

## 16 SUMMARY OF ENVIRONMENTAL OUTCOMES

### 16.1 Overview

This chapter summarizes the overall environmental outcome due to the development of NENT NDAs in accordance with the Clause 3.4.18 of the Study Brief.

### 16.2 Population and Environmental Areas Protected

#### 16.2.1 Affected Population along the Project

According to the Recommended Outline Development Plan, the estimated total number of residents and employees for the NDAs is approximately 174,900 and 37,700. The total area of the NDA is 614ha. The plot ratio for KTN NDA and FLN NDA is 3.5-6 and 2-6 respectively. The estimated number of residents and employees and the land area for each of NDAs is summarized as follows:

NDA	Residents	Employees	Land (ha)
KTN NDA	101,600	31,200	450
FL NDA	73,300	6,500	164

Land resumption is required for the development. The study does endeavour to make the best use of Government lands to avoid affecting private lands, but the areas suitable for development invariably involve areas of private ownership. Also, developments for habitation have to be in contiguous and functional patterns, whereas the private lands and Government lands could be interwoven such that they are inseparable for independent development. There is just no single piece of Government land like a reclamation area that could be identified for a self-contained development. Resumption of private land is inevitable.

To minimize the potential environmental nuisance during construction phase, phasing of construction programme is proposed. In addition, good site practices for air quality, noise and water quality should be fully considered. In operational phase, provision of vertical noise barriers, vertical noise barriers with cantilevered arm, low noise surfacing, semi-enclosures / full enclosures and controlled to acceptable noise levels were proposed so as to minimize the nuisance.

#### 16.2.2 Habitat Compensation

Construction of infrastructure and road network in NDA development would cause a loss of ecologically-important habitats, especially wetlands. A total of 8.98 ha of wetland habitat of low to moderate or moderate ecological value would be impacted directly. Other wetlands in the area would be impacted indirectly, mostly as a result of disturbance, and these impacts would also require mitigation. The protection and enhancement of 37.17 ha of Long Valley and have it managed as a whole as the Long Valley Nature Park could serve to provide an on-site mitigation measure to compensate for the wetland loss due to the NDA development.

Compensatory habitat creation would also be required to mitigate for impacts to secondary woodland and plantations of ecological importance (including existing mitigation plantations). Loss of 0.26 ha of secondary woodland and 8.65 ha of plantation of ecological importance will be compensated by woodland planting of native species in locations zoned

for Green Belt in KTN areas E1-8 and G1-3. A potential planting area of 16.03ha has been identified.

### **16.2.3 Long Valley and Ho Sheung Heung**

The area of highest ecological value in Long Valley (the area of wet agriculture south of Sheung Yue River and north of Yin Kong) would be zoned for the creation of a Nature Park. The Nature Park would ensure long-term protection and management of this area, as well as providing an opportunity for wetland enhancement as mitigation for ecological impacts on wetlands elsewhere in the NDAs. Enhancement of the Nature Park would also compensate for impacts on other areas of the Long Valley and Ho Sheung Heung Priority Site, in agreement with the New Nature Conservation Policy. Upon approval of the EIA Report, a Habitat Creation and Management Plan (HCMP) including the ecological objectives, targets and habitat management regime would be further formulated under a consultancy study and submitted under the EIAO by the project proponents with consultation of relevant stakeholders including AFCD.

The existing land zoning would be retained for areas of agricultural land to the north of Sheung Yue River and to the south of the proposed Nature Park (AGR) as well as the area surrounding Ho Sheung Heung (V) and the Ho Sheung Heung *fung shui* woodland (GB). Given that the planning zones of these areas are not changed, it is considered that there would be no direct habitat impacts from development of the NDAs. To strengthen the planning control over the AGR zone to reflect the importance of this area being on the flight path of the birds and a buffer zone for the LVNP, stringent planning control should be exercised and such intention should be stated in the Explanatory Statement of the relevant Layout Plan.

Additional measures to avoid and minimize impacts to these ecologically important habitats and fauna and flora species are summarized in **Section 16.4** below.

### **16.2.4 Man Kam To Road Egret**

Man Kam To Road egret would be impacted directly by construction of the Farling Bypass and roundabout connection to Man Kam To Road. It is proposed that these impacts should be mitigated by provision of habitat suitable for nesting egrets at Site A1-7 within the FLN NDA. The proposed site of this compensatory planting contains a former meander of the Ng Tung River currently managed as mitigation for the ecological impacts of river channelization. This habitat management should continue, with further enhancement of the site to be achieved by planting of suitable bamboo and/or tree species to attract breeding ardeids. The area would be zoned as Conservation Area (CA) to provide protection for the habitats to be provided. Public access into the site would be restricted to minimize impacts to breeding ardeids and other wildlife.

### **16.2.5 Ma Tso Lung Stream in KTN NDA**

Three-banded Box Terrapin, a globally-threatened species, has been recorded near the natural stream at Ma Tso Lung in KTN ND. To minimise potential impacts to this species and other fauna using the stream, a Green Belt land zoning would be retained for the stream to protect riparian vegetation. There would be a presumption against development within this Green Belt zone buffer, except for the

construction of a section of the LMC Loop Eastern Connection Road over and near to a section of the lower reaches of the stream. .

In this location, where the construction of the LMC Loop Eastern Connection Road will result in unavoidable impact to the stream, the road will cross the stream on viaduct. A section of 130m of Ma Tso Lung Stream will be diverted and reinstated with natural sides and bottom and with features, including pools and riffles to enhance its ecological value, with a minimum buffer width of 15m from the road on the west side. On the east side a buffer width of up to 30m would be maintained from any development under the Project, including Site F1-3 which is zoned Other Uses (Research and Development in Support of Lok Ma Chau Loop Development). The total minimum width of the buffer zone will be 45m. The buffer zone in this section would be planted with riparian trees, shrubs and other vegetation in order to maintain and enhance ecological linkages along the stream.

