

## 17 CONCLUSION

This Final EIA Report has been prepared to satisfy the requirements given in the EIA Study Brief ESB-176/2008 and the Technical Memorandum on Environmental Impact Assessment Process. All the latest planning information has been incorporated into the EIA process. Aspects that have been considered in this EIA Report include:

- Air quality;
- Noise;
- Water quality;
- Sewerage and sewage implication;
- Waste;
- Land contamination;
- Hazard to life;
- Landfill gas;
- Cultural heritage;
- Landscape and visual;
- Ecology;
- Fishery; and
- Environmental monitoring and auditing.

All the existing and planned environmental sensitive receivers within and in the vicinity of the Study Area have been identified by conducting site surveys and reviewing relevant planning information. The receivers identified include residential blocks, schools, heritage buildings etc. These receivers have all been considered and included in this EIA study.

### 17.1 Air Quality

#### 17.1.1 Construction Phase

Dust is the key pollutant during the construction phase of the NENT NDA development. Dust impacts during certain construction periods may be high due to extensive activities at the work site and proximity of the ASRs. With the implementation of dust suppression measures, dust impacts are expected to be reduced significantly.

Quantitative fugitive dust assessments have been conducted and results suggested that watering once per hour would be required to control the fugitive dust impact to acceptable levels. Therefore, effective dust control following the requirements given in the Air Pollution Control (Construction Dust) Regulation and in accordance with the EM&A programme during construction are recommended.

With such measures, all the 1-hour, 24-hour and annual concentrations at both existing and future ASRs at KTN and FLN NDA will comply with the dust criterion based on latest construction programme. Hence, it is

concluded that there are no adverse residual air quality impacts during construction phase.

### **17.1.2 Operational Phase**

Vehicular emissions from open roads are expected to be the major air pollutants during the operational phase of the NENT NDA development. Fixed polluting sources such as existing industrial emissions, odour emission from sewage treatment facilities, slaughtering house will also create air quality impacts on ASRs.

Cumulative chimney and vehicular emission impacts are predicted to be acceptable, and no mitigation measures would be required based on the assessment.

Odour impact assessments have been conducted for the 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 is acceptable.

## **17.2 Noise**

### **17.2.1 Construction Phase**

Potential construction airborne noise impacts would be caused by various construction activities including site formation, construction of infrastructure, external access route improvement works and construction of service reservoir. Construction noise assessment has concluded that the unmitigated construction noise impacts would exceed the noise criterion at some sensitive receivers.

With the implementation of practical mitigation measures including good site management practices, use of site hoarding, use of movable noise barrier, acoustic mat & full enclosure, use of “quiet” plant and working method, construction noise impacts at all most of the neighbouring noise sensitive uses would be controlled to acceptable levels. However, for some educational institutions, residual impacts during examination period are anticipated even after implementing all practicable mitigation measures. To further minimise the impact, the contractor should further verify the necessity for adopting noisy PME such as rock drill and vertical band drain installation rig to reduce the construction impacts to the nearby noise sensitive receivers. In addition, the contractor should closely liaise with the school to avoid noisy construction works during examination period.

### **17.2.2 Operational Phase**

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, sewage pumping station (SPS) and pumping station (PS) 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 proposed for educational institutions FLN C2-9 (East and south facades between 4/F to 8/F).

### **17.3 Water Quality**

The potential water quality impacts of the Project have been assessed through a qualitative assessment approach in accordance with the Annex 6 - Criteria for Evaluating Water Pollution and Annex 14 - Guidelines for Assessment of Water Pollution under the TM-EIAO, as there will be no dredging and reclamation works involved in the Project.

During construction phase, potential water pollution sources have been identified as construction site runoff, alteration of natural streams, possible groundwater from contaminated area, and sewage from workforce. Mitigation measures including the implementation of cofferdams or diaphragm walls during water diversion, etc are recommended to mitigate any potential water quality impact.

