



土木工程拓展署  
Civil Engineering and  
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Planning Department

ARUP

# 發展新界北部地區

初步可行性研究

PRELIMINARY FEASIBILITY STUDY  
ON DEVELOPING  
THE NEW TERRITORIES NORTH

## Executive Summary

December 2017



Planning Department and Civil  
Engineering and Development  
Department

Agreement No. CE 42/2013 (CE)

**Preliminary Feasibility Study on  
Developing the New Territories  
North**

**Executive Summary**

234834

December 2017

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 234834

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## Appendix

## ABBREVIATIONS AND ACRONYMS

“AIA”	Archaeological Impact Assessment
“Arup”	Ove Arup & Partners Hong Kong Limited
“ASR”	Air Sensitive Receiver
“BCP”	Boundary Control Point
“BHIA”	Built Heritage Impact Assessment
“CASET”	Computer-Aided Sustainability Evaluation Tool
“CEDD”	Civil Engineering and Development Department
“CLPP”	CLP Power Hong Kong Limited
“CP”	Concept Plan
“DIA”	Drainage Impact Assessment
“EIA”	Environmental Impact Assessment
“EIAO”	Environmental Impact Assessment Ordinance
“EIS”	Ecologically Important Stream
“FGC”	Fanling Golf Course
“FLN”	Fanling North
“FLWSR”	Flushing Water Storage Reservoir
“FWSR”	Fresh Water Service Reservoir
“G/IC”	Government, Institution or Community
“GIS”	Geographical Information System
“GB”	Green Belt
“GFS”	Government Flying Service
“ha”	Hectare
“Hong Kong 2030+”	Hong Kong 2030+: Towards a Planning Vision and Strategy Transcending 2030
“HKCG”	Hong Kong and China Gas Company Limited
“HKPSG”	Hong Kong Planning Standard and Guidelines
“HLH”	Hung Lung Hang
“HSK”	Hung Shui Kiu
“HYW”	Heung Yuen Wai
“I&T”	Innovation and Technology
“ICT”	Information and Communication Technology
“IE”	Industrial Estate
“KTN”	Kwu Tung North
“LCA”	Landscape Character Area
“LMC”	Lok Ma Chau
“LR”	Landscape Resources
“LT”	Liantang
“LT/HYW”	Liantang/Heung Yuen Wai



“MCD”	Multi-Criteria Decision
“MKT”	Man Kam To
“MSW”	Municipal Solid Waste
“NDA”	New Development Area
“NENT”	North East New Territories
“NOL”	Northern Link
“NSR”	Noise Sensitive Receiver
“NT”	New Territories
“NTM”	Ngau Tam Mei
“NTN”	New Territories North
“OU”	Other Specified Use
“P&E”	Planning and Engineering
“PC”	Ping Che
“PDA”	Potential Development Area
“PR”	Plot Ratio
“PlanD”	Planning Department
“PRD”	Pearl River Delta
“PRL”	Private Recreational Lease
“QH”	Queen’s Hill
“RDS”	Railway Development Strategy
“RDS-2014”	Railway Development Strategy 2014
“SI”	Site Investigation
“SIA”	Sewerage Impact Assessment
“SP”	Science Park
“STW”	Sewage Treatment Works
“SuDS”	Sustainable Urban Drainage System
“SWH”	Shek Wu Hui
“the Study”	Preliminary Feasibility Study on Developing the New Territories North
“TKL”	Ta Kwu Ling
“TOD”	Transit-Oriented Development
“TSE”	Treated Sewage Effluent
“TTIA”	Traffic and Transport Impact Assessment
“VSR”	Visually Sensitive Receiver
“WR”	West Rail
“WtE”	Waste-to-Energy
“WTW”	Water Treatment Works
“YL”	Yuen Long

# 1 Introduction

## 1.1 Background

- 1.1.1 The New Territories North (NTN), broadly covering the area north of Hong Kong's northern hill ranges viz. Kai Kung Leng, Pak Tai To Yan and Pat Sin Leng, has been a relatively less developed part of the plains of the territory. Apart from the Fanling/Sheung Shui New Town, which had a population of about 255,000 in 2011, developments in the area are generally confined to rural settlements or low-rise low-density residential estates, as well as open storage yards or rural industries.
- 1.1.2 Development in Shenzhen in the past three decades has resulted in a very different urban landscape in the region. With town-centre-type developments just across our northern boundary, the present rural NTN is a striking contrast. Other than the physical disparity it creates between the two sides of the boundary, development in Shenzhen, coupled with rapidly changing social and economic conditions, has gradually turned the NTN from Hong Kong's frontier area to a very dynamic portal where about 610,000 people and 42,000 vehicles passed through on a daily basis in 2015. The NTN could be more than just a boundary area. Its development potential should be better harnessed.
- 1.1.3 Apart from the North East New Territories (NENT) and Hung Shui Kiu (HSK) New Development Areas (NDAs), there are vast tracts of undeveloped areas in the NTN (including land already released from the Closed Area) that could be considered for meeting the long-term development needs of Hong Kong, while acknowledging that some areas mentioned above have high ecological/conservation significance and are unsuitable for development.
- 1.1.4 The Ping Che (PC)/Ta Kwu Ling (TKL) NDA under the NENT Planning and Engineering (P&E) Study is re-planned. Comprehensive planning of developable areas released from the Closed Area together with the nearby areas in the NTN would more effectively harness the development potential of the area.
- 1.1.5 The 2013 Policy Address states that the feasibility of taking forward the further development of the NTN should be studied with a view to developing a modern new town thereof a similar scale as the Fanling/Sheung Shui New Town.

## 1.2 The Study

- 1.2.1 The Planning Department (PlanD) and the Civil Engineering and Development Department (CEDD) commissioned Ove Arup and Partners Hong Kong Limited (Arup) on 30 January 2014 to undertake the Preliminary Feasibility Study on Developing the New Territories North (the Study). The Study has formulated a Concept Plan (CP) for the NTN and strategic infrastructure requirements, and examined the preliminary feasibility of individual Potential Development Area (PDA) identified.



## 1.3 Study Area

- 1.3.1 The Study Area has an area of about 5,300 ha. It covers the land already released from the Closed Area along major cross-boundary transport corridors, areas in PC and Hung Lung Hang (HLH) in TKL, Kong Nga Po and Lung Yeuk Tau, areas in the vicinity of the Northern Link (NOL) proposed under the Railway Development Strategy 2014 (RDS-2014), such as San Tin/Lok Ma Chau (ST/LMC). It should be noted that areas covered by the existing Fanling/Sheung Shui New Town, proposed Kwu Tung North (KTN) NDA and Fanling North (FLN) NDA under separate studies are excluded from the Study Area as shown in **Figure 1.3.1**.

## 1.4 Study Flow

- 1.4.1 The main process of the Study is summarised as follows:

- Formulation of Study Approach, Baseline Review and Identification of Development Opportunities, Constraints and Key Issues, and Formulation of Key Planning Approaches
- Delineation of PDA Boundaries and Population and Employment Estimates
- Formulation of Concept Plan
- Broad Technical Assessments in Support of the Concept Plan
- Formulation of Implementation Strategy and Development Timeframe

## 2 Study Approach, Opportunities, Key Issues and Constraints, and Overall Planning Approaches

### 2.1 “Smart Green Resilient” Approach

2.1.1 To take up the challenges of developing the next generation of new town to satisfy territorial needs, and providing visionary and pragmatic planning and design solutions to NTN, “**Smart, Green, Resilient**” is recommended as an overarching approach for NTN Development, under which various city development concepts could be subsumed.

2.1.2 The vision for NTN development has been set, which is “Creating a New Living and Working Environment” through adopting “Smart-Green-Resilient (S-G-R) Development” to balance “Living, Productivity and Ecology”.

- **Smart and Green Development:** It aims at achieving smart growth via the installation of smart application in infrastructure and the use of urban informatics;
- **Green and Resilient Development:** It aspires to reduce carbon emissions and mitigate climate change, through developing green economy to enhance economic and social resilience, as well as increasing redundancy and flexibility of future green infrastructure;
- **Resilient and Smart Development:** It seeks to use Information and Communication Technology (ICT) knowledge to enhance city resilience, via the use of information platform, early-warning system/forecasting, a more informed and resourceful society and well-informed decision-making.

### 2.2 Opportunities, and Key Issues and Constraints

#### Opportunities

2.2.1 Opportunities have been identified to provide a new direction for the future growth of the NTN.

- **Capitalize on Strategic Location** - the highly strategic location neighbouring the Shenzhen and the Pearl River Delta (PRD) area capturing the increasing cross-boundary trade and resources will serve as a catalyst for growth.
- **Unleash Existing Potential** - there is opportunity to exploit the existing assets to their full potential and optimize use of land to increase long-term land supply.
- **Stimulate Urban-Rural-Nature Integration and Exchange** - the rural character of the NTN contributes to its unique sense of place, which should be captured and strengthened.
- **Maximise Innovation and Resilience** – there is opportunity to become a pioneer for innovative planning practices. Smart City concepts will be



integrated into proposals, incorporating resilient, innovative design and green solutions.

- **Invigorate Employment Opportunities** - NTN has huge potential to address territorial economic needs, to boost employment opportunities, and to open up new market and industry potential in the long term beyond 2030.
- **Promote Inclusivity** - inclusive planning based on economic, social, environmental and culturally sensitive policies will create communities that serve and benefit the widest range of people.

### Key Issues and Constraints

2.2.2 Key issues and constraints are summarized as follows:

- **Limited Infrastructure Capacity** - The development of NTN will bring additional demand and load to existing transport infrastructure. Congestion is often experienced at the boundary crossing points due to their limited handling capacity. The limited sewerage, water supply and drainage infrastructure has posed another major development constraint.
- **Ecological Protection** - NTN is characterized by a large area of high ecological significance. Proposals should be formulated to minimize the impacts on diversity of fauna and flora and ecologically valuable areas.
- **Sensitivity of Natural Setting** - The local landscape comprises high quality upland and extensive natural hillside surroundings which have a high sensitivity to physical change and should be protected as far as possible.
- **Interface with Existing Villages, Burial Grounds, Agricultural Land and Historic Features** - Taking into account the village settlements, the permitted burial grounds, active agricultural land, cultural heritages, and to minimize impacts on the existing rural environment and the well-established communities.
- **Compatibility with Existing Land Uses** - The interface issues with existing and planned land uses, facilities and infrastructure need to be addressed. The brownfield sites across NTN should also be one of the key issues to be tackled. Any Consultation Zones arising from existing Potentially Hazardous Installations or Landfill Gas sites should also be taken into account.

## 2.3 Formulation of Key Planning Approaches

2.3.1 The planning approaches have been formulated as an overall framework for the future development of NTN and its gradual transformation into a settlement system of productive clusters and residential neighbourhoods.

### Fostering Urban-Rural-Nature Integration

2.3.2 There are many village settlements and extensive agricultural land, some of which is under active farming, in the NTN. Their wholesale conversion to make way for new urban development or the conventional approach of adopting an urban-rural dichotomy, are clearly against contemporary public aspirations for respect of the natural resource, established communities and local culture. In planning of the NTN, a more integrated form of urban development should be

adopted. Natural characters will be reinforced through nature conservation and revitalization of green and blue corridors.

- 2.3.3 Due consideration would be given to preserving established settlements and good agricultural land where possible. This new form of urban development will result in medium- to high-density developments intermingled with the rural environment comprising active agricultural land and agricultural land of high potential for rehabilitation and rural settlements. Opportunities for upgrading existing farming practices facilitated by the integrated green infrastructure system (e.g. organic waste treatment and effluent reuse by which food waste and reclaimed water could be better utilised) would be further explored. Besides, new urban development could improve the existing rural environment through integrated provision of new public and community facilities and new ICT.

### **Creating Opportunities for People and Businesses**

- 2.3.4 The strategic location of the NTN should be capitalized on developing suitable economic activities and employments. This would also help address the spatial imbalance of jobs which are currently concentrated in the urban areas. Potential industries to be accommodated in the NTN may include value-added logistics/distribution hub (leveraging on the convenient access to and from the Boundary Control Points (BCPs)), innovation and technology (I&T) industries (along the proposed Eastern Knowledge and Technology Corridor under “Hong Kong 2030+: Towards a Planning Vision and Strategy Transcending 2030” (“Hong Kong 2030+”) containing universities, science park (SP), industrial estates (IE) and industrial and service support centres), professional & production services and testing and certification, eco/cultural/heritage-tourism, urban farming and food trade, outlet stores/retail and knowledge-based green industries. Suitable economic land uses for the NTN have been further examined in the Study.
- 2.3.5 For the majority of existing informal business operations in the NTN, their uncontrolled proliferation has created considerable environmental, traffic, visual, flooding and other problems. While these brownfield activities have played a role in the economy of Hong Kong supporting the port, manufacturing, construction, vehicle repair and logistics sectors, etc., as well as providing jobs, especially those requiring low skills, they do not optimize the use of land in terms of efficiency and intensity. Their continued presence thus incurs opportunity, environmental and social costs. One appropriate approach is to convert/optimize brownfield sites to more efficient use, be it residential, commercial or special industries, through consolidation and comprehensive planning. This would also have the added benefit of improving the overall environment by eliminating the incompatible and polluting land uses in the NTN.

### **Enhancing Accessibility and Connectivity**

- 2.3.6 The proposed NOL will enhance the external connectivity of the NTN in particular the Ngau Tam Mei (NTM) and San Tin areas where new railway stations could be built. Further provision of rail link and new strategic road link to connect the urban area may be required to cope with new developments in the NTN. A balanced level of population and employment should be explored to encourage a higher self-containment ratio and reduce the need for commuting to the urban centre. Further opportunities should be explored to provide a strong



employment hub in NTN to encourage a balanced flow of traffic to optimize the capacity of the existing transport network.

- 2.3.7 Transit-Oriented Development (TOD) should be adopted in the planning for the PDAs to provide opportunities to create core areas of highly concentrated activities and development intensity adjacent to proposed/possible stations. Within these core areas, residents and commuters can enjoy convenient access to a variety of activities which reflects the high accessibility provided by the railway connectivity. In parallel, integrated land use-transport planning and demand-management measures to reduce vehicular trips, encouraging the use of public transport, setting up of car free zone to promote walking, etc. should also be explored.

### **Realizing a “Smart, Green, Resilient” City**

- 2.3.8 As an overarching vision for this Study, one important task is to explore how the smart city concepts and technologies could help improve liveability, sustainability and resilience to climate and other changes. The concept encompassing various aspects of urban development including buildings, transport, energy, waste management, water resources and city information and knowledge systems could be applied to the NTN so as to build a smart, green and resilient city.
- 2.3.9 An integrated green infrastructure system could be taken forward to support the NTN development. Some possible directions are: (1) **Traffic** - encouraging the use of public transport with traffic management measures to suppress and manage private car trips, to enhance green and walkable environment; (2) **Sewerage** - exploration of options such as effluent export and reuse of treated effluent for non-potable uses; (3) **Drainage** – adoption of flood retention & interception measures, and Sustainable Urban Drainage System (SuDS) measures, while existing upstream drainage networks and rivers could be upgraded with a green and eco-hydraulic approach for integration with overall land use planning; (4) **Water Supply** – exploration of measures to reduce reliance on fresh water sources including re-use of treated effluent and rainwater harvesting to minimize the need for new waterworks; (5) **Cavern** – suitable locations for cavern should be investigated for housing additional and relocation and co-location of infrastructure facilities, in order to achieve smart utilization of scarce land resources.
- 2.3.10 Other measures including adoption of ICT Platform enabling smart mobility, urban living and businesses, which is increasingly common in many cities across the world have also been investigated in this Study.