Additional measures to avoid and minimize impacts to these ecologically important habitats and fauna are summarized in **Section 16.4** below.

#### **16.2.6 Siu Hang San Tsuen Stream in FLN NDA**

This small stream of ecological importance for fish and dragonflies has largely been excluded from the FLN NDA. The Fanling Bypass will cross the stream at a downstream location, where the stream flows in a concrete-lined channel and is of low to moderate ecological value. The road will be placed on a viaduct, thus avoiding direct impacts to the stream and stream fauna at this location. There will be no impacts to the semi-natural upstream section of the stream of moderate to high ecological value which is outside the Project boundary. The detailed design of the viaduct and the adjacent Open Space zone should take into account the ecological importance of the stream in order to avoid or minimize ecological impacts.

Additional measures to avoid and minimize impacts to Siu Hang San Tsuen Stream and fauna are summarized in **Section 16.4** below.

#### **16.2.7 Key Assessment Assumptions and Limitation of Assessment Methodologies**

In accordance with Clause 3.4.16 of the EIA Study Brief, the key assessment assumptions and limitation of assessment methodologies are presented in **Appendix 16-1**.

### **16.3 Environmental Friendly Design and Benefit**

#### **16.3.1 Pedestrian and Cycle Track Network and Linkages**

Walkways and footpaths within the NDA will be pedestrian friendly, continuous and landscaped in order to provide a pleasant walking environment which can encourage people to walk. Pedestrian movement linking the Town Centre and the Station to the outer fringe areas of the NDA is provided via the east-west and north-south green corridors. A secondary open space loop provides safe and comfortable connection between different parts of the NDA in east-west and north-south direction. Elevated pedestrian linkage to Kwu Tung South across the Fanling Highway is proposed for linking the Town Centre/Station to the south. Not least, the central part of KTN NDA, where the possible Kwu Tung Station is located, is pedestrianised to provide a pleasant vehicle-free walking environment. Cyclists are suggested to park at the edge of this area to

create a completely safe walking and playing area. To ensure better linkage between Kwu Tung South and KTN NDA, the existing footbridge crosses Fanling Highway will be enhanced, possibly with much greening features.

A cycling track is provided along the open space loop and connects to FLN NDA via Sheung Yu River. The cycling track will be segregated from traffic. Pedestrian walkways and cycling tracks will be completely separated.

### 16.3.2 District Cooling System

District Cooling System (DCS) is proposed in KTN NDA to reduce energy consumption, and to reduce green house gas emission to facilitate flexibility in energy savings and to support low carbon economy.

Sewage effluent discharged from the sewage treatment plant is proposed to be reused in the heat rejection system of DCS.

### 16.3.3 Treated Sewage Effluent (TSE)

Reuse of Treated Sewage Effluent will have positive contributions to conserving water and reducing water pollution. TSE can be used as toilet flushing, landscape irrigation and make-up water for DCS. As tertiary treatment of the sewage generated from the NDAs will be necessary for producing relatively high quality of TSE to meet the stringent requirement of “no net increase in pollution load to Deep Bay” policy, there would be relatively limited additional cost to further improve the water quality of TSE to meet the standards for non-potable purpose.

## 16.4 Summary of the Measures taken for the Avoidance and Minimization of Environmental Impacts

The various chapters of this EIA Report have presented key measures to minimise the potential environmental impacts associated with the Project in the planning, design, construction and operational stages. Key measures to minimise the environmental impacts are summarized as below:

### 16.4.1 Phasing of Implementation

In order to minimize the environmental nuisance during construction phase, the Project will be implemented in phases. **Table 16.1** summarizes the phasing of implementation.

**Table 16.1** Summary of implementation programme

Development Package	Description	Work Period	Description of Work
Advance Works	Major Infrastructure and development of Advance Works at KTN and FLN	2017 - 2024	<ul style="list-style-type: none"> <li>• Site formation and infrastructure</li> <li>• Fanling Bypass (Eastern Section)</li> <li>• Management of Stockpiling material</li> <li>• Advanced ecological compensation works at mitigation meanders and</li> </ul>

Development Package	Description	Work Period	Description of Work
			suitable areas along main river channels
1	First stage of infrastructure and development at KTN and FLN	2018 - 2021	<ul style="list-style-type: none"> <li>• Site formation and infrastructure</li> <li>• Ecological compensation works</li> <li>• Sewerage and water supply networks</li> <li>• School, hospital, HKPF facilities and housing site</li> <li>• Fanling Bypass (Eastern Section)</li> <li>• STW Extension Phase 1B at FLN</li> <li>• Village resite in KTN and FLN</li> <li>• Secondary service reservoir</li> <li>• Trunk mains and distribution mains</li> </ul>
2	Infrastructure and development at KTN (South)	2018 - 2029	<ul style="list-style-type: none"> <li>• Site formation and infrastructure</li> <li>• Fanling Highway Widening</li> <li>• Kwu Tung Interchange</li> <li>• Pak Shek Au Interchange</li> </ul>
3	Infrastructure and development at KTN (North)	2020 - 2028	<ul style="list-style-type: none"> <li>• Site formation and infrastructure</li> </ul>
4	Remaining Infrastructure and development at FLN (East)	2021 – 2029	<ul style="list-style-type: none"> <li>• Site formation and infrastructure</li> <li>• Secondary service reservoir</li> <li>• Trunk mains and distribution mains</li> <li>• Fanling Bypass (Western Section)</li> <li>• Po Shek Wu Interchange Improvement</li> </ul>
5	Remaining Infrastructure and development at FLN (West)	2022 - 2028	<ul style="list-style-type: none"> <li>• Site formation and infrastructure</li> <li>• STW Extension Phase 2</li> </ul>

Note:

Works period of site formation for lots subject to village removal term is not included

Furthermore, advance provision of measures to mitigate for ecological impacts is required at FLN A1-7 where compensatory provision of egret habitat will be undertaken required prior to the existing Man Kam To egret site being lost to the creation of a roundabout at the western terminus of the Fanling Bypass. Advance provision of habitat is

scheduled to commence in 2014; this will allow five years for the habitat to become established prior to commencement of construction of the western section of the Fanling Bypass.

