



土木工程拓展署  
Civil Engineering and  
Development Department

Agreement No. CE 50/2021 (CE)

# Private Housing Development in Ma Wan South – Feasibility Study

Executive Summary - Revised Final

(Ref.: 24 - 04)

September 2024



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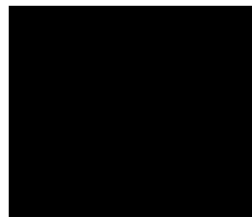
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Reviewed:



Approved for Issue:



### AECOM ASIA COMPANY LIMITED

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## Foreword

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Information in this summary paper is prepared for the purposes described in the instructions and the Brief under Contract CE/50/2021(CE), to demonstrate the feasibility of the proposed development for the reference use of the Government. Detailed arrangement of all recommendations shall be subject to future Government's decision.

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## **FIGURES**

60681377/A24/001	Site Location Plan
60681377/A24/002	Optimal Scheme

## **EXPRESSIONS**

The following words and expressions shall have the meaning hereby assigned to them:-

- a) “Government” means the Government of the Hong Kong Special Administrative Region.
- b) “Development” bears the same meaning as “Private Housing Development in Ma Wan South” and includes provision of residential blocks, schools, other supporting government, institution or community facilities, retail, welfare, open space and/or amenities.
- c) “Site” means the Site of the Development.
- d) “Infrastructure” means the site formation works and other essential engineering Infrastructure both within and outside the Site necessary to support the Development.
- e) “Study Area” means the areas to be covered by the respective engineering studies / assessments.
- f) “Project” means the Infrastructure works to support the Development.

## **APPENDIX**

Appendix A	Response to Comment
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## 1 INTRODUCTION

### 1.1 Background

- 1.1.1 Following the 2017 Policy Address, the Site in Ma Wan South is one of the 26 potential Housing Sites identified for study on the feasibility and development potential. CEDD is tasked to conduct an engineering feasibility study (EFS) to study the feasibility of the potential rezoning and the provision of associated Infrastructure required for the Site for private housing development purpose.
- 1.1.2 The Site has an area of about 12.8 hectares, with a major portion currently zoned as “Other Specified Use” annotated “Recreation and Tourism Related Uses” while the remaining portion is zoned as “Green Belt” on the approved Ma Wan Outline Zoning Plan (OZP) (No. S/I-MWI/14) and is proposed for private housing development. Location of the site is shown in **Figure No. 60681377/A24/001**.
- 1.1.3 Based on initial assessment of the Planning Department (PlanD), there is potential to rezone the site for medium density private residential development and supporting/associated uses and facilities to provide about 5,000 residential units accommodating an estimated population of about 13,100. The completion of rezoning is among the critical tasks in the implementation programme for the proposed Developments. Therefore, adequate assessment findings of this assignment with agreement of PlanD and other relevant B/Ds should be made available to PlanD for zoning amendment exercise.
- 1.1.4 The Assignment shall examine the feasibility of developing private housing at the Site by conducting various preliminary engineering and environmental assessments (e.g. EFS). The EFS is required to determine the scope of the Infrastructural Works for supporting the Developments; to assess the various impacts pertaining to the Developments and the associated Infrastructural Works; to recommend the mitigation measures to keep the potential impacts due to the Developments and Infrastructural Works within the acceptable level of the current standard/regulation and to the satisfaction of relevant B/Ds; and to establish implementation strategies and programmes for the Infrastructural Works to suit the commissioning of the Developments. The Assignment shall take into account the cumulative demand/impact of other adjoining existing, planned and committed developments to establish the recommended Infrastructural Works and the required mitigation measures. The assessments and studies will facilitate the zoning amendment for the Site and hence the EFS shall also satisfy the zoning amendment/planning application requirements of the relevant B/Ds, authorities and organizations.
- 1.1.5 To our understanding, the Government is also conducting studies on a group of major roads connecting NWNT, including Route 11 and the associated major roads, which can provide an alternate route to/from NWNT and support proposed developments in NWNT in the long run.

### 1.2 Description of the Project

- 1.2.1 AECOM Asia Company Ltd. has been commissioned by the Civil Engineering and Development Department (CEDD) to undertake Agreement No. CE 50/2021 (CE) – Private Housing Development in Ma Wan South – Feasibility Study (hereafter referred as “the Project”). The Agreement commenced on 17 March 2022 and is scheduled to complete in July 2024. The boundaries of the Sites would be comprehensively reviewed and would be subject to review throughout the course of the Assignment and subject to determination from the findings of the Assignment and agreement from respective government departments
- 1.2.2 The scope of the Project consists of the necessary Infrastructure works and supporting/associated uses and facilities to support the Development and comprises, but not limited to, the following principal works elements:-
- a) Site clearance of existing structure and trees;

- b) Site formation works;
- c) Slope cutting and earth filling works as well as geotechnical works/structures;
- d) Natural terrain hazards mitigation works;
- e) Decontamination works;
- f) Roadworks;
- g) Sewerage Infrastructure;
- h) Drainage Infrastructure;
- i) Water supply Infrastructure;
- j) Landscape works;
- k) Environmental mitigation measures; and
- l) Other infrastructure works deemed to be necessary to support the Development.

1.2.3 Necessary studies and impact assessments will be carried out in order to establish and maximise the development potential and formulate a development plan for meeting housing and other needs, as well as for the relevant parties to put forward the respective detailed design.

### **1.3 Purpose of this Summary**

1.3.1 In accordance with Clause 6.24 of the Project Scope, the Executive Summary is prepared to highlighting all the important findings including technical assessment, environmental assessment and financial assessment, etc., site formation and associated infrastructure, the issues of concern to the community, requirement for implementation of the Development and associated Infrastructure, and the basis for any implications of those requirements.

### **1.4 Structure of this Summary**

1.4.1 This summary is organized into 8 sections. Apart from this introductory section, there will be other sections as follows:

- Section 2 – summarizes the baseline conditions of the site
- Section 3 – described the latest development proposal
- Section 4 – summarizes the project feasibility in various technical aspects
- Section 5 – summarizes the Assessment in Environmental aspect
- Section 6 – outlines the Development Programme
- Section 7 – describes the Alternative Development Schemes
- Section 8 – present the findings and provides recommendations.