## 3 Concept Plan for NTN

### 3.1 Population and Employment Estimates in NTN

- 3.1.1 The population level for the future NTN development was estimated based on three approaches with different considerations, namely ‘Environmental Capacity’, ‘Engineering Infrastructure Capacity’ and ‘Employment Generating Capacity’.
- 3.1.2 In the ‘Environmental Capacity’ approach, references had been made to eco-city standards as benchmarks, among which the Economist Intelligence Unit Green City Index, the Eco-Cities in China, and the NTN land resources were examined. The population estimated under this approach was about 400,000. The ‘Engineering Infrastructure Capacity’ approach examined minimum and maximum infrastructure scenarios. The minimum infrastructure scenario would support a population of 219,000 whereas the maximum infrastructure scenario would be capped by NTN land resources and thus resulting a population estimate at 400,000. The ‘Employment Generating Capacity’ approach applied the Garin-Lowry model and generated a population estimate at 200,000.
- 3.1.3 In the employment estimation, a sector-based forecast (bottom-up approach) was adopted in which job growth in shortlisted sectoral industries was forecasted, followed by assigning a share of new jobs in each sector to the NTN according to its suitability to accommodate that sector under different employment scenarios (i.e. weak economic linkage with PRD; moderate economic effect of proximity to PRD; and very strong economic linkage with PRD). In addition, office-supporting jobs, population-supporting jobs, and jobs generated from government department anchor for office development were taken into account. It was estimated that a range between 124,000 to 215,000 jobs could be accommodated in NTN development.

### 3.2 Delineation of PDA Boundaries

- 3.2.1 A Geographical Information System (GIS)-based Multi-Criteria Decision (MCD) Analysis has been conducted. Quantitative spatial data was examined, selected and classified into 6 different categories, including topographic/geological consideration, strategic locations, land uses, infrastructure and transport connection, environmental considerations and ecological considerations. The resultant development potential maps formed a scientific basis for the delineation of the PDA boundaries.
- 3.2.2 Having regard to the aforesaid development opportunities and constraints and the findings of the MCD Analysis, PDAs covering three areas, namely LMC, Man Kam To (MKT), and Heung Yuen Wai (HYW)/TKL/Queen’s Hill(QH), have been identified for the NTN development with a total area of about 1,400 ha.

### 3.3 Formulation of Development Scenarios

- 3.3.1 Based on the delineation of PDA boundaries, the population and employment estimates, broad land use options and development phasing, a total of three development scenarios have been formulated and assessed.



3.3.2 The summary of the three scenarios are presented in **Figure 3.3.1** including the total population/employment combination, phasing and infrastructure.

- **Scenario I (Balanced Population, Highest Employment to Population Ratio)** is intended for a Productive Metropolis with a population/job combination of 255,000/215,000. This is to maximize the development intensity while keeping the operating performance of existing key railways and highways. A possible north-south railway connecting from HYW to a nearby new town would be required, which triggers a total of 2 phases of development.
- **Scenario II (High Population, Lower Employment to Population Ratio)** is intended to explore a higher population level with a lower employment to population ratio supported by additional new infrastructure compared to Scenario I (i.e. further extension of a possible north-south railway southwards to other new towns and/or urban areas). Besides, with the increased road traffic, the need and practicality of more stringent traffic demand management measures and/or a possible new highway would have to be explored. While keeping the employment of 215,000 jobs, the population under Scenario II is further increased to 350,000. A total of 3 phases of development are recommended.
- **Scenario III (Highest Population, Lowest Employment to Population Ratio)** is intended to explore the highest residential development scenario with the lowest employment to population ratio, with same infrastructure provision compared to Scenario II. Population/job combination is adjusted to 397,000/165,000. A total of 3 phases of development are recommended. Compared to Scenarios I and II, it is necessary to designate more land at the PDAs in the east NTN for residential uses and is skewed towards population increase, thus will generate even more commuting trips to the urban area than that in Scenario II. Although strategic transport infrastructure proposed is similar to Scenario II, the traffic impact is expected to be much greater.

3.3.3 After further consideration, Scenario III is not recommended for consideration in the next stage of the Study. This is mainly due to its low employment level, which the planning principle of creating opportunities for people and businesses can hardly be achieved. Although Scenario III has a comparative merit of housing high level of residential use and population, the population density is even higher than that of the Tseung Kwan O New Town and problem of incompatibility with nearby rural settlements and setting of the rural NT is also anticipated.

3.3.4 As a result, Scenarios I and II, which are considered more self-sustaining and covering a spectrum of development thresholds with different characteristics, are recommended to be further developed in the Study and form the basis for detailed planning and design for the CP to be discussed in the next section.

## 3.4 Concept Plan under Scenario I

3.4.1 Please refer to **Figure 3.4.1** for the CP under Scenario I.

### Planning Intention for Scenario I

- 3.4.2 The intention for Scenario I is to develop the NTN as a Productive Metropolis to achieve a balanced mix of ultimate population and employment of 255,000 and 215,000 respectively. The mix balances a significant provision of new employment places with residential areas, therefore minimizing the infrastructure provision.
- 3.4.3 This scenario intends to capitalize on the proposed NOL and possible new railway in the East NTN connecting from HYW to the nearby new town while keeping the operating performance of existing key railways (in particular West Rail (WR)) and highways (Tolo Highway and Tai Lam Tunnel) in the north-south direction not worse than the Base Case (without NTN development).
- 3.4.4 This balanced population/employment levels would promote resident workers in the NTN to work within the same region, that in turn would absolve their need to commute to the urban areas and reduce the distance of travel in general.

### *Phasing of NTN Development under Scenario I*

- 3.4.5 Development under Scenario I will be carried out in 2 phases in order to achieve progressive implementation as triggered by different infrastructure provision. The two development phases are triggered by proposed and possible railway lines (i.e. Phase 1 by the proposed NOL and Phase 2 by the possible north-south railway in the East NTN connecting to the nearby new town. Phase 1 development captures the development potential brought about by the proposed NOL, which opens up the full development potential of the LMC PDA. In total, the Phase 1 development of West and East NTN yields a population of 95,000 and 119,000 jobs.
- 3.4.6 In Phase 2, the new possible north-south railway connecting to the nearby new town covering QH, PC, TKL and HLH will trigger further development of the East NTN. The entire QH, HYW and TKL PDAs are proposed to be developed in this phase. As a result, the Phase 2 development will generate an additional population of 160,000 and employment of 95,000.
- 3.4.7 This Scenario can generate a population of about 255,000 and about 215,000 jobs, with jobs/population ratio equals to about 84%.

## 3.5 Concept Plan under Scenario II

- 3.5.1 Please refer to **Figure 3.5.1** for the CP under Scenario II.

### Planning Intention for Scenario II

- 3.5.2 The intention for Scenario II is to explore a high-residential development scenario with a lower employment to population ratio with due respect to the environmental capacity of the NTN, with an addition of new infrastructure when compared to Scenario I, i.e. a possible north-south railway to nearby new town and eventually a possible further extension of railway to other new towns and/or urban area. Similar to Scenario I, development during Phase 1 will be clustered in the LMC PDA at a scale that would maintain the service level of WR as in the Base Case. Further population increase will therefore be accommodated in East NTN.



- 3.5.3 With the addition of new transport infrastructure, Scenario II is intended to increase the development intensity in East NTN to accommodate a higher population closer to 400,000, while maintaining a strong economic linkage with the PRD (i.e. 215,000 jobs).
- 3.5.4 When considering a higher maximum development intensity with respect to urban design considerations, the maximum development intensity for East NTN for residential use is set at PR7.5 which is comparable to the PR of the metro area in Kowloon. Therefore, the ultimate phase of Scenario II is able to accommodate a population of about 350,000 and about 215,000 jobs.
- 3.5.5 During Phase 2 development, it is proposed to connect the possible railway line to the nearby new town. During Phase 3, the possible railway line will be further extended to other new towns and/or urban area.

#### ***Phasing of NTN Development under Scenario II***

- 3.5.6 As mentioned in the planning intention above, there will be 3 development phases under Scenario II. Same as Scenario I, the Phase 1 development of West and East NTN yields a population of 95,000 and jobs of 119,000.
- 3.5.7 In Phase 2, possible railway line covering HYW, TKL, PC and QH connecting to the nearby new town will trigger further development of the East NTN. The entire QH and HYW PDAs and majority of the TKL PDA are to be developed in this phase. Only about 16 ha of land at HLH east of the proposed ring road is developed in this phase as it can be supported by the proposed road network. As a result, the Phase 2 development will generate an additional population of 160,000 and employment of 89,000. The total population and employment (Phase 1 + 2) will be 255,000 and 209,000 respectively.
- 3.5.8 In Phase 3, population beyond 255,000 is to be triggered and supported by a possible railway extension from the nearby new town to other new towns and/or urban area. With the support of new railway connection to HLH and additional passenger capacity actuated by the possible railway extension further southward to other new towns and/or urban area, further development at the remaining 88 ha of land at HLH area is triggered. More stringent traffic demand management measures and/or new transport initiatives (e.g. possible new highway) need to be put in place. The Phase 3 development will yield an additional of 95,000 population and 6,000 jobs.
- 3.5.9 This Scenario in total (Phase 1+2+3) can generate a population of 350,000 and jobs of 215,000 with jobs/population ratio equals to about 61%.

### **3.6 Latest Changes in Broad Land Uses**

- 3.6.1 During the course of the Study, the 2016 Policy Address announced by the Chief Executive sets out that “in view of an anticipated increase in the demand for sites for scientific research and new industrial use<sup>1</sup>, the Government will identify sites

<sup>1</sup> To provide land for smart production, high value-added technology industries as well as high value-added manufacturing processes in supporting the Government’s policy on the development of innovation and technology industry and “re-industrialisation”.

near Liantang/Heung Yuen Wai (LT/HYW) Boundary Control Point (BCP) for the development of SP/IE”.

- 3.6.2 To take forward this policy initiative and provide land in support of the Government’s policy on promoting re-industrialisation, a preliminary planning assessment of the area near LT/HYW BCP to identify possible sites for the development of SP/IE was conducted. The assessment indicates that the boundary-related commercial site to the immediate south of LT/HYW BCP together with the area to its further south along the BCP Link Road is suitable for SP/IE use.
- 3.6.3 The identified SP/IE site with an area of about 56 ha (**Figure 3.6.1**) is located only about 500m from the southern edge of LT/HYW BCP and near sites of Shenzhen National Independent Innovation Demonstration Zone (深圳國家自主創新示範區) in LT<sup>2</sup>. It is in line with the concept of the Eastern Knowledge and Technology Corridor in East NT proposed under the “Hong Kong 2030+” and conveniently linked to existing SP and IE in NENT via LT/HYW BCP Link Road to be completed by 2018 and the highway network in Tai Po. It is large enough to accommodate a SP cum IE development to achieve agglomeration of innovation, research and development, and production allowing vertical integration of industries within the I&T ecosystem.
- 3.6.4 In view of the 56-ha site identified for SP/IE development near LT/HYW BCP, the land uses of the sites originally planned for SP and IE in the east of the NTN New Town<sup>3</sup> (total land area of about 61 ha) under the NTN Study have been reviewed to avoid a situation where the NTN New Town is dominated by a single industry and to achieve an integrated community of new industrial productions and urban living<sup>4</sup>.
- 3.6.5 After the review, sites of about 34 ha could be retained for SP/IE development and other supporting industries whilst the remaining sites could be considered for other competing uses such as modern logistics. It is considered that the SP and IE sites in the NTN New Town with a total area of about 90 ha are appropriate as far as sustained I&T development and the balanced composition of the New Town are concerned.
- 3.6.6 The aforesaid changes in broad land uses would lead to an increase in SP, IE and modern logistics uses and a reduction in “Mixed Use”, “Commercial”, “Green Belt”, “Open Space” and “G/IC”. Nevertheless, the overall population and employment levels of the NTN development under the two scenarios remain unchanged.

<sup>2</sup> In the Shenzhen 12th Five-Year Plan, LT had been positioned as a centre for internet industries. Parts of the industrial zones in LT are being transformed to develop the Shenzhen Internet Industrial Park (SIIP) (深圳市互聯網產業園). The SIIP, the Pengji Industrial Zone (鵬基工業區) and the No. 7 Industrial Zone (第七工業區) within LT, amongst other districts in Shenzhen would form the “Shenzhen National Independent Innovation Demonstration Zone”.

<sup>3</sup> HYW, TKL and QH PDAs are presented as the NTN New Town in the public engagement for “Hong Kong 2030+” (please refer to paragraph 7.1.2 for details).

<sup>4</sup> Residential and community facilities would be provided to support new anchor uses of the Eastern Knowledge and Technology Corridor.



## 4 Broad Technical Assessments

### 4.1 Introduction

4.1.1 Both Scenario I and Scenario II of CP are recommended for further study in the next stage. As compared to Scenario I, Scenario II has a higher population level and higher development intensity and is expected to have greater impacts. Scenario II has therefore been adopted as the worst-case scenario for the technical assessments under the Study.

4.1.2 Detailed technical assessments integrally ascertain the feasibility of the proposed measures taking into account the characteristics of the Study Area including topography, land use, population and existing infrastructure. A number of technical aspects have been assessed:

- Geotechnical
- Traffic and Transport
- Drainage, Sewerage, Water Supply and Utility
- Air Ventilation
- Socio-economics
- Sustainability
- Green Initiative and Carbon Appraisal Study and “Wise City” Concept
- Environment (Strategic)
- Landscape and Visual
- Cost (Broad)

4.1.3 The following summary of technical assessments is based on an earlier version of the CP. Changes to the CP have been made subsequently, including the expansion of the possible SP and IE development discussed in Section 3.6. As the overall population and employment levels of the NTN development under the two scenarios remain unchanged, it is considered that those changes to the CP do not have material impact on the broad technical feasibility of the CP.

### 4.2 Geotechnical Assessment

4.2.1 Geotechnical Assessment was carried out to ascertain the feasibility for the proposed development and cavern proposals for the CP.

4.2.2 A number of constraints have been identified in the Study including areas with anticipated deep weathering, extensive coverage of soft compressible deposits, marble-bearing strata and substantial natural terrain hazards.

4.2.3 For opportunities of cavern development, areas of medium to high suitability have been considered which form the basis for the proposed caverns for accommodating various infrastructure facilities for further studies in detailed design stage.

- 4.2.4 Based on broad technical assessment carried out on the existing ground conditions and proposed project works, it is concluded that the proposed site formation and infrastructure works for the CP are geotechnically feasible. Detailed geotechnical assessments including ground investigation is proposed to better define the ground conditions of individual PDAs in detailed design stage.

### 4.3 Traffic and Transport Impact Assessment

- 4.3.1 Traffic and Transport Impact Assessment (TTIA) was carried out for the design year 2041. In devising the transport strategies and infrastructure requirements to support the NTN development, major considerations have been given to:

- adjusting the employment/population development mix in NTN to increase self-containment and reduce peak directional traffic;
- increasing the transport network capacity between NTN and the metro areas;
- reducing traffic demand through more rigorous traffic suppression/ demand management measures; and
- ensuring that internal and external trips are catered for by a comprehensive, multi-modal transport system. This will be complemented by high-density, mixed use development around station areas, green transport modes including walking, cycling, and public transport.

- 4.3.2 As Scenario II represents the more critical scenario for the NTN Development in terms of transport network performance and infrastructure requirements, the TTIA was carried out based on this scenario.

#### Rail Network Assessment

- 4.3.3 Railway will serve as the backbone of public transport services in support of the TOD concept for the NTN development. Potential new railway development schemes have been studied. The studied railway schemes were neither under the committed railway projects by Government nor the proposed railway schemes under RDS-2014. The design principles are to capture the opportunities brought by future committed/planned railway network, in particular the proposed NOL (as recommended in the RDS-2014) and Shatin to Central Link (under construction), while observing the capacity constraints on the existing East Rail Line (future North South Corridor) and WR Line (future East West Corridor). The initial concepts of the transport infrastructure described in the ensuing paragraphs are assumptions adopted in this TTIA.

- 4.3.4 In the west, to take advantage of the proposed NOL, possible provision of intermediate stations along the proposed NOL (subject to further study and land use planning) is proposed to serve the LMC PDA.