Design, construction and establishment of Long Valley Nature Park will be undertaken prior to significant impacts taking place to wetland habitats elsewhere in the NDAs.

#### **16.4.2 Construction Dust**

During construction phase, watering 12 times per day to all exposed area will be implemented. In addition, other dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation and good site practices would be in place to further minimize construction dust impact. Some examples of these good site practices include:

- Any excavated or stockpile of dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet and then removed or backfilled or reinstated where practicable within 24 hours of the excavation or unloading;
- Any dusty materials remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads;
- A stockpile of dusty material should not be extended beyond the pedestrian barriers, fencing or traffic cones;
- The load of dusty materials on a vehicle leaving a construction site should be covered entirely by impervious sheeting to ensure that the dusty materials do not leak from the vehicle;
- Where practicable, vehicle washing facilities with high pressure water jet should be provided at every discernible or designated vehicle exit point. The area where vehicle washing takes place and the road section between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;
- When there are open excavation and reinstatement works, hoarding of not less than 2.4m high should be provided as far as practicable along the site boundary with provision for public crossing. Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period.

#### **16.4.3 Odour**

Odour impact assessments have been conducted for proposed SWHSTW Expansion. With the implementation of odour control measures, such as covering the major odour sources and provision of deodourising treatment, it is anticipated that the odour impact would be acceptable.

#### **16.4.4 Construction Noise**

The following mitigation measures have been considered to tackle the construction noise impact:

- Good site practices to limit noise emissions at the source;
- Use of quiet plant and working methods;
- Use of site hoarding as noise barrier to screen noise at ground level of NSRs;
- Use of temporary noise barriers, enclosure and acoustic mat to screen noise from relatively static PME's;
- Scheduling of construction works outside school examination periods in critical area;
- Alternative use of plant items within one worksite, wherever practicable, and

#### **16.4.5 Road Traffic Noise and Fixed Noise**

Operational noise impacts associated with helicopter noise, industrial noise, fixed noise sources and road traffic noise have also been investigated. Fixed noise source sound power level limits are specified for district cooling system (DCS), sewage treatment works (STW) extension, pumping station (PS) and sewage pumping station (SPS) with necessary noise control measures to comply with statutory criteria. Provision of acoustic insulation with air-conditioning is recommended to the landuse (KTN D1-12, KTN D1-13, KTN F1-3 and KTN F1-4) which is affected by helicopter noise and shooting noise near Lo Wu Classification Range. Operational road traffic noise impact on the sensitive uses outside NDA area and existing sensitive uses within NDA area would be mitigated by provision of vertical noise barriers, vertical noise barriers with cantilevered arm, low noise surfacing, semi-enclosures / full enclosures and controlled to acceptable noise levels. Similar mitigation measures have been recommended for the planned noise sensitive uses within NDA area to comply with the statutory criteria. Provision of acoustic insulation with air conditioning has been recommended for educational institutions FLN C2-9 (East and south facades between 4/F to 8/F).

#### **16.4.6 Water Quality**

Good site practices such as temporary drainage, dike or embankment for flood protection, efficient silt removal facilities, covering exposed areas with tarpaulin, vehicular washing facilities at construction site exits, oil interceptors etc. would be implemented to minimize water quality impacts during the construction phase. Practice Note for Professional Persons on Construction site Drainage, Environmental Protection Department, 1994 (ProPECC PN 1/94) should be fully implemented.

During operational phase, sewage arising from all the proposed developments within the NDAs and closed area would be collected by sewer to the upgraded/ expanded SWHSTW before disposal. The no-net increase in pollution loading policy would be complied by compensating the existing pollution loading in Deep Bay catchment through diversion

into the upgraded/expanded SWHSTW. It is recommended to implement proper drainage system with silt traps and oil interceptors as well as good management practices to mitigate any potential water quality impact from road surface/ open area runoff during operational phase.

#### **16.4.7 Sewerage and Sewage**

The existing treatment capacity of SWHSTW is 93,000m<sup>3</sup>/day, which does not have any spare capacity to cater for sewage flows from NDAs development and therefore the capacity of SWHSTW recommended to be expanded. Apart from NDAs, there are other planned developments and natural growth within Sewage Catchment Area (SCA) of SWHSTW and therefore SWHSTW is proposed to be expanded to a capacity of 190,000m<sup>3</sup>/day ADWF. Apart from this, effluent standard of SWHSTW needs to be further tightened to meet the requirement of 'no net increase in pollution loading to Deep Bay'.

In addition, sewerage systems including sewage pumping stations are proposed to convey sewage flow from the development site to STWs.

Also, Treated Sewage Effluent (TSE) reuse scheme has been proposed in NDA. The TSE from SHWSTW is proposed to supply to the two NDA and possibly outside NDAs in long term for non-potable uses. The water quality of the TSE is proposed to meet the stringent standard as to minimise the potential health impact.

#### **16.4.8 Waste Management**

The amount of C&D material that would need to be transported off site has been minimized as far as practicable in the implementation programme. Opportunity for re-using C&D material has been fully considered and implemented where practicable. Good site practices have been recommended for chemical waste, general refuse and disposal of chemical waste will follow the relevant ordinances.

#### **16.4.9 Land Contamination**

Site investigation works involving sampling and testing of soil and groundwater were conducted at 4 identified government sites (i.e. 3 in KTN and 1 in FLN). No soil and groundwater contamination was detected, except the anomalistic high arsenic was detected in all 3 sites in KTN.

All other potentially contaminated sites identified in the two NDAs (include Fanling Bypass) were inaccessible. Therefore, detailed SI for these sites should be conducted when they are resumed and handed over to the Project Proponent (PP). The PP would prepare and submit the Supplementary CAP to EPD prior to the commencement of SI works. Following on from the submission of CAP and completion of SI, the PP would prepare CAR, RAP and RR for contaminants other than As (which should follow the recommendations of the Health Risk Assessment Report) and submit to EPD for agreement prior to commencement of the development works on these sites.

