



Agreement No. CE 2/2011 (CE)

Hung Shui Kiu New Development Area Planning and Engineering Study – Investigation





土木工程拓展署

New Territories West Development Office

Civil Engineering and Development Department

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Executive Summary

April 2017

Reviewed:

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April 2017

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NOMENCLATURE AND ABBREVIATIONS

Abbreviations	Description
BEAM	Building Environmental Assessment Method
“C”	“Commercial”
“CA”	“Conservation Area”
C&D	Construction and Demolition
CE	community engagement
CEDD	Civil Engineering and Development Department
DCA	Development Character Area
DCS	District Cooling System
EFTS	Environmentally Friendly Transport Services
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
EM&A	Environmental Monitoring and Audit
EPD	Environmental Protection Department
EVs	electric vehicles
FLN	Fanling North
“GB”	“Green Belt”
GIC	Government, institution and community
GTC	Green Transit Corridor
HK2030 Study	Hong Kong 2030: Planning Vision and Strategy
HKPSG	Hong Kong Planning Standards and Guidelines
HSK	Hung Shui Kiu
KSWH	Kong Sham Western Highway
KTN	Kwu Tung North
“I”	“Industrial”
“LO”	“Local Open Space”
LCAs	Landscape Character Areas
LRs	Landscape Resources
LRT	Light Rail Transit
NDA	New Development Area
NENT	North East New Territories
NSRs	Noise Sensitive Receivers
NWNT	North West New Territories
NWNT Study	Planning and Development Study on North West New Territories
“OU(PBU+SWU)”	“Other Specified Uses (Port Back-up, Storage and Workshop Uses)”
OZPs	Outline Zoning Plans
PlanD	Planning Department
PME	Powered Mechanical Equipment
PODP	Preliminary Outline Development Plan
PRH	Public Rental Housing

Abbreviations	Description
Project	Hung Shui Kiu New Development Area project
PTI	public transport interchange
RODP	Recommended Outline Development Plan
RTS	refuse transfer station
SPS	sewage pumping station
Study	Hung Shui Kiu New Development Area Planning and Engineering Study
STW	sewage treatment works
TPB	Town Planning Board
TPO	Town Planning Ordinance
“V”	“Village Type Development”
WCZ	Water Control Zone
WR	West Rail

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1 INTRODUCTION

1.1 Background

1.1.1 The "Planning and Development Study on North West New Territories" (the NWNT Study) completed in 2003, identified the Hung Shui Kiu (HSK) area as a potential New Development Area (NDA) to cater for the long-term development needs of Hong Kong. With an area of about 450 ha, it was proposed to accommodate a population of about 160,000 and to provide about 48,000 jobs upon full development. However, the proposal was shelved in 2003 in light of an anticipated slower population growth and housing demand.

1.1.2 Subsequently, the "Hong Kong 2030: Planning Vision and Strategy" (HK2030 Study) completed in 2007, revisited the need for NDAs in the New Territories and recommended proceeding with the NDA developments to address the long-term housing demand and provide employment opportunities. The Chief Executive announced in his 2007-08 Policy Address the planning for the NDAs in HSK and the North East New Territories (NENT) as one of the ten major infrastructure projects for economic growth.

1.1.3 Since the completion of the NWNT Study in 2003, there have been changes in planning circumstances. To initiate the implementation of the HSK NDA, the Civil Engineering and Development Department (CEDD) and the Planning Department (PlanD) jointly commissioned the HSK NDA Planning and Engineering Study (the Study) in August 2011.

1.2 Main Objectives

1.2.1 The Study includes the following main objectives:

- to formulate development proposals for the HSK NDA to cater for the latest planning circumstances, community aspirations, long-term housing and development needs;
- to review, evaluate and establish the engineering feasibility of the HSK NDA project (The Project);
- to carry out Environmental Impact Assessment (EIA) to establish the environmental acceptability for the Project;
- to carry out site investigation and preliminary engineering designs for the proposed site formation and engineering infrastructure; and
- to formulate the implementation mechanism and programme to facilitate the first population intake of the NDA by the year of 2024 or earlier.

1.3 Study Process

1.3.1 The Study could be divided into five stages:

Prior to Commencement of the Study

1.3.2 Prior to the commencement of the Study in August 2011, CEDD and PlanD convened the first round activities of Stage 1 Community Engagement (CE) in November 2010 to arouse public discussions on the key issues of the NDA including its vision, strategic role and planning principles. Various statutory and advisory organisations were briefed, and consultation pamphlets were distributed to the public.

Formulation of Guiding Principles

- 1.3.3 The Study was commissioned in August 2011. An inventory of baseline conditions of the Study Area was reviewed, and key issues and guiding principles were identified to facilitate the planning and engineering tasks, taking account of the public comments received in the first round of Stage 1 CE. The second round of Stage 1 CE was launched in December 2011 to solicit public views on their visions and aspirations for the NDA and discuss key issues relating to the development of the NDA.

Formulation of Preliminary Outline Development Plan

- 1.3.4 The Preliminary Outline Development Plan (PODP) and, Preliminary Master Urban Design and Landscape Plans for the HSK NDA were formulated taking into account the public comments received from the first and second rounds of Stage 1 CE and the guiding principles, accompanied by supporting technical assessments. Stage 2 CE was launched in July 2013 to involve the public in discussing the PODP.

Formulation of Recommended Outline Development Plan

- 1.3.5 Based on the public comments received during the Stage 2 CE and findings of the technical assessments, the Recommended Outline Development Plan (RODP) and, Recommended Master Urban Design and Landscape Plans for the HSK NDA were formulated. Stage 3 CE was launched in June 2015 to gather public comments on the RODP.

Revision of Recommended Outline Development Plan

- 1.3.6 The RODP, Recommended Master Urban Design and Landscape Plans for the HSK NDA were revised taking into account the public comments received in the Stage 3 CE and the completed planning and engineering assessments. Further technical assessments were carried out to confirm the technical feasibility of the Revised RODP, which was promulgated on 5 September 2016.
- 1.3.7 An EIA was conducted in parallel with other technical assessments.
- 1.3.8 The Study also examined and recommended the implementation and costing strategy and development programme for implementing the proposed developments and engineering infrastructure.

2 EXISTING CONDITIONS OF THE HSK NDA

2.1 Study Area

2.1.1 According to the Revised RODP promulgated in September 2016, the total area of the HSK NDA spans around 714 ha and is located in the north-western part of the New Territories, midway between the Tuen Mun and Tin Shui Wai New Towns. It is surrounded by the mountain ridge of Yuen Tau Shan to the west and northwest, low-rise rural environment at Lau Fau Shan to the north, high-dense and built-up areas at Tin Shui Wai New Town to the east, as well as some low to medium-rise residential clusters to the south along Castle Peak Road.

2.1.2 The HSK NDA is bounded by Tin Ying Road / Ping Ha Road / Kiu Hung Road to the east, Castle Peak Road to the south, knolls of Yuen Tau Shan and Kong Sham Western Highway (KSWH) to the west, and Lau Fau Shan Road and hill slopes along Deep Bay Road to the north. The area to the south-east of Castle Peak Road not affected by the Project has been excluded from the NDA boundary since the promulgation of the RODP in Stage 3 CE. The HSK NDA boundary is shown in **Figure 1**.

2.2 Existing Land Uses

2.2.1 At present, the HSK NDA is characterised as a transitional area between the rural area and the urbanised new towns. Northern and central part of the NDA is predominately occupied by brownfield operations, while land located in the southern part is mainly occupied by low to medium-density residential development with some rural industrial uses mainly concentrated at Kiu Tau Wai and Hung Uk Tsuen areas. Furthermore, the NDA is transversed by the Tin Shui Wai Main Channel (also known as the Tin Shui Wai River Channel) and the existing elevated West Rail (WR) Line.

2.2.2 There are a total of 17 recognised villages, as shown on the list of recognised villages approved by the Director of Lands, located within the HSK NDA. There is also a village resite area located at Sha Chau Lei, which was for rehousing the villagers affected by previous Government projects. Meanwhile, some rural settlements could also be found in the southern part of the NDA where domestic structures are widely dispersed and some of them are impoverished temporary structures, intermingled with many non-domestic temporary structures. There are also some low to medium-density residential developments in the southern part of the NDA, including an existing public rental housing (PRH) estate, namely the Hung Fuk Estate. Moreover, there are also some existing government, institution and community (GIC) and recreational facilities and open space within and around the HSK NDA.

2.2.3 An extensive area of the HSK NDA is currently being occupied by brownfield operations. To understand the nature and operation of these brownfield operations, a questionnaire survey was conducted with the brownfield operators from August to November 2015. In the survey, a total number of 368 brownfield sites of a total area of about 200 ha were identified within the HSK NDA boundary. Among them, about 190 ha would be affected by the Project.

2.2.4 Some active agricultural land, one licensed chicken farm, some ponds and considerable amount of graves, "Urns (Kam Taps)" and shrines were identified within the HSK NDA. In addition, two Declared Monuments and seven Graded Historic Buildings (including two Grade 2 Historic Buildings and five Grade 3 Historic Buildings), five Sites of Archaeological Interest, as well as some ecological habitats including the San Sang San Tsuen egretry were also identified within the HSK NDA.

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3 PLANNING CONTEXT, DEVELOPMENT OPPORTUNITIES AND CONSTRAINTS

3.1 Overview of Planning Context

3.1.1 The NWNT Study, which was commissioned in 1997 and completed in 2003, was one of the several studies commissioned in response to projections of housing demand for Hong Kong arising from the Territory Development Strategy Review in 1996. The NWNT Study identified the HSK area with an area of about 450 ha as a suitable NDA to cater for the long-term development needs of Hong Kong. It was proposed to accommodate a population of about 160,000 (of which about 100,000 was strategic population) and to provide about 48,000 employment opportunities upon full development.

3.1.2 However, in the light of a slower population growth of population and housing demand at that time, the proposal was shelved in 2003. In fact, since the completion of the NWNT Study, the provision of new transport infrastructure has also militated against the realisation of the land use proposals put forward in the NWNT Study. In particular, the implication of the WR Line providing fast and convenient rail connection between the urban core areas and the North West New Territories (NWNT) warrants careful re-consideration of the land use proposals for the HSK area. The KSWH which provides a strategic road transport link to Shenzhen was also constructed, but the final layout and alignment were not exactly the same with the one shown on the RODP of the NWNT Study.

3.1.3 Subsequently, the HK2030 Study completed in 2007 re-visited the need for the NDAs in the New Territories and the implementation of the NDAs at the NENT and HSK, to address the long-term housing demand and provide employment opportunities. The NDAs would offer an alternative choice of living through the development of a quality living environment with convenient access to mass transportation and community facilities. Apart from providing housing land, it is anticipated that part of the HSK NDA could be considered for the provision of land reserves for special industries to meet longer-term needs.

3.2 Development Opportunities

3.2.1 The HSK NDA can form an extension to the Tin Shui Wai New Town in the northeast. Providing residential developments within the HSK NDA will create additional housing stock for Hong Kong to meet with the Government's annual housing targets.

3.2.2 The HSK NDA also occupies a strategic location in the territory. It is conveniently accessible by strategic transport infrastructure including the existing KSWH and WR Line. The Tuen Mun Western Bypass, Tuen Mun-Chek Lap Kok Link and the Hong Kong-Zhuhai-Macao Bridge under construction / planning will further enhance the accessibility of the NWNT including the HSK NDA.

3.2.3 The HSK NDA is also located in close proximity to the Mainland, and efficiently linked with the new development nodes at Lantau and the Greater Pearl River Delta region. In particular, the HSK NDA can act as a gateway for economic integration with Qianhai in Shenzhen which would likely strengthen and increase the flow of goods and services between these two areas, fostering economic development in Hong Kong.

3.3 Development Constraints

- 3.3.1 The existing major road links within the HSK NDA will likely be affected by the increase of road traffic due to the NDA development. The traffic impact to the road network has to be taken into account when considering the planning of the HSK NDA, and possible adverse impact due to traffic flow diversion in the existing strategic roads should be observed. New strategic roads would be essential to support the development at the HSK NDA before its full in-take. Moreover, most of the HSK area is not within the 500 m catchment area of the existing WR Tin Shui Wai Station and the catchment area of the Light Rail Transit (LRT) along Castle Peak Road. As such, an effective public transport network system has to be considered in the NDA to facilitate inter and intra-district movements of the future residents and workers.
- 3.3.2 A number of environmental constraints posed by the existing transport infrastructure require careful consideration in the planning of the HSK NDA. The existing WR Line and LRT are expected to pose constraints to the nearby developments in terms of environmental and visual impacts. The existing major distributor roads are also potential air pollution and noise source and will likely generate environmental impacts to the nearby developments within the NDA. Moreover, the HSK NDA falls within the Deep Bay catchment area and is subject to the requirement that no additional pollution load should be discharged into the Deep Bay as a result of the Project.
- 3.3.3 Many of the existing and planned infrastructure, including the elevated WR Line and the existing Tin Shui Wai Main Channel will also fragment much of the land parcels and pose constraints to efficient land use planning in the NDA.
- 3.3.4 Areas adjoining Tin Shui Wai New Town along Ping Ha Road are located in the flood plain and flooding is evident. Site formation and the drainage system should be designed to minimise flooding risk to the planned developments and the nearby existing settlements.

3.4 Key Issues

- 3.4.1 Potential interface issues between the retained existing villages within the HSK NDA and the proposed development should be carefully addressed. Compatibility between existing villages and the new developments should also be addressed by proper planning and urban design.
- 3.4.2 Meanwhile, there are also other rural settlements scattered in the NDA. While the planning of the HSK NDA has minimised impact on the existing developments as far as possible, impact on some existing structures is unavoidable due to their locations.
- 3.4.3 Permitted burial grounds should also be retained as far as possible unless infrastructure development for the NDA is required.
- 3.4.4 There may be opportunities to accommodate the brownfield operations in more land efficient manner for other optimal uses. Nonetheless, concerns pertaining to the interface of new developments with retained / remaining brownfield operations need to be addressed.