- 4.3.5 In the east, to enhance the connectivity and capacity of the railway network serving the eastern PDAs, a possible north-south railway is proposed connecting the eastern PDAs with possible intermediate stations at QH, PC, HYW and HLH to (i) the nearby new town, and (ii) further extension to other new towns and/or urban area. The scheme can be implemented in phases to suit the progressive phasing of the NTN development. Subject to further study of railway planning, the main line section from HYW to the nearby new town will



first be provided in Phase 2 that will then be extended further southwards connecting to other new towns and/or urban area in Phase 3.

### **Road Network Assessment**

- 4.3.6 The CP would increase traffic loading on nearby strategic roads. Subject to the Government's holistic review of traffic growth and development potential from the territory-wide perspective, more stringent traffic demand management measures (e.g. car free zone or vehicle restrictions, traffic adaptive control system, integrated intelligent public transport system, etc.) and/or new transport initiatives/proposals (e.g. the possible new highway) would need to be further investigated in the future.
- 4.3.7 The proposed local and district road network will provide connectivity both internally and externally to the PDAs via a combination of upgraded existing roads, and new single and dual carriageways. All upgraded and new roads will incorporate the appropriate pedestrian and cycling facilities. A continuous and connected cycle network is also proposed to provide cycle linkage within and between PDAs, as well as connections to the strategic cycle network in the region. The proposed road network together with necessary improvements at key local junctions would be capable of handling the traffic generated by the NTN development without causing insurmountable traffic impact.
- 4.3.8 Some of the identified strategies are only conceptual at this stage of study. Specific schemes to support the relevant strategies and their implementation feasibility will need to be further developed and examined in the stage of P&E Studies.

### **Conclusion**

- 4.3.9 In summary, it is considered that the proposed population and employment under the more critical CP can be supported by the recommended transport infrastructure, improvement schemes and/or adoption of appropriate transport strategies.
- 4.3.10 The possible north-south railway line, new transport initiatives (such as possible new north-south highway) and supporting infrastructure will provide residents and employees of the NTN development with easy access to the other new towns and/or urban area of Hong Kong. The possible north-south railway and north-south highway will have to be further investigated through more in-depth studies. With the proposed road network and necessary junction improvement works in place, no insurmountable traffic impact is envisaged as a result of the establishment of NTN.

## **4.4 Drainage, Sewerage, Water Supply and Utility Impact Assessment**

### **Drainage Impact Assessment**

- 4.4.1 Based on the findings of the Drainage Impact Assessment (DIA), increase in peak runoff intercepted within the PDAs of the CP is anticipated due to the increase in the paved surface. To mitigate the potential drainage impacts, it is recommended in the DIA to provide retention ponds and lakes to attenuate peak surface runoff within the PDAs. Multiple formation levels and stormwater treatment are

proposed to be considered in these retention tanks/lakes. Proposed revitalization and rehabilitation works to the existing drainage channels/nullahs are identified.

### **Sewerage Impact Assessment**

- 4.4.2 In the Sewerage Impact Assessment (SIA), it is estimated that the additional sewage generated within the proposed PDAs in the CP is approximately 140,846m<sup>3</sup>/day.
- 4.4.3 To deal with the additional sewage generated within the LMC PDA, two options have been recommended in the SIA for consideration. Under Option 1, 16,000m<sup>3</sup>/day sewage is recommended to be handled by the Yuen Long Sewage Treatment Works (STW) and the remaining some 22,100m<sup>3</sup>/day sewage would be treated in the new proposed STW. Under Option 2, a new STW of design capacity of 38,100 m<sup>3</sup>/day is proposed to handle all additional sewage generated within the LMC PDA.
- 4.4.4 For HYW PDA, TKL PDA and QH PDA, since there is no space in the current / expanded Shek Wu Hui STW for further expansion, it is recommended to construct a new STW to handle the additional sewage generated within the 3 PDAs.
- 4.4.5 It is also recommended that the MKT PDA would be handled by existing Shek Wu Hui STW. Diversion of flow from existing NENT sewerage system, which collects sewage flows from the existing village areas in PC and TKL as well as the leachate flows from the existing and planned expansion of the NENT Landfill, and from Shek Wu Hui STW to the new PC/TKL STW is proposed to free up spare capacity at Shek Wu Hui STW for the development at MKT PDA.
- 4.4.6 In order to comply with the “No Net Increase in Pollution Loading” Requirement of the Deep Bay Water Control Zone, three options have been considered:-
- Option 1 – Reuse of Treated Sewage Effluent (TSE) within the PDAs and other existing urban areas / proposed developments;
  - Option 2 – Export of the TSE outside of the Deep Bay Water Control Zone; and,
  - Option 3 – Hybrid solution of Option 1 and Option 2.

### **Water Supply Impact Assessment**

- 4.4.7 It is estimated that the total water demand (including fresh and flushing water) within the proposed PDAs for the CP is approximately 187,201m<sup>3</sup>/day.
- 4.4.8 To provide fresh water supply for the NTN Development, it is recommended to consider the additional fresh water demand from the NTN development for future expansion of Tai Po Water Treatment Works (WTW). In addition, uprating of existing pumping station or new pumping station will also be required to feed the treated water to the proposed service reservoirs. Two new fresh water service reservoirs (FWSRs), one in PC and another in NTM, are recommended in the Water Supply Impact Assessment to feed the proposed PDAs.
- 4.4.9 Apart from FWSRs, two sites are also identified for new flushing water storage reservoirs (FLWSRs) in PC and in NTM. In this stage, it was proposed to supply the FLWSRs with TSE generated from the existing and/or proposed STWs. Apart



from the new FWSRs and FLWSRs, associated trunk and distribution mains will also be required. Since the additional water demand is recommended to be taken up by the expansion of Tai Po WTW, a link should be provided for linking up the trunk mains of Tai Po WTW, Sheung Shui WTW and Ngau Tam Mei WTW so that the additional water demand arising from LMC PDA could be provided by Tai Po/Sheung Shui WTW.

### **Utility Impact Assessment**

#### ***Electrical Power Supply Network***

- 4.4.10 In the Study Area, there is only one electricity power service provider, the CLP Power Hong Kong Limited (CLPP). In general, most of the existing distribution cables are laid underground along public roads within the NTN. Overhead high voltage transmission powerline supported on pylons can also be found in hilly terrain and rural areas.
- 4.4.11 The clearance requirements for the 400kV and 132kV overhead power cables within the Study Area are considered to be constraints to the boundary of proposed land use developments. CLPP, Fire Services Department and Electrical and Mechanical Services Department should be consulted if there are any proposed structures encroaching onto this preferred working corridor or any reduction of existing ground clearance of the overhead lines.
- 4.4.12 New 132kV sub-station to the network may be required if the loading requirement on these land use development exceeded the planned system capacity.
- 4.4.13 The existing and planned power transmission and distribution cable system are properties of the CLPP. System capacity and its potential for expansion would require CLPP to review.

#### ***Gas Supply Network***

- 4.4.14 At the moment there is only one town gas supply company, the Hong Kong and China Gas Company Limited (HKCG) is supplying gas via pipeline system.
- 4.4.15 The need of town gas supply by pipeline would be up to the nature and density of land use. For extension of gas supply system, pipes can be branched off from the existing mains and be laid along existing or future distributor roads in the PDAs.

#### ***Telecommunication Network***

- 4.4.16 Telecommunication services are essential for the developments in PDA. The mobile network operators will need to reserve land space within the development and along public road for their future installation of base stations of mobile services in the areas that are outside the existing coverage.

#### ***Street Lighting***

- 4.4.17 Street lightings shall be powered by low voltage cable from the CLPP network. The demand of street lighting provision and associated facilities will be considered in the technical assessment in the stage of P&E Studies when necessary.

## Conclusion

- 4.4.18 The potential drainage, sewerage, water supply and utility impacts arising from the CP were assessed and proper mitigation measures have been recommended. In this regard, no insurmountable impact is anticipated.

## 4.5 Air Ventilation Assessment

- 4.5.1 A qualitative Air Ventilation Assessment, through Expert Evaluation, on the CP was carried out. The annual prevailing winds are coming from N, NNE, ENE and E directions, while the summer prevailing winds are from E, S, SSW, SW and WSW directions. The Study Area is generally flat and surrounded by hilly ranges that would limit the incoming wind. The building morphology of existing towns and committed KTN and FLN NDAs adjacent to the Study Area would also affect the wind availability of each PDA.
- 4.5.2 Since the NTN Study is at preliminary feasibility stage and detailed building layout is not available, recommendations have been made to further enhance the air ventilation performance at detailed design stage. Adoption of measures from the Sustainable Building Design Guidelines (PNAP APP-152) and the Hong Kong Planning Standard and Guidelines (HKPSG) to enhance wind penetration and permeability is recommended; such as wind corridors and localized air paths (via open space, green belts, etc.) in alignment with the prevailing/approaching wind; orientation of developments and street alignment, stepping building height profile, avoidance of large and continuous facade design, building setback/non-building area, etc.

## 4.6 Socio-Economic Impact Assessment

- 4.6.1 A Socio-Economic Impact Assessment was carried out for the CP. In particular, CP has created two major commercial agglomerations in the West and East NTN. A total of about 6 million m<sup>2</sup> of employment-supporting development is planned and total employment created would be approximately 215,000.
- 4.6.2 CP has designated a total of about 280 ha for developing new residential units and about 180 ha for villages and existing settlements. With planned residential units to cater for additional population of 350,000, it is expected to help mitigate part of the shortage in housing supply. There would be also potential upgrades in terms of the productivity of business activities given the existing brownfield operation does not represent an efficient utilization of land.
- 4.6.3 Given that the CP only shows broad land use concepts and detailed survey of existing land uses is yet to be conducted, the impacts on land uses will be subject to further investigation in the stage of P&E Studies.

## 4.7 Sustainability Assessment

- 4.7.1 A Sustainability Assessment was undertaken for the proposed development under the CP based on eight guiding principles. Two scenarios have been formulated to compare the environmental, social and economic impacts without and with the NTN development.



- 4.7.2 On the negative side, there will be a small to very small deterioration of condition with respect to construction waste, criteria air pollutants, excessive noise, landfill capacity, marine water quality, river water quality, significant landscape features (area), significant landscape features (point), terrestrial eco-value, and archeological and historical site due to the proposed development. These changes are considered to be extremely small as compared with the Hong Kong territory-wide values. Moderate deterioration is anticipated for carbon emission.
- 4.7.3 On the positive side, the proposed development is expected to extend NTN into a district which can meet housing, social, economic, environmental and local needs. The development will bring about value-added contribution to Gross Domestic Product (GDP) and employment creation to the economy. The development will also improve fixed capital, freight costs, provision of open space, travel speed and renewable energy generation.

## 4.8 Green Initiative and Carbon Appraisal and “Wise City” Concept

- 4.8.1 A sustainability framework for NTN is proposed with regard to various domains from Energy and Building, Transport, Water, Drainage, Waste and City Systems Integration. Green strategies or initiatives proposed for the CP include aspects of i) Site Planning and Urban Design, ii) Transport, iii) Drainage, Sewerage and Water Resources, iv) Waste & Materials and v) Energy.
- 4.8.2 A preliminary carbon appraisal has also been conducted to quantify emissions under two carbon saving scenarios (i.e. Prevailing Best Practice Scenario and Low-Carbon Scenario) adopting different combinations of carbon reduction strategies.
- 4.8.3 It is estimated that Prevailing Best Practice Scenario would save around 20%, while Low-Carbon Scenario would save around 46% of the carbon emission when comparing to the carbon emission for the CP.

## 4.9 Strategic Environmental Assessment

### Ecology

- 4.9.1 The Study Area constitutes disturbed developed areas with limited ecological value such as villages, infrastructural facilities, roads, open storage, grassland, shrubland and agricultural land, etc. Major elements in the Study Area with potential ecological importance include natural watercourses, fishpond habitats in the Wetland Conservation Area, Ecologically Important Stream (EIS), secondary woodland, fung shui woodland and Ping Che Egretty in different PDAs. A few floral and faunal species of conservation concern were recorded in LMC PDA and HYW PDA in low numbers.
- 4.9.2 Significant direct ecological impacts are not expected as most of the ecologically sensitive habitats within the PDA will be avoided through proper land use zoning to prohibit massive development within the vicinity. Provision of buffer areas onto certain watercourses and EIS would be considered in the stage of P&E Studies.

### Air Quality

- 4.9.3 Representative air sensitive receivers (ASRs) within 500m of each PDA have been identified based on proposed land uses (i.e. residential, commercial, and G/IC, etc.). The distance between roadways and planned ASRs within the PDAs follows the guidelines (e.g. 20m from expressways, 10m from district distributors) provided in HKPSG.
- 4.9.4 Quantitative air quality assessment for chimney and vehicle emissions was carried out. Results indicate that air quality at existing and planned ASRs would comply with the prevailing Air Quality Objectives. However, exceedances on NO<sub>2</sub> criteria are observed near the LT/HYW BCP and within the LMC PDA along San Tin Highway. Measures such as location of air non-sensitive building, setting the fresh air intake at a higher elevation and the use of central air conditioning inside exceedance zone should be considered to mitigate adverse air quality impact.
- 4.9.5 The potential impacts brought by constructions, odour emission from STWs, livestock farms and active landfills should be carefully studied and considered in the detailed design stage for compliance with relevant regulations.
- 4.9.6 Industrial (tri-generation and waste-to-energy plants) and odourous sources (STW, sludge incineration plant and waste transfer station) are proposed within caverns in close proximity to the LMC, TKL and HYW PDAs.

### Water Quality

- 4.9.7 Key existing and planned water sensitive receivers, including rivers, channelized nullahs, canals, wetlands, and other water courses, are identified within the vicinity of each PDA. Statutory regulations issued by Environmental Protection Department should be implemented to minimize the potential water quality impacts.
- 4.9.8 Potential water pollution sources during operational phase will include sewage generated by residents, visitors and workers, as well as other activities in the Study Area. It is preliminarily estimated that the Average Dry Weather Flow from the sewerage catchments of Shek Wu Hui STW and YL STW beyond 2041 and the full development will be increased. Sewage could first be explored to divert to Shek Wu Hui STW, the YL STW, and the new STW at Kam Tin South etc., depending on the sewerage catchment area in which the PDA is situated in detailed design stage. It is however evident that these existing sewage treatment facilities, even after the major expansion and upgrading works, are still inadequate to serve the sewage flows generated from the NTN development. New sewage treatment facilities strategically at LMC and TKL/HYW are therefore necessary. “No Net Increase in Pollution Loads Requirement in Deep Bay” will be incorporated into the design by considering cumulative sewerage catchment in the vicinity.
- 4.9.9 Broad water quality planning and mitigation measures, including reuse of treated effluent, possible sewage treatment and disposal measures and application of SuDS, have also been proposed to alleviate the impacts arising from construction and operational phases. With the above measures, adverse water quality impact is not anticipated.