Anomalistic high arsenic detected in KTN was investigated. The investigation results indicated that the high arsenic in KTN is likely to be naturally occurred. A Health Risk Assessment is being conducted for assessing the health risk levels due to the inhalation of arsenic-containing dust during construction stage and incidental ingestion of arsenic-containing soil during operational stage. A Health Risk Assessment Report has been prepared to summarize the extent mapping



of arsenic level and health risk assessment findings, and appended in this land contamination assessment chapter of EIA Report., once ready. The treatment methods for high arsenic background were also presented in the Health Risk Assessment Report in case the assessment findings concluded that treatment of high background arsenic soil is required.

#### **16.4.10 Cultural Heritage**

##### **16.4.10.1 Archaeology**

The Cultural Heritage Assessment Area (CHAA) shall be 100m expanded from the boundary of the NDAs and associated infrastructure works. One site of archaeological interest has been identified in the CHAA.

In addition, the archaeological survey comprising field scanning of a total area of 70 hectares, 39 auger holes and 35 test pits conducted for this Project identified 20 locations of archaeological potential within the CHAA. Sites 1, 2, 3 and 4 and Spots A and C to I in the KTN NDA CHAA; and Sites 5, 6, 7, 8 and 10 in the FLN NDA CHAA were identified to be potentially impacted by the proposed development. All potential impacts are considered acceptable with appropriate mitigation measures. The recommended archaeological mitigation measures include preservation in-situ for Site 7, Survey-cum-Rescue Excavation on impacted areas after land resumption but before construction commencement of the development that involve soil excavation in Sites 1 to 3, Spots C and I and Site 5. The purpose is to determine the precise archaeological extent and preserve the impacted archaeological deposits as far as possible.

The recommended archaeological mitigation measures include preservation in-situ for Site 7, Survey-cum-Rescue Excavation on impacted areas after land resumption but before construction commencement of the development that involve soil excavation in Sites 1 to 3, Spots C and I and Site 5. The purpose is to determine the precise archaeological extent and preserve the impacted archaeological deposits as far as possible.

Besides, as some areas are found to be inaccessible or land access consents were not obtained during the EIA stage of the Project.

Further archaeological surveys have been recommended after land resumption but before construction in the not-yet-surveyed-areas with medium archaeological potential located in the areas with proposed development to obtain further detailed field data for a detail assessment regarding the archaeological potential and potential impacts caused by the development. Appropriate mitigation measures will be recommended if necessary.

Induction training should be provided to the construction contractor before the commencement of the excavation works in Spots A and D to H and Sites 4 and 10. An induction will be conducted as part of the environmental health and safety induction programme to all site staff before they are deployed on site. The induction will include an introduction on the historical development of the Site, the possible archaeological remains that may be encountered during ground excavation works as well as the reporting procedures in case suspected archaeological remains are identified. A set of the presentation material (in the form of power point presentation) with content details will be prepared by an archaeologist and submitted to AMO for reference and

record purpose. The first induction briefing will be video recorded and it will be used as induction briefing material for new site staff.

Archaeological Impact Assessment has also been recommended for zonings where detailed design is not available for detailed assessment. Appropriate mitigation measures will be recommended if necessary based on the outcome of the assessment results.

The recommended archaeological mitigation measures including preservation in-situ, further archaeological survey before any follow up actions, and Survey-cum-Excavation should be conducted by a professional archaeologist and for archaeological works require fieldworks, the archaeologist should obtain a Licence to Excavate and Search for Antiquities from the Authority under the AM Ordinance. Prior to the application for the licence, archaeological proposals detailing the objectives, work scope, methodology, staffing plan and work programme of the archaeological works should be agreed with the AMO. For preservation in-situ with further archaeological survey, appropriate follow-up actions, including preservation of the significant archaeological deposits in-situ would then be considered based on the survey result, which would be conducted if necessary, with the consent of AMO.

Pursuant to the Antiquities and Monuments Ordinance, the construction contractor should inform the AMO immediately in case of discovery of antiquities or supposed antiquities in the course of soil excavation works in construction stage.

#### **16.4.10.2 Built Heritage**

Literature review supplemented by built heritage survey identified two Declared Monuments, two Grade 1 historic building, three Grade 2 historic buildings, seven Grade 3 historic buildings, two nil grade historic buildings, one Proposed Grade 1 historic building, 25 historic buildings and structures and 104 landscape features within the CHAA.

Within the KTN NDA CHAA, no direct impact is expected on any declared monuments and graded/proposed historic buildings. Potential vibration impacts on two Grade 2 (G202 and G203), and two Grade 3 (G303 and G308) historic buildings are anticipated. Regarding built heritage items not listed by AMO, six historic buildings and structures (ancillary structures of G303, HKT01, HKT02, HKT03 (Entrance Gate), HKT04 and HKT08) and thirty-one landscape features (KT01 – KT10, KT12, KT13, KT16, KT17, KT18, KT36, KT38 – KT41, KT43 – KT45, KT47, KT50, KT52, KT54, KT61 – KT63 and KT69) are identified to have direct impact arising from the proposed development, and one historic building (HKT03 (Main Building)) and one landscape feature (KT57) are potentially affected by the vibration due to the construction works at adjacent area. Relocation may be required for HKT01, HKT02, and Entrance Gate of HKT03 under KTN NDA.

Within the FLN NDA CHAA, no direct and indirect impacts is anticipated for the built heritage items listed by AMO. Regarding built heritage items not listed by AMO, no direct impact is expected on historic buildings but six landscape features (FL01, FL11, FL16, FL19, FL33 and FL35) are expected to have direct impact. One historical building (HFL05) and nine landscape features (FL02, FL04, FL05, FL18, FL22, FL24, FL27, FL31 and FL36) are potentially affected by vibration due to the construction works at adjacent area. Relocation may be required for FL19 under FLN NDA.

