&D material to be generated, to be re-used, and to be disposed of are summarised in **Table 6.1**.

Table 6.1 Quantity of inert and non-inert C&D materials

Construction Activity	Total C&D Materials (m ³)	Inert C&D Materials (e.g. soil, rock, concrete) (m ³)	Non-inert C&D Materials (m ³)	Reusable Backfill (m ³)	Volume of inert C&D Materials to be Disposed (m ³)
Construction of cycling bridge	127	114	13	0	114
Building works	350	315	35	20	295
Cycle track	4860	4860	0	597	4263
Total	5337	5289	48	617	4672

Chemical Waste

6.3.7. Plant and machineries maintenance will generate a small amount of chemical waste during the construction period that will require disposal. Typically, these include:

- Solid wastes, (Spent fuel/lubricant drums, used oil/air filters and scrap batteries); and
- Liquid wastes, such as, waste oils/grease, spent solvents/detergents, which may be halogenated, and possibly spent acid/alkali from battery maintenance.

6.3.8. The volume of chemical waste that will be generated will depend upon the total number of plant and vehicles, and how much maintenance actually required to be carried out on site by the Contractor.

6.3.9. In view of the small number of plant expected to be required for the works, it is anticipated that the quantity of chemical waste to be generated would be small and in the order of 50 litres per month. Given the small quantities anticipated and provided that the waste is properly handled, stored and disposed of in accordance with the Waste Disposal (Chemical Waste) (General) Regulation, no unacceptable impact is expected.

General Refuse

- 6.3.10. The exact number of workforces to be employed for the Project is not available at this stage, the maximum number of workforces to be employed is expected to be 200 workers per day. Based on a generation rate of 0.65kg per worker per day, the maximum refuse generated by the workforces per day would be 130 kg/day. The construction workforce will generate refuse such as waste papers, plastic packaging and possibly food wastes throughout the construction phase. Recycling bins for waste paper, aluminium can should be provided to maximize reuse and recycle volume. Other non-recyclable general refuse will be collected on-site, separately from C&D materials by an appropriate waste collector employed by the Contractor. It is expected that no canteen will be provided on-site.
- 6.3.11. Prior to disposal at landfills, such wastes will have to be temporarily put in a suitably covered storage area where it will have to be regularly cleaned and maintained to avoid attracting vermin and pests. With proper on-site handling and storage as well as regular disposal of these wastes, no adverse impacts will be envisaged.
- 6.3.12. A summary of the expected waste arisings is provided in **Table 6.2**.

Table 6.2 Summary of Waste Generation during Construction Phase

Material Type	Likely time of arising	Estimated rate of generation	Estimated total quantity	Proposed Disposal / Treatment Site#
Inert C&D material	construction of cycle track and associated works	31 m ³ / day	4,672 m ³	Public Fill Reception Facility (e.g. TM38 Fill Bank)
Non-inert C&D materials	construction of cycle track and associated works	1.5 m ³ / day	48 m ³	Landfill e.g. WENT Landfill
Chemical waste arising from machineries	Throughout construction	50 litre / month	Depends on actual need of maintenance works	Chemical Waste Treatment Centre or other licensed chemical waste treatment/ disposal facilities
General refuse (generated by site staff)	Throughout construction	130 kg / day	Depends on actual number of workers	Landfill e.g. WENT Landfill
Note # The actual disposal outlet maybe subject to the agreement of CEDD/EPD.				

Transportation Arrangement for Waste Disposal during Construction Phase

- 6.3.13. It is anticipated that no barging points or conveyor systems will be established in the Project area. Inert C&D materials, non-inert C&D materials, general refuse and chemical waste are expected to be carried by land transport to the disposal outlets. The tentative transportation routings for the disposal of each waste type generated during the construction phase are shown in **Table 6.3**. The transportation routings may change subject to the actual traffic conditions of the roads.
- 6.3.14. The following mitigation measures should be implemented for the transportation of waste:
 - Proper wheel washing before leaving the site;
 - Use of water tight containers;
 - Use of dump truck cover; and
 - Use of licensed chemical waste collector (for chemical waste).

Table 6.3 Tentative Transportation Routings for Waste Disposal During Construction Phase

Waste Type	Tentative Disposal Outlet#	Frequency	Tentative Transportation Routing
General refuse and non-inert C&D materials	WENT Landfill	maximum of 2 trip of truck per day	Via Castle Peak Road (Castle Peak Bay), Hoi Wing Road, Wu Shan Road and Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road
Inert C&D material	TM Area 38 Fill Bank	Maximum of 6 trip of truck per day	Via Castle Peak Road (Castle Peak Bay), Hoi Wing Road, Wu Shan Road and Lung Mun Road
Chemical Waste	Chemical Waste Treatment Centre	Approximately 1 trip every 2 months	Via Castle Peak Road (Castle Peak Bay), Castle Peak Road (Tai Lam), Tuen Mun Road, Tsuen Wan Road, Kwai Tsing Road and Tsing Yi Road
Note: # The actual disposal outlet maybe subject to the agreement of CEDD/EPD.			

Operational Phase

- 6.3.15. General refuse would arise primarily from the users of the cycle track and the supporting facilities. With reference to the Monitoring of Solid Waste in Hong Kong 2020, the domestic waste disposal rate is 0.91 kg per capita per day in 2020. Assuming the number of daily visitors will be about 70, the estimated quantity of waste generated during operation will be approximately 64 kg per day. Waste would include food, paper, wood, plastic, etc.
- 6.3.16. General refuse should be removed on a daily basis to minimize potential odour, pest and litter impacts. General refuse will have to be temporarily put in a suitably covered refuse collection point where it will have to be regularly cleaned and maintained to avoid attracting vermin and pests. With proper on-site handling and storage as well as regular disposal of these wastes, no adverse impacts will be envisaged.
- 6.3.17. General refuse will be removed daily at refuse collection point and by means of refuse collection vehicle. With reference to the estimated quantity, one trip of collection per day will be sufficient for the collection of all general refuse to the WENT landfill. The tentative transport routing is shown below:
- Via Castle Peak Road (Castle Peak Bay), Hoi Wing Road, Wu Shan Road and Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road*
- 6.3.18. Given this small daily number of vehicle trips, no adverse impacts will be envisaged.

6.4. Mitigation Measures

Waste Management Practice during Construction Phase

- 6.4.1. It is not anticipated that adverse waste management related impacts would arise, provided that good site practices are adhered to. In line with Government's position on waste minimisation, the practice of avoiding and minimising waste generation and waste recycling should be adopted as far as practicable as below:
- An on-site environmental co-ordinator employed by the Contractor should be identified at the outset of the works. Prior to commencement of Project works, the co-ordinator shall prepare a WMP in accordance with the requirements set out in the ETWB TC(W) No. 19/2005, Waste Management on Construction Sites, for the Engineer Representative (ER) 's approval. The WMP shall include monthly and yearly Waste Flow Tables (WFT) that indicate the amounts of waste

generated, recycled and disposed of (including final disposal site), and which should be regularly updated;

- The Contractor's waste management practices and effectiveness shall also be audited by the ER on regular basis;
- The reuse/ recycling of all materials on site shall be investigated and exhausted prior to treatment/ disposal off-site. Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;
- Encourage collection of aluminium cans, paper and plastic bottles by providing separate labelled bins to enable these wastes to be segregated from other general refuse generated by the workforce;
- Plan and stock construction materials carefully to minimize amount of waste generated and avoid unnecessary generation of waste;
- Good site practices shall be adopted from the commencement of works to avoid the generation of waste, to reduce cross contamination of waste and to promote waste minimisation;
- Toolbox talks should be provided to workers about the concepts of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycling; and
- The Contractor shall comply with all relevant statutory requirements and guidelines and their updated versions that may be issued during the course of project construction.

6.4.2. Recommended mitigation measures to be implemented throughout the course of the construction of the Project include:

C&D Materials

- All C&D materials shall be sorted on-site into inert and non-inert C&D materials, and where the materials can be recycled or reused, they shall be further segregated. Inert material, or public fill, will comprise stone, rock, masonry, brick, concrete and soil which is suitable for land reclamation and site formation whilst non-inert C&D materials include all other wastes generated from the construction process such as plastic packaging and vegetation (from site clearance).
- The Contractor shall be responsible for identifying what materials can be recycled/ reused, whether on-site or off-site. In the event of the latter, the Contractor shall make arrangements for the collection of the recyclable materials. Any remaining non-inert C&D materials shall be collected and disposed of at landfills whilst any inert C&D materials shall be re-used on site as far as possible. Alternatively, if no use of the inert material can be found on-site, the materials can be delivered to a Public Fill Reception Facilities after obtaining the appropriate licence.
- In order to monitor the disposal of C&D materials and solid wastes at public filling facilities and landfills, and control fly-tipping, a trip-ticket system shall be implemented by the Contractor, in accordance with the contract and the requirements of DB TC (Works) No. 6/2010 Trip Ticket System for Disposal of Construction and Demolition Materials.
- Prior to disposal off-site, non-inert C&D materials will have to be temporarily put in a suitably covered storage area where it will have to be regularly cleaned and maintained to avoid attracting vermin and pests. With proper on-site handling and storage as well as regular disposal of these wastes, no adverse impacts will be envisaged.
- Dump trucks with mechanical cover shall be used to minimize windblown litter and dust during transportation of waste.

Chemical Waste

- Under the Waste Disposal (Chemical Waste) (General) Regulation, the Contractor shall be registered as a Chemical Waste Producer if chemical wastes such as spent lubricants and paints are generated on site. Only licensed chemical waste collectors shall be employed to collect chemical waste generated at site. The handling, storage, transportation and disposal of chemical wastes shall be conducted in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes and A Guide to the Chemical Waste Control Scheme, both published by EPD.

General Refuse

- A sufficient number of covered bins shall be provided on site for the containment of general refuse to prevent visual impacts and nuisance to the sensitive surroundings. These bins shall be cleared

daily and the collected waste disposed of to the refuse transfer stations or landfills. Further to the issue of DB TC (Works) No. 8/2010 Enhanced Specification for Site Cleanliness and Tidiness, the Contractor is required to maintain a clean and hygienic site throughout the project works.

Waste Management Practice During the Operational Phase

- 6.4.3. Waste collection facilities (e.g. litter bins) will be included in the design of the supporting facilities, and at regular intervals along the route. The Government Department responsible for managing the facilities will be responsible for arranging for regular collection of litter from these facilities. Separate collection bins shall be provided for aluminium cans, plastic drinks bottles and paper wastes, which will facilitate recycling of these waste streams.
- 6.4.4. General refuse should be removed on a daily basis to minimize potential odour, pest and litter impacts. General refuse will have to be temporarily put in a suitably covered refuse collection point where it will have to be regularly cleaned and maintained to avoid attracting vermin and pests.

6.5. Residual Impacts

- 6.5.1. With the implementation of recommended mitigation measures, in particular the establishment and implementation of a Waste Management Plan, no residual impacts are expected to occur during either the construction or operation of the Project.

6.6. Environmental Monitoring and Audit Requirements

- 6.6.1. It is recommended that during the construction phase, site inspections and supervisions of waste management procedures and auditing of the effectiveness of implemented mitigation measures should be undertaken on a regular basis (e.g. weekly as a minimum). These tasks shall be scheduled in the WMP to be prepared by the Contractor, and a summary of the site audits shall be presented in the EM&A reports.
- 6.6.2. Given the nature of use of the project, there is no EM&A requirement considered necessary during the operational phase.

6.7. Conclusion

- 6.7.1. The construction activities associated with the proposed works will generate a variety of wastes including inert and non-inert C&D materials, chemical waste and general refuse.
- 6.7.2. In view of the Government policy towards the promotion of recycling schemes and the clear environmental benefits this will provide, recycling and waste reduction by site staff/ contractors (construction phase) should be encouraged.
- 6.7.3. Whilst an estimate has been made on the likely volumes and types of waste to be generated from the construction of the project, the Contractor should regularly update and submit the details of their WMP, including monthly and yearly WFT, which would provide a more accurate estimate on volumes of waste generation on-site.
- 6.7.4. Good waste management practices have been recommended to prevent and minimize any adverse environmental impacts from the handling and disposal of construction and operational wastes. It is concluded that no unacceptable environmental impacts will result from the storage, handling, collection, transport, and disposal of wastes arising from the construction and operation of the Project.

7. Land Contamination

7.1. Introduction

7.1.1. This section presents assessment of land contamination of the Project based on guidelines stated in Annex 19 of the EIAO-TM and has covered the scope outlined in Section 3.4.7 of the EIA Study Brief No. ESB-295/2016.

7.2. Relevant Standards & Guidelines

7.2.1. This section is prepared in accordance with the following EPD-issued publications applicable to land contamination:

- Annex 19 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM);
- Guidance Note for Contaminated Land Assessment and Remediation (Guidance Note);
- Guidance Manual for Use of Risk-based Remediation Goals (RBRGs) for Contaminated Land Management (Guidance Manual); and
- Practice Guide for Investigation and Remediation of Contaminated Land (Practice Guide).

7.2.2. The Guidance Note sets out the EPD requirements for the assessment and management of potentially contaminated sites, provides guidelines on how site assessments should be conducted and suggests practical remedial measures that can be adopted for the remediation of a contaminated site.

7.2.3. The Guidance Manual provides the background of the use of the RBRGs and presents instructions for the comparison of soil data that is collected to the appropriate RBRGs.

7.2.4. The Practice Guide outlines the process for conducting land contamination assessments and remediation projects in Hong Kong. The Practice Guide presents the standard investigation methods and remediation strategies for the range of potential contaminated sites and the contaminants that are typically encountered in Hong Kong.

7.3. Description of Existing Environment

7.3.1. Site inspections were conducted in March 2017, April 2017, November 2020 and December 2021. The proposed cycle track will be constructed generally alongside the existing roads. Starting from Kwun Tsing Road, it will run along the roadside footpath of Castle Peak Road – Castle Peak Bay. The alignment turns southwest near Blessing Villa and runs along the back of Cafeteria New Beach and Cafeteria Old Beach. It will then run on a viaduct section along the seashore between Cafeteria Old Beach and Kadoorie Beach, after which it turns into Tsing Yan Street at-grade to join Castle Peak Road – Castle Peak Bay near Pine Villas. The alignment would then run northwest along the existing roadside footpath and planting areas until Ki Lun Kong Public Park, where the main alignment continues west onto Hoi Wing Road and a branch-off alignment continues north along Castle Peak Road – Castle Peak Bay up to Hin Fat Lane. Except for the sections running near bathing beaches, the cycle track alignment sites are located in developed areas including roads, paved area of residential areas, roadside planters, rest gardens, BBQ sites and public carparks.

7.4. Review of Aerial Photographs and Historical Land Use

7.4.1. Historical aerial photographs (1963 to 2020) have been reviewed. The relevant aerial photographs reviewed are presented in [Appendix 7-1](#). Information obtained from the review of the historical aerial photographs are summarized in [Table 7.1](#) below.

Table 7.1 Review of Historical Aerial Photographs

Year	Description of Land Use	Potential Contamination (Yes/No)
1963	The proposed cycle track and footpath was situated mainly along Castle Peak Road – Castle Peak Bay, beaches and along the shoreline and some low-rise residential area. The alignment on Hoi Wing Road was not reclaimed yet and was part of the Castle Peak Bay near Mouse Island. (refer to Figure 1A – 1D of Appendix 7-1)	No
1973	Observation on proposed cycle track and footpath was similar to 1963. Some new land was formed near Sam Shing Estate. (refer to Figure 2A – 2D of Appendix 7-1)	No
1982	Observation on proposed cycle track and footpath was similar to 1973. Sam Shing Estate was reclaimed and built. Some new land was formed and connecting the Mouse Island to mainland. A typhoon shelter was observed near Mouse Island. The alignment on Hoi Wing Road was situated on the newly reclaimed land and typhoon shelter. Some new high-rise residential area near the northern end of the alignment was first observed. (refer to Figure 3A – 3D of Appendix 7-1)	No
1987	Observation on proposed cycle track and footpath between So Kwun Wat and Sam Shing Estate was similar to 1982. The typhoon shelter near Mouse Island was undergoing reclamation. The low-rise residential area at the northern end of the alignment was being vacated. (refer to Figure 4A – 4D of Appendix 7-1)	No
1993	Observation on proposed cycle track and footpath between So Kwun Wat and Sam Shing Estate was similar to 1987. Hoi Wing Road was reclaimed. Some new high-rise residential buildings (i.e. Handsome Court, Alpine Garden and Harvest Garden) was first observed. (refer to Figure 5A – 5D of Appendix 7-1)	No
2001	Observation on proposed cycle track and footpath was similar to 1993 except a car park was observed at the junction of Hoi Wing Road and Castle Peak Road – Castle Peak Bay. (refer to Figure 6A – 6D of Appendix 7-1)	No
2008	Observation on proposed cycle track and footpath was similar to 2001. (refer to Figure 7A – 7D of Appendix 7-1)	No
2014	Observation on proposed cycle track and footpath was similar to 2008 except a construction site office was observed at the junction of Hoi Wing Road and Castle Peak Road – Castle Peak Bay. (refer to Figure 8A – 8D of Appendix 7-1)	No
2020	Observation on proposed cycle track and footpath was similar to 2014 except a car park was observed at the junction of Hoi Wing Road and Castle Peak Road – Castle Peak Bay. (refer to Figure 9A – 9D of Appendix 7-1)	No

7.4.2. The proposed cycle track alignment area is predominantly located on built areas near beaches and shoreline, and alongside roads including Castle Peak Road – Castle Peak Bay and Hoi Wing Road. Castle Peak Road – Castle Peak Bay and the beaches were already observed in year 1963. The Sam Shing Estate area was a coastal sea area in 1963. Land was formed in this area in the 70's and Sam Shing Estate is observed to have been constructed in the 80's. No significant change in land

use of the cycle track alignment areas in comparison with the land use since 1963. No potential land contaminating land use was identified based on previous land use.

7.5. Review of Environmental Information from Government Departments

- 7.5.1. The Environmental Protection Department was contacted in March 2017, December 2020 and January 2022 to obtain the chemical spillage/leakage incident records within the Project areas. EPD Regional Office (West) replied that there were no chemical leakage/spillage records within the Project areas. The correspondence with EPD is provided in [Appendix 7-2](#).
- 7.5.2. Registration of Chemical Waste Producers (CWPs) was also reviewed at EPD office on 19th June 2017 and 29th January 2021. According to the EPD's records, there are no current valid registered CWPs located inside the Project areas. Nine valid registered CWPs were found in the vicinity of the Project and outside the Project areas. Details are provided in **Table 7.2**.

Table 7.2 Review of Chemical Waste Producers for Project Site

Site ID	License Name	Premises Address	Nature of Business
CWP1	LCSD	Cafeteria New Beach, 18.5 Milestone, Castle Peak Road, Tuen Mun, N.T.	Public bathing services
CWP2	The Director of Leisure and Cultural Services	Cafeteria Old Beach, 18 3/4 Milestone, Castle Peak Road, Tuen Mun, N.T.	Public bathing services
CWP3	LCSD	Golden Beach, 18.5 Milestone, Castle Peak Road, Tuen Mun, N.T.	Public bathing services
CWP4	The Director of Leisure and Cultural Services	Kadoorie Beach, 18 3/4 Milestone, Castle Peak Road, Tuen Mun, N.T.	Public bathing services
CWP5	The Director of Leisure and Cultural Services	Castle Peak Beach, 19 Milestone, Castle Peak Road, Tuen Mun, N.T.	Public bathing services
CWP6	The Hong Kong Ice & Cold Storage Co. Ltd.	TMTL 120, 11 Sam Shing Street, Tuen Mun, N.T.	Manufacturing & sales of ice
CWP7	Hong Kong Christian Service Pui Oi School	Area 39, Hin Fat Lane, Tuen Mun, N.T.	School
CWP8	Luen Yau Hardware Machinery Engineering Co. Limited	CLP Power Hong Kong Ltd (Tuen Mun Substation), Castle Peak Road and Tuen Hing Road, Tuen Mun, N.T.	Removal of switchboard
CWP9	Hip Hing Co. Ltd.	Tuen Mun Substation, CPTL No. 59, Castle Peak Road, Area 39, Tuen Mun, N.T.	Construction site

- 7.5.3. According to site visit findings, no chemical waste production activities were identified within or near the Project areas.
- 7.5.4. Fire Services Department was contacted in March 2017, December 2020 and January 2022 to obtain Dangerous Goods License record and incident record. FSD replied that there were no Dangerous Goods Licence records or incident records in the Project areas. The correspondence with FSD is provided in [Appendix 7-3](#).
- 7.5.5. The current Tuen Mun Outline Zoning Plan (S/TM/35) and planning application records from the Town Planning Board have been looked up and the zoning of the works area of the Project, and application of change of land use, if any, have been identified.
- 7.5.6. The proposed cycle track will run along roadside and areas zoned as "Open Space". There is no application for planning permission recorded for the Project areas.

7.6. Site Reconnaissance

- 7.6.1. Site reconnaissance was conducted in March 2017, April 2017, November 2020 and December 2021. Photos taken during the site visits to the Project areas are given in [Appendix 7-4](#). The site walkover checklist for November 2020 is provided in [Appendix 7-5](#).
- 7.6.2. The proposed cycle track will be constructed generally alongside the existing roads. Starting from Kwun Tsing Road, it will run along the roadside footpath of Castle Peak Road – Castle Peak Bay. The alignment turns southwest near Blessing Villa and runs along the back of Cafeteria New Beach and Cafeteria Old Beach. It will then run on a viaduct section along the seashore between Cafeteria Old Beach and Kadoorie Beach, after which it turns into Tsing Yan Street at-grade to join Castle Peak Road – Castle Peak Bay near Pine Villas. The alignment would then run northwest along the existing roadside footpath and planting areas until Ki Lun Kong Public Park, where the main alignment continues west onto Hoi Wing Road and a branch-off alignment continues north along Castle Peak Road – Castle Peak Bay up to Hin Fat Lane. Except for the sections running near bathing beaches, the cycle track alignment sites are located in developed urban areas including roads, paved area of residential areas, roadside planters, rest gardens, BBQ sites and public carparks. Based on this cycle track alignment, it will run through developed residential areas and bathing beaches where no potential land contaminative activities were identified.

7.7. Requirements for Site Investigation prior to Construction

No potentially contaminated sites within the Project boundary have been identified based upon a review of historical aerial photos, information obtained from the FSD and EPD and information collected during the site visit. Migration of land contaminants, if any, from offsite potentially contaminated sites to the Project works area is considered to be unlikely. Therefore, no further site investigation for land contamination is required.

8. Ecology

8.1. Introduction

8.1.1. This section presents the Ecological Impact Assessment (EcolA) of the Project based on the criteria and guidelines stated in Annex 8 and Annex 16 of the EIAO-TM and has covered the scope outlined in Section 3.4.8 of the EIA Study Brief No. ESB-295/2016.

8.2. Relevant Legislations, Standards & Guidelines

8.2.1. Regulations that are relevant to this Ecological Impact Assessment (EcolA) include the following:

- Forests and Countryside Ordinance (Cap. 96) and its subsidiary legislation, the Forestry Regulations (Cap. 96A);
- Wild Animals Protection Ordinance (Cap. 170);
- Country Parks Ordinance (Cap. 208) and its subsidiary legislation;
- Marine Parks Ordinance (Cap. 476);
- Environmental Impact Assessment Ordinance (Cap. 499) and the associated TM; and
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) and its subsidiary legislation.

8.2.2. This EcolA also makes reference to the following guidelines and standards:

- Hong Kong Planning Standards and Guidelines (HKPSG) Chapter 10, "Conservation";
- PELB Technical Circular 1/97 / Works Branch Technical Circular 4/97, "Guidelines for Implementing the Policy on Off-site Ecological Mitigation Measures";
- EIAO Guidance Note No. 3/2010 – Flexibility and Enforceability of Mitigation Measures Proposed in an EIA Report;
- EIAO Guidance Note No. 6/2010 - Some Observations on Ecological Assessment from the Environmental Impact Assessment Ordinance Perspective;
- EIAO Guidance Note No. 7/2010 – Ecological Baseline Survey for Ecological Assessment;
- EIAO Guidance Note No. 10/2010 – Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys; and
- EIAO Guidance Note No. 11/2010 – Methodologies for Marine Ecological Baseline Surveys.

8.2.3. This EcolA also makes reference to the following Mainland legislation:

- List of State Protected Wild Animals, promulgated by the State Council 國家重點保護野生動物名錄; and
- List of Wild Plants under State Protection 國家重點保護野生植物名錄.

8.2.4. Other international conventions and guidelines that are relevant to this EcolA include the following:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora ("CITES"). This Convention regulates international trade in animal and plant species considered to be at risk from such trade. Depending on the degree of threat posed by international trade, CITES classifies endangered species of animals and plants into three Appendices. Appendix I includes highly endangered species threatened with extinction. Commercial trade in specimens of these species is prohibited. Appendix II includes species which are not presently threatened with extinction but may become so unless trade is controlled. Their trade is allowed but subject to licensing controls. Appendix III species are species identified by any Party to CITES as requiring cooperation in controlling their trade. Their trade is subject to permits or certificates of origin. Hong Kong's obligations under this Convention are enforced via the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).

- IUCN. The World Conservation Union maintains, through its Species Survival Commission, a "Red List" of globally threatened species of wild plants and animals (see <http://www.iucnredlist.org>). The Red List is considered the authoritative publication to classify species into nine groups as Extinct (EX) - No individuals remaining; Extinct in the Wild (EW) - Known only to survive in captivity, or as a naturalized population outside its historic range; Critically Endangered (CR) - Extremely high risk of extinction in the wild; Endangered (EN) - Very high risk of extinction in the wild; Vulnerable (VU) - High risk of extinction in the wild; Near Threatened (NT) - Likely to become endangered in the near future; Least Concern (LC) - Lowest risk. Does not qualify for a more at risk category. Widespread and abundant taxa are included in this category; Data Deficient (DD) - Not enough data to make an assessment of its risk of extinction; Not Evaluated (NE) - Has not yet been evaluated against the criteria.
- United Nations Convention on Biological Diversity. This convention requires parties to regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use. It also requires parties to promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings. The People's Republic of China (PRC) ratified the Convention on Biological Diversity on 5th January 1993. The HKSAR Government has stated that it is "committed to meeting the environmental objectives" of the Convention (PELB 1996).
- Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the "Ramsar Convention"), which requires parties to conserve and make wise use of wetlands, particularly those supporting waterfowl populations. The PRC ratified the Ramsar Convention on 31st July 1992, and various wetlands have since been listed as wetlands of international importance (i.e. Ramsar sites). One of these, Mai Po Marshes and Inner Deep Bay Ramsar site in Hong Kong SAR, was listed on 4 September 1995.
- Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention), which requires parties to protect listed threatened or endangered migratory species occurring within their boundaries.

Criteria of Evaluating Species of Conservation Importance

8.2.5. Species listed under local legislation and international conventions for conservation of flora and fauna were given special attention. In accordance with Table 3, Annex 8 of the EIAO-TM, the ecological value of species should be assessed in terms of protection status, species distribution, and rarity. For fauna species, criteria relating to these three aspects were considerations, such as being protected under Cap. 170 (except birds), Cap. 586, and/or regional/global legislations/conventions (i.e. the protection status), whether or not they are an endemic species (i.e. species distribution and being considered rare or restricted, and highlighted in publications such as Fellowes *et al.* (2002) (i.e. rarity). References were also made to those protected by law in China. Flora species are considered of conservation importance when it is protected/listed under the regional/global legislations/conventions (e.g. listed under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586); Forestry Regulations; Category I or II protected species in mainland China; listed by IUCN (2016) or CITES), and concerned due to species distribution and rarity (e.g. considered rare by Agriculture, Fisheries and Conservation Department (AFCD) (2003, 2007, 2008a, 2008b, 2011); Xing *et al.* (2000); Wu and Lee (2000); or Siu (2000). Specifically speaking, flora or fauna species protected by the following laws/regulations or listed under the following conventions were considered to be species of conservation importance. However this excludes exotic weeds, escaped cultivars or captive species, vagrants and introduced species which have lower ecological value. Species which are classified by IUCN as Near Threatened (NT), Least Concern (LC), Data Deficient (DD), or Not Evaluated (NE), and not covered by any other laws/regulations/conventions are not considered of conservation importance in the present EcolA.

- Forestry Regulations (Cap. 96A) which are subsidiary legislation of the Forests and Countryside Ordinance (Cap. 96).
- Considered 'Rare' or 'Very Rare' plant species listed in AFCD (2003, 2007, 2008a, 2008b, 2011), Xing *et al.* (2000), Wu and Lee (2000), or Siu (2000);
- Category I or II protected species in mainland China;
- Wild Animals Protection Ordinance (Cap. 170);
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586);

- PRC Wild Animal Protection Law;
- China Red Data Book of Endangered Animals;
- China Plant Red Data Book;
- China Species Red List;
- The International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species;
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and
- Fauna species considered of concern in Fellowes et al. (2002).

8.2.6. The species identified as having conservation importance are further categorised in accordance with their relevancy with the identified impacts, and the potential impacts on them were assessed in accordance with the EIAO-TM criteria.

8.3. Assessment Area

8.3.1. The Assessment Area for terrestrial ecology covers all the project elements and all terrestrial habitats within 500m distance from the boundary of the project elements.

8.3.2. For marine ecological impact assessment, as required in the EIA Study Brief the assessment area shall be the same as the assessment area for water quality assessment. The assessment shall also include ecological sensitive receivers in the vicinity of the Project.

8.4. Methodology for Baseline Establishment

Literature Review Methodology

8.4.1. A baseline review for ecology was conducted. Relevant literature was reviewed and information was extracted to establish a preliminary ecological baseline of the Assessment Area.

8.4.2. Ecological conditions of different parts of the Assessment Area were variously covered by previous EIA studies. A list of the EIAs, investigation studies and surveys considered during establishing the ecological baseline condition is given below:

- Tuen Mun - Chek Lap Kok Link (AEIAR-174//2009);
- Tuen Mun Sewerage – Eastern Coastal Sewerage Extension (AEIAR-034/2000);
- Improvement to Castle Peak Road between Ka Loon Tsuen and Siu Lam (AEIAR-047/2001);
- Monitoring of Marine Mammals in Hong Kong (annual reports from 2009 to 2021);
- Consultancy Study on Marine Benthic Communities in Hong Kong (CityU Professional Services Limited 2002)

8.4.3. Species of conservation importance/interest/concerns recorded in these previous studies were screened under the criteria mentioned in the previous sections, e.g. excluding non-native or cultivated plant species.

Ecological Field Survey Methodology

8.4.4. The methodology of the ecological surveys makes reference to the technical guidelines of ecological assessment in Annex 16 of EIAO-TM and the relevant EIAO Guidance Notes (GN 7/2010, GN 10/2010, and GN 11/2010).

8.4.5. Ecological field surveys were carried out to verify the preliminary ecological baseline established from reviewed literature, update baseline information, and fill identified information gaps to facilitate the establishment of a complete ecological baseline of the Assessment Area and to facilitate the ecological assessment.

8.4.6. The ecological survey programme covered terrestrial, aquatic, intertidal and marine habitats, identified sites of conservation importance, and important habitats within the Assessment Area during

wet and dry seasons. The ecological surveys included habitat and vegetation, terrestrial mammal, birds, herpetofauna, dragonflies and butterflies, aquatic fauna, intertidal, subtidal and benthic biota. Details of the survey methodology are discussed in the following sections.

8.4.7. The objectives of the baseline ecological surveys are as follows:

- to identify sensitive receivers (i.e. important ecological resources) present within the Assessment Area;
- to establish an updated general ecological baseline of the Assessment Area in particular areas likely to be affected by the Project and describe the characteristics of each habitat and assemblage found;
- to update the distribution of flora/fauna of conservation importance identified from reviewed literatures; and
- to provide baseline ecological conditions for assessment of potential environmental impacts caused by the proposed Project activities and recommendation of mitigation measures to mitigate such impacts.

Survey Period

8.4.8. According to the Clause 2 (iii) in Appendix E of the EIA Study Brief, ecological field surveys should be carried out for a duration of at least 4 months. In the present study, a 4-month ecological field surveys programme was conducted from July to October 2017. Additional benthic survey was conducted in November 2017 to determine the seasonality of benthic community (**Table 8.1**).

Table 8.1 Ecological Survey Programme

Ecological Survey	2017				
	Jul	Aug	Sep	Oct	Nov
Habitat Mapping and Vegetation	✓				
Avifauna (Day)	✓	✓	✓	✓	
Avifauna (Night)		✓		✓	
Terrestrial Mammal (Day)		✓			
Terrestrial Mammal (Night)		✓		✓	
Herpetofauna (Day)	✓		✓		
Herpetofauna (Night)		✓		✓	
Dragonflies & Butterflies	✓	✓	✓	✓	
Aquatic fauna		✓			
Intertidal Fauna	✓		✓		
Benthic community		✓			✓
Coral community			✓		

Terrestrial Surveys

8.4.9. Habitat and Vegetation Survey: Habitat mapping was based on basemap and latest aerial photos, and verified by field ground-truthing including the area within the Project Site and the Assessment Area including Tai Lam Country Park. For minor watercourses on basemap, if found during ground-truthing that they were shallow and small in size, and only had at most transient flow, or were concrete urban drains or u-channels, their ecological function as watercourse habitat would be limited and thus might be incorporated into the surrounding habitats during mapping. Plant species within each habitat type of the Project Site and the Assessment Area including Tai Lam Country Park were identified and their relative abundances were recorded with special attention to rare or protected species. Nomenclature and protection of the plant species followed those documented in the AFCD's biodiversity database. Similar to the criteria used in literature review, plant species recorded during the survey are considered of conservation importance when it is 1) listed under Forestry Regulations

(Cap. 96A) in Hong Kong, 2) listed under Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong or CITES, 3) considered rare by AFCD (2003, 2007, 2008a, 2008b, 2011), Xing *et al.* (2000), Wu and Lee (2000), or Siu (2000), 4) Category I or II protected species in mainland China, or 5) listed as “vulnerable, threatened, endangered, or critically endangered” by IUCN (2016), excluding non-native species or cultivated species.

- 8.4.10. Habitat maps of the Assessment Area were produced at the suitable scale using Geographic Information Software (GIS) software. Colour photographs were taken of all habitat types encountered on site and of ecological features of special importance.
- 8.4.11. Terrestrial Mammal: Mammals within the Assessment Area were surveyed qualitatively. All sightings, tracks, and signs of mammals found were recorded. Nomenclature of mammal follows Shek (2006). As some mammal species (e.g. bats) are nocturnal, night surveys were also conducted twice between July and October 2017.
- 8.4.12. Bird: Bird surveys were conducted monthly between July and October 2017. Birds within the Assessment Area were surveyed quantitatively using transect count method. Survey transects are shown in [Figure 8.1](#). All birds seen or heard were identified and their abundance recorded. Signs of breeding (e.g. nests, recently fledged juveniles) were also recorded. As some birds (e.g. owls, nightjars) are nocturnal, night surveys were conducted twice between July and October 2017. Bird species encountered outside transects but within the Assessment Area were also recorded to produce a complete species list. Nocturnal birds were identified by active searching using spot-light and by their calls. Nomenclature of the bird species followed the latest version of List of Hong Kong Birds by Hong Kong Bird Watching Society (HKBWS).
- 8.4.13. Herpetofauna: Herpetofauna within the Assessment Area were surveyed qualitatively. All reptiles and amphibians sighted were recorded. Nomenclature of amphibian followed Chan *et al.* (2005) and reptile followed Karsen *et al.* (1998). As herpetofauna are mostly nocturnal and more active during wet season, night surveys were carried out twice between July and October 2017. Potential microhabitats of herpetofauna such as wall, fallen logs, litter, channel/nullah, underneath of stones or other materials, artificial container (e.g. pots) were searched during surveys to locate cryptic or secretive herpetofauna species. Amphibians were also identified by their calls during night surveys.
- 8.4.14. Dragonfly and Butterfly: Dragonflies and butterflies within the Assessment Area were surveyed quantitatively using the transect count method between July and October 2017. Survey transects are shown in [Figure 8.1](#). Dragonflies and butterflies observed were identified and recorded. Dragonfly and butterfly species encountered outside transects but within the Assessment Area were also recorded to produce a complete species list. Nomenclature of dragonfly followed Tam *et al.* (2011) and nomenclature of butterfly followed Chan *et al.* (2011).
- 8.4.15. Freshwater Community: Aquatic fauna, including freshwater macro-invertebrates (e.g. freshwater crabs, shrimps, molluscs and aquatic insect larvae) and fishes were surveyed in the watercourses ([Figure 8.1](#)) near the works areas by direct observation and active searching, twice between July and October 2017. Although watercourses in the uphill (within Tai Lam Country Park) will not be affected both directly and indirectly, aquatic fauna inside the uphill watercourses (i.e. most were within Tai Lam Country Park) were also surveyed. Organisms were recorded and identified to the lowest possible taxon, and their relative abundances were reported. Nomenclature for fish followed Lee *et al.* (2004), whilst those for the macro-invertebrates followed Dudgeon (2003).

Marine and Intertidal Surveys

- 8.4.16. Intertidal Community: The intertidal surveys consisted of qualitative walk-through surveys along the accessible coastlines (both natural and artificial), and quantitative transect surveys at selected survey locations ([Figure 8.1](#)), so as to produce a comprehensive species lists of the survey areas. The conservation status (including local, regional and international such as China Redlist and IUCN Redlist) of the recorded biota was provided.
- 8.4.17. For qualitative walk-through surveys, organisms encountered were recorded and their relative abundance noted.

- 8.4.18. For quantitative transect surveys, at each survey location, one 50 m horizontal transect along the coastline was surveyed at each of the three tidal levels: 1.5 m (high), 1.0 m (middle) and 0.5 m (low) above Chart Datum (CD). On each transect, five quadrats (50 cm x 50 cm) were placed randomly to assess the abundance and diversity of flora and fauna. All organisms found in each quadrat were identified and recorded to the lowest possible taxonomic level to allow density to be calculated. Sessile species, such as algae (encrusting, foliose and filamentous), barnacles and oysters, in each quadrat were identified to the lowest possible taxonomic level and estimated as percentage cover on the rock surface. In addition, should the transect locations prove to be soft shore, all organisms found in the top 50 cm x 50 cm x 5 cm layer (length x width x depth) of the substrate were identified to the lowest possible taxonomic level and recorded.
- 8.4.19. Benthic Community: Benthic survey was conducted from 3 sampling locations in the subtidal soft-bottom habitats within the Assessment Area. The sampling locations are shown in [Figure 8.1](#).
- 8.4.20. At each sampling location, three grab samples were collected. Benthic sediments were sampled using a grab sampler of 0.1 m² and 15 cm biting depth. Sediments from the grab samples were sieved on board the survey vessel, washed onto a sieve stack (comprising 1 mm and 500 µm meshes) and gently rinsed with seawater to remove all fine material. Following rinsing any materials remaining on the two screens were combined and carefully rinsed using a minimal volume of seawater into pre-labelled thick triple-bagged Ziploc plastic bags. A 5% solution of formalin containing Rose Bengal in seawater was then added to the bag to ensure tissue preservation. Care was taken to ensure the concentration of solution is not adversely diluted through rinsing into the bags. Samples were sealed in plastic containers for transfer to the laboratory for sorting and identification.
- 8.4.21. Taxonomic identifications were performed using stereo dissecting and high-power compound microscopes. Taxa were identified to the lowest practicable level. The careful sampling procedure was employed to minimize fragmentation of organisms. If breakage of soft-bodied organisms occurs, only anterior portions of fragments were counted, although all fragments were retained and weighed for biomass determinations (wet weight).
- 8.4.22. Coral Community: The proposed viaduct section was checked by reconnaissance survey ([Figure 8.1](#)) to verify whether any corals and other marine organisms with conservation importance are present.
- 8.4.23. Rapid Ecological Assessment (hereinafter referred to as 'REA') will be conducted if corals are found in the reconnaissance survey to record and verify the habitat types and ecological value by SCUBA diving and the application of REA approach. The REA survey aimed at collecting semi-quantitative data of the substrate and ecological assemblages for ranking the ecological values of the habitat.

8.5. Ecological Baseline Condition

General Descriptions of the Subject Site

- 8.5.1. The Project is situated in the western part of the New Territories. Its boundary stretches from Kwun Tsing Road at So Kwun Wat to Tuen Hing Road at Tuen Mun. The alignment of the proposed cycle track and associated facilities are mostly within developed area, but a limited number of bridge piers will be constructed to form viaduct near to the intertidal habitats.

Recognised Sites of Conservation Importance

- 8.5.2. Recognised sites of conservation importance within the 500m Assessment Area for terrestrial ecology only included Tai Lam Country Park. Tai Lam Country Park is the second largest country park in Hong Kong, which is located about 0.3km to the east of the proposed cycle track, separated by Tuen Mun Road and urbanized areas. This country park is of 5,370 ha in area size. Taiwan Acacia, Brisbane Box, Chinese Red Pine, Slash Pine and Swamp Mahogany have colonized most parts of the park, whilst native trees such as Oak and Machilus species and Castanopsis, are given a chance to regenerate in a significant scale. Protected species such as Chinese Pangolin, Chinese Leopard Cat, Common Muntjac and Hong Kong Cascade Frog were recorded within this country park.
- 8.5.3. For the recognised sites of conservation importance for marine ecology, Sha Chau and Lung Kwu Chau Marine Park, and the Brothers Marine Park were designated for protection of Chinese White

Dolphins. The distance between the Project Site and Sha Chau and Lung Kwu Chau Marine Park, and the Brothers Marine Park is over 8km and 4km, respectively.

Ecological Resources

- 8.5.4. According to the EIA study of Tuen Mun – Chek Lap Kok Link (TMCLK Link)(AECOM 2009), coral, benthic and intertidal surveys were conducted near the landing areas of TMCLK Link. Populations of gorgonian (*Guaiaorgia* sp. ~1 colony per 2m²) and the ahermatypic coral (*Paracyathus rotundatus*, ~5 colonies per 1 m²) were recorded on exposed surfaces of the vertical and sloping seawalls near Pillar Point. Diversities of benthic community were regarded as low to moderate. Whilst the number of species and abundance of intertidal organisms were relatively lower near the landing area of TMCLK Link. Except the gorgonian and ahermatypic coral, no other marine species of conservation importance were recorded.
- 8.5.5. There was a Consultancy Study on Marine Benthic Communities in Hong Kong (CCPC 2002), one of the sampling locations was near the southern part of Pearl Island. The results showed that moderate to high Shannon diversity were found at that sampling location.
- 8.5.6. The Hong Kong Cetacean Research Project (HKCRP) has been conducting a longitudinal study on Chinese White Dolphins since 1995 in Hong Kong. Part of the survey transects from the study covered the waters in the vicinity of the proposed cycle track. According to the latest annual Monitoring of Marine Mammals in Hong Kong Waters (2020-21), Chinese White Dolphins were sighted frequently along the west coast of Lantau Island as well as the northern portion of the southwest Lantau area (Hung 2021). However, the coastal waters immediately adjacent to the proposed cycle track are of very low use by Chinese White Dolphins.
- 8.5.7. According to the EIA study of Tuen Mun Sewerage – Eastern Coastal Sewerage Extension (Mouchel Asia Limited 2000), intertidal surveys were conducted on the coastline between Brother's Point to Ka Loon Tsuen. Only common intertidal species were found. No species of conservation importance were observed.
- 8.5.8. Stream surveys were conducted in the EIA study of Improvement to Castle Peak Road between Ka Loon Tsuen and Siu Lam (Maunsell 2001). No rare or species of conservation importance species were found at Tai Lam Chung River. The ecological value of the stream habitat was ranked as low. A fish survey also conducted at a stream east of So Kwun Wat Tsuen in the EIA study of Tuen Mun Sewerage – Eastern Coastal Sewerage Extension (Mouchel Asia Limited 2000), only 4 common and widespread fish species were recorded.

Ecological Survey Results

- 8.5.9. Habitat and Vegetation Survey: Habitats within the Assessment Area (including works area and proposed alignment) included mixed woodland, plantation woodland, grassland/shrubland, cultivated land, watercourse, rocky shore, sandy shore, seawall, marine waters and developed areas ([Figure 8.2](#), [Table 8.2](#)):

Table 8.2 Habitats recorded within the Assessment Area

Habitat	Within 500m Assessment Area		Within Project Boundary	
	Size (ha)	Percentage (%)	Size (ha)	Percentage (%)
Cultivated Land	8.16	1.9	-	-
Developed Area	216.24	50.7	5.39	68
Grassland/Shrubland	9.13	2.1	0.001	0.01
Marine Waters	104.27	24.5	0.56	7
Mixed Woodland	41.38	9.7	0.34	4.3
Plantation Woodland	40.85	9.6	1.21	15.2
Rocky Shore	0.07 (0.15km)	0.0	-	-
Sandy Shore	3.29 (1.51km)	0.7	0.25 (0.15km)	3.2

Habitat	Within 500m Assessment Area		Within Project Boundary	
	Size (ha)	Percentage (%)	Size (ha)	Percentage (%)
Seawall	(3.78km)	-	-	-
Watercourse	2.87 (8.80km)	0.7	0.16(0.19km)	2
Total	426.276	100	7.92	100

- 8.5.10. A total of 248 plant species were recorded within the assessment area, 118 of which were natives ([Appendix 8-1](#)). Three species of conservation importance, *Aquilaria sinensis*, *Michelia odora* and *Neottopteris nidus* was recorded. These species were recorded in plantation woodland within the Project Site boundary ([Figure 8.2](#)). Although *Michelia x alba* recorded within Project Site is under the protection of Forestry Regulations, it is not considered as species of conservation importance due to its exotic status and widely planted in Hong Kong as ornamental species. Photos of habitats and plant species of conservation importance are presented in [Figure 8.3](#).
- 8.5.11. Most of the proposed cycle track alignment and associated facilities cut across development area, with a few sections encroaching fringe of plantation and mixed woodland along Castle Peak Road. One section of the alignment between Cafeteria Old Beach and Kadoorie Beach will be on viaduct along coastal marine waters.
- 8.5.12. Mixed woodlands were recorded on remnants of natural hillslope between urban area of Tuen Mun and Tai Lam Country Park and some between Castle Peak Road and Tuen Mun Highway as well as inside Tai Lam Country Park. They are composed of a mixture of native and exotic species, including *Casuarina equisetifolia*, *Celtis sinensis*, *Macaranga tanarius* var. *tomentosa*, *Cinnamomum camphora*, *Ficus microcarpa*, *Bridelia tomentosa*. Woodland understory species included *Psychotria asiatica*, *Ligustrum sinensis*, *Alocasia macrorrhiza*, *Lantana camara* and *Bidens alba*.
- 8.5.13. Plantation woodland was mainly recorded along roads, in urban landscape areas and on hillside near and within Tai Lam Country Park. Plantation woodland at Tai Lam Country Park were mainly composed of exotic trees including *Acacia confusa*, *Eucalyptus* spp., *Pinus* spp., with a mixture of mainly common herbs and shrubs, as well as some common native trees including *Celtis sinensis* and *Macaranga tanarius* var. *tomentosa*. Plantation at urban area were consisted of a variety of landscape species, mainly *Ficus microcarpa* and *Liquidambar formosana*. The cycle track alignment passes through a garden area of private land along the edge of Tsing Yan Street. This private land is not accessible but common landscape species including *Ficus macrocarpa*, *Cinnamomum camphora* and *Cinnamomum burmannii* could be seen from outside along Tsing Yan Street. About 15 young trees of *Aquilaria sinensis* and 2 trees of *Michelia odora* were recorded in a landscape planting area between Harvest Garden and Castle Peak Road. Two individuals of another species of conservation importance *Neottopteris nidus* was recorded under the plantation near Kadoorie Beach. All three floral species are regarded as planted for landscaping purposes.
- 8.5.14. *Aquilaria sinensis* (Incense Tree) is protected under Cap. 586 in Hong Kong and is rather common in lowland forest and fung shui woods, although many mature trees however were fell or damaged illegally due to collection of resin. It is also a Category II nationally protected species in China and is listed as vulnerable in the China Plant Red Data Book and by IUCN (2015). Furthermore, it is one of the 100 rare and precious plants of Hong Kong and is included in the Illustrations of Rare & Endangered Plants in Guangdong Province.
- 8.5.15. *Michelia odora* (Tsoong's Tree) is one of the 100 rare and precious plants in Hong Kong regarded by Hu *et al.* (2003) and is protected under Forestry Regulations (Cap. 96A) in Hong Kong. It is considered very rare in Hong Kong (Xing *et al.* 2000), and is considered rare in the China Plant Red Data Book and is included in the Illustrations of Rare & Endangered Plants in Guangdong Province. Globally, *Michelia odora* is also listed as vulnerable by IUCN (2015). *Michelia odora* is sometimes planted as a landscape or ornamental species.
- 8.5.16. *Neottopteris nidus* (Bird-nest Fern) is protected under Forestry Regulations (Cap. 96A). It is an epiphytic fern with restricted distribution in woodland, but is also fairly commonly planted as a landscape species.

- 8.5.17. Patches of shrubland/grassland were mainly recorded on hillside in Tai Lam Country Park near the eastern boundary of the Assessment Area. Species recorded were typical of its kind including *Dicranopteris pedata*, *Rhodomyrtus tomentosa*, *Rhaphiolepis indica*, *Baeckea frutescens* and *Cratoxylum cochinchinensis*. If protected from hillfire, shrubland would be developed into secondary woodland under natural succession.
- 8.5.18. Isolated stands of both active and abandoned cultivated lands were scattered near villages. It was composed of orchards whilst a few vegetable farms were also observed.
- 8.5.19. Watercourse sections near the urban area were largely channelized or culverted. Only a few species including *Ficus microcarpa*, *Lantana camara*, *Mikania micrantha* and *Panicum maximum* were recorded along the bank. Minor watercourse sections upstream were relatively more natural and undisturbed except at the junction to catchwater where the channel sections were paved. Most watercourse upstream had little flow stream probably because stream water was collected along the catchwater at Tai Lam Country Park. Little flow was therefore observed in these upstream courses even during wet season. Species recorded along the narrow stream bank of the minor watercourses included *Ficus hispida*, *Melastoma malabathricum*, and *Lepidosperma chinense*.
- 8.5.20. Three swimming beaches, Castle Peak Beach, Kadoorie Beach and Cafeteria Old Beach and a small section of rocky shore lay on the southern end of the Assessment Area. Only a few planted trees including *Casuarina equisetifolia* and *Hibiscus tiliaceus* were planted on sandy beaches. Seawall and the narrow strip of rocky shore were fairly bare. No vegetation was recorded.
- 8.5.21. Residential areas, villages, highways and local roads mainly constituted developed area. Plants recorded were mainly roadside trees and ruderal vegetation, including *Cocos nucifera*, *Ficus microcarpa*, *Liquidambar formosana*, *Leucaena leucocephala* and *Panicum maximum*.
- 8.5.22. Terrestrial Mammal: Three species of mammal were recorded within the Assessment Area ([Appendix 8.2](#)). These were Domestic Dog *Canis lupus*, Domestic Cat *Felis catus* and Pallas's Squirrel *Callosciurus erythraeus*. Pallas's Squirrel was the only species of conservation importance recorded. This species was recorded in the Project Site.
- 8.5.23. Bird: Twenty-five species of bird were recorded within the Assessment Area ([Appendix 8.3](#)). Bird species of conservation importance included Great Egret *Ardea alba*, Little Egret *Egretta garzetta*, Black Kite *Milvus migrans* and White-throated Kingfisher *Halcyon smyrnensis*. White-throated Kingfisher was recorded in the Project Site, the other three species were recorded outside the Project Site. Both abundance and species richness of bird were low in Plantation and Developed Area, and very low in other types of habitats within the Assessment Area.
- 8.5.24. Reptile: Four species of reptile were recorded within the Assessment Area ([Appendix 8.4](#)). No species of conservation importance were recorded.
- 8.5.25. Amphibian: Six species of amphibian were recorded within the Assessment Area ([Appendix 8.5](#)). No species of conservation importance were recorded.
- 8.5.26. Dragonfly: Six species of dragonfly were recorded within the Assessment Area ([Appendix 8.6](#)). Emerald Cascader *Zygonyx iris* was the only species of conservation importance recorded. Emerald Cascader was recorded in Grassland/Shrubland outside the Project Site. Both abundance and species richness of dragonfly were very low in all types of habitats within the Assessment Area.
- 8.5.27. Butterfly: Seventeen species of butterfly were recorded within the Assessment Area ([Appendix 8.7](#)). Danaid Eggfly *Hypolimnas misippus* was the only species of conservation importance recorded. Danaid Eggfly was recorded in Plantation outside the Project Site. Both abundance and species richness of butterfly were low in Plantation and Cultivated Land, and very low in other types of habitats within the Assessment Area.
- 8.5.28. Freshwater Community: Nine freshwater fauna species were recorded close to the Project Site (cumulative species number of F1 and F2) and 4 species within the Tai Lam Country Park (away from the Project Site), respectively ([Appendix 8.8](#)). They included fishes, crustaceans, insects and molluscs.