## Noise

- 4.9.10 Representative existing and planned noise sensitive receivers (NSRs) within the vicinity of each PDA have been identified. The identified existing NSRs and planned noise sensitive land uses include mainly Residential and G/IC.
- 4.9.11 The construction methodology, works site area and detailed implementation programme are currently not yet available. Hence, quantitative construction noise assessment will be conducted in the stage of P&E Studies. Appropriate mitigation measures are proposed to minimize the impacts.
- 4.9.12 For operational noise impact, road traffic noise assessment results indicate that the overall noise levels with the NTN Development at some existing NSRs within PDAs would exceed the respective noise criteria. For the planned noise sensitive land use within PDAs, it is recommended that noise tolerant buildings should be placed in the buffer zones or closer to the roads which act as shielding/screening for sensitive uses located behind. Other environmental and innovation planning measures will be explored in the stage of P&E Studies. Direct noise mitigation measures are proposed such that the overall noise levels would comply with the relevant standards. Apart from the application of vertical barriers, noise mitigation measures in form of cantilever barriers, full enclosure and low noise road surfacing are also practicable mitigation that could reduce excessive road traffic noise impacts on the existing and planned NSRs. At-receiver mitigation measures including acoustic fin, noise screening balcony, acoustic window, etc. should also be considered as the last resort to alleviate the noise level in the detailed design stage, where the building layout is available.
- 4.9.13 For railway noise impact, given the proximity of the possible/existing railway, it is recommended to place non-sensitive land uses, such as a multi-storey car park building facing the railway, central air conditioned buildings which do not rely on natural ventilation, etc., to provide noise screening to the residential zone or other noise sensitive buildings behind. For possible new railway development, at-source noise mitigation measures shall be provided. As a last resort, minor at-receiver mitigation measures, such as acoustic fins and acoustic windows, could be considered to alleviate the rail traffic noise level. Other major at-receiver mitigation measures, such as single aspect design and use of air conditioning, are undesirable for future developments.
- 4.9.14 For fixed noise impact, major industrial noise sources identified within the Study Area include LMC BCP, Sheung Shui WTW, etc. Mitigation measures including suitable passive building design (e.g. self-protected building design, noise tolerant building, etc.) for the planned high and medium density residential areas should be considered to avoid direct line of sight to the existing industrial noise sources and shooting ranges. For the planned low density residential area potentially affected by the planned logistics industries nearby, site boundary wall / barrier would be able to provide screening to the low rise developments. It is also recommended to work with the operators for the provision of at-source mitigation measures including noise barrier, enclosure, acoustic treatment, etc. to mitigate the noise impact.
- 4.9.15 For helicopter noise impact, a number of helipads, which would generate noise from manoeuvring over the helipad and during the lateral flight, are located within the NTN Study Area. It was advised by Government Flying Service (GFS)

that the helipads would be used for both emergency and pre-planned tasks by the government departments. There are no fixed flight paths and routes. Mitigation measures for the high density residential areas potentially affected by the operation of San Wai/Tai Ling helipads include suitable passive building design (e.g. single aspect building design, noise tolerant building, etc.) to avoid direct line of sight to these helipads and the associated “departing” path. It is also recommended to work with GFS for the provision of alternative “taking-off” path further away from the noise sensitive uses areas subject to the Environmental Impact Assessment (EIA) study in the detailed P&E stage.

### **Hazard**

- 4.9.16 Part of the proposed developments of TKL PDA will fall within the 2km assessment area of Sheung Shui WTW. In MKT PDA, part of the area for Agri-logistics is planned within the 1km Consultation Zone of Sheung Shui WTW. There would be no proposed development in the HYW PDA / QH PDA encroached upon the 2km assessment area of Sheung Shui WTW. Preliminary quantitative risk assessment has been carried out based on the best available information. The Cumulative Frequency for CP with the development and surrounding population falls largely within “Acceptable” region, and partly marginally within the “ALARP” (As Low As Reasonably Practicable) region. It is anticipated no adverse impact in hazard to life issue.
- 4.9.17 No adverse impacts are anticipated from the NTM WTW or Organic Waste Treatment Facilities Phase 2 as no proposed developments from the PDA are within the 1km Consultation Zone or predicted hazard influence zone respectively.

### **Landfill Gas Hazard**

- 4.9.18 The proposed development in the HYW PDA is located within the Consultation Zone of the NENT Landfill and its extension. Qualitative landfill gas hazard assessment indicates that the overall risk levels of landfill gas hazards are Medium (Category C) and Low (Category D)/ High (Category B) during construction and operational phases. It is recommended that below ground rooms/voids should be avoided as far as practicable in the developments within the Consultation Zone. Besides, as the proposed development of “Tourism/Leisure” zones and “Industrial Estate” zone is about 5m from the boundary of NENT Landfill and its extension, a setback of 20m from the boundary of the existing landfill and its extension is recommended to be adopted in detailed design stage. Suitable building management and appropriate broad engineering and precautionary measures have been proposed by making reference to the “Landfill Gas Hazard Assessment Guidance Note”.
- 4.9.19 Moreover, monitoring should be undertaken when construction works are carried out in confined space within the Consultation Zone. Routine gas monitoring should be undertaken during groundwork construction and in all excavations. Monthly gas monitoring should also be conducted at the basement. Nevertheless, the requirements of operational monitoring by future site developers should be determined during the detailed design stage when the site layout details are confirmed.



## **Waste**

- 4.9.20 The construction activities of the proposed development would generate a variety of wastes including construction and demolition materials from site clearance, site formation, during the construction of buildings and structures as well as chemical waste. Appropriate mitigation measures shall be included in the Particular Specifications for the Contractor as appropriate. The waste management hierarchy could be categorized as avoidance and minimization; reuse of materials; recovery and recycling; and treatment and disposal. Records of quantities of waste generated, recycled and disposal (locations) shall be properly kept.
- 4.9.21 During the operational phase, residential buildings, public areas and other facilities will generate food waste, chemical waste and municipal solid waste (MSW). A Waste-to-Energy (WtE) Plant is proposed to be constructed, with the aim of reducing the quantities of non-recyclable MSW to be disposed to NENT landfill. In addition, the STW will generate sewage sludge and it is proposed to incorporate sludge incineration facility into the WtE plant in NTN to cope with the future requirement. The waste management hierarchy of 'Reduce, Replace, Reuse and Recycle' shall be used to evaluate the waste management options to allow maximum waste reduction. With the implementation of proper mitigation measures, no adverse waste implications are anticipated.

## **Land Contamination**

- 4.9.22 Various industrial uses which may lead to land contamination were observed within the PDAs, such as vehicle maintenance workshops, open storage areas, scrap yards, metal workshops, waste recycling workshops, container yards, etc. Site appraisal and/or site investigation (SI) should be conducted in the detailed design stage to confirm the requirement for further contamination assessment.
- 4.9.23 Naturally occurrence of medium to high levels of Arsenic, Antimony and Lead were identified in the PDA, with reference to the "Geochemical Atlas of Hong Kong" published in Year 1999. However, the geochemical mappings of the reference report was based on samples obtained from stream sediment and can only be used as reference for this Study. The actual land contamination impact on the concerned area can only be determined and verified by means of SI to be conducted at the detailed design study.

## **Cultural Heritage**

- 4.9.24 There are various built heritage resources (including graded historic buildings and new item pending heritage assessment) within the five PDAs under NTN. It is envisioned that during the construction stage, direct and indirect impacts related to moving plant and construction methods (vibration and settling issues) may occur. During operational stage, impacts including visual, ongoing vibration or pollution impacts may occur. It is therefore recommended that Built Heritage Impact Assessments (BHIAs), including a built heritage survey, should be conducted prior to the construction stage to identify the additional resources and historical villages located within or near individual proposed developments. Detailed mitigation measures should be recommended based upon the findings of each BHIA. The BHIAs may also recommend mitigation measures for the operational stage.

- 4.9.25 The village or area having a settlement history of around hundred years is classified as a historical village or area with archaeological potential. The PDAs in the NTN cover historical villages or areas with archaeological potential. Since areas with archaeological potential may exist in the PDAs that have not yet been investigated, an archaeological field survey is necessary in detailed design stage to identify the areas with archaeological potential and to ascertain the archaeological impact imposed by the proposed development within the PDAs. In addition, there are some Sites of Archaeological Interest (SAI) identified within the NTN Study Area, of which 4 fall within the PDAs.
- 4.9.26 The SAI may be directly, adversely and irreversibly affected during construction stage from works associated with development, including site formation, excavation and borrowing works, landscaping, etc. Avoidance of SAI by amending the layout plans of construction works will be made to allow preservation in-situ. During the operational stage, no further impacts are expected on archaeology. However, if the sites and areas cannot be avoided, Archaeological Impact Assessments (AIAs) will be conducted prior to the construction stage in order to identify the extent of impact of each proposed development. Detailed mitigation measures for archaeology prior to construction stage should be recommended based upon the findings of the AIAs, the measures of which may include, but not limited to preservation in-situ, rescue excavation, survey-cum-rescue excavation and/or Archaeological Watching Brief. Impacts expected on archaeology during the operational stage will also be assessed and mitigation measures will be recommended in prior agreement with the Antiquities and Monuments Office, if necessary.

## 4.10 Landscape and Visual Impact Assessment

### Landscape Impact Assessment

- 4.10.1 Landscape impact assessment has been conducted based on the baseline findings and potential sources of impacts from the CP. Prior to the implementation of mitigation measures, the proposed NTN development and its associated infrastructure works (i.e. site clearance and earthwork) would generate adverse impacts on the natural landscape resources (LRs). In addition, proposed development will also cause irreversible changes to some of the man-made landscape resources. The recommended landscape measures during construction stage (such as minimization of temporary works and storage extent, natural stream protection and tree preservation, etc.) would help to reduce the adverse impacts on the natural LR. According to the CP, some areas of man-made resources like open storage and waste ground, etc. will be rezoned for other uses to encourage their gradual phasing out, which would be beneficial for the local landscape quality. After the implementation of recommended landscape mitigation measures, the LR will experience slight to moderate adverse impacts during construction and at the early stage of operational phase. Furthermore, when the compensatory measures are applied, and further landscape enhancements are well established to enhance the degraded landscape, it is considered that the landscape impacts on the LR would be reduced to insignificant /or slight level by operation Year 10.
- 4.10.2 For the identified landscape character areas (LCAs), given the proposed developments are located within such a large-scale area, the fundamental change



in some of the LCAs would not be able to alleviate completely. Thus, the proposed development will generate moderate to substantial landscape impacts during both construction and operational phases before mitigation. However, after the application of the planning principle of 'Urban-Rural-Nature Integration' and other landscape enhancements in the CP, the impacts can be generally alleviated in local scale. It is anticipated that the landscape impact for the affected LCAs will be reduced to slight /or insignificant level by operation Year 10.

- 4.10.3 To conclude, adverse impact from the proposed development is anticipated and it is inevitable that landscape impacts caused by such major development cannot be fully reduced and would remain at some locations even after implementation of all possible mitigation measures. On review of the likely residual impacts on the LRs/ LCAs, most of them could be possibly reduced by operation Year 10 when the mitigation measures have been matured and taken effect. As a result, the overall residual landscape impacts from the proposed scheme are considered surmountable with mitigation measures if the required mitigation measures are feasible and implemented prior to impact commencement, and are able to fully account for all impacts.

#### **Visual Impact Assessment**

- 4.10.4 In summary, it is considered that the most sensitive views are those which currently experience a direct and broad visual connection with the wider undeveloped landscape setting. The proposed development's visual impact on the existing development has been preliminarily reviewed and will be assessed in the stage of P&E Studies.
- 4.10.5 Prior to mitigation, substantial adverse impacts are predicted at some of the visually sensitive receivers (VSRs) as a result of the substantial loss of visual elements and large magnitude of visual change. Mitigation works during the construction stage rely heavily on the optimization of the works area, avoidance of significant topographical changes together with the retention and compensatory planting of trees/vegetation. Greening measures help to break up the uniformity of new road formation and associated structures, and can be used with wider screening measures. With mitigation measures, adverse visual impact would be reduced at construction stage and early operational stage.
- 4.10.6 The overall visual character in NTN would be completely changed by the proposed development after the construction, all the recommended mitigation measures would not be able to alleviate the fundamental change in character, and therefore, the residual adverse impacts are still predicted in the operational stage. In terms of effectiveness of mitigation measures such as landscape planting or screening measures, and lighting control, they would help to alleviate the adverse visual impacts from the new urban development and enhance the compatibility with the existing development. It is considered that the cumulative impacts would be reduced to slight/ moderate by Year 10 of operation when the mitigation measures have been matured and taken effect.
- 4.10.7 As a result, with the possible alleviation of adverse visual impacts by means of effective mitigation measures proposed above, the overall residual visual impacts from the proposed NTN development are considered surmountable given the mitigation measures are feasible and implemented prior to impact commencement,

and are able to fully account for all impacts. A comprehensive assessment shall be conducted at detailed design stage.

## 4.11 Broad Cost Estimation

- 4.11.1 Broad cost estimation for the NTN development has been carried out in this Study. However, since the proposed development under both Scenarios I and II are highly conceptual in nature, detailed cost estimation is thus subject to detailed design should the NTN development be taken forward in the future.



## 5 Implementation Strategy and Development Timeframe

### 5.1 Implementation Strategy

- 5.1.1 For Scenario I, it will be carried out in 2 main phases. Specifically, the 2 development phases are triggered by proposed and possible railway lines (i.e. Phase 1 by the proposed NOL railway and Phase 2 by the possible railway to the nearby new town). The total (Phase 1 + 2) population and employment will be 255,000 and 215,000 respectively.
- 5.1.2 For Scenario II, it will be carried out in 3 main phases as triggered by different infrastructure provision. Specifically, the 3 development phases are triggered by proposed and possible railway lines (i.e. Phase 1 by the proposed NOL railway, Phase 2 by the possible north-south railway to the nearby new town and Phase 3 by the extension of the possible north-south railway to connect other new towns and/or urban area). The total (Phase 1 + 2 + 3) population and employment will be 350,000 and 215,000 respectively. Inevitably, the additional population intake would also induce additional road traffic demand that would need more stringent traffic demand management measures and/or new transport initiatives (e.g. possible new highway) to be in place for attenuating such impact.

### 5.2 Broad Development Timeframe

- 5.2.1 The broad timeframe for the NTN development will have to consider the followings:
- Environmental Impact Assessment Ordinance (EIAO) Process;
  - Statutory Plan Making and Gazettal Procedures;
  - Funding Approval;
  - Land Clearance and Resumption;
  - Implied time for
    - Consultancy Tendering;
    - Detailed Design;
    - Contract Tendering; and
  - Construction
- 5.2.2 It is estimated that the development implementation under Scenarios I and II would take about 22 years and 26 years respectively. The details of the development programme will be worked out in the stage of P&E Studies if the NTN development is taken forward.

## 6 Fanling Golf Course

- 6.1.1 The Study has looked at the development potential of Fanling Golf Course (FGC) from the technical perspective. Two development options of FGC have been examined, including (a) partial development; and (b) full development. For the partial development option, the eastern part of the FGC to the east of Fan Kam Road will be converted for development purpose. A conservative estimate of the flat production is 4,600 units accommodating a population of about 13,000. For the full development option, the entire FGC is proposed for housing, commercial, G/IC, open space, and tourism/leisure uses. The flat production is estimated to be 13,200 units accommodating a population of about 37,000.
- 6.1.2 The development intensity and layout of both development options have taken into consideration the major development constraints of FGC, which include the presence of large, old and well-grown tree clusters (about 30,000 trees with a diameter at breast height of over 150mm) including potential Old and Valuable Trees and protected tree species<sup>5</sup>, and secondary woodland<sup>6</sup>. Apart from tree clusters, the scattered ancestral graves<sup>7</sup>, built heritage<sup>8</sup> and the difficulty of widening Fan Kam Road<sup>9</sup> involving substantial tree felling and relocation of the Dongjiang water mains also pose significant constraints to the development of FGC. In examining the proposals, the Study has also taken into account the surrounding environment, the overall infrastructure capacity, the potential impacts of the development as well as urban design considerations. Further information on the two development options is at **Appendix**.
- 6.1.3 The Hong Kong Golf Club operates FGC under a Private Recreational lease (PRL), the policy for which is being reviewed by the Government. The decision as to whether the FGC should be taken back by the Government and released for alternative use would be contingent upon the outcome of the PRL Policy Review, which would take into account relevant key factors including the role of FGC in terms of its contribution to sports development.

<sup>5</sup> There are about 80 potentially registrable Old and Valuable Trees; and at least another 84 trees of protected species (e.g. Aquilariasinensis, Artocarpus hypargyreus, Keteleeria fortune) found within the FGC (according to a tree survey conducted by the Hong Kong Golf Club).

<sup>6</sup> Tree clusters and secondary woodland are linearly arranged on both sides of fairways.

<sup>7</sup> A total of 69 graves and 80 urns are scattered throughout the FGC.

<sup>8</sup> There are three graded historic buildings (Fanling Lodge – Grade 1; Club House – Grade 2 and Half-way House – Grade 3) within the FGC.