Appropriate mitigation measures comprising a baseline condition survey and baseline vibration impact assessment to be conducted during pre-construction stage by qualified building surveyor or qualified structural engineer to define the vibration limit and to evaluate if construction vibration monitoring and structural strengthening measures are required during construction phase to ensure the construction performance meets with the vibration standard stated in the EIA report. Cartographic and photographic records are also recommended to mitigate the impacts as far as possible.

It is also recommended the contractor should ensure that the change of watertable induced by the construction works and development activities will not result in settlement of built heritage.

For the retained built heritage items in developable area, drainage system and access route would be designed to prevent the persevered flooding and maintain the accessibility to the built heritage.

#### **16.4.11 Landscape and Visual**

At the Project planning stage, many factors have been considered to avoid, reduce and/ or help compensate for the potential L&V impacts of the NDAs, with highest priority given to avoidance. Several alternative layouts/profiles for the Project have been assessed, taking into account potential L&V impacts, but also taking account of other considerations such as geotechnical constraints, existing settlements and infrastructure, as well as other environmental factors such as cultural heritage, water, noise etc. A summary of the planning context, framework and concepts that have shaped the revised RODPs, highlighting those that minimize the negative L&V impacts of each NDA.

As well as the planning principles and concepts outlined above (considered as mitigation prior to construction), measures to further avoid, as well as reduce and/or compensate for particular unavoidable impacts during the construction and/or operation of the Project have all been considered, with highest priority given to impact avoidance and reduction.

These proposed mitigation measures should be implemented as early as possible but those listed here have not been categorized separately as 'design', 'construction' or 'operation' mitigation measures due to measures often spanning different phases of the Project. For example soft landscape mitigation measures will be considered during detailed design, most likely be implemented during construction, and their full effect often not appreciated until 10 years on, when the Project is operational. Equally, detailed design measures such as fine tuning the footprint and design of a building may reduce construction impacts but will also reduce operation impacts.

Each NDA has multiple components due to be built in different phases and includes projects designated for stand-alone EIA under Schedule 2 of the EIAO. For each component or phase, all of the proposed mitigation measures should be considered and implemented as appropriate and specific to the Schedule 2 DPs.

- **Minimum Topographical Change (MM1)**

To minimise landscape and visual impacts, the footprint and elevation of such elements should be optimised to reduce topographical/ landform changes, as well as reduce land take and interference with natural terrain. Where there is a need to significantly cut into the existing landform,

retaining walls should be considered as well as cut slopes, to minimize landform changes and land resumption, while also considering visual amenity. Earthworks and engineered slopes should be designed to be a visually interesting landform, compatible with the surrounding landscape and to mimic the natural contouring and terrain e.g. introduction and continuation of natural features such as spurs and ridges where appropriate, to support assimilation with the hillside setting.

- Detailed Design (Visual) (MM2)

The planning of the revised RODP has considered reducing visual impacts, enhancing visual amenity and keeping visual corridors.

The footprint and massing of development components and the works area should also be kept to a practical minimum and the detailed design of development components for construction stage should follow the Sustainable Building Design Guidelines.

The form, textures, finishes and colours of the proposed development components should aim to be compatible with the existing surroundings. To improve visual amenity, designs should be aesthetically pleasing and treatment of structures also improve visual amenity. For example natural building materials such as stone and timber, should be considered for architectural features, and light earthy tone colours such as shades of green, shades of grey, shades of brown and off-white should also be considered to reduce the visibility of the development components, including all roadwork, buildings and noise barriers. In addition, the design of structures should consider green roofs where feasible, following guidelines laid out in *CIBSE HK Branch's Technical Guidelines for Green Roof Systems in Hong Kong (2011)* and *ArchSD/Urbis Study on Green Roof Application in Hong Kong (2007)* (Also see MM10).

All barriers, particularly noise barriers but also any barriers proposed for ecological impact mitigation, should be kept to a practical minimum, be designed to integrate as well as possible into the surrounding visual context and be as low as practical to minimise blocking views. Noise barrier design, including vertical, cantilever or curved, and noise enclosures including semi-enclosure and full enclosure, at grade and/ or elevated, should follow the *Greening, Landscape and Tree Management Section (GLTM) of the Development Bureau's Guidelines on Greening of Noise Barriers (April 2012)*.

Construction time frame should also be considered and designs seek to keep it to a practical minimum.

- Open Space Provision (MM3)

In planning the revised RODP, impacts to most open space/ recreational areas have been avoided. To help alleviate loss of open space unavoidably affected by the Project, the principles adopted in the RODP planning ensure that public open space systems are incorporated and also improve landscape and visual amenity. In KTN NDA, the key open spaces are the east-west running Town Park in the town centre and the Fung Kong Shan Park in the northern part of the NDA as well as a riverside promenade along the western side of Sheung Yue River. In FLN NDA, Site C2-8 is proposed as a Central Park and areas along the northern and southern banks of Ng Tung River will be developed into continuous promenades with some Riverside Parks at a number of Sites (e.g. B1-2, B2-1, B2-8, B2-10, D1-2 and D1-3). The public open space within the RODPs will enhance the visual amenity of the area and

improve the overall landscape character as well as ensuring no overall loss of open space/ recreational Landscape Resource (LR).

- Tree Protection & Preservation (MM4)

Existing trees to be retained within the Project Site should be carefully protected during construction. In particular OVTs will be preserved according to *ETWB Technical Circular (Works) No. 29/2004*. Detailed Tree Protection Specification shall be provided in the Contract Specification. Under this specification, the Contractor shall be required to submit, for approval, a detailed working method statement for the protection of trees prior to undertaking any works adjacent to all retained trees, including trees in contractor's works areas.