- 8.5.29. Diversity of freshwater fauna was low in the watercourse. As the sampling locations F1 and F2 are estuarine, relatively higher diversity were recorded than the sampling locations in the Tai Lam Country Park due to the occurrence of intertidal fauna in sampling locations F1 and F2. All species recorded in the surveys are common and widespread in Hong Kong. No aquatic species of conservation importance were recorded during the surveys.
- 8.5.30. Intertidal Community (Qualitative Walk-through): Within the Assessment Area, qualitative walk-through survey was conducted along the accessible shorelines of the survey locations, to record organisms encountered with their relative abundance noted ([Appendix 8.9](#)).
- 8.5.31. Results of this qualitative survey showed that the shorelines along the survey locations mainly comprised of artificial seawall, rocky shore and sandy shore.
- 8.5.32. A total of 21 intertidal organisms were found in the survey locations during the qualitative surveys. *Cellana grata* and *Saccostrea cucullata* were the dominant species found in the higher intertidal level of rocky shore, whilst *Brachidontes variabilis* and *Balanus amphitrite* were the dominant species in the lower intertidal level. Number of species and the relative abundance were very low in the artificial seawall and sandy shore.
- 8.5.33. Highly mobile fauna such as crab and fish were recorded in the qualitative surveys. No species of conservation importance was recorded. All species recorded were considered to be common and widespread as in other intertidal shores in Hong Kong.
- 8.5.34. Intertidal Community (Quantitative): Transects were deployed in the shorelines of the survey locations, covered the major habitats of the intertidal areas. The transects covered three shore heights: 2m (high-shore), 1.5m (mid-shore) and 1m (low-shore) above Chart Datum (CD). Dominant species among the transects were found to be quite similar as in quantitative survey described above. The results of each transect in each survey location are shown in [Appendix 8.10](#).
- 8.5.35. A total of 17 organisms were recorded during the quantitative surveys. Dominant species found were typical species in that particular shore as described in the qualitative survey.
- 8.5.36. **Table 8.3** shows the number of species (S), density (D i.e. individuals/m²), evenness (J) and Shannon Diversity (H') of intertidal organisms recorded in the survey locations (both qualitative and quantitative surveys are present). Number of species, density, evenness and Shannon diversity were higher in rocky shore than artificial seawall and sandy shore:

Table 8.3 Intertidal Organisms Recorded in the Survey Locations

Site (type of shore)	Qualitative	Quantitative			
	S	S	D	J	H'
Rocky shore	19	15	73	0.75	0.84
Artificial seawall	3	2	8	0.88	0.43
Sandy shore	1	1	0.8	N/A	0
Note: Number of species (S); density (D individual/m ²); evenness (J); and Shannon Diversity (H')					

- 8.5.37. Benthic Community: Subtidal benthic surveys at 3 sampling locations in the Assessment Area showed that 15 and 8 individuals of organisms in 4 phyla, 10 and 6 families, and 10 and 6 species in 18 grab samples during wet and dry seasons, respectively.
- 8.5.38. In terms of infaunal abundance, the majority of the organisms recorded in the subtidal soft bottom habitat were from the phylum annelida in both wet (73%) and dry (38%) seasons (**Table 8.4**). As the diversity and the abundance of benthic fauna recorded were low, no dominant species were recorded. All of the species recorded are common and widespread in Hong Kong.
- 8.5.39. In terms of infaunal biomass, organisms from the phylum chordata contributed to about 83% of the total biomass recorded during wet and dry seasons (**Table 8.4**). Benthic Shannon Diversity Index

(*H*) ranged from 1.10 – 1.56 during wet season and from 0.69 – 1.10 during dry season (**Table 8.5**). Pielou’s Evenness Index (*J*) was relatively high for all sampling locations for both seasons, as the benthic diversity and abundance were low, the organisms were quite evenly distributed (record details provided in [Appendix 8-11](#) to [Appendix 8-14](#)).

8.5.40. The benthic assemblages within the Assessment Area are relatively lower than that in Hong Kong waters. Previous studies of benthic surveys showed that value of value of *H* varied from 2.21 – 3.50 in the eastern waters, which is higher than Victoria Harbour (1.10 to 2.49), Tolo Harbour and Channel (1.51 – 1.85), western waters at outer Deep Bay (2.14 – 2.86) and southern waters (2.53 – 2.98) (CityU Professional Services Limited 2002).

Table 8.4 Benthic fauna composition within the Assessment Area

Phylum / season	No. of families		No. of species		No. of individuals		% of abundance		Biomass (g)		% of biomass	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
Annelida	7	2	7	2	11	3	73	38	0.06	0.37	1.48	15.69
Arthropoda	1	1	1	1	2	2	13	25	0.62	0.01	15.32	0.48
Chordata	1	2	1	2	1	2	7	25	3.38	1.94	83.19	83.61
Nemertinea	1	1	1	1	1	1	7	12	0.00	0.01	0.02	0.22
Total	10	6	10	6	15	8	100	100	4.07	2.33	100	100

Table 8.5 Summary Information from Subtidal Benthic Survey in Dry and Wet Seasons (replicates of sub-stations are pooled together)

Location / season	No. of species		Abundance		Wet weight (g)		Evenness		Shannon diversity	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
A	3	3	3	3	0.03	0.02	1	1	1.10	1.10
B	4	3	6	3	4.01	1.42	0.96	1	1.33	1.10
C	5	2	6	2	0.02	0.56	0.97	1	1.56	0.69

8.5.41. Coral Community: Rocky shore, sandy shore and artificial seawall near the marine works areas were surveyed for coral communities.

8.5.42. A species of hard coral *Oulastrea crispata* and a gorgonian *Guaigorgia* sp. were recorded during the survey in the vicinity of the proposed viaduct. *O. crispata* is commonly found in Hong Kong, as this species is tolerant to extreme environment; whilst *Guaigorgia* sp. is common in western Hong Kong waters. The coverage of both species were less than 5%. Some of the selected photos taken during the dive survey are shown in [Figure 8.4](#).

8.6. Evaluation of Habitats and Species of Conservation Importance

Evaluation of Habitats

8.6.1. The ecological importance of the habitats within the Assessment Area was evaluated in accordance with the criteria stipulated in Annex 8 of EIAO-TM (**Table 8.6** to **Table 8.15**).

Table 8.6 Evaluation of Mixed Woodland within the Assessment Area

Criterion	Description
Naturalness	Semi-natural habitat, consisting of a mixture of native tree species, exotic and/or orchard species.
Size	41.38 ha
Diversity	Low to moderate for plants. Very low faunal diversity
Rarity	None for flora and fauna.
Re-creatability	Feasible, but the more mature the woodland, the longer time required for compensation/re-creation.
Fragmentation	Isolated stands along ravine, catchwater and foothills
Ecological linkage	Linked to nearby shrubland/grassland or plantation woodland
Potential value	Low to moderate if protected from anthropogenic disturbance or destruction
Nursery/breeding ground	No significant observation. Can provide breeding habitats for birds and butterfly.
Age	Young
Abundance/richness of wildlife	Very low faunal diversity
Overall ecological value	Low to moderate

Table 8.7 Evaluation of Plantation Woodland within the Assessment Area

Criterion	Description
Naturalness	Man-made habitat mainly on hillside and in landscape area
Size	40.85 ha
Diversity	Low to moderate flora diversity; Very low to low faunal diversity
Rarity	None for flora. Fauna species of conservation importance included Danaid Eggfly
Re-creatability	Easy to re-create
Fragmentation	Scattered in urban area, formed contiguous stands on hillside
Ecological linkage	Linked to nearby shrubland/grassland or mixed woodland
Potential value	Moderate for uphill stands with protection from fire and active management including thinning and interplanting with native species
Nursery/breeding ground	No significant observation.
Age	Young
Abundance/richness of wildlife	Low faunal diversity
Overall ecological value	Low

Table 8.8 Evaluation of Shrubland/Grassland within the Assessment Area

Criterion	Description
Naturalness	Fairly natural
Size	9.13 ha
Diversity	Low to moderate flora diversity; Very low faunal diversity
Rarity	None for flora Fauna species of conservation importance included Emerald Cascader
Re-creatability	Easy to recreate
Fragmentation	isolated small stands along roads and on hills
Ecological linkage	Linked to nearby plantation woodland or mixed woodland
Potential value	Might develop into more complex habitats through succession, if given enough time
Nursery/breeding ground	No significant observation. Could provide breeding habitats for birds, butterflies and reptiles
Age	N/A
Abundance/richness of wildlife	Very low faunal diversity
Overall ecological value	Low

Table 8.9 Evaluation of Cultivated Land within the Assessment Area

Criterion	Description
Naturalness	Man-made
Size	8.16 ha
Diversity	Low flora diversity Very low to low faunal diversity
Rarity	None for flora and fauna
Re-creatability	Easy to re-create
Fragmentation	Fragmented, subject to abandonment
Ecological linkage	Linked to nearby shrubland/grassland, plantation woodland or mixed woodland
Potential value	Might develop into semi-natural habitats if given enough time, but limited by small size, fragmentation and disturbance
Nursery/breeding ground	No significant observation.
Age	N/A
Abundance/richness of wildlife	Low faunal diversity
Overall ecological value	Low

Table 8.10 Evaluation of Developed Area within the Assessment Area

Criterion	Description
Naturalness	Man-made habitat
Size	216.24 ha
Diversity	Low flora diversity, mainly composed of landscape and ornamental species. Very low to low faunal diversity.
Rarity	None for flora. Fauna species of conservation importance included Black Kite
Re-creatability	Easy to re-create
Fragmentation	N/A
Ecological linkage	Linked to nearby shrubland/grassland, plantation woodland or mixed woodland
Potential value	Low
Nursery/breeding ground	No significant observation
Age	N/A
Abundance/richness of wildlife	Low faunal diversity
Overall ecological value	Very Low

Table 8.11 Evaluation of Watercourse within the Assessment Area

Criterion	Description
Naturalness	Most channelized/culverted in urban area and catchwater. Fairly natural uphill but many were small in size and dry /only had ephemeral flow during wet season.
Size	2.87 ha (8.80 km)
Diversity	Low diversity of plant, very low faunal diversity
Rarity	None for flora and fauna
Re-creatability	Natural section difficult to re-create, channelized sections easy to recreate
Fragmentation	Stream habitat fragmented by the channelised section and the underground culvert
Ecological linkage	Uphill sections of watercourse linked to mixed woodland
Potential value	Low for channelized/culverted sections, high for the uphill natural sections
Nursery/breeding ground	Nursery/breeding ground for aquatic life
Age	N/A
Abundance/richness of wildlife	Low faunal diversity
Overall ecological value	Low for channelized/culverted sections, moderate for uphill natural sections

Table 8.12 Evaluation of Rocky Shore (intertidal and subtidal parts) and Sandy Shore within the Assessment Area

Criterion	Description	
	Rocky Shore	Sandy Shore
Naturalness	Natural	Natural, but backshore modified/developed
Size	0.07 ha (0.15km)	3.29 ha (1.51 km)
Diversity	Low diversity for intertidal organisms	Very low diversity for intertidal organisms
Rarity	None	None
Re-creatability	Difficult to recreate	Difficult to recreate
Fragmentation	Fragmented, only small sections remained	Fragmented, only small sections remained. Backshore modified.
Ecological linkage	Connected to marine waters	Connected to marine waters
Potential value	Moderate, natural rocky shores provide substrate for intertidal organisms	Low. Unlikely to become an area of conservation value
Nursery/breeding ground	Breeding and nursery ground for limited intertidal and/or subtidal organisms	Breeding and nursery ground for limited intertidal organisms
Age	N/A	N/A
Abundance/richness of wildlife	Very low to low faunal diversity	Very low faunal diversity
Overall ecological value	Low	Low

Table 8.13 Evaluation of Seawall within the Assessment Area

Criterion	Description
Naturalness	Man-made habitat
Size	3.78km
Diversity	Low diversity for intertidal organisms
Rarity	None
Re-creatability	Easy to recreate
Fragmentation	N/A
Ecological linkage	Connected to marine waters
Potential value	Low
Nursery/breeding ground	Provide substrate for intertidal and marine organisms
Age	N/A
Abundance/richness of wildlife	Low faunal diversity
Overall ecological value	Low

Table 8.14 Evaluation of Marine Waters (including subtidal seabed) inside the 500m Assessment Area

Criterion	Description
Naturalness	Natural
Size	104.3 ha
Diversity	Low for subtidal benthic organisms
Rarity	Species of conservation importance included <i>Oulastrea crispata</i> and <i>Guaiaigorgia</i> sp. Fauna species of conservation importance included Great Egret and Little Egret
Re-creatability	Difficult to re-create
Fragmentation	Not fragmented
Ecological linkage	Connected to other marine waters and intertidal habitats
Potential value	Nursery grounds for fishes and invertebrates
Nursery/breeding ground	Low for benthic organisms
Age	N/A
Abundance/richness of wildlife	Low faunal diversity
Overall ecological value	Low to moderate

Table 8.15 Evaluation of the Project Site

Criterion	Description
Naturalness	Mostly man-made habitat (developed area, landscape area under plantation, channelled watercourse) Some natural/semi-natural habitat (mixed woodland, sandy beach, marine waters)
Size	7.92 ha
Diversity	Low diversity for plants. Very low faunal diversity
Rarity	Flora of conservation importance included <i>Aquilaria sinensis</i> , <i>Michelia odora</i> and <i>Neottopteris nidus</i> (all planted in landscape area) Fauna of conservation importance included Pallas' Squirrel (exotic species) and White-throated Kingfisher
Re-creatability	Easy to create
Fragmentation	Not fragmented
Ecological linkage	Some parts linked to plantation woodland or mixed woodland
Potential value	Low
Nursery/breeding ground	No significant observation.
Age	N/A
Abundance/richness of wildlife	Very low faunal diversity
Overall ecological value	Low

Evaluation of Species of Conservation Importance

- 8.6.2. In accordance with Table 3, Annex 8 of the EIAO(TM), the ecological value of species was assessed in terms of protection status (e.g. fauna protected under WAPO (except birds), and flora and fauna protected under regional/global legislation/conventions), species distribution (e.g. endemic), and rarity (e.g. rare or restricted). Flora and fauna of conservation importance recorded within the

Assessment Area are evaluated according to the EIAO(TM) in **Table 8.16** and **Table 8.17**, respectively.

Table 8.16 Evaluation of Flora Species of Conservation Importance

Scientific Name	Common Name	Conservation Status	Locations / Habitats recorded	Rarity
<i>Aquilaria sinensis</i>	Incense Tree	Cap. 586 Category II Nationally Protected Species in the PRC China Plant Red Data Book: Vulnerable Near Threatened (NT) in China (AFCD 2015) Listed in Rare and Precious Plants in Hong Kong (AFCD 2015) Vulnerable in IUCN (2015) Included in Illustrations of Rare & Endangered Plants in Guangdong Province	Plantation within Project Site	Common (Xing et. al. 2000) Rare (Hu et al. 2003)
<i>Michelia odora</i>	Tsoong's Tree	Cap. 96A Listed in Rare and Precious Plants of Hong Kong China Plant Data Book: Rare Included in Illustrations of Rare & Endangered Plants in Guangdong Province Vulnerable in IUCN (2015)	Plantation within Project Site	Very rare (Xing et. al. 2000)
<i>Neottopteris nidus</i>	Bird-nest Fern	Cap. 96A	Plantation within Project Site	Very common (Wu and Lee et. al. 2000)

Table 8.17 Evaluation of fauna species of conservation importance

Scientific Name	Common Name	Location recorded	Conservation Status	Distribution ¹	Rarity ¹
<i>Callosciurus erythraeus</i>	Pallas's Squirrel	Recorded in the Project Site.	WAPO	Widely distributed in Hong Kong	Common
<i>Ardea alba</i>	Great Egret	Recorded in Marine Water outside the Project Site.	Fellowes et al. (2002): PRC, (RC); WAPO	Widely distributed in Hong Kong	Common resident and winter visitor
<i>Egretta garzetta</i>	Little Egret	Recorded in Marine Water outside the Project Site.	Fellowes et al. (2002): PRC, (RC); WAPO	Widely distributed in lowlying wet or coastal areas in Hong Kong	Common resident

Scientific Name	Common Name	Location recorded	Conservation Status	Distribution ¹	Rarity ¹
<i>Milvus migrans</i>	Black Kite	Recorded in Developed Area outside the Project Site.	Cap. 586; Class 2 Protected Animal of China; CITES: Appendix II; Protected under WAPO; Fellowes et al. (2002): (RC); WAPO	Widely distributed in Hong Kong and occurs in many types of habitats	Common resident and winter visitor
<i>Halcyon smyrnensis</i>	White-throated Kingfisher	Recorded in the Project Site	Fellowes et al. (2002): (LC); WAPO	Mainly found in coastal mudflat and mangroves, also seen in inland fishponds, wet agricultural areas	Common resident.
<i>Zygonyx iris</i>	Emerald Cascader	Recorded in Grassland / Shrubland outside the Project Site.	Fellowes et al. (2002): PGC	Widely distribute in moderately clean, rapidly flowing forested streams throughout Hong Kong	Common
<i>Hypolimnys misippus</i>	Danaid Eggfly	Recorded in Plantation outside the Project Site	Fellowes et al. (2002): LC	Found in scattered areas including Ngau Ngak Shan, Lung Kwu Tan, Wetland Park, Mount Parker, Cloudy Hill, Lin Ma Hang	Uncommon
<i>Oulastrea crispata</i>	Zebra coral	Seawall	Cap. 586	Many places in Hong Kong ³	Common ³
<i>Guaiaagorgia sp.</i>	-	Seawall and rocky shore	Nil	Common in western waters ⁴	Common ⁴

Note

1: AFCD (2016), 2: Wang (1998), 3: Chan et al. 2005), 4: Mott MacDonald 2014

Level of concern: LC = local concern, PRC = potential regional concern, RC = regional concern, GC = global concern; Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence (Fellowes et al. 2002).

8.7. Impact Identification and Prediction

- 8.7.1. A relatively small development footprint is required for the cycle track and associated facilities though the length of the track portrays a much larger land-loss impact. However, for much of the alignment of the cycle track route followed through urbanized areas with low ecological value. Ecological impacts to terrestrial ecology are expected to be low, in view of this localized development. For marine ecology, a viaduct section of the cycle track would be constructed on waterfront between Cafeteria Old beach and Kadoorie Beach, and some sections of the alignment are closed to marine habitats, marine ecology might be affected.
- 8.7.2. The assessment below identified and quantified as far as possible the potential terrestrial, aquatic, and marine ecological impacts associated with the Project, both directly (e.g. by physical disturbance) and indirectly (e.g. by change of water quality and hydrodynamic regime), including construction

phase and operational phase, to recognised sites of conservation importance, important habitats, and the associated wildlife groups/species. Predicted impacts would be quantified as far as possible and evaluated with reference to the criteria in Annex 8 and 16 of the EIAO-TM. Impacts are generally ranked as “Insignificant”, “Minor”, “Moderate” or “Severe”. Where significant negative impacts are predicted, the strategy followed the priority of “avoid, minimize, and compensate”. The acceptability of residual impacts following mitigation was assessed. Finally, the assessment evaluated the need for ecological monitoring and audit, and prescribed in detail any required EM&A programme in accordance with the Study Brief. The potential impacts that may arise as a result of the construction and operation of present Project are presented below.

8.8. Impact Evaluation

Construction Phase – Direct Impacts

Terrestrial

- 8.8.1. Estimated loss of area of each habitat type is summarised in **Table 8.18**. Among all the terrestrial habitat types to be lost, developed area will constitute the largest portion, i.e. about 4.37 ha, to the estimated habitat loss. The overall ecological value of the developed area is very low due to its man-made nature, low diversity of wildlife and high level of disturbance. Other habitats (grassland/shrubland, mixed woodland and plantation woodland) will only be affected in small scales. The estimated loss of the habitats was calculated by works areas boundaries and alignment. But the actual encroachment area should be much smaller, in particular for mixed woodlands and plantation woodland, where the alignment mainly went through near the edge of the habitats, and thus only the fringe of those habitats, which fall within a highly disturbed area (closed to Castle Peak Road), will be affected. It is also subject to the detailed design on the actual number of trees to be affected in the woodland and plantation, and it is convinced that efforts will be made to avoid tree loss. The impact on the habitats would be further reduced. The potential impact due to loss of habitats is ranked as **minor**. It is considered that there is no need to provide compensatory woodland as tree loss impact will be mitigated by compensatory tree planting under landscape impact assessment.

Table 8.18 Estimated Habitat Loss

Habitat	Size (ha)		
	Estimated Temporary Loss (ha)	Estimated Permanent Loss (ha)	Estimated Total Loss (ha)
Cultivated Land	-	-	-
Developed Area	4.4	0.99	5.39
Grassland/Shrubland	0.001	-	0.001
Mixed Woodland	0.23	0.11	0.34
Plantation Woodland	0.92	0.29	1.21
Rocky Shore	-	-	-
Sandy Shore	0.196 (0.12km)	0.06 (0.03km)	0.256 (0.15km)
Marine Waters	0.07	0.0019 (only the piles will encroach the marine waters)	0.0719
Watercourse*	0.17 (0.09km)	0.06 (0.1km)	0.23 (0.19km)
Note: *the section of the watercourse within the Project Site was channelized and without water			

- 8.8.2. One section of channelised watercourse of about 190m in the Cafeteria Old Beach will be lost to the development of the cycle track alignment. As mentioned in the baseline above, watercourse sections near the urban area were largely channelized or culverted. No water flow or aquatic life were observed in this section even in the wet season. Only transient flow of water is expected after rainfall. Given the channelization nature and lack of flow, this section is not considered being a habitat for aquatic

life. *Hibiscus tiliaceus* were found dominant in the section of watercourse. As no water flow and aquatic life were found in the section of watercourse, the potential impact due to loss of watercourse is ranked as **Insignificant**.

Marine

- 8.8.3. No dredging or reclamation are required for the Project. The proposed viaduct between Cafeteria Old Beach and Kadoorie Beach however will involve bored piles in the marine waters, direct encroachment of small area (about 19 m²) of seabed due to the bored piles are expected. As revealed in the dive survey, low coverage (less than 5%) of the common hard coral *Oulastrea crispata* and common gorgonian *Guaiaigorgia* sp. were recorded in the subtidal area near the proposed viaduct, but potential encroachment on these hard coral and gorgonian is not likely. Avoidance of encroachment impact on the low coverage hard coral and gorgonian has been considered. The potential impact due to loss of small size of piling areas is ranked as **Minor**.

Construction Phase – Indirect Impacts

Terrestrial

- 8.8.4. Noise, dust and human activities will increase during construction phase, and might temporarily reduce the abundance and distribution of fauna in habitats adjacent to the works areas. Most of the nearby habitat is developed area (i.e. highways, residential areas), which is considered of very low ecological value. Utilisation of this type of habitat by fauna is very low due to the high level of disturbance. Some construction sites will be near mixed woodland, sandy shore, channelized sections of watercourse and plantation woodland. These habitats are of low/ low to moderate ecological value. In addition, the potentially affected mixed woodland, sandy shore, channelized sections of watercourse and plantation woodland are subjected to disturbance from nearby works areas. Utilisation of these habitats by fauna is expected to be low. Disturbance due to noise, dust and human activities will be short-term and localised. The potential impact due to these sources in construction phase is ranked as Insignificant. Good site practice will be implemented to minimize the potential impact.
- 8.8.5. During the construction phase, watercourse near the works areas would potentially be impacted by surface runoff, especially during rainstorm. The surface runoff might be polluted by sedimentation from site surfaces; earth working areas and stockpiles, wash water from dust suppression sprays and wheel washing facilities; and chemicals spillage such as fuel, oil, solvents and lubricants from maintenance of construction machinery and equipment.
- 8.8.6. Elevated suspended solids levels caused by site runoff could increase the suspended solids load in the water bodies and could decrease dissolved oxygen levels. A lower oxygen level would affect stationary species, whilst mobile species would tend to temporarily avoid the area. The result could be a temporary reduction in aquatic life abundance and/or change in distribution. The watercourses near the Project Site are ranked as low ecological value, and low diversity and abundance of aquatic life were found. If without proper control of surface runoff, the potential impact due to runoff to watercourse is considered **Minor to Moderate**.
- 8.8.7. On the other hand, Tai Lam Country Park is located uphill and away from the proposed works areas, thus the indirect impact to the watercourses within Tai Lam Country Park is not likely.

Marine

- 8.8.8. Bored pile will be used for constructing the viaduct between Cafeteria Old Beach and Kadoorie Beach. Sediment plumes (suspended solids) due to construction works of bored pile would be localised. High suspended solid level might block the gill of fish and other marine organisms and would affect the gaseous exchange, whilst the high turbidity would affect the foraging of organisms relying on eye sights. High sedimentation rate could also affect sessile benthos including subtidal ones such as coral, gorgonian and even intertidal ones such as epifauna on intertidal habitats. A lower oxygen level would affect stationary species, whilst mobile species would tend to temporarily avoid the area. The results could be a temporary reduction in aquatic life abundance. Nutrients and/or contaminants in the seabed sediment might be released into the marine waters when the sediment is disturbed, and might have negative effects on water quality such as increasing the chances of algal bloom or accumulation of contaminants inside organisms. Since only bored piles will be constructed, large

scale release of contaminants from the sediment would not occur, and the suspended solids would be localised. Hence the water quality effect on marine organisms would be “**Minor**”.

- 8.8.9. Pollutants or chemical spillage from the land works areas might occur, but the magnitude is not expected to be significant and should be transient. The potential water quality impacts due to land works including site runoff, sewage from workforce, wastewater from various construction activities, and accidental spillage would be controlled through the implementation of suitable site facilities. The potential adverse water quality impacts would be ranked as **Insignificant**.

Recognized Sites of Conservation Importance

- 8.8.10. Tai Lam Country Park is outside the proposed cycle track and will not be encroached. There will be no significant potential indirect disturbance to fauna inside the recognized site of conservation importance due to the considerable distance from the Project Site. In view of the localised nature of impact, the potential impact to the fauna inside Tai Lam Country Park is ranked as Insignificant. Good site practice and site precautionary measures will be implemented to avoid the potential indirect impact to important habitats from the sources.
- 8.8.11. Due to the scale and nature of the project, water quality impacts would be localised. Hence, potential impacts to Sha Chau and Lung Kwu Chau Marine Park and the Brothers Marine Park are not anticipated.

Species of Conservation Importance

- 8.8.12. The Project will mainly affect developed area and small areas of other habitats subject to disturbance. The three plant species of conservation importance, i.e. *Aquilaria sinensis*, *Michelia odora* and *Neottopteris nidus*, found within the Project Site are regarded as planted for landscaping purpose. All individuals, including seedlings, of *Aquilaria sinensis*, *Michelia odora* and *Neottopteris nidus* found within the Project Site will be retained. If retaining of the plants is not practicable, the affected individuals will be transplanted. A Tree Preservation and Removal Proposal (TPRP) shall be submitted to relevant Authorities for approval in a later stage. Given that the three plant species were planted in a landscaping area and will be retained, impacts to them are ranked as **Insignificant**. Among the fauna species of conservation importance listed in **Table 8.17**, only Pallas’s Squirrel and White-throated Kingfisher were found within the Project Site, but they are very mobile and will not be affected during construction. Indirect impacts to the species of conservation importance outside the Project Site are not likely. Hence, the potential impact to these fauna species is considered **Insignificant**.

Operational Phase – Direct Impacts

Terrestrial

- 8.8.13. There will be no direct impacts during operational phase.

Marine

- 8.8.14. Permanent marine habitat loss occurs during operational phase due to the presence of bored piles. The permanent loss of marine habitats is considered **Insignificant**.

Operational Phase – Indirect Impacts

Terrestrial

- 8.8.15. Indirect impacts due to disturbance to wildlife from human activity along the cycle track will increase during operational phase. Habitats along the alignment of the cycle track are subjected to existing disturbance from nearby developed area. Fauna inhabit these habitats are already habituated to human activities. Hence, the potential impact is expected to be **Insignificant**

Marine

- 8.8.16. As only limited number of bored piles will be constructed in the marine habitats, change in hydrodynamics is not expected. Pollution from cyclists to marine waters is also not expected. No

maintenance dredging would be required for the viaduct, and therefore no water quality impacts could be induced. Hence, no operational phase impacts are anticipated from the Project.

8.9. Mitigation Measures

- 8.9.1. The following paragraphs identify feasible and practicable mitigation measures to reduce the severity of any negative impacts identified in the previous sections. Following the “Avoid, Minimize and Compensate” approach of dealing with impacts as stipulated in EIAO-TM, the feasibility to avoid impacts was first examined. Where impacts are anticipated, efforts were made to minimize the impacts such as by refining the extents or scopes. Mitigation measures were then provided to address the inevitable impacts.

Impact Avoidance

- 8.9.2. No site or habitat of conservation importance would be directly impacted. Direct impacts on the three plant species of conservation importance would be avoided.

Impact Minimisation

- 8.9.3. Most sections of alignments and facilities confined to developed area. Only a few sections would encroach mixed woodland, plantation woodland and grassland/shrubland due to site constraints. Even though, the alignments would only go through the fringe of woodland and plantation, and the actual loss of trees are expected to be much smaller.

- 8.9.4. During the construction phase, site runoff would need to pass through sedimentation tanks to reduce the concentration of SS. In accordance with the Practice Note for Professional Persons on Construction Site Drainage, Environmental Protection Department, 1994 (ProPECC PN 1/94), best management practices should be implemented on site as far as practicable to control site runoff and drainage at all work sites during construction, so that the treated runoff will be discharged to public drainage system in compliance with the WPCO. Construction effluent, site run-off and sewage should be properly collected and/or treated. Wastewater from a construction site should be managed. Proper locations for discharge outlets of wastewater treatment facilities well away from the natural streams/rivers should be identified. Effluent monitoring should be incorporated to make sure that the discharged effluent from construction sites meets the effluent discharge guidelines. The best practices are detailed in the water quality chapter.

Impact Mitigation

- 8.9.5. The temporary and permanent loss of fringe of woodland habitats, if any, does not require specific mitigations under EcoIA, as their ecological values are ranked as Low or Low to Moderate. The loss of trees will be mitigated by the compensatory planting provided in landscape impact assessment.
- 8.9.6. Besides the adoption of the water quality measures, including but not limited to the deployment of cage type silt curtains for reduction of sediment release to marine habitat from the bored pile installation, as stated in the water quality chapter, no other specific mitigation measures for marine ecology are required.
- 8.9.7. No specific mitigation measures would be required for the operational phase of the Project.

Precautionary Measures

- 8.9.8. There will be loss of small area (about 19 m²) of seabed. Although there will be no direct encroachment of coral or gorgonian in the proposed viaduct, a low coverage (<5%) of common hard coral and common gorgonians was found in the vicinity of the proposed viaduct. As a precautionary approach, it is recommended that a coral survey should be conducted within the piling footprint prior to the commencement of piling works, to verify that no significant coral colonies within the footprint and confirm the corals are not feasible for translocation. Should coral colonies of significant sizes and feasible for translocation are identified, coral translocation should be conducted. A Coral Translocation Plan should be submitted to AFCD for approval before the coral translocation. The plan should cover the pre-translocation survey findings (i.e. findings from the verification survey, including the number, locations, species, sizes, conditions and feasibility for translocations of coral colonies),

identifications of coral recipient site, the translocation methodology and coral post-translocation monitoring and reporting requirements. The verification survey and all translocation activities should be carried out by experienced marine ecologists agreed by AFCD.

- 8.9.9. With the abovementioned mitigation measures, no secondary/induced/additional/synergistic impacts are anticipated. A summary of the impacts in construction and operational phases, with sources, receivers, nature, significance and mitigation required, are provided in **Table 8.19**.

Enhancement Measures

- 8.9.10. As there will be a vertical above-seabed substructure to support the marine viaduct, the subtidal portion of many man-made structures could provide hard substrates for colonization of corals or other epibenthos. The submerged structures in the future marine viaduct could also provide hard surface for colonization of marine sessile epibenthos. It is also known that by suitable design, the colonization of epibenthos would be faster and/or of higher abundance, and the ecological functions of epibenthic communities on the subtidal portions of these structures could be further enhanced.
- 8.9.11. One of the approaches is to provide uneven surface or selected patterns on the future substructure (either incorporating on the structures or installing additional panels/ tiles with such features). The enhanced surface could provide microhabitats for various marine organisms to colonise and grow, and develop into communities to provide feeding and hiding habitats for juveniles of marine fauna, and thereby effectively enhance biodiversity and ecosystem functions of the new man-made structures. A study would be conducted prior to commencement of the marine works for the marine viaduct section to explore if feasible and practical ecological enhancement measures could be adopted as trial.

Table 8.19 Summary of Construction Phase and Operational Phase Impacts

Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
Construction Phase – Direct Impacts										
Habitat loss	Works areas on land	Developed area, grassland/shrubland, mixed woodland, plantation woodland	Overall ecological value within Project Site is ranked as low as they fall within a highly disturbed area (closed to Castle Peak Road)	Low diversity of plants and very low faunal diversity on land	Developed area: 5.39ha; grassland/shrubland: 0.001ha; mixed woodland: 0.34ha; plantation woodland: 1.21ha	Mostly permanent	Not reversible	Minor	Minor	Compensatory planting, and minimize tree loss during detailed design
	Works areas on watercourse	Watercourse	Low ecological value	Low diversity of plants and none aquatic life	0.11ha or 190m	Permanent	Not reversible	Minor	Insignificant	No
	Works areas in marine habitats	Sandy shore, seawall, marine waters	Low ecological value (even the sea is ranked as low to moderate ecological value within the Assessment Area)	Low diversity and abundance of intertidal and subtidal organisms, including low coverage of common hard coral and gorgonian	Sandy shore: 0.26ha; marine waters: 0.0719ha	Mostly permanent	Not reversible	Minor	Minor	Coral survey within footprint prior to piling works

Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
Construction Phase – Indirect Impact										
Disturbance impacts (noise, dust and human activities)	Construction works	Sensitive habitats near the works area	Range from “very low” to “low to moderate” for various habitat types	Terrestrial fauna	Vary	Temporary	Reversible	Minor	Insignificant	Good site practice
Water quality	Surface runoff from works area	Watercourse and marine habitats	Low for channelized / culverted watercourse sections and moderate for uphill natural watercourse sections; low to moderate for marine habitats	Aquatic and marine organisms	Vary	Temporary	Reversible	Minor	Minor to moderate	Follow water quality mitigation measures
	Bore piling process	Marine habitats	Low to moderate	Marine organisms including low coverage of common hard coral and gorgonian	Vary	Temporary	Reversible	Minor	Minor	Follow water quality mitigation measures

Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
Operational Phase – Direct Impact										
Habitat loss	Cycle track	No additional habitat loss during operational phase	Overall ecological value within Project Site is ranked as low	Generally low diversity of flora and fauna as well as marine organisms	Vary	Permanent	Not reversible	Low	Insignificant	No
Operational Phase – Indirect Impact										
Disturbance impacts	Cycle track	Sensitive habitats near the potential development area	Range from “very low” to “low to moderate” for various habitat types	Generally low diversity of flora and fauna as well as marine organisms	Vary	Permanent	Not reversible	Insignificant	Insignificant	No

8.10. Cumulative Impacts

- 8.10.1. In order to assess the cumulative impacts, a review of best available information at the time of preparing this EIA report to identify a number of other projects that are undergoing planning, design, construction and/or operation within the construction and/or operational period for this Study has been conducted and a list of concurrent projects identified at this stage is provided in Section 2 of this EIA report. The potential occurrence of cumulative impacts would be mostly determined by the nature of the projects, the project scales, and the distances between the projects. The cumulative impacts were assessed based on Section 4.3.3 of the EIAO-TM.
- 8.10.2. Although there are a number of major committed and planned projects that are located in the vicinity of the Project, only four of them interface with present Project. The table below (**Table 8.20**) summarizes the relevancy of the key concurrent projects within 500m Study Area and the potential impacts involved. Project relevant to ecology is examined individually.
- 8.10.3. Three concurrent projects, including Widening of Castle Peak Road – Castle Peak Bay – Design and Construction, Construction of Public Housing Development at Hin Fat Lane, and Site Formation and Infrastructure Works at Tuen Mun Central Phase 1 – Remaining Infrastructure Works (**Table 8.20**), have potential cumulative impacts on terrestrial ecology with present Project, no information on other concurrent projects. However, present Project only contributes to small portion of the cumulative impacts due to the scale and nature of the Project.

Table 8.20 Evaluation of Cumulative Impacts from Concurrent Projects

Potential Concurrent Projects	Scheduled construction period		Potential cumulative impacts (Construction Phase)	Potential cumulative impacts (Operational Phase)
	Start	Completion		
Agreement No. CE17/2013(HY) – Widening of Castle Peak Road – Castle Peak Bay – Design and Construction, by Highways Department (HyD)	4 th quarter of 2020	2 nd quarter of 2024	Potential cumulative disturbance impacts to terrestrial habitats near the Project Site due to the road widening works. Marine works not relevant.	Relevant to cumulative terrestrial disturbance impacts due to human activities. Marine works not relevant.
District Open Space in Area 27 (Sam Shing), Tuen Mun, by Architectural Services Department (ASD)	End of 2020	2023	Marine works not relevant.	Marine works not relevant.
Construction of Public Housing Development at Hin Fat Lane, Tuen Mun, by HKHA	2020	2024	Potential cumulative disturbance impacts to terrestrial habitats near the Project Site due to the construction works. Marine works not relevant.	Relevant to cumulative terrestrial disturbance impacts due to human activities. Marine works not relevant.

Potential Concurrent Projects	Scheduled construction period		Potential cumulative impacts (Construction Phase)	Potential cumulative impacts (Operational Phase)
	Start	Completion		
Contract No. CV/2021/01 - Site Formation and Infrastructure Works at Tuen Mun Central Phase 1 – Remaining Infrastructure Works, by CEDD	3 rd quarter of 2021	3 rd quarter of 2024	Potential cumulative disturbance impacts to terrestrial habitats near the Project Site due to the infrastructure works. Marine works not relevant.	Relevant to cumulative terrestrial disturbance impacts due to human activities. Marine works not relevant.
Traffic Improvement Scheme in Tuen Mun – Widening and Addition of Slip Roads at Lung Fu Road / Tuen Mun Road / Wong Chu Road / Hoi Wing Road, by HyD	n/a	2031	No define start date of this project.	No define start date of this project.

8.11. Residual Impacts

- 8.11.1. Residual environmental impact refers to the net environmental impact after the implementation of all mitigation measures, with the background environmental conditions and the impact from existing, committed and planned projects in nearby areas being taken into account.
- 8.11.2. As a result of land-based construction activities, up to 0.99 ha developed area, 0.11 ha mixed woodland, 0.29 ha plantation woodland and 0.1 km man-made watercourse would be permanently lost due to the construction of the cycle track. The affected habitats are considered to be of very low, low or low to moderate ecological values. With the implementation of the recommended mitigation measures discussed in Section 8.9, it is anticipated that all potential ecological impacts will be reduced to an acceptable level. Therefore, no adverse residual impact due to the construction of proposed cycle track is expected from the aspect of terrestrial ecology.
- 8.11.3. In terms of marine-based construction works, approximately 0.0019 ha marine waters, 0.03 km sandy shore of low ecological value will be lost permanently due to the marine piling works for the viaducts. Since the loss of marine habitats is very small in size in the context of surrounding similar habitats, therefore no unacceptable residual impacts are anticipated from the aspect of marine ecology.

8.12. Conclusion

- 8.12.1. This section of the EIA has described the potential terrestrial and marine ecological impacts associated with the construction and operation of the Project. The purpose of the assessment is to evaluate the acceptability of the predicted impacts to terrestrial and marine ecological resources and sensitive receivers. Findings of literature review and dedicated baseline field surveys have provided information for the evaluation of species of conservation importance and ecological importance of various habitats within the Assessment Area.
- 8.12.2. A total of 10 habitat types were identified within the Assessment Area. There are terrestrial habitats (i.e. cultivated land, developed area, grassland/shrubland, mixed woodland, plantation woodland and watercourse) and coastal habitats (i.e. marine waters, rocky shore, sandy shore and seawall). Many of the habitats are of very low to low ecological value, except for the watercourse within Tai Lam Country Park of moderate ecological value, mixed woodland and marine waters of low to moderate ecological value. Apart from this, only Tai Lam Country Park is located within the Assessment Area but there will be no impacts on this recognized site of conservation importance.
- 8.12.3. Regarding the terrestrial species of conservation importance, 3 plant species, 1 mammal species, 4 bird species, 1 dragonfly species and 1 butterfly species were recorded from the ecological surveys.

As the three plant species were planted in the plantation within the Project Site, and the fauna species are mobile species, significant impacts to these species are not expected. Marine fauna of conservation importance recorded within the Assessment Area included *Oulastrea crispata* and *Guaiaigorgia* sp.. Low coverage (less than 5%) of hard coral *Oulastrea crispata* and gorgonian *Guaiaigorgia* sp. were recorded in the subtidal area near the Project Site, but potential risk of encroachment of these hard coral and gorgonian is not likely. Avoidance of encroaching the hard coral and gorgonian is adopted. As a precautionary approach, a coral survey should be conducted to record the number, locations, species, sizes, conditions and feasibility for translocations of coral colonies along and in the vicinity of the proposed viaduct.

- 8.12.4. During the construction phase, construction activities would have direct impacts on small areas of developed area, grassland/shrubland, mixed woodland, plantation woodland and man-made watercourse, due to the small areas and low or low to moderate ecological value, terrestrial ecological impact arising from the cycle track would be low.
- 8.12.5. During the operational phase, indirect impacts including human activities might affect the wildlife in the vicinity. However, all habitats are surrounded by developed area which are subject to existing disturbance, the potential impact due to human activities is ranked as Insignificant.
- 8.12.6. For marine ecological impact, habitat loss of marine waters which is of low to moderate ecological value (within the Project footprint) will arise from minor piling works and there will be potential burial of benthic organisms, i.e. 0.0019 ha. Intertidal and subtidal habitats will be impacted temporarily due to the deterioration of water quality arising from minor piling works.
- 8.12.7. With the implementation of the proposed mitigation measures, no adverse residual impact due to the land-based and marine-based construction of cycle track is anticipated

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9. Fisheries

9.1. Introduction

9.1.1. This section presents the fisheries assessment of the Project based on the criteria and guidelines stated in Annex 9 and Annex 17 of the EIAO-TM and has covered the scope outlined in Section 3.4.9 of the EIA Study Brief No. ESB-295/2016.

9.2. Relevant Legislations, Standards & Guidelines

9.2.1. The local relevant regulations, legislation and guidelines for the assessment of fisheries impacts include the following:

- The Environmental Impact Assessment Ordinance (Cap. 499) and the associated TM;
- Fisheries Protection Ordinance (Cap. 171) and its subsidiary legislation, the Fisheries Protection Regulations;
- Marine Fish Culture Ordinance (Cap. 353) and its subsidiary legislation;
- Marine Parks Ordinance (Cap. 476); and
- Water Pollution Control Ordinance (Cap. 358) and its subsidiary regulations and statements.

9.2.2. Annex 17 of the EIAO-TM sets out the general approach and methodology for assessments of fisheries impacts arising from a project or proposal, to allow a complete and objective identification, prediction and evaluation of the potential fisheries impacts. Annex 9 recommends the criteria that can be used for evaluating fisheries impacts.

9.2.3. Destructive fishing practices such as the use of explosive, toxic substances, electricity, dredging, suction and trawling devices for the purpose of fishing are detrimental to fisheries and the marine ecosystem, and are prohibited under the Fisheries Protection Ordinance (Cap 171).

9.2.4. Marine fish culture is protected and regulated by the Marine Fish Culture Ordinance (Cap. 353) which requires all marine fish culture activity to operate under licence in designated fish culture zones.

9.2.5. Under the Marine Parks Ordinance (Cap. 476), fishing activities, including commercial fishing, inside Marine Parks are restricted, and could only conducted with a permit issued by the Authority.

9.2.6. Water Pollution Control Ordinance (Cap. 358) aims to control water pollution in the waters of Hong Kong. According to the Ordinance and its subsidiary legislation, Hong Kong waters are divided into ten water control zones (WCZ). Water control zones are designated with individual water quality objectives to promote the conservation and best use of those waters in the public interest. Corresponding statements of Water Quality Objectives (WQO) are stipulated for different water regimes (marine waters, inland waters, bathing beaches subzones, secondary contact recreation subzones and fish culture subzones) in each of the WCZ.

9.3. Assessment Area and Approach

Assessment Area

9.3.1. As set out in Section 3.4.9 of the EIA Study Brief (EIA Study Brief No.: ESB-295/2016), the Assessment Area for the Fisheries Impact Assessment (FIA) shall include areas within 500m from the site boundary of the Project Site and the associated works. The Assessment Area shall be extended to include other areas if they are also found likely to be impacted by the construction or operation of the Project during the course of the EIA study. Special attention shall be given to potential loss or disturbance of fishing grounds, fisheries resources and habitats, spawning grounds at sensitive receivers particularly the Ma Wan Fish Culture Zone.

Assessment Approach

- 9.3.2. It is stated in the Appendix F of the EIA Study Brief that the existing information regarding the Assessment Area shall be reviewed. Based on the review results, the assessment shall identify data gap and determine if there is any need for field surveys to collect adequate and updated baseline information. If field surveys are considered necessary, the assessment shall recommend appropriate methodology, duration and timing for such surveys.
- 9.3.3. The scopes of the FIA as required in the Appendix F of the EIA Study Brief are as follows:
- i. Description of the physical environmental background;
 - ii. Description and quantification of the existing fisheries activities;
 - iii. description and quantification of the existing fisheries resources;
 - iv. identification of parameters (e.g. water quality parameters) and sites of fisheries importance;
 - v. prediction and evaluation of any other direct/indirect, onsite/offsite impacts on fisheries (such as potential loss or disturbance of fishing grounds, fisheries habitats, spawning or nursery grounds, fishing activities, water quality deterioration at sensitive receivers such as fish culture zones and artificial reefs) caused by the project;
 - vi. evaluation of cumulative impacts on fisheries due to other planned and committed concurrent development projects at or near the assessment area;
 - vii. proposals of practicable mitigation measures with details on justification, description of and programme feasibility as well as staff and financial implications including those related to subsequent management and maintenance requirements of the measures; and
 - viii. review for the need of monitoring during the construction and operation stages of the Project and, if necessary, proposal for a monitoring and audit programme.

Key Fisheries Issues

- 9.3.4. A number of fisheries resources are identified in the vicinity of the Project Site and/or the Assessment Area. These include:
- Fishing grounds for capture fisheries (i.e. coastal waters) within 500m distance;
 - Fisheries habitats;
 - Spawning grounds of commercial fisheries resources;
 - Ma Wan Fish Culture Zone.
- 9.3.5. The existing information on commercial fisheries resources and fishing operations in the waters of the Assessment Area and its vicinity shall be reviewed. Based on the review results, the assessment shall identify data gap and determine if there is any need for field surveys to collect adequate fisheries baseline information. The FIA will follow Annexes 9 and 17 of the EIAO-TM, in which the general approach and methodology for assessments of fisheries impacts, and the criteria that can be used for evaluating fisheries impacts are stipulated.

9.4. Methodology for Baseline Establishment

Literature Review Methodology

- 9.4.1. Existing information about the fisheries baseline condition within the Assessment Area were reviewed. Relevant literature included previous EIA studies, consultancy studies, and AFCD data were reviewed. The review, with focus primarily on the Project Site and secondarily on the assessment area, aimed to collect fisheries data, to establish the fisheries baseline conditions, and to identify practices, areas and species of potential fisheries importance which may be affected by the Project for incorporation into the assessment.

- 9.4.2. This review included but was not limited to the following:
- Port Survey 2016/2017;
 - Agriculture, Fisheries and Conservation Department (AFCD) latest annual report and website;
 - Other relevant reports from government and private sectors.
- 9.4.3. Port Survey is a comprehensive survey routinely conducted by AFCD to collect data on fisheries production and fishing operations in Hong Kong waters. Uniform grid of 720 ha cell size was overlaid on Hong Kong's waters for Port Survey 2016/2017 and the fisheries related information (e.g. production, vessel number, catch value) was presented in several categories. The fisheries resources within the Assessment Area were evaluated based upon the information from Port Survey. The results of Port Survey 2016/2017 are available on AFCD website.
- 9.4.4. AFCD's latest annual report 2017/2018 and website provide the most updated information on the development and trend in Hong Kong fisheries. The latest annual fisheries production is also provided.
- 9.4.5. Other relevant studies include:
- 3RS EIA Study; and
 - Fisheries Resources and Fishing Operations in Hong Kong Waters (ERM 1998).
- 9.4.6. The validity of the information compiled during the literature review was assessed before it is adopted into the present FIA study.

9.5. Baseline Conditions

Sites of Fisheries Importance

- 9.5.1. Fishing grounds cover most of the open waters within the Assessment Area.
- 9.5.2. Besides the fishing grounds in the Assessment Area, the following sites of fisheries importance are located in the vicinity:
- Spawning grounds of commercial fisheries resources;
 - Artificial reefs in Sha Chau and Lung Kwu Chau Marine Park, Brothers Marine Park, and airport extension; and
 - Ma Wan Fish Culture Zone (FCZ).