During operational phase, potential water quality sources have been identified, including sewage and sewerage system, discharge from district cooling system, runoff from roads/open areas, drainage system and reuse of treated sewage effluent. Mitigation measures including collection all sewage into the upgraded/expanded Shek Wu Hui Sewage Treatment Works (STW) and implementation of proper drainage system with silt traps and oil interceptors as well as good management practices are recommended to mitigate any potential water quality impact during operational phase.

With implementation of recommended mitigation measures, no residual water quality impact is anticipated.

### **17.4 Sewerage and Sewage Implication**

The proposed KTN and FLN NDAs will generate an additional Average Dry Weather Flow (ADWF) of about 33,722 m<sup>3</sup>/day and 17,785 m<sup>3</sup>/day sewage, respectively. The current treatment capacity of SWHSTW is 93,000m<sup>3</sup>/day which does not take into consideration the sewage flows from NDA development and therefore the capacity of SWHSTW needs to be expanded. Also, taking account of the projected natural population growth in the vicinity, 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'.

Treated Sewage Effluent (TSE) reuse scheme has been proposed in NDA. The TSE from SWHSTW is proposed to be further polished and supplied to the two NDAs and North District for irrigation, toilet flushing and cooling water for district cooling system. The total projected demand of TSE reuse for the two NDAs is in order of 24MLD respectively. The water quality of the TSE reuse is proposed to meet the stringent standard as to minimise the potential health impact. The implementation of TSE reuse scheme is to be liaised with WSD, EPD and DSD.

Based upon the assessment, it can be concluded that the proposed NDA development is sustainable from sewerage collection, treatment, reuse and disposal perspective. Expansion/upgrading of the SWHSTW to handle 190,000m<sup>3</sup>/day ADWF is necessary to cater for sewage flows from the KTN and FLN NDAs and also for additional flows due to base growth in sewage catchment area. In addition, TSE reuse is proposed for irrigation, toilet flushing and cooling water in NDA and North District which is generated by the tertiary treatment and polishing of SWHSTW.

## **17.5 Waste**

The waste management assessment has reviewed the potential impacts from various types of wastes generated from the construction and operational phases of the proposed NDAs developments.

Through the preliminary analysis of the Project activities, the quantity and quality of waste arising have been identified, including C&D materials generated from excavation, chemical waste arising from maintenance of plant and equipment, general waste from daily activities, as well as municipal solid waste in the operational phases.

With the implementation of recommended mitigation measures, in particular the Waste Management Plan, which becomes a part of the Environmental Management Plan in accordance with ETWBTC (Works) 19/2005, no significant adverse impact is anticipated with either the construction and operational waste from the NDA developments.

In addition, no construction work is allowed to proceed until all issues on management of C&D materials have been resolved and all relevant arrangements have been endorsed by the relevant authorities including PFC and EPD.

## **17.6 Land Contamination**

The potential land contamination impacts of the Project have been assessed. The assessment involved site appraisal, site investigation, assessment of contamination level, and health risk assessment for arsenic-containing soil detected in KTN.

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 2 NDAs (include Fanling Bypass) were inaccessible and hence, no soil and groundwater sample was collected during the course of this land contamination assessment study. Nevertheless, detailed SI for these sites should be conducted when they are resumed and handed over to the Project Proponent (PP).

On the other hand, although many of the sites were not identified as potentially contaminated or could not be accessed for visual inspection during the site survey, these sites would still in operation until commencement of construction. Any potential change of land uses (e.g. change of uses to say chemical storage area, dismantling workshop, etc) may result in potential land contamination. Re-appraisal of these sites is therefore required if they become part of the land requirement for NDA development.

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 was 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 was 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. The Health Risk Assessment confirmed that the soil with arsenic level above 571 mg/kg is required to be treated. The treatment method “Cement Stabilization/Solidification” for treating the arsenic-containing soil was proposed.

### **17.7 Hazard to Life**

A quantitative risk assessment (QRA) has been carried out since part of the proposed NDAs development (KTN and FLN) resides in the 1-km Consultation Zone (CZ) of Sheung Shui Water Treatment Works (SSWTW), which is a potentially hazardous installation (PHI). The assessment has been conducted to determine the risk associated with the storage, use and transport of chlorine at SSWTW for the construction and operation stages of the NDAs development.