A detailed tree survey will be carried out for the Tree Removal Application (TRA) process which will be carried out at the later detailed design stage of the Project. The detailed tree survey will propose which trees should be retained, transplanted or felled and will include details of tree protection measures for those trees to be retained.

- Tree Transplantation (MM5)

Trees unavoidably affected by the Project works should be transplanted where practical. Trees should be transplanted straight to their final receptor site and not held in a temporary nursery as far as possible. A detailed Tree Transplanting Specification shall be provided in the Contract Specification, where applicable. Sufficient time for necessary tree root and crown preparation periods shall be allowed in the project programme.

A detailed transplanting proposal will be submitted to relevant government departments for approval in accordance with *ETWBTC 2/2004 and 3/2006* and final locations of transplanted trees should be agreed prior to commencement of the work.

For trees associated with highways e.g. roadside planting along highways, that are unavoidably affected and should be transplanted, *HyD HQ/GN/13 'Interim Guidelines for Tree Transplanting Works under Highways Department's Vegetation Maintenance Ambit'* should be referred to.

- Slope Landscaping (MM6)

Site formation has been reduced as far as possible to avoid substantial slope cutting (also see MM1).

Hydroseeding of modified slopes should be done as soon as grading works are completed to prevent erosion and subsequent loss of landscape resources and characters. Woodland tree seedlings and/ or shrubs should be planted where the slope gradient and site conditions allow. In addition, landscape planting should be provided for the retaining structures associated with modified slopes, where conditions allow. All slope landscaping works should comply with *GEO Publication No. 1/2011-Technical Guidelines on Landscape Treatment for Slopes*.

- Compensatory Planting (MM7) (For specific woodland compensatory planting, see MM8)

Compensatory tree planting for felled trees shall be provided to the satisfaction of relevant Government departments. Required numbers and locations of compensatory trees shall be determined and agreed separately with Government during the Tree Removal Application

process under *ETWBTC 3/2006*. Based on a very broad brush estimate, 17,000 trees will be affected by the Project of which 30% will be retained/transplanted. Those unavoidably lost will be compensated for by planting within KTN NDA and FLN NDA to the satisfaction of relevant Government departments as outlined above.

In addition, compensatory planting for shrubs should be considered in suitable locations. Native species such as *Melastoma malabathricum*, *Diospyros vaccinioides*, *Gardenia jasminoides*, *Ixora chinensis*, *Ligustrum sinense*, *Litsea rotundifolia*, *Melastoma dodecandrum*, *Atalantia buxifolia*, *Rhodomyrtus tomentosa*, *Rhaphiolepis indica*, and *Rhododendron simsii* are suggested.

The location of compensatory planting is proposed at the potential open areas such as open spaces, amenity areas, open areas of the streetscapes including roadside planting, as well as the open areas within development lots. Should space allow, the woodland compensatory planting areas (see MM8) may also be able to accommodate some standard tree and shrub compensation.

- Woodland Compensatory Planting (MM8)

Specific woodland compensatory planting is proposed for any areas of quality woodland that are unavoidably affected by the Project. The compensatory woodland planting will principally be within habitats of lower value such as upland grassland. The proposed locations are identified, for example, on the foothills of Tai Shek Mo, and on the higher ground of Fung Kong Shan in KTN NDA; along Fanling Bypass; and a small area in the northern FLN NDA.

The total area allocated for compensatory woodland planting is more than 16 ha. This provision allows in part for the fact that it will take some time for the compensatory planting to achieve the landscape and ecological function and value of the area to be lost. In addition, it allows for the fact that not all of the areas identified for planting will prove to be plantable, by virtue of topography and ground conditions and, especially, because though the areas identified are largely grassland it is inevitable that these areas will already support some patches of trees and shrubs which would be inappropriate for further planting.

The intention of the compensatory woodland will be to recreate areas of quality woodland, not necessarily to compensate for loss of trees on a like for like basis. Native tree species are suggested for planting, including *Ailanthus fordii*, *Bischofia javanica*, *Castanopsis fissa*, *Celtis sinensis*, *Cinnamomum burmannii*, *Cinnamomum camphora*, *Xanthoxylum avicennae*, *Liquidambar formosana*, *Sapium discolor*, *Schefflera heptaphylla* and *Ilex rotunda*. In addition some understory vegetation may be planted including shrubs such as *Atalantia buxifolia*, *Diospyros vaccinioides*, *Gardenia jasminoides*, *Ixora chinensis*, *Ligustrum sinense*, *Litsea rotundifolia*, *Melastoma malabathricum*, *Melastoma dodecandrum*, *Rhodomyrtus tomentosa*, *Rhaphiolepis indica*, and *Rhododendron simsii*.

- Vertical Greening (MM9)

Planting of climbers to grow up vertical surfaces where appropriate (e.g. building edges, piers), to soften hard structures and facilities.

- Green Roof (MM10)

Roof greening where appropriate should be established on proposed buildings to reduce exposure to untreated concrete surfaces and particularly mitigate visual impact to Visual Sensitive Receivers (VSRs) at high levels. Green roofs can also provide attractive landscaping and greening. *CIBSE HK Branch's Technical Guidelines for Green Roof Systems in Hong Kong (2011)* and *ArchSD/Urbis Study on Green Roof Application in Hong Kong (2007)* should be referred to when considering and developing green roofs. These documents provide further details including information regarding structural loading, design, and maintenance etc. considerations as well as providing information on what types of plants might be suitable.

- Screen Planting (MM11)

Tall screen/buffer trees and shrubs should be planted to screen proposed structures such as roads and buildings. This measure may additionally form part of the compensatory planting and will improve compatibility with the surrounding environment and create a pleasant pedestrian environment.

- Road Greening (MM12)

For viaducts, soft landscaping should be provided to soften the hard, straight edges (for climbers used to cover the vertical, hard surfaces of the piers – see MM9 Vertical Greening) and shade tolerant plants should be planted, where light is insufficient, to improve aesthetic value of areas under viaducts. Both at grade planting and use of elevated planters should be considered for the soft landscaping of viaducts, taking into account the preference to minimise the overall viaduct bulk and integrate architectural forms and textural finishes which improve aesthetics.