Capture Fisheries

- 9.5.3. The fishing industry of capture fisheries makes an important contribution to Hong Kong in maintaining a steady supply of fresh marine fish to local consumers. In 2020, it produced an estimated 116,000 tonnes of capture fisheries valued at about \$ 2.7 billion (Information from AFCD website, 2021).
- 9.5.4. AFCD Port Survey provides the most comprehensive information on capture fisheries in Hong Kong waters, including fishing operations and fisheries production (adult fish and fish fry).
- 9.5.5. The Port Survey consisted of an interview programme. In Port Survey 2016/2017, about 36% of the local fishing fleet which accounted for all homeports (places at which local fishing vessels are based) and vessel types was interviewed (AFCD website, 2020). Particulars such as vessel length, type and homeport of the fishing vessels were recorded and information about their fishing operations and fisheries production in Hong Kong waters was collected during the interviews.
- 9.5.6. In Port Survey 2016/17, the fishing operation in grid cells was categorized into 6 classes, i.e. > 0-50 vessels; >50-100 vessels; >100-200 vessels; >200-400 vessels; >400-600 vessels; and >600-800 vessels. Sampan is assumed as the only fishing operation in the study area as fishing vessels other than sampan are less likely to operate at the nearshore area around the study area. There were 200 – 400 vessels operating in the waters in the vicinity of the Project Site (ranked as moderate) ([Figure](#)

9.1). The grid cells were categorised into one of the 6 classes, in accordance with their overall adult fish production. i.e. > 0 - 50 kg/ha; >50-100 kg/ha; >100-200 kg/ha; >200-300 kg/ha; >300-400 kg/ha; and >400-600 kg/ha. As reported in Port Survey 2016/17, the sampan fisheries production of the grid cell adjacent to the Project Site was >50 – 100 covering the footprint for the viaducts and >100 – 200 kg/ha in the vicinity (ranked as low and low to moderate, respectively) (Figure 9.2).

Spawning/Nursery Grounds and Artificial Reefs

- 9.5.7. Artificial reefs were deployed at Sha Chau and Lung Kwu Chau Marine Park, Brothers Marine Park and the area near airport extension. The aims of deploying artificial reefs in those areas are to increase the fisheries resources and to provide more food prey for Chinese White Dolphin.
- 9.5.8. Negligible fish fry production was found in the waters near the Project Site according to Port Survey 2016/17. However, the North Lantau waters between the Brothers and Lung Kwu Chau were identified as important spawning grounds of fish and shrimp during a fisheries consultancy study in Hong Kong (Figure 9.3) (AFCD 1998), which consist of spawning individuals of high commercial value (e.g. *Lateolabrax japonicus*, *Metapenaeus affinis* and *Oratosquilla oratoria*) (*ibid*). The shortest separation distance of the spawning area is over 2 km from the Project Site. Major species included Pony fish *Leiognathus brevisrostris*, Sea bass *Lateolabrax japonicus*, and Gizzard shad *Clupanodon punctatus*.

Findings from other EIA studies

- 9.5.9. Fisheries surveys were conducted during the 3RS EIA study, and the scopes covered field surveys (adult fish and fish larvae) and interview programme. Fisheries surveys included fish trawl, purse-seine, gill net, underwater visual counts, ichthyoplankton and fish post-larvae were conducted. Four locations were sampled, including northern and western Chek Lap Kok waters, Sha Chau and Lung Kwu Chau Marine Park (SCLKCMP), and The Brothers (Figure 9.4). In general, a total of 182 species were recorded, most of the dominant species are of no or low commercial values. The interview programme revealed a moderate number of vessels of 150 frequently operated within the surveyed area. This study provided fisheries information at northern Chek Lap Kok / western part of Hong Kong waters. The nearest sampling location was the SCLKCMP, which is over 4 km navigation distance from the western coastline of Tuen Mun. Trawling survey was not conducted in this location for minimising the disturbance to seabed. A total of 68 species were recorded in the SCLKCMP. The top five dominant species recorded in terms of abundance were *Nematalosa nasus*, *Sardinella albella*, *Collichthys lucidus*, *Valamugil cunnesius* and *Leiognathus brevisrostris*. In terms of yield, the top five dominant species were *Nematalosa nasus*, *Sardinella albella*, *Valamugil cunnesius*, *Ilisha elongata* and *Pampus argenteus*.
- 9.5.10. Another sampling location from 3RS EIA study closed present Project Site is northern Chek Lap Kok. Most of the surveys were generally recorded a moderate yield. *Thryssa kammalensis*, *Sardinella albella*, *Temnopleurus toreumaticus*, *Leiognathus brevisrostris* and *Alepes djedaba* were the top five abundant species recorded, whilst *Thryssa kammalensis*, *Sardinella albella*, *Nematalosa nasus*, *Rhizoprionodon acutus* and *Temnopleurus toreumaticus* were the dominant species recorded in terms of yield.
- 9.5.11. According to the results of ichthyoplankton and post-larvae surveys for 3RS EIA study, it was shown that the mean ichthyoplankton density (1.13 ± 1.98 larvae m^{-3} ; family richness: 6.79 ± 3.34) and mean post-larvae density (9.85 ± 11.35 larvae m^{-3} ; family richness: 3.79 ± 2.32) were low and mostly consisted of families of low commercial values.. Both in SCLKCMP and northern Chek Lap Kok waters, the ichthyoplankton and post-larvae densities and family richness were low, and mostly consisted of families of low commercial values.

Culture Fisheries

- 9.5.12. As there is no fishpond in the vicinity of Tuen Mun to So Kwun Wat, pond fish culture is not an issue for this FIA and would not be further discussed. This FIA would only focus on mariculture of culture fisheries. The predominant type of mariculture in Hong Kong is marine fish culture. Marine Fish culture involves rearing of marine fish from fry or fingerlings to marketable size in cages suspended by floating rafts usually in sheltered coastal areas. The species cultured changed gradually over the recent years depending on the availability of imported fry mainly from Mainland, Taiwan, Thailand,

Philippines or Indonesia. Common species under culture include green grouper, brown-spotted grouper, giant grouper, Russell's snapper, mangrove snapper, goldlined seabream, and star snapper (Information from AFCD website, 2020).

- 9.5.13. Marine fish culture is protected and regulated by the Marine Fish Culture Ordinance (Cap. 353), which requires all marine fish culture activities to operate under licence in designated FCZs. Currently, there are 26 FCZs occupying a total sea area of 209 ha with some 925 licensed operators. In 2020, the estimated production from local marine fish culture was about 687 tonnes (of value HK\$ 52 million), which catered about 5% of local demand for live marine fish (Information from AFCD website, 2020).
- 9.5.14. There are no FCZs in the vicinity of the Project Site. Of the 26 gazetted FCZs zones in Hong Kong, Ma Wan FCZ ([Figure 9.5](#)) is the one located nearest to the Project Site, but is over 6 km distance.

Need for Field Survey

- 9.5.15. According to the reviewed literature, existing information has well covered the Assessment Area, which provides comprehensive and quantitative data in North Lantau waters, including the waters near Project Site. The fisheries production and the fishing operation are not high in the Project Site and its vicinity. It is considered that the literature can provide sufficient information for fisheries impact assessment and there is no information gap on fisheries baseline conditions within the Assessment Area, and thus no fisheries surveys were proposed for the study.

9.6. Assessment Methodology

Assessment Criteria

- 9.6.1. The impacts have first been assessed before implementation of mitigation measures. Both construction and operational phase impacts on fisheries are assessed individually, then cumulatively, in combination with other existing, committed and proposed developments.
- 9.6.2. The significance of fisheries impacts has been evaluated based primarily on the criteria set forth in Annex 9 of the EIAO-TM:
- Nature of impact;
 - Size of affected area;
 - Loss of fisheries resources/production;
 - Destruction and disturbance of nursery and spawning grounds;
 - Impact on fishing activity; and
 - Impact on aquaculture activity.
- 9.6.3. Impacts are generally ranked as "minor", "moderate" or "severe", although in a few cases a ranking of "insignificant" (less than "minor") may be given. The ranking of a given impact would vary, based on the criteria listed above. Wherever possible, significance of fisheries impacts would be quantified to allow ready appreciation of relative significance.
- 9.6.4. Besides adverse impacts, potential beneficial influences brought by the Project would also be considered in the assessment.
- 9.6.5. Then, the assessment would conclude whether the mitigation measures envisaged could alleviate any negative impacts of the Project and its components to within acceptable levels. The acceptability of the overall residual impacts would then be determined.
- 9.6.6. Cumulative impacts from concurrent projects (during both the construction and operational phases) would be evaluated and included in the EIA Report. Planned/on-going development projects in the North Lantau waters, in particular those would likely have cumulative fisheries impact during both the construction and operational phases of the Project would be considered and the potential cumulative fisheries impacts would be assessed. The cumulative construction phase impacts may include, cumulative water quality deteriorations (in particular suspended sediments), and cumulative disturbance impacts to fishing operations (particularly due to marine traffic of works vessels and works

areas). The cumulative operational phase impacts would include, cumulative loss of fishing grounds (due to reclamation footprints, restricted areas, and other areas not available for fishing operations), changes of hydrological regime, tidal exchanges and water quality in North Lantau waters due to the presence of reclamation and marine structures, and disturbance to fishing operations due to operational phase marine traffic.

- 9.6.7. Finally, the assessment would evaluate the need for fisheries monitoring and audit, and was prescribed in detail any required EM&A programme in accordance with the EIA Study Brief.

9.7. Fisheries Impact Evaluation

Construction Phase – Direct Impacts

- 9.7.1. The proposed viaduct between Cafeteria Old Beach and Kadoorie Beach involves bored piles in the marine waters, direct encroachment of fishing grounds is expected. An estimated fishing grounds loss including both works area and Project Site will be about 0.0719 ha. An estimated fishing grounds will be lost temporarily in the works area, about 0.07 ha. However, no fisheries sensitive receivers such as the spawning ground and Ma Wan Fish Culture Zone will be encroached.
- 9.7.2. When compared with the 1,651 km² (approximately 165,100 ha) of Hong Kong's total marine waters (EPD 2013) which is mostly available for fishing, the construction phase fishing ground loss (about 0.0719 ha) caused by the Project is considered to be of insignificant proportion. Moreover, the area in the vicinity of the Project Site is of low or low to moderate production output (for sampan) according to Port Survey 2016/2017. Production of the grid cell covering the Project Site is ranked as low (50 – 100 kg/ha) (Information from AFCD website, 2020), the magnitude of the impact is not severe due to the low production rate, and is ranked as Minor. No specific mitigation measures are required.
- 9.7.3. After the setting up of the marine works area, fishermen originally use the area of marine waters as part of their fishing grounds might need to shift their operation locations to other locations/areas. Based on the information from Port Survey 2016/2017, and the facts that the area is close to the existing coastline, it is expected that fishing vessels will operate in this area if any would be mainly small fishing vessels such as sampans. Only moderate numbers of vessels (200 – 400 sampans) were operating in the area according to the Port Survey 2016/17, and the sampans are more flexible than large vessel during operation. Hence, the impact to fishing operation is considered minor. No specific mitigation measures are needed.

Construction Phase – Indirect Impacts

- 9.7.4. Bored pile will be used for constructing the viaduct between Cafeteria Old Beach and Kadoorie Beach. Sediment plumes (suspended solids) due to construction works of bored pile would be localised, as the predicted elevated suspended solids concentration shows that the non-compliance would disappear rapidly after 20m away from the piling works source, if silt curtain is not deployed. Upon installation of silt curtain, the non-compliance would disappear after 3-5m away from the bore piling work source (see Chapter 5). High suspended solid level might block the gill of fish and other marine organisms and would affect the gaseous exchange, whilst the high turbidity would affect the foraging of organisms relying on eye sights. A lower oxygen level would affect stationary species, whilst mobile species would tend to temporarily avoid the area. The results could be a temporary reduction in abundance of fisheries resources. Nutrients and/or contaminants in the seabed sediment might be released into the marine waters when the sediment is disturbed, and might have negative effects on water quality such as increasing the chances of algal bloom or accumulation of contaminants inside organisms. Since only bored piles will be constructed, large scale release of contaminants from the sediment would not occur, and the suspended solids would be localised. Hence the water quality effect on fisheries resources as well as the fisheries sensitive receivers such as the artificial reefs at Sha Chau and Lung Kwu Chau Marine Park, Brothers Marine Park, and the area near airport extension, spawning ground and Ma Wan Fish Culture Zone would be "Minor".
- 9.7.5. Pollutants or chemical spillage from the land works areas might occur, but the magnitude is not expected to be significant and should be transient. The potential water quality impacts due to land works including site runoff, sewage from workforce, wastewater from various construction activities, and accidental spillage would be controlled through the implementation of suitable site facilities, and

no adverse water quality impacts would be anticipated due to spillage, sewage from works forces and wastewater from land-based works is ranked as Insignificant.

Operational Phase – Direct Impacts

- 9.7.6. Permanent fishing ground loss occurs during operational phase due to the presence of bored piles (0.0019 ha). The permanent loss of marine habitats is considered Insignificant.

Operational Phase – Indirect Impacts

- 9.7.7. As only limited number of bored piles will be constructed in the marine habitats, change in hydrodynamics is not expected. Water pollution from cyclists to marine waters is also not expected, as there are public toilets in the vicinity of the proposed cycle track. No maintenance dredging would be required for the viaducts, and therefore no water quality impacts could be induced. Hence, no operational phase impacts to fisheries are anticipated from the Project.

9.8. Mitigation Measures

Considerations for Impact Avoidance

- 9.8.1. There is no fishpond or mariculture site within the Project Site. The proposed viaduct is not located in waters of high fisheries production or fish fry collection, and also away from other sites of fisheries importance such as the artificial reefs in the vicinity, spawning grounds for fisheries species in North Lantau waters.

Considerations for Impact Minimisation

- 9.8.2. During the construction phase, site runoff would need to pass through sedimentation tanks to reduce the concentration of SS. In accordance with the Practice Note for Professional Persons on Construction Site Drainage, Environmental Protection Department, 1994 (ProPECC PN 1/94), best management practices should be implemented on site as far as practicable to control site runoff and drainage at all work sites during construction, so that the treated runoff will be discharged to public drainage system in compliance with the WPCO. Construction effluent, site run-off and sewage should be properly collected and/or treated. Wastewater from a construction site should be managed. Proper locations for discharge outlets of wastewater treatment facilities well away from the natural streams/rivers should be identified. Effluent monitoring should be incorporated to make sure that the discharged effluent from construction sites meets the effluent discharge guidelines. The best practices are detailed in the water quality chapter.
- 9.8.3. The adoption of the water quality measures stated in the water quality chapter (Section 5.7), to control construction site runoff, sewage effluents, general construction activities, and accidental spillage of chemicals, would help minimize impact on fisheries. No other specific mitigation measures for fisheries are required.
- 9.8.4. No specific mitigation measures would be required for the operational phase of present Project.
- 9.8.5. From the information presented above, the fisheries impacts associated with the Project are not considered to be significant. An evaluation of the impacts during construction phase and operational phase of the Project are shown in **Table 9.1** and **Table 9.2**, respectively.

Table 9.1 Evaluation of Potential Fisheries Impact during Construction Phase

Potential Impact	Nature of impact	Size of affected area	Loss of fisheries resources/ production	Destruction and disturbance of nursery and spawning grounds	Impact on fishing activity	Impact on aquaculture activity	Impact significance	Mitigation required
Direct loss of fishing ground by construction of bored piles	Permanent for the footprint, temporary for the works area	0.0719 ha = (0.0019 + 0.07 ha) of fishing ground	Low	No direct impact to the nursery and spawning grounds for pier	The footprint of the bored piles and the temporary works area is small-scale. The project area is moderately used by small vessels.	No	Minor	No
Disturbance of fishing activities by the footprints and temporary works area of pier	Permanent for the footprint, temporary for the works area	Same as fishing ground loss	N/A	N/A	The footprint of the bored piles and the temporary works area is small-scale. The project area is moderately used by small vessels.	No	Minor	No
Indirect disturbance of fisheries habitats due to deterioration of water quality from the construction works	Temporary	Localized in the vicinity of the works area	Low	Insignificant	N/A	No	Minor	Follow water quality mitigation measures (e.g. silt curtain)

Table 9.2 Evaluation of Potential Fisheries Impact during Operational Phases

Potential Impact	Nature of impact	Size of affected area	Loss of fisheries resources/ production	Destruction and disturbance of nursery and spawning grounds	Impact on fishing activity	Impact on aquaculture activity	Impact significance	Mitigation required
Direct loss of fishing ground at the footprint of the pier	Permanent	0.0019 ha	Same as construction phase	No direct impact to the nursery and spawning grounds.	The footprint of the bored piles is small-scale. The project area is moderately used by small vessels.	No	Insignificant	No
Indirect impacts such as change in hydrodynamics and water pollution	Permanent	N/A	N/A	No	No	No	No	No

9.9. Cumulative Impacts

- 9.9.1. In order to assess the cumulative impacts, a review of best available information at the time of preparing this EIA report to identify a number of other projects that are undergoing planning, design, construction and/or operation within the construction and/or operational period for this Study has been conducted and a list of concurrent projects identified at this stage is provided in **Section 2.9** of this EIA report. The potential occurrence of cumulative impacts would be mostly determined by the nature of the projects, the project scales, and the distances between the projects. Among the concurrent projects, none of them relevant with fisheries as they are all land-based works.
- 9.9.2. As all of the key concurrent projects within the 500m of the Project are away from the marine waters, cumulative impacts during construction phase and operational phase are not anticipated.

9.10. EM&A for Fisheries

- 9.10.1. Site inspections during construction phase should be carried out to monitor any malpractice leading to deterioration of water quality of the surrounding which may in turn affect the fisheries resources as stated in Section 5.10 (i.e. a monitoring and audit programme aims to ensure that the released SS concentrations from the piling activities at marine viaduct sections). As there are no anticipated adverse impacts during operational phase, monitoring and audit requirements are not required.

9.11. Residual Impacts

- 9.11.1. Residual fisheries impacts would be the permanent loss of 0.0019 ha of low production fishing grounds in the coastal waters off Castle Peak Beach and Cafeteria Old Beach. Given the small proportion in fishing grounds in Hong Kong waters and the small contribution on Hong Kong fisheries production, as well as the implementation of the mitigation measures for water quality, the residual impact is considered acceptable.

9.12. Conclusions

- 9.12.1. The Assessment Area for the Fisheries Impact Assessment (FIA) included areas within 500m from the site boundary of the Project Site and the associated works as well as any other areas likely to be impacted by the Project. Special attention has been given to potential loss or disturbance of fishing grounds, fisheries resources and habitats, spawning grounds at sensitive receivers.
- 9.12.2. Information from literature has been incorporated, which provided sufficient information on fisheries resources in the Assessment Area. The fisheries production in the vicinity of the proposed development is regarded as low and no mariculture site is located near the proposed development. As only bored piles with 0.0019 ha will be constructed, together with the approaches for avoidance and minimization of impacts, potential fisheries impacts due to construction and operation of the Project are considered Minor and Insignificant.
- 9.12.3. Since no unacceptable impacts to fisheries resources and fishing operations are anticipated, no fisheries-specific mitigation measures are required.

10. Landscape and Visual

10.1. Introduction

- 10.1.1. This section describes legislation and guidelines that will be reviewed in the Landscape and Visual Impact Assessment (LVIA). The landscape baseline reviews the condition of existing landscape resources (LRs) and landscape character areas (LCAs), planning and development control framework, and the visual amenity and visually sensitive receivers (VSRs).
- 10.1.2. The assessment has been based on the criteria and guidelines stated in Annexes 10 and 18 of the EIAO-TM and covered in the scope outlined in Section 3.4.10 of the EIA Study Brief (No. ESB-29512016). The assessment identifies potential landscape and visual impacts that would occur during the construction and operational phases of the cycle tracks and associated supporting facilities, recommends landscape mitigation measures to alleviate the impacts; and identifies residual effects apparent after mitigation.

10.2. Relevant Legislations, Standards & Guidelines

- 10.2.1. Legislation, Standards, Guidelines and Criteria relevant to the consideration of landscape and visual impacts in this report include the following:
- Environmental Impact Assessment Ordinance (Cap. 499) and the Technical Memorandum on EIA Process (EIAO-TM), particularly Annexes 3, 11, 10, 18, 20 and 21;
 - EIAO Guidance Note 8/2010 on Preparation of Landscape and Visual Impact Assessment under the EIAO;
 - DEVB TC(W) No. 4/2020 - Tree Preservation;
 - DEVB TCW No. 6/2015 - Maintenance of Vegetation and Hard Landscape Features;
 - DEVB TC(W) No. 5/2020 - Registration and Preservation of Old and Valuable Trees;
 - Highways Department Technical Circulars, HyDTC No. 10/2001 on Visibility of Directional Signs;
 - Highways Department Technical Circulars, HyDTC No. 7/2006 on Independent Vetting of Tree Works under the Maintenance of Highways Department;
 - WBTC No. 7/2002 – on Tree Planting in Public Works (subsumed under Project Administration Handbook for Civil Engineering Works, 2020 Edition);
 - Forests and Countryside Ordinance (Cap. 96) and its subsidiary legislations;
 - Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586);
 - Planning Department - Landscape Value Mapping of Hong Kong;
 - DEVB TC(W) No. 9/2020 'Blue-Green Drainage Infrastructure'; and
 - GEO Publication No. 1/2011 Technical Guidelines on Landscape Treatment for Slopes.

Environmental Impact Assessment Ordinance

- 10.2.2. The Environmental Impact Assessment Ordinance (EIAO) was implemented on 1 April 1998. Its purpose is to avoid, minimize and control the adverse impact on the environment of designated projects, through the application of the EIA process and the Environmental Permit (EP) system.
- 10.2.3. The landscape and visual impact assessments have been carried out in accordance with the guidelines contained in Annexes 10 and 18 of the Technical Memorandum on EIA Process.

EIAO Guidance Notes 8/2010 on Preparation of Landscape and Visual Impact Assessment under the EIAO

- 10.2.4. The guidance note (GN) advises on the requirements in vetting Landscape and Visual Impact Assessment (LVIA) of designated projects (DPs) under the Technical Memorandum on EIA Process (EIAO-TM) for the EIAO. The main aim is to facilitate practitioners to prepare LVIA and to satisfy their own Quality Management System prior to making submissions under the EIAO.

DEVB TC(W) No. 4/2020 - Tree Preservation

- 10.2.5. This Circular sets out the policy on tree preservation, and the procedures for control of tree felling, transplanting and pruning in Government projects and covers the reporting of unauthorized tree removal (i.e. felling or transplanting), on both private and unleased Government land.

DEVB TCW No. 6/2015 - Maintenance of Vegetation and Hard Landscape Features

- 10.2.6. This Circular sets out the departmental responsibilities for maintenance of vegetation and hard landscape features. It should be read in conjunction DEVB TC(W) No. 7/2015 - Tree Preservation in Government Projects.

DEVB TC(W) No. 5/2020 on Registration and Preservation of Old and Valuable Trees

- 10.2.7. This Circular sets out the procedures for registration of old and valuable trees on unleased Government land within built-up areas and tourist attraction spots in village areas and the guidelines for preservation and maintenance of the registered trees.

HyDTC No. 7/2006 on Independent Vetting of Tree Works under the Maintenance of Highways Department;

- 10.2.8. Technical Circular promulgates the establishment of the Tree Works Vetting Committee (TWVC). It should be read in conjunction with DEVB TCW No. 6/2015 which sets out the policy on tree preservation, and the procedures for control of tree felling, transplanting and pruning in Government projects. It also stipulates that Highways Department (HyD) will provide advice to Lands Department (LandsD) for vetting of tree removal applications relating to land within the boundary of expressways and SIMAR slopes maintained by HyD through the setting up of the independent internal vetting body TWVC.

HyDTC No. 10/2001 on Visibility of Directional Signs

- 10.2.9. This guidance from the Highways Department highlights the importance of maintaining clear visibility of directional signs and provides guidance to Highways Department staff on appropriate actions.

WBTC No. 7/2002 on Tree Planting in Public Works (subsumed under Project Administration Handbook for Civil Engineering Works, 2020 Edition)

- 10.2.10. This Circular affirms the advocated policy on tree planting, which adopts a flexible and balanced approach in the planning and design of public works. It is subsumed under Project Administration Handbook for Civil Engineering Works, 2020 Edition.

Forests and Countryside Ordinance (Cap. 96) and its subsidiary legislations

- 10.2.11. The Forests and Countryside Ordinance (Cap. 96) prohibits the felling, cutting, burning or destroying of trees and growing plants in forests and plantations on Government land. The subsidiary Forestry Regulations prohibit the picking, felling or possession of listed rare and protected plant species. The list of protected species in Hong Kong, which comes under the Forestry Regulations, was last amended on 11 June 1993 under the Forestry (Amendment) Regulation 1993 made under Section 3 of the Forests and Countryside Ordinance.

Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)

- 10.2.12. The Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) restricts the import and export of species listed in CITES Appendices so as to protect wildlife from overexploitation or extinction. The Ordinance is primarily related to controlling trade in threatened and endangered species and restricting the local possession of them.

GEO Publication No. 1/2011 "Technical Guidelines on Landscape Treatment for Slopes

- 10.2.13. The Technical Guidelines are written for use by engineers engaged in slope works. It is intended that they will form a platform for the future research into and development of new techniques, especially in bio-engineering, in order to achieve visually and environmentally appropriate slopes.

10.3. Assessment Area

Landscape Impact Assessment

- 10.3.1. The scope for defining the assessment area for Landscape Impact Assessment (LIA) is in accordance with the requirements of the EIA Study Brief (No. ESB-295/2016) and EIAO Guidance Note No. 8/2010. The Study Area for LIA covers all areas within 500m from the Project boundary. This extent is illustrated in [Figure 10.1](#).

Visual Impact Assessment

- 10.3.2. The assessment area for Visual Impact Assessment (VIA) is identified by the visual envelope of the Project as specified the EIA Study Brief (No. ESB-295/2016). In accordance with EIAO GN No. 8/2010, the visual envelope (zone of visual influence) is generally the view shed formed by natural or manmade features such as vegetation, landform and/or built development. It contains areas which are fully, partially visible, glimpsed or unseen from this Project and its associated works. The Study Area for VIA is illustrated in [Figure 10.8.1](#).

10.4. Landscape and Visual Impact Assessment Methodology

Landscape and Visual Impact Assessment Methodology

- 10.4.1. Preparation of LVIA is based on the EIAO GN No. 8/2010 "Preparation of Landscape and Visual Impact Assessment under the EIAO" for evaluation of the proposed cycle track and associated facilities. The details of the Project have been described in Section 2 and the consideration of alternative layout, alignment and design have been explored and discussed in Section 2.3. The methodology for the LVIA and the assessment of the optimized final alignment is described in the following sections.

Review of Cycle Track Alignment

- 10.4.2. The proposed cycle track alignment and location of supporting facilities has been subject to design development regarding the spatial, land resumption, landscape and other environmental constraints and this review and design refinement process has been briefly described in Section 2.6 of the overall EIA for the project. This process has informed the final cycle track alignment and location of supporting facilities which forms the basis for this LVIA.

Landscape Planning Review

- 10.4.3. A review of the existing planning studies and documents has been undertaken as part of the baseline study to gain an insight into the planned role of the site, its surrounding areas, the landscape context and to help to determine if the Project fits into the wider existing and future landscape context. Compatibility of the proposed cycle track and associated supporting facilities to the planned developments either within or adjacent to the Study Area are also considered in terms of landscape and visual impacts.

Landscape Baseline Review and Impact Assessment

- 10.4.4. The assessment of the potential impacts of a proposed scheme on the existing landscape comprises two distinct sections namely the baseline survey and the landscape impact assessment. Landscape Impact Assessment (LIA) Study Area has been undertaken to include all areas within 500 m of the site boundary.

- 10.4.5. A baseline survey of the existing landscape resources and landscape character has been undertaken based on a combination of desktop studies and site surveys. The landscape elements which contribute to the landscape character include:
- Local topography;
 - Woodland extent and type;
 - Other vegetation types;
 - Built form;
 - Patterns of settlement;
 - Land use;
 - Scenic spots;
 - Details of local materials, styles, streetscapes, etc.;
 - Prominent watercourses; and
 - Cultural and religious identity
- 10.4.6. The process of landscape characterisation draws on the information gathered in the desktop and site survey and provides an analysis of the way in which the elements including the identified landscape resources (LRs) interact to create the character of the landscape. The Study Area is then divided into broadly homogenous units of similar character, which are called Landscape Character Areas (LCAs).
- 10.4.7. The sensitivity of the individual LR and LCAs to change is rated using low, medium or high depending on the following factors:
- Condition, quality and maturity of the LR / LCAs;
 - Importance and rarity of special landscape elements (rarity being of either local, regional, national or global importance);
 - Ability of the LR / LCAs to accommodate change; and
 - Statutory or regulatory requirements relating to the landscape including its resources.
- 10.4.8. The next stage of the assessment process is the identification of the assessment of the magnitude of change (rated as negligible, small, intermediate or large) arising from the implementation of the Project and the principal sources of impact based on the following factors:
- Scale of the cycle track and the associated supporting facilities;
 - Compatibility of the Project with the surrounding landscape;
 - Duration of impacts (temporary or permanent) under construction and operational phases; and,
 - Reversibility of change.
- 10.4.9. The degree of significance of landscape impact is derived from the magnitude of change which the Project will cause to the existing landscape context and its sensitivity. This makes a comparison between the landscapes which would have existed in the absence of the Project with that predicted as a result of the implementation of the Project. The significance threshold for impacts to LR and LCAs is rated as substantial, moderate, slight or insubstantial. The impacts may be beneficial or adverse.

10.4.10. The significance threshold is derived from the following matrix:

Magnitude of Change caused by the Project	Large	Moderate Impact	Moderate / Substantial Impact	Substantial Impact
	Intermediate	Slight / Moderate Impact	Moderate Impact	Moderate / Substantial Impact
	Small	Slight Impact	Slight / Moderate Impact	Moderate Impact
	Negligible	Insubstantial Impact	Insubstantial Impact	Insubstantial Impact
		Low	Medium	High
Sensitivity of Landscape to Change				

10.4.11. The above matrix will apply in the assessment of the majority of situations, however, in certain cases a deviation from this may occur, e.g. the impact may be so major that a substantial impact may occur to a LCA or LR with a low sensitivity to change.

Tree Survey Methodology

10.4.12. To minimize conflicts with existing vegetation a preliminary tree survey in accordance with DEVB TC(W) No. 4/2020, 'Tree Preservation' has been undertaken. This survey informs the potential tree impact assessed in this LVIA as a result of the proposed works. This tree survey involves the identification of individual trees within the proposed works area, which is at least 2 m offset from either side of the proposed cycle track alignment and site boundary of the associated facilities. The survey includes individual tree species, sizes, health condition, form, and amenity value and their treatment as a result of the implementation of proposed works.

10.4.13. A broad brush desktop review of the overall 500m assessment area has also been undertaken backed up by field investigation undertaken by the project ecologist and described under the existing landscape baseline review. The total quantity of trees within the assessment area has been estimated and further described under each of the Landscape Resources identified as part of the landscape baseline review.

10.4.14. This existing tree data allows the fine tuning of the detailed design for the proposed works and ensures that any significant trees including potential old and valuable trees or rare or protected tree species, where possible, be protected during both the construction and operational phases of the Project.

Visual Baseline Review and Impact Assessment

10.4.15. The assessment of the potential visual impact of the scheme comprises two distinct parts:

- Baseline survey; and
- Visual impact assessment which includes the identification of the sources of visual impact, and their magnitude, that would be generated during construction and operational phases of the proposed works; and identification of the principal visual impacts primarily in consideration of the degree of change to the baseline conditions.

10.4.16. The assessment area for the Visual Impact Assessment (VIA) is defined by an Visual Envelope (VE) which includes all areas from which the proposed works can be seen, or the area forms the view shed formed by natural / manmade features such as existing ridgelines, built development and for example areas of woodland / large trees. Within the VE, Zone of Visual Influence (ZVI) is identified to demonstrate the visibility of the proposed works. This is achieved through a combination of detailed walkover surveys, and desk-top study of topographic maps and photographs, and preparation of cross-sections to determine visibility of the improvement works from various locations.

- 10.4.17. The baseline survey of all views towards the Project is undertaken by identifying:
- The VE and ZVI as have been described above and may contain either wholly or partially within views. This must also include indirect effects such as offsite construction activities; and,
 - The visually sensitive receivers (VSRs) within the visual envelope whose views will be affected by the scheme.
- 10.4.18. The potential receivers are considered as four groups:
- Views from residences – the most sensitive of receivers due to the high potential of intrusion on the visual amenity and quality of life;
 - View from workplaces – less sensitive than above due to visual amenity being less important within the work environment;
 - Views from recreational landscapes – including all areas apart from the above, e.g. public parks, recreation grounds, footpaths, cultural sites etc. Sensitivity of this group depends on the length of stay and nature of activity, e.g. sitting in a park as opposed to an active sporting pursuit; and
 - Views from riverside access, public roads and highways including vehicle travellers with transitory views.
- 10.4.19. The assessment of sensitivity has also been based on the quality and extent of the existing view. Therefore, a view from a residential property, which would normally be considered the most sensitive view, may be less so if for example it is degraded by existing development or partially screened by intervening visual obstacles such as existing vegetation. Factors affecting the sensitivity of receivers for evaluation of visual impacts:
- Value and quality of existing views;
 - Availability and amenity of alternative views;
 - Type and estimated number of receiver population;
 - Duration or frequency of view; and,
 - Degree of visibility.
- 10.4.20. Views available to the identified VSRs are rated according to their sensitivity to change using low, medium or high.
- 10.4.21. The location and direction of its view relative to the scheme also influences the sensitivity of each group. Typical viewpoints from within each of the visually sensitive groups are identified and their views described. Both present and future (planned) visually sensitive receivers (PVSRs), if any, are considered.
- 10.4.22. The factors affecting the magnitude of change for assessing the visual impacts include the following:
- Scale of the cycle track and the associated supporting facilities;
 - Compatibility of the Project with the surrounding landscape forming the view; extent of visibility (level of potential blockage of the view);
 - Viewing distance;
 - Duration of impacts under construction and operational phases; and
 - Reversibility of change;
- 10.4.23. The magnitude of change to the views will be classified as follows:
- Large: e.g. Large project works extent/ Extensively blocked the views of VSRs/ Project nature is not compatible to existing visual context/ Works area located in the foreground of the visual context / Permanent impacts/ irreversible of change;
 - Intermediate: e.g. Intermediate project works extent/ Partially blocked the views of VSRs/ Project nature is fairly compatible to existing visual context/ Works area located in the middle ground of the visual context and not immediately adjacent to VSRs or their views are already partially

screened by existing topography, built structures or vegetation/ Permanent impacts/ Irreversible of change;

- Small: e.g. Small project works extent/ No blockage of views/ Project nature is compatible to existing visual context/ Works area located in distant to VSRs/ Permanent impacts and duration of construction impacts is short/ Irreversible change or temporary change of view; and
- Negligible: e.g. no discernible change in visual context.

10.4.24. The significance threshold for visual impact is rated in a similar fashion to the landscape impact, i.e. substantial, moderate, slight and insubstantial. The impacts may be beneficial or adverse. Therefore, the impact is derived from the magnitude of change, which the Project will cause, to the existing landscape context and its ability to tolerate the change, i.e. its quality and sensitivity. The significance threshold is derived from the following matrix:

Magnitude of Change caused by Proposals	Large	Moderate Impact	Moderate / Significant Impact	Substantial Impact
	Intermediate	Slight / Moderate Impact	Moderate Impact	Moderate / Substantial Impact
	Small	Slight Impact	Slight / Moderate Impact	Moderate Impact
	Negligible	Insubstantial Impact	Insubstantial Impact	Insubstantial Impact
		Low	Medium	High
Sensitivity of Receptor				

10.4.25. The above matrix will apply in the assessment of the majority of situations, however, in certain cases a deviation from this may occur, e.g. the impact may be so major that a substantial impact may occur to a view with a low sensitivity to change.

10.4.26. **Table 10.1** provides an explanation of the degree of impact for both landscape and visual aspects of the Project.

Table 10.1 Degree of Impact for Landscape and Visual Aspects

Impact	Description
Substantial	Adverse / beneficial impact where the Project would cause significant deterioration or improvement in existing landscape quality or visual amenity.
Moderate	Adverse / beneficial impact where the Project would cause a noticeable deterioration or improvement in existing landscape quality or visual amenity.
Slight	Adverse / beneficial impact where the Project would cause a barely perceptible deterioration or improvement in the existing landscape quality or visual amenity.
Insubstantial	No discernible change in the existing landscape quality or visual amenity.

Landscape Mitigation Measures

10.4.27. The purpose of mitigation is to avoid, reduce, and where possible remedy or offset any adverse effects on the environment arising from the Designated Project. The ideal strategy for identifiable adverse impacts is one of avoidance. If this is not possible, alternative strategies of reduction, remediation and compensation should be explored.

10.4.28. Mitigation measures may be considered under two categories:

- Primary mitigation measures that intrinsically comprise part of the identification of proposed cycle track alignment and the location and design of supporting facilities through an iterative process. This form of mitigation is generally the most effective; and

- Secondary mitigation measures designed to specifically address the remaining (residual) adverse effects of the proposed works.
- 10.4.29. Primary mitigation measures form integrated mainstream components of the proposed works focusing on the adoption of alternative alignment of the cycle track and location of supporting facilities, or revisions to the basic engineering and architectural design including layout, built structures etc to prevent and/or minimize adverse impacts. The design philosophy can also describe the benefits to the design of alternative solutions, introduced to reduce potential adverse impacts, and indicate how these have been addressed.
- 10.4.30. Secondary mitigation measures are specifically designed to mitigate the adverse impacts of the proposed works and are considered in the assessment of the landscape and visual impacts. These may take the form of remedial measures such as colour and textural treatment of built structure; and compensatory measures such as the implementation of landscape design measures (e.g. tree planting, creation of new amenity area etc) to compensate for unavoidable adverse impacts and to attempt to generate potentially beneficial long-term impacts.

Residual Impacts

- 10.4.31. The residual impacts are those, which remain after the proposed mitigation measures, have been implemented. This has been assessed both during the construction period and during the design year, which is often taken to be 10 years after the proposed scheme has been opened to normal operation when the soft landscape mitigation measures are deemed to have reached a level of maturity, which allows them to perform their original design objectives.
- 10.4.32. The level of impact is derived from the magnitude of change, which the Project will cause to the view, which would have existed during this period if the proposed scheme had not been constructed, and its ability to tolerate change, i.e. its quality and sensitivity taking into account the beneficial effects of the proposed mitigation. The significance threshold is derived from the matrices described separately above for the landscape and visual impacts.
- 10.4.33. In accordance with Annex 10 of the EIAO-TM a final conclusion is also made of the residual landscape and visual impacts attributable to the proposed scheme. The degree of residual impact is considered in accordance with the Residual Impact Significance Threshold Matrix in **Table 10.2**.

Table 10.2 Residual Impact Significance Threshold Matrix

Residual Impact	Description
Beneficial	The project will complement the landscape and visual character of its setting, will follow the relevant planning objectives and will improve overall and visual quality
Acceptable	There will be no significant effects on the landscape, no significant visual effects caused by the appearance of the project, or no interference with key views.
Acceptable with mitigation measures	There will be some adverse effects, but these can be eliminated, reduced or offset to a large extent by specific measures.
Unacceptable	The adverse effects are considered too excessive and are unable to be mitigated practically.
Undetermined	Significant adverse effects are likely, but the extent to which they may occur or may be mitigated cannot be determined from the study. Further detailed study will be required for the specific effects in question.

Graphic Presentation of Mitigation Measures

- 10.4.34. In order to illustrate these landscape and visual impacts and to demonstrate the effectiveness of the proposed landscape and visual mitigation measures, photomontages at selected representative viewpoints have been prepared to illustrate:

- Existing conditions
- Day 1 of Operation Phase without Landscape Mitigation Measures
- Day 1 of Operation Phase with Landscape Mitigation Measures; and
- Year 10 of Operation Phase with Landscape Mitigation Measures

10.5. Project Summary

10.5.1. The proposed cycle track route extends, from Tuen Hing Road at Tuen Mun in the north to So Kwun Wat Road at So Kwun Wat at the easterly extreme of the Project area. As described in Section 1.2 of the EIA Study Brief, the Project is to construct and operate a cycle track between Tuen Mun and So Kwun Wat with supporting and recreation facilities. The Project will comprise the following designated projects:

- A dredging operation due to construction of foundation construction being less than 500m from the nearest boundary of existing bathing beaches.

10.5.2. During development of the design and route alignment, the original cycle track alignment and location of supporting facilities shown on the Project brief was reviewed to incorporate government and public comments regarding the reduction of the potential impacts on private land, air quality, significant ecological and landscape resources etc. The following major changes have been made in the current Project:

- Removal of the originally proposed resting station near Aegean Coast and a proposed optional resting station near Golden Beach Car Park and localized amendments to the cycle track route and extent to reflect these revisions;
- Realign the track to run along Hoi Wah Road to remove requirements for construction of a cycle underpass in the vicinity of Sam Shing Street;
- Realign a section of track avoiding existing trees and existing barbeque area at Castle Peak Bay and construction of structures along the coastline to connect to Sam Shing Street;
- Review the works limit along the cycle track alignment to maximise the preservation of existing trees and ensure that sufficient space is reserved within the works limit for transplanted trees, compensatory planting and other landscape works;
- In order to minimize visual impacts brought to the existing beaches the two viaduct sections from Kadoorie Beach to Castle Peak Beach via Kadoorie Pier have been avoided and the cycle track realigned to a less visually prominent inland route.

10.5.3. After the above design review, the current proposed works are summarised as follows:

- Construction of a new cycle track with footpath (at-grade) with a total length of about 3.2 km, consisting of a 2.4 km long main trunk starting from the existing New Territories cycle track network at Hoi Wah Road at Tuen Mun to Kwun Tsing Road at So Kwun Wat, and a 0.8 km long section branching off from Castle Peak Road – Castle Peak Bay at Ki Lun Kong Public Park along Castle Peak Road – Castle Peak Bay to Hin Fat Lane;
- Construction of a new cycle track with footpath (viaduct) with a total length of about 0.2 km, constructed on existing government waterfront between Cafeteria Old Beach and Kadoorie Beach;
- Provision of 2 to 4 m wide new planting areas alongside the track and landscape areas associated with the supporting facilities, where space allows and technically feasible, for transplanted trees and to compensate the potential loss of existing trees and provide better integration of the proposed track and facilities within the existing open space and roadside landscapes;
- Modification of existing sloping areas or embankment adjacent to existing roads and footpath to accommodate the level differences between the existing ground level and proposed cycle track level;
- Construction of minor retaining structures along the proposed alignment where minor slope cutting is required to accommodate the new track;

- Provision of new box culvert and stream crossing opposite Cafeteria Old Beach accommodated a 4 m wide cycle track and 2 m wide footpath on the beach sides of the track;
- Associated landscaping, traffic aids, street lighting and other ancillary works; and
- Provision of bicycle parking spaces as supporting facilities for the cycle track, individual proposals are listed in **Table 10.3** below:

Table 10.3 Summary of Supporting Facilities

Facility	Location	Approximate Works Area Required (m ²)
Cycle parking areas (3 in total)	Near Kwun Tsing Road, Cafeteria Old Beach and Hin Fat Lane respectively	To be determined
Note: Approximate Works Area includes extent of site formation works to accommodate all proposed facilities, circulation spaces and planting areas. It is subject to review at the detailed design stage.		

10.6. Review of Planning and Development Control Framework

- 10.6.1. A review of the existing planning studies and documents has been undertaken to gain an insight into the planned role of the site, its context and to help to determine if the Project fits into the wider landscape context. The assessment does not consider all of the areas zoned on the OZP but focuses on only those potentially affected by the proposed works. The locations of these areas are shown on [Figure 10.3](#). This review considered the following aspects of the identified planning designations:
- Zoning areas which would be physically affected by the Project, that is where the implementation of the proposal works would lead to the actual loss of an area;
 - The potential degradation of the landscape setting of an area which might affect the viability of its landscape planning designation but not result in a loss of zoning area;
 - The visual amenity enjoyed by future residents or users; and
 - The general fit of the Project into this future landscape.
- 10.6.2. The assessment covers areas shown on the approved Tuen Mun Outline Zoning Plan No. S/TM/35. The relevant OZP Zoning areas through which the route passes and relevant zoning areas in close proximity to the proposed route include the following:
- Open Space - O
 - Green Belt - GB
 - Industrial - I
 - Residential (Group A) – R(A)
 - Undetermined
 - Government, Institution or Community - GIC
 - Other Specified Uses - OU
 - Residential (Group B) – R(B)
- 10.6.3. The land use zones generally reflect the predominately urban nature of the study area, although there are significant areas zoned Open Space and Green Belt, within and in close proximity to the proposed Project boundary. The Planning Intention of “Green Belt” zone is primarily for defining the limits of urban and sub-urban development areas by natural features and to contain urban sprawl as well as to provide passive recreation outlets. At this area of Tuen Mun the Green Belt designation largely functions to provide a buffer between the urban area and Tai Lam Country Park in the uplands to the north and west of the site. The proposed route runs close to such areas near Sam Shing Hui and in areas between residential zones along Castle Peak Road- Castle Peak Bay and these are important aspect of the visual context in these locations. Regarding areas zoned Open Space (O) the proposed cycle track, as a development aimed at the promoting of recreation and leisure is deemed to be in accordance with the planning intentions of this zone.

- 10.6.4. Areas that would be physically affected by the implementation of the proposed Cycle Track are generally located adjacent to the roadside areas along Castle Peak Road – So Kwun Wat and Castle Peak Road – Castle Peak Bay, and areas along the backshore of Castle Peak Beach, Kadoorie Beach, Cafeteria Old Beach and Cafeteria New Beach. The majority of the proposed works will not directly affect the current functioning of the existing land uses.
- 10.6.5. At three areas the cycle route passes directly through the edge of GB designated areas, although these areas are currently hard paved or otherwise developed and in this condition are not currently fulfilling the objectives of the GB zone. These localised infringements on the GB zone include a small area of Green Belt north of Handsome Gardens and Green Belt areas extending from the wooded knoll at Sam Shing Hui. This includes the Ki Lun Kang Park through which the proposed cycle track passes, within an existing hard paved footpath. No tree felling would be involved with the development of the cycle track in these areas.
- 10.6.6. Generally, the proposed route runs through existing areas within the highway boundary and through areas designated as Open Space (O). However, owing to variances between existing residential boundary structures on the ground and zoning boundaries on the OZP, in several areas the route strays from open spaces or highway areas into land zoned as residential, although on site the cycle track is situated outside the boundary demarcations of existing residential properties.
- 10.6.7. R(B) designations border the proposed cycle track at several locations and existing developments within this zone includes Aegean Coast at Castle Peak Road – So Kwun Wat and Monte Carlo Villa, Spring Sea View Development at the southern section of Castle Peak Road – Castle Peak Bay. At the coastal section of the cycle track Blessing Villa, Aquamarine Garden and Bay View Terrace overlooking the beach front are developments zoned R(B), whilst further to the north where the route turns inland again Palm Cove, Harvest Garden, Alpine Garden and Handsome Court along Castle Peak Road – Castle Peak Bay are typical developments within this zoning.
- 10.6.8. Along the northern portion of Castle Peak Road – Castle Peak Bay, the proposed cycle track runs along the eastern edge of the existing Tsing Sin Garden. This majority of this area is within the Highway boundary, however along the eastern edge adjacent residential zoning areas appear to overlap with the route. Similar situations occur South of Sam Shing Hui where the R(B) zoning associated with Palm Cove development extends almost to the carriageway edge of Castle Peak Road – Castle Peak Bay and similarly at residential zones to south such as Monte Carlo Villa, Spring Sea View and Palm Beach. The possible areas of R(B) zone affected are summarised in **Table 10.4**.
- 10.6.9. Other zones likely to be affected by the scheme include possible infringements to the boundary of R(A) zoning north of Handsome Gardens and impacts on G/IC zone. Use of G/IC zoned areas are likely to be required to facilitate the implementation of the scheme. The cycle passes along the edge of such an area at Sam Shing Hui, whilst the area of land zoned G/IC opposite Aegean Coast is likely to be required for compensatory tree planting.
- 10.6.10. Although there are some impacts to zoned areas, the proposed works would not degrade the landscape setting of the area or affect its viability or existing character. New tree planting alongside of the proposed cycle track will also enhance the landscape value along existing road corridors as well as the interface encroaching to individual zoning areas. In terms of the O and GB zoning it is considered that the use of screen planting will mitigate any potential visual impacts whilst there will be no direct physical loss of these zoning areas.
- 10.6.11. Given the above summary and detailed review in **Table 10.4**, the proposed cycle track largely fits into the planning and development control framework and integrates with the future outlook of the urban landscape context.

Table 10.4 Review of Existing Planning and Development Control Framework

The approved Tuen Mun Outline Zoning Plan (OZP No. S/TM/35)	Landscape Planning, Design and Conservation Intention of Zoning	Potential Impacts/Approx. Area Affected by the Proposed Works / Total Zoning Area	Mitigation Measures and Future Outlook of the Area with the Proposed Works
Open Space (O)	This zone extends as a connected strip along the waterfront of Tuen Mun Typhoon Shelter, Castle Peak Beach, Kadoorie Beach, Cafeteria Old Beach and Cafeteria New Beach and Golden Beach, as well as comprising various pockets within the urban area such as at So Kwun Wat Road to the south of the scheme. The zone is intended to provide outdoor open air public space for active and passive recreation uses serving the needs of the local residents as well as the general public.	At the coastal area the proposed cycle track and footpath runs along the landside edge of this "O" zone.. Whilst some vegetated areas shall be impacted, the potential to create a continuous pedestrian and cycling connection between the various beach areas along the coast represents a public benefit in leisure and recreation terms. 0.76 ha/18.9 ha (4%)	Given that the track is designed for the enjoyment of both local residents and general public, the proposed works are thus considered compatible to the planning intention for this area. Proposed new tree planting alongside of the track can facilitate potential enhancements to the function of this zone and improve integration and connections with future recreation landscapes.
Green Belt (GB)	This zone encompasses the existing vegetated knoll at Sam Shing Hui and generally extends as a buffer across the foothills to the north and west of the proposed cycletrack route. The planning intention of this zone is to define the limits of urban and suburban development areas by natural features, to contain urban sprawl as well as to provide passive recreational outlets.	Whilst the majority of the zone is outside the proposed cycle track works area, the route passes through the edge of this zone at two localized areas; the junction between Tuen Mun Road and Castle Peak Road – Castle Peak Bay and at a localized area north of Handsome court 0.11 ha/64.9 ha (0.17%)	Given that the proposed cycle track only occupies a small portion of this zone, the track is designed for the enjoyment of both local residents and general public, and that trees and vegetated areas shall be unaffected, the proposed works are thus considered compatible to the planning intention. Proposed new tree planting alongside of the track makes a better integration to the Green Belt than the current condition at these locations.
Residential (Group A) (R(A))	This zone encompasses the high-rise residential development in this area of Tuen Mun. Although there are several such zones within the study area only one such area is adjacent to the proposed cycle track. This zone is intended primarily for high density residential developments where commercial uses are always permitted on the lowest three floors of a building.	The proposed cycle track runs alongside the footpath to the west of an R(A) zone to the south of Tuen Mun Substation and may have minor infringement to the boundary of this zone. However, no existing residential development area will be affected. 0.039ha/43ha 0.09%)	Given that the proposed cycle track only occupies a small portion of this zone adjacent to the existing road, and that the track is designed for the enjoyment of both local residents and general public; hence the proposed works are compatible to the planning intention for this area. The proposed new tree planting alongside of the track makes a better integration to this high-rise developed landscape.