The assessment has concluded that the risks are acceptable as per the individual and societal risk criteria set out in Annex 4 of the EIAO-TM.

### **17.8 Landfill Gas**

The potential landfill gas hazards of the Project have been assessed. A preliminary qualitative assessment on potential hazards associated with LFG migration from Ma Tso Lung Landfill (MTLL) to the proposed development in KTN NDA and within MTLL has been conducted.

The MTLL is considered as a “Medium” source of gas migration due to high carbon dioxide levels detected in monitoring drillhole. The risk categories associated with the source-pathway-target have been identified. It is concluded that the potential risk during construction phase for developments within the consultation zone is “Medium” and during operational phase is ‘Low’ to ‘High’ depending upon the location and nature of the target being considered. Similarly, the level of risk for the development within MTLL during the construction phase is also “Medium” and during operational phase is ‘Low’ to ‘High’ depending upon the location and nature of the target being considered. Therefore, this implied “some precautionary measures” to “significant engineering measures” required by the future site developers to protect the proposed development.

To minimize the risk of landfill gas hazard to the future occupants of the proposed developments, below ground rooms/ voids should be avoided as far as practicable in the developments within the Consultation Zone. For the proposed developments within the MTLL, underground rooms/



voids should totally be avoided not only to minimize the risk of landfill gas hazard to the future occupants, but also to prevent interruption to the landfill restoration facilities. In addition, buildings or structures within the MTLL (i.e. the proposed recreational area in site E1-1) should be at ground level with raised floor slabs which are less prone to gas ingress. It is also recommended that further LFG monitoring should be carried out prior to the commencement of the detailed design of the developments to provide the latest LFG data for the detailed QLFGHA.

General protection and precautionary measures have been proposed for consideration during the construction, design and operational phases of the developments. In addition, the design, construction and operation of the proposed development within the MTLL (i.e. the proposed recreational area in site E1-1) should be fully compatible with the landfill restoration and aftercare works and impose no adverse impact to them. Caution should be exercised to ensure long term integrity of the capping system and other restoration facilities. The design and construction method of the proposed development within MTLL should also be provided to EPD for agreement during the design stage.

It is expected that with the proposed precautionary measures in place, the potential risk of LFG migration from MTLL to KTN development would be minimal. Nevertheless, a detailed QLFGHA should be undertaken during the detailed design stage of the developments to review the need and practicality of the protection and precautionary measures proposed and provide recommendations on the detailed protection and precautionary measures to be adopted. Such requirement could be imposed on developers by including it in the lease conditions by Lands D.

## **17.9 Cultural Heritage**

### **17.9.1 Archaeology**

One Site of Archaeological Interest is identified in the CHAA of the Project, direct impact is anticipated to part of the site. An Archaeological Impact Assessment after land resumption and before construction when detail construction information is available to determine the need for archaeological follow up actions in the impacted area is recommended. Although no mitigation is necessary in Site 11, as part of the Sheung Shui Wa Shan Site of Archaeological Interest falls within the CHAA of the project, it is recommended that an Archaeological Impact Assessment should be required if there is any development work within the Sheung Shui Wa Shan Site of Archaeological Interest.

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.

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.

### **17.9.2 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 to be conducted by qualified building surveyor or qualified structural engineer to define the vibration limit (a vibration limit at 7.5mm/s and 15mm/s could be adopted for graded historic buildings and historic buildings respectively) 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.

Meanwhile, since the construction works and development activities may induce change in the watertable. It is 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.

## **17.10 Landscape and Visual**

### **17.10.1 Overall Conclusion for Schedule 3 LVIA**

In general, rural and urban peripheral villages is the major landscape resources and landscape character area which experience substantially significant impacts before the implementation of mitigation measures and agricultural land will generally experience moderate impacts. Most of the high density residential buildings and other associated facilities are



proposed on these landscapes and the impact significance is generally predicted to still be moderate there after 10 years of operation.