- 3.4.5 The ratio of public-to-private housing for the HSK NDA should be carefully considered to ensure a balanced economic and social environment, also taking into account the preponderance of public housing in the nearby Tin Shui Wai New Town. Adequate GIC facilities and utilities should also be provided in the HSK NDA while serving the surrounding neighbourhood. It is desirable that through the development of the HSK NDA, certain improvements can be brought to Tin Shui Wai New Town by redressing the imbalanced housing mix and facilities provision.
- 3.4.6 There is also opportunity for the HSK NDA to become an employment hub for the NWNT. This will bring jobs closer to the residents and reduce the imbalance in the spatial distribution of homes and jobs in the territory.
- 3.4.7 A number of ecological, landscape and cultural heritage resources are found within the HSK NDA. Proper planning and land use zoning designation would help conserving these resources and integrating with the overall planning of the NDA.

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4 Community Engagement

4.1 Introduction

4.1.1 Community engagement is an important element of the Study. To foster community support and general consensus on the key issues, a series of CE activities has been built into the study process. A 3-stage CE has been carried out.

4.2 Community Engagement Programme

4.2.1 The Stage 1 CE (Round 1) was held between November 2010 and January 2011, prior to the commencement of the Study, to engage the community in the early beginning to help building the community visions for the HSK NDA and to facilitate the preparation of development concepts for further discussion in the community.

4.2.2 To foster more in-depth discussions and exchange of views on the development of the NDA, the Stage 1 CE (Round 2) was held between December 2011 to February 2012 to elicit comments and suggestions from members of the public and local stakeholders on the key issues, vision, strategic role and planning principles of the HSK NDA.

4.2.3 The Stage 2 CE was held from July to October 2013 to consult the public on the PODP and seek consensus on the land use planning and development framework for the NDA so as to facilitate the preparation of the RODP in the next stage.

4.2.4 The Stage 3 CE was held from June to September 2015 for three months. Taking into account public comments received in the Stage 2 CE, the planning and engineering considerations and the results of technical assessments, the RODP was formulated and the public was consulted on the RODP through the Stage 3 CE.

4.2.5 During the various stages of CE activities, public views were gathered through public forums / workshops and meetings with various statutory / advisory bodies, professional institutes and relevant stakeholders, including local residents, business operators and owners. Written comments including both supportive and opposing comments have been received.

4.2.6 Public comments/suggestions received and relevant responses in each stage of the CE were set out in the CE Reports, which were uploaded onto the study website (<http://www.hsknda.gov.hk>).

4.2.7 On 5 September 2016, the Revised RODP (as shown in **Figure 2**) was promulgated with an Information Digest. Briefings to the Town Planning Board, Tuen Mun and Yuen Long District Councils, Ha Tsuen, Ping Shan and Tuen Mun Rural Committees, Panel on Development of Legislative Council and other relevant stakeholders were made in September to November 2016. During the briefings, members of these boards and committees mainly reiterated their previous comments raised during Stage 3 CE with the common concerns covering the transport capacity, impacts on existing residents and impacts on the affected brownfield operations. The Yuen Long District Council has expressed concerns about the Project and formed a working group to follow up the Project.

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5 OUTLINE DEVELOPMENT PLANS

5.1 Vision

5.1.1 The HSK NDA commands a strategic location in the NWNT conveniently connected with different districts of Hong Kong and Shenzhen. This geographically favourable location enables development of the area in promoting economic activities. Moreover, the HSK NDA will be one of the major sources of land supply to meet the housing needs of Hong Kong in the medium to long-term. It should integrate well with the existing neighbouring urban development clusters including Tin Shui Wai, Yuen Long and Tuen Mun New Towns to enable effective sharing of infrastructure, GIC facilities and job opportunities, and to improve the housing mix. In line with sustainable development principles, the development potential of the NDA should be maximised within the infrastructure capacity limits without compromising urban design principles, while minimising impacts on existing communities, cultural heritage resources, as well as the natural environment.

5.2 Guiding Principles

5.2.1 Four guiding principles have been formulated to facilitate planning of the HSK NDA:

- Enhancing the strategic role of the HSK NDA;
- Building a people-oriented community;
- Creating a green living and working environment; and
- Integrating with development of Tin Shui Wai, Yuen Long and Tuen Mun New Towns.

5.3 Preliminary Outline Development Plan

5.3.1 Taking into account the public views received in Stage 1 CE, the analysis of baseline information and results of various initial technical assessments, the PODP for the HSK NDA was formulated based on the vision and guiding principles discussed above. Under the PODP, the total population and employment upon full development is about 218,000 persons and about 100,000 employment opportunities respectively. The major development parameters of the PODP are summarised in **Table 5.3.1** below.

Table 5.3.1 Major Development Parameters of the PODP for the HSK NDA

Total NDA Area	About 826 ha
Total Population	About 218,000 (including existing population and base growth of about 43,000)
New Housing Units	About 60,000
Housing Mix	Public 51% : Private 49% (Together with Tin Shui Wai New Town, the overall housing mix is about Public 69% : Private 31%)
New Employment Opportunities	About 100,000

5.4 Recommended Outline Development Plan

- 5.4.1 Taking account of the public views collected in Stage 2 CE on the PODP and findings and recommendations of various technical assessments, appropriate amendments to the land uses in the HSK NDA have been made when formulating the RODP. The area to the south-east of Castle Peak Road not affected by the Project has been excluded from the NDA boundary, and the NDA Area was reduced from 826 ha to around 714 ha.
- 5.4.2 Under the RODP, a population of about 215,000 and employment opportunities of about 150,000 were proposed. The major development parameters of the RODP are summarised in **Table 5.4.1** below.

Table 5.4.1 Major Development Parameters of the RODP for the HSK NDA

Total NDA Area	About 714 ha
Development Area	About 442 ha
Total Population	About 215,000 (including new population of about 173,000 and population of about 42,000 from existing and committed developments)
New Housing Units	About 60,100
Housing Mix	Public 51% : Private 49% (Together with Tin Shui Wai New Town, the overall housing mix is about Public 69% : Private 31%)
New Employment Opportunities	About 150,000

5.5 Revised Recommended Outline Development Plan

- 5.5.1 Taking account of the public views received during Stage 3 CE and findings of various technical assessments, some amendments to the land uses and layout in the HSK NDA have been made to the RODP.
- 5.5.2 Under the Revised RODP, the HSK NDA will cater for a total population of about 218,000 and employment opportunities of about 150,000. The Revised RODP of the HSK NDA is shown in **Figure 2** and the major development parameters of the Revised RODP are summarised in **Table 5.5.1** below.

Table 5.5.1 Major Development Parameters of the Revised RODP for the HSK NDA

Total NDA Area	About 714 ha
Development Area	About 441 ha
Total Population	About 218,000 (including new population of 176,000 and population of about 42,000 from existing and committed developments)
New Housing Units	About 61,000
Housing Mix	Public 51% : Private 49% (Together with Tin Shui Wai New Town, the overall housing mix is about Public 69% : Private 31%)
Maximum Plot Ratio	Residential : 6.0 Commercial : 9.5
New Employment Opportunities	About 150,000

Planning Concepts and Considerations

Positioning of the NDA

- 5.5.3 Capitalising on the strategic location and distinct setting of the HSK, the HSK NDA will be the next generation new town of Hong Kong creating a desirable place to live, work, play and do business for a population of about 218,000. It will also serve as a “Regional Economic and Civic Hub” for the NWNT, where about 150,000 employment opportunities will be generated through a mix of commercial, business, industrial, community and government land uses. This will help reducing the imbalance in the spatial distribution of homes and jobs in the territory, boosting the vibrancy of local communities, providing new employment opportunities for the adjacent Tin Shui Wai New Town and other parts of the NWNT and enabling effective sharing of infrastructure and GIC facilities with the adjoining areas.

Fostering Economic Vibrancy

- 5.5.4 Mixed commercial and residential sites with higher development intensity are planned around the proposed HSK Station and the existing WR Tin Shui Wai Station to reinforce their respective functions as “Regional Economic and Civic Hub” and “District Commercial Node”. The north-western part of the NDA is also designated as “Logistics, Enterprise and Technology Quarter” and industrial zone to provide development spaces for accommodating a wide range of industrial and special industrial uses. It is also anticipated that certain demand for brownfield operations will remain within the HSK NDA and options to consolidate and rationalise these uses in a land-efficient manner should be explored. The consolidation of these operations in the HSK NDA will improve the current situation in which they are environmentally despoiling and result in the waste of a valuable land resource.

Social Mix and Supportive Community Facilities

- 5.5.5 The ratio of new housing units in the NDA is around 51:49 in public and private housing developments. Taking both the NDA and the Tin Shui Wai New Town together, the overall public to private housing ratio will become about 69:31. The proposed public to private housing ratio in the NDA will help redressing the existing imbalance of public / private housing in the Tin Shui Wai New Town. The NDA is also planned for a people-oriented and balanced community taking into account the requirements of the surrounding areas including Tin Shui Wai New Town. A wide range of social and community facilities should be provided to meet the needs of different ages and families, serving not only residents of the HSK NDA but also residents of the nearby areas.

Enhancing the Transport Network to Improve Accessibility

- 5.5.6 In terms of external connectivity, possible new strategic highways connecting the NDA with Tuen Mun and the urban area will be planned to cope with the anticipated traffic growth in the NWNT region in the long term. The proposed HSK Station will also help enhancing the accessibility by mass transit system to the NDA. For internal connectivity, new primary and district distributor roads will be provided to facilitate east-west and north-south movements within the NDA. A comprehensive local road networks, cycle tracks and pedestrian walkways and pedestrian streets have been planned to facilitate internal vehicular and pedestrian movements. A Green Transit Corridor (GTC), including an Environmentally Friendly Transport Services (EFTS), pedestrian walkways and cycle tracks, would also be introduced in the NDA to provide rapid intra-district transport service and green mobility, and connect the residential clusters with the employment nodes, railway stations and key community facilities. Public Transport Interchanges (PTIs) will also be provided to facilitate convenient transfer of various transport modes and enhancement of internal circulation.

Creating a Smart and Green City

- 5.5.7 The NDA will be a green city adopting a sustainable and energy saving strategy to achieve energy efficiency, carbon emission reduction and sustainable living. Major population, economic activities and community facilities should be concentrated within walking distance of mass transit and public transport nodes. Green mobility is promoted within the NDA through the introduction of the GTC and a comprehensive cycling and pedestrian networks. Other green initiatives including sustainable use of water, sustainable drainage system, solid waste management, use of green energy and establishment of information and communication technology platform would also be promoted.

6 URBAN AND LANDSCAPE DESIGN

6.1 Urban Design Framework

6.1.1 The development of the Urban Design Framework has taken direct reference to the proposals and recommendations made to the relevant Outline Zoning Plans (OZPs), Practice Notes for Authorised Persons, Sustainable Building Design Guidelines, the Hong Kong Planning Standards and Guidelines (HKPSG), as well as the public aspirations from the Stage 1 to Stage 3 CE to inform the planning of the HSK NDA. **Figure 3** shows the Master Urban Design Plan.

6.1.2 A comprehensive urban design framework responding to the physical environment and stated objective of developing the NDA as a sustainable, quality and green living environment and socially integrated community has been formulated. The key urban design elements are summarised below.

- **Compact City** - Concentrate higher density developments around railway stations and public transport nodes;
- **Distinctive Nodes** - Develop a hierarchy of identifiable focal points to foster interaction and vibrancy;
- **Green Spine** - Capitalise green space along the river channels, the Regional Park, Regional Plaza and other open spaces to form a green spine of the NDA;
- **Blue-Green Design** - Revitalise existing river channel to form a continuous blue-green network;
- **Walkability** - Create local communities with good accessibility and walkability through pedestrian network including pedestrian and shopping streets;
- **Breathing Space** - Create ventilation corridors and breathing space through disposition of developments;
- **Celebrating Views** - Optimise vistas by maintaining fung shui lanes and introducing visual corridors;
- **Stepped Development Profile** - Create a harmonious urban context through stepped building height and development intensity profile;
- **Integrative Design** - Respond to the pattern of existing spatial layouts and characters in the adjoining areas; and
- **Appreciation of Nature and Culture** - Preserve and enhance natural and cultural assets and connectivity.

6.2 Development Character Areas

6.2.1 Based on the planning design concepts and urban design framework, five Development Character Areas (DCAs) are identified, each with a defined character and function.

Regional Commercial and Civic Hub

- 6.2.2 The “Regional Economic and Civic Hub” around the proposed HSK Station will be the major town centre of the NDA and the regional hub for the NWNT. This major economic and employment node will be buttressed by two anchor developments creating critical mass of commercial uses, and supplemented by less sizable commercial and commercial/residential sites. A wide range of uses including offices, hotels, retail facilities and public and private residential developments, are planned within 500m of the proposed HSK Station. The Regional Plaza stretching across the town centre will become an important breathing and leisure space within the regional hub. A civic hub is also planned to the southeast of the Regional Plaza and easily accessible by the WR to serve the wider catchment.

District Commercial Node

- 6.2.3 Located to the immediate south of the existing WR Tin Shui Wai Station, the “District Commercial Node” will be developed as a secondary node of the HSK NDA providing commercial space for offices, retail and hotel uses. It can also serve the needs of Tin Shui Wai New Town for additional commercial and community facilities. A hospital is also proposed in this DCA to serve not only local residents of the NDA but also those in the neighbouring communities.