The approved Tuen Mun Outline Zoning Plan (OZP No. S/TM/35)	Landscape Planning, Design and Conservation Intention of Zoning	Potential Impacts/Approx. Area Affected by the Proposed Works / Total Zoning Area	Mitigation Measures and Future Outlook of the Area with the Proposed Works
Residential (Group B) (R(B))	This zone encompasses medium density residential development and its associated access roads and recreation areas to the development. This zone is intended primarily for medium-density residential developments where commercial uses serving the residential neighbourhood may be permitted on application to TPB.	<p>Owing to variances between existing residential boundary structures on the ground and zoning boundaries on the OZP, in several areas the route strays from open spaces or highway areas into land zoned as residential. However, on site the cycle track is situated outside the boundary demarcations of existing residential properties and most residential development area will be unaffected.</p> <p>0.59 ha / 82.6 ha (0.71%)</p>	The proposed cycle track occupies a fairly large area but owing to the prevalence of this zone within the study area this represents only a small percentage of the overall zone. Given that the track is designed for the enjoyment of both local residents and general public the proposed works are compatible to the planning intention for this area. The proposed new tree planting alongside of the track makes a better integration to this medium density developed landscape.
Government, Institution or Community – (G/IC)	The cycle passes along the edge an area zoned G/IC at Sam Shing Hui, whilst the area of land zoned G/IC opposite Aegean Coast is also within the remit of the scheme. This zone is intended primarily for Government, Institution or Community Facilities serving the needs of local residents or the wider community.	<p>The area of land zoned G/IC opposite Aegean Coast is likely to be required for compensatory tree planting. At Sam Shing Hui the cycle passes along the eastern and northern periphery of this zone which requires only modification of existing footpath or informal track.</p> <p>0.15 ha /37 ha (0.4%)</p>	Given that the proposed cycle track occupies a small portion of this zone and that the track is designed for the enjoyment of both local residents and general public the cycle track is generally felt to be compatible with this zone. At Sam Shing Hui the small scale of the infringement means that it will not be a development constraint to planned G/IC development and, the proposed works are thus considered compatible to the planning intention. Opposite Aegean Coast the proposed compensatory tree planting would be a benefit to the outlook of this development but the scale of the required planting would likely preclude other forms of intensive development.

10.7. Existing Landscape Baseline

Baseline Conditions

- 10.7.1. The development of the cycle track shall need to be sensitive to the disposition of existing landscape resources and areas of attractive landscape character in order to integrate effectively with the existing landscape context. The baseline review of the existing landscape establishes the broad characteristics, identifies landscape resources, and then provides a characterisation and evaluation of the identified Landscape Character Areas (LCAs).
- 10.7.2. [Figure 10.4](#) shows the existing LR's found within the 500m Study Area. [Figure 10.5.1 to Figure 10.5.2](#) illustrate the existing LR's located with the study area. [Figure 10.6](#) shows the extent of identified LCAs and [Figure 10.7.1 and Figure 10.7.2](#) demonstrate the quality of LCAs with site photographs.

Topography

- 10.7.3. Tuen Mun and the urban developments of the study area are set in lowlands extending around Castle Peak Bay which comprises a gently sweeping coastal bay backed by coastal lowlands formed between the uplands of Castle Peak (583 mPD) to the west and Peaks within Tai Lam Country Park (507 mPD) to the east. Along the coast this overall form of a sweeping bay is further divided into a series of lesser bays and headlands which correspond to the beaches and rocky shores which may up the natural coastal profile of the study area. Beyond the coastline a broad valley forms the setting of the main urban area of Tuen Mun, extending inland from Castle Peak Bay towards the central New Territories. Further to the East, extending from Cafeteria New and Old beaches the coastal lowlands form a relatively narrow belt backed by foothills and the lower slopes of Tai Lam which create a gently undulating topography within which the urban area has been formed. These foothills are periodically punctuated by stream courses extending from the uplands to the coast, which represent the natural drainage pattern of the study area.
- 10.7.4. Some of the topographic setting has been altered by built developments. Along the coastline the introduction of seawalls and revetments form man-made coastal structures such as the Tuen Mun Typhoon Shelter, Kadoorie Pier and the Gold Coast Marina. Tuen Mun Road (expressway) passes across the lower foothills, with cuttings and man-made slopes created in the undulating topography to facilitate construction of the required road profile. Similarly, but to a lesser degree, the route of Castle Peak Road has also required site formation and the creation of man-made slopes and associated areas of cut and fill, which have locally modified the original topography of the area. The lower section of several of the streams and watercourses which originate in the uplands and flow towards the coast have also been channelized and form part of the man-made drainage infrastructure of the urban area.
- 10.7.5. The built development of much of the central area of Tuen Mun is characterized by high rise residential towers, often on podium. Along the coastal foothills there are several high-rises, private residential clusters and also some large-scale government and community buildings including public and private schools. In contrast, the rural fringe landscapes of Kar Wo Lei located at the eastern end of the study area; on either side of the highway corridor is largely dominated by scattered village houses, some active agricultural fields and is occasionally punctuated by drainage structure, vegetated knolls and strands of woodland.

Vegetation

- 10.7.6. The vegetation contained within the Study Area has for the large part been considerably modified by human activity and so the existing pattern of vegetation represents a variation from the natural regime or climax vegetation, which would naturally occur in this area. This reflects the historical development of the area and the process of urbanization, which is still ongoing. Most of the proposed cycle track alignment and associated facilities cut across developed areas, with a few sections encroaching fringe of plantation and mixed woodland along Castle Peak Road.
- 10.7.7. The main vegetation pattern is characterised by vegetation types associated with road corridors, agricultural fields, foothills and wooded hill slopes which punctuate the coastal plain and rural fringe

and urban areas. The main vegetation types are described in greater detail as part of the landscape resources section below. [Figure 10.2](#) is an aerial photograph which gives a broad indication of the existing vegetation cover within the Study Area.

- 10.7.8. Mixed woodlands were recorded on remnants of natural hillslope between urban area of Tuen Mun and Tai Lam Country Park and some between Castle Peak Road and Tuen Mun Highway. They are composed of a mixture of native and exotic species, including *Casuarina equisetifolia*, *Celtis sinensis*, *Macaranga tanarius*, *Cinnamomum camphora*, *Ficus microcarpa*, *Bridelia tomentosa*. Woodland understory species include *Psychotria asiatica*, *Ligustrum sinensis*, *Alocasia macrorrhiza*, *Lantana camara* and *Bidens alba*.
- 10.7.9. Plantation woodland is mainly located along roads, in urban landscape areas and on hillside of Tai Lam Country Park. Plantation woodland at Tai Lam Country Park is mainly composed of exotic trees such as *Acacia confusa*, *Eucalyptus* spp., and *Pinus* spp, presumably planted for slope restoration purposes. Plantation at urban areas is generally composed of a variety of common landscape species.
- 10.7.10. Patches of shrubland/grassland are mainly found on hillsides in Tai Lam Country Park near the eastern boundary of the Assessment Area. Vegetation species typically include *Dicranopteris pedata*, *Rhodomyrtus tomentosa*, *Rhaphiolepis indica*, *Baeckea frutescens* and *Cratogeomys cochinchinensis*. Isolated stands of both active and abandoned cultivated land are also scattered near village areas, mainly located to the east of the study area. These are typically composed of orchards whilst a few vegetable farms are also under cultivation.
- 10.7.11. Watercourse sections near the urban area are largely channelized or culverted. Only a few species including *Ficus microcarpa*, *Lantana camara*, *Mikania micrantha* and *Panicum maximum* are noted to be growing along the banks of these channels. Minor watercourse sections upstream are relatively more natural and undisturbed and species along these narrow stream bank include *Ficus hispida*, *Melastoma malabathricum*, and *Lepidosperma chinense*.
- 10.7.12. Three swimming beaches, Castle Peak Beach, Kadoorie Beach and Cafeteria Old Beach and a small section of a rocky shore are located in the coastal section of the study area. Only a few trees including *Casuarina equisetifolia* and *Hibiscus tiliaceus* have been planted on sandy beaches, although the backshore areas exhibit more vegetational diversity. The Seawall rocky shore are largely devoid of vegetation.
- 10.7.13. Residential areas, villages, highways and local roads comprise much of the developed part of the study area. Roadside trees include *Cocos nucifera*, *Ficus microcarpa*, *Liquidambar formosana*, *Leucaena leucocephala* and *Panicum maximum*. Further details of the tree planting along the cycle track route is provided at Section 10.7.

Landscape Resources

- 10.7.14. Landscape resources include the existing trees along the backshore of the coastal area and various existing street trees and slope plantation areas within the road corridors through which the cycle track will pass. A number of existing trees will be affected by the proposed alignment and these will need to be reviewed for conflict with the proposed engineering works in order to optimize the retention of the existing landscape resource. Where trees add value to the landscape all efforts should be made for their retention, whilst where conflicts are unavoidable compensatory planting shall be proposed which will add to the quality of the future landscape.
- 10.7.15. The route also passes through a number of existing leisure and recreation facilities. Along the coastal area these include various informal beach facilities along the backshore of Golden Beach and BBQ facilities at Kadoorie Beach and Castle Peak Bay BBQ. Within the urban area, the route also passes through Ki Lun Kong Public Park; and Tsing Sin Garden along Castle Peak Road - Castle Peak Bay. The Landscape Proposals shall need to address the integration of the proposed cycle track with these existing leisure facilities in order to minimize impacts on the existing extent, functionality and aesthetic qualities of these key public locations.
- 10.7.16. The important determinants of the landscape character within the Study Area includes a combination of beaches and rocky shores, residential developments of varying scales, road

corridors and remnants of natural upland landscapes. These landscape resources (LRs) are shown on [Figure 10.5.1](#) and [Figure 10.5.2](#). The following LR's are identified within the Study Area:

- *LR1 Cultivated Land (approximately 12.6ha within study area)* – Fields are scattered within the village settlement for agricultural purposes, including isolated plots to the north of the study area. However, the majority are found associated with village areas in the southern part of the study. These are typically composed of orchards whilst a few vegetable farms are also under cultivation. As agricultural activities are becoming less common in Hong Kong this LR has medium landscape value is considered to have a medium sensitivity to change. There are estimated to be approximately 3,000 no trees associated with this LR within the study area.
- *LR2 Urban New Town development (approximately 135.55ha within study area)* – The urban area consists of a mix of building types including government and community facilities, services and utility related structures and commercial and retail developments which help form the urban framework of the new town public realm. Nevertheless, as noted in Section 10.7.17 there are trees with protected status within this landscape resource, although these species are also commonly planted amenity species which are clearly of planted origin and therefore not considered as floral specimens of conservation importance. As noted in the ecological survey there is also *Aquilaria sinensis* species and some planted undersized specimens of less common native trees including *Manglietia glauca*, *Michelia odora*, *Rhodoleia championii* and *Tutcheria championii* and the location of these trees is illustrated on [Figure 10.4](#). A small cluster of *Neottopteris nidus* is also observed in the urban area near Kadoorie Headland and this vegetation species of conservation importance is also identified on the Landscape Resources Plan. Overall, this Landscape Resource is able to accommodate extensive change, hence, is considered to have a low sensitivity to change. There are estimated to be approximately 10,000 no trees associated with this LR within the study area.
- *LR2.1 Major Road and Highway (approximately 31.13ha within study area)* – The roads and highways running parallel to the coast are a prominent element of the landscapes form and urban function. Where the context is low rise and rural, they represent a significant urban intrusion Major highway and road contained within the Study Area including Castle Peak Road and Tuen Mun Highway, This resource has relatively low landscape and amenity value which is able to accommodate extensive change, hence, is considered to have a low sensitivity to change. There are estimated to be approximately 1,000 no trees associated with this LR within the study area.
- *LR2.2 High Rise Residential Development (approximately 60.2ha within study area)* – Modern medium and high-rise development is located as infill development within the existing urban area and forms clusters of development along the coast. This resource is man-made landscape able to accommodate change, hence, is considered to have a medium sensitivity to change. There are estimated to be approximately 5,000 no trees associated with this LR within the study area.
- *LR2.3 Low and medium Rise Residential Development (approximately 14.9ha within study area)* – Villa and low rise residential developments are located along the beachfront areas south of Castle Peak Road, whilst similarly scaled Village settlements are scattered alongside of the major road corridors in coastal plain to the south of the study area. This resource is man-made landscape able to accommodate change, hence, is considered to have a medium sensitivity to change. There are estimated to be approximately 2,000 no trees associated with this LR within the study area.
- *LR3 Grassland/Shrubland (approximately 90ha within study area)* – Small pockets of this LR are found in the northern part of the study area where a mixture of grassland and shrubland is found at the lower hill-side areas of Tai Lam Country Park. These areas are remote from the proposed works and would be unaffected by the proposed development. This resource has relatively low significance in the landscape context and reasonably tolerant to changes regarding to their immature nature, hence it is considered to have a medium sensitivity to change.
- *LR4 Marine Waters (approximately 113.22ha within study area)* – This LR constitutes a significant element of the coastal landscape setting. Owing to the open nature of coastal waters and the distinctiveness of the marine ecosystem it is considered to have a high sensitivity to change.

- *LR5 Mixed Woodland (approximately 41.5ha within study area)* – patches of mixed woodland strands or vegetated knolls are interspersed with clusters of urban development in the Southern Part of the Study area, where these are well connected, such as in the northern part of the study area, they provide an important part of the green belt function. As such these woodland areas are locally significant in the landscape context, and susceptible to small changes. Sensitivity to change is considered to be high. There are estimated to be approximately 20,000 no trees associated with this LR within the study area.
- *LR6 Plantation Woodland (approximately 45.6ha within study area)* – this resource forms hillside, roadside, and channel-side planting and serves as buffer planting between development clusters and major transport corridors such as Castle Peak Road and Tuen Mun Road. Such planting contributes to the local landscape context in terms of greening mass rather than ecological value as many are fast growing non-native species. This resource has less ecological and landscape value than the mixed woodland and is considered reasonably tolerant of changes, hence it is considered to have a medium sensitivity to change. There are estimated to be approximately 25,000 no trees associated with this LR within the study area.
- *LR7 Rocky Shore (approximately 0.39ha within study area)* – A small strip of Rocky shoreline is located at the headland area between Kadoorie Beach and Cafeteria Old Beach. It is susceptible to small change, hence is considered to have a high sensitivity to change.
- *LR8 Sandy Shore (approximately 3.09ha within study area)* – This resource includes the Beach areas of Castle Peak Beach, Kadoorie Beach and Cafeteria Old Beach Due to the open nature these areas are susceptible to small change and hence this LR is considered to have a high sensitivity to change.
- *LR9 Watercourse (approximately 1.62ha within study area)* - The majority of the more natural watercourses are located to the north of the study area on the slopes bordering Tai Lam Country Park. As these enter the urban area they are however integrated with the urban drainage infrastructure. The one significant drainage channel in the southern part of the study area, which discharges into Gold Coast Marina is also channelised and urban in its lower sections. Although such watercourses are somewhat modified by engineering works, they are still scenic elements in the local landscape context. They are reasonably tolerant to changes, hence this LR is considered to have a medium sensitivity to change.

10.7.17. **Table 10-5** below summarises the sensitivity of the LRs to accommodate changes.

Table 10.5 Sensitivity of Landscape Resources (LRs)

	LR1	LR2	LR2.1	LR2.2
Quality	Medium	Medium	Low	Medium
Important/ Rarity	Medium	Low	Low	Medium
Ability to accommodate change	Medium	High	Medium	Medium
Significance	Medium	Low	Low	Medium
Maturity	Medium	Medium	Medium	Medium
Sensitivity	Medium	Low	Low	Medium
	LR2.3	LR3	LR4	LR5
Quality	Medium	Medium	High	High
Important/ Rarity	Medium	Medium	Medium	Medium
Ability to accommodate change	Medium	Low	Low	Medium
Significance	Medium	Medium	High	High
Maturity	Medium	Medium	High	High
Sensitivity	Medium	Medium	High	High

	LR6	LR7	LR8	LR9
Quality	Medium	High	High	Medium
Important/ Rarity	Medium	High	High	Medium
Ability to accommodate change	Medium	Low	Low	Low
Significance	Medium	High	High	Medium
Maturity	Medium	High	Medium	Medium
Sensitivity	Medium	High	High	Medium

Existing Trees

- 10.7.18. A preliminary tree survey in accordance with DEVB TC(W) No. 4/2020, 'Tree Preservation' has been undertaken and form part of the landscape resources assessment in this LVIA. This tree survey involves the identification of individual trees within or adjacent to the works area, which is approximately 5m offset from either side of the proposed cycle track alignment and site boundary of associated supporting facilities and temporary works area. Although there are other existing trees located within the 500 m LVIA study boundary, they are not in conflict with the proposed works, and hence the tree survey is limited to the works area and not the whole LIA Study Area. A broad-brush desktop assessment supported by field-survey estimates that there are approximately 75,000 trees within the assessment area. These are briefly described under the baseline review of landscape resources and the approximate number of trees within relevant Landscape Resources provides some context to the trees surveyed in detail.
- 10.7.19. The survey includes individual tree species, sizes, health condition, form, and amenity value and their treatment as a result of the implementation of proposed works. Preliminary Tree Survey Plans and schedule are presented in [Appendix 10-1](#).
- 10.7.20. A total of 1263 nos. individual trees have been surveyed along the proposed route of the cycle track. This existing tree growth is concentrated along road margins and beach edges through which the proposed cycle track is routed whilst approximately 80 no trees are identified within private garden areas to be resumed as part of the works. Additionally, 58 nos. tree groups have been identified in areas bordering the route and which comprise approximately 1214 nos. trees. These are surveyed for additional appreciation of the landscape setting and context, however they are set back from the proposed cycle track and would be unaffected by the proposed works. In addition, the route passes through an area of private land along the edge of Tsing Yan Street which is to be resumed to facilitate the works. This private area is not accessible for the undertaking of a detailed tree survey however it is estimated that there are approximately 80 existing trees within this private garden area which would potentially be affected by the proposed works.
- 10.7.21. The majority of these trees comprise common amenity species and common tree species native to Hong Kong. Of the individually surveyed trees some ninety-one different species have been identified. The most numerous of the existing trees are *Ficus benjamina* (95 nos.), an exotic species which is commonly planted for amenity purposes in Hong Kong. The second and third most numerous of the existing trees are *Hibiscus tiliaceus* (88 nos.) and *Ficus microcarpa* (84 nos.), which are both native species and also common in Hong Kong. A small number of protected species were also identified as part of the trees survey. Three specimens of *Aquilaria sinensis* are located at the roadside green space between Harvest Gardens and Castle Peak Road whilst one no. *Manglietia glauca* and two nos. *Tsoongiodendron odorum* have also been identified as part of the survey.
- 10.7.22. Twelve specimen of *Lagerstroemia speciosa*, one no. of *Magnolia soulangeana* and four nos. of *Michelia x alba* were surveyed within the survey area. *Lagerstroemia speciosa*, *Magnolia soulangeana* and *Michelia x alba* are generally protected in Hong Kong under the Forestry Regulations (Cap. 96. sub. leg.) except for "plants grown outside Hong Kong or on any land held from the Government under a lease, licence or permit or by virtue of an Ordinance". Since all the recorded *Lagerstroemia speciosa*, *Magnolia soulangeana* and *Michelia x alba* were observed within roadside amenity planting it is likely that they have been planted for ornamental purposes

and therefore not protected under the Forestry Regulations (Cap. 96. sub. leg.) and not considered as a floral species of conservation interest for this Project. (Hong Kong Herbarium and South China Botanical Garden eds., 2007).

- 10.7.23. In addition to the above, some protected undersized trees (DBH < 95mm) were noted within the survey area. These include 24 no specimens comprising four species (*Manglietia glauca*, *Michelia odora*, *Rhodoleia championii* and *Tutcheria championii* Scheduled under Cap. 96. sub. leg.) at the roadside green space between Harvest Gardens and Castle Peak Road. Around the same area, 10 nos. undersized specimens of *Aquilaria sinensis* were identified during the survey.
- 10.7.24. A further tree to note is *Leucaena leucocephala* (49 nos.); a species originally from tropical America which has become naturalised throughout the region. It is extremely vigorous and a prolific seed producer which often colonises disturbed and urban fringe sites. *Leucaena leucocephala* is identified as an undesirable species with aggressive growth characteristics which prevent natural succession of indigenous species and so is not controlled by the same preservation requirements as other more valuable tree species. As such this tree has been identified as weed species which should be removed as part of development projects where the opportunity exists and replaced with better quality amenity trees.
- 10.7.25. One Number of OVT (Registration No. LCSD TM/3, located at Castle Peak Beach) was identified on site, within the Tree Group TG38, which is remote from the proposed works and will therefore be unaffected by the Project. There are also 17 nos. trees surveyed which may meet the requirements for a potential Old and Valuable Trees (OVT) (DEVB TC(W) No. 5/2020 – Registration and Preservation of Old and Valuable Trees). As they have a DBH greater than one metre, which meets one of the criteria for designation as an OVT. These trees are identified in the detailed tree survey schedule contained at [Appendix 10-1](#) as tree numbers T237, T255, T272, T283, T292, T485, T816, T1476, T1496, T1655, T1737, T1738, T1959, T2023, T2273, T2314 and T2481. Photographs of these trees are also provided at [Appendix 10-1](#) for reference.

Landscape Character

- 10.7.26. The route of the cycle track passes through a range of urban and coastal environments of varying urban characteristics and compositions which, for the purpose of outline description, can broadly be divided into three physical areas. At the northern section the proposed cycle track route runs parallel to Hoi Wing Road, an urban boulevard which is flanked by high and medium rise residential developments within the Tuen Mun urban area. At the central section of the Project the route joins Castle Peak Road and then extends along the coastal waterfront of Castle Peak Bay. This waterfront is characterized by beaches and rocky headlands and is developed for lower density residential and beach related leisure facilities. At the eastern end of the waterfront the route turns back inland towards the Gold Coast area, and follows a route along Castle Peak Road, passing private residential developments and the Gold Coast Marina.
- 10.7.27. With the broader (500m radius) study area, the composition of the landscape has been studied and the prevailing patterns configured as a series of landscape character areas. The extent of Landscape Character Areas (LCA's) is illustrated on [Figures 10.6](#) and [Figure 10.7.1](#) and [Figure 10.7.2](#). The following LCAs are identified within the Study Area:
- *LCA1 Tuen Mun Urban Core (approximately 66.6ha within study area)* – Central Tuen Mun is generally a densely developed environment of high-rise buildings which form a prominent component of the urban landscape. The urban area comprises a mix of land-uses including government and community facilities, services and utility related structures and commercial and retail developments, in addition to high rise residential developments; both private and public. There is also a network of open spaces and streetscapes which define the public realm of this planned urban settlement. This LCA is able to accommodate change, hence, is considered to have a medium sensitivity to change. There are estimated to be approximately 2,000 nos. trees associated with this LCA within the study area.
 - *LCA2 Castle Peak Garden Corridor (approximately 28.7ha within study area)* – This LCA follows the route of Castle Peak Road between the eastern edge of Tuen Mun and the foothills of Tai Lam Country Park. The buildings flanking the road include both public and private high rise residential development. However, as the route is close to the edge of the urban area the backdrop of wooded hills is glimpsed between developments whilst buildings are also set back

from the roadside creating a relatively wide boulevard with planted edges both in public and private areas contributing to a marked greening effect. As such this LCA is characterised as a garden corridor. This LCA is largely man-made and able to accommodate some change, hence, is considered to have a medium sensitivity to change. There are estimated to be approximately 2,500 nos. trees associated with this LCA within the study area.

- *LCA3 Sam Shing Wharfside (approximately 31.8ha within study area)* – This LCA, which includes the Tuen Mun Typhoon shelter and related shoreline development has a maritime industrial ambience. However, the landside area is also a public destination, with a popular seafood village at the south-eastern end of the waterfront area. This LCA is able to accommodate some change owing to its functional nature, hence, is considered to have a medium sensitivity to change. There are estimated to be approximately 200 nos. trees associated with this LCA within the study area.
- *LCA4 Castle Peak Cove (approximately 23.8ha within study area)* – The beach at Castle Peak is smaller and more contained than some of the other beaches along the coastal section of the study area, by virtue of both the natural coastal profile and man-made coastal structures. This imparts a more intimate character to this section of beach and promenade. Castle Peak Road runs directly above the beach at this location creating a place where the city and more natural landscape are closely related. Owing to the open nature of the setting this LCA is considered to have a high sensitivity to change. There are estimated to be approximately 300 nos. trees associated with this LCA within the study area.
- *LCA5 Beachside Community (approximately 20.9ha within study area)* – The beaches between Kadoorie Beach and Golden Beach are a popular leisure destination forming a linked sequence of open spaces with associated leisure and recreation facilities. Predominantly low and medium rise residential developments are located behind the beachfront areas within an established framework of tree planting helping to integrate this relatively low density development with its landscape setting. Owing to the small scale nature of the setting this LCA is considered to have a high sensitivity to change. There are estimated to be approximately 5,000 nos. trees associated with this LCA within the study area.
- *LCA6 Bayside Residential Corridor (approximately 51ha within study area)* – The coastal belt between Castle Peak Road and Tuen Mun Road is characterized by gentle wooded slopes interspersed with high rise private residential developments. This LCA forms a linear character area along the coast against the backdrop of uplands behind. Owing to the larger scale character of this LCA it is considered to have a medium sensitivity to change. There are estimated to be approximately 10,000 nos. trees associated with this LCA within the study area.
- *LCA7 Gold Coast Resort (approximately 41ha within study area)* – The Gold coast resort area is a distinctive development centred on the Gold Coast marina and the embracing clusters of surrounding high end residential developments overlooking the coast. The ornamental waterfront landscape setting imparts a resort-like ambience which forms the basis for this character zone. This LCA is largely man-made and able to accommodate some change, hence, is considered to have a medium sensitivity to change. There are estimated to be approximately 3,000 nos. trees associated with this LCA within the study area.
- *LCA8 Kar Wo Wei Village (approximately 51.5ha within study area)* - This area is characterised by scattered village settlement and low-rise development within an undulating wooded landscape. Developed areas are also interspersed with areas of disturbed land and occasional agricultural lots. Given the combination of disturbed land and village landscape character its sensitivity to change is considered medium. There are estimated to be approximately 12,000 nos. trees associated with this LCA within the study area.
- *LCA9 Tai Lam Foothills (approximately 95.1ha within study area)* – The lower slopes of the vegetated uplands that form Tai Lam Country Park are located to the north west of the study area. This LCA is an area of protected natural landscape and its sensitivity to change is considered to be high. There are estimated to be approximately 40,000 nos. trees associated with this LCA within the study area.
- *LCA10 Marine Waters (approximately 60.1ha within study area)* – The open waters between the north-west New Territories and Lantau island are a significant element of the coastal landscape setting. Owing to the open nature of these coastal waters this LCA is considered to have a high sensitivity to change.

10.7.28. **Table 10.6** determines the sensitivity of the following LCAs to accommodate changes

Table 10.6 Sensitivity of Landscape Character Areas (LCAs)

	LCA1	LCA2	LCA3	LCA4	LCA5
Quality	Medium	Medium	Medium	Medium	Medium
Important/ Rarity	Low	Low	Medium	Medium	Medium
Ability to accommodate change	High	High	Medium	Medium	Medium
Significance	Low	Low	Medium	Medium	Medium
Maturity	Medium	Medium	Medium	Medium	Medium
Sensitivity	Medium	Medium	Medium	High	High
	LCA6	LCA7	LCA8	LCA9	LCA10
Quality	Medium	Medium	Low	High	High
Important/ Rarity	Medium	Medium	Low	Medium	Medium
Ability to accommodate change	Medium	Medium	Medium	Low	Low
Significance	Medium	Medium	Low	Medium	Medium
Maturity	Medium	Medium	Medium	Medium	High
Sensitivity	Medium	Medium	Medium	High	High

10.8. Landscape Impact Assessment

Impact on Existing Landscape Resources

- 10.8.1. For the purposes of this assessment the landscape resources are represented by the existing land coverage. The condition of these landscape resources is also important in determining the landscape quality of the Study Area and its sensitivity to change as described above. Therefore, the preservation and enhancement of the existing landscape resources is important to the successful integration of the Project into the landscape context of the Study Area. The following describes the impact on landscape resources due to the proposed works.
- 10.8.2. **Table 10.7** presents the predicted unmitigated and mitigated (residual) impacts on the existing landscape resources resulting from the proposed works during the construction and operational phases of the Project. These impacts also are mapped on [Figure 10.13.1 to Figure 10.13.3](#). The mitigated (residual) impacts are assessed during the design year for the purpose of this study and is taken as being between 10 and 15 years after the schemes opening when the proposed mitigation planting is deemed to have reached a level of maturity, which is sufficient for it to perform the design objectives. The assessment of the residual impacts on Landscape Resources is described at section 10.12.
- 10.8.3. The scale of the proposed works is relatively small and linear in form and are fairly compatible to the majority of the landscape context. A relatively small development footprint is required for the cycle track and associated facilities though the length of the track portrays a much larger land-loss impact. Two of the identified landscape resources of the study area are remote from the proposed works and would be unaffected by the proposed developments; namely *LR1 Cultivated Land* and *LR3 Grassland/Shrubland*. These LR's are therefore not considered further as part of this assessment. In terms of the other landscape resources, as described below there will be no substantial adverse impacts to all these existing LR's.

Potential Sources of Landscape Impact

- 10.8.4. The proposed works will be the source of impacts inducing adverse landscape impacts during the construction phase and the operation phase. It should be noted that some sources may actually induce positive impact.
- 10.8.5. During the construction period, the proposed works may give rise to the following sources of temporary and reversible construction phase impacts:
- The commencement of construction activities and their impact on the existing site (e.g. site clearance/ removal of existing vegetation/ vegetated surface and conversion to bare soil, gravel or hard paved surface);
 - site formation and excavation works;
 - presence of construction equipment, machinery and plant;
 - temporary storage of construction materials;
 - setting up of construction site offices, parking and yards;
 - nighttime security lighting;
 - erection of site hoardings and temporary noise barriers;
 - temporary loss of plantation woodland at the peripheries of the track alignments;
 - impacts arising from the presence of incomplete structures; and
 - construction traffic near the project sites and along adjacent access roads.
- 10.8.6. Impacts during the operation phase will be permanent and irreversible. Sources of operation phase impact will include:
- Modification of the existing landform and natural slope profiles to accommodate the cycle track proposals including the introduction of new retaining walls and engineered slopes; and
 - Introduction of new built structures such as cycle bridges and footbridges and their displacement of previous landscape resources.
- 10.8.7. The predicted impacts on Landscape Resources (unmitigated) are described as follows:
- Moderate**
- LR4 Marine Waters*
- 10.8.8. The proposed viaduct between Kadoorie Beach and Cafeteria Old Beach involves mini bored piles set into the marine waters. However, as the structure is elevated the direct loss of this resource would be limited to the areas of supporting columns located at intervals around the two headlands around which the route will pass. This loss represents a small proportion of the overall resource within the study area, although these losses are relatively irreversible and less readily mitigated. Despite the relatively small area of this resource affected by the proposed construction, the high sensitivity of the resource leads to the assessment of a moderate impact, without mitigation, during the construction stage and a slight/moderate impact in the operation stage (before mitigation).
- LR5 Mixed Woodland*
- 10.8.9. The majority of the mixed woodland identified within the study area is remote from the proposed location of the cycle route and therefore unaffected by the works. The track alignment does however come close to this LR at two locations: to the west of Palm Gardens residential development and to the north of Ki Lun Kong Public Park. Whilst no direct land loss is anticipated

in either location, the need to create a clear headroom space above the track at Ki Lun Kong will require removal of some trees growing in adjacent wooded slope areas. These impacts are described more specifically under the following section describing impacts on existing trees. Whilst the impacts are quite localized and affect a very small area of this overall resource within the study area, this is a high-quality landscape resource which is sensitive to change. The combination of these factors leads to the assessment of a moderate impact on this LR before mitigation in the Construction and Operation Phases.

LR7 Rocky Shore

- 10.8.10. Rocky shore represents a relatively uncommon landscape resource within the study area, found only locally in the vicinity of the headlands between Cafeteria Old Beach, Kadoorie Beach and Castle Peak Beach. The proposed cycle track is offset from the shoreline to avoid direct impacts on this shore landscape resource, however some minor impacts are anticipated where the route crosses the shoreline at the headland between Cafeteria Old Beach and Kadoorie Beach. Whilst direct impacts of the works on this landscape resource will be limited, the proposed cycle bridge located within the coastal waters around the margin of this headland will affect the setting of this shoreline, whilst greater impacts may be anticipated at low tide. Despite the very small area of this resource affected by the proposed construction, the limited extent of this resource within the study area and its high sensitivity to change leads to the assessment of a moderate impact, without mitigation, during the construction stage and a slight/moderate impact in the operation stage prior to mitigation.

LR8 Sandy Shore

- 10.8.11. Sandy shore is the shoreline condition for broad extents of the land:sea interface within the study area, The proposed cycle track is set back from the beach along most of this extent and the beach areas at Golden Beach and Cafeteria Beach which would thus be unaffected by the works. However, some minor impacts are anticipated at the ends of the beach areas at Cafeteria Old Beach and Kadoorie Beach, where the cycle route forms an elevated bridge structure and extends towards the open water areas. The direct impacts of the works on this landscape resource will be relatively limited and form a small proportion relative to the overall extent of this resource within the study areas. Despite the very small area of this resource affected by the proposed construction, the limited extent of this resource within the study area. However, its high sensitivity to change leads to the assessment of a moderate impact, without mitigation, during the construction stage and a slight/moderate impact in the operation stage prior to mitigation.

Slight / Moderate

LR6 Plantation Woodland

- 10.8.12. An area of plantation woodland to the front of the Palm Gardens residential development will be affected by a combination of the route of the cycle track and the widening of Castle Peak Road. This aspect is further described under the section dealing with Cumulative impacts. For the current assessment the impacts on all these trees are assessed and is also further described in the next section, describing impacts on existing trees. Whilst removal of this roadside vegetation will have a localized impact, the extent is small relative to the overall extent of this resource within the study area. Unmitigated impacts are deemed to be slight / moderate in both the construction and operational phase.

LR9 Watercourse

- 10.8.13. The implementation of the Project will lead to some minor loss of watercourse (LR9), along the backshore of Cafeteria Old Beach. The existing watercourse at this location is an open channel which has become overgrown with vegetation. As part of the cycle track implementation this drainage channel shall be constructed as a covered culvert, atop which the new cycle track shall then be constructed. Overall, this will create more accessible public space at the waterfront, however in terms of assessing specific landscape resources the impact will be a reduction in open water course area within the landscape. Given the degraded nature of the existing water course its sensitivity has been deemed moderate. However, during construction it is anticipated that a wider land area be required for excavation and construction of the culvert structure and impacts are predicted to be slight / moderate in both the construction and operational phase (before mitigation).

Slight

LR2 Urban New Town development

- 10.8.14. This LR includes the public realm of the urban area, outside the major roads and highways. This includes three main areas; the entrance to Golden Beach and the backshore area of Cafeteria Old Beach and New Beach and the Open Space at Ki Lun Kong Public Park. Whilst these are important public areas, the cycle track is considered compatible with the current recreational emphasis of the existing open spaces and they are also a relatively small area of the overall urban area within the study area. It is noted that the small cluster of *Neottopteris nidus* within this area is likely to be unaffected by the works whilst undersized trees of species *Manglietia glauca*, *Michelia odora*, *Rhodoleia championii* and *Tutcheria championii* which are affected by the works are proposed to be transplanted. Impacts on these affected areas will be reinstated through new tree and shrub planting along the track. Given the scale, nature and compatibility of the Project, the magnitude of change to the above resources is small and the impact to these LRs overall will be slight adverse during construction and operational phase prior to mitigation.

LR2.1 Major Road and Highway

- 10.8.15. The scale of the Project will lead to a relative loss of existing footpath area along Castle Peak Road, which forms part of the Major Road and Highway Landscape Resource (LR2.1). The routing will also require the removal of some existing roadside trees; impacts which are further described in the next section of this report. However, this impact is somewhat offset by the ongoing widening of Castle Peak Road in the south of the site, which is providing widened footpath areas as part of the works. To the north, the routing of the cycle track through existing roadside open spaces such as Tsing Sin Garden will also have localized impacts on the amenity of the area. However, the re-provisioning of footpath and new amenity areas alongside the track will upgrade these existing resources, and the nature of the cycle track is also compatible with the roadside landscape. Hence the magnitude of change to these resources is relatively small during both the construction and operational phase. Given the low to medium sensitivity to change of these LRs and the relatively small change to these resources, there will be slight impact on the Major Road and Highway (LR2.1) during construction and operational phase prior to mitigation.

Insubstantial

LR2.2 High Rise Residential Development

- 10.8.16. The proposed route opposite Palm Gardens will occupy a small section of the current garden areas at the front of this property. This is considered an insubstantial impact overall on this Landscape Resource, given that it is very low proportion of the overall extent of this resource within the study area.

LR2.3 Low and medium Rise Residential Development

- 10.8.17. The proposed route along Castle Peak road in the southern part of the study area will require some very small impacts to residential boundaries. These are considered insubstantial impacts overall on this Landscape Resource.

The assessment contained in **Table 10.7** concluded that even though there is moderate to slight impact on some of LRs, the majority of the works areas will be reinstated to their original status or provided with new planting areas along the track after mitigation. The recommended landscape mitigation measures and residual impact on these LRs is further discussed in Sections 10.10 and 10.12.

Table 10.7 Existing Landscape Resources and Predicted Impacts

Landscape Resource	Sensitivity	Total Area of Resource (Ha) / Loss (Ha) / % Loss	Determinants for Magnitude of Change			Magnitude of Change (Construction / Operation Phase)	Significance Threshold (Unmitigated)		Mitigation Measures	Significance Threshold (Mitigated)	
			Compatibility	Scale	Reversibility		Construction	Operation		Construction	Operation
LR 2 Urban New Town Development	Low	135.55/ 2.11 1.56.%	High	Very Small	Medium	Small/ Small	Slight Adverse	Slight Adverse	CP1, CP2 CP3, CP4, CP5 OP1 to OP4.	Slight Adverse	Insubstantial (Day 1 and Year 10)
LR 2.1 Major Road and Highway	Low	31.13/ 0.03 <1%	High	Very Small	Medium	Small/ Small	Slight Adverse	Slight Adverse	CP1, CP3, CP5 OP1 to OP4.	Slight Adverse	Insubstantial (Day 1 and Year 10)
LR 2.2 High Rise Residential areas	Medium	60.2/ 0 0%	Medium	Very Small	Medium	Negligible	Insubstantial	Insubstantial	CP1, CP3, OP1	Insubstantial	Insubstantial (Day 1 and Year 10)
LR 2.3 Low and medium Rise Residential areas	Medium	14.9/ 0 0%	Medium	Very Small	Medium	Negligible	Insubstantial	Insubstantial	CP1, CP3, OP1.	Insubstantial	Insubstantial (Day 1 and Year 10)
LR 4 Marine Waters	High	113.22/ 0.11 <1%	Low	Very Small	Medium	Small/ Small	Moderate Adverse	Slight / Moderate Adverse	OP1 and OP5	Slight / Moderate Adverse	Slight Adverse (Day 1 and Year 10)
LR 5 Mixed Woodland	High	41.5 / 0.0096 <1%	Medium	Very Small	Medium	Small/ Small	Moderate Adverse	Moderate Adverse	CP1, CP2, CP3, CP4 OP1 to OP4	Slight / Moderate Adverse	Slight / Moderate Adverse (Day 1) / Slight Adverse (Year 10) (Extensive new tree planting along track)

Landscape Resource	Sensitivity	Total Area of Resource (Ha) / Loss (Ha) / % Loss	Determinants for Magnitude of Change			Magnitude of Change (Construction / Operation Phase)	Significance Threshold (Unmitigated)		Mitigation Measures	Significance Threshold (Mitigated)	
			Compatibility	Scale	Reversibility		Construction	Operation		Construction	Operation
LR 6 Plantation	Medium	45.6 / 0.054 1.18%	Medium	Very Small	Medium	Small/ Small	Slight / Moderate Adverse	Slight / Moderate Adverse	CP1, CP2, CP3, CP4, CP5 OP1 to OP3	Slight Adverse	Slight Adverse (Day 1) Insubstantial (Year 10) (Extensive new tree planting along track)
LR 7 Rocky Shore	High	0.39/ 0.0015 <1%	Low	Very Small	Low	Small/ Small	Moderate Adverse	Slight / Moderate Adverse	OP1 and OP5	Slight / Moderate Adverse	Slight Adverse (Day 1 and Year 10)
LR 8 Sandy Shore	High	3.09/ 0.041 1.33%	Low	Very Small	Medium	Small/ Small	Moderate Adverse	Slight / Moderate Adverse	OP1 and OP2	Slight / Moderate Adverse	Slight Adverse (Day 1 and Year 10)
LR 9 Water Course	Medium	1.62 / 0.068 4.20%	Medium	Very Small	Low	Small/ Small	Slight / Moderate Adverse	Slight / Moderate Adverse	CP1 to CP3, OP1, OP2 and OP3	Slight / Moderate Adverse	Slight Adverse (Day 1 and Year 10)
<p>Key:</p> <p>Sensitivity of Resource: Low, Medium or High Magnitude of Change: Negligible, Small, Intermediate or Large Significance Threshold: Insubstantial, Slight, Moderate and Substantial (adverse or beneficial)</p>											

Impacts on Existing Trees

Tree Preservation

- 10.8.18. As mentioned in the Project description in the previous section, the alignment of the cycle track has been reviewed to maintain as far as possible the existing individual or group of trees which have great contribution to the local landscape context. Based on the findings of the preliminary tree survey it is estimated that approximately 811 trees (60.4%) can be retained in their current locations within the works area. This includes 15 of the 17 nos. individually surveyed trees identified as having a DBH >1m. As noted, the OVT (Registration No. LCSD TM/3) is also remote from the works area and would be unaffected by the cycle track works.

Tree Transplantation Proposals

- 10.8.19. In terms of assessing the feasibility of transplanting the existing trees a number of factors have been considered including their form, health and amenity value. Also considered was the existence of rare and native species, the accessibility for machinery required for transplantation; age; and the availability and technical feasibility of providing recipient sites for the transplanted trees have been considered.
- 10.8.20. Based on the preliminary tree survey finding it is recommended that 147 (10.9%) of the existing trees are suitable for transplantation. This transplantation will be required due to the implementation of the proposed works. The trees identified for transplantation include those of fair to good form and health condition having contribution to the local landscape context, relatively younger and accessible to machinery and of species more tolerant of transplantation. These suitable candidates will be transplanted to the future amenity areas along the cycle track adjacent to their current locations. Potential recipient locations of these transplanted trees are shown in [Figure 10.12.1 to Figure 10-12.6](#) Preliminary Landscape Master Plan.

Tree Felling Proposals

- 10.8.21. As a direct result of the proposed construction, it was found that it would not be feasible to retain or transplant approximately 225 (16.7%) of the individually surveyed existing trees within public realm for the following reasons:
- In some locations the scope of the proposed works precludes any opportunities to retain existing trees, regarding spatial constraints, particularly in the works areas between existing property boundaries, roads and highways, watercourses and drainage channels. However, for a large part these trees are non-native roadside trees having lower individual ecological and amenity value.
 - A minimum width of 4 m cycle track and associated 2 m wide footpath is required to ensure safety for future cyclists in accordance with the TPDM. Hence it is technically unfeasible to retain the trees within the works area and accommodate the required clear width for these routes.
 - The trees are of poor health, condition and form.
- 10.8.22. Unfortunately, the tree felling proposals directly associated with the cycle track project include the felling of one of the 17 nos. trees with DBH in excess of 1m (Tree T2314). For tree T2314, cycle track alignment adjustments cannot readily be achieved to avoid impacts on it, and it is too large to be considered for transplantation. As such the preliminary recommendation for this tree is that it is to be felled.

Summary of Tree Impacts

- 10.8.23. It should be noted that none of the trees outside the extent of the detailed tree survey for the project would be affected by the proposed works, the impacts of which are confined to trees located in areas immediately adjacent to the route of the cycle track. Tree findings and recommendation of their treatment are summarised in **Table 10.8**.

Table 10.8 Summary of Tree Survey

Recommendation (Individual Trees within the survey area)	Number of Trees	% Trees
Trees to be retained	811	60.4%
Trees to be transplanted	147	10.9%
Trees to be felled	187	13.9%
Dead trees to be felled	20	1.5%
Undesirable species trees to be felled	18	1.3%
Trees to be removed by PWP No. 6853 TH ¹	80	6%
Estimated tree felling in land resumption area adjacent to Tsing Yan Street ²	80	6%
Total number of trees	1343	100%
Note:		
1. The tree removal of 80 nos. shall be handled by PWP No. 6853 TH, Widening of Castle Peak Road – Castle Peak Bay.		
2. This private area is not accessible for detailed tree survey however it is estimated that approximately 80 existing trees within this private garden area would potentially be affected.		

- 10.8.24. The finding and recommendation of the preliminary tree survey report is subject to the completion of a detailed review as part of preparation for a formal Tree Preservation and Removal Proposal in accordance with DEVB TC(W) No. 4/2020, Tree Preservation, however the anticipated number of trees affected has been quantified as far as practical at this stage.

Impact on Existing Landscape Character

- 10.8.25. The scale of the proposed works extent is relatively small, with the majority of the works area utilising roadside area of existing roads and roadside margins. More significant construction is proposed the construction of cycle bridges within the coastal waters and Beachside community LCA's and also box culvert construction in the beachside area. However, the scale of these proposed structures is relatively small and at most locations, particularly roadside areas, the proposed works are fairly integrated with the local landscape character. Three of the LCA's within the wider study area, LCA3 Sam Shing Wharveside, LCA7 Gold Coast Resort and LCA8; Kar Wo Wei Village are not directly impacted by the cycle track route and therefore not considered further as part of this assessment. For the remaining eight LCAs there is no significant adverse impact assessed. Impacts on LCAs are mapped on [Figure 10.14.1 to Figure 10.14.3](#). **Table 10.9** identifies the magnitude of change and the potential impacts on the affected LCAs in the construction and operational phases prior to mitigation.

Moderate

LCA4 Castle Peak Cove

- 10.8.26. The character of this LCA is defined by the embrace of the coastal landscape at the edge of the urban area and the combination of smaller scale development in close proximity to the natural beach environment. The cycle track is compatible with the urban part of this LCA, combining with the recreational focused open promenade aligned to the waterfront and set within landscape strips aligned with the road corridor. It is a small scale element which affects a small proportion of this LCA. As such moderate impacts are predicted in the absence of mitigation in the construction stage however impacts on landscape character in the operation stage are deemed insubstantial.

LCA5 Beachside Community

- 10.8.27. The cycle track will be a small-scale element within the majority of this waterfront LCA and where it is routed through backshore areas of beaches the scale of built development will be compatible with the existing mix of recreational facilities such as barbeque sites, shade structures and amenity blocks set within a framework of coastal tree planting. However, where the route extends out toward the open sandy and rocky shoreline potential impacts are magnified. Whilst this only occurs towards the ends of the bathing beaches in the northern area of this LCA, the associated structures will impact upon the natural character at these locations. Given that the magnitude of change on this LCA is small, a moderate impact is predicted during construction and Slight/ Moderate impacts in the operational phase without mitigation.

LCA10 Coastal Waters

- 10.8.28. Whilst the direct impacts on this LCA are limited to specific areas, these are magnified by the fact that the character of this LCA relies upon the open, panoramic nature of the water areas and proposed structures within the water areas would impact on this open character. As such this LCA sensitivity to change is High. However, the impacts are located close to the shore which limits their impact on the overall open character of this LCA. Given that the magnitude of change on this LCA is small, a moderate impact is predicted during construction stage and a slight moderate impact in the operational phase before mitigation.

Slight/Moderate

LCA1 Tuen Mun Urban Core

- 10.8.29. The cycle track is routed within open space and roadside areas within this LCA. The existing character is relatively large scale, built and urban, within which the proposed cycle track represents a small-scale intervention, with limited impact on the overall character of LCA. However, there will be some localized impacts on street trees and other greenery which forms a component of the New Town Character of the urban area. Nevertheless, the magnitude of change to this LCAs is small and hence a slight/moderate impact is predicted to the landscape context during construction and a slight impact in the operational phase prior to mitigation.

LCA2 Castle Peak Garden Corridor

- 10.8.30. The cycle track would be routed to the eastern side of Castle Peak Road, within a predominantly paved area which also functions as a linear park. The development is compatible with the existing transport and recreational function of this area and is also compatible with the scale of the existing public realm within the road corridor. The character of the LCA also relies on the surrounding framework of greenery which imparts a garden character. Impacts on tree and shrub planting in order to construct the works would initially have slight/moderate impact is predicted to the landscape context during construction and a slight impact in the operational phase prior to mitigation.

LCA6 Bayside Residential Corridor

- 10.8.31. The cycle track route along Castle Peak Road will impact this LCA both in the north opposite Castle Peak Bay and to the South opposite the Hong Kong Gold Coast Development. At both locations the cycle track is set within the road corridor, which forms the western edge of this LCA. The character of this LCA relies upon the combination of high-rise residential development set within a framework of established tree canopies associated with surrounding wooded slopes and residential garden areas. The cycle track will have localized impacts on trees, particularly opposite the Palm Gardens development and thus have some impact on the harmony between the natural and built environments that epitomize this LCA at these specific locations, prior to mitigation. This is rates as a slight/moderate impact during construction and a slight impact in the operational phase prior to mitigation.

Insubstantial

LCA9 Tai Lam Foothills

- 10.8.32. Construction work for the cycle track that might impinge upon this LCA is limited to a small area east of Ki Lun Kong Public Park. There will only be limited disturbance to selected trees along the edge of this LCA and no direct land impact. Given the relative size of this LCA and that its overall character is more defined by the elevated wooded hillslopes at higher elevations any impacts on this peripheral part of the LCA are predicted to be insubstantial.
- 10.8.33. **Table 10.9** presents the unmitigated and mitigated (residual) impacts on Landscape Character Areas arising from the proposed works during the construction and operational phases of the Project. The mitigated (residual) impacts are assessed during the design year which for the purpose of this study is taken as being between 10 and 15 years after the cycle track open to public when the proposed mitigation planting is deemed to have reached a level of maturity, which is sufficient for it to perform the design objectives. The mitigated (residual) impacts are further discussed in Section 10.12.

Table 10.9 Existing Landscape Character Area and Predicted Impacts

Landscape Character Area (LCA)	Sensitivity	Total Area of LCA (Ha) / Affected Area (Ha) / Source of Impact	Determinants for Magnitude of Change			Magnitude of Change (Construction / Operation Phase)	Significance Threshold (Unmitigated)		Mitigation Measures	Significance Threshold (Mitigated)	
			Compatibility	Scale	Reversibility		Construction	Operation		Construction	Operation
LCA1 Tuen Mun Urban Core Urban Core	Medium	66.6 ha/ 0.41 ha 0.61% Construction of 4m wide cycle track and 2m wide footpath along an existing footpath to the east of Hoi Wing Road.	High	Very small	Medium	Small/Small Project scale is very small relative to the large-scale urban character of this LCA. The impacts are at the very edge of this LCA and changes to its overall urbanised character would not be anticipated.	Slight / Moderate Adverse	Slight Adverse	CP1 to CP6 and OP1 to OP4	Slight Adverse	Insubstantial (Day 1 and Year 10)
LCA2 Castle Peak Garden Corridor	Medium	28.7 ha/ 0.37 ha 1.27% Construction of 4m wide cycle track along an existing walkway and roadside linear park to the east of Castle Peak Road.	High	Very small	Medium	Small/Small Project scale is small relative to the large-scale urban boulevard surroundings.	Slight / Moderate Adverse	Slight Adverse	CP1 to CP5 and OP1 to OP3	Slight Adverse	Insubstantial (Day 1 and Year 10)
LCA4 Castle Peak Cove	High	23.8 ha/ 0.13 ha <1% Construction of 4m wide cycle track adjacent to Castle Peak Road	Medium	Small	Medium	Small/Negligible Works to the existing promenade will have a moderate impact, without mitigation owing.	Moderate Adverse	Insubstantial	CP1 to CP6 and OP1 to OP6	Moderate / Slight Adverse	Insubstantial (Day 1 and Year 10) (Proposed works will be compatible with the character of the existing promenade.)