Other landscape resources which also experience moderate levels of impact even after the implementation of mitigation measures, include streams in Kwu Tung (KLR2.1) and the Rural Development Area in Shek Tsai Leng, Tong Kok, Fung Kong and Tit Hang (KLR-12.9) in KTN NDA, and in FLN NDA include Natural Streams in Tin Ping Shan Agricultural Land (FLR-2.1) as well as agricultural land in Ting Ping Shan Tsuen (FLR-9.4) and Wu Nga Lok Yeung, Siu Hang San Tsuen, Siu Hang Tsuen and Lung Yeuk Tau (FLR-9.6). These streams and the agricultural land will be permanently lost permanently during construction and therefore the impact will stay moderate during operation. The loss of agricultural land has been carefully studied for this Project and the setup of the LVNP and preservation and even enhancement of agricultural land in that area, as well as zoning of large sites to the north and south of LVNP as agricultural land, is considered to go some way to help alleviate impacts on agricultural land. In addition, the LVIA assessment has included both active and abandoned agricultural land including orchard areas in its classification of agricultural land and according to a further review and site inspection in December 2012/January 2013 by PlanD with assistance from AFCD, the amount of active agricultural land affected by the Project is approximately 28 ha. According to the AFCD Annual Report 2011-2012, there are 4,071 ha of abandoned agricultural land in Hong Kong and 734 ha of active agricultural farmland and as such, the affected agricultural land only represents a small percentage of active agriculture land in Hong Kong. In the surrounding areas of the Project, 160 ha of land have been found potentially suitable for agricultural rehabilitation/re-site, the major cluster (34 ha) being found at Kwu Tung South. Given all these considerations, and understanding the need of the Project, the significance of impacts on agricultural land are thought to be acceptable.

For the rural development area in KTN NDA, over 30 ha will change land use and despite careful planning and implementation of mitigation, the change to an urban landscape is hard to mitigate for. The need of the Project is explained in **Chapters 1 and 2** and the planning of the RODP and the future detailed design of elements are key means by which this impact can be alleviated.

Most of the other landscape impacts can be reduced to slight and insignificant after the implementation and full establishment of mitigation measures.

Given the proposed development involves major land use changes for a new town development in an existing rural area, it is inevitable that visual (and some landscape) impacts caused by such major development cannot be fully reduced and remain at a certain level at some locations even after implementation of all possible mitigation measures, including minimizing topographical change, detailed design of the built structures to ensure compatibility of the proposed development with the existing surroundings, tree protection, preservation and transplantation as well as compensatory planting, woodland compensatory planting, screen planting to buffer structures from views, decorative hoarding to screen undesirable views of work sites, light control within construction sites and at operation to reduce light glare that could potentially cause visual disturbance to VSRs at night time, provision for green roofs and vertical greening to soften hard surfaces on built structures in sight. Particular

care has been taken to conserve the Long Valley area with its agricultural land and ponds. This will also help mitigate for any marsh and wetland loss due to the Project that will occur under the Long Valley Nature Park Management Plan. Additionally the NDAs have been carefully designed to try and avoid natural watercourses by avoiding development at the most sensitive streams or designating protective zoning to preserve them, and designating buffer areas along key stretches. In view of the nature of the development, it is generally fair to accept that some of the impacts cannot be fully reduced and will only remain at a certain level for some areas. Nevertheless, such residual impacts are predicted to be acceptable with implementation of the proposed mitigation measures as the changes in land uses gradually adapt to the existing rural context. Besides, residual impacts are generally only slight or insignificant for the majority of the other LRs, LCAs and VSRs within the NDAs as a large extent of the impacts caused by the developments will be reduced or eliminated by the implementation of the proposed mitigation measures.

It is therefore anticipated that given the need of the Project as explained in **Chapters 1 and 2** and assuming the implementation of the measures described, the overall residual landscape and visual impacts from the Project are considered acceptable. Therefore the Project is 'acceptable with mitigation measures' in accordance with the EIAO TM Annex 10.