<sup>9</sup> Fan Kam Road is currently a substandard single two-way rural road running through the FGC. Widening of Fan Kam Road is constrained by mature trees on both sides of the road and the 48-inch diameter Dongjiang water mains.



## 7 Conclusion

7.1.1 To conclude, this Study has:

- **Formulated a “Smart Green Resilient” Study Approach** - This was undertaken at the beginning to set the overall approach for the Study;
- **Conducted a Baseline Review and Identified Key Issues and Opportunities & Formulated Key Planning and Design Principles** - A baseline review and land use review of the 5,300ha Study Area informed the six over-arching opportunities and four key planning and design principles which guided the study process;
- **Delineated PDA Boundaries and Provided Population and Employment Estimates for NTN** - Given the vast area of land in NTN, a GIS-based MCD Analysis has been carried out to provide a basis for delineation of the boundaries of the PDAs. The exercise also involved the estimation of the appropriate level of population and employment to be planned in the future NTN;
- **Formulated Concept Plan for NTN** – A set of planning approaches guided the distribution of land uses and led to the formulation of three development scenarios, together with the considerations of development phasing for progressive implementation of the CP triggered by different infrastructure provision. Two development scenarios, namely Scenario I (Balanced Population and Employment) and Scenario II (High Population and Employment) are recommended for further study; and
- **Conducted Broad Technical Assessments in Support of the Concept Plan for NTN** -Throughout the Study, three rounds of broad technical assessments were carried out iteratively to support the planning and development of the CP. The broad technical feasibility for the CP under both Scenarios I and II has been ascertained.

7.1.2 **Way Forward**

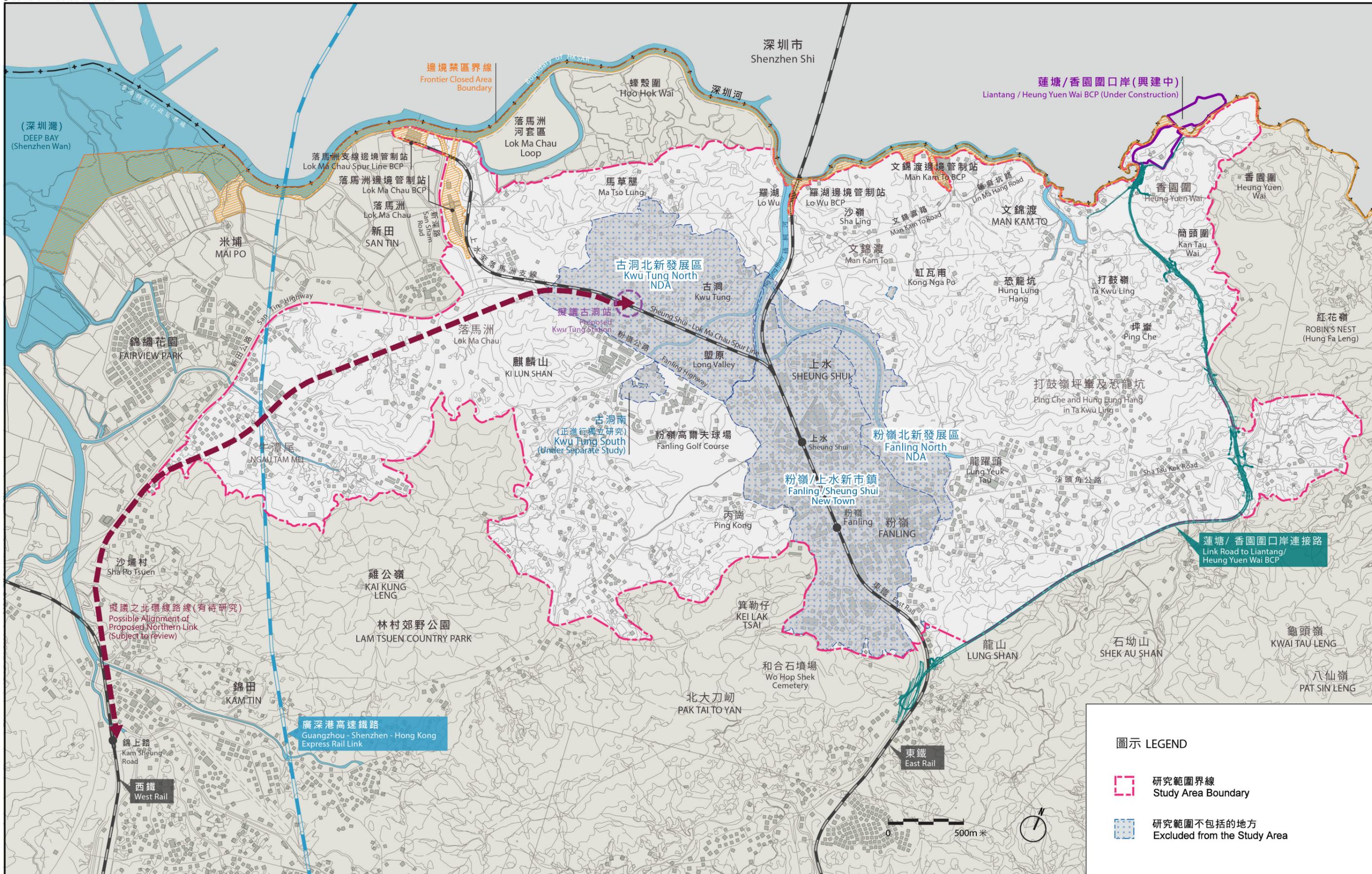
Being one of the two strategic growth areas under the conceptual spatial framework in the “Hong Kong 2030+”, the two development scenarios of NTN and broad land use concepts which were simplified from the CP in Section 3, have been presented in public engagement for “Hong Kong 2030+” conducted by PlanD in October 2016<sup>10</sup> (See **Figure 7.1.1**). While LMC and MKT PDAs are named ST/LMC Development Node and MKT Logistics Corridor respectively, HYW, TKL and QH PDAs are presented as the NTN New Town in the public engagement. Subject to the outcome of “Hong Kong 2030+”, the preliminary findings and recommendations of this Study together with the public views on the NTN development will provide the basis for detailed P&E Studies to be conducted, if the NTN development is taken forward.

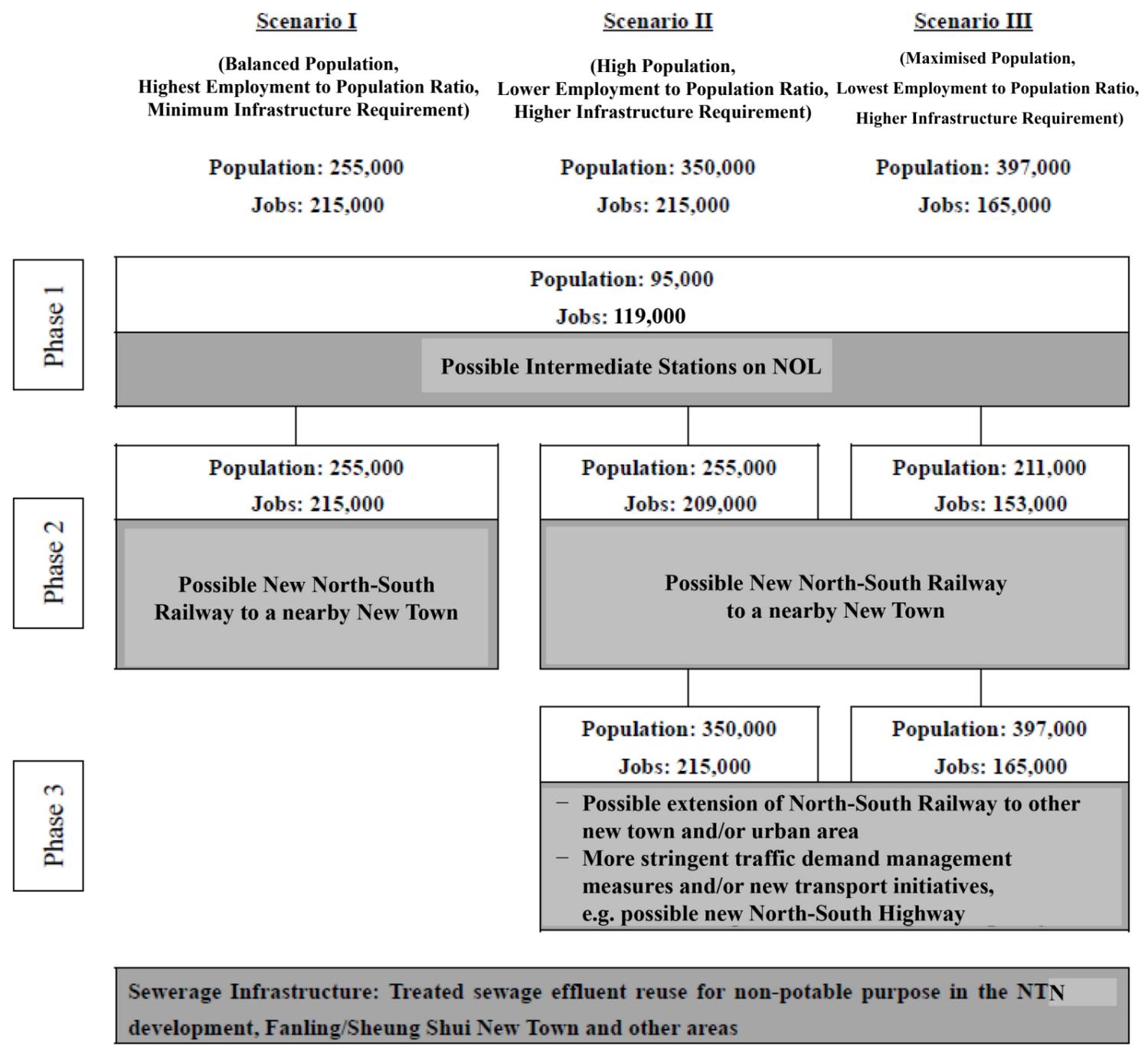
<sup>10</sup> The public engagement exercise of the “Hong Kong 2030+” is conducted from 27 October 2016 to end April 2017.



NTN

## Figures



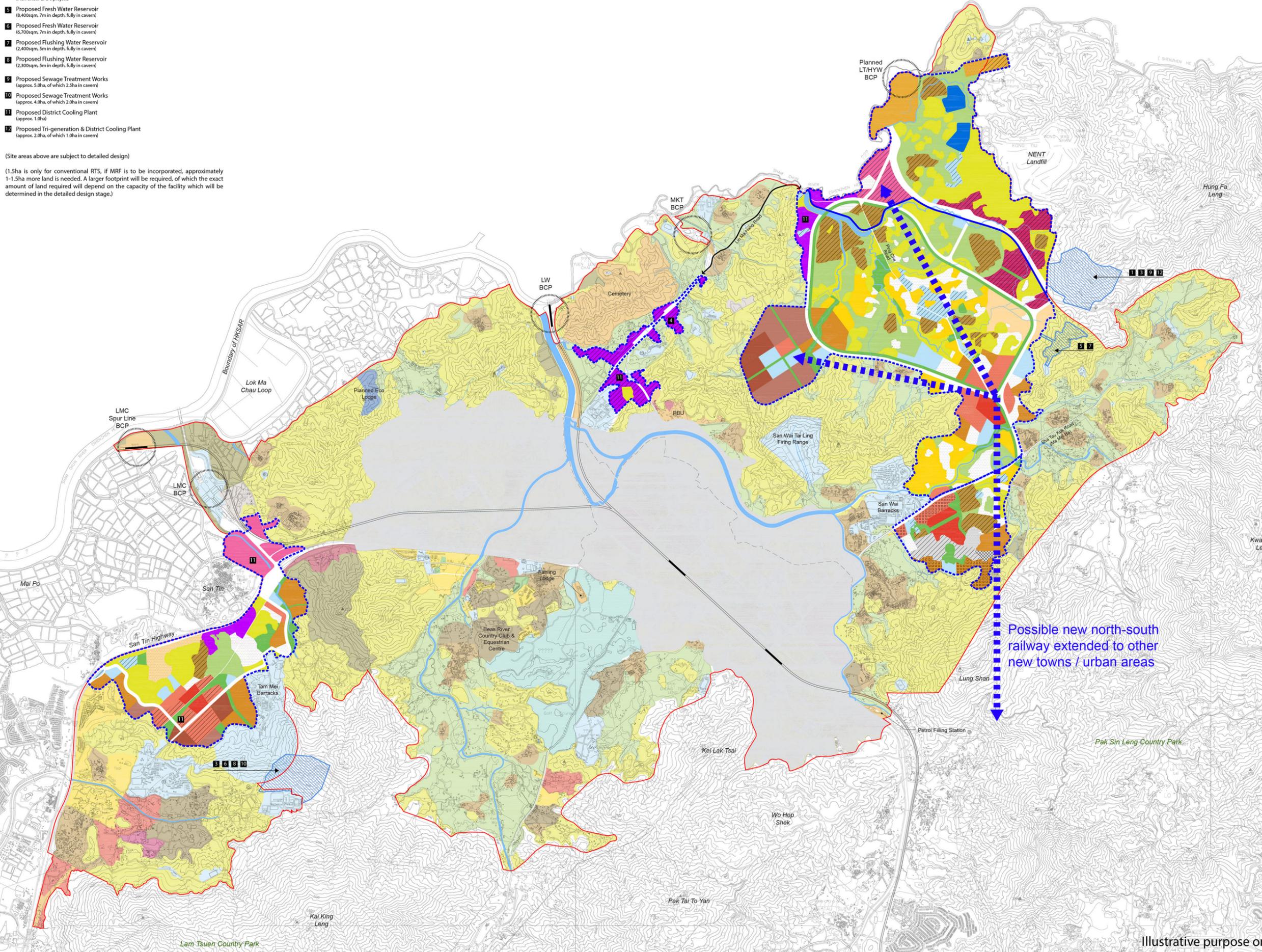


Note: Population of 40,000 of the planned QH Development is included in the population figures shown above.

- Major Smart City Proposals  
(Indicative only)
- 1 Proposed Waste-to-Energy (WtE) Plant  
(Include incinerators for MSW and sludge respectively)  
(approx. 18.0ha, of which 3.6ha in cavern)
  - 3 Proposed Local Sorting & Recycling Centre (Ping Che) & Refuse Transfer Station (RTS) & Local Sorting & Recycling Centre (Ngau Tam Mei)  
(approx. 1.5ha, of which 0.75ha in cavern)
  - 4 Planned Organic Waste Treatment Facilities (OWTF) II  
(Plan under EPD's project)
  - 5 Proposed Fresh Water Reservoir  
(8,400sqm, 7m in depth, fully in cavern)
  - 6 Proposed Fresh Water Reservoir  
(6,700sqm, 7m in depth, fully in cavern)
  - 7 Proposed Flushing Water Reservoir  
(2,400sqm, 5m in depth, fully in cavern)
  - 8 Proposed Flushing Water Reservoir  
(2,300sqm, 5m in depth, fully in cavern)
  - 9 Proposed Sewage Treatment Works  
(approx. 5.0ha, of which 2.5ha in cavern)
  - 10 Proposed Sewage Treatment Works  
(approx. 4.0ha, of which 2.0ha in cavern)
  - 11 Proposed District Cooling Plant  
(approx. 1.0ha)
  - 12 Proposed Tri-generation & District Cooling Plant  
(approx. 2.0ha, of which 1.0ha in cavern)

(Site areas above are subject to detailed design)

(1.5ha is only for conventional RTS, if MRF is to be incorporated, approximately 1-1.5ha more land is needed. A larger footprint will be required, of which the exact amount of land required will depend on the capacity of the facility which will be determined in the detailed design stage.)