Landscape Character Area (LCA)	Sensitivity	Total Area of LCA (Ha) / Affected Area (Ha) / Source of Impact	Determinants for Magnitude of Change			Magnitude of Change (Construction / Operation Phase)	Significance Threshold (Unmitigated)		Mitigation Measures	Significance Threshold (Mitigated)	
			Compatibility	Scale	Reversibility		Construction	Operation		Construction	Operation
LCA5 Beachside Community	High	20.9 ha/ 0.63 ha Construction of 4m wide cycle track along the backshore area of bathing beaches and some elevated structures at localized beach areas.	Medium	Small	Medium	Small/Small	Moderate Adverse Construction of structures within shallow waters around the existing headland and works to the existing promenade will have a moderate impact, without mitigation)	Moderate / Slight Adverse	CP1 to CP5 and OP1 to OP6	Slight Moderate Adverse /	Slight adverse (Day 1) Insubstantial (Year 10) (Proposed works will improve connectivity in the public realm and with sensitive design the character of the area is largely unaffected.
LCA6 Bayside Residential Corridor	Medium	51 ha/ 0.28 ha Construction of 4m wide cycle track with 2m wide footpath alongside of Castle Peak Road.	Medium	Small	Medium	Small/Small Construction works is limited to the roadside area. Some roadside vegetation will be temporary removed but will be reinstated upon the completion of the works.	Slight Moderate Adverse /	Slight Adverse	CP1 to CP6 and OP1 to OP4	Slight Adverse	Insubstantial (Day 1 and Year 10) (Proposed works will be screened by established tree planting along the track.)
LCA9 Tai Lam Foothills	High	95.1 ha/ 0 ha Construction of 4m wide cycle track associated with 2m wide footpath at location on the urban margin of this LCA.	Low	Small	Medium	Negligible/ Negligible Construction work is limited to a small area east of Ki Lun Kong Public Park. There will only be limited disturbance to trees along the edge of this LCA.	Insubstantial	Insubstantial	CP1 to CP3 and OP1 to OP4.	Insubstantial	Insubstantial (Day 1 and Year 10)

Landscape Character Area (LCA)	Sensitivity	Total Area of LCA (Ha) / Affected Area (Ha) / Source of Impact	Determinants for Magnitude of Change			Magnitude of Change (Construction / Operation Phase)	Significance Threshold (Unmitigated)		Mitigation Measures	Significance Threshold (Mitigated)	
			Compatibility	Scale	Reversibility		Construction	Operation		Construction	Operation
LCA10 Coastal Waters	High	60.1 ha/ 0.11 ha Construction of 6m wide cycle track and footpath on an elevated structure in the shallow near coast water area around two headlands between Castle Peak Beach and Kadoorie Beach.	Low	Small	Medium	Small/Small	Moderate Adverse Although the impacts are localized, the presence of structural works compromises the open character of this LCA.	Moderate / Slight Adverse	CP3 and OP1, OP5, OP6	Moderate / Slight Adverse	Slight Adverse (Day 1 and Year 10)
<p>Key:</p> <p>Sensitivity of Resource: Low, Medium or High / Magnitude of Change: Negligible, Small, Intermediate or Large / Significance Threshold: Insubstantial, Slight, Moderate and Substantial (adverse or beneficial)</p>											

10.9. Existing Visual Context and Visual Impacts

Existing Visual Context

Visual Envelope and Zones of Visual Influence

10.9.1. The Visual Envelope (VE) for the proposed cycle track within the urban area is largely defined by the existing road corridor of Castle Peak Road and the containing high rise developments aligned to this key vehicular transport artery. The majority of open views to the cycle track development are contained within this Castle Peak Road corridor. In terms of the available viewing distances, typical views extend not more than 50 m within interruption by intervening obstacles such as small structures and vegetation. Within the waterfront and beach areas open views are contained by vegetation to the backshore areas where the cycle track is largely located. However, where the route extends out toward the shoreline the VE extends out over the open coastal zone to encompass distant views from the sea. The VE and Zone of Influence (ZVI) are mapped on [Figure 10.8.1 to Figure 10.8.4](#). The Zones of Visual Influence are defined as follows:

- *Primary Zone of Visual Influence* - Area of Greatest visibility of the proposed scheme, largely restricted to the existing road corridor of Castle Peak Road through which the route passes, road junctions, backshore areas of the beach and localised areas of recreation focused waterfront and pocket parks adjacent to Castle Peak Road such as Ki Lun Kong Public Park and Tsing Sin Garden.
- *Secondary Zone of Visual Influence* - Area with more limited visibility of the proposed scheme due to intervening obstacles including a combination of existing roadside and shoreline trees and vegetation and small structures such as beach facilities and porous boundary structures. This ZVI includes elevated views from high rise residential developments overlooking the scheme and roadside and beachside areas with views through retained vegetation and other intermittent obstacles towards the proposed cycle track.
- *Tertiary Zone of Visual Influence* - For the most part views of the proposed scheme are screened by a combination of intervening development, landform and vegetation. This ZVI includes at-grade areas along Castle Peak Road where, although the locations are relatively close to the scheme, sections of solid boundary walls in combination with existing vegetation and other structures largely screen the scheme from view. This ZVI also includes localized areas of Cafeteria Old Beach and Cafeteria New Beach and more distant views from publicly accessible viewpoints near Golden Beach and the perimeter of Tuen Mun Typhoon shelter.
- *Quaternary Zone of Visual Influence* - This is the area where there are occasional and partial glimpsed views of the scheme. This ZVI comprises the open water area along the coastline between Golden Beach and Tuen Mun Typhoon shelter. At Cafeteria Old Beach and Cafeteria New Beach the scheme may be partially glimpsed by swimmers and boats between existing trees and shoreline structures. At the rocky headland between Kadoorie Beach and Cafeteria Old Beach the route alignment offers more direct open views of cycle track structures, however there would be relatively few and occasional receivers of these view (perhaps only periodic boat traffic).

Existing Visually Detracting Elements

10.9.2. A number of the existing elements within the landscape of the Study Area may be considered as visually detracting in that they are visually incompatible with the existing landscape and visual context. These elements and their role within the visible landscape include:

- Tuen Mun Road Highways which is elevated or in form of a viaduct traversing the Study Area; and
- Large Scale structure associated with Light Rail Interchange and Podium at Handford Gardens; and
- Open carpark areas and temporary use areas land areas currently under construction for road infrastructure and private developments including areas to the east of Handford Gardens and locations in the vicinity of Kar Wo Wei.

Existing Visual Amenity and Visually Sensitive Receivers

- 10.9.3. For the purposes of this assessment and in accordance with current approaches the VSRs are based on publicly accessible and popular locations. Priority is given during the selection to public view points and key pedestrian routes, with these selected from orientations which may also capture ground levels views from the direction of residential properties and other less accessible locations within the Project visual envelope. The existing view, predicted impacts and recommended mitigation measures for each of the identified VSRs are presented in **Table 10.10** and **Table 10.11** and located on [Figure 10.8.1 to Figure 10.8.4](#).
- 10.9.4. The visual amenity observed by VSRs inside the primary ZVI is characterised by the views contained along road, beachside and open space corridors which, in the main, are limited to low- level views. Higher level views are also available from surrounding high rise developments, typical where the route runs along road corridors. Such views tend to form part of the secondary ZVI as they are from a greater distance and are likely to be obscured to some extent by intervening existing infrastructure, building and vegetation. More open views are available from beaches, headlands and open water areas along the coastal section of the route, and are mainly categorized as the tertiary and quaternary ZVI, where the proposed cycle track tends to form a small-scale element in panoramic views of the landscape as experienced by leisure related VSRs along the waterfront.

Visual Sensitive Receivers

- 10.9.5. **Table 10.10** determines the sensitivity of selected VSRs within the ZVI to accommodate changes. **Table 10.11** identifies the magnitude of change and the potential impacts on their visual amenity and the residual impact with recommended landscape mitigation measures fully established. VSRs identified within the ZVI are listed below and their existing visual context is illustrated in [Figure 10.9.1 to Figure 10.9.4](#), and comprise the following:

- VSR1 Visitors at Gold Coast Yacht and Country Club
- VSR2 Pedestrians and residents on Castle Peak Road – Ting Kau near Aegean Coast
- VSR3 Pedestrians and vehicles on Castle Peak Road – Ting Kau opposite Hong Kong Gold Coast Phase 1
- VSR4 Pedestrians on Castle Peak Road – Ting Kau opposite Monte Carlo Villas
- VSR5 Visitors at Golden Beach Office
- VSR6 Visitors at Cafeteria New Beach
- VSR7 Visitors at Cafeteria Old Beach Car Park
- VSR8 Visitors at Cafeteria Old Beach
- VSR9 Visitors at Cafeteria Old Beach Shoreline
- VSR10 Visitors at Cafeteria Old Beach BBQ Area
- VSR11 Pedestrians on Beach Footpath at Cafeteria Old Beach
- VSR12 Visitors at Kadoorie Beach Visitor Facilities
- VSR15 Pedestrians on Castle Peak Road – Castle Peak Bay opposite Verdant Villa
- VSR17 Pedestrians and Residents at Castle Peak Road – Castle Peak Bay
- VSR18 Visitors at Castle Peak Beach Facilities
- VSR19 Pedestrians and workers at seawall of Tuen Mun Typhoon Shelter
- VSR21 Pedestrian on over-bridge at Hoi Wing Road
- VSR23 Visitors and Residents at Mouse Island Children’s Playground
- VSR24 Visitors on walkway overlooking Ki Lun Kong Public Park
- VSR25 Pedestrians and residents at Sam Shin Street near Hanford Gardens
- VSR26 Visitors at Tsing Sin Playground

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- VSR27 Pedestrians and residents along Castle Peak Road – Castle Peak Bay near Alpine Garden
 - VSR28 Pedestrians and residents Opposite Handsome Court
 - VSR29 Pedestrians at Crossing near Yan Oi Market

Table 10.10 Sensitivity of Visually Sensitive Receivers

	VSR1	VSR2	VSR3	VSR4
	View for Visitors at Gold Coast Yacht and Country Club	View for Pedestrians and residents on Castle Peak Road – Ting Kau near Aegean Coast	Pedestrians and vehicles on Castle Peak Road – Ting Kau opposite Hong Kong Gold Coast Phase 1	Pedestrians on Castle Peak Road – Ting Kau opposite Monte Carlo Villas
Quality of View	High View looking north across the ornamental gardens at the frontage of the Gold Coast leisure area. View to hillside backdrop channelled between buildings and across the gardens and amenity landscape which form part of the Club environs.	Medium View towards the west of a roadside area framed by high rise residential development affording open views towards the wooded hills of Tai Lam Country Park.	Medium Low level views looking north west along Castle Peak from the roadside footpath adjacent to an existing cycle parking area. The road corridor is framed on one side by high rise residential development (Hong Kong Gold Coast Phase 1) and by existing plantation on the other	Medium Views looking south west along the entry road towards Golden Beach Car Park and Golden Beach Visitor Facilities. View consists of lower rise roadside development set within framed by tree planting largely within private lots.
Availability and Amenity of Alternative Views	High Alternative views of entrance garden area to the south and south east within similar high rise residential context and providing background views to wooded hillsides.	Medium Alternative open views towards the south, however views in other directions blocked by existing built development and screen planting.	Medium Similar alternative views available looking south east along Castle Peak Road. Views generally confined by existing planting and roadside development to within the road corridor.	Medium Views largely confined within the road corridor by roadside development and existing vegetation.
Type (Permanent or Transient) /No. of VSRs (Few/ Small/ Intermediate/ Large)	Transient/ Large	Permanent/ Intermediate	Transient/ Intermediate	Transient/ Intermediate
Duration and Frequency of Views to Proposed Works	Short and Variable Only VSRs using the parking facilities or visiting the retail outlets at this end of the development would experience this view, which is outside the main drop-off and arrival zone for the club and marina.	Long and Stable Only VSRs at the western end of Aegean Coast would potentially experience a view of the scheme.	Short and Variable Pedestrians and vehicle travellers will experience this view brief as they move through the road corridor.	Short and Variable Pedestrians will experience this view brief as they move through the road corridor. Those entering the access road to the beach will likely experience the view for longer durations.
Degree of Visibility	Low Works area would only be glimpsed through layers of existing vegetation.	Low The main façade of Aegean Coast does not overlook the proposed project, whilst ground level views would be screened by intervening vegetation.	Medium The proposed works will occupy an area of the roadside footpath along the northern edge of the road corridor.	Medium Whilst the cycle track turns towards the beach and is routed behind existing building next to an existing fence wall, the roadside track and proposed cycle parking facilities would be relatively more visible.
Sensitivity of VSR	Medium	Medium Relatively lower sensitivity compared to other residential receivers as views are largely interrupted by adjacent vegetation.	Medium	Medium

	VSR5	VSR6	VSR7	VSR8
	Visitors at Golden Beach Office	Visitors at Cafeteria New Beach	Visitors at Cafeteria Old Beach Car Park	Visitors at Cafeteria Old Beach
Quality of View	<p>Medium</p> <p>Low level views looking north west from the public arrival at Gold Coast Beach visitor facilities. Built facilities are relatively small scale and comprise decorative elements reflective of their leisure function. Amenity planting set within the building environs.</p>	<p>Medium</p> <p>Views looking east from Cafeteria old beach towards the existing visitor facilities set within tree planting at the backshore area of the beach. Various structures such as changing areas, lockers and seating out areas set within the framework of existing trees which also functions to screen views of low rise private residential development behind the open space area.</p>	<p>Low</p> <p>Views looking south east from the slightly elevated vantage point of the access path leading from the Car Park at Cafeteria Old Beach towards the waterfront areas. Views through existing pathside vegetation and filtered views through trees and single storey structures towards the beach. Lack of coherence of built structures and general rundown condition of built elements reduces the potential quality of the view.</p>	<p>Medium</p> <p>View from beach looking north towards the main BBQ Area and related facilities within the wooded backshore of the Open Space.</p>
Availability and Amenity of Alternative Views	<p>High</p> <p>Alternative Low-level views below the canopies of roadside trees towards the beach and coastal areas.</p>	<p>High</p> <p>Alternative Open views of the beach and waterfront can be enjoyed in a view arc between north west and south east of this VSR.</p>	<p>Medium</p> <p>Alternative urban view back towards the car park area and vegetated views along the existing stream course to the north.</p>	<p>High</p> <p>Alternative Open views of the beach and waterfront can be enjoyed in a view arc between north west and south east of this VSR.</p>
Type (Permanent or Transient) /No. of VSRs (Few/ Small/ Intermediate/ Large)	Transient/ Large	Transient/ Large	Transient/ Intermediate	Transient/ Intermediate
Duration and Frequency of Views to Proposed Works	<p>Short and Variable</p> <p>Visitors are moving through this area on their way to other areas. At popular times such as weekend and holidays this view may be experienced by many leisure VSR's, with less frequency outside peak periods.</p>	<p>Medium and Variable</p> <p>Beach users include those walking through the open space and others resting for longer periods to enjoy the beach surroundings.</p>	<p>Short and Variable</p> <p>Visitors are moving through this area on their way to other areas. At popular times such as weekend and holidays this view may be experienced by many leisure VSR's, with less frequency outside peak periods.</p>	<p>Medium and Variable</p> <p>Beach users include those walking through the open space and others resting for longer periods to enjoy the beach surroundings</p>
Degree of Visibility	<p>Low</p> <p>Works area is largely obstructed by existing buildings and would only be glimpsed through layers of existing vegetation.</p>	<p>Medium</p> <p>The proposed works are small scale and largely obstructed by existing structures and planting within the backshore area of the beach. However, localised tree felling will be a visible aspect of the works.</p>	<p>High</p> <p>The Cycle track and proposed footpath will pass in front of the entrance path from the Car Park. To the north a culvert shall be constructed to contain the existing stream, which would also be visible for these VSRs.</p>	<p>Medium</p> <p>The proposed cycle track is small scale and largely obstructed by existing shelters and planting within the backshore area of the beach. However, localised tree felling associated with the proposed culvert construction will be visible aspect of the works.</p>
Sensitivity of VSR	Medium	Medium	Low	Medium

	VSR9	VSR10	VSR11	VSR12
	Visitors at Cafeteria Old Beach Shoreline	Visitors at Cafeteria Old Beach BBQ Area	Pedestrians on Beach Footpath at Cafeteria Old Beach	Visitors at Kadoorie Beach Visitor Facilities
Quality of View	<p>High</p> <p>Open view in a north west direction along Cafeteria Old beach. Sandy shoreline with intermittent rocky outcrops and distant views along the coastline towards Castle Peak and high-rise development around the Butterfly Estate. Medium rise development extends above the wooded backshore which extends towards the coast as a rocky headland forming the northern end of the beach.</p>	<p>Medium</p> <p>View in a northerly direction across a secondary BBQ area set against a wooded backdrop aligned to an existing stream. Medium rise developments overlooking the beach rises above this boundary tree belt belying the urban edge context of the location. Hard, functional appearance of the BBQ area reduces the potential quality of the view.</p>	<p>High</p> <p>View along the coastal footpath at the northern end of Cafeteria Old beach as it extends around the wooded, rocky shoreline.</p>	<p>Medium</p> <p>Views looking south east from the slightly elevated vantage point of the visitor facilities at Kadoorie beach. Foreground of the view is hard paved, with views to the beach and coastal waters beyond channelled through existing clusters of waterfront trees.</p>
Availability and Amenity of Alternative Views	<p>High</p> <p>Alternative, high quality, open views of the beach, waterfront and hillside backdrop can be readily enjoyed from this open beachfront vantage point</p>	<p>High</p> <p>The open nature of the interface between the BBQ area and the beach provides high quality alternative views over the beachfront area.</p>	<p>High</p> <p>Alternative high quality, open views of the beach and waterfront can be enjoyed towards the south</p>	<p>Medium</p> <p>Filtered views through vegetation are available to the west, though the location is relatively contained by existing vegetation, landform and buildings.</p>
Type (Permanent or Transient) /No. of VSRs (Few/ Small/ Intermediate/ Large)	Transient/ Small	Transient/ Intermediate	Transient/ Intermediate	Transient/ Intermediate
Duration and Frequency of Views to Proposed Works	<p>Medium and Variable</p> <p>Beach users include those walking through the open space and others resting for longer periods to enjoy the beach surroundings</p>	<p>Medium and Variable</p> <p>BBQ users may typically spend a few hours using these facilities and enjoying the beach surroundings.</p>	<p>Medium and Variable</p> <p>Beach users include those walking through the open space and others resting for longer periods to enjoy the beach surroundings</p>	<p>Medium and Variable</p> <p>Beach users include BBQ users and swimmers and others using these beachfront facilities.</p>
Degree of Visibility	<p>Low</p> <p>Much of the route is concealed behind backshore planting and beach structures in views for these VSRs. Where the track is routed towards the coast at the northern end of the beach the proposed cycle bridge structure would be a visible but relatively distant element, viewed against fence walls on the existing wooded headland.</p>	<p>Medium</p> <p>The main impacts will arise from the removal of vegetation to facilitate the construction of a culvert at the existing stream which runs behind this BBQ area.</p>	<p>High</p> <p>At this location the cycle track will be routed away from the backshore and towards the coast. The track and footpath will be constructed on an elevated bridge structure and pass through the shallow waters surrounding this headland. Owing to the open nature of views, these new structures will be highly visible.</p>	<p>Medium</p> <p>At this location the cycle track will be constructed on an elevated bridge structure and pass through the shallow waters and rocky shoreline surrounding the headland to the south of this VSR. However, much of this proposed construction shall be screened by existing trees and vegetation at the back of Kadoorie Beach.</p>
Sensitivity of VSR	High	Medium	High	Medium

	VSR15	VSR17	VSR18
	Pedestrians on Castle Peak Road – Castel Peak Bay opposite Verdant Villa	Pedestrians and residents at Castle Peak Road – Castle Peak Bay	Visitors at Castle Peak Beach Facilities
Quality of View	<p>Medium</p> <p>Views looking South West from a bus stop along Castle Peak Road, across the road carriageway towards the waterfront promenade above Castle Peak Beach. Limited views from at grade vantage points to open water areas, with promenade and streetscape features comprising much of the view.</p>	<p>Medium</p> <p>Open view over the road carriageway towards the waterfront promenade overlooking Castle Peak Beach. Glimpsed views of open water between waterfront pavilions.</p>	<p>Medium</p> <p>View along the roadside Footpath towards the Castle Peak Beach Visitor facilities / amenity building. Roadside vegetation and garden planting associated with adjacent residential developments such as Palm cove lend the road corridor a verdant character.</p>
Availability and Amenity of Alternative Views	<p>Medium</p> <p>Views largely confined within the road corridor by roadside development and existing vegetation.</p>	<p>Medium</p> <p>Similar alternative views available looking north west along Castle Peak Road, however views in other directions blocked by existing built development and screen planting.</p>	<p>Medium</p> <p>Similar alternative views available looking south east along Castle Peak Road. Views generally confined by existing planting and roadside development to within the road corridor.</p>
Type (Permanent or Transient) /No. of VSRS (Few/ Small/ Intermediate/ Large)	Transient/ Intermediate	Permanent/ Intermediate	Transient/ Intermediate
Duration and Frequency of Views to Proposed Works	<p>Short and Variable</p> <p>Pedestrians and vehicle travellers will experience this view brief as they move through the road corridor.</p>	<p>Long and Variable</p> <p>Residents and pedestrians will experience some modifications to the layout of the existing waterfront promenade.</p>	<p>Short and Variable</p> <p>Pedestrians and vehicle travellers will experience this view brief as they move through the road corridor.</p>
Degree of Visibility	<p>Medium</p> <p>The proposals would be a small-scale addition to the roadside view, although the removal of some waterfront trees to accommodate the works would be a visible change in the composition of the view from this VSR.</p>	<p>Medium</p> <p>The proposals would be a small-scale addition to the roadside view of the waterfront promenade, although the removal of some waterfront trees to accommodate the works would be a visible change in the composition of the view from this VSR.</p>	<p>Medium</p> <p>The cycle track will occupy around half the width of the existing promenade, although, as this is an existing hard surface, the change to another form of hard surface will not be visually significant. The works will however entail relocation of other existing elements such as light poles.</p>
Sensitivity of VSR	Medium	Medium	Medium

	VSR19	VSR21	VSR23
	Pedestrians and workers at Seawall of Tuen Mun Typhoon Shelter	Pedestrian on over-bridge at Hoi Wing Road	Visitors and residents at Mouse Island Children's Playground
Quality of View	High Open, panoramic views across the typhoon shelter towards the coastal belt, with urban development set against the wooded hillside of Tai Tam Country Park.	Low Elevated view from a pedestrian bridge looking west along Hoi Wing Road. Large scale road corridor lined with high rise development, softened by street trees and podium garden planting.	Low View across Hoi Wing Road towards the podium of the Hanford Gardens development. Large scale urban development softened by tree planting within the central road reserve.
Availability and Amenity of Alternative Views	High Alternative Open views of the beach and waterfront can be enjoyed to the other side of the seawall, whilst open sea views towards Lantau are available to the west.	Medium Alternative views available looking east along Hoi Wing Road. Views generally confined by existing planting and roadside development to within the road corridor.	Medium Alternative View across the urban areas to the west of the Playground, although generally ground level views are constrained by the density of surrounding urban development.
Type (Permanent or Transient) /No. of VSRs (Few/ Small/ Intermediate/ Large)	Transient/ Few	Transient/ Intermediate	Transient/ Intermediate
Duration and Frequency of Views to Proposed Works	Short and infrequent Periodic Pedestrians and workers accessing the typhoon shelter	Short and Variable Typically, pedestrians would cross over the bridge quickly and not linger to observe the view.	Medium and Variable Open space users and residents enjoying the playground facilities at various times of day.
Degree of Visibility	Medium Whilst the cycle track is some distance from this VSR it is the only land-based vantage point from which both cycle bridges along the coastline would be visible. Whilst at this distance they would represent a small scale and low-profile element along the waterfront, they would affect a reasonable length of the coastline visible from this VSR.	High The cycle track and associated road works would affect a significant extent of the roadside visible in this view.	Medium The proposed cycle track is small scale and largely obstructed by the central reserve along Hoi Wing Road. However, the removal of trees from the central reserve will increase the visibility of the proposed works.
Sensitivity of VSR	Medium	Low	Medium

	VSR24	VSR25	VSR26
	Visitors on walkway overlooking Ki Lun Kong Public Park	Pedestrians and residents at Sam Shin Street near Hanford Gardens	Visitors at Tsing Sin Playground
Quality of View	<p>Medium</p> <p>View of an existing park backed by an area of secondary woodland provides a varied and green scene. However, the visibility of shotcrete slopes and the relatively hard / built nature and limited extent of the open space reduces the potential quality of this view.</p>	<p>Medium</p> <p>A streetscape view channelled between buildings towards an area of secondary woodland on the urban edge with a hillside backdrop of Tai Lam Country Park.</p>	<p>Medium</p> <p>A view across Castle Peak Road towards the proposed cycle track route with central reserve and roadside tree planting creating a layered planting effect.</p>
Availability and Amenity of Alternative Views	<p>Medium</p> <p>Alternative streetscape view available to the south west, with other view directions are constrained by existing infrastructure and built development.</p>	<p>Medium</p> <p>Alternative views available looking east along Hoi Wing Road. Views generally confined by existing planting and roadside development to within the road corridor.</p>	<p>Medium</p> <p>Alternative Views to the north and south along Castle Peak Road although generally ground level views are constrained by the density of surrounding urban development.</p>
Type (Permanent or Transient) /No. of VSRs (Few/ Small/ Intermediate/ Large)	Transient/ Intermediate	Transient/ Intermediate	Transient/ Intermediate
Duration and Frequency of Views to Proposed Works	<p>Short and Variable</p> <p>Typically, pedestrians would cross over the bridge quickly and not linger to observe the view.</p>	<p>Short and Variable</p> <p>Pedestrians and vehicle travellers will experience this view brief as they move through the road corridor.</p>	<p>Short and Variable</p> <p>Open space users and residents enjoying the playground facilities at various times of day.</p>
Degree of Visibility	<p>Medium</p> <p>The cycle track and proposed footpath located to the edge of the current open space. Whilst intermittent planting would partially screen views the proposals would be more visible from elevated viewpoints.</p>	<p>Medium</p> <p>The proposals would be a small-scale addition to the roadside view towards Ki Lun Kong Public Park, although the removal of some roadside trees to accommodate the works would be a visible change in the composition of the view from this VSR.</p>	<p>Medium</p> <p>The cycle track will occupy an area of towards the edge of the road corridor. Whilst the construction will involve the removal of some small trees, these will be viewed from this vantage point through several layers of existing roadside trees which will help screen the works from this VSR.</p>
Sensitivity of VSR	Medium	Medium	Medium

	VSR27	VSR28	VSR29
	Pedestrians and residents along Castle Peak Road – Castle Peak Bay near Alpine Garden	Pedestrians at Bus stop Opposite Handsome Court	Pedestrians at Crossing near Yan Oi Market
Quality of View	<p>Medium</p> <p>A view along the linear roadside gardens which flank Castle Peak Road with ornamental and amenity planting defining footpath and terrace areas contained within the boundary walls of adjacent residential developments.</p>	<p>Medium</p> <p>A view across Castle Peak Road towards Tsing Sin Garden with the Handsome Court Development largely containing views within the road corridor.</p>	<p>Medium</p> <p>A view across Castle Peak Road with ornamental and amenity planting in the foreground framing longer views towards the hillside backdrop of Tai Lam Country Park.</p>
Availability and Amenity of Alternative Views	<p>Medium</p> <p>Alternative View to the south along Castle Peak Road, although generally other ground level views are constrained by the density of surrounding urban development around the road corridor.</p>	<p>Medium</p> <p>Alternative Views to the north and south along Castle Peak Road although generally ground level views are constrained by the density of surrounding urban development.</p>	<p>Medium</p> <p>Alternative View along Castle Peak Road and filtered views to hillsides to the northeast.</p>
Type (Permanent or Transient) /No. of VSRS (Few/ Small/ Intermediate/ Large)	Permanent/ Intermediate	Permanent/ Intermediate	Transient/ Intermediate
Duration and Frequency of Views to Proposed Works	<p>Long and Stable</p> <p>Pedestrians and residents overlooking the scheme set within the existing public realm of Castle Peak Road.</p>	<p>Long and Stable</p> <p>Pedestrians and residents overlooking the scheme set within the existing public realm of Castle Peak Road.</p>	<p>Long and Stable</p> <p>Pedestrians and residents overlooking the scheme set within the existing public realm of Castle Peak Road.</p>
Degree of Visibility	<p>Medium</p> <p>The cycle track will occupy an area of existing footpath and would be quite visible from this viewpoint. However, at this location the track can be accommodated without major modifications to surrounding planters and street furniture, largely limiting the impacts to the ground plane.</p>	<p>Medium</p> <p>The cycle track will occupy an area of towards the edge of the road corridor. The construction will involve the removal of some small trees, which will thin the tree coverage of the road corridor as perceived from this VSR.</p>	<p>Medium</p> <p>The cycle track will occupy an area of towards the edge of the road corridor. The construction will involve the removal of some small trees, which will thin the tree coverage of the road corridor as perceived from this VSR.</p>
Sensitivity of VSR	Medium	Medium	Medium

Visual Impacts

- 10.9.6. The potential visual impacts on identified VSRs resulting from the proposed works during the construction and operational phases of the Project are summarised in the following sections and listed in **Table 10.11**. These impacts are also mapped on [Figure 10.15.1 to Figure 10.15.3](#). The mitigated (residual) impacts are assessed during the design year which for the purpose of this study is taken as being between 10 and 15 years after the schemes opening when the proposed mitigation planting is deemed to have reached a level of maturity, which is sufficient for it to perform the design objectives.
- 10.9.7. The scale of the proposed works is relatively small whilst the visual context of several of the individual VSRs are obstructed by existing infrastructure or adjacent built structures. Some of the VSR's are at a distance where the proposals will form a minor component in the view, whilst in others the general compatibility of the proposed works with the existing roadside infrastructure is a factor. As such there is no significant adverse impact on the visual quality or amenity of all VSRs, in the absence of mitigation. The impacts are described in summary below with further details provided in **Table 10.11**.

Moderate / Substantial

- 10.9.8. Whilst the scale of the works to construct the cycle track is typically relatively small (4 m wide cycle track and 2 m wide footpath), at certain location the construction works are more intensive, for instance where road carriageway works are required to make space for the cycle track within the road corridor or where bridge structures are necessary to make functional connections between sections of the track. Where such larger scale construction works coincide with highly sensitive VSR's more significant impacts are predicted. Pedestrians on Beach Footpath at Cafeteria Old Beach (VSR11) will be subject to a moderate / substantial change of visual context with the construction of cycle bridges structures around the headlands between Kadoorie Beach and Cafeteria Old Beach and a Moderate Adverse Visual Impact at the Operation stage (prior to mitigation). Their extensive open views will experience this impact in the absence of mitigation measures during construction and operational phase.

Moderate

- 10.9.9. Moderate construction and Operation stage impacts include Visitors at Cafeteria Old Beach Shoreline (VSR9) who will experience similar changes to the visual context of the beach / waterfront area as noted above, but from a greater distance, where these changes are less significant in the context of the overall coastal scene. This rating also includes less sensitive VSR's where larger scale works are proposed such as Visitors to Mouse Island Children's Playground (VSR23) which will experience Moderate impacts in the Construction and Operation stage prior to mitigation. Moderate unmitigated impacts are also anticipated in the construction stage for Pedestrians on Castle Peak Road – Castle Peak Bay opposite Verdant Villa (VSR15) and Visitors at Castle Peak Beach Facilities (VSR18), although the impacts are then rated as slight / Moderate and slight respectively in the operation stage prior to mitigation.

Slight / Moderate

- 10.9.10. Some VSRs are assessed to have a slight/moderate impact in the construction phase and during the operation phase (without the adoption of mitigation measures). This includes less sensitive VSR's where larger scale works are proposed, including Pedestrian on over-bridge at Hoi Wing Road (VSR21). Visitors at Kadoorie Beach Visitor Facilities (VSR12) are also anticipated to experience slight/moderate impact in the construction phase and during the operation phase prior to mitigation where views of the cycle bridge will be filtered through existing retained vegetation.
- 10.9.11. Some beach and waterfront VSRs will experience a slight/moderate impact in the construction phase and typically a slight impact in the Operation Phase, typically where views to the cycle track are partially screened by backshore vegetation or the VSR's are located at a greater distance from the proposed works. This includes Visitors at Cafeteria New Beach (VSR6), and Visitors at Cafeteria Old Beach Car Park (VSR7), Visitors at Cafeteria Old Beach BBQ Area (VSR10) and Pedestrians and workers at seawall of Tuen Mun Typhoon Shelter (VSR19).
- 10.9.12. Several Roadside and residential VSRs are also assessed to have a slight/moderate impact in the construction phase and typically a slight impact in the Operation Phase. Whilst the majority of the

works are small scale, these VSR's tend to be located where the cycle track is routed through more prominent locations along the roadside. This includes VSR to the south and central areas of the route, including Pedestrians and residents on Castle Peak Road – Castle Peak Bay (VSR17), Visitors at Ki Lun Kong Public Park (VSR24) and Pedestrians at Sam Shin Street near Hanford Gardens (VSR25). At the northern section of Castle Peak Road VSRs in this category also include Visitors at Tsing Sin Playground (VSR26), Pedestrians and Castle Peak Road – Castle Peak Bay near Alpine Garden (VSR27), Pedestrians at Bus stop Opposite Handsome Court (VSR28) and, Pedestrians at Crossing near Yan Oi Market (VSR29).

- 10.9.13. Some Moderate / Slight Construction stage impacts and Slight Operation Stage impacts will also be experienced from roadside / residential VSRs, including Pedestrians and Vehicles on Castle Peak Road – Ting Kau opposite Hong Kong Gold Coast Phase 1 (VSR3) and Pedestrians and Vehicles on Castle Peak Road – Ting Kau opposite Monte Carlo Villas (VSR4). Typically, at these locations, although the construction activities are small scale they will be relatively visible and involve removal of some existing trees during the construction stage. However, owing to the small scale of the works the unmitigated impacts are deemed slight at the Operation stage (prior to mitigation).

Slight and Insubstantial

- 10.9.14. With exception of the VSRs mentioned in the above section, the remaining VSRs including Visitors at Golden Beach Office (VSR5) and Visitors at Cafeteria Old Beach (VSR8) will experience a slight adverse impact in the absence of mitigation measures during construction and operational phases. In view of the scale and nature of the cycle track, this will lead to only very small changes in their visual context. Two VSRs; Visitors at Gold Coast Yacht and Country Club (VSR1) and Pedestrians on Castle Peak Road – Ting Kau near Aegean Coast (VSR2) are also determined to experience insubstantial visual impact due the limit nature of the view towards the proposed track.
- 10.9.15. The assessment contained in **Table 10.11** concluded that even though there are variable impacts on visual amenity of the VSRs, the proposed cycle track and associated facilities in combination with reinstatement of works areas to their original status, preservation of existing trees and new tree and shrub planting proposals along the track and within the facilities will mitigate the change of visual amenity and restore the roadside landscape as before for many of the affected locations. For the most significant impacts on coastal landscapes noted above, the responsive design of the proposed track will be a key mitigation strategy. The recommended landscape mitigation measures and residual impact on these VSRs is further discussed in Sections 10.10 and 10.12.

Table 10.11 Visually Sensitive Receivers and Predicted Impacts

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR1 Visitors at Gold Coast Yacht and Country Club	Medium	146m Existing views largely blocked	Medium	Small / low level development with some localised slope works	Irreversible	3yrs/ Permanent	Negligible / Negligible Works largely screened and therefore change largely imperceptible.	Insubstantial	Insubstantial	CP1, CP3, CP6, OP1, OP2 and OP4.	Insubstantial Works largely screened and therefore change largely imperceptible.	Insubstantial (Day 1 and Year 10) Works largely screened and therefore change largely imperceptible.
VSR2 Pedestrians and residents on Castle Peak Road – Ting Kau near Aegean Coast	Medium	59m Existing views largely blocked	High	Small Low level development with some localised slope works.	Irreversible	3yrs./ Permanent	Negligible / Negligible Works largely screened and therefore change largely imperceptible.	Insubstantial	Insubstantial	CP1, CP3, CP6, OP1, OP2 and OP4.	Insubstantial Works largely screened and therefore change largely imperceptible.	Insubstantial (Day 1 and Year 10) Works largely screened and therefore change largely imperceptible.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR3 Pedestrians and vehicles on Castle Peak Road – Ting Kau opposite Hong Kong Gold Coast Phase 1	Medium	23 m No blockage of existing views	High	Medium Whilst the cycle track works are small in scale the route requires some modification to existing slopes and retaining walls at the edge of the road corridor	Irreversible	3yrs./ Permanent	Small/ Small Pedestrian VSRs have direct views towards the cycle track, nevertheless the area represents a relatively small component of the overall view along the road corridor. The nature and scope of works are restricted to existing roadside areas of Castle Peak Road and the elements that form the cycle track are compatible with the roadside character. Given the above reasons, the proposed works will represent a minor component in the roadside context.	Slight / Moderate Adverse Slope works will require some more visible activities and disturbances to the visual context during the construction stage	Slight Adverse The cycle track is small scale and compatible with the existing roadside environment. However, there will be minor widening of the road corridor and resultant removal of some existing roadside vegetation.	CP1, CP2, CP3, CP4, CP6, OP1, OP2, OP3 and OP4	Slight Adverse Given the implementation programme at specific location along the whole alignment is relatively short, duration of the impact in views of these VSRs will be shortened. Temporary works and affected roadside amenity areas will be reinstated locally upon sectional completion of the works. Proper management of material storage and construction activities can alleviate some of the construction stage impacts.	Insubstantial (Day 1 and Year 10) Reinstatement of roadside slope and planting areas and the upgrading of amenity area such as the roadside cycle parking area will generally compensate for the slight widening of the roadside margins to accommodate the cycle track route. Proposed new tree planting will soften the localized engineering slopes. Upon full establishment of the above mitigation measures, visual quality looking along Castle Peak Road will be re-established and the visual impact will be alleviated.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR4 Pedestrians and vehicles on Castle Peak Road – Ting Kau opposite Monte Carlo Villas	Medium	18 m No blockage of existing views	High The surrounding road landscape is a linear and transport orientated environment whilst the gateway to the beachfront leisure area is compatible with the proposed function of the cycle track.	Small	Irreversible	3yrs./ Permanent	Small/ Small The construction activities will affect one side of the junction to the beach car par. The proposed works are small scale and will have limited impact on existing built structures. Some existing railings shall need to be removed whilst there will need to be some removal of existing exotic tree planting to create sufficient space for the track.	Slight / Moderate Adverse This is a visible gateway area and although the construction activities are small-scale, they will be relatively visible.	Slight Adverse Despite the small scale of the works the tree removal shall be a visible impact in the absence of mitigation.	CP1, CP2, CP3, CP4, CP5, CP6, OP1, OP2 and OP3	Slight Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts. Given the implementation of above mitigation measures, the construction impact may be minimized.	Insubstantial (Day 1 and Year 10) Establishment of proposed new tree planting will help re-establish the green setting of the entrance road. Upon full establishment of the above mitigation measures, visual quality looking towards the beach will be reinstated and the impact will be alleviated.
VSR5 Visitors at Golden Beach Office	Medium	35m	Medium	Small Low level development with some localised tree impacts.	Irreversible	3yrs/	Small/ Small Works largely screened by existing buildings and vegetation.	Slight Adverse Despite the Works being largely screened removal of some trees and low-level vegetation shall be a visible impact in the absence of mitigation.	Slight Adverse The operation impact to these VSRs is the same as construction impact regarding to the nature of project.	CP1, CP3, CP4, OP1, OP2 and OP3.	Slight Adverse Works largely screened by retained vegetation which will help mitigate construction stage impacts	Insubstantial (Day 1 and Year 10) Establishment of proposed new tree and shrub planting will compensate for the initial loss of greenery.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR6 Visitors at Cafeteria New Beach	Medium	37 m Existing views partially blocked by intervening structures and vegetation.	High	Small	Irreversible	3yrs./ Permanent	Small/ Small The proposed works are small scale and views from the beach are largely obstructed by existing structures and planting within the backshore area. However, localised tree felling will be a visible aspect of the works.	Slight / Moderate Adverse Construction works may impact on some existing access and informal use of the backshore area. Existing level changes will require some excavation and levelling along the route and adjacent areas.	Slight Adverse The operation impact to these VSRs is largely a consequence of the background trees that will be required to be removed to make way for the cycle track route.	CP1, CP3, OP1, OP2, OP3 and OP4.	Slight Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Given the public nature of the space screen hoarding is likely to be required to separate visitors and existing users from the proposed construction works. Proper management of material storage and construction activities will also help alleviate construction stage impacts.	Slight Adverse (Day 1 and Year 10) Given the spatially constrained nature of the location there is limited available space for the establishment of mitigation planting to help compensate for localized tree felling along the boundary of the open space. Therefore, the impacts remain slight adverse in the Operation Phase (after mitigation)



Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR7 Visitors at Cafeteria Old Beach Car Park	Low	12 m No blockage of existing views	High	Medium The works include construction of a box culvert to contain the flow of an existing stream to the north of this vantage point.	Irreversible	3yrs./ Permanent	Intermediate/Small In the Construction Phase the excavation and related works to construct a buried box culvert will increase the visual impact of the works. The cycle track and its related footpath and street furniture will then be constructed on top of this concealed culvert. Given the relatively built-up nature of the existing backshore at this location this will represent a small magnitude of change during the Operation Phase.	Slight / Moderate Adverse The construction of the box culvert will impact this view during the construction stage. However, the existing visual context is already somewhat discordant, reducing the perceived impact of these works.	Slight Adverse Whilst the repaving of the existing hardscape areas may represent an improvement over the existing condition the operation impact to these VSRs is largely a consequence of the removal of existing trees that will be required to facilitate the box culvert construction.	CP1, CP2, CP3, OP1, OP2, and OP3.	Slight Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Given the public nature of the space screen hoarding is likely to be required to separate visitors and existing users from the proposed construction works at the existing stream area. Proper management of material storage and construction activities will also help alleviate construction stage impacts.	Insubstantial (Day 1) Slight Beneficial (Year 10) Whilst the introduction of the box culvert will close over the existing stream, its current overgrown state and odour issues are not an asset to this public open space. The works are an opportunity to clean up this backshore area, which currently contains several temporary structures, and make it more user friendly for leisure use by the public. Responsive design of the alignment will help integrate with the exiting visual context. With the establishment of tree planting above the buried culvert and amenity planting to mitigate the impact of the works a slight beneficial residual impact is anticipated.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR8 Visitors at Cafeteria Old Beach	Medium	41 m Existing views partially blocked by intervening structures and vegetation.	Medium	Medium The works include construction of a box culvert to contain the flow of an existing stream to the north of this vantage point.	Irreversible	3yrs./ Permanent	Small/ Small The proposed works are small scale and views from the beach are largely obstructed by existing structures and planting within the backshore area. However, reduction in the backshore canopy density as a result of tree felling to facilitate the culvert construction will be a visible aspect of the works.	Slight Adverse The construction of the box culvert will impact this view during the construction stage. However, these works will be somewhat screened by retained existing trees in front of the proposed culvert alignment.	Slight Adverse The operation impact to these VSRs is largely a consequence of the background trees that will be required to be removed to make way for the cycle track route.	CP1, CP3, CP5, OP1, OP2 and OP3.	Slight Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Given the public nature of the space screen hoarding is likely to be required to separate visitors and existing users from the proposed construction works. Proper management of material storage and construction activities will also help alleviate construction stage impacts.	Insubstantial (Day 1 and Year 10) Establishment of proposed new tree planting will help re-establish the green setting of the backshore area. Upon full establishment of the above mitigation measures, visual quality looking towards the cycle track from the central area of the beach will be reinstated and the impact will be Alleviated.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR9 Visitors at Cafeteria Old Beach Shoreline	High	47m Close views blocked by existing fencing and backshore vegetation.	Medium	Medium The at grade sections involve small scale works however the construction of the cycle bridge structure around the headland are larger in scale.	Irreversible	3yrs./ Permanent	Small/ Small The proposed works are small scale. Close views from the beach are largely obstructed by existing structures and planting within the backshore area whilst the more visible works where the track extends around the headland at the northern end of the beach are more distant from this vantage point and would be seen against the outline of an existing fence wall.	Moderate Adverse The construction of the cycle bridge will impact this view during the construction stage, although they are some distance from this VSR at the central area of the beach.	Moderate Adverse The operation impact to these VSRs is largely a consequence of the visibility of the cycle track bridge around the headland at the northern end of the beach	CP1, CP3, CP5, OP1, OP2, OP3, OP4 and OP6.	Slight / Moderate Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts.	Slight Adverse (Day 1 and Year 10) Establishment of proposed new tree planting will help re-establish the green setting of the backshore area. Due to the open nature of this coastline the cycle bridge will always represent a visual element. However, responsive design of the alignment and bridge appearance will help integrate with the exiting visual context around the headland.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR10 Visitors at Cafeteria Old Beach BBQ Area	Medium	26m Close views partially blocked by existing shelters and backshore vegetation.	High	Medium The at grade sections involve small scale works however the construction of the cycle bridge structure around the headland are larger in scale	Irreversible	3yrs./ Permanent	Small/ Small The proposed works are small scale and the magnitude of change moderated by the current hard / built appearance of the current BBQ area. The main impacts will arise from the removal of vegetation to facilitate the construction of a culvert at the existing stream which runs behind this BBQ area.	Slight / Moderate Adverse The construction of the cycle track to the north and east of this area will impact on existing vegetation and footpaths whilst the construction of the cycle bridge will also impact this view during the construction stage.	Slight Adverse The operation impact to these VSRs is largely a consequence of the visibility of the cycle track bridge around the headland and tree felling associated with the at grade section of the track extending along the backshore area.	CP1, CP3, CP5, OP1, OP2, OP3, OP4 and OP6	Slight Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Given the public nature of the space screen hoarding is likely to be required to separate visitors and existing users from the proposed construction works. Proper management of material storage and construction activities will also help alleviate construction stage impacts.	Slight Adverse (Day 1 and Year 10) Establishment of proposed new tree planting will help re-establish the green setting of the backshore area and help integrate the at-grade sections of cycle track with their visual context. Due to the open nature of this coastline the cycle bridge will always represent a visual element. However, responsive design of the alignment and bridge appearance will help integrate with the exiting visual context around the headland.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR11 Pedestrians on Beach Footpath at Cafeteria Old Beach	High	7m No blockage of existing views	Medium The existing coastal footpath and associated wall construction are existing elements that are compatible with the proposals.	Medium Whilst the construction scheme is relatively low in profile and follows the coastline it will represent a large scale than the existing coastal path.	Irreversible	3yrs./ Permanent	Intermediate/ Intermediate At this location, the cycle track will be routed away from the backshore and towards the coast. The track and footpath will be constructed on an elevated bridge structure and pass through the shallow waters surrounding this headland. Owing to the open nature of views, these new structures represent an intermediate magnitude of change from close viewing positions as represented by this VSR.	Moderate / substantial Adverse The construction of the cycle bridge in open waters will impact this view during the construction stage	Moderate Adverse The operation impact to these VSRs is largely a consequence of the visibility of the cycle track bridge around the headland and the visual impacts on the existing rocky headland landscape as the interface with the coastal waters.	CP1, CP3, OP1, OP2, OP4, OP5 and OP6	Moderate Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts.	Slight / Moderate Adverse (Day 1 and Year 10) Due to the open nature of this coastline the cycle bridge will always represent a visual element. However, responsive design of the alignment and bridge appearance will help integrate with the exiting visual context around the headland. The bridge should be as low profile and light weight as possible and respect the layout of existing rocky shore in order to fit with the landscape context and create an engaging feature for public enjoyment.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR12 Visitors at Kadoorie Beach Visitor Facilities	Medium	9m Close views largely blocked by existing backshore vegetation.	Medium	Medium The beach is already developed with various leisure related structures and facilities	Irreversible	3yrs./ Permanent	Small/ Small At this location, the cycle track will be constructed on an elevated bridge structure and pass through the shallow waters and rocky shoreline surrounding the headland to the south of this VSR. However, much of this proposed construction shall be screened by existing trees and vegetation at the back of Kadoorie Beach.	Slight / Moderate Adverse The construction of the cycle bridge will impact this view during the construction stage, whilst works on the existing wooded slopes to integrate the route with existing feature will also require site formation and tree removal which will be glimpsed through retained vegetation from this viewpoint.	Slight / Moderate Adverse The operation impact to these VSRs is largely a consequence of the visibility of the cycle track bridge around the headland and tree removal on adjacent slope areas.	CP1, CP2, CP3, CP5, OP1, OP2, OP3 and OP4, OP5, OP6	Slight Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts.	Slight Adverse (Day 1 and Year 10) Establishment of proposed new tree planting will help re-establish the green setting of the backshore area. Due to the open nature of this coastline the cycle bridge will always represent a visual element glimpsed through the existing vegetation at the margins of the beach.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR15 Pedestrians on Castle Peak Road – Castle Peak Bay opposite Verdant Villa	Medium	17m No blockage of existing views	High	Intermediate	Irreversible	3yrs./ Permanent	Intermediate/ Intermediate The cycle track proposals would be a small-scale addition to the roadside view, however the removal of some roadside trees to accommodate the works would be a visible change in the composition of the view from this VSR.	Moderate Adverse This is a visible area at a turn in the road and although the construction activities are small-scale they will be relatively visible.	Slight / Moderate Adverse Despite the small scale of the works the tree removal along the roadside shall be a visible impact in the absence of mitigation.	CP1, CP3, CP6, OP1, OP4, and OP6.	Slight / Moderate Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts. Given the implementation of above mitigation measures, the construction impact may be minimized.	Slight Adverse (Day 1 and Year 10) There is limited opportunity for additional tree planting at this location, however finishes to the cycle track and adjacent structures can help to blend the proposals with their existing context.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR17 Pedestrians and residents on Castle Peak Road – Castle Peak Bay	Medium	18m No blockage of existing views	High	Small	Irreversible	3yrs./ Permanent	Small/ Small The proposals would be a small-scale addition to the roadside view of the waterfront promenade, although the removal of some waterfront trees at the southern end of the promenade to accommodate the works would be a visible change in the composition of the view from this VSR.	Slight / Moderate Adverse This is a visible and open promenade area and although the construction activities are small-scale they will be relatively visible.	Slight Adverse Despite the small scale of the works the tree removal localized at the southern end shall be a visible impact in the absence of mitigation.	CP1, CP3, CP6 and OP1	Slight Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts. Given the implementation of above mitigation measures, the construction impact may be minimized.	Insubstantial (Day 1 and Year 10) Establishment of proposed new tree planting will help re-establish the green setting of the promenade. Upon full establishment of the above mitigation measures, visual quality looking towards the waterfront will be reinstated and the impact will be alleviated.



Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR18 Visitors at Castle Peak Beach Facilities	Medium	0m No blockage of existing views	High	Small	Irreversible	3yrs./ Permanent	Intermediate / Small The cycle track will occupy around half the width of the existing promenade, although, as this is an existing hard surface, the change to another form of hard surface will not be visually significant. The works will however entail relocation of other existing elements such as light poles.	Moderate Adverse This is a visible and open promenade area and although the construction activities are small- scale they will be relatively visible.	Slight Adverse The change to another form of hard surface will not be visually significant and the appearance of the promenade after construction shall be quite similar to the existing.	CP1, CP3, CP6, OP1, OP2 and OP3	Slight / Moderate Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts. Given the implementation of above mitigation measures, the construction impact may be minimized.	Insubstantial (Day 1 and Year 10) Use of attractive and coordinated street furniture and paving materials can lead to a general upgrade of the promenade condition which offsets any visual impact associated with the cycle track development.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR19 Pedestrians and workers at seawall of Tuen Mun Typhoon Shelter	Medium	460m No blockage of existing views	Medium	Small	Irreversible	3yrs./ Permanent	Small/ Small Whilst the cycle track is some distance from this VSR it is the only land-based vantage point from which both cycle bridges along the coastline would be visible. Whilst at this distance they would represent a small scale and low-profile element along the waterfront, they would have a small effect on a reasonable length of the coastline visible from this VSR	Slight / Moderate Adverse The construction of the cycle bridges will impact this view during the construction stage, although they are some distance from this VSR.	Slight Adverse The operation impact to these VSRs is largely a consequence of the visibility of the cycle track bridges around the headlands visible along the coast between Castle peak beach and cafeteria Old Beach.	CP1, CP3, OP1, OP2, OP5 and OP6	Slight / Moderate Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts.	Slight Adverse (Day 1 and Year 10) Due to the open nature of this coastline the cycle bridge will always represent a visual element. Responsive design of the alignment and bridge appearance will help integrate with the exiting visual context around the headland, although such refinements would not be particularly perceptible over such a distance.
VSR21 Pedestrian on over-bridge at Hoi Wing Road	Low	4m No blockage of existing views	High	Medium	Irreversible	3yrs./ Permanent	Intermediate/ Intermediate The cycle track and associated road works would affect a significant extent of the roadside visible in this view.	Slight / Moderate Adverse	Slight / Moderate Adverse The operation impact to these VSRs is largely a consequence of the visibility of the cycle track and the removal of the trees at the median of the road.	CP3, OP1, OP2, OP3	Slight / Moderate Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts.	Slight / Moderate Adverse (Day 1) Slight Adverse (Year 10) Use of attractive and coordinated street furniture and paving materials can lead to a general upgrade of the footpath condition. However, due to spatial constraints there is insufficient space to compensate for all the trees removed at this location. As such the impacts of the works cannot be entirely mitigated.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR23 Visitors and residents at Mouse Island Children's Playground	Medium	28m Views of the cycle track largely blocked by existing planter and vegetation at the central median of the road.	High	Medium The works involve road carriageway modification in addition to the cycle track / footpath construction	Irreversible	3yrs./ Permanent	Intermediate/ Intermediate The proposed cycle track is small scale and largely obstructed by the central reserve along Hoi Wing Road. However, the removal of trees from the central reserve and associated carriageway modifications will increase the visibility of the proposed works.	Moderate Adverse	Moderate Adverse The operation impact to these VSRs is largely a consequence the removal of the trees at the central median of the road.	CP3, OP1, OP2, OP3	Slight / Moderate Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts.	Slight / Moderate Adverse (Day 1 and Year 10) Due to spatial constraints, there is insufficient space to compensate for all the trees removed at this location. The location for compensatory trees is relatively distant from this vantage point. As such the impacts of the works cannot be entirely mitigated.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR24 Visitors on walkway overlooking Ki Lun Kong Public Park	Medium	8m Some blockage of existing views by park planting	High	Small	Irreversible	3yrs./ Permanent	Small/ Small The cycle track and proposed footpath located to the edge of the current open space. Whilst intermittent planting would partially screen views the proposals would be more visible from elevated viewpoints.	Slight / Moderate Adverse The construction of the cycle track will impact this view during the construction stage, given the proximity of the view and constrained space available the impacts are deemed Slight / Moderate Adverse.	Slight Adverse The operation impact to these VSRs is largely a consequence of the visibility of the cycle track and the removal of the planter along the toe of the existing engineered slope.	CP1, CP2, CP3, CP5, OP1 and OP3.	Slight Adverse Given the public nature of the space screen hoarding is likely to be required to separate the public from the proposed construction works. Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts.	Slight Adverse (Day 1 and Year 10) Use of attractive and coordinated street furniture and paving materials can lead to a general upgrade sections of the park. However, due to the constrained space there is limited opportunity to mitigate the loss of planting area.



Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR25 Pedestrians and residents at Sam Shin Street near Hanford Gardens	Medium	81m Close views partially blocked by existing tree and amenity planting.	High	Small	Irreversible	3yrs./ Permanent	Small/ Small The proposals would be a small-scale addition to the roadside view towards Ki Lun Kong Public Park, although the removal of some roadside trees to accommodate the works would be a visible change in the composition of the view from this VSR.	Slight / Moderate Adverse This is a visible and open roadside area and although the construction activities are small-scale they will be relatively visible.	Slight Adverse Despite the small scale of the works some limited tree removal shall be a visible impact in the absence of mitigation.	CP1, CP3, CP5, CP6, OP1 to OP4.	Slight Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts. Given the implementation of above mitigation measures, the construction impact may be minimized.	Insubstantial (Day 1 and Year 10) Establishment of proposed new tree planting will help re-establish the green setting of the roadside. Upon full establishment of the above mitigation measures, visual quality looking towards the roadside cycle track will be reinstated and the impact will be alleviated.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR26 Visitors at Tsing Sin Playground	Medium	35m Close views partially blocked by existing tree and amenity planting.	High	Small	Irreversible	3yrs./ Permanent	Small/ Small The cycle track will occupy an area of towards the edge of the road corridor. Whilst the construction will involve the removal of some small trees, these will be viewed from this vantage point through several layers of existing roadside trees which will help screen the works from this VSR.	Slight / Moderate Adverse Although the construction activities are small-scale they will involve moderate disturbance of the existing area to facilitate construction.	Slight Adverse Despite the small scale of the works some limited tree removal shall be a visible impact in the absence of mitigation.	CP1, CP3, CP5, OP1, OP2 and OP3.	Slight Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts.	Insubstantial (Day 1 and Year 10) Establishment of proposed new tree planting will help re-establish the green setting of the roadside. Upon full establishment of the above mitigation measures, visual quality looking towards the roadside cycle track will be reinstated and the impact will be alleviated.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR27 Pedestrians and residents along Castle Peak Road – Castle Peak Bay near Alpine Garden	Medium	0m Close views partially blocked by existing tree and amenity planting.	High	Small	Irreversible	3yrs./ Permanent	Small/ Small The cycle track will occupy an area of existing footpath and would be quite visible from this viewpoint. However, at this location the track can be accommodated without major modifications to surrounding planters and street furniture, largely limiting the impacts to the ground plane.	Slight / Moderate Adverse This is a visible pedestrian area and although the construction activities are small-scale they will be relatively visible to existing users of the space.	Slight Adverse Despite the small scale of the works some limited tree removal shall be a visible impact in the absence of mitigation.	CP1, CP3, OP1 and OP3	Slight Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts. Given the public nature of the space screen hoarding is likely to be required to separate residents and existing users from the proposed construction works.	Insubstantial (Day 1 and Year 10) Establishment of proposed new tree planting will help re-establish the green setting of the roadside. Upon full establishment of the above mitigation measures, visual quality looking towards the roadside cycle track will be reinstated and the impact will be alleviated.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR28 Pedestrians at Bus stop Opposite Handsome Court	Medium	45m Close views partially blocked by existing tree and amenity planting.	High	Small	Irreversible	3yrs./ Permanent	Small/ Small The cycle track will occupy an area of towards the edge of the road corridor. The construction will involve the removal of some small trees, which will thin the tree coverage of the road corridor as perceived from this VSR.	Slight / Moderate Adverse Although the construction activities are small-scale they will involve moderate disturbance of the existing area to facilitate construction.	Slight Adverse Despite the small scale of the works some limited tree removal shall be a visible impact in the absence of mitigation.	CP1, CP3, CP5, OP1, OP2 and OP3.	Slight Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts. Given the implementation of above mitigation measures, the construction impact may be minimized.	Insubstantial (Day 1 and Year 10) Establishment of proposed new tree planting will help re-establish the green setting of the roadside. Upon full establishment of the above mitigation measures, visual quality looking towards the roadside cycle track will be reinstated and the impact will be alleviated.

Visually Sensitive Receivers (VSR)	Sensitivity	Determinants for Magnitude of Change					Magnitude of Change (Construction / Operation Phase)	Impact Significance Threshold (Unmitigated)		Mitigation Measures	Impact Significance Threshold (Mitigated)	
		Viewing Distance/ Blockage of view	Compatibility with surrounding landscape	Scale	Reversibility	Duration Construction/ Operation		Construction	Operation		Construction	Operation
VSR29 Pedestrians at Crossing near Yan Oi Market	Medium	44m Close views partially blocked by existing tree and amenity planting.	High	Small	Irreversible	3yrs./ Permanent	Small/ Small The cycle track will occupy an area of towards the edge of the road corridor. The construction will involve the removal of some small trees, which will thin the tree coverage of the road corridor as perceived from this VSR.	Slight / Moderate Adverse This is a visible roadside area and although the construction activities are small-scale they will be relatively visible to pedestrians and vehicles transiting this area.	Slight Adverse Despite the small scale of the works some limited tree removal shall be a visible impact in the absence of mitigation.	CP1, CP2, CP3, CP4, CP5, OP1, OP2, OP3 and OP4.	Slight Adverse Duration of the impact in views of these VSRs can be shortened by appropriate phasing and sectional completion of the works. Proper management of material storage and construction activities will also help alleviate construction stage impacts. Given the implementation of above mitigation measures, the construction impact may be minimized.	Insubstantial (Day 1 and Year 10) Establishment of proposed new tree planting will help re-establish the green setting of the roadside. Upon full establishment of the above mitigation measures, visual quality looking towards the roadside cycle track will be reinstated and the impact will be alleviated.

Key to Table 10.11 Visually Sensitive Receivers and Predicted Impacts
 Sensitivity of Resource: Low, Medium or High
 Magnitude of Change: Negligible, Small, Intermediate or Large
 Significance Threshold: Insubstantial, Slight, Moderate and Substantial (adverse or beneficial)

10.10. Recommended Mitigation Measures

- 10.10.1. The landscape mitigation measures described in this report are at a level which both demonstrates their ability to alleviate the potential landscape and visual impacts identified in the assessment and also to allow the Project to be carried forward during the detailed design stage. The measures are designed to address both the construction and operational phases of the Project. More detailed landscape and compensatory planting proposals will be developed at later stage during detailed design and construction phase of this project following the completion and acceptance of the detailed Tree Survey Report and will seek for approval from relevant departments at that stage.
- 10.10.2. The landscape and visual mitigation measures are described both in a generic sense, which apply to all of works area and in terms of the proposed landscape strategy for the beachside and roadside planting and amenity areas alongside of cycle track. The aim of the mitigation measures is to:
- Alleviate where possible those landscape and visual impacts which are unavoidable through the review of alignment and cycle parking facilities;
 - Establish a coherent and integrated landscape framework for the proposed works drawing together the visually disparate components if any of the proposed works;
 - Enhance the existing landscape and visual context of the surrounding areas providing integration between the proposed works and its context; and
 - Provide a co-ordinated approach between the ecological and landscape mitigation proposals where there is an interface.
- 10.10.3. The Design Concept Drawings of cycle track and associated facilities and the Conceptual Landscape Master Plan are presented as [Figure 10.11.1 to Figure 10.11.5](#) and [Figure 10.12.1 to Figure 10.12.6](#) respectively demonstrate the main landscape and visual mitigation strategies and the application of design mitigation measures including integrated design approach, compensatory and new roadside planting proposals and treatment of retaining wall and slope. Application of the recommended mitigation measures are mapped in [Figures 10.10.1 to Figure 10.10.3](#).
- 10.10.4. It is recommended that the Environmental, Monitoring and Audit Requirements (EM&A) for landscape and visual resources are undertaken during the construction of the Project.

Primary Mitigation Measures

- 10.10.5. In accordance with the EIAO-TM, the hierarchy for landscape and visual impact mitigation is first avoidance of impact, then minimisation of impact and finally compensation of impact. As has been described in the Project description in this report, the current proposals have been undertaken to fulfil the following objectives:
- Minimisation of potential impacts on landscape resources such as coastal landscapes, watercourses and existing trees by review the alignment and location of the cycle track route, associated facilities and necessary structure through limiting the extent of track routed through sensitive coastal landscapes and extent of impacts on existing watercourses;
 - Restoration and enhancement of existing beachside and roadside landscapes through planting large feature and ornamental trees following the completion of the construction phase of the Project, this will create an instant greening effect be apparent in the enhancement of the streetscape of Castle Peak Road and the backshore area of the beaches. At beaches, a range of native coastal planting suitable for exposed rocky shore conditions would also be promoted as a practical and character enhancing landscape design response;
 - Refinement of the alignment and rationalize the scale of cycle bridges in order to minimize the potential ecological, visual and landscape impacts at the open coastal area. In particular, key features of the existing environment such as the rocky nature of the headlands and their wooded promontory extending towards the sea should be respected; and
 - Responsive Design of cycle bridges in relation to their landscape context. Whilst the proposed cycle track bridge structure will impact on the open interface between the headland's rocky shore and the sea, with sensitive design the overall experience of the exposed coastal promontory can be retained. A smooth, sweeping deck structure that reinforces the panoramic nature of the

coastal views at this location can be considered, such that the composition of new and old, natural materials with man-made, can harmonise with the coastal context.

- 10.10.6. In accordance with the EIAO-TM, mitigation measures for the construction and operational phases of the Project have been designed to minimize predicted landscape and visual impacts, and to compensate for lost landscape resources as far as is possible, given the Project constraints.

Secondary Mitigation Measures

- 10.10.7. A series of mitigation measures designed to alleviate impact and where possible compensate for loss of landscape resources, change of landscape character and visual amenity for VSRs resulting from the construction and operational phases of the Project. The implementation, funding, and management and maintenance for the amenity landscape areas associated with the proposed works will be undertaken by relevant departments.

- 10.10.8. The mitigation measures are summarised in **Table 10.12** and **Table 10.13**.

Table 10.12 Proposed Construction Phase Mitigation Measures

Mitigation Code	Mitigation Measures
CP1	Preservation of Existing Trees - Trees / woodland within the Works Area which are unaffected by the works shall be protected and preserved during the detailed design stage and construction phase. The tree preservation proposals shall be coordinated with the layout and design of the engineering and architectural works at the detailed design stage for further retention of individual trees. The preservation of existing tree shall provide instant greening and screening effect for proposed works. Tree protection works to be undertaken in accordance with DEVB TC(W) 4/2020 on "Tree Preservation" and tree risk assessment in accordance with "Guidelines for Tree Risk Assessment and Management Arrangement" by DEVB.
CP2	Preservation of Existing Topsoil - Topsoil disturbed during the construction phase will be tested using a standard soil testing methodology and where it is found to be worthy of retention stored for re-use. The soil will be stockpiled to a maximum height of 2 m and will be either temporarily vegetated with hydro-seeded grass during construction or covered with a waterproof covering to prevent erosion. The stockpile should be turned over on a regular basis to avoid acidification and the degradation of the organic material, and reused after completion. Alternatively, if this is not practicable, it should be considered for use elsewhere, including other projects. This is also considered a general measure for good site practice.
CP3	Works Area and Temporary Works Areas - The landscape of these works areas should be restored to their original status or redesigned as new amenity areas following the completion of the construction phase. Construction site controls shall be enforced, where possible, to ensure that the landscape and visual impacts arising from the construction phase activities are minimized including the storage of materials, the location and appearance of site accommodation and the careful design of site lighting to prevent light spillage. Screen hoarding may not be practicable for several linear sections of this project due to the close viewing distances involved and spatial constraints of the works areas.
CP4	Mitigation Planting - Replanting of existing / disturbed vegetation shall be undertaken as soon as technically feasible during the construction phase. The priority shall be areas at the periphery of the site to ensure that proposed planting fulfils its role in mitigating the predicted impacts including screening views of the Project as early as possible during the operational phase.
CP5	Transplantation of Existing Trees – For the 147 existing trees recommended to be transplanted under the current proposal, the final recipient site should be, as far as space allows, adjacent to their current locations alongside of the cycle track or within supporting facilities to retain their contribution to the local landscape context. The potential recipient sites are shown in Figure 10.12.1 to Figure 10.12.6 Conceptual Landscape Master Plan. The implementation programme of the proposed works should reserve enough time for advance tree transplanting preparation works to enhance the survival of these transplant trees. Transplanting proposals will be subject to the findings of the detailed tree survey and felling application undertaken at the detailed design stage and upon approval by relevant departments.

Mitigation Code	Mitigation Measures
CP6	Coordination with Concurrent Projects- Coordinated implementation program with concurrent projects such Castle Peak Road Widening in order to minimize cumulative visual and landscape impact during the construction phase.

Table 10.13 Proposed Operational Phase Mitigation Measures

Mitigation Code	Mitigation Measures
OP1	<p>Design of Cycle Track and Associated Facilities - the cycle track will incorporate design features as part of design mitigation measures including:</p> <ol style="list-style-type: none"> 1. Integrated design approach – the alignment of cycle track should integrate, as far as technically feasible, with existing built structures such as existing road, footpath and coastal walkways, shade structures and other open space facilities as part of design mitigation measures to reduce the potential cumulative impact of the proposed works. The location and orientation of the associated facilities should be away from landscape and visually sensitive areas such open coastal waterfronts. 2. Building and infrastructure massing – the proposed use of responsive design with cycle bridges and related structures to be low profile and as light weight as is structurally feasible in order to reduce the intrusion of built scale into the waterfront and roadside public realm. 3. Treatment of built structures - the architectural and engineering design should seek to reduce the apparent visual mass of the built facilities and infrastructure such as cycle bridges through the use of natural materials such as wooden frame, vertical greening or other sustainable materials such as recycled plastic. 4. Responsive building finishes - In terms of the building finishes natural tones should be considered for the colour palette with non-reflective finishes recommended on the outward facing building facades to reduce glare effect. 5. Responsive lighting design – Aesthetic design of architectural and track lighting with following glare design measures: <ul style="list-style-type: none"> • Directional and full cut off lighting is recommended particularly for recreation and roadside areas to minimize light spillage to the surrounding areas. • Minimize geographical spread of lighting, only applied for safety at the key access points and staircases; • Limited lighting intensity to meet the minimum safety and operation requirement; and • High-pressure sodium road lighting is recommended for more stringent light control reducing spillage and thus visual impacts.
OP2	<p>Roadside and Amenity Planting – This planting will utilise large ornamental trees, either with high canopy and thin foliage to allow visual access in the views from the adjacent neighbourhoods to the further roadside or leisure landscape or dense foliage at selected locations to provide shade environment for cyclist and to give accent to the existing roadside planting. Native species will be utilised on sloping or wooded areas thereby enriching the ecological connectivity between existing woodland habitats with the advantage of creating a more coherent landscape framework. Large Feature Trees will be utilised along the cycle track, where space allows, with the design intent to create shaded environment and instant greening effect at key sections of the route. Smaller ornamental and preferably native species will also be incorporated within the planting proposal to add to create visual interest for the public and to help create a comprehensive planting framework that could enhance both ecological and landscape value of the surroundings.</p>

Mitigation Code	Mitigation Measures
OP3	Compensatory Planting Proposals – The Project Proponent would implement the compensatory planting as proposed in the Tree Preservation and Removal Proposal (TPRP) to be submitted to relevant government departments for approval in accordance with DEVB TC(W) No. 4/2020 to compensate for the trees to be felled. As far as practicable, implementation of compensatory tree planting should be of a ratio not less than 1:1 in terms of number of trees removed including dead trees, but excluding trees of undesirable species. Based on the cycle track layout, approximately 207 nos. of trees within areas of the existing public realm are proposed to be compensated. However, there would be limited space available for new tree planting in the vicinity of the proposed cycle track. Given these constraints, space within the Project is available for the planting of approximately 50 nos. new trees on a sustainable basis. As for the remaining 157 nos. new trees to be planted offsite, the Project Proponent will actively liaise with all the relevant departments throughout the TPRP process to confirm their planting locations.
OP4	Treatment of Retaining Wall and Slopes- In accordance with GEO Publication No. 1/2011, these engineering structures will be aesthetically enhanced through the use of soft landscape works including tree and shrub planting to give man-made slopes a more natural appearance blending into the local rural landscape. Whip sized planting is preferred on the face of soil cut slopes and at the crest and toe of the slope, and within berm planters these smaller, younger plants adapt to their new growing conditions more quickly than larger sized stock and establish a naturalistic effect more rapidly.
OP5	Protection and Reinstatement of Rocky Shore at Headlands – The proposed cycle bridges will pass over an area of rocky shore, with various existing rock outcrops and features visible at low tide. The design shall aim to avoid impacting these rocky features and where unavoidably impacted shall remove elements for later reinstatement on completion of the works in order to help integrate the new structures with the natural shoreline context.
OP6	Design of an Elegant Bridge Structure and Crossings – The proposed cycle bridge is potentially a visually prominent structure. As such it is important that careful attention is given to the design of the structure, the associated profile, arrangement of piers and the compatibility with its landscape context. The design of railing and parapets with sculptural and decorative forms shall be employed to lift the aesthetics of these structures beyond a purely functional / utilitarian appearance (Figure 10.11.6 refers).

Funding of Implementation of Visual Enhancement and Landscape Mitigation Measures

- 10.10.9. The construction phase measures described in **Table 10-12** will be adopted from the commencement of construction and will be in place throughout the entire construction period. The operational phase measures listed in **Tables 10-13** shall be adopted during the detailed design, and be built as part of the construction works so that they are in place at the date of commissioning of the Project. However, it should be noted that the full effect of the soft landscape mitigation measures will not be realised for several years until planting matures. The agencies responsible for the funding, implementation, management and maintenance of the mitigation measures are identified in **Table 10.14**.

Table 10.14 Agencies Responsible for Funding, Implementation, Management and Maintenance of the Mitigation Measures

Mitigation Code	Funding	Implementation	Management and Maintenance
CP1	CEDD	CEDD	CEDD
CP2	CEDD	CEDD	CEDD
CP3	CEDD	CEDD	CEDD
CP4	CEDD	CEDD	CEDD
CP5	CEDD	CEDD	CEDD
CP6	CEDD	CEDD	CEDD
OP1	CEDD	CEDD	CEDD/HyD/TD/LCSD
OP2	CEDD	CEDD	HyD/TD
OP3	CEDD	CEDD	HyD/LCSD
OP4	CEDD	CEDD	CEDD/HyD/LCSD
OP5	CEDD	CEDD	CEDD/HyD/LCSD
OP6	CEDD	CEDD	CEDD/HyD/LCSD

10.11. Programme for Landscape Works

- 10.11.1. The landscape works will closely follow the completion of the construction of the proposed cycle track and associated facilities. The design year for the purpose of this study is taken as approximately 10 to 15 years after the scheme opening when the proposed soft landscape mitigation is mature. The landscape works will be implemented at the earliest possible time in the planting season immediately following the sectional completion of the construction works.

10.12. Residual Landscape and Visual Impacts

- 10.12.1. Overall, in terms of residual landscape and visual impacts, the main effects will primarily result from the interruption of existing roadside and waterfront landscapes. However, the proposed works will occupy a small part of roadside or waterfront area and the majority of works only involves modification of existing roads and tracks, footpaths, hard stands and planting areas. Much of the works area will also be reinstated to its original status or new amenity function on completion of the construction phase. Overall, it is evident that the works will not cause permanent impact to the majority of landscape resources, and where such residual impacts exist they are small and localised. A relatively low level of disturbance to visual context and visual amenity available to most VSRs will result from the proposed works and the works will form only a small component in each identified landscape character areas within the Study Area.
- 10.12.2. All landscape characters will largely remain unchanged after full establishment of the recommended mitigation measures, by reason of the following considerations:
- the scale and nature of the proposed works is small and low building height profile will be adopted;
 - some proposed structures are integrated with existing built structures;
 - provision of new recreation facilities and amenity areas; and
 - tree preservation and new tree planting proposals, where space allows, will be implemented alongside the track.
- 10.12.3. The planting proposals also form part of compensatory planting proposals for the loss of landscape resources, such as existing trees, which will be compensated at a minimum of 1:1 (by number) within the existing public realm for the benefit the future landscape within the Study Area.

Landscape Resources (Construction Stage)

Slight / Moderate Adverse

- 10.12.4. Of the Landscape Resources impacted by the Project the following are anticipated to be subjected to slight / Moderate adverse residual impacts in the construction stage:
- LR4 Marine Waters
 - LR6 Plantation Woodland
 - LR7 Rocky Shore
 - LR8 Sandy Shore
 - LR9 Watercourse
- 10.12.5. There are six construction stage Mitigation measures listed in Table 10-11, however only CP3; Works Area and Temporary Works Area would be applicable in the more open coastal landscape areas of LR4, LR7 and LR8, where measures to minimize the works area and phasing of construction works would provide some mitigation and generally are assessed to reduce the impacts from Moderate to Slight/Moderate with Mitigation. For the terrestrial Landscape Resources, LR5 (Mixed Woodland) and LR9 (Watercourse), Tree Preservation (CP1) is also available as a mitigation measure and is deemed to provide some mitigation to the assessed construction stage impacts for LR5, reducing to Slight Moderate Adverse from Moderate Adverse (without mitigation). However, the loss of watercourse area at the backshore area of Cafeteria New Beach where a culvert is to be constructed is not readily compensated in the Construction Stage and therefore is rated as slight / moderate impact (both unmitigated and mitigated).

Slight Adverse

- 10.12.6. Of the Landscape Resources impacted by the project the following are anticipated to be subjected to slight adverse residual impacts in the construction stage:
- LR2.0 Urban New Town Development
 - LR2.1 Major Road and Highway
 - LR 6 Plantation Woodland
- 10.12.7. The scale of the works is relatively small and construction stage mitigation measures potentially available to compensate for the loss of these Landscape Resources include CP3; Works Area and Temporary Works Area and CP1; Tree Preservation. However, for areas within road corridors the linear nature of the site and congested urban conditions imposes spatial constraints on the works areas and the effectiveness of CP3 measures. As such in new town and road/highway areas where there are fewer existing trees little change is anticipated as compared to the unmitigated situation. Preservation of existing trees is however seen to reduce construction stage impacts for LR6 (Plantation Woodland) to Slight from Slight/Moderate Adverse.

Insubstantial

- 10.12.8. Since largely unaffected by the works Landscape resources with insubstantial residual impacts in the construction stage are as follows:
- LR2.2 High Rise Residential Development
 - LR2.3 Low and medium Rise Residential Development

Landscape Resources (Operation Stage)

Slight Adverse

- 10.12.9. Of the Landscape Resources impacted by the project the following are anticipated to be subjected to slight adverse residual impacts at the Operation Stage:

- LR 4 Marine Waters
- LR5 Mixed Woodland
- LR7 Rocky Shore
- LR8 Sandy Shore
- LR9 Watercourse

- 10.12.10. There are limited mitigation measures available to compensate for the loss of Coastal Landscape Resources, however the areas affected are very small. For LR4 (Marine Waters) and LR7 (Rocky Shore), the mitigation measures, include OP1; Responsive design of the cycle bridge to minimize the size and extent of structures and OP5; Protection and re-instatement of rocky shore at headlands, which in combination are assessed to reduce the residual impacts from Slight / Moderate Adverse (without mitigation) to Slight adverse during the operations stage (with mitigation). A minimisation of column footprints and the sensitive routing around existing rocky outcrops in the mitigated scheme reduce the impacts but cannot fully mitigate for the small overall loss of area of these Landscape Resources in the Operational stage, either at Day 1 or Year 10. Similarly, LR8 Sandy Shore mitigation measures include OP1; detailing of the at grade and bridge sections and OP2, the introduction of some path side mitigation planting of shrub species compatible with coastal / beachfront conditions are deemed to reduce the residual impacts to slight adverse during the operations stage but cannot fully mitigate the small overall loss in the extent of this resource.
- 10.12.11. Regarding LR5 (Mixed Woodland) the sensitive design and detailing of the cycle track and associated retaining walls and structures (OP1 and OP4) and the addition of amenity planting (OP2) and compensatory trees (OP3) are deemed to be effective in mitigating impacts to slight /moderate adverse at Day 1 and Slight Adverse at Year 10 (with Mitigation). For LR9 (Watercourse) similar mitigation measures are deemed to be effective in mitigating impacts to Slight Adverse at both Day 1 and Year 10 (with Mitigation), reflecting that the overall loss of a small area of watercourse is not able to be fully mitigated.

Insubstantial

- 10.12.12. Of the Landscape Resources impacted by the project the following are anticipated to be subjected to insubstantial residual impacts:
- LR2.0 Urban New Town Development
 - LR2.1 Major Road and Highway
 - LR2.2 High Rise Residential Development
 - LR2.3 Low and medium Rise Residential Development
 - LR 6 Plantation Woodland
- 10.12.13. For residential developments (LR2.1 / 2.2), the unmitigated impacts are also insubstantial. For the other Landscape Resources listed above, the implementation of mitigation measures such as compensatory tree planting and roadside and amenity planting are anticipated to effectively mitigate the initial impacts from Slight Adverse (Day 1) to Insubstantial (Year 10 – with mitigation). For instance, for LR6 (Plantation Woodland) with mitigation primarily comprising compensatory tree planting, the residual impacts are reduced to insubstantial at year 10 of the Operation Phase by virtue of the maturing tree planting. For LR2.1 (with mitigation) the design of footpaths and amenity areas alongside the track will upgrade these resources through full establishment of new roadside and amenity planting.
- 10.12.14. In combination with tree preservation proposals, the mitigation measures will help to mitigate the loss of existing Landscape Resources. The most significant residual impacts are in the open coastal areas of the site where loss of resources is less readily directly mitigated; where, for instance, Marine Waters

are occupied by the columns and footings of cycle bridge structures. However, the scale of these impacts is small relative to the size of these resources within the study area and the impacts are localized to small areas of the cycle track route.

- 10.12.15. With the implementation of compensatory planting the proposals offset the initial loss of plantation and tree coverage as shown in Figure 10-10 to Figure 10-12 to 10.12.5, Preliminary Landscape Master Plan.

Landscape Character Areas (Construction Stage)

Moderate/Slight Adverse

- 10.12.16. Of the Landscape Character areas impacted by the project the following are anticipated to be subjected to Moderate/slight adverse residual impacts in the construction stage:

- LCA4 Castle Peak Cove
- LCA5 Beachside Community
- LCA10 Marine Waters

- 10.12.17. The character of the coastal LCA's relies in part on their open and largely undeveloped character, which will be affected by the construction works and is difficult to entirely mitigate in such an open setting. For LCA4 and LCA10, only a small part of each character area is directly impacted by the proposed development and mitigation measures such as CP3; Works Area and Temporary Works Area including measures to minimize the works area and phase construction works, would provide some mitigation. For LCA5 a greater extent of the area is affected by the works, however a broader range of mitigation measures are available including CP1; Preservation of existing trees, CP4; Mitigation Planting and CP5; tree transplanting, in addition to site management measures under CP3.

Slight Adverse

- 10.12.18. The majority of LCA are anticipated to have slight adverse residual impacts with the implementation of construction stage mitigation measures. This includes the following LCA's:

- LCA1 Tuen Mun Urban Core
- LCA2 Castle Peak Garden Corridor
- LCA6 Bayside Residential Corridor

- 10.12.19. These LCAs are anticipated to have slight residual impacts, where a greater range of mitigation measures are available to reduce the impacts of the construction stage works as compared to the open coastal LCAs. This includes CP1; Preservation of existing trees, CP4 Mitigation Planting and CP5 tree transplanting, in addition to site management measures under CP3.

Insubstantial

- 10.12.20. LCA9 Tai Lam Foothills is anticipated to have insubstantial residual impacts after implementation of mitigation measures in the construction stage since this LCA has a very limited interface with the works area.

Landscape Character Areas (Operation Stage)

Slight Adverse

- 10.12.21. Of the Landscape Character areas impacted by the project the following are anticipated to be subjected to slight adverse residual impacts:

- LCA5 Beachside Community

- LCA10 Marine Waters

10.12.22. The character of these LCA's relies in part on their open and largely undeveloped character, which will be slightly affected by the proposed scheme and is difficult to entirely mitigate. However, only a small part of each character area is directly impacted by the proposed development. At LCA5, owing to the extent of the LCA affected the mitigated residual impacts are deemed to be Slight at Day 1 but reduce to insubstantial at Year 10 after the establishment and growth of the proposed tree and shrub planting measures.

Insubstantial

10.12.23. The majority of LCA are anticipated to have insubstantial residual impacts after the successful establishment of mitigation measures. This includes the following LCA's:

- LCA1 Tuen Mun Urban Core
- LCA2 Castle Peak Garden Corridor
- LCA4 Castle Peak Cove
- LCA6 Bayside Residential Corridor
- LCA9 Tai Lam Foothills

10.12.24. The LCA are anticipated to have insubstantial residual impacts include LCA2 Castle Peak Garden Corridor where after mitigation when compensatory planting re-establishes the previous green framework the residual impacts would be negligible. Similarly for LCA6 Bayside Residential Corridor the scale of the impacts is small relative to the overall extent of this LCA within the study area and residual impacts in the operation phase, after re-establishment of tree planting, are deemed insubstantial.

Visual (Construction Stage)

Moderate Adverse

10.12.25. The VSR's experiencing Moderate Adverse Residual Visual Impacts in the constructing stage include:

- Pedestrians on Beach Footpath at Cafeteria Old Beach (VSR11),

10.12.26. The impact on coastal VSR's of the proposed construction of the cycle bridge structures are localized, but there are limited mitigation measures in the construction stage to offset these impacts. CP3; Works Area and Temporary Works Area would provide some mitigation with measures to minimize the works area, phasing of construction works and the control of lighting at night.

Slight / Moderate Adverse

10.12.27. The VSR's experiencing Slight / Moderate Adverse Residual Visual Impacts in the Construction stage include:

- Visitors at Cafeteria Old Beach Shoreline (VSR9)
- Pedestrians on Castle Peak Road – Castle Peak Bay opposite Verdant Villa (VSR15)
- Visitors at Castle Peak Beach Facilities (VSR18)
- Pedestrians at seawall of Tuen Mun Typhoon Shelter (VSR19)
- Pedestrian on over-bridge at Hoi Wing Road (VSR21)
- Visitors and Residents at Mouse Island Children's Playground (VSR23)

- 10.12.28. Due to the open nature of the coastline the cycle bridge construction works will always represent a visual intrusion for Visitors at Cafeteria Old Beach Shoreline (VSR9) and Pedestrians at seawall of Tuen Mun Typhoon Shelter (VSR19). However, the relatively distant view results in a lower rating than the other coastal VSRs mentioned above.
- 10.12.29. For roadside VSR; Pedestrians on Castle Peak Road – Castle Peak Bay opposite Verdant Villa (VSR15), Visitors at Castle Pak Beach Facilities (VSR18), Pedestrians on the over-bridge at Hoi Wing Road (VSR21) and Visitors to Mouse Island Children’s Playground (VSR23) there are spatial constraints in the narrow road corridor and as such the impacts of the works cannot be entirely mitigated in the construction stage, particularly from elevated viewpoints.

Slight Adverse

- 10.12.30. The majority of the VSR’s are anticipated to experience an Slight Adverse Residual Visual Impact during the construction stage, as follows:
- Pedestrians and vehicles on Castle Peak Road – Ting Kau opposite Hong Kong Gold Coast Phase 1 (VSR3)
 - Pedestrians and vehicles on Castle Peak Road – Ting Kau opposite Monte Carlo Villas (VSR4)
 - Visitors at Golden Beach Office (VSR5)
 - Visitors at Cafeteria New Beach (VSR6)
 - Visitors at Cafeteria Old Beach Car Park (VSR7)
 - Visitors at Cafeteria Old Beach (VSR8)
 - Visitors at Cafeteria Old Beach Visitors Facilities (VSR10)
 - Visitors at Kadoorie Beach BBQ Area (VSR12)
 - Pedestrians and residents on Castle Peak Road – Castle Peak Bay (VSR17)
 - Visitors at Ki Lun Kong Public Park (VSR24)
 - Pedestrians at Sam Shin Street near Hanford Gardens (VSR25)
 - Visitors at Tsing Sin Playground (VSR26)
 - Pedestrians and Castle Peak Road – Castle Peak Bay near Alpine Garden (VSR27)
 - Pedestrians at Bus stop Opposite Handsome Court (VSR28)
 - Pedestrians at Crossing near Yan Oi Market (VSR29)
- 10.12.31. For Streetscape and waterfront areas generally these are views of areas where small scale, low level construction works are proposed, however the works area may relatively visible from public vantage points and the constrained and linear nature of the works area may limit the mitigation measures that can be instigated to help screen the works from view. Control of night time lighting (CP3) will be important in Streetscape and Coastal areas overlooked by residential developments whilst the phasing and sectional completion of works can help limit the duration and extent of disruption. These are also generally VSRs which may be affected by some Tree / Vegetation removal during the construction stage however there are also Trees preserved (CP1) which help maintain the green setting and minimize the visual disruption of the vegetation loss.

Insubstantial

- 10.12.32. Two of the VSR's are anticipated to experience an insubstantial Residual Visual Impact during the construction stage:
- Visitors at Gold Coast Yacht and Country Club (VSR1)
 - Pedestrians and vehicles on Castle Peak Road – Ting Kau near Aegean Coast (VSR2)
- 10.12.33. These VSR's have negligible views without mitigation and retain their insubstantial rating at the construction stage (with mitigation).

Visual (Operation Stage)

Slight/Moderate Adverse

- 10.12.34. The VSR's experiencing Slight/Moderate Adverse Residual Visual Impacts at the operation stage are as follows:
- Pedestrians on Beach Footpath at Cafeteria Old Beach (VSR11),
 - Pedestrian on over-bridge at Hoi Wing Road (VSR21)
 - Visitors and Residents at Mouse Island Children's Playground (VSR23)
- 10.12.35. The impact on coastal VSR's of the proposed cycle bridge structures are localized, but there are limited mitigation measures to offset these impacts. The elegant design of the bridge structures (OP6), and Responsive design (OP1) such as careful alignment to respect the natural outline of the coast are the major measures available. Since these are relatively close views more detailed measures such as the protection and reinstatement of Rocky Shore (OP5) and the decorative treatment of ballustrades and railings (OP6) can also help improve the aesthetics of the structures and blend structures with existing vegetation backdrop from certain viewpoints.
- 10.12.36. Due to the open nature of this coastline the cycle bridge will always represent a visual element. However, responsive design of the alignment and bridge appearance will help integrate with the exiting visual context around the headland. The bridge should be as low profile and light weight as possible and respect the layout of existing rocky shore in order to fit with the landscape context and create an engaging feature for public enjoyment.
- 10.12.37. For roadside VSR; Pedestrians on the over-bridge at Hoi Wing Road (VSR21) and Visitors to Mouse Island Children's Playground (VSR23) the use of attractive and coordinated street furniture and paving materials (OP1) can lead to a general upgrade of the roadside condition. However, due to spatial constraints there is insufficient space to compensate for all the trees removed from the central reserve at Hoi Wing Road. As such the impacts of the works cannot be entirely mitigated, although with growth of tree planting the impacts by Year 10 for VSR21 are deemed to be reduced to Slight Adverse.

Slight Adverse

- 10.12.38. The VSR's experiencing Slight Adverse Residual Visual Impacts in the operation stage include:
- Visitors at Cafeteria New Beach (VSR6)
 - Visitors at Cafeteria Old Beach Shoreline VSR9)
 - Visitors at Cafeteria Old Beach Visitors Facilities (VSR10)
 - Visitors at Kadoorie Beach BBQ Area (VSR12)
 - Pedestrians on Castle Peak Road – Castle Peak Bay opposite Verdant Villa (VSR15)

- Pedestrians at seawall of Tuen Mun Typhoon Shelter (VSR19)
 - Visitors at Ki Lun Kong Public Park (VSR24)
- 10.12.39. For Visitors at Cafeteria New Beach (VSR6) and Pedestrians on Castle Peak Road – Castle Peak Bay opposite Verdant Villa (VSR15), given the spatially constrained nature of the location there is limited available space for the establishment of mitigation planting to help compensate for localized tree felling along the boundary of the open space and roadside areas. Therefore, the impacts remain slight adverse in the Operation Phase (after mitigation). For Visitors at Ki Lun Kong Public Park (VSR24) the use of attractive and coordinated street furniture and paving materials can lead to a general upgrade within sections of the park. However, due to the constrained space there is limited opportunity to fully mitigate the loss of planting area.
- 10.12.40. Due to the open nature of the coastline the cycle bridge will always represent a visual element for Visitors at Cafeteria Old Beach Shoreline (VSR9) and Pedestrians at seawall of Tuen Mun Typhoon Shelter (VSR19). However, the relatively distant view and the use of responsive design of the alignment and bridge appearance (OP1, OP6) will help integrate with the exiting visual context around the headland. Similarly, for Visitors at Kadoorie Beach BBQ Area (VSR12) the establishment of proposed new tree planting (OP2 and OP3) will help re-establish the green setting of the backshore area and help ameliorate the glimpsed views of the cycle bridge structure through the existing vegetation at the margins of the beach.

Insubstantial

- 10.12.41. Several of the VSR's are anticipated to experience an insubstantial Residual Visual Impact at the Operation Stage, including:
- Visitors at Gold Coast Yacht and Country Club (VSR1)
 - Pedestrians and vehicles on Castle Peak Road – Ting Kau near Aegean Coast (VSR2)
 - Pedestrians and vehicles on Castle Peak Road – Ting Kau opposite Hong Kong Gold Coast Phase 1 (VSR3)
 - Pedestrians and vehicles on Castle Peak Road – Ting Kau opposite Monte Carlo Villas (VSR4)
 - Visitors at Golden Beach Office (VSR5)
 - Visitors at Cafeteria Old Beach (VSR8)
 - Pedestrians and residents on Castle Peak Road – Castle Peak Bay (VSR17)
 - Visitors at Castle Peak Beach Facilities (VSR18)
 - Pedestrians at Sam Shin Street near Hanford Gardens (VSR25)
 - Visitors at Tsing Sin Playground (VSR26)
 - Pedestrians and Castle Peak Road – Castle Peak Bay near Alpine Garden (VSR27)
 - Pedestrians at Bus stop Opposite Handsome Court (VSR28)
 - Pedestrians at Crossing near Yan Oi Market (VSR29)
- 10.12.42. Some of these VSR's such as Visitors at Gold Coast Yacht and Country Club (VSR1) have negligible views without mitigation, whilst at other locations the establishment of proposed new tree planting will help re-establish the green setting of tree canopies rendering the change largely imperceptible. Many of these VSR's are situated in road corridors where the majority of the works area will be reinstated

to near its original status and the cycle track represents a small intervention in the overall scene. Similarly, at some of the waterfront and Open space VSR's there is also the opportunity for new amenity planting areas to be introduced to offset removal of tree and shrub planting works required to facilitate the works. Tree and shrub planting will be implemented along the track (OP2 and OP3) and the responsive design of built structures will be adopted (OP1). The visual intrusion of the proposed works will therefore be reduced to insubstantial upon the full establishment of the recommended mitigation measures.

Slight beneficial

- 10.12.43. Whilst insubstantial impacts are anticipated at Day 1, Slight beneficial residual visual impacts are anticipated for Visitors at Cafeteria Old Beach Car Park (VSR7), after the maturing of tree planting. The works are an opportunity to clean up this backshore area, which currently contains several temporary structures, and make it more user friendly for leisure use by the public.

Photomontages

- 10.12.44. A series of computer-generated images or photomontages have been prepared for the proposed works demonstrating a worst-case scenario to VSRs and are presented as [Figure 10.17.1 to Figure 10.17.32](#). The location of the vantage points used for these images has been identified on [Figure 10.16](#). The photomontages of the proposed works show the existing conditions, Day 1 of Operational Phase after the completion of the construction phase in the absence of mitigation measures and Day 1 of Operational Phase with mitigation measures. Year 10 of Operational Phase with mitigation measures to demonstrate the predicted residual impacts, which would exist in the design year during the operational phase taken as between 10 and 15 years after the completion of the construction phase.
- 10.12.45. During the preparation of the photomontages the baseline photographs of the existing situation were taken with a 50 mm lens (representing the actual situation as closely as possible) as series of photographs. These photographs were amalgamated to form a panoramic view utilising the central portion (approximately 50%) of each photograph (this is the area with the least distortion). These photographs were used to demonstrate the existing view. The photomontages of those views cannot cover the whole development in one single shot due to the effects of perspective and so are presented as a series of individual images.
- 10.12.46. The vantage points have been selected to illustrate the variety of situations where the cycle track may have an impact on the various types of identified VSR's, including roadside, parkland, streetscape, back shore and waterfront locations. A total of 16 nos. of vantage points have been selected as representative of this range of conditions with the visual context of the study area. The selected Vantage points and their corresponding VSRs are summarised in **Table 10.15** below:

Table 10.15 Selected Vantage Points for Photomontage

Vantage Point	VSR No	VSR Description
Vantage Point 01	VSR3	Pedestrians and vehicles on Castle Peak Road – Ting Kau opposite Hong Kong Gold Coast Phase 1
Vantage Point 02	VSR4	Pedestrians and vehicles on Castle Peak Road – Ting Kau opposite Monte Carlo Villas
Vantage Point 03	VSR5	Visitors at Golden Beach Office
Vantage Point 04	VSR6	Visitors at Cafeteria New Beach
Vantage Point 05	VSR7	Visitors at Cafeteria Old Beach Car Park
Vantage Point 06	VSR10	Visitors at Cafeteria Old Beach BBQ Area
Vantage Point 07	VSR11	Pedestrians on Beach Footpath at Cafeteria Old Beach
Vantage Point 08	VSR12	Visitors at Kadoorie Beach Visitor Facilities
Vantage Point 12	VSR18	Visitors at Castle Peak Beach Facilities
Vantage Point 13	VSR19	Pedestrians and workers at seawall of Tuen Mun Typhoon Shelter

Vantage Point	VSR No	VSR Description
Vantage Point 14	VSR21	Pedestrian on over-bridge at Hoi Wing Road
Vantage Point 15	VSR23	Visitors and Residents at Mouse Island Children's Playground
Vantage Point 16	VSR24	Visitors on walkway overlooking Ki Lun Kong Public Park
Vantage Point 17	VSR26	Visitors at Tsing Sin Playground
Vantage Point 18	VSR27	Pedestrians and residents along Castle Peak Road – Castle Peak Bay near Alpine Garden
Vantage Point 19	VSR29	Pedestrians at crossing near Yan Oi Market

Roadsides and Streetscapes (7 No VPs)

- 10.12.47. These photomontages show the proposed cycle track from footpath level at a variety of distances and angles of view to demonstrate the change of visual amenity of pedestrians and the residents living adjacent to various section of Castle Peak Road and adjacent roads. Generally, the Project is small scale and compatible with the existing landscape of the road corridors. However, impacts at Hoi Wing Road are more significant and less readily mitigated due to the limited available space for replacement tree planting measures. (Vantage points VP1, VP2, VP12, VP14, VP15, VP17 and VP19 refers).

Beach and Headland (3 No VPs)

- 10.12.48. The photomontages of views towards beaches and headlands show the proposed cycle track from eye level at various distances from the proposed cycle track and cycle bridges. At close viewing distances the structures extending around the coast have an obvious impact on the existing scene. However, from more distant vantage points these elements can be seen within their landscape context and the relatively small scale and low profile of the proposals is more in evidence. The photomontage incorporating mitigation measures illustrate the potential for design of the bridge structures to be developed to create a more streamlined form which also affords better visual access to the waterfront for cyclists and pedestrians using the proposed new connections around the coast. The unmitigated structure ([Figure 10.11.2](#) refers) has a solid edge parapet and is based on a support structure with three columns. The mitigated structure ([Figures 10.11.3 and 10.11.4](#) refer) has adopted a T shaped support with a single central column and has introduced decorative railings and parapets with for a lighter weight appearance. The design of the waterfront cycle bridges with the proposed mitigation measures are illustrated in photomontage from seven vantage points. (Vantage points VP7, VP8 and VP13 refers).

Parks and Open spaces (6 No VPs)

- 10.12.49. The photomontages of views from and into the parks and open spaces tend to illustrate that the cycle track is relatively compatible with the visual context in the longer term. The image shows the comparatively small scale of the proposed works in relation the existing layout of open space areas along the waterfront and the relatively comfortable accommodation of the route within more urban open spaces such as Tsing Sin Gardens and Ki Lun Kong Public Park.
- 10.12.50. Along the waterfront there is some space to implement edge planting along the cycle track utilising a combination of both native and ornamental tree species and shrub planting to form part of landscape mitigation measures. This planting proposal also provides shaded cycling environment for the future users. The adverse impact resulted from the proposed works can generally be alleviated with full establishment of this planting edge and related mitigation measures. (Vantage points VP3, VP4, VP5, VP6, VP16 and VP18 refers)

10.13. Environmental Monitoring and Audit Requirements

- 10.13.1. The design, implementation and maintenance of landscape and visual mitigation measures is a key aspect and should be checked to ensure that they are fully realised, thus EM&A for landscape and visual resources should be undertaken. Implementation of the mitigation measures recommended shall be monitored through the site audit programme.

10.14. Cumulative Landscape and Visual Impacts

- 10.14.1. As described at **Section 2.9**, there is a concurrent project identified as Agreement No. CE17/2013(HY) – Widening of Castle Peak Road – Castle Peak Bay – Design and Construction, by Highways Department (HyD) which has potential to contribute to cumulative landscape and visual impacts in the vicinity of the cycle track scheme. This road widening scheme for Castle Peak Road shall require the removal of some existing roadside trees. As outlined in the tree survey schedule at [Appendix 10-1](#), this includes the removal of an estimated 80 nos. trees in roadside areas along the cycle track route. As outlined in **Table 10.8**, the cycle-track works shall require the removal of a total of 452 nos. trees (147 nos. to be transplanted and 305 nos. to be felled (including dead trees and undesirable species and estimated trees affected within an existing area of private property)). As such the concurrent project results in the removal of approximately 15% of the total existing trees in the vicinity of the cycle-track route.
- 10.14.2. The Road widening works do affect one of the seventeen trees surveyed as having a DBH>1m. T1476 is a larger tree ((DBH: 1975mm, 17m Height, 16m spread) with a relatively balanced form but does not possess the exceptional attributes that would be associated with an OVT. The T1476 tree species is *Ficus Microcarpa*; a specie where trunk DBH >1m is not uncommon. The form, health condition, structural condition and amenity value of this trees is recorded as Fair rather than Good. Whilst a DBH>1m is a potential factor in defining an OVT it seems unlikely that an overall assessment of the attributes of these trees would reach such a conclusion. The survey has also identified a cavity at the base of the trunk which may affect its longer-term viability.
- 10.14.3. The additional tree removal and other impacts associated with the road widening works are concentrated along the road corridor of Castle Peak Road. The impacts are therefore limited to one Landscape Resource (LR2: Urban New Town) and two Landscape Character Areas (LCA1: Tuen Mun Urban Core and LCA6: Bayside Residential Corridor). LR2 is estimated to contain 10,000 nos. trees within the assessment area, of which 80 nos. (0.8%) are the additional trees to be felled as a result of the concurrent project. Similarly minor overall impacts are associated with LCA1 (9 nos. trees out of 2,000 total (<0.5%) and LCA6 (71 nos. trees out of 10,000 total (<0.8%)),
- 10.14.4. In terms of cumulative visual impacts, the works may have an impact on the VSRs 1 to 4, 15, 17, 18, 24 and 25. Although parts of the proposed scheme are overlapped with the proposed works boundary of the Castle Peak Road widening project, the Contractor of this Project will be required to closely liaise with the corresponding parties of any concurrent projects in the vicinity to avoid construction works within 300m of each other. While it is noted that some noise semi-enclosures and lifts are proposed under the Castle Peak Road widening project near VSR24, no cumulative impact will be induced by the Project in which no vertical structure will be constructed. In addition, the construction stage works are likely to be quite similar in nature to the cycle track works and the extent of impacts is limited to roadside and verge areas. As such these concurrent works are not deemed to modify the ratings adopted in the visual impact assessment for these VSRs.