Logistics, Enterprise and Technology Quarter

- 6.2.4 Located at the western extent of the HSK NDA, the “Logistics, Enterprise and Technology Quarter” easily accessed by strategic transport corridors is designated for logistics facilities, Enterprise and Technology Park, industrial zone, as well as to provide land for development of multi-storey buildings for accommodating some of the brownfield operations affected by the Project. This location in the NDA enjoys direct access to strategic roads, which would also minimise movements and impact of heavy vehicular traffic within the NDA. The existing San Sang San Tsuen egretry will be retained and preserved, complementing the expanded open space corridor to further protect the egretry and flight paths of the ardeids.

Riverine and Village Neighbourhood

- 6.2.5 The “Riverine and Village Neighbourhood” is located at the north-eastern extent of the NDA, providing quality residential neighbourhood and riverine public spaces. With the re-planning of Tin Ying Road, a promenade along the regenerated river channel is planned to enhance the riverside environment where retail and dining facilities will be provided to promote vibrancy, and landscape planting, pedestrian walkways and cycle tracks will be planned alongside the promenade. The Regional Park will also be provided in this DCA and be integrated with the riverside promenade for providing leisure and recreational uses.

Bayview Neighbourhood and Local Service Core

- 6.2.6 The “Bayview Neighbourhood”, mainly for residential development and GIC facilities, is located at the northern extent of the HSK NDA overlooking the beautiful scenery of Deep Bay and Yuen Tau Shan. A stepped building intensity and building height profile is adopted to harmonise with the surrounding natural and rural environment near Lau Fau Shan and Deep Bay. A “Local Service Core” is planned within the “Bayview Neighbourhood” with a mix of retail facilities, PTI, public car park, clinic and other social and community facilities. A local commercial centre with car parking facility is also planned at the northern tip of the NDA for serving the neighbourhood including those from Tin Shui Wai north, and complementing the tourism activities in Lau Fau Shan.

6.3 Landscape Design Framework

6.3.1 The landscape design framework for the HSK NDA gives emphasis to create an integrated landscape system which links the future developments with the existing landscape resources. The proposed landscape design framework encompasses the following principal objectives:

- Establishing a high quality functional landscape network;
- Enhancing connectivity; and
- Establishing a green infrastructure network.

6.3.2 A hierarchy of active and passive open spaces will be created in the HSK NDA. The application of landscape treatment works is also proposed within the existing river channels that are located on the confluence of the Tin Shui Wai New Town and the HSK NDA. In line with these landscape treatment works, the introduction of two green landscape 'spines' are proposed in the HSK NDA from which vertebrae of open space corridors will extend. The open space which will extend from the green spine will include the Regional Park, Regional Plaza, riverine promenade and other open spaces, in which a range of recreational activities can be provided.

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7 TECHNICAL ASSESSMENTS

7.1 Introduction

7.1.1 Various technical assessments have been undertaken to evaluate the technical feasibility and impacts of the Revised RODP. Findings of these technical assessments are summarised below.

7.2 Geotechnical Assessment and Site Investigation

7.2.1 The HSK NDA is generally situated in areas of low topographic relief. The ground level at the eastern part and area adjacent to watercourse of the NDA are generally lower while the northwest corner has a higher ground level. In addition, localised small hills are located in other parts of the HSK NDA.

7.2.2 Much of the site in NDA is covered by quaternary superficial deposits including alluvium and colluvium near hillslopes areas. Recent marine and pond deposits are also located in the northeastern portion of the NDA. Treating the materials in-situ to improve the physical properties of these materials is proposed.

7.2.3 The solid geology within the NDA comprises granitic rocks in the west with the majority of the remaining area underlain by metamorphosed sandstone and siltstone of the Lok Ma Chau Formation and volcanic rocks of the Tuen Mun Formation.

7.2.4 The eastern portion of the NDA falls within Scheduled Area No. 2 with marble (and dissolution cavities) identified in both the Tuen Mun and Lok Ma Chau Formations. In the Lok Ma Chau Formation the marble was predominantly identified as banded impure layers. In the Tuen Mun Formation the marble was identified as clasts within volcanic deposits. Large cavities have also been identified within the volcanic rocks of the Tuen Mun Formation both within and outside the boundary of the Scheduled Area. Ground improvement by infilling the cavities with cement grout could be a possible solution.

7.2.5 Due to the relatively high groundwater table at much of the HSK NDA, groundwater control measures may be required for excavation and lateral support works.

7.2.6 Five Natural Terrain Hazards Study areas have been identified which may affect the Project and the likely scope of hazard mitigation works has been identified based on a preliminary assessment of the geomorphological characteristics of the areas and their landsliding history.

7.2.7 Based on the available information, the HSK NDA is located in an area of complex geology which presents a number of geological / geotechnical risks and constraints. However, these potential constraints can be technically solved by possible solutions. It is considered that the Project is technically feasible.

7.3 Site Formation Assessment

7.3.1 The site formation works for the HSK NDA have been reviewed and proposed. Rock will be excavated during formation of some sites adjoining the hillside but blasting works are not expected. To meet the minimum formation levels recommended in the drainage impact assessment, the proposed site formation works would require about 6.0 million m³ of fill materials where about 4.8 million m³ can be excavated from within the NDA. Non-inert construction and demolition (C&D) materials (about 0.18 million m³) would be recycled and re-used as far as possible. There will be a deficit of about 1.37 million m³ to be imported.

7.3.2 Unsuitable materials such as soft clays / silts may be encountered during excavation works within the HSK NDA. It is proposed to carry out appropriate soil mixing or cement mixing work to improve the physical properties of these materials such that they can be re-used on-site as general fill material.

7.3.3 Boreholes have been drilled and soil samples were recovered for chemical analyses. Screening of results suggests widespread contamination is not present in the NDA.

7.4 Land Requirement Study

7.4.1 Based on the development proposals under the Revised RODP, the development area is approximately 441 ha, including private land and Government land of about 324 ha and 117 ha respectively. A majority of affected private land is currently occupied by existing brownfield operations and dwellings that are rural in nature.

7.4.2 In estimating the number of structures which might be affected by the development proposals, estimation on both permanent and temporary structures within the HSK NDA were counted. These structures are scattered all over the HSK NDA and their height and size varies. The number of affected structures was counted based on the desktop study on the digital map data and supplemented by field survey in some areas of the HSK NDA. Based on the rough estimation, about 1,500 living structures will be affected under the HSK NDA.

7.4.3 Within the HSK NDA, some 7 ha of active agricultural land and about 20 ha of inactive agricultural land will be affected inevitably due to their locations. There are also about 1.3 ha of ponds without ecological significance will be affected. Meanwhile, there is a chicken farm within the HSK NDA situated in Kai Pak Leng, Ha Tsuen but will not be affected by the Project.

7.4.4 Within the HSK NDA, there are considerable amount of graves, "Urns (Kam Taps)" or shrines especially at the location of the western side of the NDA. According to a rough estimation, about 55 graves, "Urns (Kam Taps)" or shrines will be affected.

7.4.5 Since private land accounts for about 73% of the total development area of the HSK NDA, land resumption would be inevitable. The land resumption limit and operations / facilities to be cleared would be ascertained in the detailed design stage.

7.5 Land Use Assessment

7.5.1 The HSK NDA provides land not only for housing development and supplementary community facilities, but also provides solution spaces in the NWNT to meet the surging demand for various economic land uses. An assessment of the different land uses requirements for the HSK NDA was therefore conducted taking account of the latest circumstances and the public comments received.

7.5.2 An array of civic and GIC facilities will be provided in the HSK NDA to support the future residents living within and near the NDA, and create a family-friendly and age-friendly community. Adequate open space has also been planned within the NDA. In overall term, the provision of GIC facilities and open space has taken into account the requirement of the HKPSG and advice from relevant bureau / departments.

- 7.5.3 In terms of office space provision, there has been ongoing demand of office space in Hong Kong in the past years in line with the continuous Gross Domestic Product growth. On the supply side, the growth of office space in Years 2010 to 2015 is rather limited with very small new supply. As such, it is desirable to provide adequate office supply in some of the NDAs in the New Territories in order to relieve pressure for office space in the urban core, while meeting the needs of local residents. In particular, the strategic location of the HSK NDA warrants the development as a commercial hub function for the NWNT region. The provision of adequate office space in the HSK NDA will provide support to various commercial activities, and create diverse employment opportunities to the local population. This will also eliminate the need for future residents to travel to urban areas for 'office work' and address the imbalanced home-job balance across the territory.
- 7.5.4 Apart from office space, there is scope to develop the HSK NDA as a regional shopping centre in view of the lacking of regional shopping centre in the NWNT. It is recommended that the regional retail centre be located around the proposed HSK Station, which could serve as important pull factor in attracting visitors and shoppers. In order to create diversified retail experiences, a variety of shopping environment should also be provided including large shopping complex, smaller district and local retail centres, as well as street shops. A number of shopping streets are also proposed in the NDA with retail frontages for shops and services.
- 7.5.5 Moreover, given the close proximity to the existing cross boundary links, the HSK area is a prime location for brownfield operations. It is likely that a certain demand for these operations will remain within the HSK NDA and efforts should be made to rationalise these uses. The consolidation of brownfield operations in land-effective manner, such as accommodating them in multi-storey buildings, will help improve the current situation which has caused environmental degradation and waste of valuable land resources. To this end, the Government has already commenced studies to explore the feasibility of accommodating some of the affected brownfield operations in proposed multi-storey buildings. About 24 ha of land with direct access to the KSWH have been reserved at the northwestern part of the NDA for such purpose.

7.6 Traffic and Transport Impact Assessments

- 7.6.1 This assessment aims to assess the supporting transport infrastructure and networks (including both roads and railways) for the demand of forecasting years according to the Revised RODP. A strategic territorial model and a local area traffic model were developed to produce robust traffic forecasts.
- 7.6.2 Having regard to all engineering and planning considerations as well as the result of the transport models, the following new roads and improvement works are proposed:

Primary Distributor Road

- A primary distributor road, namely Road P1 will mainly be a dual 2-lane carriageway running in north-south direction.

District Distributor Roads

- There will be eight district distributor roads in the HSK NDA, namely Road D1 to D8. The Road D1 is a dual 3-lane / dual 2-lane carriageway running in east-west direction. Road D2 is currently known as the existing Ping Ha Road and will be upgraded to a dual 2-lane carriageway running in north-south direction. District distributors Roads D3 to D8 will also be dual 2-lane carriageways.

Local Roads

- Tin Ha Road, Shek Po Road, Hung Shui Kiu Tin Sam Road, Hung Shui Kiu Main Street, Hung Yuen Road and Tan Kwai Tsuen Road will be retained with no improvement works;
- Tin Ying Road (between Tin Wah Road and Ping Ha Road) will be re-planned; and
- Hung Tin Road (between Ping Ha Road and Castle Peak Road) will be downgraded to local road.

Car Parking Space

- 7.6.3 For the HSK NDA, the requirements of HKPSG are adopted for the provision of parking and loading / unloading spaces for different types of land uses.
- 7.6.4 On top of the parking spaces to be provided in accordance with HKPSG, the Revised RODP has reserved a total of an additional 200 number of public car parking spaces at the “Commercial” (“C”) and “Other Specified Uses” annotated “Commercial and Residential Development” sites near the proposed HSK Station, as well as the “C” and “Other Specified Uses (Commercial cum PTI and Public Carpark)” sites in the northern part of the HSK NDA. These four sites are located adjacent to railway or EFTS stations, and /or equipped with PTIs.

Traffic Impact Assessment

- 7.6.5 Road link and junction capacity assessments were carried out to preliminarily determine the performance of the proposed new roads and the traffic impact on the major road links and critical junctions based on the Revised RODP in 2026, 2031 and 2036.
- 7.6.6 The results of the assessment on major road links were summarised in **Table 7.6.1**. These major road links will be operating within capacity (i.e. at a volume / capacity ratio less than 1.2).

Table 7.6.1 Major Road Links Performance within Area of Influence in Year 2026, 2031 and 2036

Key Link			Capacity (pcu/hr)	Peak	Link Performance (v/c ratio)		
					2026	2031	2036
L1	Yuen Long Highway – Hung Shui Kiu	E/B	6,100	AM	4740	5010	5460
					(0.78)	(0.82)	(0.90)
		W/B		PM	5520	6260	6420
					(0.90)	(1.03)	(1.05)
L2	Yuen Long Highway – Lam Tei	E/B	6,100	AM	6120	6970	7030
					(1.00)	(1.14)	(1.15)
		W/B		PM	4260	4590	5030
					(0.70)	(0.75)	(0.82)
L2	Yuen Long Highway – Lam Tei	E/B	6,100	AM	5780	5130	5840
					(0.95)	(0.84)	(0.96)
		W/B		PM	6080	5200	6080
					(1.00)	(0.85)	(1.00)
L2	Yuen Long Highway – Lam Tei	E/B	6,100	AM	6770	5710	6920
					(1.11)	(0.94)	(1.13)
		W/B		PM	5130	4550	5720
					(0.84)	(0.75)	(0.94)

Key Link			Capacity (pcu/hr)	Peak	Link Performance (v/c ratio)		
					2026	2031	2036
L3	Kong Sham Western Highway (Near Deep Bay)	N/B	6,100	AM	1170	1370	1470
					(0.19)	(0.22)	(0.24)
				PM	1270	1450	1600
					(0.21)	(0.24)	(0.26)
		S/B	6,100	AM	1030	1160	1280
				(0.17)	(0.19)	(0.21)	
PM	1290	1460	1610				
(0.21)	(0.24)	(0.26)					
L23	Kong Sham Western Highway (Near Yuen Long Highway)	N/B	6,100	AM	2180	3680	4720
					(0.36)	(0.60)	(0.77)
				PM	1800	3440	4410
					(0.30)	(0.56)	(0.72)
		S/B	6,100	AM	1790	3050	4920
				(0.29)	(0.50)	(0.81)	
PM	2120	3670	4700				
(0.35)	(0.60)	(0.77)					
L4	Castle Peak Road – Lam Tei	E/B	3,200	AM	1200	1230	1530
					(0.38)	(0.38)	(0.48)
				PM	1830	1860	1900
					(0.57)	(0.58)	(0.59)
		W/B	3,200	AM	1870	2050	2180
				(0.58)	(0.64)	(0.68)	
PM	1630	1730	1940				
(0.51)	(0.54)	(0.61)					

7.6.7 The result of the assessment shows that new roads and local roads will operate within their capacity.

7.6.8 Junction improvement works are proposed to alleviate the potential traffic problems at 4 local junctions, namely Ping Ha Road / Tin Ha Road, Castle Peak Road / Ping Ha Road, Castle Peak Road / Fuk Hang Tsuen Road / Ng Lau Road, and Hung Tin Road / Castle Peak Road (Ping Shan). With the proposed improvement works, all assessed critical junctions will operate within their design capacity.