At grade road planting should be considered along central dividers and on road islands e.g. in the middle of roundabouts. *HQ/GN/15 - Guidelines for Greening Works along Highways* should be referred to for greening of highways specifically and *Development Bureau TCW No. 2/2013 – Greening on Footbridges and Flyovers for footbridges and flyovers*.

(Roadside planting i.e. at the road edge and not in the central divider or road island, is considered part of MM11 Screen Planting and might also be part of MM7 Compensatory Planting or MM5 Tree Transplanting (where the transplanted tree is planted)

- Marsh/Wetland Compensation (MM13)

Direct loss of marsh and wetland areas caused by the Project will be mitigated by compensatory habitat and management in the proposed Long Valley Nature Park (LVNP) where there will be some addition of wetland areas.

Also see 'MM14 Watercourse Impact Mitigation' as wetland planting should be provided along the embankments and beds of modified watercourses.

- Watercourse Impact Mitigation (MM14)

Watercourses in the Study Area are broadly categorised into channelized water courses (LR1) and non-channelized or more natural watercourse including natural streams (LR2). During the formulation of the RODP, key features, which include the large channelized rivers of Ng Tung, Shek Sheung, Sheung Yue and Ma Wat channel, as well as areas of

natural streams have been actively avoided as far as; where they cannot be fully avoided, care has been taken to zone the land appropriately to ensure their protection wherever possible. Inevitably, given the nature of the Project, there will be some impacts on watercourses and MM14.1-4 below describe specific measures that can be applied to help mitigate watercourse impacts.

#### Reprovision of Natural Stream (MM14.1)

Where natural streams are unavoidably affected along some of their length, they can be diverted to avoid the proposed new developments and retain the integrity of the whole stream. Detailed design of any stream diversion should follow the Guidelines in *ETWB Technical Circular (Works) No. 5/2005 (Protection of natural streams/rivers from adverse impacts arising from construction works)* and appropriate construction methods should be used.

Two short stretches of the Ma Tso Lung Stream will be affected by Project in the KTN NDA; by the LMC Eastern Connection Road on the western border of Site F1-3 and further upstream by Site E-2. At both these locations, the affected stream will be reprovioned and maintain the flow between unaffected sections of the stream. The reprovioned stream will be provided with a natural bed and banks, as well as having an area of marsh/ pool next to it and trees and shrubs further from the banks. Full details of this stream mitigation are provided in Chapter 13.

#### Stream Buffer Planting (MM14.2)

Providing a minimum 10 m buffer with planting (where there is a general presumption against any development taking place) along streams where they flow close to developments, confers a degree of protection to the stream course and its associated vegetation.

For the stream at Siu Hang San Tsuen in FLN NDA, changes to the proposed NDA boundary during the revised RODP design have excluded much of this stream from the NDA and within the NDA boundary much of the stream would be located underneath the viaduct for the proposed Fanling Bypass. To the south of the viaduct the stream flows through the area D1-3, zoned as Open Space, prior to joining Ng Tung River. In this Open Space zone a 10m buffer is proposed in which natural vegetation will be retained and enhanced and human activities will be limited in order to avoid direct impacts to the stream bed and to minimise potential indirect impacts to the stream and riparian corridor.

#### Enhancement Planting along Embankment (MM14.3)

For channelized watercourses, if these are modified, the *Drainage Services Department Practice Note No.1/2005 – Guidelines on Environmental Considerations for River Channel Design*, should be considered and appropriate mitigation measures included ensuring the new watercourses match the existing as far as possible. Measures can include enhancement planting to upgrade the channels as appropriate, including consideration of wetland planting along embankments where appropriate; as well as consideration of the best materials for the channel lining (e.g. gabion). All measures must also ensure any necessary maintenance work can be carried out and that the channel meets all its requirements for water flow, etc.



For example, a stretch of the Ma Wat River Channel in the south of FLN NDA will have to be diverted for the construction of the Fanling Bypass Eastern Section. This measure will be particularly relevant in this area.

#### Avoid affecting Watercourses (MM14.4)

At the planning stage care has been taken to avoid affecting watercourses as far as possible. In the detailed design, consideration should again be made of watercourses, to minimise any impacts e.g. at new bridge crossings, viaducts, road alignment etc. Guidelines for this include *ETWB Technical Circular (Works) No. 5/2005 Protection of natural streams/rivers from adverse impacts arising from construction works* as well as Building Department (BD) *Practice Note for Authorized Persons and Registered Structural Engineers 295: Protection of natural streams/rivers from adverse impacts arising from construction works*.

For example, the stream at Siu Hang San Tsuen in FLN NDA much of the stream is located underneath the viaduct for the proposed Fanling Bypass. In order to avoid impacts to the stream, the detailed final design of the viaduct should follow guidelines and ensure that no viaduct footings or other structures are placed in the stream.

Bridges and box culverts should also be used to minimise the necessity of watercourse modification and protect the watercourses where necessary.

- Pond Replacement (MM15)

In planning the revised RODP, impacts to most ponds have been avoided by exclusion from the NDA or suitable zoning that allow for the ponds to be protected e.g. Agricultural zoning in A1-3 and A1-9 in the west of FLN NDA. To help alleviate the loss of ponds unavoidably affected by the Project, the principles adopted in the RODP design ensure that new ponds are incorporated and also improve landscape and visual amenity. For example the Fung Kong Shan Park in E1-7 of KTN NDA will incorporate a pond and the requirement of such re-provision has been stipulated in the planning documents for the formulation of the Preliminary Layout Plan (In addition, the LVNP at C1-9 will ensure the retention and possible provision of ponds as reported in MM13).