## **2 BASELINE CONDITIONS**

### **2.1 Assessment Area and Planning Context**

2.1.1 The Development Site is located at the southeast of Ma Wan Island surrounded by natural landscape, the Lantau Link and Tsing Ma Bridge, traditional burial grounds and directly faces the coastal area. The proposed low to medium density housing development is considered compatible with the surroundings. With the proposed alternative roads and proposed strategic transport infrastructures (i.e. Route 11 & Tsing Yi-Lantau Link) in mind, opportunities for the Development Site to optimise its development potential in fulfilling the housing demand, as well as to better connect with the Hong Kong International Airport and Northwest New Territories developments would be explored.

2.1.2 Having regard to its scenic setting and close proximity to the iconic Tsing Ma Bridge, the planning and design of the Development Site would be in harmony with the landmark bridge and the surrounding natural landscape. In view of the visually prominent location, the scenic setting and the transport and infrastructure capacity constraints in Ma Wan, assessments in support of the specific type and scape of the proposed development within the Development Site will be conducted. The building layout and orientation shall consider the potential air quality and noise impact, as well as airport height restriction for the Area whilst local conditions would be well respected. To facilitate air flow and the formulation of pedestrian and visual corridors, key breezeways would be duly considered.

### **2.2 Technical constraints**

2.2.1 Major faults traverse the site in approximately Northwest-Southeast direction is identified and could induce deep and undulating rockheads. Target specific site investigations shall be well-planned to establish the geological model. The western portion of the site may be potentially affected by natural terrain hazards. Detailed Natural Terrain Hazard Study will be carried out at later stage to assess the impacts induced from these hazards to the site.

2.2.2 Several environmental issues and constraints were identified. The key constraints to the proposed Development and associated Infrastructure were mainly related to air quality impact, noise impact, impacts to ecology and fisheries, waste management implication, and hazard to life.

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### 3 LATEST DEVELOPMENT PROPOSAL

#### 3.1 The Optimal Scheme

3.1.1 Three development schemes were explored and studied. An optimal scheme was selected based on below principles:

- Open space integration and coherence
- Land development flexibility
- Development density
- Pedestrian friendliness
- Infrastructure scope requirements
- Complexity of construction works implementation
- Affordability of developer(s)

3.1.2 Under the Optimal scheme evaluated by the above principles, the overall development is anticipated to be implemented by a single developer, as shown in **Figure No. 60681377/A24/002**. With this arrangement, public and internal road space and infrastructure facility could be minimized thus allowing more flexible arrangement of residential towers and integration of open space.

3.1.3 Around 5,340 units are anticipated based on the given maximum domestic plot ratio of 3.6. Based on the number of residential units, a population of about 13,884 is estimated. The net area for residential development is 8.9 ha which is about 73% of the total site area. A Joint-user Complex is proposed at the northern entrance of the Site with connection to existing Pak Yan Road to serve the new and existing population. The Public Transport Interchange located under a Joint-user complex is strategically located to minimize through traffic within the Site. A new saltwater and a sewage pumping station are proposed at the northeastern corner. Moreover, to optimize waterfront resource for community's and visitors' use, a waterfront promenade as public open space is proposed along the eastern waterfront area.

3.1.4 In the central area of the site, a major open space is proposed as the key recreation node for future residents which directly connects the clubhouse facilities and further connects with the proposed waterfront promenade through a strip of east-west open space. The central recreation node is surrounded by residential blocks which is intended to create an enclosed space and a sense of belonging in community.

3.1.5 To facilitate air ventilation and permeability, adequate spacing between building blocks will help effective air flows. To accommodate the total domestic Gross Floor Area, 21 blocks are resulting a domestic site coverage at around 17% of which 6 of them are single-aspect blocks.

3.1.6 Taking into account existing site topography and future site formation, a stepped height profile descending from west to east and from north to south to the waterfront is proposed. Moreover, a GFA concession of 10% has also been adopted in examining the future building massing and height requirements. As a result, the residential towers at the western part of the site will reach around +105 mPD and towers of around 75mPD are allocated around the waterfront area.

#### 3.2 G/IC and Supporting Facilities

3.2.1 A Public Transport Interchange with an area of about 8,000m<sup>2</sup> is proposed at the north of the site. The Public Transport Interchange shall occupy the ground floor of the proposed Joint-user Complex. Upper floor of the proposed Joint-user complex shall include retail facilities, kindergarten, Neighbourhood Elderly Centre, Integrated Children and Youth Services Centre.

3.2.2 Considering the existing electric substation in Ma Wan is incapable to serve the additional electric loading, a new substation will be proposed near the existing substation. Site

formation and slope works will be anticipated.

- 3.2.3 New sewage pumping station and a private salt water pumping station are proposed at the north-east side within the Ma Wan South Development site. Detail of the sewage pumping station shall be further liaised with Environmental Protection Department and Drainage Services Department at detailed design stage while the private salt water pumping station is proposed to meet the salt water demand generated from the Development as flushing water.

### **3.3 Pedestrian and vehicular access**

- 3.3.1 The Site is linked to existing Ma Wan Road network via Pak Yan Road and an unnamed access road near Ma Wan Soccer Pitch at its northwest corner. Development Scheme 1 proposes a roundabout at the northwest corner of Subject Site to connect the unnamed access road near existing Ma Wan Soccer Pitch, existing access road to Ma Wan coach parking area, proposed Public Transport Interchange (PTI) and the major access road to Proposed Residential Development. The existing maintenance access road for Lantau Link would be maintained, adjacent to vehicular access to/from Proposed PTI. The existing access road to Ma Wan Substation would be closed off and the vehicular access for the substation would be re-provided at Proposed Access Road. Along the Proposed Access Road, minimum 7.3m wide carriageway is provided. Minimum 3.5m wide footpath is provided on both sides of the carriageway. The detailed arrangement is subject to further design and liaison with Transport Department and Highways Department.
- 3.3.2 Furthermore, as the existing pedestrian connection to Tai Leng Tau from the unnamed service road will be affected by the development, a new hiking trail is provided.