7.6.9 Existing local roads within the HSK NDA would be maintained and provides accesses to local villages and activity nodes except re-planning of Tin Ying Road between Tin Wah Road and Ping Ha Road, downgrading of Hung Tin Road between Ping Ha Road and Castle Peak Road, and widening of Ping Ha Road.

Public Transport Provision

West Rail Line

7.6.10 The Revised RODP has envisaged the usage of rail as the backbone of public transport service. With reference to “The Railway Development Strategy 2014”, the indicative implementation window of the proposed HSK Station for planning purpose will be 2021 to 2024. Nevertheless, the timing of the station opening should be reviewed subject to the development phasing of the HSK NDA.

- 7.6.11 To alleviate the existing crowdedness of the WR Line, the number of train compartments of the WR Line has been gradually increased from 7-car to 8-car starting from January 2016. When comparing with the situation in 2015, the passenger carrying capacity will be increased by about 14% after all WR trains are operated with 8-car. With consideration of the facilities along the “East-West Corridor” (comprises Ma On Shan Line, Sha Tin to Central Link (Tai Wai to Hung Hom Section) and WR Line) such as the fire safety requirements at tunnel sections and the length of platforms, etc., it is estimated that the “East-West Corridor” can ultimately reach an hourly frequency of 28 at each direction, with 8-car trains. On this basis, the carrying capacity of the WR Line will increase by 60% over the 7-car trains operating in 2015 at an hourly frequency of about 20.
- 7.6.12 Upon completion of the three new railway projects, i.e. Northern Link and Kwu Tung Station, Tuen Mun South Extension and HSK Station, according to the indicative implementation windows, the WR Line will be able to meet the demands during the peak hours (around 8 am to 9 am) at the busiest section of the WR Line (i.e. from Kam Sheung Road Station to Tsuen Wan West Station) with the trains slightly congested. As pointed out in the “Railway Development Strategy 2014”, when allowed by resources and other related factors, a service benchmark of four persons per square metre in train compartments will be adopted in the planning of the new railway lines. As for the existing railway lines (including the WR Line) or their extension, the service level will still be subject to the infrastructural constraints of the existing railway lines (i.e. six person per square metre), such as the signalling system and the shortest platform of a railway line.
- 7.6.13 In the long term, the Government will timely commence studies on improving the carrying capacity of the railways in the NWNT beyond 2031, to cope with the traffic demand.

Public Transport Interchange

- 7.6.14 In the Revised RODP, three new PTIs are proposed. Two of the PTIs are located near the proposed HSK Station and another new PTI is located at the northern side of HSK NDA near the junction of Tin Wah Road and Road D1. The sizing of these PTIs will be adequate to provide the interchange for different types of transportation modes. The PTI will also provide cycling parking facilities for interchange.

Other Environmentally Friendly Transport Facilities

Pedestrian Network

- 7.6.15 Pedestrian walkways will be provided along district distributor roads and local roads to ensure the connectivity between developments. Pedestrian walkways will also be provided along the GTC so that there will be a continuous pedestrian walkway within the NDA.
- 7.6.16 Grade-separated pedestrian facilities, such as subways or footbridges, are provided across roundabouts. Signal controlled crossing will also be provided at the signalised junctions and/or mid-block location if necessary.

Cycle Track Network

- 7.6.17 A comprehensive cycle track network will be provided within the HSK NDA. Cycle track will be provided along one side of the district distributors and some of the local roads. The cycle track network will be integrated with the existing cycle tracks at Ping Ha Road, Hung Tin Road, Hung Chi Road, Hung Shui Kiu Tin Sam Road, Hung Shui Kiu Main Street and Tin Ha Road. The proposed cycle track network will provide connectivity between major developments and public transport hub. In addition, an artery cycleway will be provided connecting between Tin Wah Road at north and the proposed HSK Station and Castle Peak Road at south serving as a major north-south cycle track network in the HSK NDA.

- 7.6.18 Cycle parking areas will be provided in the proposed HSK Station, PTIs and major residential developments. The provision of cycle parking spaces should meet the HKPSG guidelines. In addition, it is proposed to provide public cycle parking spaces along the artery cycleway.

Environmentally Friendly Transport Services

- 7.6.19 A highly efficient rail-based or road-based public transport system – EFTS can provide large carrying capacity and reliable service to cope with high passenger demand.
- 7.6.20 Grade-separated arrangement will be adopted to avoid conflicts with the vehicular road at the intersections. A feasibility study “Environmentally Friendly Transport Services in Hung Shui Kiu New Development Area and Adjacent Areas – Feasibility Study” is being carried out to identify the most suitable green transport mode(s) and further review the design and operation mode of the EFTS.

7.7 Drainage Impact Assessment

- 7.7.1 Assessment on the drainage impact arising from the development of the HSK NDA has been conducted based on the Revised RODP taking into account the change in land-use, climate change effect and proposed river revitalisation works.
- 7.7.2 Additional stormwater surface runoff will be generated from the increase in impermeable surfaces due to the change of land use. Taking into account of the climate change as stipulated in United Nations Intergovernmental Panel on Climate Change Fifth Assessment Report, there will be increase in rainfall intensity and rise in sea level which will affect the hydraulic performance of the drainage system. For river revitalisation, there will be some rises in river channel water levels due to increase in channel roughness. A separate study will be conducted and any further mitigation measures will be proposed to minimise the drainage impact due to the river revitalisation.
- 7.7.3 To mitigate the drainage impacts, necessary drainage improvement works are required. The concept of blue-green infrastructure, revitalisation of water bodies, water-friendly culture and sustainable drainage system will be adopted in the drainage design. In the Revised RODP, a number of locations at the planned local / district / regional open space have been identified to allocate stormwater retention facilities in controlling surface runoffs discharging to existing river channels. To accommodate the latest development on climate change and to allow the flexibility of other open spaces for other uses, three sites including the Regional Park, the district open space located to the north side of Hong Mei Tsuen, and the local open space near Fung Kong Tsuen in Lau Fau Shan have been identified for stormwater retention.

7.8 Sewerage Impact Assessment

- 7.8.1 Based on the population and employment data of the Revised RODP for the HSK NDA, the net additional sewage flow generated from design population and employment of the HSK NDA will be about 85,400 m³ per day.
- 7.8.2 As the planned San Wai Sewage Treatment Works (STW) – Phase 1 was not designed to cater for the additional flow generated from the Project, a new HSK STW with total treatment capacity of about 85,500 m³ is proposed. The sewage will be treated by tertiary treatment and secondary plus treatment (with UV disinfection and 75% nitrogen removal).

7.8.3 Reclaimed water will be provided from the proposed HSK STW with tertiary treatment plus hypo-chlorination facilities to ensure a higher water quality standard. Reuse of reclaimed water is recommended for non-potable uses such as toilet flushing. The rest of sewage effluent will be treated and discharged to Urmston Road submarine outfall.

7.8.4 Four new sewage pumping stations (SPSs) are proposed to convey the sewage to the new HSK STW.

7.9 Water Supply and Utilities Impact Assessments

Water Supply

7.9.1 It is estimated that the daily fresh water demand for the HSK NDA is about 107,600 m³/day whereas daily flushing and other water demand (including water for irrigation) is approximate about 39,400 m³/day.

7.9.2 To cope with the ultimate fresh water demand of HSK NDA, the new Tan Kwai Tsuen Fresh Water Service Reservoir with a capacity around 86,000 m³ is proposed for fresh water supply. The proposed Tan Kwai Tsuen Fresh Water Service Reservoir will be supplied from Au Tau Water Treatment Works.

7.9.3 Currently, there is no comprehensive salt water supply in HSK NDA for flushing purpose. It is proposed to treat part of the sewage to a higher level and use reclaimed water as flushing water for the HSK NDA so as to avoid technical difficulty for salt water supply and reduce the water quality impact to North Western Water Control Zone (WCZ). The reclaimed water from the proposed HSK STW will be supplied to the proposed reclaimed water reservoirs at Tan Kwai Tsuen and Fung Kong Tsuen to serve the flushing water demand.

Other Utilities

7.9.4 Four new electrical substations will be built. The new electrical substations and associated network will be progressively established for power supply according to the development programme.

7.9.5 The planning proposal for the HSK NDA has no conflict with the 400kV overhead cables. There is currently no plan for diversion of the overhead cable.

7.9.6 Medium pressure gas mains will be extended to serve the HSK NDA. Gas governor kiosks are required for reducing the gas pressure to serve the development sites.

7.9.7 Telecommunication cables serving the NDA will be laid along the pedestrian walkways of the proposed roads and distributed to the development sites. Cables will be extended from the nearby existing network.

7.10 Air Ventilation Assessment

7.10.1 The purpose of the Air Ventilation Assessment is to evaluate the air ventilation performance of the HSK NDA.

7.10.2 An experimental Site Wind Availability Study was conducted to obtain the characteristics of the natural wind availability. The annual and summer prevailing wind characteristics corresponding to non-typhoon winds are found to be similar to the overall characteristics of non-typhoon winds approaching the Hong Kong region. It is found that:

- Annual prevailing winds are coming from north, east-northeast and east; and

- Summer prevailing winds are coming from east, south, and southwest.
- 7.10.3 A detailed study of the air ventilation performance using Wind Tunnel Modelling was conducted. The wind tunnel models were installed with a total number of 869 test points to measure velocity ratios and median hourly mean wind speeds at pedestrian level. Due to the large extent of the project site, 21 focus areas at the HSK NDA and 6 selected regions adjacent to the HSK NDA were defined for the ease of assessment.
- 7.10.4 Based on the wind tunnel tests, it is found that the Site Spatial Average Velocity Ratio and Spatial Average Velocity Ratio determined for the focus areas at the southern part of the HSK NDA are generally better than those of the northern part under both annual and summer conditions. This is because the site environment around the southern part of the HSK NDA is relatively open in nature. Also, the pedestrian wind environment at the northern part would be affected by the existing residential developments in Tin Shui Wai.
- 7.10.5 There are two fung shui corridors in the HSK NDA, which could function as air paths. While the fung shui corridor in the south is more effective in air ventilation, sites near the fung shui corridor in the north have been rearranged to enhance its function as air path as much as possible by complementing with education sites of lower density and expanding local open spaces. Several potential air paths have also been identified in the HSK NDA and have been aligned with the proposed road network in the Revised RODP.
- 7.10.6 Higher average median hourly mean wind speeds are observed in the southern part of the HSK NDA. For the northern part of the NDA, relatively high average annual and summer median hourly mean wind speeds are also measured at some areas, attributing to the relatively open exposure of these zones to the north winds.
- 7.10.7 Relevant mitigation measures for areas with relative low average annual and summer median wind speeds are proposed. In addition to the incorporation of a number of major air paths as discussed above, the Revised RODP has included an interconnected regional, district and local open space network and planned roads throughout the HSK NDA, which would facilitate wind flow. These unobstructed air paths allow the prevailing winds to penetrate into the built environment of the NDA as well as the existing developments in the surroundings.
- 7.10.8 To further enhance penetration of prevailing winds to individual development sites, development parcels together with a matrix of pedestrian streets are recommended to align in the north-to-south and northeast-to-southwest directions. Future developments should meet the requirements in the Sustainable Building Design Guidelines. Different design principles should also be considered for individual sites to improve wind penetration at pedestrian level, including terraced podium design, stepped building height profile, integration with the proposed regional, district and local open spaces, green belts and amenity areas which form the green spines throughout the HSK NDA, other greening measures, etc.
- 7.11 Socio-Economic Impact Assessment**
- 7.11.1 A socio-economic impact assessment has been undertaken to identify the potential social-economic impacts and mitigation measures required.

Potential Socio-Economic Impacts

- 7.11.2 The planning of the HSK NDA has minimised impacts on the existing residents as far as possible. However, it is unavoidable that some existing developments will be affected. Yick Yuen Tsuen, Tin Sam San Tsuen and San Sang San Tsuen are located within 500m of the proposed HSK Station which would be the future “Regional Economic and Civic Hub” for high density development. Shek Po Road Mei Tsuen and Sha Chau Lei (II) are also the central areas of the NDA and would be developed into the future Regional Park and sports facilities for serving the entire NWNT. As the affected structures are rather dispersed and varied in qualities, it is difficult to preserve them in any consistent manner without adversely affecting the coherence of the plan for the HSK NDA. It is estimated that about 1,600 households would be affected. An existing elderly home located within the central location of the NDA and in a site planned for PRH development, will also be unavoidably affected.
- 7.11.3 The planning of the NDA has also minimised impact on the farmland under active cultivation as far as possible. However, some 7 ha of active agricultural land will inevitably be affected by the NDA development due to their locations. These agricultural land are mainly situated near the existing Yick Yuen Tsuen and San Sang San Tsuen area, in proximity to the proposed HSK Station, which will be the future town centre of the HSK NDA.
- 7.11.4 With a view to enhancing land use efficiency and environmental quality, the HSK NDA will convert the vast extent of brownfield sites to more optimum uses to meet housing and other economic needs. It is estimated that some 190 ha brownfield operations would be affected by the Project. Subject to detailed studies, some of the affected brownfield operations, may be consolidated and accommodated in proposed multi-storey buildings. Other affected businesses may have to move elsewhere should they wish to continue their businesses.
- 7.11.5 In terms of cultural heritage, 12 nil grade structures will be affected. Two of the Sites of Archaeological Interest in Tseung Kong Wai and Tung Tau Tsuen might also be partially impacted by construction works, but no insurmountable impact is anticipated. About 55 graves, “Urns (Kam Taps)” and shrines will also be affected.