10.15. Conclusion

Compatible to the Landscape Planning Framework

- 10.15.1. A large part of the route is within the highway boundary or within waterfront open space areas, which are compatible planning designations for the proposed cycle track. However, the proposed cycle track and associated facilities encroach upon a few other zoning areas including small areas zoned as green belt and residential.
- 10.15.2. Generally, the proposed route runs through existing areas within the highway boundary and through areas designated as Open Space (O). However, owing to variances between existing residential boundary structures on the ground and zoning boundaries on the OZP, in several areas the route strays from open spaces or highway areas into land zoned as residential, although on site the cycle track is situated outside the boundary demarcations of existing residential properties.
- 10.15.3. At three areas the cycle route passes directly through the edge of GB designated areas, although these areas are currently hard paved or otherwise developed and in this condition are not currently fulfilling the objectives of the GB zone. These localised infringements on the GB zone include a small

area of Green Belt north of Handsome Gardens and Green Belt areas extending from the wooded knoll at Sam Shing Hui. This includes the Ki Lun Kang Park through which the proposed cycle track passes, within an existing hard paved footpath. No tree felling would be involved with the development of the cycle track in these areas.

- 10.15.4. In summary, the proposed cycle track and associated facilities largely fit into the planning and development control framework and integrate with the future outlook of this urban and waterfront landscape context.

Landscape Impact

- 10.15.5. The landscape impacts are localized and centred on the more sensitive coastal areas of the study area and the Landscape Character areas and Landscape Resources found at these locations.
- 10.15.6. The proposed viaduct in area of Castle Peak Beach and Cafeteria Old Beach involves mini bored piles set into the marine waters (LR4). However, as the structure is elevated the direct loss of this resource would be limited to the areas of supporting columns located at intervals around the two headlands around which the route will pass. As such this loss represents a very small proportion of the overall resource within the study area. Rocky shore (LR7) however represents a relatively uncommon landscape resource within the study area, found only locally in the vicinity of the headlands between Kadoorie Beach and Castle Peak Beach. The proposed cycle track is offset from the shoreline to avoid direct impacts on this shore landscape resource. However some minor impacts are anticipated where the route crosses the shoreline on either side of each headland. Sandy shore (LR8) is the shoreline condition for broad extents of the land:sea interface within the Study area, The proposed cycle track is set back from the beach along most of this extent and the beach areas at Golden Beach and Cafeteria Beach which would thus be unaffected by the works. However, some impacts are anticipated at the ends of the beach areas at Cafeteria Old Beach and Kadoorie Beach, where the cycle route forms an elevated bridge structure and extends towards the open water areas.
- 10.15.7. The direct impacts of the works on this landscape resource will be relatively limited and form a small proportion relative to the overall extent of this resource within the study areas. Despite the very small area of this resource affected by the proposed construction, its high sensitivity to change leads to the assessment of a moderate impact, without mitigation, during the construction stage. Mitigation measures, including detailing of the at grade and bridge sections and the introduction of some path side mitigation planting is assessed to reduce the residual impacts to slight adverse during the operations stage.
- 10.15.8. Impacts on Landscape character include LCA10 Coastal Waters, where impacts on this LCA are limited to specific areas but are magnified by the fact that the character of this LCA relies upon the open, panoramic nature of the water areas and the proposed structures within the water would impact on this open character. Similarly the character of LCA4 Castle Peak Cove is defined by the embrace of the coastal landscape at the edge of the urban area and the combination of smaller scale development in close proximity to the natural beach environment. The cycle track is compatible with the urban aspect of the LCA, however, the elevated structure which passes around the headland between Cafeteria Old Beach and Kadoorie Beach within the coastal area of this LCA has potential to impact upon the natural character that is also a key component of this LCA.
- 10.15.9. The preliminary planting proposals for the proposed works include some 50 and 157 new trees within Project site and offsite locations, respectively, utilising a combination of standard to heavy standard sized stock in general roadside planting areas and heavy standard sized stock for feature trees at selected locations along the track. The proposed planting will result in a compensatory planting ratio of minimum 1:1 (new planting: trees recommended for felling) for areas within the existing public realm.

Visual Impact

- 10.15.10. Since much of the route passes through open space and streetscape areas, there is high compatibility with the existing visual context in these areas. Visual impacts also tend to be focused on the coastal VSR's experiencing views of the proposed cycle bridge structures. Although these are localized there are limited mitigation measures to entirely offset the impacts. Due to the open nature of the coastline the cycle bridge will always represent a visual element. Responsive design such as the elegant design

of the bridge structures and careful alignment to respect the natural outline of the coast are the major measures available, whilst the use of decorative railings and parapets can also help improve the appearance of these structures from certain viewpoints.

- 10.15.11. For roadside VSRs including pedestrians on the over-bridge at Hoi Wing Road (VSR21) and Visitors to Mouse Island Children's Playground (VSR23), the use of attractive and coordinated street furniture and paving materials can lead to a general upgrade of the roadside condition. However, due to spatial constraints there is insufficient space to compensate for the trees removed from the central reserve at Hoi Wing Road. As such the impacts of the works at this location cannot be entirely mitigated, although it should also be noted that the visual quality of the existing environment is not so high.
- 10.15.12. Overall, and in accordance with Annex 10 of the EIAO-TM, the landscape and visual impacts of the proposed works would be 'acceptable with mitigation measures,' that is to say 'there would be some adverse effects, but these can be eliminated, reduced or offset to a large extent by specific measures.

11. Cultural Heritage

11.1. Introduction

- 11.1.1. This section presents the cultural heritage impact assessment of the Project based on the criteria and guidelines stated in Annex 10 and Annex 19 of the EIAO-TM and has covered the scope outlined in Section 3.4.11 of the EIA Study Brief No. ESB-295/2016.

11.2. Relevant Legislations, Standards & Guidelines

- 11.2.1. Legislation, standards, guidelines and criteria relevant to the consideration of Cultural Heritage Impacts under this study include the following;

- Antiquities and Monuments Ordinance (Cap. 53);
- Environmental Impact Assessment Ordinance (EIAO), including Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) Annexes 10 and 19, and Guidelines for Cultural Heritage Impact Assessment;
- Hong Kong Planning Standards and Guidelines (HKPSG);
- Guidelines for Marine Archaeological Investigation; and
- Proposed Grading and Graded Historic Buildings Classification.

Antiquities and Monuments Ordinance (Cap.53)

- 11.2.2. This Ordinance contains statutory procedures for the Declaration of Monuments. The proposed monument can be any place, building, site or structure, which is considered to be of public interest by reason of its historical, archaeological or paleontological significance.

- 11.2.3. Under Section 6 sub-section (1) and subject to sub-section (4) of the Ordinance, the following acts are prohibited in relation to certain monuments, except under permit granted by the Secretary for Development (the Authority):

- To excavate, carry on building works, plant or fell trees or deposit earth or refuse on or in a proposed monument or declared monument; and
- To demolish, remove, obstruct, deface or interfere with a proposed monument or declared monument.

- 11.2.4. The discovery of an antiquity or supposed antiquity, as defined in the ordinance must be reported to the Authority, or a designated person. The Ordinance also provides that, the ownership of every relic discovered in Hong Kong after the commencement of this ordinance shall vest in the HKSAR Government from the declared moment of discovery. The Authority on behalf of the HKSAR Government may disclaim ownership of the relic.

- 11.2.5. No archaeological excavation may be carried out by any person, other than the Authority and the designated person, without a licence issued by the Authority. A licence will only be issued if the Authority is satisfied that the applicant has sufficient scientific training or experience to enable him to carry out the excavation and search satisfactorily, is able to conduct, or arrange for, a proper scientific study of any antiquities discovered as a result of the excavation and search and has sufficient staff and financial support.

- 11.2.6. It should also be noted that the discovery of an antiquity under any circumstances must be reported to the Authority or designated person. The Authority may require that the antiquity or supposed antiquity is identified to the Authority and that any person who has discovered an antiquity or supposed antiquity should take all reasonable measures to protect it.

Environmental Impact Assessment Ordinance (Cap.499)

- 11.2.7. The EIAO was implemented on 1 April 1998. Its purpose is to avoid, minimize and control any adverse impact on the environment arising from designated projects, through the application of the EIA

process and the Environmental Permit (EP) system. The relevant document pertaining to cultural heritage under the legislation is the “Technical Memorandum on Environmental Impact Assessment Process”.

- 11.2.8. The general criteria and guidelines for evaluating and assessing impacts to Sites of Cultural Heritage are listed in Annexes 10 and 19 of the Technical Memorandum on Environmental Impact Assessment Process TM-EIAO. It is stated in Annex 10 that all adverse impacts to Sites of Cultural Heritage should be kept to an absolute minimum and that the general presumption of impact assessment should be in favour of the protection and conservation of all Sites of Cultural Heritage. Annex 19 provides the details of scope and methodology for undertaking Cultural Heritage Impact Assessment, including baseline study, impact assessment and mitigation measures.

Guidelines for Cultural Heritage Impact Assessment

- 11.2.9. The document outlines the specific technical requirement for conducting terrestrial archaeological and built heritage impact assessments and is based upon the requirements of the TM-EIAO. It includes the parameters and scope for the Baseline Study, specifically desk-based research and field evaluation. Besides, it also includes guidelines encompassing reporting requirements and archive preparation and submission in the form of Guidelines for Archaeological Reports and Guidelines for Handling of Archaeological Finds and Archives.
- 11.2.10. The prerequisite conditions for conducting impact assessment and mitigation measures are presented in detail, including the prediction and evaluation of impacts based upon five levels of significance (Beneficial, Acceptable, Acceptable with Mitigation Measures, Unacceptable and Undetermined). The guidelines also state that preservation in totality must be taken as the first priority and if this is not feasible due to site constraints or other factors, full justification must be provided.
- 11.2.11. Mitigation measures will be proposed in cases with identified impacts and shall have the aim of minimising the degree of adverse impact and also where applicable providing enhancement to a heritage site through means such as enhancement of the existing environment or improvement to accessibility of heritage sites. The responsibility for the implementation of any proposed mitigation measures must be clearly stated with details of when and where the measures will be implemented and by whom.

Hong Kong Planning Standards and Guidelines

- 11.2.12. Chapter 10 of the HKPSG details the planning principles for the conservation of natural landscape and habitats, historic buildings and archaeological sites of archaeological interest. The document states that the retention of significant heritage features should be adopted through the creation of conservation zones within which uses should be restricted to ensure the sustainability of the heritage features. The guidelines state that the concept of conservation of heritage features, should not be restricted to individual structures, but should endeavour to embrace the setting of the feature or features in both urban and rural settings.
- 11.2.13. The guidelines also address the issue of the preparation of plans for the conservation of historic buildings, sites of archaeological interest and other antiquities. It is noted that the existing Declared Monuments and proposed Monuments and sites of archaeological interest be listed in the explanatory notes of Statutory Town Plans and that it be stated that prior consultation with Antiquities and Monuments Office (AMO) is necessary for any redevelopment or rezoning proposals affecting these sites or buildings and their surrounding environments.
- 11.2.14. It is also noted that planning intention for non-statutory town plans at the sub-regional level should be include the protection of declared monuments, historic buildings, sites of archaeological interest and other antiquities through the identification of such features on sub-regional layout plans. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong, and Government departments involved in conservation.

Guidelines for Marine Archaeological Investigation

- 11.2.15. The AMO have issued Guidelines for Marine Archaeological Investigation (MAI) which detail the standard practice, procedures and methodology which must be undertaken in determining the marine

archaeological potential, presence of archaeological artefacts and defining suitable mitigation measures, if needed.

Proposed Grading and Graded Historic Buildings Classification

- 11.2.16. A grading system has been in place as a Government administration mechanism for classifying historic buildings based on heritage significance since the 1980's. Currently the Antiquities Advisory Board (AAB) is completing the task of assessing 1,444 historic buildings. There are three grades which are defined as follows;
- Grade 1. Grade-1 buildings are those of outstanding merits, of which every effort should be made for preservation if possible;
 - Grade 2. Grade-2 buildings are those of special merits, of which efforts should be made for selective preservation; and
 - Grade 3. Grade-3 buildings are those of some merits, of which preservation in some form would be desirable and alternative means could be considered if preservation is not practicable.
- 11.2.17. The system is not established under any legislation and graded buildings are not under any statutory protection unlike Declared Monuments.
- 11.2.18. As well as the assessment of the 1,444 historic buildings listed above, the AAB will also consider the heritage value and grading of the New Items proposed by the public for assessment.

11.3. Baseline Conditions

Geological and Topographic Background

- 11.3.1. The Study Area for this Cultural Heritage Impact Assessment Study includes heritage sites and potential heritage areas within 50m unless the heritage place has the potential to attract visitors during operational stage of the cycle track. The study area stretches from Kwun Tsing Road at So Kwun Wat to Tuen Hing Road at Tuen Mun, and is aligned mainly along Castle Peak Road or the coastline. The topography of the proposed alignment consists of the original rocky coastline and the reclaimed land at Castle Peak Bay and will run along at elevations between 2.9 to 17mPD. The section located between Cafeteria Old Beach and Kadoorie Beach and the coastal section near Sam Shing Hui are proposed to be built offshore in the form of elevated road supported on viaducts.
- 11.3.2. Overall the proposed alignment is located mainly on coarse-grained granite and fine-grained granite along the coast. It also crosses over pockets of Holocene alluvium and beach deposits in various locations. The areas with the proposed viaducts mentioned above are situated mostly on Holocene marine sand and small pockets of beach deposits and coarse-grained granite. The alignment at Hoi Wing Road and the proposed storeroom located to the south of the former Mouse Island are located on reclaimed land (Figure 11.2 of [Appendix 11-1](#)).

Archaeological Background

- 11.3.3. There are two known Sites of Archaeological Interest (SAI), namely So Kwun Wat Perowne Barracks SAI and Castle Peak Pottery Kiln, located within or in close proximity to the Study Area or with potential for public interest. Their locations are shown in Figure 11.3 and Figure 11.4 of [Appendix 11-1](#) respectively.

So Kwun Wat Perowne Barracks SAI (AM98-0925)

- 11.3.4. The site of archaeological interest was first identified in 1997 during the Second Territory-wide Survey when four test pits were conducted in the south-eastern part of the former So Kwun Wat Perowne Barracks. The discovery within several of the test pits of a 6 to 10cm thick layer of iron slags suggested the possibility of iron smelting activity dated to as early as Ming dynasty in the area. Underneath the iron slag deposit a Ming blue-and-white porcelain sherd was found. Other findings included a possible prehistoric stone object from a disturbed layer and various black or grey coloured pottery sherds of unknown date (AMO 1998).

- 11.3.5. A subsequent investigation comprising a field scan, 9 auger hole tests and 3 test pit excavations was undertaken in the southern end of the SAI as part of the Tsuen Wan and Tuen Mun Cycle Track project was undertaken in 2010. The investigation recorded an artificial fill deposit which had been deposited as part of site formation works ahead of the construction of the former So Kwun Wat Perowne Barracks in the 1960s, but no archaeological materials (Ove Arup 2011).

Castle Peak Pottery Kiln (AM82-0300)

- 11.3.6. This ceramic kiln structure is located at Hin Fat Lane, Castle Peak Road, Tuen Mun. It is located 50.5 m from the proposed alignment (40m from works boundary). The brick-made and vaulted kiln was built in the 1940s by Szeto Nu Tao. Its long fire chamber is lying along an upward slope, and thus known locally as 'Dragon Kiln'. The kiln stopped operation in 1982 (AAB 2017). The kiln is also known as a Grade 3 historic structure (GB-05 below), ceramic kiln, Hin Fat Lane, Castle Peak Road, Tuen Mun, New Territories. Both names, Castle Peak Pottery Kiln and Ceramic Kiln, Hin Fat Lane are used in the report.

Historical Background of the Study Area

- 11.3.7. Archaeological findings reveal human activities in Castle Peak, Tuen Mun from at least the Late Neolithic period. These prehistoric sites, such as So Kwun Wat, are mainly located along the coast of Tuen Mun and Castle Peak (AMO web site).
- 11.3.8. Apart from limited Han dynasty findings recorded in So Kwun Wat (AMO web site), Castle Peak is associated with the legend of the Jin dynasty Buddhist monk Pui To, whom was believed to have once resided in Castle Peak (TMDC 2007:17). As indicated in some historical documents, by Tang dynasty, Castle Peak and Tuen Mun area was a vibrant place, mainly due to its prominent position in the maritime trade between Guangzhou and South-East Asia or as far as the Persian Gulf (Ouyang & Song 2006: Chapter 43, Lo 1959: 21-22). A military base was subsequently set up in Tuen Mun to safeguard the entrance of the estuary (Wang 2012: Chapter 73). In Song dynasty, the inland area of Tuen Mun was widely settled and Tuen Mun remained an important naval base during the Ming dynasty. Its strategic location attracted the Portuguese who stationed offshore in Tuen Mun Bay and faced a subsequent battle (Lau & Lau 2012:21).
- 11.3.9. The study area mostly runs parallel to Castle Peak Road along the coast between So Kwun Wat and Castle Peak Bay. Castle Peak Road was originally constructed between 1911 and 1920 and was 25 miles in length. It connected Kowloon to the West New Territories and linked Sham Shui Po, via Tsuen Wan to Yuen Long, Sheung Shui and Fanling. The section of road between Tsuen Wan and Tuen Mun relevant for this study was built in 1919 (Cheng 2002:12).
- 11.3.10. A major reclamation scheme at Castle Peak Bay was commenced in 1970s corresponding to the new town development of Tuen Mun. As a result, the small fishing village of Sam Shing Hui, together with its market and the fishing boats harboured at the bay were relocated. Mouse Island, a former small island located off Castle Peak Bay, is now landlocked. A total of approximately 240 hectares of tidal flats were reclaimed in this early stage of the Castle Peak Bay reclamation (NTDD 1976:10) (Figure 11.1 of [Appendix 11-1](#)).

Marine Archaeological Investigation (MAI)

- 11.3.11. A MAI comprising baseline review and diver survey was completed and the report is included as [Appendix 11-3](#). The Baseline review established high marine archaeological potential based on historical evidence. There are no known underwater cultural heritage resources within the study area which is 50m from all engineering works. A comprehensive diver survey of 25 searches from the shore to 50m offshore at 25m intervals were completed across the study area. No objects or features with archaeological potential were located. It was therefore concluded that there are no underwater cultural heritage resources within the study area and therefore no mitigation is required.

Existing Impacts

- 11.3.12. The existing impacts along the proposed alignment consists of steep rocky shoreline, cut slopes, reclaimed land, and the construction and maintenance of Castle Peak Road. In addition, as noticed during a recent site visit, major site formation or construction work are ongoing in some parts of the

study area, such as the south-western part of the So Kwun Wat Perowne Barracks SAI and the former Gordon Camp area.

Previous Archaeological Impact Assessment (AIA) Investigations

Agreement No. CE 9/2008 (HY) Cycle Track between Tsuen Wan and Tuen Mun – Investigation Revised Final Archaeological Impact Assessment Report (Ref: REP-049-02)

- 11.3.13. An AIA was carried out in 2008 and several areas of archaeological potential were identified in the report including some within the current study area.
- 11.3.14. A subsequent field investigation was carried out in 2010 in five areas along the proposed cycle track alignment. Three of the investigated areas—Sam Shing Hui, So Kwun Wat Perowne Barracks SAI, and So Kwun Wat—were located in the vicinity of the current study area (see below).
- 11.3.15. At Sam Shing Hui (ASA05), there were no archaeological materials, deposits or potential recorded in the field scan. A total of three auger hole tests and one test pit excavation were carried out along the original north to north-west facing coastal steep slope of the small hillock of Sham Shing Hui (Kylin) Hill. Within the So Kwun Wat Perowne Barracks (ASA04) area, a field scan, nine auger hole tests and three test pit excavations were carried out along the south-eastern edge of the So Kwun Wat Perowne Barracks SAI but did not reveal any archaeological findings. It was concluded that the original landform, comprising a gentle slope, was severely altered by the cut-and-fill site formation method adopted for the construction of the former So Kwun Wat Perowne Barracks in the 1960s. Finally, at So Kwun Wat (ASA03) area, a total of three test pits were conducted in the vicinity of the current Study Area. No archaeological findings were recorded in the field scan or the auger hole tests. Due to the lack of archaeological artefacts or layers of cultural deposits during the survey, the final revised AIA report concluded that there is no archaeological potential within the project area.

11.4. Identified Built Heritage Resources

- 11.4.1. Five heritage sites, namely Shing Miu (Grade 2), Kesarbahadur Hall, Former Perowne Barracks (Grade 3), Gurkha Temple, Former Perowne Barracks (Grade 3), Watervale House, Former Gordon Hard Camp (Grade 2) and Ceramic kiln, Hin Fat Lane (Grade 3) are graded historic buildings. Apart from the buildings graded by the AAB, a field survey was undertaken in December 2017 to identify potential for additional heritage resources which may be of heritage, tourism or educational interest.
- 11.4.2. The field survey focused on cultural heritage resources within an area of 50 metres from the cycle track, but included others further away if they are potentially interesting for educational or tourist purposes. The focus of the field survey in line with the *Guidelines for Cultural Heritage Impact Assessment*, was on buildings/structures/sites of architectural/historical significance and cultural interest, cultural landscape including places associated with historic events, activity, or person or exhibiting other cultural or aesthetic values, such as sacred religious sites, battlefields, as setting for buildings or structures of architectural or archaeological importance, historic field patterns, clan graves, old tracks, fung shui woodlands and ponds, and etc.
- 11.4.3. The additional cultural heritage resources include Tin Hau Temple at So Kwun Wat, a Tai Shan Shek Kam Dong Tablet on Cafeteria Old Beach, Boulder Lodge at No.3 Tsing Bik Street, six cannons on Kadoorie Beach, Ki Lun Rock in Ki Lun Kong Public Park, Tsing Shan Sam Shing Hui Rural Committee Building and Fuk Tak Tsz in Sam Shing Hui, Guard House and School Building within Former Perowne Barracks and the former Mouse Island. The Graded Historic Buildings and other cultural heritage resources have been mapped in relation to the proposed cycle path in Figures 11.3-11.11 of [Appendix 11-1](#).
- 11.4.4. The full description of the recorded resources can be found separately in [Appendix 11-2](#). A brief description of all recorded built heritage is given below:

GB-01 – Shing Miu, Sam Shing Hui, Ching Shan Wan, Tuen Mun, New Territories (Grade 2) (Figure 11.5 of [Appendix 11-1](#))

- 11.4.5. This well-preserved 1921 constructed Grade 2 historic building is a traditional Qing vernacular style building with a three-hall-three bay design. It is a temple combining three Chinese religions of Confucianism, Buddhism and Taoism (AAB 2017).

GB-02 – Kesarbahadur Hall, Former Perowne Barracks, No. 2 Castle Peak Road – Castle Peak Bay, Tuen Mun, New Territories (Grade 3) (Figure 11.6 of [Appendix 11-1](#))

- 11.4.6. This Grade 3 historic building was previously used as a recreational and training hall for the soldiers resided at the former Perowne Barracks. It was constructed before 1956. The Hall consists of two sections, including the 2-storey main entrance and the tall single storey building with a metal half-tube shape dome (AAB 2017).

GB-03 – Gurkha Temple, Former Perowne Barracks, No. 2 Castle Peak Road – Castle Peak Bay, Tuen Mun, New Territories (Grade 3) (Figure 11.6 of [Appendix 11-1](#))

- 11.4.7. The Grade 3 historic building is a single-storey Hindu temple of post-modern architectural style of the 1950s. It was built between 1961 to 1963 (AAB 2017).

GB-04 – Watervale House, Former Gordon Hard Camp, Castle Peak Road - Castle Peak Bay Section, Area 48, Tuen Mun, New Territories (Grade 2) (Figure 11.7 of [Appendix 11-1](#))

- 11.4.8. The L-shaped single-storey building was constructed around 1933 as a private residence. A two-storey extension was added to the rear of the original structure shortly after WWII (AAB 2017).

GB-05 - Castle Peak Ceramic Kiln (Grade 3) (Figure 11.4 of [Appendix 11-1](#))

- 11.4.9. In addition to a Site of Archaeological Interest, the Castle Peak ceramic kiln is also classified as a Grade 3 historic building. For details discussing the kiln refer to Section 11.2.6 or [Appendix 11-2](#).

Other built heritage items without grading:

HB-01 – Mouse Island, Mouse Island Children’s Playground (Figure 11.8 of [Appendix 11-1](#))

- 11.4.10. A former small island located at Castle Peak Bay. The now completely landlocked island forms part of the Mouse island Children’s Playground.

HB-02 – Tin Hau Temple, So Kwun Wat (Figure 11.6 of [Appendix 11-1](#))

- 11.4.11. This 1991 rebuilt one-hall-one-room temple was originally located along the coast but is now hidden among the residential area of Gold Coast.

HB-03 – Tai Shan Shek Kam Dong Tablet, Cafeteria Old Beach (Figure 11.9 of [Appendix 11-1](#))

- 11.4.12. A modern stone tablet with ‘Tai Shan Shek Kam Dong’ inscription set inside a fenced off cave at Cafeteria Old Beach.

HB-04 – Boulder Lodge, No.3 Tsing Bik Street (Figure 11.10 of [Appendix 11-1](#))

- 11.4.13. Boulder Lodge is a private mansion owned by the Kadoorie Family. It was constructed in the 1930s on a boulder site along Castle Peak Bay (Yuk 2017, Braga 2012).

HB-05a-e – Five Cannons, Kadoorie Beach (Figure 11.10 of [Appendix 11-1](#))

- 11.4.14. Five cannons set by the shore in front of Boulder Lodge; likely as part of Boulder Lodge.

HB-06 – Cannon, Kadoorie Beach (Figure 11.10 of [Appendix 11-1](#))

- 11.4.15. Decorative cannon set at the shore to the west of Boulder Lodge.

HB-07 – Tsing Shan Sam Chau Ma Miu Tin Hau Temple, Sam Shing Hui (Figure 11.11 of [Appendix 11-1](#))

- 11.4.16. Tsing Shan Sam Chau Ma Miu, Sam Shing Hui consists of a single-storey structure dedicated to Tin Hau.

HB-08 – Ki Lun Rock, Ki Lun Kong Public Park, Sam Shing Hui (Figure 11.11 of [Appendix 11-1](#))

- 11.4.17. The Ki Lun Rock is a natural boulder by the original coastline below Ki Lun Kong. It has been regarded as a fung shui rock by local fishermen (The Sun 2006).

HB-09 – Tsing Shan Sam Shing Hui Rural Committee Building, Sam Shing Hui (Figure 11.5 of [Appendix 11-1](#))

- 11.4.18. A 1960 built single-storey structure belonging to the Tsing Shan Sam Shing Hui Rural Committee.

HB-10 – Fuk Tak Tsz Shrine, Sam Shing Hui (Figure 11.5 of [Appendix 11-1](#))

- 11.4.19. A shrine located within the compound of the graded building of Shing Miu.

HB-11 – Guard House, Former Perowne Barracks, No. 2 Castle Peak Road – Castle Peak Bay, Tuen Mun, New Territories (Figure 11.6 of [Appendix 11-1](#))

- 11.4.20. A single storey round building situated at the entrance of the Former Perowne Barracks along Castle Peak Road.

HB-12 – School Building, Former Perowne Barracks, No. 2 Castle Peak Road – Castle Peak Bay, Tuen Mun, New Territories (Figure 11.6 of [Appendix 11-1](#))

- 11.4.21. A single storey structure located near the entrance of the Former Perowne Barracks along Castle Peak Road.

11.5. Impact Evaluation

- 11.5.1. The proposed cycle track works consist of (1) at-grade tracks measuring 3.5 to 4m with and without adjacent footpaths measuring no less than 2m, (2) footpaths and cycle track on viaduct, and (3) bicycle parking spaces. The proposed works are illustrated on **Figures 11.3 to 11.11** in [Appendix 11-1](#).

- 11.5.2. The main works items for the construction of Project includes:

- Site clearance
- Setting up site office
- Levelling/ excavation works
- Construction of retaining structure and slope cutting
- Construction of cycle bridge
- Building works
- Construction of drainage and utilities
- Cycle track / road paving

- 11.5.3. The majority of the heritage resources are distanced from the works, some mitigation may be required however, for potential construction phase impacts. Such impacts may be caused by the construction activities for the above works items. Special attention shall be paid to avoid potential adverse physical impact, while the construction methodology, equipment used, or safety measures implemented shall be targeted to minimize adverse impacts to the heritage resources.

- 11.5.4. During the operational stage no adverse impacts are expected, although there is the opportunity to highlight some of the cultural heritage sites along Castle Peak Road. The heritage sites have the potential to be educational or tourist attractions along the cycling route. The sites of archaeological interest and built heritage resources, located within and in vicinity of the proposed alignment are listed in **Table 11.1**.

- 11.5.5. A Marine Archaeological Investigation comprising Baseline Review and Diver Survey were completed. No underwater cultural heritage resources were located within the study area. There will therefore be no impact from the proposed engineering works.

Table 11.1 Identified Heritage Resources and Potential Impact Assessment

Reference	Item	Proposed works	Distance to proposed works	Potential impacts and assessment
Sites of Archaeological Interest				
Figure 11.3 of Appendix 11-1	So Kwun Wat Perowne Barracks Site of Archaeological Interest	At-grade cycle track	Adjacent and slight overlap	<p>The works are located along Castle Peak Road and touch upon the boundary of the SAI. Existing impacts such as construction of Perowne Barracks, construction and maintenance of Castle Peak Road and ongoing road widening are expected to have negatively affected archaeological potential which was confirmed in previous archaeological investigation results in 2010.</p> <p>No impacts arising from the proposed works are expected.</p> <p>Acceptable Impact</p>
Figure 11.4 of Appendix 11-1	Ceramic kiln, Hin Fat Lane, Castle Peak Road, Tuen Mun, New Territories (SAI and Grade 3)	At-grade cycle track, with and without and footpath	50.5m	<p>No impacts are expected due to the adequate distance from the proposed works.</p> <p>No impacts arising from the proposed works are expected.</p> <p>Acceptable Impact</p>
Graded Historic Buildings				
GB-01 Figure 11.5 of Appendix 11-1	Shing Miu, Sam Shing Hui, Ching Shan Wan, Tuen Mun, New Territories (Grade 2)	At-grade cycle track which includes site clearance, excavation works, cycle track paving	42m	<p>No works impacts are expected due to the adequate distance from the proposed works.</p> <p>Potential for tourist visitation or as architectural example for temple of Qing vernacular style with a three-hall-three-bay design.</p> <p>No Impacts are Expected</p> <p>Acceptable Impact</p>

Reference	Item	Proposed works	Distance to proposed works	Potential impacts and assessment
GB-02 Figure 11.6 of Appendix 11-1	Kesarbahadur Hall, Former Perowne Barracks, No. 2 Castle Peak Road – Castle Peak Bay, Tuen Mun, New Territories (Grade 3)	At-grade cycle track	84m	<p>No works impacts are expected due to the adequate distance from the proposed works.</p> <p>The current condition of the buildings is not suitable for visitation and as such it has limited tourism potential.</p> <p>No Impacts are Expected</p> <p>Acceptable Impact</p>
GB-03 Figure 11.6 of Appendix 11-1	Gurkha Temple, Former Perowne Barracks, No. 2 Castle Peak Road – Castle Peak Bay, Tuen Mun, New Territories (Grade 3)	At-grade cycle track with footpath	114m	<p>No works impacts are expected due to the adequate distance from the proposed works.</p> <p>Potential for tourist visitation and good example of Gurkha place of worship in Hong Kong.</p> <p>No Impacts are Expected</p> <p>Acceptable Impact</p>
GB-04 Figure 11.7 of Appendix 11-1	Watervale House, Former Gordon Hard Camp (Grade 2)	At-grade cycle track with footpath	89m	<p>No impacts are expected due to the adequate distance from the proposed works.</p> <p>Potential for tourist visitation and education as building is associated with person of note, local innovator Feng Rui.</p> <p>No Impacts are Expected</p> <p>Acceptable Impact</p>
GB-05 Figure 11.4 of Appendix 11-1	Ceramic kiln, Hin Fat Lane, Castle Peak Road, Tuen Mun, New Territories (Grade 3)	At-grade cycle track with footpath which including site clearance, excavation works, cycle track paving	53.5m	<p>No impacts are expected due to the adequate distance from the proposed works.</p> <p>Potential for tourist visitation and education as the only HK example of intact dragon kiln although it is no longer working.</p> <p>No Impacts are Expected</p> <p>Acceptable Impact</p>

Reference	Item	Proposed works	Distance to proposed works	Potential impacts and assessment
Other built heritage items without grading				
HB-01 Figure 11.8 of Appendix 11-1	Mouse Island, Mouse Island Children's Playground	At-grade cycle track with footpath	2.5m	<p>No impacts are expected due to the (changed) nature of the heritage and no direct impact from the proposed works.</p> <p>The area is of tourist/education interest as a former Island and site for lighthouse.</p> <p>No impacts arising from the works are expected.</p> <p>Acceptable Impact</p>
HB-02 Figure 11.6 of Appendix 11-1	Tin Hau Temple, So Kwun Wat	At-grade cycle track	24m	<p>No impacts are expected due to the adequate distance from the proposed works which are on the other side of Castle Peak Road.</p> <p>The area has limited heritage significance but has some tourist/education interest as a small local new temple.</p> <p>No impacts arising from the works are expected.</p> <p>Acceptable Impact</p>
HB-03 Figure 11.9 of Appendix 11-1	Tai Shan Shek Kam Dong Tablet, Cafeteria Old Beach	<p>Cycle track and footpath on viaduct and</p> <p>At-grade cycle track with footpath</p>	<p>10m</p> <p>7m</p>	<p>The works are in very close proximity of the tablet and have the potential to physically come in contact with equipment, storage areas, associated works.</p> <p>Some potential adverse impacts arising from the works may be occur.</p> <p>Acceptable Impact with Mitigation</p> <p>The cultural associations of the tablet is of potential tourist and education interest.</p>

Reference	Item	Proposed works	Distance to proposed works	Potential impacts and assessment
HB-04 Figure 11.10 of Appendix 11-1	Boulder Lodge, No.3 Tsing Bik Street	Cycle track and footpath on viaduct	43m	<p>No impacts are expected due to the adequate distance from the proposed works.</p> <p>Private nature of the residence renders it unsuitable for tourist visitation or education.</p> <p>No impacts arising from the works are expected.</p> <p>Acceptable Impact</p>
HB-05 (a to e) Figure 11.10 of Appendix 11-1	Five Cannons, Kadoorie Beach	Cycle track and footpath on viaduct	a: 40m b: 65m c: 88m d: 110m e: 100m	<p>Although not the original location the cannons are testimony of the military/strategic history of Tuen Mun.</p> <p>No impacts are expected due to the adequate distance from the proposed works.</p> <p>Acceptable Impact</p>
HB-06 Figure 11.10 of Appendix 11-1	Cannon, Kadoorie Beach	Cycle track and footpath on viaduct	50m	<p>Although not the original location the cannons are testimony of the military/strategic history of Tuen Mun.</p> <p>No impacts are expected due to the adequate distance from the proposed works.</p> <p>Acceptable Impact</p>
HB-07 Figure 11.11 of Appendix 11-1	Tsing Shan Sam Chau Ma Miu Tin Hau Temple, Sam Shing Hui	At-grade cycle track	2.5m	<p>The works are in very close proximity of the temple and have the potential to physically come in contact with equipment, works, associated works and storage areas.</p> <p>Some potential adverse impacts arising from the works may be occur.</p> <p>Acceptable Impact with Mitigation</p> <p>The temple has a vibrant appearance and has the potential for tourism visitation although little heritage significance.</p>

Reference	Item	Proposed works	Distance to proposed works	Potential impacts and assessment
HB-08 Figure 11.11 of Appendix 11-1	Ki Lun Rock, Ki Lun Kong Public Park, Sam Shing Hui	At-grade cycle track	7m	<p>The works have the potential to physically come in contact with equipment, works, associated works and storage areas.</p> <p>Some potential adverse impacts arising from the works may be occur.</p> <p>Acceptable Impact with Mitigation</p> <p>The rocks are of educational and tourism interest as they mark the original shoreline.</p>
HB-09 Figure 11.5 of Appendix 11-1	Tsing Shan Sam Shing Hui Rural Committee Building, Sam Shing Hui	At-grade cycle track	11m	<p>The works are in very close proximity have the potential to physically come in contact with equipment, works, associated works and storage areas.</p> <p>Some potential adverse impacts arising from the works may be occur.</p> <p>Acceptable Impact with Mitigation</p> <p>The building is of some architectural interest and as example of rural committee building in New Territories.</p>
HB-10 Figure 11.5 of Appendix 11-1	Fuk Tak Tsz Shrine, Sam Shing Hui	At-grade cycle track	33.8m	<p>No impacts are expected due to the adequate distance from the proposed works.</p> <p>Although of limited heritage significance the shrine is a good modern example.</p> <p>No impacts arising from the works are expected.</p> <p>Acceptable Impact</p>
HB-11 Figure 11.6 of Appendix 11-1	Guard House, Former Perowne Barracks, No. 2 Castle Peak Road – Castle Peak Bay, Tuen Mun, New Territories	At-grade cycle track	4.3m	<p>The works are in very close proximity of the building and have the potential to physically come in contact with equipment, works, associated works and storage areas.</p> <p>Some potential adverse impacts arising from the works may be occur.</p> <p>Acceptable Impact with Mitigation</p> <p>The building may have potential heritage significance and some tourist/education interest.</p>

Reference	Item	Proposed works	Distance to proposed works	Potential impacts and assessment
HB-12 Figure 11.6 of Appendix 11-1	School Building, Former Perowne Barracks, No. 2 Castle Peak Road – Castle Peak Bay, Tuen Mun, New Territories	At-grade cycle track	5.8m	<p>The works are in very close proximity of the building and have the potential to physically come in contact with equipment, works, associated works and storage areas.</p> <p>Some potential adverse impacts arising from the works may be occur.</p> <p>Acceptable Impact with Mitigation</p> <p>The building may have potential heritage significance and some tourist/education interest.</p>

11.6. Mitigation Measures

- 11.6.1. There are no potential direct and indirect impacts arising from the construction of the cycle path on Sites of Archaeological Interest and Graded Historic Buildings. Some potential works impacts have been identified on eight other non-graded built heritage items during the construction phase and mitigation may include a range of measures. The descriptions below will provide the detailed requirements for each of the mitigation actions recommended. The descriptions are abbreviated in **Table 11.2** by the letters shown in brackets.
- 11.6.2. As a precautionary measure, AMO should be informed immediately in case of discovery of antiquities or supposed antiquities in the course of works, so that appropriate mitigation measures, if needed, can be timely formulated and implemented in agreement with AMO.
- 11.6.3. If there are any buildings / structures both at grade level and underground which were built on or before 1969, the project proponent is required to alert AMO in an early stage or once identified.
- 11.6.4. The Marine Archaeological Investigation did not locate any underwater cultural heritage resources so there is no need for any mitigation measures.

Condition Survey (CS)

- 11.6.5. A condition survey will be carried out by qualified building surveyor or engineer in advance of works for other built heritage items that may be affected by ground-borne vibration. The Condition Survey Report should contain descriptions of the structure, identification of fragile elements, an appraisal of the condition and working methods for any proposed monitoring and precautionary measures that are recommended.
- 11.6.6. The condition survey report for the other built heritage items must be submitted to AMO for comment before construction activities commence. The location of proposed monitoring points in the building should avoid damaging the historic fabric and agreed by the owner. The Contractor should implement the approved monitoring and precautionary measures.

Provision of Buffer Zones (BZ)

- 11.6.7. A buffer zone should be provided to separate the building or structure from the construction works. The buffer zone should be clearly marked out by temporary fencing. The buffer zone should be made at least 1m from the proposed works or if this is not possible as large as the site restrictions allow.

Provision of Safe Public Access (SPA)

- 11.6.8. Any proposed works in close proximity to buildings or structures used by the public have the potential to create an unsafe environment for members of the public.
- 11.6.9. The Contractor should ensure that safe public access if possible, through provision of clearly marked paths separated from the construction works areas is provided for any such affected cultural heritage structure.

Table 11.2 Proposed Mitigation during construction phase for other built heritage items identified as having potential impacts

Reference	Description	Proposed works	Distance to proposed works	Mitigation recommendation
Other built heritage items without grading				
HB-03 Figure 11.9 of Appendix 11-1	Tai Shan Shek Kam Dong Tablet, Cafeteria Old Beach	Cycle track and footpath on viaduct	10m	BZ, SPA
		at-grade	7m	
HB-07 Figure 11.11 of Appendix 11-1	Tsing Shan Sam Chau Ma Miu, Sam Shing Hui	At-grade cycle track and footpath	2.5m	BZ, SPA
HB-08 Figure 11.11 of Appendix 11-1	Ki Lun Rock, Ki Lun Kong Public Park, Sam Shing Hui	At-grade cycle track and footpath	7m	BZ
HB-09 Figure 11.5 of Appendix 11-1	Tsing Shan Sam Shing Hui Rural Committee Building, Sam Shing Hui	At-grade cycle track	11m	CS, BZ, SPA
HB-11 Figure 11.6 of Appendix 11-1	Guard House, Former Perowne Barracks, No. 2 Castle Peak Road – Castle Peak Bay, Tuen Mun, New Territories	At-grade cycle track	4.3m	CS, BZ, SPA
HB-12 Figure 11.6 of Appendix 11-1	School Building, Former Perowne Barracks, No. 2 Castle Peak Road – Castle Peak Bay, Tuen Mun, New Territories	At-grade cycle track	5.8m	CS, BZ, SPA
Note: Condition Survey (CS), Buffer Zones (BZ), Safe Public Access (SPA)				

- 11.6.10. Mitigation measures for cultural heritage will not be required during operational phases, but it has to be pointed out that some of the heritage resources along the alignment are opportunity for users of cycle track to visit either for tourism or educational purposes. The organisation or promotion of sites

for education or tourism is outside the purview of the study, but the resources with potential are presented in **Table 11.2** and the descriptions can be found in **Appendix 11-2** for future use.

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12. Environmental Monitoring and Audit Requirements

12.1. Introduction

12.1.1. This section provides a summary of the requirements of the environmental monitoring and audit (EM&A) for the Project based on the findings of this EIA study. An EM&A programme has been formulated and the details are provided in the separate EM&A Manual prepared in accordance with Annex 21 of the EIAO-TM.

12.1.2. The objectives of conducting the EM&A programme for the Project are as follows:

- To provide a database against which any short or long-term environmental impacts of the Project can be determined;
- To provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards;
- To monitor the performance of the Project and the effectiveness of mitigation measures;
- To verify the environmental impacts predicted in this EIA;
- To determine project compliance with regulatory requirements, standards and government policies;
- To take remedial action if unexpected problems or unacceptable impacts arise; and
- To provide data to enable an environmental audit.

12.1.3. The following section summarises the recommended EM&A requirements for the Project. Details of the specific requirements are provided in a stand-alone EM&A Manual.

12.2. Air Quality

Construction Phase

12.2.1. With the implementation of the dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation and good site practices, no adverse construction dust impacts would be expected. Hence, no specific construction dust monitoring is recommended. However, regular environmental audits to be implemented by the Environmental Team during the construction stage are recommended to ensure the implementation of the dust control measures.

Operational Phase

12.2.2. No air quality impacts are anticipated as a result of the implementation of the Project during the operational phase. Thus, no specific EM&A programme with respect to air quality during the operational phase is required.

12.3. Noise

Construction Phase

12.3.1. Mitigation measures have been recommended to control the construction noise impacts arising from the Project. A Construction Noise Management Plan shall be provided by the Contractor before commencement of the construction to avoid noise exceedance. All the recommended mitigation measures will be incorporated into the EM&A programme for implementation during construction.

12.3.2. The recommended mitigation measures, monitoring procedures and locations are detailed in the Environmental Monitoring and Audit (EM&A) Manual and should be implemented by the Environmental Team. This will allow the Contractor to have early warning and undertake the necessary actions to reduce noise emissions at specific areas.

Operational Phase

- 12.3.3. No noise impacts are anticipated as a result of the implementation of the Project during the operational phase. Thus, no specific EM&A programme with respect to noise during the operational phase is required.

12.4. Water Quality

Construction Phase

- 12.4.1. The assessment on water quality impacts has concluded that the proposed piling activities at marine viaduct section may cause dispersion of sediment and fine material due to bored pile installation and drilling process, with possible consequences of reducing dissolved oxygen levels. With the deployment of silt curtain, the elevated SS concentration shows that the non-compliance would disappear rapidly after 5m away from the piling work source. The prediction also indicates that the suspended solids released during piling works would not have adverse impact to nearby WSRs. It is concluded that no significant Dissolved Oxygen Depletion would occur at all the identified WSRs during both the dry and wet seasons, respectively. The release of organic compounds, heavy metals and nutrients during piling was predicted to be negligible.
- 12.4.2. Site runoff, general construction activities, sewage arising from the workforce, and spillage of chemicals are not expected to cause adverse impacts to the water environment, provided that proper mitigation measures are implemented.

Operational Phase

- 12.4.3. During the operational phase, runoff from the cycle track including the at-grade section, viaduct section and retaining structure sections will be conveyed into designated drainage systems. Silt trap/interceptor would be provided and maintained in the designated drainage systems to minimize water quality impact arising from surface runoff. The wastewater (i.e., sewage effluent from visitors) arising will be properly conveyed into existing sewerage system. The administrative measures such as regular cleaning of cycle track surface, maintenance of silt trap, etc. would be in place. Therefore, adverse impact on water quality during operational phase is not anticipated.

12.5. Waste Management Implications

Construction Phase

- 12.5.1. The assessment on waste management has concluded that with proper handling, storage, collection, transportation and disposal of waste materials generated during construction phase, no significant impacts to nearby sensitive receivers are expected.
- 12.5.2. Waste management would be the Contractor's responsibility to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with good waste management practices and EPD's regulations and requirements.
- 12.5.3. Whilst no specific EM&A requirement have been considered necessary, it is recommended that during the construction phase, site inspections and supervisions of waste management procedures and auditing of the effectiveness of implemented mitigation measures should be undertaken by the Environmental Team on a regular basis (e.g. weekly as a minimum). These tasks shall be scheduled in the Waste Management Plan to be prepared by the Contractor, and the site audits summary shall be presented in the EM&A reports.

Operational Phase

- 12.5.4. No adverse waste management impacts would be expected as a result of the implementation of the Project during operational phase. Thus, no specific EM&A programme with respect to waste management during the operational phase is required.

12.6. Land Contamination

Construction Phase

- 12.6.1. There are no potential contamination land uses within the construction areas. Potential land contamination impacts on the sensitive receivers are not anticipated. No specific EM&A programme is required.

Operational Phase

- 12.6.2. The operational phase of cycle track would not cause land contamination. Therefore, no impacts on land contamination are expected to occur. No specific EM&A programme is required.

12.7. Ecology

Construction Phase

- 12.7.1. Construction activities would have direct impacts on small areas of developed area, grassland/shrubland, mixed woodland, plantation woodland and man-made watercourse. Due to the small size and low or low to moderate ecological value of the areas, terrestrial ecological impact arising from the cycle track would be minor.
- 12.7.2. The proposed viaduct between Cafeteria Old Beach and Kadoorie Beach however will involve bored piles in the marine waters, direct encroachment of small area (about 19 m²) of seabed due to the bored piles are expected. Avoidance of encroachment impact on the low coverage hard coral and gorgonian in the adjacent subtidal area has been considered. The potential impact due to loss of small size of piling areas is ranked as Minor.

Operational Phase

- 12.7.3. During the operational phase, indirect impacts including human activities might affect the wildlife in the vicinity. However, all habitats are surrounded by developed area which are subject to existing disturbance, the potential impact due to human activities is ranked as Insignificant.
- 12.7.4. Besides the coral translocation plan as precautionary approach, good site practice and the mitigation measures stated in Water Quality Chapter, no other specific mitigation measures for ecology are required during construction and operational phases.

12.8. Fisheries

Construction Phase

- 12.8.1. The proposed viaduct between Cafeteria Old Beach and Kadoorie Beach involves bored piles in the marine waters, direct encroachment of fishing grounds is expected. An estimated fishing grounds loss including both works area (0.07 ha) and Project Site (0.0019 ha) will be about 0.0719 ha. However, the magnitude of the impact is ranked as Minor. No specific mitigation measures are required.

Operational Phase

- 12.8.2. As only limited number of bored piles will be constructed in the marine habitats, change in hydrodynamics is not expected. Pollution from cyclists to marine waters is also not expected. No maintenance dredging would be required for the viaducts, and therefore no water quality impacts could be induced. Hence, no operational phase impacts are anticipated from the Project.

12.9. Landscape and Visual

Construction Phase

- 12.9.1. The proposed works will occupy a small part of roadside or waterfront area and the majority of works only involves modification of existing road and tracks, footpaths, hard stands and planting areas. Much of the works area will also be reinstated to its original status or new amenity function on the completion of the construction. Overall, it is evident that the works will not cause permanent impact to the majority of landscape resources, and where such residual impacts exist they are small and localised. A relatively low level of disturbance to visual context and visual amenity available to most VSRs will result from the proposed works and the works will form only a small component in each identified landscape character areas within the Study Area.

Operational Phase

- 12.9.2. The direct impacts of the works on this landscape resource will be relatively limited. Overall, it is evident that the works will not cause permanent impact to the majority of landscape resources, and where such residual impacts exist, they are small and localised. A relatively low level of disturbance to visual context and visual amenity available to most VSRs will result from the proposed works and the works will form only a small component in each identified landscape character areas within the Study Area.

12.10. Cultural Heritage

Construction Phase

- 12.10.1. There are no potential impacts arising from the construction of the cycle path on Sites of Archaeological Interest and Graded Historic Buildings. Some potential works impacts have been identified on six other built heritage items during the construction phase and mitigation may include a range of measures presented in **Table 11.2**.
- 12.10.2. A MAI comprising baseline review and comprehensive diver survey was carried out. The MAI concluded that there are no underwater cultural heritage resources within the study area, therefore, no impact to underwater cultural heritage resources will be induced.