## 4 TECHNICAL ASSESSMENTS SUMMARY

### 4.1 Traffic and transport impact

#### The Proposed MWS Development

- 4.1.1 The Site is located at south-east of Ma Wan Island with approximately 12.8 hectares in area. A medium-density private residential development with about 5,340 residential units accommodating 13,884 population is proposed. There will also be a 10-classroom kindergarten, approximately 3,000 sqm GFA of retail and a Public Transport Interchange (PTI) included in the Site.
- 4.1.2 The existing unnamed access road near Ma Wan Soccer Pitch will be main access of the Site. Under the Optimal Scheme, the main access road connects with a proposed 4-arm roundabout located at northwest corner of the Site. After reaching the roundabout, traffic can either use northeast arm to the proposed Public Transport Interchange, southeast arm to the proposed development, and west arm to existing Ma Wan coach parking area.

#### Existing Traffic Management and Condition

- 4.1.3 Based on the development principle, there is currently vehicular restrictions implemented on Ma Wan Island by the Government under gazette notice in order to manage the road traffic. Only vehicles with valid permits issued by Transport Department (TD) are allowed to access the island except goods vehicles, urban taxis and buses which are allowed to visit the island under specific requirements and restrictions. Under the traffic management, all existing roads within Ma Wan Island are designed in single-2 configuration and considered sufficient.
- 4.1.4 It is crucial to understand traffic impact arising from the Site to surrounding road network during different stages. Area of Influence (AOI) of the Site under this feasibility study was discussed with relevant departments. Total 7 key junctions and 19 road links (15 are existing and 4 are future) are included in the agreed Area of Influence and assessed the traffic impact with and without the Site. To evaluate the existing traffic condition and pattern, data from other government studies adjacent to Ma Wan and recent in-house AECOM projects, as well as traffic survey are collected and reviewed. Ting Kau Bridge eastbound and Tuen Mun Road (west of Ting Kau Bridge) eastbound are only road links observed a volume over capacity (v/c) ratio above 1, i.e. likely a traffic congestion during morning Peak.

#### Assessment Approach

- 4.1.5 According to the Brief, the design years of traffic assessments are 2031, 2036 and 2041 for both the cases with and without the Site. Population intake of the Site is subject to further review. Traffic impacts from construction and operation phases have been assessed with appropriate assumption intake year. Further traffic impact assessment would be carried out if necessary.
- 4.1.6 To produce robust traffic forecasts, a 2-tier modelling approach is adopted which comprises with a strategic transport model in the upper tier and a local area traffic model in lower tier. Task Force Planning Dataset from Transport Department forms the basis of territorial planning data assumptions while other committed road/railway schemes are included in the traffic models. In addition, data related to Kau Yi Chau Artificial Islands and Northern Metropolis Development are also considered to produce more realistic future year traffic models. Looking at similar development scale, characteristics, traffic management and transport facilities provision with existing Ma Wan North area, its travel demand and pattern are made referenced to our assessment.
- 4.1.7 Based on the above approach and data collected, assessment of key junctions and road links within AOI were undertaken under each scenario.

### Assessment Results

- 4.1.8 Assessment results suggest all key junctions will be operating below capacity during all peaks and design years up to 2041. On the other hand, most of road links will operate below capacity during both construction and operation stages, except Lantau Link (Tsing Ma Bridge), Lantau Link (Kap Shui Mun Bridge) westbound, Ting Kau Bridge SB and Tuen Mun Road (west of Ting Kau Bridge) Eastbound. The last 3 road links are observed the same in traffic flows between reference and design cases, which implies the high v/c ratios are due to background traffic only and not the Site. Lantau Link (Tsing Ma Bridge) westbound is also observed high background traffic with v/c ratio of 1.12 during morning Peak. Its v/c ratio slightly increases to 1.15 (equivalent to ~120 additional pcu) under design case and the impact is considered minimal.
- 4.1.9 With 1% growth per year applied, the Lantau Link (Tsing Ma Bridge) westbound will operate at v/c ratio of 1.17 prior to commencement of several highway schemes such as Tsing Yi-Lantau Link and Route 11. This is considered the most critical scenario of Lantau Link under this Study. However, its traffic level will be effectively alleviated upon those captioned highway schemes in operation and its v/c ratio will immediately be reduced to below 1, and until 2041 at least. In overall, traffic impact arising from the Site is considered limited and will be improved by Tsing Yi-Lantau Link and Route 11 in longer future.

### Findings and Recommendations

- 4.1.10 A Preliminary TTIA has been undertaken to evaluate the impact arising from the Site, as well as the required transport related facilities to support the development.
- 4.1.11 Traffic impact arising from the Site is believed minimal to only Lantau Link (Tsing Ma Bridge) WB. Thus, no mitigation solution would be required.
- 4.1.12 Total six new franchised bus routes are proposed to serve the Site, three of them (to Tsing Yi, Kwai Fong and Tsuen Wan) are regular bus routes with all-day operation and the other three (to Tsim Sha Tsui, Wan Chai and Kwun Tong) are uni-directional bus route operating during peak hours only. A PTI is proposed within the Site while another new bus stop is proposed at Pak Lam Road near the junction of Pak Lam Road/ Pak Yan Road/ Fong Yuen Road which only allow uni-directional bus service routes for boarding/alighting. Some road improvement works are also proposed along Pak Lam Road and Pak Yan Road to ensure a smooth maneuvering of 12.8m buses.
- 4.1.13 In case of emergency or during closure of land transport links, passengers can travel to / from Ma Wan via ferry services.
- 4.1.14 To align with the prevailing traffic management and development principle of Ma Wan Island, no parking space nor taxi stand are proposed within the Site.

## **4.2 Financial Viability for Public Transport Options**

### Public Transport Options

- 4.2.1 A road-based solution using franchised bus is recommended. 6 franchised bus routes including 3 uni-directional to Kwun Tong, Tsim Sha Tsui and Wan Chai as well as 3 whole-day services to Tsuen Wan, Kwai Fong and Tsing Yi were proposed and shall be evaluated, on both standalone and consolidated basis under the FVA, and concluded to be viable for the proposed franchised bus routes.

### Sensitivity Analysis

- 4.2.2 In examining the impact of bus fare level and other key risk factors through sensitivity analyses, it is acknowledged that changes in the limited competition environment in transportation provision at the Development Area, demographic and commuting pattern of patrons and fluctuation in operating expenses such as road/tunnel toll(s), staff and fuel cost shall be pertinent to the sustainability of financially viable. These factors should be continuously monitored and serve as indicators which alert of change in situation over time, so as to provide timely adjustment or fine tuning for the existing public transport provision.