Benefits from the HSK NDA

- 7.11.6 While the Project will create disturbances to the existing residents and business operators, the future development of the HSK NDA could offer a catalytic role for the development of the NWNT. Certain benefits can also be brought to the existing community in the NDA as well as residents in the neighbouring areas of Tin Shui Wai, Tuen Mun and Yuen Long New Towns and Hong Kong as a whole.
- 7.11.7 The HSK NDA will fulfil future housing demand by providing about 61,000 new housing flats. Taking into account the relatively high proportion of public housing at Tin Shui Wai New Town, only about half of the new homes at the NDA will be public housing to achieve a better overall balance in housing mix. The proposed commercial developments around the proposed HSK Station and the existing WR Tin Shui Wai Station will also provide a critical mass for decent retail facilities and generate job opportunities of about 150,000 of a wide spectrum of sectors, which is currently lacking in the area.
- 7.11.8 Moreover, with the overall improved infrastructure provision for the whole HSK NDA, opportunities will be taken to improve the environment of the existing villages such as providing buffer zones between the new developments and the existing villages via the amenity areas in order to minimise possible interface issues. In addition, the provision of infrastructure including better transport linkages, GIC facilities and open space could also further improve the living environment of the retained villages.

Mitigation of Impacts

- 7.11.9 The potential impacts to the affected residents, business operators and farmers induced by the Project should be properly addressed before implementation. Considering the scale of the development, these impacts can be effectively mitigated should the development be implemented gradually and in phases, and allow reprovisions of facilities as much as possible. Some mitigation measures are proposed for Government's consideration.
- 7.11.10 According to prevailing policy, when land is required to be resumed by the Government, compensation will be made to private land owners in accordance with the relevant ordinances. In addition, the affected indigenous villagers who owned building lots may be provided with village resite when their building lots are resumed due to public works according to the New Territories Village Removal Policy. The Government will also provide various cash allowances and rehousing arrangements in the form of PRH or interim housing to eligible clearerees affected by public works. As for the Project, the Government has announced that consideration will be given to provide special compensation and rehousing arrangements for affected clearerees, making reference to the compensation and rehousing package for the Kwu Tung North (KTN) and Fanling North (FLN) NDAs. Clearerees who are not eligible for PRH, but meeting certain criteria, will be offered special ex-gratia allowance.
- 7.11.11 For the purpose of maintaining the social fabric of the existing communities, rehousing should preferably be made within the same district as far as possible. To this end, under the Revised RODP, a site near Hung Fuk Estate has been reserved for rehousing of eligible clearerees. Village resites are also designated to accommodate affected villagers eligible for compensation under the Village Removal Policy. Given the significance of the NDA and to help minimising the hardship of affected residents arising from land resumption and clearances, it is worthwhile to explore enhancing the compensation arrangement and other local rehousing options to meet the rehousing needs of the clearerees.
- 7.11.12 A Community Liaison Team has been set up since 2015 to enhance the communication with the potentially affected households and to enhance their understanding about the development proposals for the HSK NDA. The team also collects the views and concerns of the potentially affected households and provides basic assistance to them and refers the cases to appropriate parties to follow up.
- 7.11.13 Under the prevailing practice, eligible business operators will be offered ex-gratia allowances, but there will not be relocation arrangement provided by the Government. Land owners will also be compensated according to the prevailing resumption policy. To allow the continuation of brownfield operations in the region as far as possible, under the Revised RODP, about 24 ha of land has been reserved for proposed multi-storey buildings to accommodate some of the affected brownfield operations. CEDD has also commissioned feasibility studies on multi-storey buildings for accommodating the affected brownfield operations. For industrial uses, an "Industrial" ("I") zone is planned at the western fringe of the HSK NDA near the KSWH to provide land for industrial operations. The affected industrial operators may also find relocation premises/sites in other industrial areas in the region such as Yuen Long Industrial Estate and Tung Tau Industrial Area. Depending on the business nature, some affected industrial operators might need to identify other suitable sites outside the NWNT for relocation.

7.11.14 According to prevailing policy, owners of agricultural land in the New Territories will be compensated for the land when their land is resumed. The Government will also provide technical support to assist the affected farmers to re-establish their farming activities. Affected genuine farmers whose domestic structures are affected by land clearance can apply to the Lands Department for agricultural resite upon relocation. They can also apply various ex-gratia allowances such as crop compensation and disturbance allowances according to the established mechanisms. To further assist affected farmers in finding suitable land for agricultural resite / rehabilitation, the Government will also pursue the special agricultural land rehabilitation scheme by providing proactive and priority assistance in matching of farmers and agricultural land owners.

7.11.15 12 nil grade structures, which are assessed to contain no cultural significance, will be unavoidably affected. Preservation by record (including cartographic and photographic record) prior to any construction works would be required for the directly impacted structures. A heritage trail to link up some of the heritage resources to facilitate public appreciation is proposed.

7.12 Green Initiatives Study

7.12.1 The green initiatives will enable better utilisation of the available land for development and to minimise creating constraints to the development of the NDA in the coming decades. Most important, the green initiatives will help establishing an environmentally friendly living and working environment for the citizens.

Green Mobility

7.12.2 In order to provide mobility for the population within the HSK NDA, EFTS is considered necessary to minimise emissions from transportation means. The proposed EFTS will form the internal transportation backbone for the HSK NDA, which connects with the WR stations.

7.12.3 In addition to mass transportation provided by EFTS, electric vehicles (EVs) are recommended to be running within the HSK NDA. Charging facilities are recommended to be installed within public and private developments as well as along roadsides. The use of EVs will reduce the roadside emissions within the HSK NDA.

7.12.4 Pedestrian walkways and cycling tracks will be provided along both sides of proposed roads and within GTC reserve to encourage people using cycling and walking for short distance travels to promote a walkable and cycle-friendly NDA. The pedestrian walkways and cycling tracks will also link up with open spaces within the NDA and join with the proposed heritage trail to facilitate better enjoyment of the environment in the open space and to promote cultural heritage in the region. Bicycle-sharing system may also be considered for the shared use of bicycles on a short-term basis. This will be explored in a further study.

Sustainable Drainage System

7.12.5 The future lake in the proposed Regional Park is designed as a flood retention lake to attenuate peak surface runoff during extreme rainfall event while serving other recreational and ecological functions. Blue-green infrastructure such as river revitalisation of Tin Shui Wai Main Channel, HSK Main Channel, Tin Sam Channel is also proposed.

7.12.6 Rainwater harvesting will be explored to collect rainwater for non-potable uses like irrigation. Also roadside bioretention swale will be explored to attenuate the surface runoff to the downstream.

Total Water Management

- 7.12.7 The domestic sewage generated from the HSK NDA will be collected, conveyed to STW for treatment before disposal. As there is no comprehensive salt water supply in HSK NDA for flushing, reclaimed water is proposed as flushing water for the HSK NDA.
- 7.12.8 Smart water system is proposed in the HSK NDA for detection of water leakage of underground pipes by using remote control flowmeters to better monitor the fresh water supply.

District Cooling System

- 7.12.9 District cooling system (DCS) has been developed allowing the system to be used by a number of stakeholders instead of individual or isolated buildings. Two sites for DCS plant have been reserved near the proposed HSK Station and the existing WR Tin Shui Wai Station.
- 7.12.10 The HSK NDA is far from seafront and it is not practical or not cost-effective to lay long distance pipes for drawing sea water and discharging after used. Therefore, the ordinary fresh water supply will be used for cooling agent for the DCS. Further detailed feasibility study for DCS is recommended in the HSK NDA to be conducted by relevant departments.

Waste Management

- 7.12.11 Proper waste management facilities and measures are required to reduce increasing loading to the existing facilities. Apart from waste reduction strategy implemented by the Government to encourage reduction, recycling and reuse, sorting facilities and waste reduction plant will be recommended installing in residential estates, commercial buildings and within refuse collection points to reduce the volume of waste to be disposed of.
- 7.12.12 The Study also recommended the waste management facilities including automatic refuse collection system and the organic waste management facilities to be further explored in separate studies.
- 7.12.13 A community green station is proposed to be co-located with the new refuse transfer station (RTS) for environmental education purposes, convenient collection of recyclables from the local community, and to provide synergy to achieve better operational efficiency and environmental sustainability.

Green Buildings

- 7.12.14 The principles of green building design are to design for deconstruction, minimising building energy consumption, use of renewable energy and utilising sustainable resources. Currently there are regulations and guidelines under buildings and energy regulations that need to comply with. There are proven examples of meeting these requirements. In addition, most proponents are aiming at achieving high grade under Hong Kong Building Environmental Assessment Method (BEAM) and Leadership in Energy and Environmental Design Green Building Rating System. The applications of green buildings to be used in design of buildings in HSK NDA will depend on the proponents of the developments.

Renewable Energy and Energy Efficient Devices

- 7.12.15 Apart from complying with the Building Energy Code, renewable energy will be used as far as possible. The technology in the application of solar energy is well advanced. Solar photovoltaic panels can widely be installed on the roof of Government buildings as well as in public housing blocks. The energy generated may be used for public lighting. In addition, solar energy can be used to drive the operation of pumps for irrigation and fountains in open spaces and the Regional Park.

7.13 Carbon Appraisal

- 7.13.1 In the HSK NDA, the carbon appraisal will further enhance the “Hong Kong’s Climate Change Strategy and Action Agenda”, which was proposed by Legislative Council – Panel on Environmental Affairs, 2011 to reduce carbon intensity by 50-60% by 2020 when compared with 2005, so that the proposed strategy will be readily implementable to the context of NDA.
- 7.13.2 A series of carbon reduction strategies to reduce the greenhouse gas emissions in the HSK NDA are proposed including:
- Green residential, retail, education, social welfare and government buildings;
 - Development to comply with the building environmental certification scheme, such as BEAM certification scheme;
 - Green office, hotel, industrial and other development;
 - Energy efficient industrial development;
 - Low-emission transport and bicycle track for residents and workers;
 - Compact urban planning;
 - Waste recycling;
 - Total water management;
 - Carbon removal by tree planting;
 - Provision of renewable energy in building development by requiring development to comply with the building environmental certification scheme; and
 - DCS.
- 7.13.3 With the reduction packages of good, better and best scenarios of carbon mitigation strategy, the HSK NDA has been evaluated to meet the proposed carbon reduction target of “Hong Kong’s Climate Change Strategy and Action Agenda”.

7.14 Sustainability Assessment

- 7.14.1 A sustainability assessment for the Study was undertaken using the Computer Aided Sustainability Evaluation Tool adopted by the Sustainable Development Unit of Environmental Bureau.
- 7.14.2 In social and economic terms, the assessment indicates that the Project will bring about benefits to the community by providing land to solve the housing shortage problem and improving environment and infrastructure for better quality of life. It will also increase investment in infrastructure, housing developments and other developments such as commercial uses, brownfield operations, logistics centre, data centre, information & technology centre, etc., creating new job opportunities and enhancing the economic competitiveness of Hong Kong in the long term. The proposed NDA will also promote social cohesion, self-reliance and equal opportunities through improvements in the quality of living, creation of job opportunities and provision of housing supply. Provision of open spaces and recreational facilities in the NDA will also improve the health condition of the residents.

- 7.14.3 On cultural and environmental aspects, due consideration has been given to minimise impact to the natural resources. Impacts to habitats and species have generally been avoided in the Revised RODP through its layout and retention of habitats in “Green Belt” (“GB”) zones. Various measures will be implemented to mitigate the impacts arising from the NDA. Provision of considerable amount of landscape area and preservation of landscape features has made the NDA development desirable. Proper land use planning has also been adopted in the Revised RODP to minimise potential environmental impacts.
- 7.14.4 In short, the Project exhibits a range of benefits, particularly in the aspects of social, economy, leisure and cultural vibrancy and mobility. It nevertheless will bring about some potential impacts in natural resources and environmental quality aspects. However, due to the relatively insignificant implications, it is expected that it will contribute to positive effects with the implementation of the HSK NDA and no insurmountable issues due to the Project are foreseen in terms of sustainability.

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8 ENVIRONMENTAL IMPACT ASSESSMENT

8.1 Overview

8.1.1 The Study is a designated project under Item 1 Schedule 3 of Environmental Impact Assessment Ordinance (EIAO) - Engineering feasibility study of urban development projects with a study area covering more than 20 ha or involving a total population of more than 100,000.

8.1.2 A comprehensive EIA was carried out for the proposed developments and infrastructure of the HSK NDA to assess the potential environmental impacts during both construction and operation phases. The EIA report was approved with conditions by the Director of Environmental Protection on 15 December 2016. Overall, the EIA report revealed that the proposed developments and infrastructure of the HSK NDA would be environmentally acceptable with the implementation of the proposed mitigation measures for construction and operation phases. An environmental monitoring and audit (EM&A) Manual has been formulated to ensure the effectiveness of the recommended mitigation measures. Environmental permits for major roadworks and SPSs were issued in February 2017.

8.2 Air Quality

8.2.1 The potential air quality impact from the construction works of the Project would mainly relate to construction dust from excavation, material handling, spoil removal and wind erosion. With mitigation measures stipulated in the Air Pollution Control (Construction Dust) Regulation and the EM&A Manual, no unacceptable air quality impacts during construction phase is anticipated.