**Legend**

- Study Area Boundary
- Excluded from Study Area
- PDA Boundary

**Proposed Land Use**

- Commercial (PR3) BH: 15-25 Storeys
- Commercial (PR4) BH: 12-30 Storeys
- Commercial (PR3.5) BH: 10-20 Storeys
- Commercial (PR3) BH: 4-14 Storeys
- Cross Boundary Retail (PR6) BH: 10-20 Storeys
- Cross Boundary Retail (PR4) BH: 4-14 Storeys
- Mixed Use (PR3+1) BH: 24-30 Storeys
- High Residential (PR8) BH: 28-40 Storeys
- High Residential (PR5) BH: 24-30 Storeys
- Medium Residential (PR4.5) BH: 20-32 Storeys
- Medium Residential (PR3.5) BH: 12-25 Storeys
- Medium Residential (PR3) BH: 8-20 Storeys
- Low residential (PR1.5) BH: 6-8 Storeys
- Logistic Industries (PR3) BH: 5-10 Storeys
- Agri-Logistics/Light Industry (PR3) BH: 3-5 Storeys
- Science Park (PR3) BH: 5-14 Storeys
- Tourism/Leisure (PR 0.8) BH: 3-5 Storeys
- Industrial Estate (PR4) BH: 3-10 Storeys
- Enterprise Park (PR3) BH: 3-5 Storeys
- Other Specified Uses (BCF)
- Other Specified Uses (Railway Depot for possible North-South Railway - outside Study Area)
- Other Specified Uses (Railway Depot for possible North-South Railway - within Study Area)
- Village
- Existing Settlements
- Recreational
- Agriculture
- Green Belt
- G/C (Proposed)
- G/C (Existing/Planned)
- Open Space
- Queens Hill Development (Private - PR3.6)
- Queens Hill Development (Planned Public Housing Development-PR8)
- Existing/Planned Railway (G/C)
- Existing/Planned Railway/Railway Station
- Main Rivers
- Road Connection

**Existing/Planned Land Use**

- Agriculture
- Commercial
- Comprehensive Development Area
- Conservation Area
- Fantling Golf Course
- Green Belt
- Government, Institution/Community
- Industrial
- Mixed Use
- Open Space
- Open Storage
- Other Specified Uses
- Low Residential (PR-1.5)
- Recreational
- Site of Special Scientific Interest
- Tourism/Leisure
- Undetermined
- Village

**Scale and Orientation**

N

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Drawing No. Figure 3.4.1	Drawn JH	Date Mar 2016
	Checked	Approved

Drawing Title  
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Scenario I - Land Use Plan

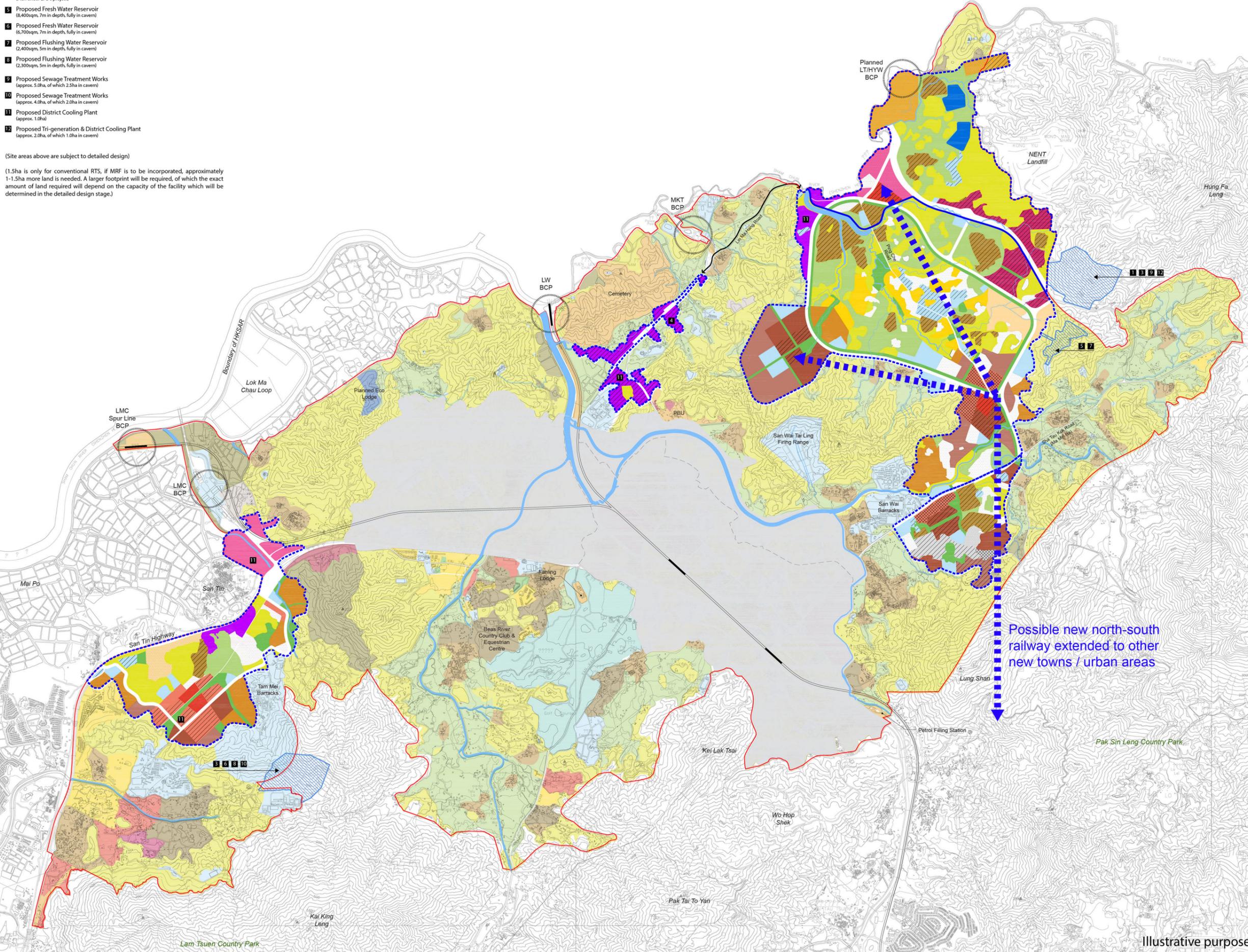
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Agreement No. CE 42/2013 (CE)  
Preliminary Study on Developing  
the New Territories North

Illustrative purpose only

- Major Smart City Proposals  
(Indicative only)
- 1 Proposed Waste-to-Energy (WtE) Plant  
(Include incinerators for MSW and sludge respectively)  
(approx. 18.0ha, of which 3.6ha in cavern)
  - 3 Proposed Local Sorting & Recycling Centre (Ping Che) & Refuse Transfer Station (RTS) & Local Sorting & Recycling Centre (Ngau Tam Mei)  
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(approx. 4.0ha, of which 2.0ha in cavern)
  - 11 Proposed District Cooling Plant  
(approx. 1.0ha)
  - 12 Proposed Tri-generation & District Cooling Plant  
(approx. 2.0ha, of which 1.0ha in cavern)

(Site areas above are subject to detailed design)

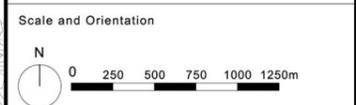
(1.5ha is only for conventional RTS, if MRF is to be incorporated, approximately 1-1.5ha more land is needed. A larger footprint will be required, of which the exact amount of land required will depend on the capacity of the facility which will be determined in the detailed design stage.)



Possible new north-south railway extended to other new towns / urban areas

- Legend**
- Study Area Boundary
  - Excluded from Study Area
  - PDA Boundary
- Proposed Land Use**
- Commercial (PR6.5) BH: 20-45 Storeys
  - Commercial (PR5) BH: 15-35 Storeys
  - Commercial (PR3) BH: 4-14 Storeys
  - Cross Boundary Retail (PR7.5) BH: 12-28 Storeys
  - Cross Boundary Retail (PR4) BH: 4-14 Storeys
  - Mixed Use (PR6+1.5) BH: 28-50 Storeys
  - Mixed Use (PR5+1) BH: 24-50 Storeys
  - High Residential (PR7.5) BH: 32-50 Storeys
  - High Residential (PR6) BH: 28-40 Storeys
  - High Residential (PR5.5) BH: 24-35 Storeys
  - High residential (PR5) BH: 24-35 Storeys
  - Medium Residential (PR3.5) BH: 12-25 Storeys
  - Low residential (PR1.5) BH: 6-8 Storeys
  - Logistic Industries (PR3) BH: 5-10 Storeys
  - Agri-Logistical/Light Industry (PR3) BH: 3-8 Storeys
  - Tourism/Lesisure (PR 0.8) BH: 3-4 Storeys
  - Industrial Estate (PR4) BH: 3-10 Storeys
  - Enterprise Park (PR3) BH: 3-8 Storeys
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  - Existing Settlements
  - Recreational
  - Agriculture
  - Green Belt
  - GIC (Proposed)
  - GIC (Existing/Planned)
  - Open Space
  - Queens Hill Development (Private - PR3.6)
  - Queens Hill Development (Planned Public Housing Development-PR6)
  - Queens Hill Development (GIC)
  - Existing/Planned Railway/Railway Station
  - Main Rivers
  - Road Connection

- Existing/Planned Land Use**
- Agriculture
  - Commercial
  - Comprehensive Development Area
  - Conservation Area
  - Fairing Golf Course
  - Green Belt
  - Government, Institution/Community
  - Industrial
  - Mixed Use
  - Open Space
  - Open Storage
  - Other Specified Uses
  - Low Residential (PR-1.5)
  - Recreational
  - Site of Special Scientific Interest
  - Tourism/Lesisure
  - Undetermined
  - Village



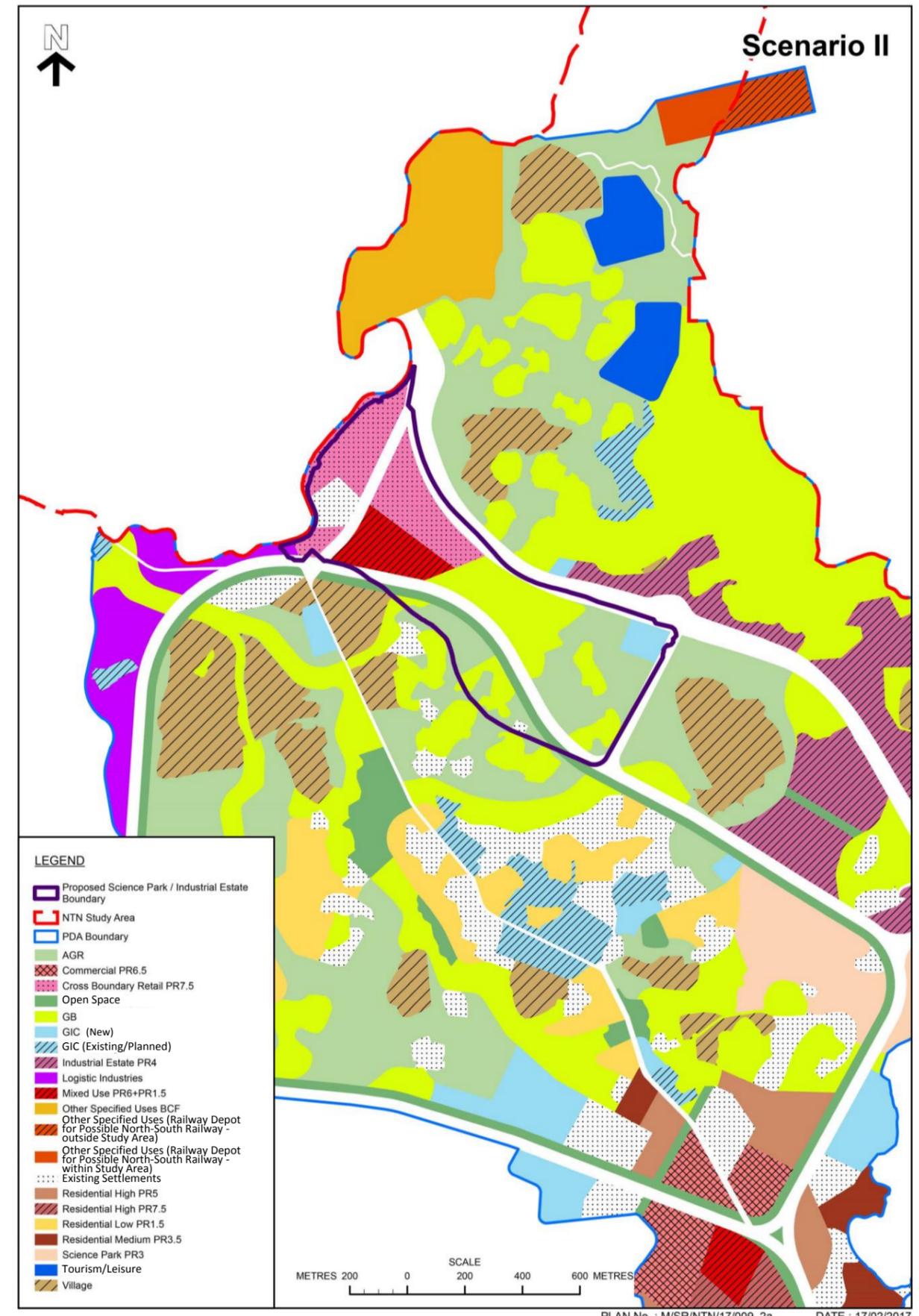
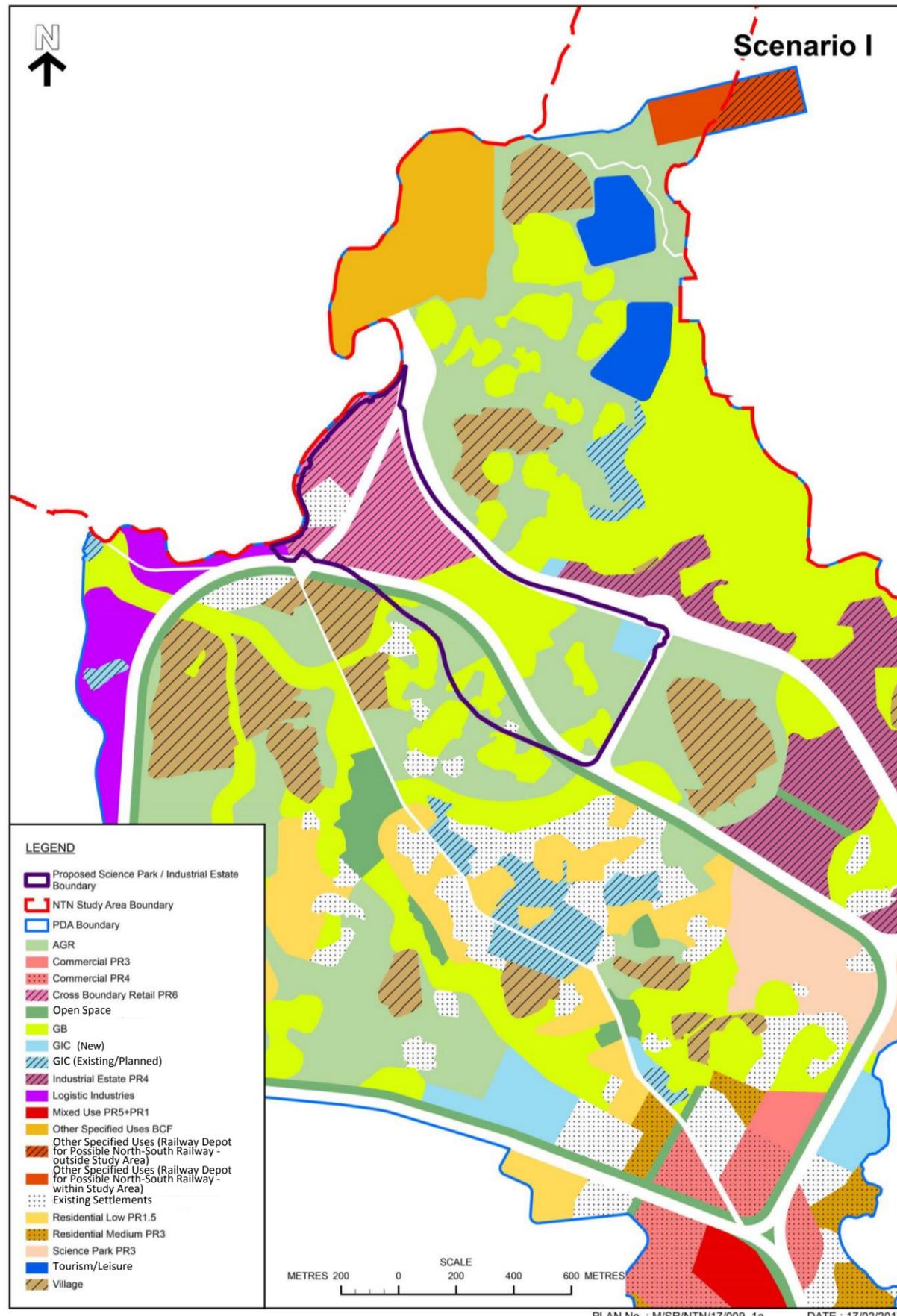
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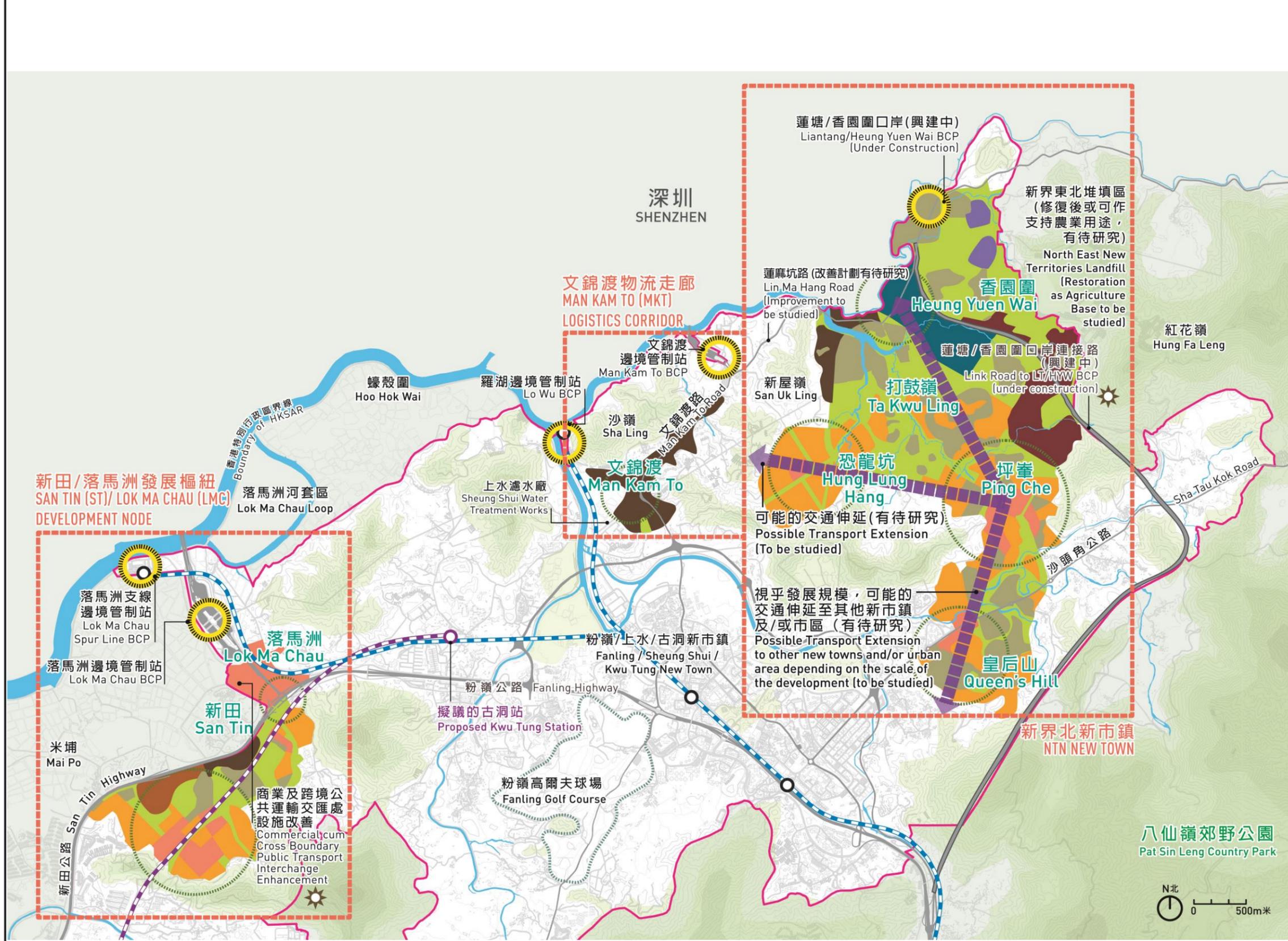
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	Checked	Approved