### 4.3 Drainage Impact Assessment

#### Design Criteria

- 4.3.1 The preliminary DIA is prepared in accordance with the scope and requirements as set out in the Environmental, Transport and Works Bureau Technical Circular (Works) (ETWB TC(W)) No. 2/2006 and in accordance with the fifth edition of Stormwater Drainage Manual (SDM) with modifications from Corrigendum No. 1/2022. Rational Method is adopted for estimating the peak drainage flows based on Stormwater Drainage Manual. The proposed drainage systems serving the Site will generally be designed for 1-in-200-year events for trunk drainage system and 1-in-50-year events for branch drainage system. Since hydraulic performance of the drainage system is affected by both rainfall and sea level, the design flood levels of the drainage system are to be assessed based on the joint probabilities of rainfall dominated and sea level dominated events. Design allowance for climate change is incorporated for projected rainfall and sea levels to assess the hydraulic performance of the proposed drainage improvement works.

#### Existing Drainage Conditions

- 4.3.2 Most of the surface runoff of the Site are collected by natural streams and u-channels and then to pipes and outfalls and eventually to the sea. Based on drainage record plans, there are three outfalls within the Site. Some of the areas of the Site have surface runoffs directly discharged into the sea. No major flooding records are identified within the Site Area while no Ecologically Important Streams/Rivers (EIS) as defined under ETWB TCW No. 5/2005 are affected by the development.
- 4.3.3 The existing catchment of the Site is mostly unpaved area with approximately 16% of the existing catchment is paved. The catchment areas for the existing outfalls are referenced from the hydraulic model provided by Drainage Services Department and the as-built record plans. Baseline scenario with existing peak runoffs for existing outfalls are evaluated.

#### Potential Drainage Impact

- 4.3.4 Additional stormwater runoff will be generated when compared with baseline scenario due to the introduction of impermeable surfaces from the development. Approximately 55% of the Site area is assumed to be paved after development according to Buildings Department's PNAP APP-152 "Sustainable Building Design Guidelines". Appropriate mitigation measures for the drainage impact are recommended. Moreover, the development and construction of access roads may obstruct existing drainage paths which would require diversion of the existing drainage layout.

#### Mitigation Measures

- 4.3.5 Due to the increased surface runoff expected from the change in catchment characteristics within the Site, an existing Outfall is proposed to be replaced with Outfall with twin cell box culvert with cells of 1.5m height and 2.5m width to cater for the additional runoff due to the development. Due to the removal of existing Outfall, existing catchments are proposed to be discharged via other existing outfall with no adverse drainage impact aroused. New drainage system is proposed to connect to proposed outfall. Considering potential backwater effects, the site formation level is proposed to be at least +6.00mPD to allow for a minimum 500mm freeboard within the box culvert under 10-year sea level and 200-year rainfall. Details of drainage design and connection to existing public stormwater drainage system should be submitted to Drainage Services Department and relevant departments during detailed design stage for agreement.
- 4.3.6 The maintenance responsibility of stormwater drainage system should be determined in accordance with ETWB TC(W) No. 14/2004 – Maintenance of Stormwater Drainage Systems and Natural Watercourses. Drainage reserve zone is proposed as there are proposed public drainage systems within the proposed residential site area. According to Chapter 7 of Hong Kong Planning Standard and Guidelines, unrestricted vehicular access to

drainage reserve should always be provided. The operation and maintenance of proposed drainage system would be further confirmed and agreed with relevant parties and departments.

#### **4.4 Sewerage Impact Assessment**

##### Design Criteria

- 4.4.1 The preliminary Sewerage Impact Assessment (SIA) is prepared in accordance with the scope and requirements as set out in the Sewerage Manual published by DSD and EPD Report No. EPD/TP 1/05 Guidelines for Estimating Sewage Flows (GESF) for Sewerage Infrastructure Planning Version 1.0. 2.2.1. The SIA study has been carried out in accordance with the guidelines laid down in the Technical Paper on Guidelines for Estimating Sewage Flows for Sewerage Infrastructure Planning Version 1.0 (Environmental Protection Department, 2005). Sewer capacity is calculated using appropriate hydraulic Equation with appropriate assumption for pipe parameters.

##### Existing Sewerage Conditions

- 4.4.2 The site is unsewered and it is not served by the existing sewerage system in the island. 450mm or smaller diameter sewers are identified in existing networks for conveying sewage discharge from development to Ma Wan Sewage Treatment Works (MWSTW) for treatment. The existing effluent is discharged to nearest stormwater drainage system and to the sea through drainage outfall at Western Buffer Water Control Zone.
- 4.4.3 Currently all sewage is discharged to Ma Wan Sewage Treatment Works as the only treatment plant in Ma Wan commissioned in 2002. The existing Ma Wan Sewage Treatment Works mainly serves residential development in northern part of Ma Wan with secondary treatment procedures of a design capacity of 7,600 m<sup>3</sup>/d.

##### Potential Sewerage Impacts

- 4.4.4 According to the latest “Optimal Scheme”, the largest residential units and population are about 5,340 units and about 13,880 people respectively, generating an estimated ADWF of around 4,400m<sup>3</sup>/d. Although the implementation program of the proposed development is yet to be determined, the handling capacity of MWSTW is found to be sufficient to cater for the ADWF from the population projected by both the proposed development and Ma Wan existing development under this study.
- 4.4.5 It is proposed to construct a new sewerage pumping station (SPS), a twin sewer rising mains and a sewer pipe system to transport the additional loads to Ma Wan Sewage Treatment Works. The proposed pumping station will be located at the north-eastern corner of the Site. The proposed sewerage rising main originates from the pumping station, and travels north along Pak Yan Road. At Ma Wan Rural Committee Road, the rising mains and a gravity-dominated sewer pipes system takes over, still running along Pak Lam Road - the proposed pipes are outer diameter 400mm. The proposed pipe system will connect to the existing network and discharge into existing Ma Wan Sewage Treatment Works.