8.2.2 For the operation phase, cumulative air quality impact arising from the vehicular emissions from the open roads, portal emission and emission from ventilation building from Tuen Mun Western Bypass and chimney emissions within the assessment area has been assessed at the worst case years. The assessment results conclude that the emission would comply with the Air Quality Objectives with the implementation of proposed mitigation measures.

8.2.3 Exceedance of odour criterion would be expected at a small portion of one planned "Other Specified Uses (Port Back-up, Storage & Workshop Uses)" ("OU(PBU+SWU)") site near the existing chicken farm. It is proposed that these areas to be designed as non-air sensitive uses or with the fresh air intake located at higher level.

8.2.4 The potential cumulative odour impact from four proposed new SPSs, upgraded San Wai STW, new HSK STW and planned RTS have also been assessed. No unacceptable odour impact is predicted from these facilities.

8.3 Noise Impacts

8.3.1 Construction noise associated with the use of powered mechanical equipment (PME) for different stages of construction has been conducted. With the implementation of practical mitigation measures, including good site management practices, use of movable noise barrier, use of "quiet" plant and proper workfront management, proper grouping of PMEs for some construction activities at critical work areas and provision of minimum separations between the affected schools and the critical works areas during the examination period, no unacceptable impact arising from the construction of the Project will be anticipated.

8.3.2 Operational road traffic noise impact on existing and planned noise sensitive uses within and in the vicinity of the Project have been assessed for the worst case year. Results indicate that the noise impacts from the Project roads can be mitigated by a combination of noise mitigation measures including:

- (i) Application of low noise road surface materials on some roads;
- (ii) Vertical noise barriers/cantilever noise barriers along some Project road sections;
- (iii) Building set-back, orientation and special building design such as provision of blank façade / acoustic windows at some buildings; and
- (iv) Provision of boundary wall, air conditioning and noise insulated windows for affected planned educational institutes.

8.3.3 These mitigation measures would also ensure that the noise levels at the planned Noise Sensitive Receivers (NSRs) under the Project are within the respective noise criteria.

8.3.4 The noise impacts from WR line and LRT on NSRs would be mitigated with the provision of architectural fins, non-sensitive use or fixed glazing and building layout setback. Moreover, the operations of EFTS, existing fixed plant noise sources and helicopter noise generated by existing helipad near Ha Tsuen Interchange of KSWH would not pose unacceptable noise impact on the nearby NSRs.

8.4 Water Quality

8.4.1 During the construction phase, potential water pollution will include general construction activities, construction site run-off, accidental spillage, and sewage effluent from construction workforce. Mitigation measures, including good site practices in accordance with ProPECCPN 1/94 "Construction Site Drainage" and the ETWB TC (Works) No. 5/2005 "Protection of natural stream/rivers from adverse impacts arising from construction works" are recommended to minimise the potential water quality impacts from the construction activities.

8.4.2 An Emergency Response Plan is recommended to minimise the potential water quality impact from construction site discharges under failure of treatment facilities during emergency situations or inclement weather.

8.4.3 During the operation phase, sewage generated from the Project will be discharged to the public sewerage system and diverted to the proposed HSK STW for proper treatment. Part of the sewage will be treated in the HSK STW and will be reused as reclaimed water for flushing in the HSK NDA. The remaining treated sewage will be pumped to the NWNT effluent tunnel for discharging to the Urmston Road submarine outfall. Mitigation measures, including contingency plan with precautionary measures, adequate stormwater drainage system with suitable pollutant removal devices, blue-green infrastructure and best stormwater management practices are recommended to mitigate any potential water quality impacts.

8.5 Sewerage and Sewage Treatment

8.5.1 The new HSK STW is proposed with a tertiary treatment process, for reuse of reclaimed water and secondary plus treatment (with UV disinfection and 75% nitrogen removal) for disposal of effluent. In addition, new public sewers are proposed in the development area to replace and collect sewage in some of the existing unsewered areas. This is likely to result in an improvement to the water quality of watercourses within the HSK NDA area.

8.5.2 Based upon sewerage impact assessment, it can be concluded that the Project is sustainable from sewerage collection, treatment and disposal perspective.

8.6 Waste Management

8.6.1 During the construction phase, typical wastes include C&D materials, chemical waste, general refuse, excavated sediment and contaminated soil. Implementation of mitigation measures including reusing of C&D materials before off-site disposal and ensuring the waste is handled, transported and disposed of using approved methods would minimise the impact.

8.6.2 During the operation phase, typical wastes including municipal solid waste, chemical waste and sewage sludge will be generated. Three new refuse collection points and a new RTS will be used to handle the increased quantity of waste in the district. Furthermore, a Community Green Station is proposed to provide environmental education, convenient collection of recyclables from the local community, and to provide synergy to achieve better operational efficiency and environmental sustainability. Provided that the waste is handled, transported and disposed of using approved methods, adverse environmental impacts would not be expected.

8.7 Land Contamination

8.7.1 Since most of the potentially contaminated sites within the NDA were inaccessible or permission could not be obtained from the site operators to carry out in-depth assessment at the time of the Study, potentially contaminated sites have been identified within the HSK NDA based on desktop reviews (e.g. review of historical aerial photos and relevant information from Environmental Protection Department (EPD) and Fire Services Department), helicopter reconnaissance and site surveys.

8.7.2 Based on the findings from the assessment, a majority of the potentially contaminated sites are currently used as open area storage, container storage and warehouse sites. The contamination (if any) is therefore expected to be localised if the main types of goods stored on-site are not potential sources of contamination. In addition, the land uses of the remaining identified potentially contaminated sites are not large scale polluting installations / facilities, which further support that the contamination (if any) would be localised rather than widespread. Further works including site re-appraisal, Site Investigation works as well as submissions for EPD's approval are recommended to be carried out after the sites are handed over for development.

8.8 Ecological Impacts

8.8.1 The Revised RODP has generally avoided impacts to habitats and species through its layout and the retention of higher ecological value habitats (e.g. the egret, woodland). With the implementation of the recommended mitigation measures (e.g. measures to avoid/minimise impacts to San Sang San Tsuen egret, measures to reduce disturbance from construction activities, etc.), no unacceptable residual impacts including both direct and indirect residual impacts during construction and operation phases would be expected.

8.9 Fisheries Impacts

- 8.9.1 Existing fisheries resources within the assessment area include active fishponds (outside of the HSK NDA area) and capture fisheries resources of North Western and Deep Bay WCZs. The value of capture fisheries in the North Western WCZ is low to moderate while low in the Deep Bay WCZ. An important nursery and spawning ground for commercial fisheries species has been identified within the North Western WCZ. No oyster culturing and intertidal fishing were recorded within the coastal area from Ngau Hom Sha to Lau Fau Shan.
- 8.9.2 Potential fisheries impacts arising from the Project have been assessed. No active fishponds are located within the HSK NDA area. Three inactive fishponds would be affected due to the Project therefore the impact to pond fish culture is considered negligible to low when taking into account the potential conversion of inactive fishponds back to active fishpond.
- 8.9.3 No unacceptable water quality impacts to the Deep Bay and North Western WCZs are anticipated from the Project with proper implementation of mitigation measures. Therefore, monitoring of fisheries resources during the construction and operation phase would not be necessary.

8.10 Landscape and Visual Impacts

- 8.10.1 At the outset of drawing up the Revised RODP, a comprehensive planning and urban design framework has been formulated to minimise landscape and visual changes as far as possible. The Project has been carefully planned to achieve a distinct landscape and visual characteristic of a NDA. A stepped building height and development intensity profile is adopted with the tallest and densest developments concentrated at the commercial nodes near the railway stations, and descending towards area which is more rural and low-rise in scale. Care has also been taken to establish a network of linked open spaces, accommodating a number of parks, green amenity strips, shopping streets and landscape/visual corridors, to create 'green' communities and partly compensate for any loss of landscape/visual resources due to the Project.
- 8.10.2 Within the assessment area, 18 Landscape Resources (LRs) and six Landscape Character Areas (LCAs) are identified. Due to the nature of the Project, some LR and LCAs are inevitably affected. Based on the impact assessment findings, a number of mitigation measures have been proposed. These include tree protection and preservation, tree transplantation, compensatory planting, road greening, as well as integration of the abovementioned open space framework to mitigate the loss of major LR and reinstate streetscape areas to equal or better quality than currently existing. With the mitigation measures in place, the residual landscape impacts during the operation phase will consist largely of loss of vegetation and fragmentation of some LR only, of which will be replaced by new and / or compensatory planting.
- 8.10.3 In terms of potential visual impacts, a number of mitigation measures have been proposed. These include adopting alternative designs or revisions to the basic engineering and architectural designs to prevent and/or minimise adverse impacts; remedial measures such as appropriate colour and textural treatment of building features; and compensatory measures such as the implementation of landscape design elements (e.g. tree planting, creation of new open space, etc.) to compensate for unavoidable adverse impacts and to attempt to generate potentially beneficial long-term impacts. The overall change that is to occur as a result of the Project will ultimately bring about positive enhancement. In fact, the transformation of the area from what is presently an area predominantly occupied by haphazard and dilapidated brownfield sites into a contemporary planned community with varying DCAs and applicable landscape treatments will result in strong visual interest and character and improved visual outlook.

8.10.4 The urban design framework is an intrinsic part of the Project that must be viewed in connection with proposed mitigation measures. While not all impacts can be fully reduced or eliminated through the implementation of mitigation measures due to the nature of the Project, the urban design framework goes further by specifically outlining and dedicating areas for open space, riverside promenade development, fung shui lanes and view corridors, and green belt areas that will result in the creation of new, positive LRs with positive visual outlooks for visual sensitive receivers. The urban design framework also provides guidelines on building heights, massing and scale in order to address the visual change that will result from new buildings and provide contextual, sensitive treatment to the surrounding developments. The measures sought in the urban design framework work in unison with mitigation measures to ensure that a quality, green, and attractive NDA replaces the existing mix of brownfield operations that presently exist with the goal of realising a positive impact as a result of the development of the NDA.

8.10.5 Overall, assuming full implementation of mitigation measures in combination with the key urban design and planning proposals outlined above, the residual landscape and visual impacts are perceived to be acceptable with mitigation measures as outlined in Annex 10 of the EIAO-Technical Memorandum, provided that appropriate mitigation measures are implemented during the construction and operation phases of the Project.

8.11 Cultural Heritage

8.11.1 A total of six Sites of Archaeological Interest (of which five of them are within the HSK NDA boundary) and four Archaeological Potential Areas with uncertain archaeological potentials were identified within the assessment area. The archaeological impact arising from the construction works should be assessed when the detailed design of the works is available. The following mitigation measures should be considered, such as archaeological surveys, archaeological watching brief, preservation by record and relocation of archaeological remains.

8.11.2 A total of two Declared Monuments, seven Graded Historic Buildings (including two Grade 2 Historic Buildings and five Grade 3 Historic buildings), and 339 nil grade built heritage were identified within the assessment area. The Project would not affect any Declared Monuments or Graded Historic Buildings, only 12 nil grade built heritage assessed to contain no cultural significance may be impacted. The remaining 327 nil grade built heritage would be preserved.

8.11.3 A cultural heritage trail to link up some of the heritage resources to facilitate public appreciation is proposed. As no development is proposed in the "Village Type Development" ("V") zones, no impact is anticipated to the cultural heritage resources within the "V" zone and hence no mitigation measure is required.

8.12 Summary of Environmental Outcomes

8.12.1 The Project will be the next generation new town for Hong Kong. In addition, to providing housing and other land supply in Hong Kong, the Project will also serve as a "Regional Economic and Civic Hub" for the NWNT, given its strategic location in the NWNT and connection to Tin Shui Wai, Tuen Mun and Yuen Long New Towns. The Project aspires to turn the existing vast extent of brownfield operations which have created considerable environmental, traffic, visual, and other problems, to more optimal uses and better land utilisation for future development of Hong Kong.

8.12.2 Avoidance of environmental impacts has been one of the key considerations throughout the entire EIA Study. The key environmental problems that have been avoided and any sensitive areas protected in the Revised RODP are summarised below.

Protection of Sites of Conservation Importance

- The majority of Sites of Conservation Importance (i.e. “Costal Protection Area” zone and most of the “Conservation Area” (“CA”) zone) have been avoided. Where there is a slight encroachment into the “CA” zone, the preferred option has avoided impacts to semi-natural/natural habitats and graves.

Protection of San Sang San Tsuen Egretty

- The Egretty is retained and protected in “GB” zone, which is an improvement upon its current condition in a highly disturbed storage area. The egretty is also protected from disturbance through the provision of “Local Open Space” (“LO”) zone, which provides a buffer to the south of the “GB” zone. The “LO” zone also provides an eco-corridor, covering the ardeid flight paths, and connecting the “GB” zone with the egretty to the “GB” zone and foraging habitats to the east.

Preservation of Habitats with Ecological Value and Species of Conservation Importance

- Most of the sites of conservation importance as well as habitats with high ecological value have been excluded from the HSK NDA area during the optioneering stages. In addition, the majority woodland, shrubland and plantation located in green belt areas is retained during the development to avoid the loss of natural habitats. This also includes avoidance of direct impacts to species of conservation importance.

Protection of Natural Watercourses in the Project Area

- A natural watercourse is located in the “I” zone in the west of the HSK NDA area. To avoid direct loss of this watercourse, the watercourse and the area south of it is zoned “GB” thereby protecting it from development.

Protection of the Deep Bay Water Quality

- There will be no increase in the pollution loading to the Deep Bay waters, as the sewage generated by the Project will be either reused as reclaimed water or properly disposed at North Western WCZ. In addition, providing new sewerage network in the Project which will the existing unsewered areas within the proposed development area, and will reduce the pollution loading to Deep Bay.
- The recommended preventative design measures of the four new SPSs would also protect the inland watercourses and Deep Bay waters downstream of the SPSs.