### **17.10.2 Overall Conclusion for DP Packages A-D**

This section gives an overall conclusion of the 4 DP Packages grouped under this NDA development.

#### **DP Package A**

This DP Package includes the following Schedule 2 Designate Projects:

**DP1** - San Tin Highway and Fanling Highway Kwu Tung Section Widening (between San Tin Interchange)

**DP2** - Castle Peak Road Diversion (Major Improvement)

**DP3** - KTN NDA Road P1 and P2 (New Road) and associated new Kwu Tung Interchange (New Road) and Pak Shek Au Interchange Improvement (Major Improvement)

**DP4** - KTN NDA Road D1 to D5 (New Road)

Landscape and visual mitigation works in relation to these DP during the construction stage rely heavily on the minimisation of the footprint of the works area, avoidance of significant topographical changes together with the retention, protection and compensatory planting of trees / vegetation. These measures if deployed have the capacity to reduce the level of residual impact experienced by the VSRs, LRs and LCAs at the construction stage.

It is not possible to fully mitigate all impacts in relation to loss of mature woodland or tree planting, including the visual amenity/ screening they provide, for all VSRs, LRs and LCAs in the construction period and early operational stage, mainly as long periods of time are required to sufficiently compensate for the associated impacts. Providing compensatory measures are applied, in combination with transplantation of existing trees (which can help to accelerate the establishment period), the impacts to VSRs and LRs affected by these DPs can be reduced to slight or insignificant levels relatively quickly. Road greening measures such as use of climbing plants and verge planting help to break up the

uniformity of new road formation and associated structures (such as footbridges), when used in combination with wider screening measures they help to reduce the visual impacts in the early operational stages until tree screens have established and matured.

On review of the likely residual impacts and possibility to reduce all to slight or insignificant level by operational year 10, it is considered that DPs 1, 2, 3 and 4 would be acceptable in terms of landscape and visual impacts.

### **DP Package B**

This DP Package includes the following Schedule 2 Designate Project:

#### **DP5 - New Sewage Pumping Stations (SPS) in KTN NDA**

Due to the very small construction footprint and relative low sensitivity of the LRs and LCAs affected and limited number of associated VSRs of this DP, it is considered that potentially adverse landscape and visual impacts can be controlled through the implementation of construction and operational mitigation measures. The most effective measures in both locations arise from consideration of the architectural details and choice of materials, at the detailed design stage, so that the buildings would complement the future urban environment. Screen planting would be integrated into the proposed amenity planting within the surrounding landscape areas, also compensating for any tree losses during the construction stage. Vertical greening measures and application of green roofs will assist with visual integration during the early operational stages, to help break up the appearance and uniformity of roofscape, building facades and boundary treatments.

In this case it is considered that the SPS within DP 5 would be acceptable in terms of landscape and visual impacts.

### **DP Package C**

This DP Package includes the following Schedule 2 Designate Projects:

#### **DP7 - Utilization of Treated Sewage Effluent (TSE) from Shek Wu Hui Sewage Treatment Works (SWHSTW)**

#### **DP11 - Shek Wu Hui Sewage Treatment Works - Further Expansion (SWHSTW)**

#### **DP13 - New Sewage Pumping Stations (SPSs) in FLN NDA**

It is considered that work in relation to the SWHSTW comprising DPs 7 and 11 (including the expansion, upgrading and adjacent utilisation of TSE) and the proposed SPS in FLN NDA (DP13) would generally be acceptable within the receiving landscape both in term of landscape and visual impact. Through the application of mitigation measures, principally compensatory planting (for screening and replacement trees) and sensitive detailed design of the future developments, the majority of impacts during the construction stage can be controlled to slight or insignificant levels. In operation these impacts can all be mitigated to insignificant or slight levels at an early stage when landscape planting has matured, providing effective screening and compensation for loss of landscape resources incurred at the construction stage.