## 4.5 Water Supply and Utilities Impact Assessment

### Water Supply Impact Assessment

- 4.5.1 For the existing fresh water supply, existing Ma Wan No. 2 Fresh Water Service Reservoir (MW2FWSR) is identified at North of Ma Wan for the supply of developments at North of Ma Wan. For the fresh water demand of the proposed Development, it is estimated to be around 5,800m<sup>3</sup>/d. A new fresh water service reservoir – Ma Wan No. 3 Fresh Water Service Reservoir (MW3FWSR) is planned as an extension to the existing MW2FWSR together with new fresh water distribution main network to be constructed. MW2FWSR and MW3FWSR have sufficient capacity for the fresh water supply for the proposed Development. No upgrading works are required for the planned fresh water mains supplying the proposed Development. No adverse impact is envisaged.
- 4.5.2 For the existing flush water supply, existing private salt water supply system is identified at North-east side of Ma Wan while no existing nor planned salt water system is identified for the South of Ma Wan. For the flush water demand of the proposed Development, it is estimated to be around 2,191m<sup>3</sup>/d. New private direct feed saltwater pumping station with sufficient design capacity and pumping head is proposed to meet the future demand of flushing water for the Site and to be maintained and operated by Lot owner(s). Sea water intake culvert is required while new salt water distribution main network is proposed to supply flush water to proposed Development. No adverse impact is identified on the existing salt water supply system.

### Utilities Impact Assessment

- 4.5.3 The assessment aims to propose or divert the utilities to cater for future demand of the Site and avoid conflict with the proposed Development and infrastructural works.
- 4.5.4 For the electricity supply, existing substation shall be retained and a new substation serving the proposed Development is required to cater for the additional electric loading. China Light and Power Company (CLP) was liaised for the preliminary layout for of the new substation.
- 4.5.5 For the gas supply, Ma Wan currently adopts centralized Liquefied Petroleum Gas (LPG) supply system as their energy source. It is estimated that the existing Liquefied Petroleum Gas storage facility is capable to deal with the additional Liquefied Petroleum Gas demand due to development of the Site. DN180 pipe extension and lead-in of the existing Liquefied Petroleum Gas supply network are proposed.
- 4.5.6 For telecommunication services, three telecommunication providers are identified to provide telecommunications services in Ma Wan including Hong Kong Telecom (HKT), HGC Global Communication Limited (HGC), and Hong Kong Broadband Network Limited (HKBN). Preliminary agreement is carried out with abovementioned service providers on the possible connection point from their existing services network to the proposed Development.
- 4.5.7 No adverse impact is identified for the utilities to cater for future demand of the Site.

## 4.6 Geotechnical Assessment

### Natural Terrian Hazards

- 4.6.1 The proposed works and existing facilities are potentially affected by NTH including channelization debris flow (CDF), open hillslope failure (OHL) from hillside catchments along the western boundaries of the Site. Natural terrain hazard assessment has been carried out for the Site to determine the need for natural terrain hazard mitigation measures. Preferred mitigation measures include construction of concrete barrier and soil nails. It should, however, be noted that the result of the NTHS and relevant mitigation measures may be affected by the profile and extent of the proposed site formation works and the proposed formation level.

### Geotechnical Assessments

- 4.6.2 The Site is transverse by faults and /or Rockhead depression trending generally in the NW-SE and NNW-SSE, where preferential weathering may occur. Highly undulating/ deep / steeply inclined rockhead may be present near the faults / Rockhead depression, which may cause difficulties in the construction and excavation of end-bearing piles and increase the risks on issues of long pile, “rock cliff” and pile verticality. Corestones which are also commonly found around fault may cause excavation difficulties for replacement piles or result in early refusal for displacement piles. Highly fractured rocks which also frequently observed along fault / Rockhead s may induce pile bell-out instability and construction difficulties.
- 4.6.3 Besides, extensive areas of the Ma Wan South development are anticipated to be underlain with soft compressible soils. The soft compressible soils need to be treated prior to disposal or re-used as the backfilling. Relevant measures with respect to possible consolidation issues include soil replacement/ground treatment. Further ground investigation (GI) will be required to investigate the extent, location, thickness and properties of the soft to firm cohesive materials and the location of faults.
- 4.6.4 Further to potential mitigation measures, new geotechnical features (slope and retaining walls) would be formed as results of the site formation works, especially at the area near the existing natural hillsides with higher elevation and sloping grounds.

#### **4.7 Site Formation Assessment**

##### Proposed Site Formation Works

- 4.7.1 The Site for housing development in Ma Wan South will be comprised five main zones with formation level ranging from 6mPD to 25mPD, retaining walls and slopes, proposed road network and drainage system are proposed. Retaining structures with retained height up to 8m are proposed at the south-western portion of the Site to support the level difference between the proposed housing development platforms and the existing platforms. Regarding the proposed FWSR, excavation materials should be reused on site and/or to coordinate with Ma Wan South residential site earthworks as far as applicable. Further reviews and updated on the site formation layout are required subject to the ground condition when further GI are available.
- 4.7.2 Based on the Slope Information System (SIS) provided by Geotechnical Engineering Office (GEO), there are 13 Nos. of registered man-made features identified within, or in the close proximity to the Development Site and the Works Boundary for Proposed Infrastructure. These man-made slope features potentially affect or to be affected by the site formation works, and are likely to be removed or modified during the site formation work.
- 4.7.3 With the layout from optimal scheme and associated infrastructure works, it is considered that the estimated volume of excavation is more than estimated volume of fill. Excavation and fill volume would reach around 260,000 and 240,000 cubic metre respectively. The excavated materials are mainly from Pak Nai Shan and will be reused on-site as far as possible or otherwise transported to concurrent projects and to public fill banks if the mentioned measures are not feasible.

##### Coastal Hazard Study

- 4.7.4 The coastal area of the Site is proposed to be filled up to 6 to 11mPD. Design scenario based on year 2100 sea level rise predictions presenting the most severe wave conditions was taken during preliminary formation level design. To prevent coastal flooding during extreme wave event, mitigation measures are suggested and to be considered during detail design stage such as wave wall, planter wall, buffer zone and flood gate. Besides, Management measures and emergency plan for the coastal areas should be provided.