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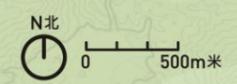
Job Title  
Agreement No. CE 42/2013 (CE)  
Preliminary Study on Developing  
the New Territories North

Illustrative purpose only





- 圖示 LEGEND**
- 新界北研究範圍  
New Territories North Study Area
  - 邊境管制站/口岸  
Boundary Control Points
  - 主要道路及交通設施  
(現有及興建中)  
Major Roads and Transport Facilities  
(Existing and Under Construction)
  - 東鐵線  
East Rail Line
  - 擬議的北環線  
Proposed Northern Link
  - 現有鐵路站  
Existing Railway Stations
  - 擬議的鐵路站  
Proposed Railway Stations
  - 可能的運輸連接(有待研究)  
Possible Transport Connection(to be studied)
  - 可能的岩洞發展作基礎設施用途(有待研究)  
Possible Cavern Development for Infrastructure (to be studied)
  - 交通樞紐  
Transport Hubs
  - 主要河流  
Major Rivers
  - 住宅  
Residential
  - 商業  
Commercial
  - 可能的科學園 / 工業邨  
Possible Science Park / Industrial Estate
  - 東部知識及科技走廊的新重點用途  
(產城融合區)  
New Anchor Uses of Eastern Knowledge and Technology  
Corridor (Integrated Community of New Industrial  
Productions and Urban Living)
  - 旅遊 / 消閒  
Tourism / Leisure
  - 企業園  
Enterprise Park
  - 物流  
Logistics
  - 綠地/康樂用地/農地/原有鄉郊民居  
Greenery / Recreation / Agricultural Land /  
Established Rural Settlements
  - 現有 / 已計劃 / 已承諾的發展  
Existing / Planned / Committed Development





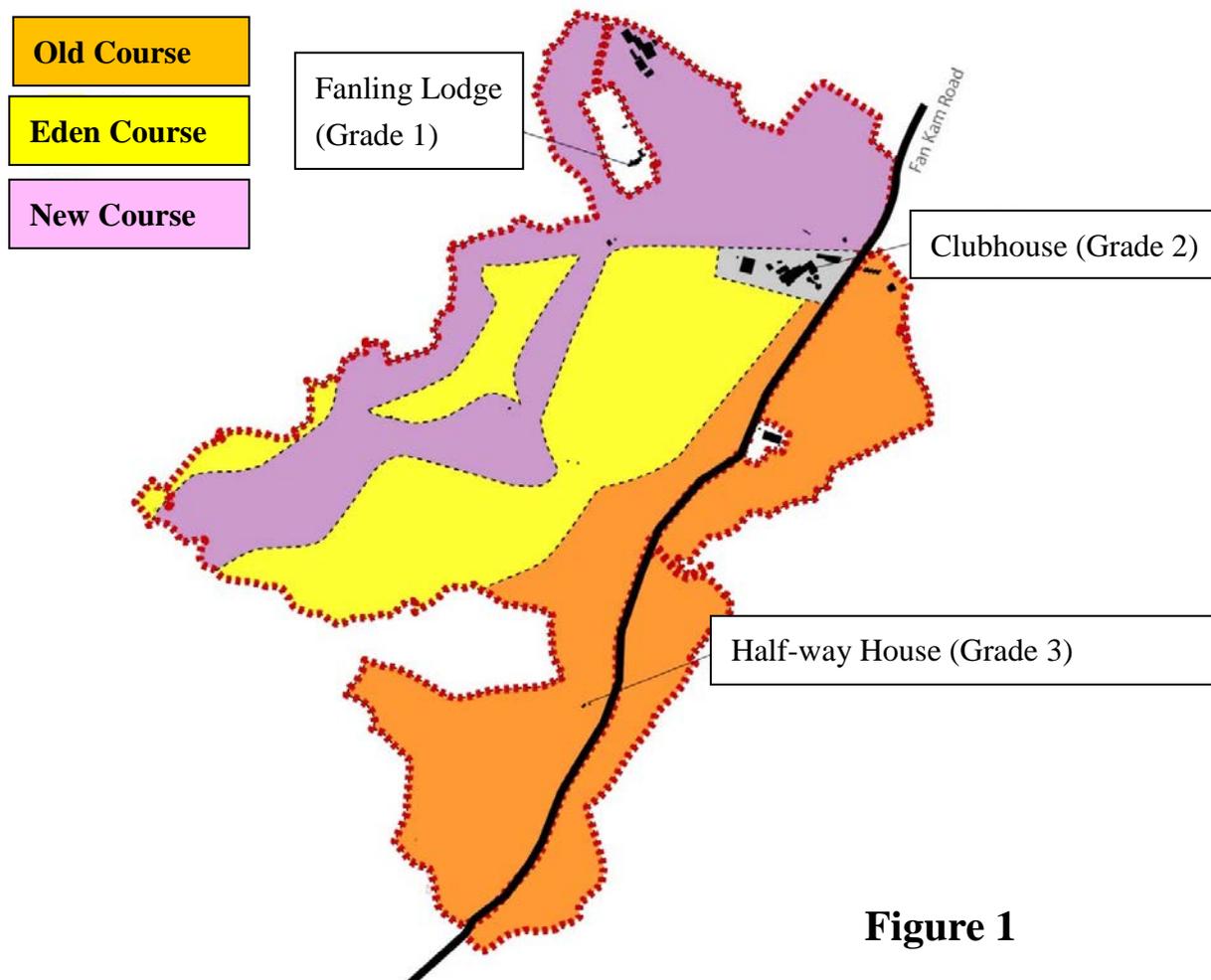
NTN

## Appendix

## Broad Assessment of the Development Potential of the Fanling Golf Course Site

### 1 About Fanling Golf Course

- 1.1 The closest point of Fanling Golf Course (FGC) is about 800m to the west of Sheung Shui Railway Station. It is composed of three distinct 18-hole courses set within 172 ha of land. The Old, New and Eden Courses (**Figure 1**) were built in 1911, 1931 and 1970 respectively.



### 2 Development Constraints and Considerations

- 2.1 Development of FGC is subject to a number of constraints and considerations:

#### Historical and Heritage Considerations

- 2.2 The environment of FGC is well-known for a group of historic buildings that include the Clubhouse (Grade 2), the Half-way House (Grade 3) and the Fanling Lodge (Grade 1). The Old Course was created in 1911, which is the second-oldest course outside Britain, after the Royal Calcutta Golf Club's course in India.



Scattered Ancestral Graves within FGC



Clubhouse (Grade 2)



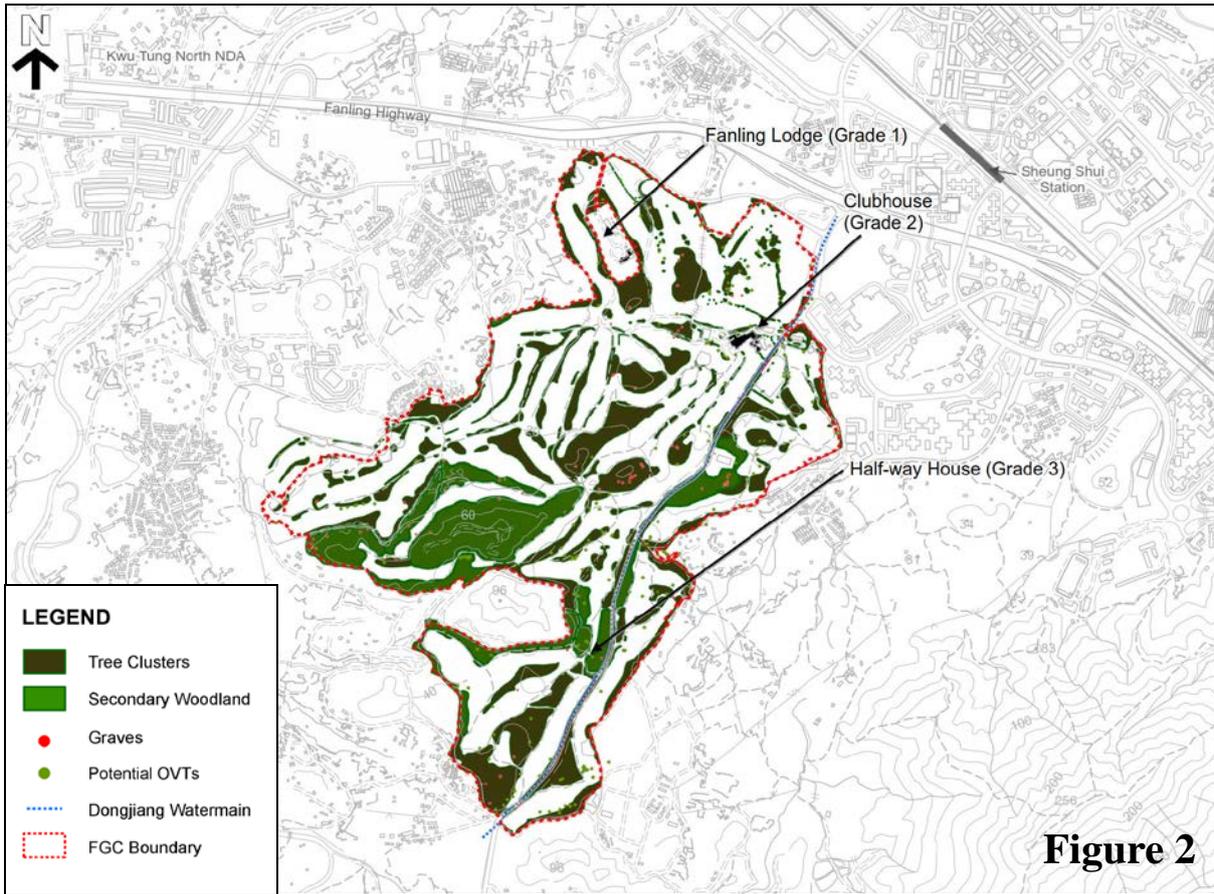
Half-way House (Grade 3)