In this case, tree screening mitigation measures combined with landscape treatments to engineered slopes can assist in reducing the visual impact of the reservoir developments to slight adverse impacts at

operational stage year 10. It is considered that, providing full implementation of the recommended mitigation measure that visually these developments would be acceptable within the landscape setting.

On review of the likely residual impacts and possibility to reduce all to slight or insignificant level by operational year 10, it is considered that DPs 7, 11 and 13 would be acceptable in terms of landscape and visual impacts.

#### **DP Package D**

This DP Package includes the following Schedule 2 Designate Projects:

**DP8** - Po Shek Wu Interchange Improvement (Major Improvement)

**DP9** - Fanling Bypass Western Section (New Road)

**DP10** - Fanling Bypass Eastern Section (New Road)

**DP12** - Reprovision of temporary wholesale market in FLN NDA

The following section provides the overall conclusion of the LVIA for Schedule 2 DPs associated with KTN and FLN NDAs.

In summary, the principal landscape character areas and resources that will be affected by the construction and operational phases of the scheme are rural and urban peripheral villages, hillside landscapes (including woodland) and agricultural land. Generally they experience substantial to moderate substantial adverse impacts as a result of road construction or the site of the FLN and KTN Flushing Water Service Reservoirs. In these cases, the level of residual impact significance remain at a moderate level until operational year 10 as direct compensation for the related LCAs/LRs cannot be achieved.

In addition, agricultural landscape resources cannot be direct compensated of which will be inevitably lost in the development. Agricultural land is easy to re-create given the right environment and not rare in the New Territories. According to the AFCD Annual Report 2011-2012, currently, there are 4,071 ha of abandoned agricultural land in Hong Kong and 734 ha of active agricultural farmland, the agricultural land affected by the Schedule 2 DPs only represents a small percentage of active agriculture land in Hong Kong. In view of medium sensitivity of this LR, the impact significant is considered moderate or lower. The residual impact to this LR remains unchanged as there is no direct mitigation measures to compensate the lost. Other measures, including retaining about 48 ha of land zoned agriculture in KTN and FLN NDAs, setting up of LVNP and preserving and transplanting trees in the concerned LR would alleviate the impacts slightly.

Most of the landscape impacts can be reduced to slight and insignificant after the implementation and full establishment of mitigation measures. After all, the residual impacts are considered to be acceptable. Given the proposed developments are located within in an existing rural area, it is inevitable that landscape and visual impacts caused by such major development cannot be fully reduced and remain at a certain level at some locations even after implementation of all possible mitigation measures, including minimising topographical change, detailed design of the engineered structures to ensure compatibility of the proposed development with the existing surroundings, tree protection, preservation and transplantation as well as compensatory planting, woodland compensatory planting, screen planting to buffer structures from views,

decorative hoarding to screen undesirable views of work sites, light control within construction sites and at operation to reduce light glare that could potentially cause visual disturbance to VSRs at night time, provision for green roofs and vertical greening to soften hard surfaces on built structures in sight.

It is therefore anticipated that the overall residual landscape and visual impacts from the development of the schedule 2 DPs forming the key infrastructure component of the NDAs are considered acceptable with mitigation measures.

### **17.11 Ecology**

An ecological impact assessment has been conducted to address the potential ecological impacts arising from the development of the NDAs.

The area of highest ecological value in the Study Area is Long Valley which is a site of ecological significance in a Hong Kong context due to its being the largest remaining contiguous area managed for the production of wet agricultural crops. These, in combination with the other habitats in the Long Valley area, support a diverse fauna, of which the bird community, especially the freshwater-associated wetland bird community, is of high significance.

The Ma Tso Lung Stream, its tributaries and the riparian zone of these streams is also of ecological importance. While it is disturbed in several places by developed areas, and includes some partially channelised sections in the north of the Study Area, much of the stream is largely natural. A number of species of conservation importance have been found in or near the stream, of these Three-banded Box Terrapin, which is listed as being Critically Endangered globally is of greatest significance.