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## **5 ENVIRONMENTAL ASSESSMENTS SUMMARY**

### **5.1 Environmental Review**

#### Air Quality

- 5.1.1 The major construction dust impact arising from the construction activities of the Project would be fugitive dust emissions during site formation due to site clearance, excavation, backfilling, handling and transport of spoils and wind erosion of exposed area. With the implementation of mitigation measures specified in the Air Pollution Control (Construction Dust) Regulation together with the recommended dust suppression measures, good site practices, no adverse dust impact at Air Sensitive Receivers (ASRs) would be anticipated.
- 5.1.2 For open road emissions during operation phase, with implementation of sufficient buffer distance as per requirement stated in the Chapter 9 of Hong Kong Planning Standards and Guidelines, adverse air quality impact due to vehicular emissions is not expected.
- 5.1.3 For potential odour impact arising from the proposed sewerage pumping station, given the sewerage pumping station are to be equipped with appropriate odour control measures, no adverse odour impact on the proposed development or existing Air Sensitive Receivers is expected.

#### Noise Impact

- 5.1.4 Construction noise impact on the existing Noise Sensitive Receivers (NSRs) within 300m from the proposed works would be expected from the use of Powered Mechanical Equipment (PME) during site formation and excavation works, foundation works, construction of infrastructure etc.
- 5.1.5 Noise control requirements stipulated in Recommended Pollution Control Clauses for Construction Contracts and the recommended mitigation measures should be adopted as appropriate to ensure compliance of relevant noise criteria under the Noise Control Ordinance. A construction noise management plan, covering the identification of noise source inventory and assessment of the effectiveness construction noise mitigation measures, should be prepared by the Contractor before the commencement of construction works.
- 5.1.6 Operational road traffic noise impacts from the existing and proposed road network on the proposed Development and from the proposed access road on the existing noise sensitive receivers (NSRs) have been assessed. The results indicated that the noise exceedance is due to Other Roads, no noise mitigation measure would therefore be required for the proposed access road. For the proposed Development, considering the site constraints on provision of direct noise measures on existing major noise source, at-receiver mitigation measures including incorporation of blank facades / non-noise sensitive façade into the building block design and provision and acoustic windows have been recommended to mitigate for the adverse traffic noise impacts.
- 5.1.7 Subject to the EIA study of the planned Tsing Yi-Lantau Link, in case direct noise mitigation measures could not be provided at the planned road due to engineering constraints or as liaised with this Project, practicable at-receiver noise mitigation measures should be reviewed in the detailed design stage of the Project. The predicted overall traffic noise levels at all proposed NSRs would comply with the respective noise criteria with the recommended at-receiver mitigation measures in place. No adverse road traffic noise impact is anticipated.
- 5.1.8 Potential operational fixed plant noise impacts from the existing and planned fixed noise sources on the proposed Development have been evaluated. Since detailed design information and noise specification of proposed fixed plants have yet to be confirmed, the maximum permissible noise levels (SWL), taking into account cumulative noise levels from all planned fixed noise sources, were determined for future detailed design of the fixed plant

to ensure compliance with the relevant noise criteria. Provided that the planned fixed plants are properly designed to meet the maximum permissible SWL, no operational phase noise impacts would be anticipated.

- 5.1.9 Potential operational rail noise impacts on the proposed Development from railway tracks of Tung Chung Line (TCL) and Airport Express Line (AEL) located in the sheltered lower deck of Tsing Ma Bridge and Ma Wan Viaduct have been evaluated. Given that lower deck of Ma Wan Viaduct is fully enclosed within concrete structure, adverse rail noise impacts would not be anticipated from the rail along that section. The predicted equivalent rail noise levels from the rail along Tsing Ma Bridge at all representative NSRs would comply with the relevant daytime / evening and night-time noise criteria with the provision of the recommended mitigation measures. No adverse operational phase rail noise impacts would be anticipated.
- 5.1.10 Potential aircraft noise impacts on the proposed Development have been reviewed. The predicted NEF 25 contours of the 3RS would be all outside the proposed Development Site with more than 500m separation distance from the proposed residential uses and education institutions. Nonetheless, although not under the statutory requirements, consider that the proposed Development would be in vicinity of the existing and planned flight paths of the HKIA, the use of acoustic insulation in form of well-gasketed window should be considered for the proposed residential development to enhance the indoor living environment. As such, no adverse aircraft noise impacts would be anticipated.
- 5.1.11 Potential helicopter noise impacts on the proposed Development from the operation of helicopters of Government Flying Service and Hong Kong Business Aviation Centre operating into and out of Hong Kong International Airport routing potentially through areas / in the vicinity of the Development have been reviewed. Consider that sufficient setback distance for achieving the Lmax 85 dB(A) helicopter noise criterion (i.e. 130m) is allowed, adverse helicopter noise impacts would not be anticipated.

#### Water Quality

- 5.1.12 Water quality impacts from construction are associated with wastewater generated from general construction activities, construction site run-off, construction works in close proximity of inland waters, potential diversion / rerouting of watercourse, accidental spillage of chemicals and potential contamination of surface water and groundwater, and sewage from construction workforce. Impacts can be controlled by implementing the recommended mitigation measures. As such, no adverse water quality impact during construction phase would be anticipated.
- 5.1.13 During operational phase, all sewage effluent generated from the Development will be discharged to proposed SPS and diverted to existing Ma Wan Sewage Treatment Works for treatment. With provision of adequate sewerage and sewage pumping facilities for the Development, adverse water quality impact is not anticipated.
- 5.1.14 The key potential sources of water quality impacts during operational phase would be related to the non-point source surface run-off from the Development Site and emergency sewage bypass of the proposed Sewerage pumping station. It is anticipated that the water quality impacts associated with the non-point source pollution could be minimised / avoided by appropriate mitigation measures such as adequate storm drainage system and best storm water management practices. With the incorporation of the recommended precautionary measures, emergency discharge of sewage would be prevented to the maximum practicable extent and the potential impact would be short-term in the unlikely event that an emergency discharge does occur. No unacceptable water quality impact would be expected during the operational phase of the Project.

#### Waste Management

- 5.1.15 During construction phase, waste types generated from the Project are likely to include inert and non-inert Construction and Demolition (C&D) materials from construction and

excavation works, chemical wastes from the maintenance of construction works and vehicles, and general refuse from the workforce. Subject to the detailed design at a later stage of the Project, excavated sediment may be generated during excavation works. Provided that these wastes are handled, transported and disposed of according to the recommended good site practices and mitigation measures, no adverse environmental impacts would be anticipated during the construction phase.