- Screen Hoarding (MM16)

Screen hoarding shall be erected along areas of the construction works site boundary where the works site borders with public accessible routes and/or is close to VSRs, to screen undesirable views of the works site. It is proposed that the screening be compatible with the surrounding environment and where possible, non-reflective, recessive colours be used. Any works areas near the ecological sensitive areas should erect 2m high dull green site boundary fence. Details can refer to the ecological impact assessment (Chapter 13 of the EIA report).

- Light Control (MM17)

Construction day and night time lighting should be controlled to minimize glare impact to adjacent VSRs during the construction stage. Street and night time lighting shall also be controlled to minimize glare impact to adjacent VSRs during the operation phase. This is considered a general measure for good practice.

- Other good practise measures.

For areas unavoidably disturbed by the Project on a short term basis e.g. works areas, the general principle to try and restore these to their former state to suit future land use, should be adhered to.

With regard to topsoil, where identified, it should be stripped, treated appropriately, and where suitable and practical stored for re-use in the construction of the soft landscape works such as roadside amenity strips, and open space sites. For the all planting, this should be installed as soon as the areas become available, to achieve early establishment.

#### **16.4.12 Ecology**

In addition to the measures described in **Sections 16.2.2 – 16.2.7** which have been adopted during the design development of the Project, the following specific measures are required in order to avoid, minimize and compensate for ecological impacts, and to reduce any residual impacts to an acceptable level:

##### **General**

- Erection of 2m high solid dull green site barrier fence between active works areas and all areas/habitats of ecological importance on edge of development areas, including along any roads adjacent to or penetrating into areas/habitats of ecological importance;
- Erection of 2m high solid dull green site boundary barrier fence between river channel and any active works area along or adjacent to Ng Tung, Sheung Yue and Shek Sheung Rivers;
- Detailed design of Open Space areas and development areas along Ng Tung, Sheung Yue and Shek Sheung River corridors to include measures to minimise construction and operational impacts to fauna using the rivers and the river corridors;
- Preparation and implementation of Guidelines for building design measures to minimize mortality and light and glare impacts to fauna;
- Use opaque, non-transparent, non-reflective noise barriers for all developments, including roads, associated with the Project;
- Pre-site clearance check of proposed works areas for presence of flora or fauna of conservation significance and bat roosts and consideration of measures to avoid, minimise or avoid impacts and mortality including adjustment of programme, detailed design amendments and translocation;
- Pre-works commencement check on any watercourses to be physically and/or hydrologically impacted by construction activities and translocation of any stream fauna of conservation significance;
- Prevention of dust, run-off and pollutants impacting Deep Bay catchment area;

- Prevention of dust, run-off and pollutants impacting habitats, flora and fauna;

#### Long Valley

- Habitat enhancement measures to compensate for direct habitat loss and disturbance impacts to fauna; in particular, large waterbird species of conservation significance; during the construction and operational stages of the Project to be incorporated in Detailed HCMP for LVNP and implemented in Long Valley;
- Construction stage measures to minimise hydrological and ecological construction stage impacts to Long Valley habitats and fauna to be included in Detailed HCMP for LVNP and implemented in Long Valley and at source;
- Building setback from Long Valley in KTN B3-12 (Commercial, Research & Development) to be included in Explanatory Statement in OZP;
- No construction during ardeid breeding season along Sheung Yue River north or east of KTN D1-5 and east of D1-9 and C2-3.

#### Ma Tso Lung

- Buffer zone of 15-30m on both sides of Ma Tso Lung Stream and tributaries to be shown in Layout Plan and detailed in Explanatory Statement;
- Ma Tso Lung Stream diversion during construction of LMC Loop Eastern Connection Road and creation of a permanent 15m minimum vegetated buffer between the road and the stream and a minimum 30m vegetated buffer between the stream and any other development of the Project;
- Construction of development along lower reaches of Ma Tso Lung Stream in OU zones F1-2 and F1-3 to be set back beyond buffer and of Lok Ma Chau Loop link road to minimize and compensate for impacts to stream;
- Maintenance of permanent 1.2m high solid fauna barrier at all at-grade sections of LMC Loop Connection Road north of junction with road D4 within 15-30m of Ma Tso Lung Stream buffer.

#### Siu Hang San Tsuen Stream

- Detailed design of Siu Hang San Tsuen Stream to have 10m wide vegetated buffer in Open Space zone D1-3;
- Fanling Bypass to cross stream on viaduct,;
- All stream (including upstream sections not impacted by the Project) to have permanent buffer of 10m on either side of

stream to be detailed in Explanatory Statement in the Layout Plan.

#### Elsewhere

- Provision of egret habitat to compensate the loss of the Man Kam To Road egret site and compensatory habitat for the dragonfly Dingy Dusk-hawker at A1-7 to compensate for of mitigation wetland site along the Ng Tung River;
- Avoidance of works within channels and surface water catchments of Ma Wat River upstream of current Fanling Highway crossing point and Kau Lung Hang Watercourses.
- Scheduling of works to avoid concurrent construction of more than one bridge over the main river channels.

#### **16.4.13 Fisheries**

The following mitigation measures are proposed in order to avoid adverse impacts to fisheries:

- Early notification of resumption programme to fish fry farm operator at Fung Kong, KTN and Hong Kong N.T. Fish Culture Association to allow operator to reprovision fish fry farm elsewhere or Fish Culture Association to institute alternative arrangements for importation and culture of fish fry.
- Avoidance of downstream impacts on fisheries at Ma Tso Lung and in the Deep Bay catchment by avoiding sedimentation and pollution of watercourses.

#### **16.4.14 Minor Changes in Revised RODP**

After the formulation of the revised RODP, there are some minor changes in revised RODP. **Figure 16.1** and **16.2** show the changes. The environmental assessment on these changes has been summarized in **Appendix 16.2**. With the mitigation measures proposed in this EIA report, the environmental impact can be mitigated to the acceptable level.

## Figures

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## Appendix 16.1

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### **Key Assessment Assumptions and Limitation of Assessment Methodologies**

Appendix 16.2

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**Environmental  
Assessment for minor  
change in revised  
RODP**