Other habitats and sites of particular ecological interest include the channel of the Ng Tung, Sheung Yue and Shek Sheung Rivers, *fung shui* woodland at Ho Sheung Heung, young secondary woodland and older plantations and some other streams.

Alternatives to safeguard the conservation value of Long Valley were considered and it is proposed to designate the area of highest ecological value (37.17ha), the largely wetland area south and east of the Sheung Yue River and south and west of the Shek Sheung River, as LVNP, zoned as Other Uses (OU) Nature Park (area C1-9 in KTN).

The proposed Long Valley Nature Park will safeguard the ecological value of this freshwater wetland area, which is unique in a Hong Kong context. Active conservation management of the LVNP will also provide the opportunity to enhance its ecological value, both to mitigate for loss of wetland habitats and other impacts on wetland fauna, and to increase its value for wildlife.

It is proposed to retain the agricultural (AGR) zonings of the area west and north of the Ng Tung and Sheung Yue Rivers and east of Ho Sheung Heung (C2-2), and the area south and east of area C1-9 and east of Yin Kong (C1-6). 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 will be exercised and such intention will be stated in an Explanatory Statement of the relevant Layout Plan.



Alternatives to avoid potential impacts to Man Kam To Road Egret were considered, but were found to be impractical due to engineering constraints and requirements; mitigation measures to compensate for this loss are therefore proposed;

Alternatives to avoid potential impacts to the Ma Tso Lung Stream and marsh and its riparian corridor and fauna of conservation significance were considered, and the stream and its tributaries and their riparian corridors south of the point where it will be crossed by the LMC Loop Eastern Connection Road will be included in a Green Belt zone (KTN area H1-1) where there is a presumption against development. Where the construction of the LMC Loop Eastern Connection Road will result in unavoidable impact to a downstream section of the stream in the north of the Project Area, alternatives to minimise impacts were considered. Avoidance of direct impacts by placing the road on viaduct were evaluated as being greater than impacts of diverting a section of the stream and minimising and compensating for such impacts.

Options to find an appropriate balance between the width of buffer which could be provided post-diversion, and the length of stream to be diverted were then considered; and it was resolved that the optimum solution, given the site constraints, is for a section of 130m of Ma Tso Lung Stream to be diverted and reinstated, with a minimum buffer width of 15m from the road to be maintained, following diversion, on the west side of the stream. On the east side a buffer width of up to 30m would be maintained from any development under the Project (such that at no point will the combined width of the buffer on both sides of the stream be less than 45m). The stream section to be diverted will be reinstated with natural materials and marsh vegetation will be established alongside the stream, Tree and shrub planting will be undertaken on each side of this up to the edges of the buffer zone. Once this vegetation has become established it is considered that the ecological value of the riparian corridor as a movement corridor for target fauna species of conservation significance will be fully mitigated, if not increased. In addition, in order to maintain connectivity for fauna moving in a direction perpendicular to the riparian corridor (and the LMC Loop Eastern Connection Road) a faunal underpass will be formed beneath the road. This, together with similar underpasses to be provided to the north of the project boundary under the LMC Loop project, will mitigate for cumulative fragmentation impacts of the two projects.

Finally, in order to minimise mortality impacts on fauna, construction stage barriers are proposed to prevent fauna from entering any project works area and a permanent barrier is proposed to minimise mortality impacts on fauna, in particularly the critically endangered Three-banded Box Terrapin,

### ***Impacts of the Project***

Construction and operation of the Project will result in a range of ecological impacts some of which, if unmitigated, are predicted to cause ecological impact of significance. The key habitat losses and indirect impacts are as follows:

#### **Direct Impacts**

Direct impacts of the Project will not result in the direct loss of areas of habitat that are of high importance, either in terms of function or area, in the context of the Study Area and the northern New Territories. However,

the combined loss of wetland habitats of ecological value, including wet agricultural land, pond, mitigation wetland and seasonally wet grassland is 8.70ha. Most of the areas which will be lost are fragmented and somewhat disturbed, and of limited ecological function, but the loss of wetland area, in aggregate, is of significance.