- 5.1.16 The main waste type to be generated during operational phase of the Project will be municipal solid waste (domestic waste). Limited amount of chemical waste from maintenance activities of the residential buildings or associated infrastructure of the proposed Development, as well as screenings from the proposed sewage pumping station would also be generated. With the implementation of the recommended good waste management practices for handling, transportation and disposal of waste, adverse environmental impacts would not be anticipated during operational phase.

#### Land Contamination

- 5.1.17 A site appraisal, in the form of desktop review and site walkover, had been carried out from March to October 2022 to identify the past and current land uses within the Site. Based on the site appraisal, no historical / current potentially contaminating land uses / activities were identified within the Site. No adverse land contamination impact to the proposed development under the Project is anticipated. As such, no mitigation measures for land contamination are considered necessary.

#### Terrestrial Ecology

- 5.1.18 The proposed Development Site and its associated works boundary (i.e. collectively referred to as the Site) are located in the southern part of Ma Wan, where it is separated by Lantau Link from the extensive urban development in the north. The Site was largely covered by developed area/wasteland and shrubland habitat. Small area of mixed woodland and a small watercourse were also found present within the Site. No site of conservation importance was identified within the Site.
- 5.1.19 The flora species of conservation importance, Small Persimmon, was recorded within the Site. If the Small Persimmon would unavoidably be directly impacted, transplantation of the floral species of conservation importance should be duly considered.
- 5.1.20 The existing condition of other habitats identified within the Site and in the assessment area are largely modified and highly influenced by nearby development and human activities, as such their ecological values were found to be low and low to moderate. The fauna and flora communities which these habitats were found to support are mostly made up of species that are commonly and/or very commonly found in urban landscape and/or disturbed environment and were mostly of low diversity and abundance. As such, predicted direct and indirect ecological impacts on these habitats and associated vegetation and wildlife are considered to be low.
- 5.1.21 With the adoption of recommended mitigation measures and precautionary measure, the residual ecological impacts from the Project are expected to be low.

#### Fisheries Impact

- 5.1.22 A review was carried out for fisheries resources and baseline information identified within the 500 m assessment area for the Project, assessed and evaluated the potential fisheries impacts that may result from the proposed private housing development in Ma Wan South.
- 5.1.23 Given that there no marine works is proposed under the Project, no direct impact is anticipated. Indirect fisheries impact, in terms of water quality deterioration from construction runoff during construction phase and emergency discharge from the proposed SPS during operational phase, is anticipated to occur. Though water quality deterioration resulting from these events are expected to be temporary and/or of minor scale with the implementation of

the proposed water quality protection and mitigation measures, no unacceptable fisheries impact is anticipated.

#### Cultural Heritage

- 5.1.24 No built heritage resource is located within the proposed Development Site or the proposed infrastructure works area.
- 5.1.25 Ma Wan kiln Site with Archaeological Interest is located approximately 270m and 220m away from the proposed Development Site and the proposed infrastructure works area respectively. No adverse impacts would be anticipated due to the substantial distance from the proposed works.
- 5.1.26 The excavation area in the Salvage Excavation in Sha Lau Tong Wan lies within the proposed Development Site. The excavation had unveiled artefacts from Neolithic period. However, the site and the area nearby have been heavily disrupted due to the sand mining works since the 1940s and the construction of Lantau Link.
- 5.1.27 As the original landscape within the proposed Development Site or proposed infrastructure works area have been heavily modified by urban development including Park Island development and Lantau Link, archaeological deposits (if any) would have been disturbed. Thus, archaeological impacts would not be anticipated during the construction phase. No mitigation measures would be required. As a precautionary measure, AMO should be informed immediately in case of discovery of antiquities or supposed antiquities in the course of works, so that appropriate mitigation measures, if needed, can be timely formulated for consideration of AMO and implemented to the satisfaction of AMO.

#### Hazard to Life

- 5.1.28 Based on Optimal Development Scheme, no uses which may involve dangerous goods or have potential risk impact to the population within Development site and its surrounding areas are identified. The Development site does not fall with the CZ of any PHI or would not impact the operation of the existing PHI, i.e. the estate LPG store operated by DSG Energy. No hazard to life issue would be envisaged during the construction and operation of the proposed Development.

#### Landscape and Visual

- 5.1.29 With the proposed measures implemented, the impact to landscape and visual quality shall be minimised. Further details shall refer to Section 5.5 – Landscape and Visual Impact Assessment in this Executive Summary.

## **5.2 Sustainability Assessment**

### Assessment Results

- 5.2.1 The findings suggest that the Development would not generate any significant impacts to the sustainability indicators. It should be noted that the CASET methodology has its limitations, as it is unable to capture the local impacts of the Development, and most indicators are territorial parameters. The local impacts were covered under respective sustainability aspects.
- 5.2.2 The key rationale of the Development is to provide a development scheme to satisfy the growing housing demand in Hong Kong. Findings point out that the Development would result in a wide range of social benefits to the community in terms of housing as well as society and social infrastructure. The Development might lead to small positive impact on physical/mental health, adequate housing, leisure and cultural activities, facilities and opportunities, and very small positive impact on living space, private rental, family solidarity and social cohesion.
- 5.2.3 Key benefit of the Development is the additional area of land to develop private residential house to ease the housing shortage issue in Hong Kong. The development also provides land sale revenue to the government.

### **5.3 Hazard Assessment**

#### Main Site

- 5.3.1 The Development do not fall within the consultation zone (CZ) of any potential hazardous installations (PHIs). The closest PHI, i.e. the estate LPG store operated by DSG Energy Ltd with 40 tonnes LPG storage capacity, is located at over 900m from the Development site. No LPG and natural gas (NG) facilities, including LPG terminals, LPG compounds with bulk tanks, LPG filling stations, NG pipelines, NG gasholders, are identified on Ma Wan. No hazard to life issue would be envisaged from the proposed Development due to operations of any LPG and NG facilities or PHI(s).

#### Ma Wan No.3 Freshwater Service Reservoir (MW3FWSR)

- 5.3.2 The planned Ma Wan No.3 Freshwater Service Reservoir is situated on a slope with the works areas at around +48 mPD, and located at around 100m south from the Liquefied petroleum gas store. Since the vertical distance between the Liquefied petroleum gas storage vessels and the planned Ma Wan No.3 Freshwater Service Reservoir is around 42m, while the worst-case flammable cloud height at 100m downwind from the liquefied petroleum gas store reduces to less than 40m, the flammable clouds could not reach the population group at the planned Ma Wan No.3 Freshwater Service Reservoir, and thus a Quantitative Risk Assessment is considered not necessary. No adverse hazard to life implications would be anticipated from the potential works at Ma Wan No.3 Freshwater Service Reservoir.