Preservation of Built Heritage

- All of the Declared Monuments and Graded Historic Buildings have been preserved within the Revised RODP. A cultural heritage trail is also proposed under the Revised RODP to allow public to appreciate these precious heritage resources by walking.

- 8.12.3 Other than measures to avoid environmental impacts, efforts have also been exercised to minimise and compensate any unavoidable impacts. The need for any environmental designs required to mitigate the associated impacts have been identified and will be implemented as appropriate.

Minimising Water Quality Impacts

- By reducing and attenuating stormwater flows through the adoption of sustainable drainage systems or facilities, flooding would be avoided/reduced, water quality of river channels and subsequent ecological value of channels would be improved.
- By reducing the amount of effluent discharge from the new HSK STW via Urmston Road submarine outfall, with reusing part of the treated sewage effluent as reclaimed water, the pollution loading to the North Western WCZ would be minimised.

Minimising Landscape and Visual Impacts

- A comprehensive open space network is planned for the NDA to create a continuous riverside promenade, where additional open spaces are introduced on the Revised RODP with corresponding changes to the spatial layout of the developments along Tin Shui Wai Main Channel to further enhance air ventilation performance and visual porosity. The landscape and ecological value of the riverside promenade will be enhanced by planting vegetation of native species.
- Sufficient buffer has been introduced on the Revised RODP as "Amenity" zone and non-building area between the existing "V" zone and new developments. A 5m non-building area is also proposed along Road D2 for the private residential developments facing Lo Uk Tsuen, Ha Tsuen and San Uk Tsuen to increase the separation of buildings from the "V" zone.
- The proposed building height and development intensity profile for the HSK NDA area gives due regard to the physical form and setting of the existing and retained uses. This will allow better integration with the existing / retained areas and enhance the quality of the overall visual character of the HSK NDA area.

Minimising Air Quality Impacts

- The Revised RODP has concentrated the population, key economic activities and major community facilities within walking distance of mass transit and public transport nodes. Community neighbourhoods will also be created within easily accessible daily necessities to promote walking. With the above planning, road traffic and associated vehicular emissions will be minimised.
- The GTC encompassing EFTS, pedestrian walkways and cycle tracks, and a comprehensive pedestrian walkway and cycle track networks will connect residential clusters with the "Logistics, Enterprise and Technology Quarter", railway stations and key community facilities to facilitate people movement between different activity nodes within the HSK NDA area and hence minimise road traffic noise and vehicular emissions.
- The re-arrangement of the road network by re-planning of Tin Ying Road and downgrading of Hung Tin Road will minimise air pollutants generated from road traffic as well as reduce the existing road traffic noise.

- The Revised RODP layout also removes the existing interface problem between brownfield operations and the adjoining residential developments and will minimise movements of heavy goods vehicles traffic within the HSK NDA area by diverting the traffic to the new primary distributor underneath KSWH.

Minimising Noise Impacts

- As stated above, the Project has been carefully planned to minimise road traffic and associated emissions, and noise by promoting walking and cycling; providing GTC within the HSK NDA area; and locating “OU(PBU+SWU)” sites away from residential areas, as far as practicable. The GTC will also be separated from future roads to minimise traffic disturbance, and the depressed sections at road junctions will also shield some of the traffic noise. Noise impacts to a significant number of residents in Tin Shui Wai New Town will also be ameliorated through re-planning of Tin Ying Road. Non-noise sensitive uses and set-back from roads have also been proposed as far as practicable in order to avoid excessive noise barrier or sterilising too much land.
- NSRs are protected through various mitigation measures to comply with the statutory traffic noise limit. These include application of low noise road surfacing materials; noise barriers/cantilever noise barriers; and building set-back, orientation and special building design such as façade design, provision of architectural fins/acoustic windows for affected developments.
- The location of the planned logistics facilities buildings would help to screen the fixed plant noise from proposed “OU(PBU+SWU)” sites, thereby minimising impact on the existing villages.

8.12.4 Overall, the EIA Study has predicted that HSK NDA project, with the implementation of the mitigation measures, would be environmentally acceptable with no adverse residual impacts on the population and environmentally sensitive resources. A number of enhancements (including enhancing ecological connectivity across the Revised RODP; provision of landscape planting in the “LO” zone adjacent to the egretry that could potentially be used by ardeids for nesting; wetland planting in the flood retention facilities in the Regional Park could provide additional resources for birds) and environmental benefits (including provision of dedicated “OU(PBU+SWU)” sites thereby reducing existing industrial / residential interface issues; rearrangement of the road network to reduce the existing traffic noise and minimise air pollutants generated from traffic; pollution loading to the Deep Bay waters will be reduced, as the existing unsewered areas within the proposed development area will be provided with new sewerage and no treated sewage effluent generated by the development will be discharged to Deep Bay) within the proposed development area are also likely to result from the Project.

9 IMPLEMENTATION AND COST ESTIMATION

9.1 Implementation Mechanism

9.1.1 Implementation options can be set at two extremes: full public sector (i.e. by Government) and full private sector involvements.

9.1.2 Full land resumption approach (i.e. “full public”) allows secure time control by the Government to achieve a balanced and sustainable development. In view of the recent development of the KTN and FLN NDAs where some flexibility on the implementation mechanism of the “full public” approach has been considered with allowance for modification of lease including in-situ land exchange applications meeting specific criteria by specified deadlines, as well as considerations of public views collected during Stage 1 CE, Stage 2 CE and Stage 3 CE, it is recommended adopting the “full public” approach with allowance of modification of lease including in-situ land exchange applications similar to the KTN and FLN NDAs, i.e. the Enhanced Conventional New Town Approach.

9.1.3 With appropriate design of the mechanism for allowing modification of lease including in-situ land exchange applications in individual cases meeting specific criteria while retaining the “full public” approach as the primary mode for implementation, the Enhanced Conventional New Town approach could achieve the purpose of advancing housing supply with the benefit inherent in the “private” approach.

9.2 Statutory Procedures

9.2.1 To implement the NDA, a number of statutory procedures are required with a view to complying with the relevant Ordinances including:

- Environmental Impact Assessment Ordinance;
- Town Planning Ordinance (TPO);
- Roads (Works, Use and Compensation) Ordinance;
- Railways Ordinance; and
- Water Pollution Control (Sewerage) Regulation.

9.3 Public Consultation

9.3.1 Public consultation with Rural Committees and District Councils, as appropriate, will be conducted for all gazettal procedures under TPO, Roads (Works, Use and Compensation) Ordinance, Railways Ordinance and Water Pollution Control (Sewerage) Regulation.

9.3.2 The gazettal of the OZPs will also be arranged in accordance with the TPO and the public can make representation within 2 months under the Ordinance.

9.4 Summary of Implementation Programme

9.4.1 The implementation of the NDA is proposed to be divided into 5 stages, namely Advance Works, Stage 1, Stage 2, Stage 3 and Stage 4, and the major site formation and engineering infrastructure are sub-divided into 11 Works Contracts tentatively. First population intake will be expected in 2024 and the full development in 2037/2038. The implementation phasing plan within the HSK NDA is shown in **Figure 4**.

Table 9.4.1 Proposed Implementation Programme

Development Stage	Development Year
Advance Works Stage	2019 – 2029
Development Stage 1	2022 – 2025
Development Stage 2	2026 – 2031
Development Stage 3	2031 – 2035
Development Stage 4	2031 – 2038

9.5 Cost Estimation

9.5.1 The detailed development cost could only be worked out upon confirmation of the user requirements and finalisation of the design in the detailed design stage. Based on a rough estimate, the estimated total cost of site formation and engineering infrastructure for the HSK NDA is in the order of \$50 billion in September 2015 prices. The estimated cost will be reviewed in future detailed design assignments of the respective works packages.

10 PRELIMINARY ENGINEERING LAYOUT AND DESIGN MEMORANDUM

10.1 Preliminary Engineering Layout

10.1.1 Preliminary engineering design has been carried out for the following engineering works and environmental mitigation measures proposed under the Study:

- Site formation works with associated slopes and retaining walls;
- One primary distributor road, eight district distributor roads, local roads, improvement of existing roads and junctions, and associated roadworks, including noise barriers, pedestrian walkways, cycle tracks; and
- Drainage, sewerage, waterworks and utilities systems, including fresh water service reservoir, reclaimed water service reservoirs and four SPSs.

10.2 Design Memorandum

10.2.1 The Design Memorandum has been developed for the proposed infrastructure, which presents the standards, design concept and criteria. It is intended to serve as a reference guide to the use and interpretation of the relevant design manuals required during the design process.

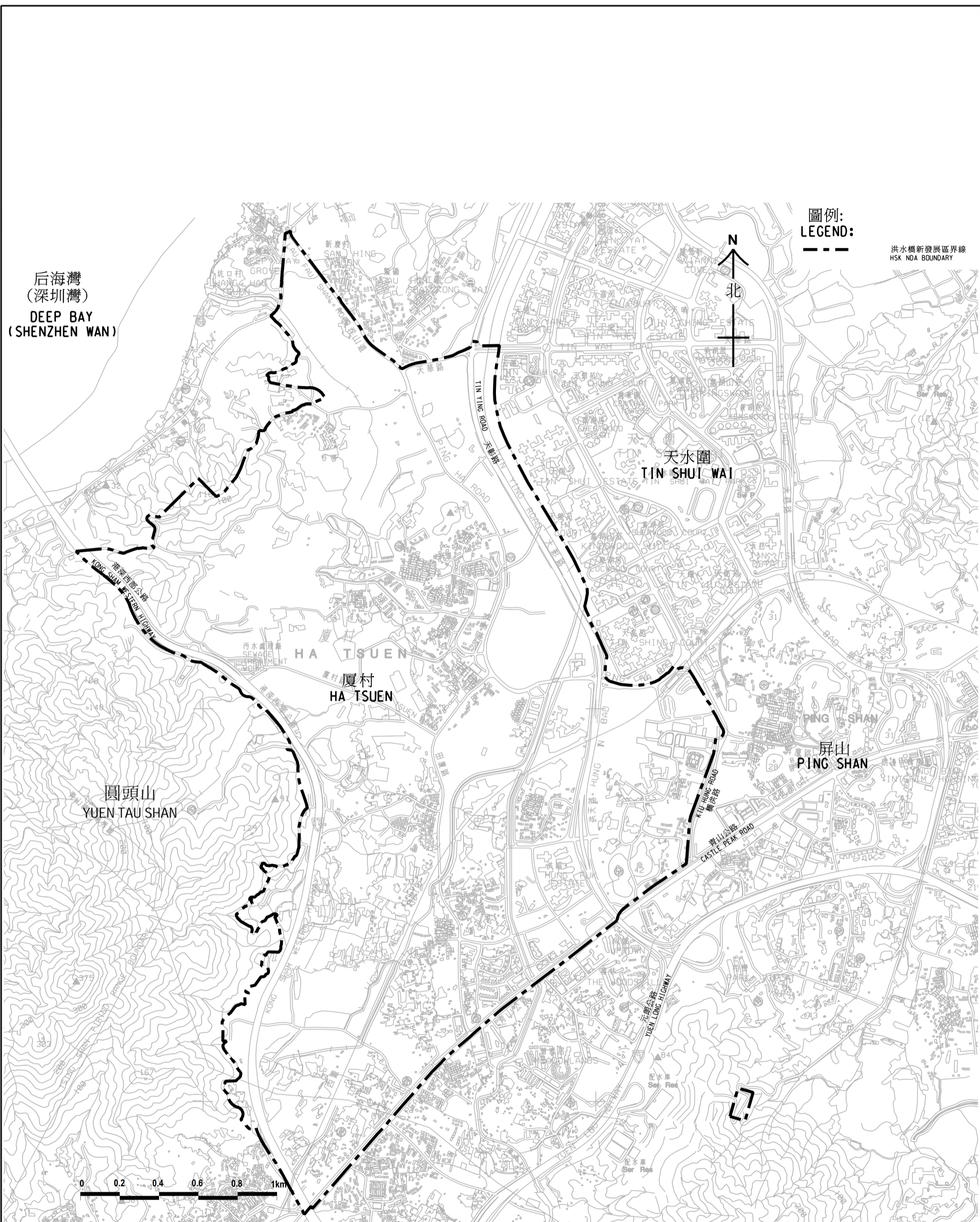
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11 CONCLUSIONS

- 11.1.1 The HSK NDA will be the next generation new town of Hong Kong. The Study has established a planning and development framework for the HSK NDA to meet the medium to long-term housing, economic and other land use needs of Hong Kong. Under the overall vision for creating a sustainable, people-oriented and balanced community, the HSK NDA will be developed as a desirable place to live, work, play and do business. Through comprehensive planning and development, the HSK NDA will transform the vast extent of deserted agricultural land being used for brownfield operations into a new generation new town with enhanced land use efficiency and environmental quality. The NDA will also give impetus to foster our city's economic growth and becoming the "Regional Economic and Civic Hub" for the NWNT. The HSK NDA will provide about 150,000 new employment opportunities, bring jobs closer to residents. This will also help reducing the imbalance in the spatial distribution of homes and jobs in the territory. Upon full development, the NDA will provide homes for about 218,000 residents, including 176,000 new population. The NDA will help redress the imbalanced housing mix of the Tin Shui Wai New Town. Together with Tin Shui Wai, Yuen Long and Tuen Mun New Towns, it will form an enlarged new town development cluster in the NWNT.
- 11.1.2 A Revised RODP for the HSK NDA incorporating findings and recommendations of various planning, engineering and technical assessments including EIA has been formulated. The relevant technical assessments have been conducted which demonstrate that the NDA development is technically feasible in such as traffic and transport, drainage and sewerage, water supply and public utilities, air ventilation and sustainable development and environmental aspects. The preliminary engineering layout, implementation programme and a rough cost estimation for the proposed site formation and engineering infrastructure have been developed.