#### Indirect Impacts

- Disturbance impact on Long Valley;
- Indirect impact including disturbance, hydrological impact, potential pollution impact and fragmentation impact on Ma Tso Lung Stream and riparian corridor;
- Disturbance impact on Sheung Yue, Ng Tung and Shek Sheung Rivers and on wetland-dependent fauna using the rivers, in particular impacts on large waterbirds foraging in the Sheung Yue River and using the flight-line linking Long Valley along the Ng Tung River to Hoo Hok Wai;
- Disturbance impact on Ho Sheung Heung *fung shui* and secondary woods.

#### **Key Mitigation Measures**

Mitigation measures comprise the following:

- Designation of 37.17ha of Long Valley (LVNP) as Other Uses (Nature Park) in the revised RODP;
- Habitat enhancement measures to be implemented in LVNP to compensate for loss of wetland habitats and ecological function of loss of dry agricultural land;
- A series of measures to mitigate for disturbance impacts on Long Valley, including planning control, installation of 2m high fences around works areas; restrictions on work during the ardeid breeding season on flight-lines;
- Preservation and provision of screen planting and optimize building setback along main river channels;
- Phasing of works along main river channels and near Egrettries;
- Provision of alternative egrettry roosting site;
- A series of measures to protect the Ma Tso Lung Stream riparian corridor including designation of a no-building buffer zone, minimisation of stream diversion, restoration of the stream to natural conditions following diversion, restoration and enhancement of vegetation in the riparian corridor, LMC Loop Eastern Connection Road to cross the stream on viaduct, a permanent barrier on the at-grade section of the LMC Loop Eastern Connection Road to prevent terrestrial fauna mortality and a faunal underpass to mitigate for fragmentation impacts;
- Compensation for loss of secondary woodland and higher value plantation by provision of compensatory woodland habitats, and native tree and shrub planting;
- Pollution control in works areas of ecological significance, and in or adjacent to watercourses;

- Installation of 2m high fences around works areas adjacent to habitats/areas of ecological importance.

After implementation of mitigation measures, no significant adverse residual ecological impacts are predicted. While mitigation measures to reduce disturbance impacts on waterbirds using the main river channels are proposed, disturbance impacts to the more sensitive species on the Sheung Yue and Ng Tung River channels will be mitigated in full by provision and management of compensatory wetland habitat within Long Valley.

Construction phase impacts of Low severity are predicted on some wooded habitats and areas on some species using these habitats and operation phase disturbance impacts of Low severity on Ho Sheung Heung *fung shui* woodland and secondary woodland. However, the compensatory woodland habitat to be provided will generate a net ecological benefit to the Study Area once established.

### **17.12 Fisheries**

The current RODP would result in the loss of a fish fry farm at Fung Kong in KTN NDA. The loss of this pond would have a moderate impact on fish fry supply to pond fisheries in Hong Kong. It is proposed that appropriate notice should be given to the operator to permit the reinstatement of activities at an alternative location prior to the closure of the existing farm.

Other than the fish fry farm, fisheries in the two NDAs are of low importance in the overall productivity of Hong Kong fisheries. Impacts to the other fisheries are not considered to be significant in a Hong Kong context.

However, potential downstream impacts to fisheries in the Deep Bay ecosystem, and in the Ma Tso Lung area in particular, will require to be mitigated at source by preventing sediment or pollutants arising from the construction and operation of the Project entering watercourses.

### **17.13 Environmental Monitoring and Audit Requirements**

It is recommended to implement an EM&A programme throughout the entire construction period to monitor the environmental impacts on the neighbouring sensitive receivers regularly.

An EM&A Manual was prepared to specify the monitoring requirements, timeframe and responsibilities for the implementation of the environmental mitigation measures identified in the EIA process. All the requirements in the EM&A Manual shall be complied with.

An Environmental Mitigation Implementation Scheme has been included in the EIA report and EM&A Manual to summarise all the measures, the implementation locations, timeframe, agency etc.