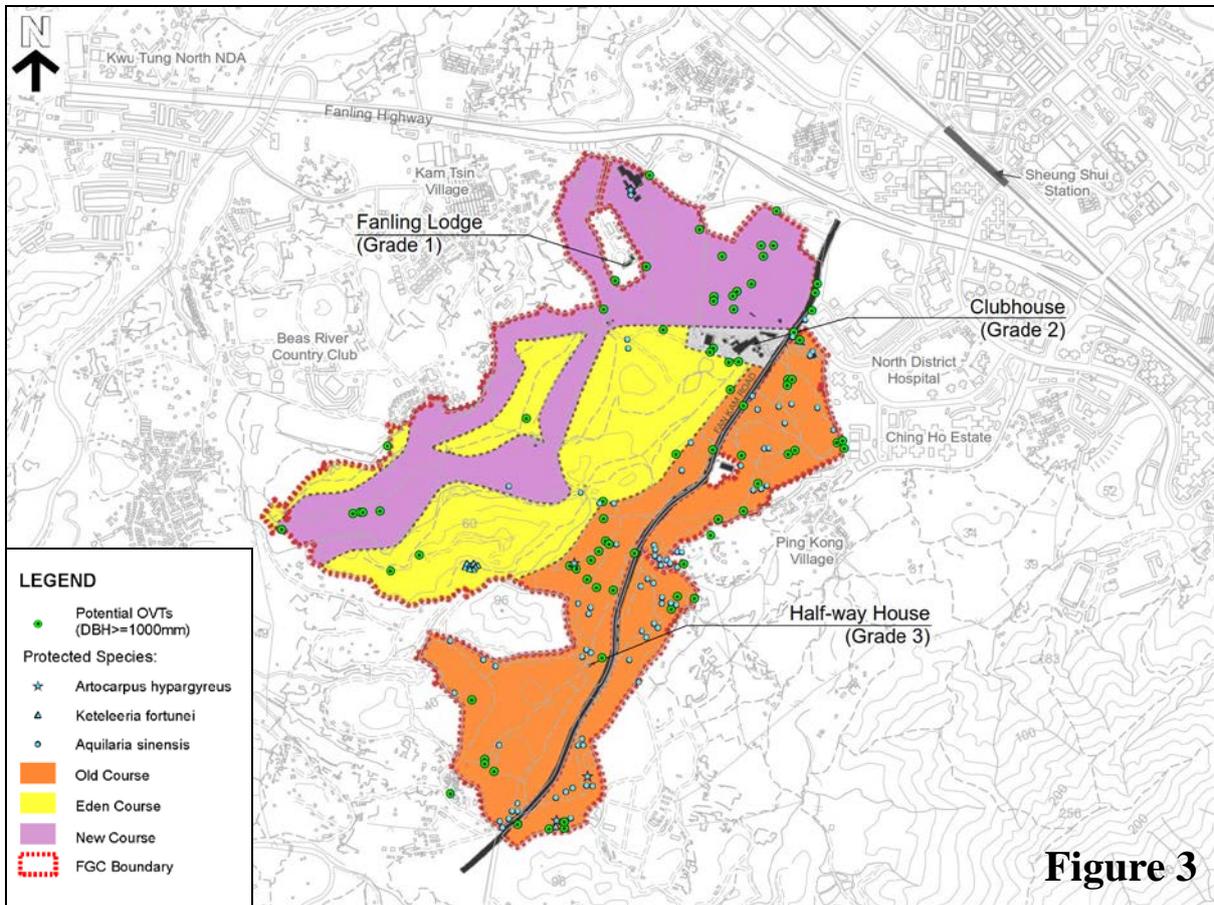
Fanling Lodge (Grade 1)

## Trees

2.3 According to the broad brush tree/vegetation survey conducted by the Hong Kong Golf Club (HKGC), there are about 30,000 trees in the golf course (with a diameter at breast height (DBH) over 150mm). Registration of Old and Valuable Trees (OVTs) within FGC has yet to be carried out. There are about 80 trees potentially meeting the criteria for OVTs (with a DBH over 1,000mm, the majority of which are estimated to be over 100 years old and scattered across the golf course), and at least another 84 trees protected species (such as *Aquilariasinensis* (土沉香), *Artocarpus hypargyreus* (白桂木), *Keteleeria fortune* (油杉)) found within the FGC. In addition, there are large tree clusters and secondary woodland of considerable sizes with mature trees with ecological value within the FGC (**Figures 2 and 3**).



**Figure 2**



**Figure 3**

### Graves and Road Widening

2.4 Apart from the built heritage and tree clusters, the scattered ancestral graves<sup>1</sup> and the difficulty of widening Fan Kam Road<sup>2</sup> involving substantial tree felling and relocation of the Dongjiang water mains also pose significant constraints to the development of the FGC.

### International Golf Tournament

2.5 An annual international golf tournament (HK Open) has been held in FGC since 1959, making the HKGC one of the three golf clubs worldwide which have hosted a championship event at the same venue for more than 50 years. According to HKGC, the HK Open is a large-scale international golf tournament that is co-sanctioned by the European Tour and the Asian Tour. The only golf course in Hong Kong that has a similar scale as FGC is Kau Sai Chau, but the latter is limited by accessibility for the purpose of holding international tournaments.

2.6 In general, the HK Open is mainly played on part of the New Course and the Eden Course, while the remaining portion of the FGC including the Old Course would provide supporting services to a total of 40,000 spectators and volunteers, as well as practising areas for the golfers of the tournament and grounds for a junior event over four days of the event. The supporting functions during HK Open include providing car parking and space for hospitality tents, media center, etc. The Old Course is also important in ensuring continuous provision of golfing venue within the FGC when the course for HK Open is closed for maintenance or inclement weather during summer months leading to HK Open.

## **3 Development Options of FGC**

3.1 Besides the above site-specific factors, the Study has taken into account the surrounding environment, overall infrastructure capacity, the potential impacts of the development as well as urban design considerations in examining the two development options of FGC, including (a) partial development; and (b) full development.

### Partial Development Option

3.2 The option proposes to convert the eastern part of the Old Course to the east of Fan Kam Road for development purpose. Although it has been assumed that the potential

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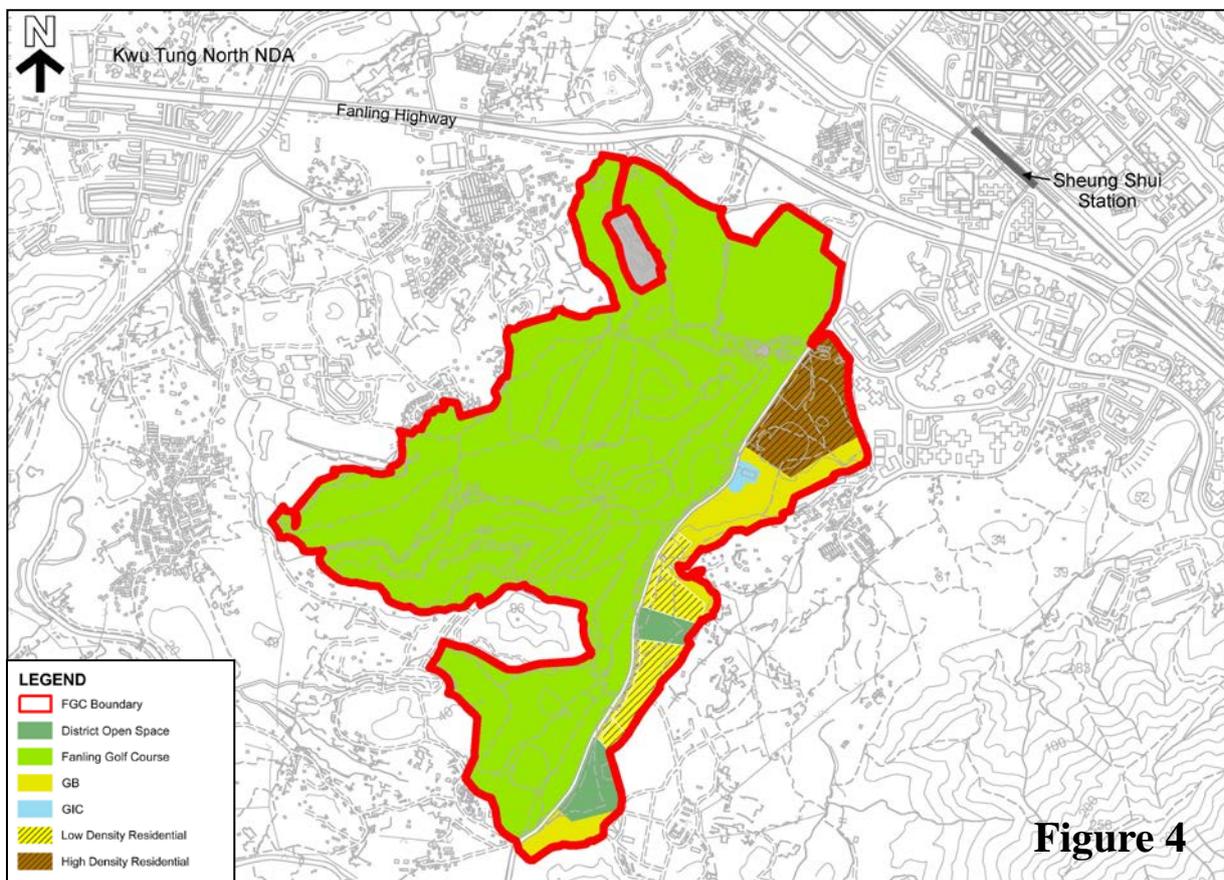
<sup>1</sup> A total of 69 graves and 80 urns are scattered throughout the FGC.

<sup>2</sup> Fan Kam Road is currently a substandard single two-way rural road running through the Old Course. Widening of Fan Kam Road is constrained by mature trees on both sides of the road and the 48-inch diameter Dongjiang water mains.

OVTs, protected species and trees would be preserved as far as possible, the integrity of the landscape quality could not be maintained. Under this option, whilst space has been retained for supporting international golf tournaments, including the HK Open, whether the HK Open would still be held in FGC is subject to views of the stakeholders and the sanctioning bodies of the HK Open. The European Tour, the Hong Kong Golf Association and the HKGC have already expressed that the HK Open is only fitting in the schedule of both Asian and European Tours given FGC's current space and heritage contributed by the three courses as a whole. Losing any part of FGC would significantly impact its ability to host the event.

3.3 Under this option, residential developments of higher density are concentrated in the northern part of the site closest to the Fanling/Sheung Shui New Town which has better access to the major road network and public transport, as well as existing government, institution or community (GIC) and commercial facilities. Residential developments of lower density are proposed in the southern portion of the site due to limited capacity of Fan Kam Road and low-rise character of neighbouring uses.

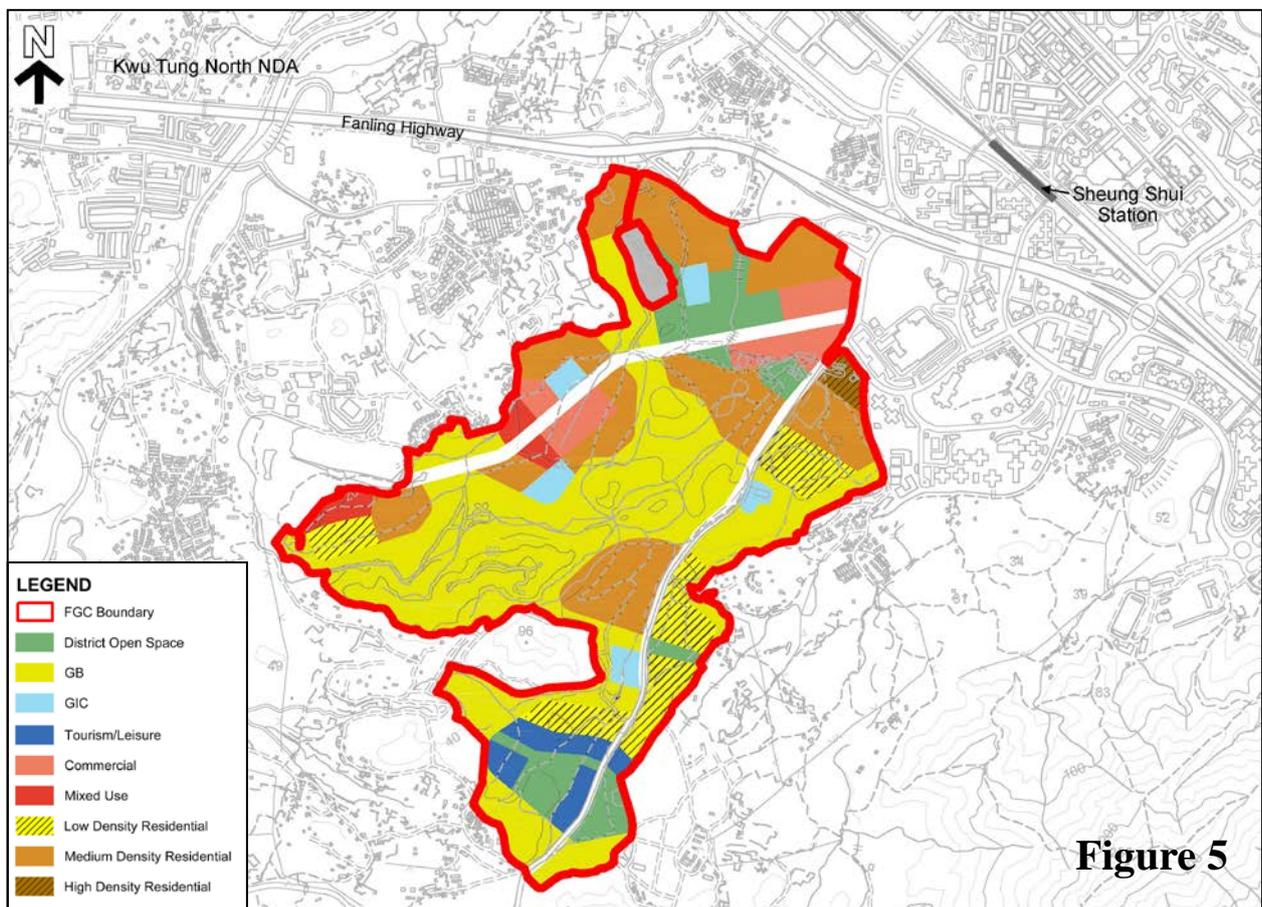
3.4 The proposed development area within Old Course is shown in **Figure 4**. A conservative estimate of the flat production in this option is **4,600** accommodating a population of about **13,000**.



### Full Development Option

3.5 Under this option, the entire FGC is proposed for housing, commercial, GIC, open space, and tourism/leisure uses, with woodland covers and major tree clusters conserved as green belt. Similar to the considerations under the Partial Development Option, residential developments of higher density are located in the northern portion of the site. GIC and open space uses are proposed in accordance with the requirements set out under the Hong Kong Planning Standards and Guidelines and advice of relevant bureaux/departments.

3.6 The proposed development area is shown in **Figure 5**. The flat production from this option is **13,200** accommodating a population of about **37,000**.



3.7 A comparison of the key development parameters of the two options is shown in the table below:

	<b>Partial Development Option</b>	<b>Full Development Option</b>
	<b>32</b> ha of land in FGC (entire area east of Fan Kam Road to be released )	Whole FGC ( <b>172</b> ha of land to be released)
<b>Development Area<sup>1</sup> (ha) (about)</b>	15	96
<b>Housing Units</b>	4,600	13,200
<b>Population</b>	13,000	37,000
<b>Jobs</b>	840	12,000
<b>Land Uses by Area (ha) (about):</b>		
Residential /Mixed Commercial & Residential Use [assumed plot ratio]	15 [1.5-5 (mainly 5)]	68 [1.5-5 (mainly 3)]
Commercial/Tourism/Leisure	-	14
Government, Institution or Community Use <sup>2</sup> / Others	2	14
Green Belt (covering major tree clusters) / Open Space	15	76
Fanling Golf Course	140	0
<b>Total</b>	<b>172</b>	<b>172</b>

1. Excluding the retained FGC area, the existing GIC facilities and road, and the area proposed for green belt and open space.
2. GIC uses mainly include nursery and kindergarten, schools, sport center, children and youth service center, etc. for the Full Development Option. No major GIC use is required under the Partial Development Option as the requirements can be met by existing provisions in the wider area.

3.8 The Study confirms that both options are technically feasible. The Full Development Option is assumed to be pursued together with the NTN development proposed under the Study, where a possible north-south railway connecting Heung Yuen Wai to a nearby new town and/or the main urban areas will have to be implemented. The Partial Development Option alone may be implemented independent of the NTN development subject to infrastructural improvements in terms of road interchange, road, sewerage, drainage and water supply<sup>3</sup>.

<sup>3</sup> Infrastructure enhancements in support of the Partial Development Option include (i) improvement of Po Shek Wu Road Interchange by another project; (ii) widening of a short section of Fan Kam Road between Po Kin Road and the proposed site access; (iii) new on-site self-contained sewage treatment works (STW) or sewerage requirements incorporated in the new STWs in the North District South; (iv) necessary drainage mitigation measures; and (v) expansion/upgrading of existing water treatment works/pumping stations in Ngau Tam Mei and Tai Po.