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Figures

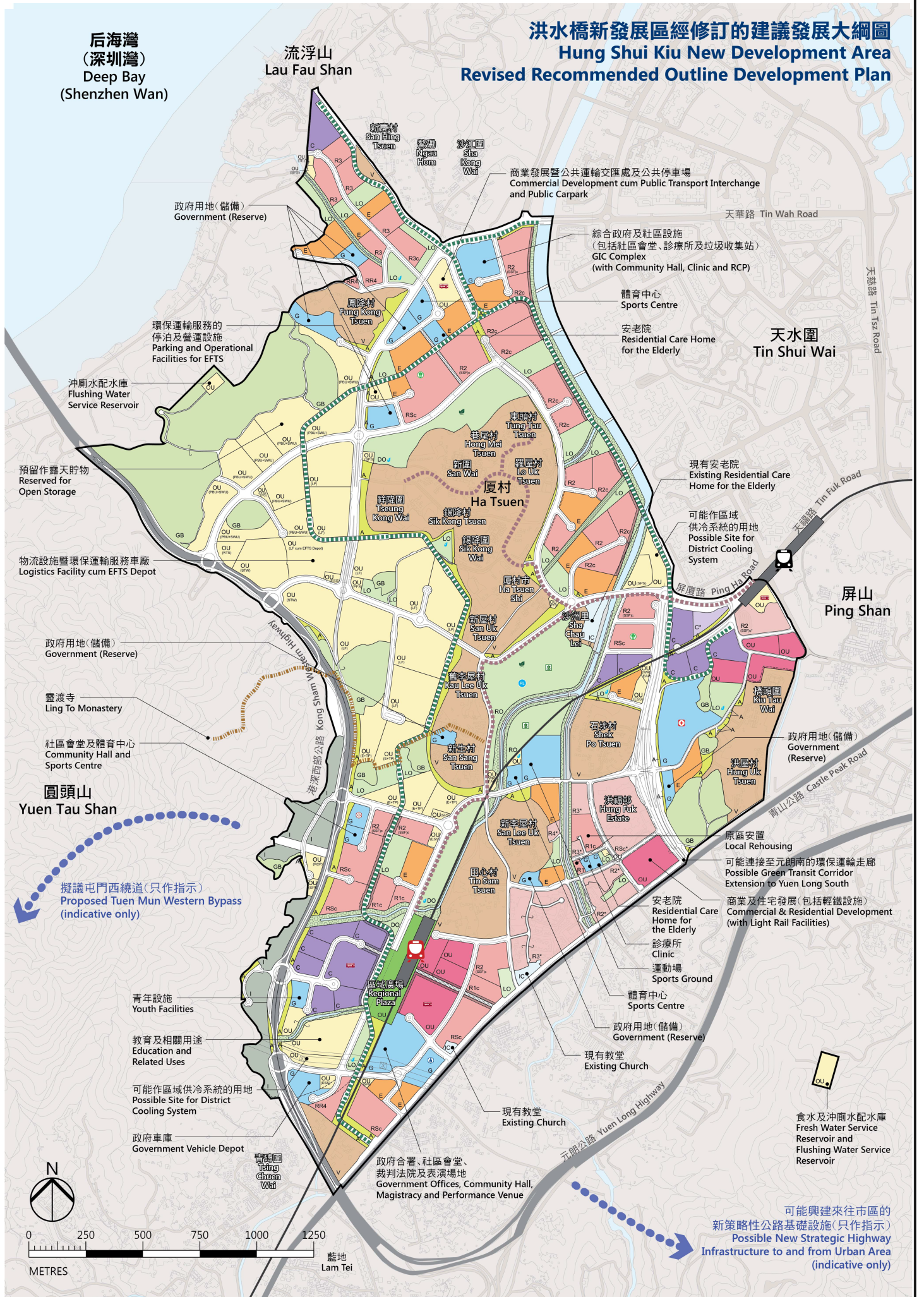


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洪水橋新發展區界線
HSK NDA Boundary

SCALE	DATE	APR 2017
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JOB No.	60222570	圖 1 Figure 1
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洪水橋新發展區經修訂的建議發展大綱圖 Hung Shui Kiu New Development Area Revised Recommended Outline Development Plan

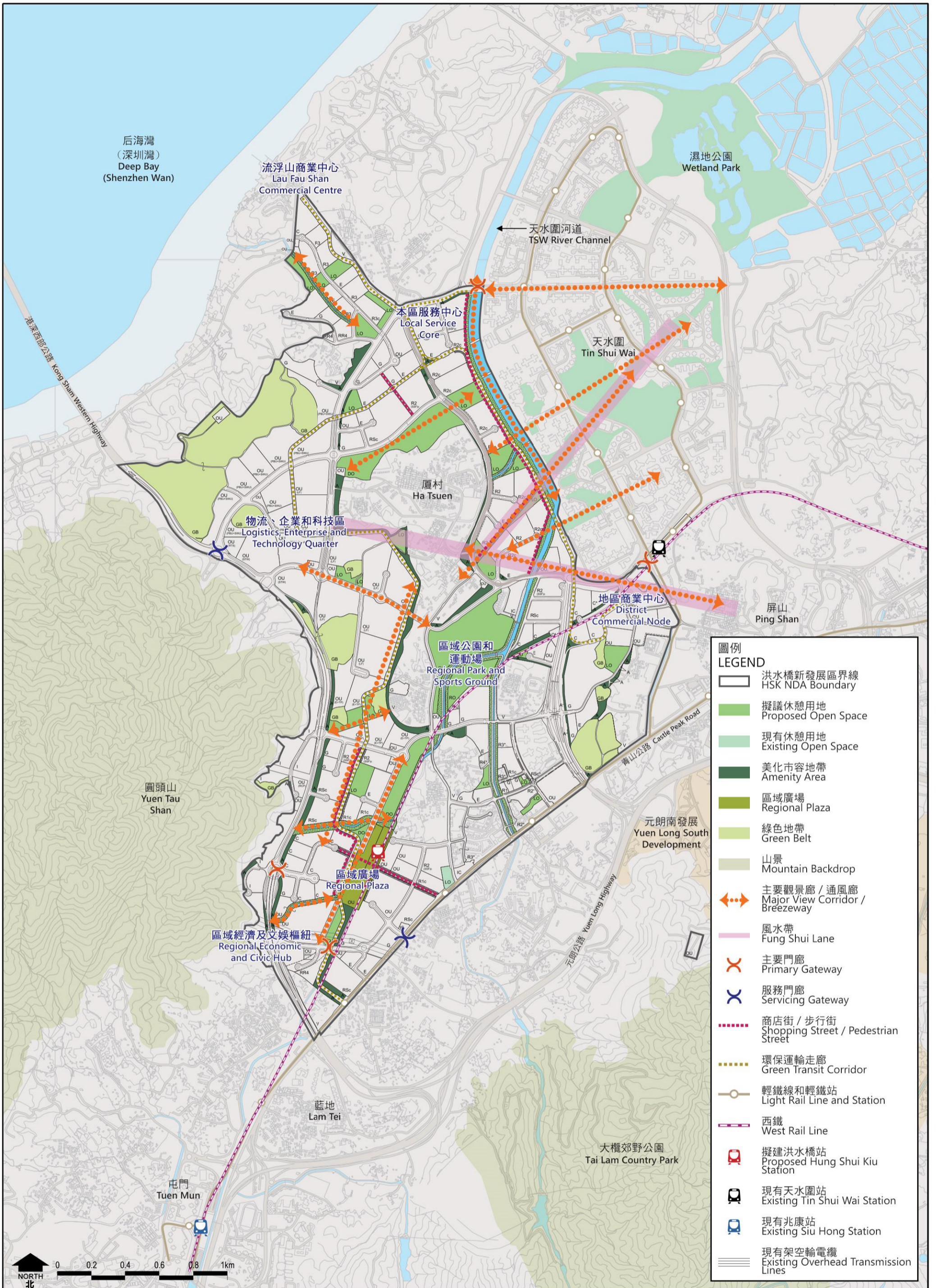


- 註釋**
Notation
- 洪水橋新發展區界線
Hung Shui Kiu New Development Area Boundary
 - 西鐵線
West Rail Line
 - 道路、路口及其他
Roads, Junctions etc.
 - 擬建洪水橋站
Proposed Hung Shui Kiu Station
 - 現有天水圍站
Existing Tin Shui Wai Station
 - 環保運輸走廊
Green Transit Corridor
 - 規劃中的道路項目
Road Projects under Planning
 - 擬議文物徑
Proposed Heritage Trail
 - 擬議生態徑
Proposed Eco Trail
 - 非建築用地
Non-Building Area (NBA)
 - 公共運輸交匯處
Public Transport Interchange (PTI)
 - 醫院和專科及分科診所
Hospital, Specialist Clinic / Polyclinic
 - 區消防局警救總站及職員宿舍
Divisional Fire Station cum Ambulance Depot cum Staff Quarters
 - 警區警署及已婚警察宿舍
District Police Station and Married Quarters
 - 擬議街市
Proposed Market
 - 區域公園
Regional Park
 - 社區園圃及農場
Community Farming and Farmers' Market
 - 蓄洪湖泊
Flood Retention Lake
 - 蓄洪設施
Flood Retention Facilities
 - 商店街
Shopping Street
 - 步行街
Pedestrian Street
 - 現有架空輸電纜
Existing Overhead Transmission Lines
 - 西鐵緊急通道
West Rail Line Emergency Access Point
 - 電力支站
Electricity Substation
 - 石油氣加氣站
Liquefied Petroleum Gas Filling Station
 - 加油站
Petrol Filling Station
 - 垃圾收集站
Refuse Collection Point
 - 廢物轉運站
Refuse Transfer Station
 - 污水抽水站
Sewage Pumping Station
 - 污水處理廠
Sewage Treatment Works
 - 電話機樓
Telephone Exchange

各種土地用途 Schedule of Uses	地積比率 Plot Ratio
C 商業 Commercial	1.5 / 5 / 8 / 9.5
R1 住宅發展密度第一區 (原區安置) Residential - Zone 1 (Local Rehousing)	5.5
R1c 住宅發展密度第一區 (原區安置) (包括商業用途) Residential - Zone 1 (Local Rehousing) (with commercial)	6
R1c 住宅發展密度第一區 (包括商業用途) Residential - Zone 1 (with commercial)	6 / 6.5
R2 住宅發展密度第二區 Residential - Zone 2	5
R2c 住宅發展密度第二區 (包括商業用途) Residential - Zone 2 (with commercial)	5.5
R3 住宅發展密度第三區 Residential - Zone 3	2.5
R3c 住宅發展密度第三區 (包括商業用途) Residential - Zone 3 (with commercial)	3.5
R4 住宅發展密度第四區 Residential - Zone 4	--
RR4 鄉郊住宅發展密度第四區 Rural Residential - Zone 4	--
R5C 公共屋宇 - 租住公屋 (包括商業用途) Special Residential - Public Rental Housing (with commercial)	6
R2/ISSFC 住宅發展密度第二區 (資助出售房屋) (包括商業用途) Residential - Zone 2 (Subsidised Sales Flat) (with commercial)	5.5
I 工業 Industry	3
OU 其他指定用途 - 商業及住宅發展 Other Specified Uses - Commercial & Residential Development	7
OU 其他指定用途 - 商業及住宅發展 (包括輕鐵設施) Other Specified Uses - Commercial & Residential Development (with Light Rail Facilities)	5
OULF 其他指定用途 (物流設施) Other Specified Uses (Logistics Facility)	5
OUE+TP 其他指定用途 (企業和科技園) Other Specified Uses (Enterprise and Technology Park)	5
OUPH+SW 其他指定用途 (港口後勤、貯物及工場用途) Other Specified Uses (Port Back-up, Storage and Workshop Uses)	
OU 其他指定用途 Other Specified Uses	
OU 其他指定用途 - 區域廣場 Other Specified Uses - Regional Plaza	
V 鄉村式發展 Village Type Development	
G 政府 Government	
IC 機構或社區 Institution or Community	
E 教育 Education	
GB 綠化地帶 Green Belt	
RO 區域休憩用地 Regional Open Space	
DO 地區休憩用地 District Open Space	
LO 鄰舍休憩用地 Local Open Space	
A 美化市容地帶 Amenity Area	

*土地用途及發展密度按照現時分區計劃大綱圖的規定
Land use and development intensity based on the provisions in current Outline Zoning Plans

SCALE	DATE	APRIL 2017
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		REV



圖例
LEGEND

- 洪水橋新發展區界線
HSK NDA Boundary
- 擬議休憩用地
Proposed Open Space
- 現有休憩用地
Existing Open Space
- 美化市容地帶
Amenity Area
- 區域廣場
Regional Plaza
- 綠色地帶
Green Belt
- 山景
Mountain Backdrop
- 主要觀景廊 / 通風廊
Major View Corridor / Breezeway
- 風水帶
Fung Shui Lane
- 主要門廊
Primary Gateway
- 服務門廊
Servicing Gateway
- 商店街 / 步行街
Shopping Street / Pedestrian Street
- 環保運輸走廊
Green Transit Corridor
- 輕鐵線和輕鐵站
Light Rail Line and Station
- 西鐵
West Rail Line
- 擬建洪水橋站
Proposed Hung Shui Kiu Station
- 現有天水圍站
Existing Tin Shui Wai Station
- 現有兆康站
Existing Siu Hong Station
- 現有架空輸電纜
Existing Overhead Transmission Lines

AECOM

城市設計總圖
Master Urban Design Plan

SCALE	1: 20,000 @ A3	DATE	APR 2017
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