Operational Phase

- 12.10.3. Mitigation for cultural heritage will not be required during operational phases, but it has to be pointed out that some of the heritage resources along the alignment are opportunity for users of cycle track to visit either for tourism or educational purposes. The organisation or promotion of sites for education or tourism is outside the purview of the study, but the resources with potential are presented in **Table 11.2** and the descriptions can be found in [Appendix 11-2](#) for future use.
- 12.10.4. A MAI comprising baseline review and comprehensive diver survey was carried out. The MAI concluded that there are no underwater cultural heritage resources within the study area, therefore, no impact to underwater cultural heritage resources will be induced.

12.11. Summary of Environmental Monitoring and Audit Requirements

Noise impact monitoring is recommended during the construction phase of the Project whilst water quality impact monitoring is recommended during the construction of the marine viaduct section. Environmental inspections and audits are recommended for other aspects, and are summarized in **Table 12.1**.

Table 12.1 Summary of EM&A Requirements

Environmental Aspect	Construction Phase		Operational Phase
	Sampling / Monitoring	Inspection / Audit	Inspection / Audit
Air quality	No	Yes	No
Noise	Yes	Yes	No
Water quality	Yes	Yes	No
Waste management and land contamination	No	Yes	No
Ecology & fisheries	No	Yes	No
Landscape & visual	No	Yes	No
Cultural heritage	No	Yes	No

13. Implementation Schedule of Mitigation Measures

13.1. Introduction

- 13.1.1. This section summarises the implementation schedules for the recommended mitigation measures for the Project based on the findings of this EIA study. It has been prepared following the requirements in Section 3.5 of the EIA Study Brief No. ESB-295/2016 and in accordance with Annex 21 of the EIAO-TM.
- 13.1.2. The implementation schedules for the recommended mitigation measures for each environmental aspect covered in this EIA are given in **Table 13.1** to **Table 13.7**.

Table 13.1 Implementation Schedule of Recommended Mitigation Measures – Air Quality

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
Construction Phase						
3.6.1	3.2.3	Dust control requirements stipulated in Air Pollution Control (Construction Dust) Regulation should be implemented:	Air Quality (fugitive dust) Control during Construction Phase	Contractors	At all construction areas of the site during the entire construction period	Annex 4 of EIAO-TM, Air Pollution Control (Construction Dust) Regulation
3.6.1	3.2.3	<ul style="list-style-type: none"> The works area for site clearance shall be sprayed with water before, during and after the operation so as to maintain the entire surface wet. 	Air Quality (fugitive dust) Control during Construction Phase	Contractors	At all construction areas of the site during the entire construction period	Annex 4 of EIAO-TM, Air Pollution Control (Construction Dust) Regulation
3.6.1	3.2.3	<ul style="list-style-type: none"> Restricting heights from which materials are to be dropped, as far as practicable to minimize the fugitive dust arising from unloading/ loading. 	Air Quality (fugitive dust) Control during Construction Phase	Contractors	At all construction areas of the site during the entire construction period	Annex 4 of EIAO-TM, Air Pollution Control (Construction Dust) Regulation
3.6.1	3.2.3	<ul style="list-style-type: none"> Immediately before leaving a construction site, all vehicles shall be washed to remove any dusty materials from the bodies and wheels. However, all spraying of materials and surfaces should avoid excessive water usage. 	Air Quality (fugitive dust) Control during Construction Phase	Contractors	At all construction areas of the site during the entire construction period	Annex 4 of EIAO-TM, Air Pollution Control (Construction Dust) Regulation
3.6.1	3.2.3	<ul style="list-style-type: none"> Where a vehicle leaving a construction site is carrying a load of dusty materials, the load shall be covered entirely by clean impervious sheeting to ensure that the dusty materials will not leak from the vehicle. 	Air Quality (fugitive dust) Control during Construction Phase	Contractors	At all construction areas of the site during the entire construction period	Annex 4 of EIAO-TM, Air Pollution Control (Construction Dust) Regulation
3.6.1	3.2.3	<ul style="list-style-type: none"> Travelling speeds should be controlled to reduce traffic induced dust dispersion and re-suspension within the site from the operating haul trucks. 	Air Quality (fugitive dust) Control during Construction Phase	Contractors	At all construction areas of the site during the entire construction period	Annex 4 of EIAO-TM, Air Pollution Control (Construction Dust) Regulation
3.6.1	3.2.3	<ul style="list-style-type: none"> Erection of hoarding of not less than 2.4 m high from ground level, where appropriate. 	Air Quality (fugitive dust) Control during Construction Phase	Contractors	At all construction areas of the site during the entire construction period	Annex 4 of EIAO-TM, Air Pollution Control (Construction Dust) Regulation

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
3.6.1	3.2.3	<ul style="list-style-type: none"> Any stockpile of dusty materials shall be covered entirely by impervious sheeting; and/or placed in an area sheltered on the top and 4 sides. 	Air Quality (fugitive dust) Control during Construction Phase	Contractors	At all construction areas of the site during the entire construction period	Annex 4 of EIAO-TM, Air Pollution Control (Construction Dust) Regulation
3.6.1	3.2.3	<ul style="list-style-type: none"> All dusty materials shall be sprayed with water or a dust suppression chemical immediately prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet. 	Air Quality (fugitive dust) Control during Construction Phase	Contractors	At all construction areas of the site during the entire construction period	Annex 4 of EIAO-TM, Air Pollution Control (Construction Dust) Regulation
3.6.1	3.2.3	<ul style="list-style-type: none"> Non-road Mobile Machinery should be approved or exempted with a label issued by EPD. The label should be displayed at a conspicuous position of the machine or vehicle. 	Air Quality (NRMM emissions)	Contractors	At all construction areas of the site during the entire construction period	Annex 4 of EIAO -TM, Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation
3.6.1	3.2.3	<ul style="list-style-type: none"> The requirements stipulated in the Works Branch Development Bureau Technical Circular (Works) No. 8/2010 Enhanced Specification for Site Cleanliness and Tidiness should be followed as far as practicable to enhance the cleanliness and tidiness of construction sites. 	Air Quality (fugitive dust) Control during Construction Phase	Contractors	At all construction areas of the site during the entire construction period	Works Branch Development Bureau Technical Circular (Works)
Operational Phase						
N/A	N/A	None specific	N/A	N/A	N/A	N/A

Table 13.2 Implementation Schedule of Recommended Mitigation Measures – Noise

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
Construction Phase						
4.8.1	4.3	<p>Good site practice and noise management should be followed:</p> <ul style="list-style-type: none"> ▪ only well-maintained plants should be operated on-site and plants should be serviced regularly during the construction works; ▪ machines and plants that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum; ▪ plants known to emit noise strongly in one direction should, where possible, be orientated to direct noise away from the NSRs; ▪ mobile plant should be sited as far away from NSRs as possible; ▪ material stockpiles and other structures should be effectively utilized, where practicable, to screen noise from on-site construction activities; ▪ contractor shall prepare their own Construction Noise Management Plan before construction commencement; and ▪ silencers or mufflers on construction equipment should be utilized where appropriate and should be properly maintained during the construction periods. 	Noise control	Contractors	At all construction areas of the site during the entire construction period	Annex 5 of EIAO-TM, contractual requirements
4.8.4, Table 4.5	4.3	Use of quieter PME.	Noise control	Contractors	At all construction areas of the site during the entire construction period	Annex 5 of EIAO-TM, contractual requirements

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
4.8.5, Table 4.6	4.3	Use of temporary noise barrier with a minimum surface density of 10 kg/m ² and fitted with appropriate absorptive material to minimize multiple reflections of noise due to confined space of the surroundings and the proposed barriers for PME. The temporary noise barrier shall be constructed with sufficient length (e.g. at least five times greater than its height) or bent around the noise sources and shall have no opening or gaps at joints to avoid noise leakage. The use of cantilevered top cover to provide screening benefits at upper floors shall be considered when necessary.	Noise control	Contractors	At all construction areas of the site during the entire construction period	Annex 5 of EIAO-TM, contractual requirements
4.8.6, Table 4.6	4.3	Use of noise enclosure with a sufficient surface density of no less than 10 kg/m ² is proposed to surround certain PMEs. The internal wall of the enclosure should be lined with 50 mm of sound-absorbent material, or with 25 mm of similar material if mounted on battens.	Noise control	Contractors	At all construction areas of the site during the entire construction period	Annex 5 of EIAO-TM, contractual requirements
4.8.8, 4.9.3, Table 4.7	4.3	To reduce the construction noise impact, quieter type wire saw and hydraulic crusher will be adopted by the Contractor for the demolition of boundary wall at workfront 020 as considered in the unmitigated scenario. Non-explosive chemical expansion agent and a concrete pump instead of circular wood saw and concrete lorry mixer, respectively, will be used during the construction of drainage and utilities, while the hand-held jigsaw will replace the circular wood saw for site clearance works. Other quieter equipment / construction methods not adopted in the assessment shall be considered during the design, tendering and implementation stage of the construction works as appropriate.	Noise control	Contractors	Works near Crossroads Foundation, Starfront Royale Tower 1 and 2, Seacoast Royale Tower 3, TMTL 518 Tower 8, Blessing Villa Block F, Surfside, Villa La Plage, Bayview Terrace, Boulder Lodge Staff Quarter, Castle Peak Sam Chau Ma Temple and Fu Hong Society Yau Chong Home.	Annex 5 of EIAO-TM, contractual requirements

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
4.9.4	4.3	Due to site constraints, dump truck, lorry and concrete lorry mixer would not be able to access the site at workfronts 008 and 009. Similarly, as an additional mitigation measures to reduce the noise impact on Crossroads Foundation, Starfront Royale Tower 1 and 2, Seacoast Royale Tower 3, TMTL 518 Tower 8 and Villa La Plage, dump truck, lorry and concrete lorry mixer will be restricted from accessing workfronts 003, 004, 005, 006, 010, 011 and 012. Considering the inaccessible/restricted distance to the above workfronts is relatively short, only a concrete pump with noise enclosure will be required to replace the concrete lorry mixer. All transportation of materials, including the concrete, will be carried out by trolley with manpower.	Noise Control	Contractors	Works near Crossroads Foundation, Starfront Royale Tower 1 and 2, Seacoast Royale Tower 3, TMTL 518 Tower 8, Blessing Villa, Surfside and Villa La Plage.	Annex 5 of EIAO-TM, contractual requirements
4.9.5	4.3	Additional temporary noise barrier will be provided in front of Blessing Villa Block F so as to offer protection to the upper floors. To further reduce the noise impact on Blessing Villa Block F, the concrete pump will be placed at least 11.5m away from the NSR.	Noise control	Contractors	Works near Blessing Villa Block F	Annex 5 of EIAO-TM, contractual requirements
4.9.6	4.3	Contractor shall erect substantial fixed barriers with a minimum surface density of 10 kg/m ² and constructed with sufficient height and length to completely screen the PME to be used on the construction site such that none of the PME will be visible when viewed from any openings of the NSRs. The fixed noise barriers shall also be constructed with no openings and gaps at joints to avoid noise leakage. Cross-sectional drawings to demonstrate the provision of substantial fixed barriers in front of Seacoast Royale Tower 3 and Villa La Plage are provided in Figures 4.4.2 to 4.4.5 for reference. To further reduce the noise impact, the concrete pump will be placed at least 7.5m away from Seacoast Royale Tower 3 and 26m away from Villa La Plage.	Noise control	Contractors	Works near Seacoast Royale Tower 3 and Villa La Plage.	Annex 5 of EIAO-TM, contractual requirements

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
4.9.7, Table 4.9	4.3	Additional temporary noise barriers shall be provided in front of Castle Peak Sam Chau Ma Temple to block the sightline to the adjacent workfront to alleviate the potential noise impact. In any case, the Contractor shall establish a communication channel with the operator of Castle Peak Sam Chau Ma Temple and maintain liaison with the temple on the works schedule, in particular when the PME are unavoidably close to the temple, e.g. when the asphalt paver is operating at 30m or less away from the temple, the Contractor shall re-schedule the works when no ritual services are held in the temple, in collaboration with the temple operator. Table 4.9 summarises the recommendation on the use of PME.	Noise Control	Contractors	Works near Castle Peak Sam Chau Ma Temple	Annex 5 of EIAO-TM, contractual requirements
4.9.8	4.3	Contractor shall liaise with the school's management for the schedule of construction works to avoid carrying out noisy construction activities during examination period.	Noise Control	Contractors	Works near The Salvation Army Sam Shing Nursery School	Annex 5 of EIAO-TM, contractual requirements
4.9.9	4.3	The Contractor shall submit a Construction Noise Management Plan (CNMP) to EPD for approval prior to the commencement of construction of the Project. The CNMP shall be checked independently and endorsed by the Project Engineer and CEDD to ensure that the proposals are practicable and could be effectively implemented on site, before submission of the CNMP to EPD. Details on the use of plants and equipment, their on-time percentages and the adoption of noise mitigation measures for the construction phase shall be clearly provided in the CNMP, demonstrating that the construction works to be undertaken will comply with all prevailing environmental standards and requirements. All noise mitigation measures implemented shall be properly maintained during construction of the Project.	Noise Control	Contractors	Prior to the commencement of construction of the Project	Annex 5 of EIAO-TM, contractual requirements



EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
4.10.2	4.3	Given the long project extent, the Project will be constructed in phases, and the construction activities of the cycle tracks Project will be implemented in separated sections (e.g. 300m between two active working sections) to avoid cumulative impacts due to concurrent works of this Project. The Contractor of this Project will liaise with the corresponding parties of the concurrent projects to schedule their works avoiding concurrent works within 300m of these other projects as far as possible.	Noise Control	Contractors	At all construction areas of the site during the entire construction period	Annex 5 of EIAO-TM, contractual requirements
Operational Phase						
N/A	N/A	None specific	N/A	N/A	N/A	N/A

Table 13.3 Implementation Schedule of Recommended Mitigation Measures – Water Quality

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
Construction Phase						
5.7.1	5.11.1	<ul style="list-style-type: none"> ▪ The rate of constructing a pile is 15 m/day and 2 piles will be constructed per day; the diameter of pile is 600mm; the working hour shall be 12 hour per day from 07:00 to 19:00. ▪ Cage type silt curtains (i.e. size adjustable to suit environmental condition) must be deployed with an efficiency of 75% or higher for reduction of sediment release from the bored pile installation. The engineer will review using higher efficiency silt curtain in later stage. ▪ Restrict beach users from entering the piling works area. ▪ Maintain close liaison with LCSD on construction works schedule of marine viaduct during swimming season from March to October. ▪ No more than 1/3 of the bathing area (for each beach) shall be closed and only one side of the beach (for each beach) shall be occupied during the construction. ▪ Contingency plan setup with LCSD on alert beach users if there are unpredicted sediment suspension. 	Water quality control	Contractors	Piling Works at Marine Viaduct Section during the entire construction period	Annex 6 of EIAO-TM, WPCO
5.7.3	5.11.3	<ul style="list-style-type: none"> ▪ No construction site discharge will be allowed within 100m of the boundaries of a gazetted beach in any direction, including rivers, streams and storm drains. ▪ Sand/silt removal facilities such as sand traps, silt traps and sediment basins should be provided to remove sand/silt particles from runoff to meet the requirements of the Technical Memorandum standards under the WPCO. The design of silt removal facilities should be based on the guidelines provided in ProPECC PN 1/94. All drainage facilities and erosion and sediment control structures should be inspected monthly and maintained to ensure proper and efficient operation at all times and particularly during rainstorms. 	Control of site runoff	Contractors	At all construction areas of the site during the entire construction period	ProPECC PN1/94, WPCO

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
		<ul style="list-style-type: none"> ▪ Work programmes should be designed to minimize the size of work areas to minimize the soil exposure soil and reduce the potential for increased siltation and runoff. ▪ Boundaries of earthworks should be marked and surrounded by dykes or embankments for flood protection, as necessary. ▪ Silt removal facilities, channels and manholes should be maintained and cleaned regularly to ensure the proper function. ▪ Water pumped out from excavations should be discharged into silt removal facilities. ▪ Careful programming of the works to minimize soil excavation during the rainy season; If excavation of soil cannot be avoided during the wet season (April to September), exposed slope surfaces should be covered by a tarpaulin or other means. Other measures that need to be implemented before, during, and after rainstorms are summarized in ProPECC PN 1/94. ▪ Earthwork surfaces should be well compacted and the subsequent permanent work or surface protection should be carried out immediately after the final surfaces are formed. ▪ Open stockpiles of construction materials on site should be covered with tarpaulin or similar fabric during rainstorms. ▪ Wastewater generated from the washing down of mixer trucks and drum mixers and similar equipment should wherever practicable be recycled. The discharge of wastewater should be kept to a minimum. ▪ To prevent pollution from wastewater overflow, the pump sump of any water recycling system should be provided with an on-line standby pump of adequate capacity and with automatic alternating devices. ▪ Under normal circumstances, surplus wastewater may be discharged into foul sewers after treatment in silt removal and pH adjustment facilities (to within the pH 				

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
		range of 6 to 10). Disposal of wastewater into storm drains will require more elaborate treatment. Surface run-off should be segregated from the concrete batching plant and casting yard area as much as possible, and diverted to the stormwater drainage system. Surface run-off contaminated by materials in a concrete batching plant or casting yard should be adequately treated before disposal into stormwater drains.				
5.7.4	5.11.4	Portable chemical toilets and sewage holding tanks should be provided for handling the construction sewage generated by the workforce. A licensed contractor should be employed to provide appropriate and adequate portable toilets to cater populations and be responsible for appropriate disposal and maintenance.	Control of Sewage Effluent from on-site Workforce	Contractors	At all construction areas of the site during the entire construction period	ProPECC PN1/94, WPCO
5.7.5	5.11.5	Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the nearby environment during the construction phase of the Project. Regular environmental audit on the construction site should be conducted to provide an effective control of any malpractices and achieve continual improvement of environmental performance on site. It is anticipated that sewage generation during the construction phase of the Project would not cause water quality impact after undertaking all required measures.,	Control of Sewage Effluent from on-site Workforce	Contractors	At all construction areas of the site during the entire construction period	ProPECC PN1/94, WPCO
5.7.7	5.11.7	Good site practices should be adopted to clean the rubbish and litter on construction sites to avoid the rubbish, debris and litter from entering to nearby water bodies. It is recommended to clean the construction sites on a regular basis.	Control for general activities	Contractors	At all construction areas of the site during the entire construction period	ProPECC PN1/94, WPCO
5.7.8	5.11.8	Wastewater generated from the washing down of mixer trucks and drum mixers and similar equipment should wherever practicable be recycled. The discharge of wastewater should be kept to a minimum.	Control for general activities	Contractors	At all construction areas of the site during the entire construction period	ProPECC PN1/94, WPCO

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
5.7.9	5.11.9	To prevent pollution from wastewater overflow, the pump sump of any water recycling system should be provided with an on-line standby pump of adequate capacity and with automatic alternating devices.	Control for general activities	Contractors	At all construction areas of the site during the entire construction period	ProPECC PN1/94, WPCO
5.7.10	5.11.10	Under normal circumstances, surplus wastewater may be discharged into foul sewers after treatment in silt removal and pH adjustment facilities (to within the pH range of 6 to 10). Disposal of wastewater into stormdrains will require more elaborate treatment. Surface run-off should be segregated from the concreting works area as much as possible, and diverted to the stormwater drainage system. Surface run-off contaminated by materials during concreting works should be adequately treated before disposal into stormwater drains.	Control for general activities	Contractors	At all construction areas of the site during the entire construction period	ProPECC PN1/94, WPCO
5.7.11	5.11.11	Illegal disposal of chemicals should be strictly prohibited. Registration to EPD as a CWP (Chemical Waste Producers) is required if chemical wastes are generated and need to be disposed of. Disposal of chemical wastes should be carried out in compliance with the Waste Disposal Ordinance (WDO). The Code of Practice on Packaging, Labelling and Storage of Chemical Wastes published under the WDO should be used as a guideline for handling chemical wastes.	Control for accidental spillage	Contractors	At all construction areas of the site during the entire construction period	ProPECC PN1/94, WPCO
5.7.12	5.11.12	Oils and fuels should only be used and stored in designated areas which have pollution prevention facilities. To prevent spillage of fuels and solvents to any nearby storm water drains, fall tanks and storage areas should be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank. The bund should be drained of rainwater after a rain event.	Control for accidental spillage	Contractors	At all construction areas of the site during the entire construction period	ProPECC PN1/94, WPCO

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
Operational Phase						
5.7.13	5.11.13	The ProPECC PN 5/93 is applicable to the Project during the operational phase. Runoff from the cycle track will be conveyed into designated drainage systems. Silt trap/interceptor would be provided and maintained in the designated drainage systems to minimize water quality impact arising from surface runoff. The wastewater (i.e., sewage effluent from visitors) arising will be collected by existing sewerage pipeline. The administrative measures such as regular cleaning of cycle track surface, maintenance of silt trap, etc. would be in place.	Control for runoff and sewerage	Operator	At the project site area during the operational period	ProPECC PN5/93,

Table 13.4 Implementation Schedule of Recommended Mitigation Measures - Waste Management Implications

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
Construction Phase						
6.4.2	6.3.2	<p>C&D Materials</p> <ul style="list-style-type: none"> ▪ All C&D materials shall be sorted on-site into inert and non-inert C&D materials, and where the materials can be recycled or reused, they shall be further segregated. Inert material, or public fill will comprise stone, rock, masonry, brick, concrete and soil which is suitable for land reclamation and site formation whilst non-inert C&D materials include all other wastes generated from the construction process such as plastic packaging and vegetation (from site clearance). ▪ The Contractor shall be responsible for identifying what materials can be recycled/ reused, whether on-site or off-site. In the event of the latter, the Contractor shall make arrangements for the collection of the recyclable materials. Any remaining non-inert C&D materials shall be collected and disposed of at landfills whilst any inert C&D materials shall be re-used on site as far as possible. Alternatively, if no use of the inert material can be found on-site, the materials can be delivered to a Public Fill Reception Facilities after obtaining the appropriate licence. ▪ In order to monitor the disposal of C&D materials and solid wastes at public filling facilities and landfills, and control fly-tipping, a trip-ticket system shall be implemented by the Contractor, in accordance with the contract and the requirements of DB TC (Works) No. 6/2010 Trip Ticket System for Disposal of Construction and Demolition Materials. ▪ Prior to disposal off-site, non-inert C&D materials will have to be temporarily put in a suitably covered storage area where it will have to be regularly cleaned and maintained to avoid attracting vermin and pests. With proper on-site handling and storage as well as 	Waste management during construction	Contractors	At all construction areas of the site during the entire construction period	Annex 7 of EIAO-TM, Waste Disposal Ordinance

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
		<p>regular disposal of these wastes, no adverse impacts will be envisaged.</p> <ul style="list-style-type: none"> ▪ Dump trucks with mechanical cover shall be used to minimize windblown litter and dust during transportation of waste. 				
6.4.2	6.3.2	<p>Chemical Waste</p> <ul style="list-style-type: none"> ▪ Under the Waste Disposal (Chemical Waste) (General) Regulation, the Contractor shall register as a Chemical Waste Producer if chemical wastes such as spent lubricants and paints are generated on site. Only licensed chemical waste collectors shall be employed to collect chemical waste generated at site. The handling, storage, transportation and disposal of chemical wastes shall be conducted in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes and A Guide to the Chemical Waste Control Scheme, both published by EPD. 	Waste management during construction	Contractors	At all construction areas of the site during the entire construction period	Annex 7 of EIAO-TM, Waste Disposal Ordinance
6.4.2	6.3.2	<p>General Refuse</p> <ul style="list-style-type: none"> ▪ A sufficient number of covered bins shall be provided on site for the containment of general refuse to prevent visual impacts and nuisance to the sensitive surroundings. These bins shall be cleared daily and the collected waste disposed of to the refuse transfer stations or landfills. Further to the issue of DB TC (Works) No. 8/2010 Enhanced Specification for Site Cleanliness and Tidiness, the Contractor is required to maintain a clean and hygienic site throughout the project works. 	Waste management during construction	Contractors	At all construction areas of the site during the entire construction period	Annex 7 of EIAO-TM, Waste Disposal Ordinance
Operational Phase						

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
6.4.3	6.3.3	Waste collection facilities (e.g. litter bins) will be included in the design of the supporting facilities, and at regular intervals along the route. The Government Department responsible for managing the facilities will be responsible for arranging for regular collection of litter from these facilities. Separate collection bins shall be provided for aluminium cans, plastic drinks bottles and paper wastes, which will facilitate recycling of these waste streams.	Waste management during operation	Maintenance department	Operation	Annex 7 of EIAO-TM, Waste Disposal Ordinance
6.4.4	6.3.4	General refuse should be removed on a daily basis to minimize potential odour, pest and litter impacts. General refuse will have to be temporarily put in a suitably covered refuse collection point where it will have to be regularly cleaned and maintained to avoid attracting vermin and pests.	Waste management during operation	Maintenance department	Operation	Annex 7 of EIAO-TM, Waste Disposal Ordinance

Table 13.5 Implementation Schedule of Recommended Mitigation Measures – Ecology and Fisheries

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
Construction Phase						
8.9.4	8.2.3	In accordance with the Practice Note for Professional Persons on Construction Site Drainage, Environmental Protection Department, 1994 (ProPECC PN 1/94), best management practices should be implemented on site as far as practicable to control site runoff and drainage at all work sites during construction, so that the treated runoff will be discharged to public drainage system in compliance with the WPCO. Construction effluent, site run-off and sewage should be properly collected and/or treated. Wastewater from a construction site should be managed. Proper locations for discharge outlets of wastewater treatment facilities well away from the natural streams/rivers should be identified. Effluent monitoring should be incorporated to make sure that the discharged effluent from construction sites meets the effluent discharge guidelines.	Control for general activities	Contractors	At all construction areas of the site during the entire construction period	ProPECC PN1/94, WPCO
Operational Phase						
N/A	N/A	None specific	N/A	N/A	N/A	N/A

Table 13.6 Implementation Schedule of Recommended Mitigation Measures – Landscape and Visual

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
Construction Phase						
10.10.8 Table 10.12 CP1	10.3.1 Table 10.1 CP1	CP1 - Preservation of Existing Trees - Trees / woodland within the Works Area which are unaffected by the works shall be protected and preserved during the detailed design stage and construction phase. The tree preservation proposals shall be coordinated with the layout and design of the engineering and architectural works at the detailed design stage for further retention of individual trees. The preservation of existing tree shall provide instant greening and screening effect for proposed works. Tree protection works to be undertaken in accordance with DEVB TC(W) 4/2020 on “Tree Preservation” and tree risk assessment in accordance with “Guidelines for Tree Risk Assessment and Management Arrangement” by DEVB.	Good site practices and to minimize landscape and visual impact	Project Proponent – CEDD (Via the ER / Contractor)	Work sites during construction	Annex 10 and Annex 18 of EIAO-TM, DEVB TC(W) No. 4/2020
10.10.8 Table 10.12 CP2	10.3.1 Table 10.1 CP2	CP2 - Preservation of Existing Topsoil - Topsoil disturbed during the construction phase will be tested using a standard soil testing methodology and where it is found to be worthy of retention stored for re-use. The soil will be stockpiled to a maximum height of 2 m and will be either temporarily vegetated with hydro-seeded grass during construction or covered with a waterproof covering to prevent erosion. The stockpile should be turned over on a regular basis to avoid acidification and the degradation of the organic material, and reused after completion. Alternatively, if this is not practicable, it should be considered for use elsewhere, including other projects. This is considered a general measure for good site practice.	Good site practices and to minimize landscape and visual impact	Project Proponent – CEDD (Via the ER / Contractor)	Work sites during construction	Annex 10 and Annex 18 of EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
10.10.8 Table 10.12 CP3	10.3.1 Table 10.1 CP3	CP3 - Works Area and Temporary Works Areas - The landscape of these works areas should be restored to their original status or redesigned as new amenity areas following the completion of the construction phase. Construction site controls shall be enforced, where possible, to ensure that the landscape and visual impacts arising from the construction phase activities are minimized including the storage of materials, the location and appearance of site accommodation and the careful design of site lighting to prevent light spillage. Screen hoarding may not be practicable for several linear sections of this project due to the close viewing distances involved and spatial constraints of the works areas.	Good site practices and to minimize landscape and visual impact	Project Proponent – CEDD (Via the ER / Contractor)	Work sites during construction	Annex 10 and Annex 18 of EIAO-TM
10.10.8 Table 10.12 CP4	10.3.1 Table 10.1 CP4	CP4 - Mitigation Planting - Replanting of existing / disturbed vegetation shall be undertaken as soon as technically feasible during the construction phase. The priority shall be areas at the periphery of the site to ensure that proposed planting fulfils its role in mitigating the predicted impacts including screening views of the Project as early as possible during the operational phase.	Good site practices and to minimize landscape and visual impact	Project Proponent – CEDD (Via the ER / Contractor)	Work sites during construction	Annex 10 and Annex 18 of EIAO-TM, DEVB TC(W) No. 4/2020
10.10.8 Table 10.12 CP5	10.3.1 Table 10.1 CP5	CP5 - Transplantation of Existing Trees – For the 147 existing trees recommended to be transplanted under the current proposal, the final recipient site should be, as far as space allows, adjacent to their current locations alongside of the cycle track or within supporting facilities to retain their contribution to the local landscape context. The implementation programme of the proposed works should reserve enough time for advance tree transplanting preparation works to enhance the survival of these transplant trees. Transplanting proposals will be subject to the findings of the detailed tree survey and felling application undertaken at the detailed design stage and upon approval by relevant departments.	Good site practices and to minimize landscape and visual impact	Project Proponent – CEDD (Via the ER / Contractor)	Work sites during construction	Annex 10 and Annex 18 of EIAO-TM, DEVB TC(W) No. 4/2020

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
10.10.8 Table 10.12 CP6	10.3.1 Table 10.1 CP6	CP6 - Coordination with Concurrent Projects- Coordinated implementation program with concurrent projects such Castle Peak Road Widening in order to minimize cumulative visual and landscape impact during the construction phase.	Good site practices and to minimize landscape and visual impact	Project Proponent – CEDD (Via the ER / Contractor)	Work sites during construction	Annex 10 and Annex 18 of EIAO-TM
Operational Phase						
10.10.8 Table 10.13 OP1	10.3.1 Table 10.2 OP1	To incorporate design features considering: <ul style="list-style-type: none"> - Integrated design approach - Building and infrastructure massing - Treatment of built structures - Responsive building finishes - Responsive lighting design 	To enhance the visual compatibility to the neighbouring environment	Project Proponent – CEDD (Via the detailed design consultant / Contractor)	Project sites during design	Annex 10 and Annex 18 of EIAO-TM
10.10.8 Table 10.13 OP2	10.3.1 Table 10.2 OP2	Roadside and Amenity Planting – This planting will utilise large ornamental trees, either with high canopy and thin foliage to allow visual access in the views from the adjacent neighbourhoods to the further roadside or leisure landscape or dense foliage at selected locations to provide shade environment for cyclist and to give accent to the existing roadside planting. Native species will be utilised on sloping or wooded areas thereby enriching the ecological connectivity between existing woodland habitats with the advantage of creating a more coherent landscape framework. Large Feature Trees will be utilised along the cycle track where space allows, with the design intent to create shaded environment and instant greening effect at key sections of the route. Smaller ornamental and preferably native species will also be incorporated within the planting proposal to add to create visual interest for the public and to help create a comprehensive planting framework that could enhance both ecological and landscape value of the surroundings.	To enhance the visual compatibility to the neighbouring environment	Project Proponent – CEDD (Via the detailed design consultant / Contractor)	Project sites during design	Annex 10 and Annex 18 of EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
10.10.8 Table 10.13 OP3	10.3.1 Table 10.2 OP3	Compensatory Planting Proposals - The Project Proponent would implement the compensatory planting as proposed in the TPRP to be submitted to relevant government departments for approval in accordance with DEVB TC(W) No. 4/2020 to compensate for the trees to be felled. As far as practicable, implementation of compensatory tree planting should be of a ratio not less than 1:1 in terms of number of trees removed including dead trees, but excluding trees of undesirable species. Based on the cycle track layout, approximately 207 nos. of trees within areas of the existing public realm are proposed to be compensated. However, there would be limited space available for new tree planting in the vicinity of the proposed cycle track. Given these constraints, space within the Project is available for the planting of approximately 50 nos. new trees on a sustainable basis. As for the remaining 157 nos. new trees to be planted offsite, the Project Proponent will actively liaise with all the relevant departments throughout the TPRP process to confirm their planting locations.	To enhance the visual compatibility to the neighbouring environment	Project Proponent – CEDD (Via the detailed design consultant / Contractor)	Project sites during design	Annex 10 and Annex 18 of EIAO-TM,
10.10.8 Table 10.13 OP4	10.3.1 Table 10.2 OP4	Treatment of Retaining Wall and Slopes- In accordance with GEO Publication No. 1/2011, these engineering structures will be aesthetically enhanced through the use of soft landscape works including tree and shrub planting to give man-made slopes a more natural appearance blending into the local rural landscape. Whip sized planting is preferred on the face of soil cut slopes and at the crest and toe of the slope, and within berm planters these smaller, younger plants adapt to their new growing conditions more quickly than larger sized stock and establish a naturalistic effect more rapidly.	To enhance the visual compatibility to the neighbouring environment	Project Proponent – CEDD (Via the detailed design consultant / Contractor)	Project sites during design	Annex 10 and Annex 18 of EIAO-TM,

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
10.10.8 Table 10.13 OP5	10.3.1 Table 10.2 OP5	Protection and Reinstatement of Rocky Shore at Headlands – The proposed cycle bridges will pass over an area of rocky shore, with various existing rock outcrops and features visible at low tide. The design shall aim to avoid impacting these rocky features and where unavoidably impacted shall remove elements for later reinstatement on completion of the works in order to help integrate the new structures with the natural shoreline context.	To enhance the visual compatibility to the neighbouring environment	Project Proponent – CEDD (Via the detailed design consultant / Contractor)	Project sites during design	Annex 10 and Annex 18 of EIAO-TM,
10.10.8 Table 10.13 OP6	10.3.1 Table 10.2 OP6	Design of an Elegant Bridge Structure and Crossings – The proposed cycle bridge is potentially a visually prominent structure. As such it is important that careful attention is given to the design of the structure, the associated profile, arrangement of piers and the compatibility with its landscape context. The design of railing and parapets with sculptural and decorative forms shall be employed to lift the aesthetics of these structures beyond a purely functional / utilitarian appearance.	To enhance the visual compatibility to the neighbouring environment	Project Proponent – CEDD (Via the detailed design consultant / Contractor)	Project sites during design	Annex 10 and Annex 18 of EIAO-TM,

Table 13.7 Implementation Schedule of Recommended Mitigation Measures – Cultural Heritage

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
Construction Phase						
11.6.5, 11.6.6 Table 11.2	11.2.4, 11.2.5 Table 11.1	<ul style="list-style-type: none"> A condition survey will be carried out by qualified building surveyor or engineer in advance of works for other built heritage items that may be affected by ground-borne vibration. The Condition Survey Report should contain descriptions of the structure, identification of fragile elements, an appraisal of the condition and working methods for any proposed monitoring and precautionary measures that are recommended. The condition survey report for the other built heritage items must be submitted to AMO for comment before construction activities commence. The location of proposed monitoring points in the building should avoid damaging the historic fabric and agreed by the owner. The Contractor should implement the approved monitoring and precautionary measures. 	Condition Survey	Contractor	Works near HB-09, HB-11 and HB-12	Annex 10 of EIAO-TM
11.6.7 Table 11.2	11.2.6 Table 11.1	<ul style="list-style-type: none"> A buffer zone should be provided to separate the building or structure from the construction works. The buffer zone should be clearly marked out by temporary fencing. The buffer zone should be made at least 1m from the proposed works or if this is not possible as large as the site restrictions allow. 	Provision of Buffer Zones	Contractor	Works near HB-03, HB-07, HB-08, HB-09, HB-11, HB-12	Annex 10 of EIAO-TM
11.6.8, 11.6.9, Table 11.2	11.2.7, 11.2.8, Table 11.1	<ul style="list-style-type: none"> Any proposed works in close proximity to buildings or structures used by the public have the potential to create an unsafe environment for members of the public. The Contractor should ensure that safe public access if possible, through provision of clearly marked paths separated from the construction works areas is provided for any such affected cultural heritage structure. 	Provision of Safe Public Access	Contractor	Works near HB-03, HB-07, HB-09, HB-11, HB-12	Annex 10 of EIAO-TM
Operational Phase						
N/A	N/A	<ul style="list-style-type: none"> None specific 	N/A	N/A	N/A	N/A

14. Summary of Environmental Outcomes

14.1. Overview

- 14.1.1. This chapter summarises the key environmental outcomes arising from this EIA study, the approaches that have been adopted to either avoid or minimize various environmental impacts throughout the design process, and the associated environmental mitigation measures.
- 14.1.2. This EIA study predicted that, with the implementation of the recommended mitigation measures, this Project would be environmentally acceptable with no adverse residual impacts on the population and environmentally sensitive resources. The following section presents the key environmental outcomes of the Project.
- 14.1.3. The summary of environmental impacts and the recommended mitigation measures as well as the summary of key assessment assumptions, limitation of assessment methodologies are presented in **Table 14.1** and **Table 14.2** below.

14.2. Key Environmental Outcomes

Population and environmentally sensitive area protected

- 14.2.1. The Project is located at the southeast of Tuen Mun and within the Approved Tuen Mun OZP No. S/TM/35. Population and environmental sensitive areas in the vicinity of the Project site have been protected through the avoidance and / or minimisation of environmental impacts from the construction and operation of the Project. Population protected from noise impacts due to the construction and operation of the Project comprise Crossroads Foundation, Starfront Royale Tower 1 and 2, Seacoast Royale Tower 3, TMTL 518 Tower 8, Blessing Villa Block F, Surfside, Villa La Plage, Boulder Lodge Staff Quarter, Castle Peak Sam Chau Ma Temple, Fu Hong Society Yau Chong Home and the Salvation Army Sam Shing Nursery School, which are along the alignment of the Project. Adverse air quality impacts on sensitive receivers in the assessment area under both construction and operational phases would not be anticipated. Environmental sensitive areas protected from adverse water quality impacts include the adjacent water sensitive receivers such as Kadoorie Beach, Castle Peak Beach, Cafeteria Old Beach and Cafeteria New Beach.

Environmentally Friendly Design Adopted

- 14.2.2. In conserving the cycle track alignment, the key is to ensure continuity and connectivity to the entire cycle track network from Tuen Mun to Tsuen Wan. The Project at the Tuen Mun side is therefore located at Hoi Wing Road so as to connect with the existing cycle track network. This would make use of the existing cycle track network and land resources. This also reduces the amount of wastes to be generated from construction phase due to downsize of the Project.
- 14.2.3. In considering the interfacing issue with the future Tuen Mun Bypass Project, coordination works had been carried out with HyD and TD. As the open area near Hanford Garden would be occupied by the Tuen Mun Bypass Project, the entry/exit hub at Hoi Wah Road has been removed from this Project. Hence, less wastes and nuisances would be generated from construction phase of the Project.
- 14.2.4. Three marine viaduct sections from the original proposal have been removed. Hence, impact to marine ecology and adjacent water sensitive receivers, as well as the visual impacts on existing beaches have been minimized.
- 14.2.5. To avoid adverse water quality impact to the adjacent water sensitive receivers, pre-bored H-pile has been proposed as the foundation type for the marine viaduct section. Removal of excavated material from the piling works will be made via the pile casing thus avoiding the need for open sea dredging and minimizing sediment generation.
- 14.2.6. A study would be conducted prior to commencement of the marine works to explore if feasible and practicable ecological enhancement measures could be adopted as trial.

Environmental benefits of environmental protection measures recommended

- 14.2.7. With the consideration of various alternative options in Project design and construction methods, the Project has avoided or minimized the following environmental problems:
- i. Avoidance of three marine viaduct sections and impact to marine quality during construction phase;
 - ii. Avoidance of tree felling of plant species of conservation importance during construction phase;
 - iii. Avoidance of open sea dredging during construction phase;
 - iv. Minimization of impact to water quality during construction phase;
 - v. Minimization of impact to marine ecology and visual impacts during construction and operational phases;
 - vi. Minimization of wastewater effluent discharge during construction phase and operational phases;
 - vii. Minimize impact to air quality and noise by avoiding excessive civil construction works during construction phase; and
 - viii. Minimization of the footprint of the project.
- 14.2.8. Mitigation measures have been recommended to further reduce the potential environmental impacts due to construction and operation of the Project. Key recommended mitigation measures and any associated benefits are summarised in **Table 14.1** below.

Table 14.1 Summary of Environmental Impacts and the Recommended Mitigation Measures

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Relevant Standards / Criteria	Extent of Exceedance (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
<u>Air Quality Impact - Construction Phase</u>					
ASRs within 500m from the Project boundary	Potential dust impact	Annex 4 EIAO-TM	N/A	Implementation of dust control measures as recommended in Air Pollution Control (Construction Dust) Regulation	No adverse residual impact
<u>Air Quality Impact - Operational Phase</u>					
N/A	N/A	N/A	N/A	N/A	N/A
<u>Noise Impact - Construction Phase</u>					
NSRs within 300m from the Project boundary	Noise exceedances at NSRs	Annex 5 EIAO-TM	Predicted unmitigated construction noise would exceed EIAO-TM standard up to 33 dB(A)	Quality PME Temporary noise barrier and noise enclosure for PME Quieter equipment or construction method Well scheduling of works Implementation of Construction Noise Management Plan (CNMP) Recommendation on the use of PME	No adverse residual impact
<u>Noise Impact - Operational Phase</u>					
N/A	N/A	N/A	N/A	N/A	N/A

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Relevant Standards / Criteria	Extent of Exceedance (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
<u>Water Quality Impact - Construction Phase</u>					
WSRs within 500m from the Project boundary	No exceedance at WSRs.	Annex 6 EIAO-TM	Elevated SS concentration within 20m from marine piling work source (wet season), and 10m from marine piling work source (dry season).	Silt curtain at marine piling site Control of site runoff Control of spillage Control of sewage effluent from workforce	No residual impact
<u>Water Quality Impact - Operational Phase</u>					
WSRs within 500m from the Project boundary	No exceedance at WSRs.	Annex 6 EIAO-TM	N/A	Control of site runoff Control of sewage effluent from visitors	No residual impact
<u>Waste Management - Construction Phase</u>					
Project area	Estimated quantity of waste generation: - Inert C&D Materials: 4672 m ³ - Non-inert C&D Materials: 48 m ³	Annex 7 EIAO-TM	N/A	The reuse/ recycling of all materials on-site shall be implemented as far as possible prior to disposal of off-site; Implementation of good site practices, proper waste management plan	No residual impact
<u>Waste Management - Operational Phase</u>					
Project area	Limited amounts of general refuse	Annex 7 EIAO-TM	N/A	Proper storage and collection regularly.	No residual impact
<u>Ecology and Fisheries - Construction Phase</u>					
Marine piling works at cycle track viaduct section	0.0719 ha marine waters and 0.15 km sandy shore of low and low to moderate ecological value will be lost due to the marine piling works for the viaduct	Annex 7, 9 and 17 EIAO-TM	Potential impacts due to loss of small size of piling areas are minor.	Control of sediment release during piling works	No residual impact

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Relevant Standards / Criteria	Extent of Exceedance (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
<u>Ecology and Fisheries - Operational Phase</u>					
N/A	N/A	N/A	N/A	N/A	N/A
<u>Landscape and Visual - Construction Phase</u>					
Landscape resources and visual sensitive receivers identified near the Project Site.	The proposed works will occupy a small part of roadside or waterfront area and the majority of works only involves modification of existing road and tracks, footpaths, hard stands and planting areas. A relatively low level of disturbance to visual context and visual amenity available to most VSRs will result from the proposed works and the works will form only a small component in each identified landscape character areas within the Study Area.	Annexes 10 and 18 of EIAO-TM; EIAO GN-8/2002	N/A	Much of the works area will be reinstated to its original status or new amenity function on the completion of the construction.	Small and localised residual impacts are anticipated. However, they will not cause permanent impact to the majority of landscape resources.

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Relevant Standards / Criteria	Extent of Exceedance (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
<u>Landscape and Visual - Operational Phase</u>					
Landscape resources and visual sensitive receivers identified near the Project Site	The direct impacts of the works on this landscape resource will be relatively limited. Overall, it is evident that the works will not cause permanent impact to the majority of landscape resources, and where such residual impacts exist, they are small and localised. A relatively low level of disturbance to visual context and visual amenity available to most VSRs will result from the proposed works and the works will form only a small component in each identified landscape character areas within the Study Area.	Annexes 10 and 18 of EIAO-TM; EIAO GN-8/2002	N/A	Much of the works area will be reinstated to its original status or new amenity function on the completion of the construction.	Small and localised residual impacts are anticipated. However, they will not cause permanent impact to the majority of landscape resources.
<u>Cultural Heritage - Construction Phase</u>					
Other built heritage items without grading	Potential to physically come in contact with equipment, works, associated works	Annex 10 EIAO-TM	N/A	Buffer Zones (BZ), Safe Public Access (SPA), Condition Survey (CS)	No residual impact
<u>Cultural Heritage - Operational Phase</u>					
N/A	N/A	N/A	N/A	N/A	N/A

Table 14.2 Key Assessment Assumptions and Limitation of Assessment Methodologies

Assessment Methodology	Key Assessment Assumption	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD	Proposed Alternative Assessment Tools/ Assumptions (if applicable)
<u>Air Quality Impact</u>				
<p><u>Construction Phase</u></p> <ul style="list-style-type: none"> The air quality impact assessment for the Project follows Annex 4 and Annex 12 of the Technical Memorandum on Environmental Impact Assessment (TM-EIAO) and requirement from the EIA Study Brief (ESB-295/2016). Qualitative assessment was conducted for air quality impact for construction phase 	<ul style="list-style-type: none"> The qualitative assessment was conducted based on the Project design and construction details available at the time of the EIA study. 	N/A	N/A	N/A
<p><u>Operational Phase</u></p> <p>The Project is not an air polluting source. Thus, no adverse air quality impact is anticipated during the operational phase of the Project. No mitigation measures is expected to be required during operational phase.</p>	N/A	N/A	N/A	N/A
<u>Noise Impact</u>				
<p><u>Construction Phase</u></p> <ul style="list-style-type: none"> The noise impact assessment for the Project follows Annex 5 and Annex 13 of the EIAO-TM, the requirement in the EIA Study Brief (ESB-295/2016) and Technical Memorandum on Noise from Construction Works other than Percussive Piling (GW-TM) under the Noise Control Ordinance (NCO). 	<ul style="list-style-type: none"> The construction noise was predicted based on standard acoustic principles. Sound Power Levels (SWLs) of powered mechanical equipment (PME) were taken from Table 3 of the GW-TM. Where no relevant SWL can be found in the GW-TM and other PME, reference is made to the information relating to Quality Powered Mechanical Equipment (QPME) available at EPD's web site or other previous similar studies or from measurements taken at other sites in Hong Kong. 	<ul style="list-style-type: none"> The prediction of construction noise impact was based on the procedures in GW-TM under the NCO. The programme and plant inventory for proposed construction works adopted in the assessment might vary in future. 	Assessment methodology as required in Appendix B of the EIA Study Brief	N/A

Assessment Methodology	Key Assessment Assumption	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD	Proposed Alternative Assessment Tools/ Assumptions (if applicable)
<p><u>Operational Phase</u> The Project is not a noise emitting source. Thus, no adverse noise quality impact is anticipated during the operational phase of the Project. No mitigation measures are expected to be required during operational phase.</p>	N/A	N/A	N/A	N/A
<u>Water Quality Impact</u>				
<p><u>Construction Phase</u></p> <ul style="list-style-type: none"> The water quality impact assessment for the Project follows Annexes 6 and 14 of the EIAO-TM as well as the requirements given in EIA Study Brief (No. ESB-295/2016). Qualitative assessment was conducted for water quality impact in operational phase, whilst the impacts associated to the piling activities under the construction phase have been evaluated quantitatively with reference to the methodology provided in Appendix 5-1 of the EIA Report. 	N/A	N/A	Appendix C of the EIA Study Brief	<ul style="list-style-type: none"> Methodology of the assessment of the associated water quality impacts is provided in Appendix 5-1.
<p><u>Operational Phase</u> During the operational phase, runoff from the cycle track will be conveyed into designated drainage systems. Therefore, impact on water quality is not anticipated.</p>	N/A	N/A	N/A	N/A
<u>Waste Management Implications</u>				
<ul style="list-style-type: none"> The waste management implication assessment for the Project follows Annexes 7 and 15 of the EIAO-TM as well as the requirements given in EIA Study Brief (No. ESB-295/2016). 	<ul style="list-style-type: none"> The waste quantities to be generate from the Project during construction and operational phases were estimated based on the engineering assessment. 	N/A	Appendix D of the EIA Study Brief	N/A

Assessment Methodology	Key Assessment Assumption	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD	Proposed Alternative Assessment Tools/ Assumptions (if applicable)
<u>Land Contamination</u>				
<ul style="list-style-type: none"> ▪ The land contamination assessment for the Project follows Annex 19 of the EIAO-TM, requirements given in EIA Study Brief (No. ESB-295/2016) as well as the following: ▪ Guidance Note for Contaminated Land Assessment and Remediation (EPD, 2007) ▪ Practice Guide for investigation and Remediation of Contaminated Land (EPD, 2011) ▪ Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management (EPD, 2007) 	<ul style="list-style-type: none"> ▪ The assessment was undertaken based on historical land use and site reconnaissance. 	N/A	N/A	N/A
<u>Ecology and Fisheries</u>				
<ul style="list-style-type: none"> ▪ The ecological impact assessment for the Project follows: ▪ Annexes 8 and 16 of the EIAO-TM for the criteria, general approach and methodology for assessment of ecological impacts ▪ EIAO Guidance Note No. 3/2010, No. 6/2010, No. 7/2010 and No. 10/2010 for general guidelines for conducting ecological baseline surveys and environmental mitigation measure recommendations ▪ The fisheries impact assessment for the Project follows Annexes 9 and 17 of the EIAO-TM as well as the requirements given in EIA Study Brief (No. ESB-295/2016). 	<ul style="list-style-type: none"> ▪ The assessment and evaluation of ecological impact was undertaken based on the results of literature review, and ecological field survey. ▪ The assessment and evaluation of fisheries impact was undertaken based on the results of literature review and water quality modelling results. 	N/A	N/A	N/A

Assessment Methodology	Key Assessment Assumption	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD	Proposed Alternative Assessment Tools/ Assumptions (if applicable)
<u>Cultural Heritage Impact</u>				
The cultural heritage impact assessment for the Project follows: <ul style="list-style-type: none"> ▪ Antiquities and Monuments Ordinance (Cap. 53); ▪ Annexes 10 & 19 of the EIAO-TM; ▪ Requirements given in EIA Study Brief (No. ESB-295/2016); ▪ Proposed Grading and Graded Historic Buildings Classification; ▪ Guidelines for Marine Archaeological Investigation; and ▪ Hong Kong Planning Standards and Guidelines 	<ul style="list-style-type: none"> ▪ No works area will be located in close proximity to the identified heritage resources. 	N/A	Appendix H of the EIA Study Brief	N/A
<u>Landscape and Visual Impact</u>				
The landscape and visual impact assessment for the Project follows: <ul style="list-style-type: none"> ▪ Annexes 10 & 18 of the EIAO-TM; ▪ Requirements given in EIA Study Brief (No. ESB-295/2016); and ▪ EIAO Guidance Note No. 8/2010 	<ul style="list-style-type: none"> ▪ Much of the works area will be reinstated to its original status or new amenity function on the completion of the construction. 	N/A	N/A	N/A