## 5.4 Air Ventilation Assessment

### Baseline Scenario (Existing Condition)

- 5.4.1 The annual and summer prevailing winds were studied. According to the RAMS wind data, ENE, E, and ESE winds were identified as the annual prevailing wind directions while E, ESE, SSE, S, and SSW winds are identified as the summer prevailing wind directions. The ventilation performance of the wind influencing zone under the above wind directions were assessed.
- 5.4.2 With a gross area of 12.8 hectares (ha), the major portion of the Site is currently zoned as “Other Specified Use” annotated “Recreation and Tourism Related Uses”, and the remaining portion is zoned as “Green Belt” according to the approved Ma Wan Outline Zoning Plan (OZP) (No. S/I-MWI/14). There are no developments locate within the Site currently. Western portion of the Site is occupied by the hilly features, whereas eastern portion of the Site is low-lying woodlands. No air ventilation problem is anticipated under Baseline Scenario.

### Proposed Scenario

- 5.4.3 The proposed scenario comprises 21 residential blocks with 75 to 105mPD appx., 1 non-domestic block, as well as a substation. The good design features mentioned in Section 5 for improving the air ventilation performance include:
- Podium-free design;
  - Setback from the waterfront as promenade;
  - Large local open space in the central portion;
  - Maintain building separations of more than 15m between groups of 2 or 3 high-rise buildings; and
  - Stepped building height profile with lower buildings at waterfront sites while higher buildings at inland
- 5.4.4 The proposed developments would inevitably impact the ventilation performance to the nearby surroundings, a slight impact on air ventilation performance of the proposed scheme as compared with the baseline scheme is expected, especially under summer wind condition. However, the building gaps reserved allow the incoming wind to penetrate through the Site. In general, no significant air ventilation impacts would be caused by the proposed developments, the wind influencing zone would not adversely affecting the surroundings.

### Recommendations

- 5.4.5 Besides the good design features mentioned, the following mitigation measures should be considered at the detailed design stage:
- Maximize the size and clearance of empty bay at-grade;
  - Minimize the building height at waterfront site at the southern portion of the Development Site;
  - Adopt podium-free design for the whole site.
  - Reserve a wider building gap between the northern building blocks to increase the effectiveness of the penetration of SSW to SSE winds;
  - Maximize the building separations between the western building blocks to create air path for SSW wind flowing towards the central portion of the Development Site.
  - Building Permeability (refer to “P” in the PNAP APP-152 Sustainable Building Design Guideline): building gaps of more than 15m is proposed to avoid long continuous projected facade and to maintain the effectiveness of the building gaps under several prevailing wind directions;
  - Greening coverage and building setback with reference to PNAP APP-152;



- Alternative approach (such as acoustic window and/ or acoustic balcony) in resolving noise issue to reduce extent of noise barriers (if required) for more effective air paths; and
- Reference could also be made to recommendations of design measures in the Hong Kong Planning Standards and Guidelines.
- The recommendation in allowing building gaps of more than 15m in two major directions are suggested to be included in statutory documents for the Development. Nevertheless, other than above recommendations and guidelines, details of further development restrictions to enhance air ventilation shall refer to relevant department(s)' decision in preparation of land tender and zoning.

#### Way Forward

- 5.4.6 Based on expert assessment, the proposed private housing development at the Site would inevitably have localized impacts within the Development Site and on the downstream pedestrian wind environment.

## 5.5 Landscape and Visual Impact Assessment

### Landscape Impact Assessment

- 5.5.1 Based on the tree and vegetation survey result, it is estimated there are approximately 2,794 numbers of existing trees found on site and will be potentially affected under site formation works. They are generally in poor to fair form and low to medium amenity value. No Old and Valuable Trees (OVTs) or Trees of Particular Interest (TPI) are identified within the Assessment Area.
- 5.5.2 Approximately 2,739 nos. of trees (which includes 1,215 nos. of undesirable species trees *Leucaena leucocephala*) are proposed to be removed. 1,524 nos. of trees are proposed to be compensated.

### Visual Impact Assessment

- 5.5.3 Within the Visual Envelope of the proposed development, most of them are coastal areas of the surrounding islands of Ma Wan. The major visual resource and landmark within the Visual Envelope is the spectacular Tsing Ma Bridge and the harbour. Ma Wan Park and Noah's Ark Hong Kong Theme Park are the major recreational spots within the Visual Envelope of the proposed development. Other visual resources are mainly landscape resources including hillside woodland, Ma Wan Tung Beach, harbour at Nam Wan, Lung Ha Wan, Kung Tsai Wan, Ma Wan Channel and Tam Shui Wan and coastal lowland shrubland.
- 5.5.4 7 public viewpoints (VPs) are identified to evaluate the visual impact of the proposed development including Ma Wan Tung Wan Beach (VP1), Fa Peng Teng (VP2), Lantau Link Viewing Platform (VP3), Sham Tseng (VP4), Tai Leng Tau (VP5), Shek Wan (VP6) and Ma Wan Public Pier (VP7). The visual change caused by the Proposed Development is not significant when viewed from the identified VPs. The visual impact of VP1 is graded as moderately to significantly adverse; VP2 is graded as slightly to moderately adverse; VP3 is graded as moderately adverse; and VP4 is graded as slightly adverse. The visual impact of VP5 is graded as significantly adverse; VP6 is graded as slightly to moderately adverse; and VP7 is graded as slightly to moderately adverse.
- 5.5.5 Design consideration should be adopted during the design stage before construction in order to minimize footprint of landscape and visual impact by refining project design where possible. Suggestions are provided as below:
- Buffer areas should be considered during design stage, in order to avoid visual impact due to hard edge of proposed structures, and allow sufficient space for provision of landscape and visual mitigations such as screen and amenity planting etc; and
  - Coherent design of structures and materials should be considered, which helps to coordinate façade of built form with the surroundings in harmony through proper choice of colour scheme (e.g. Beige/ light brown) which would help to recess and harmonize with the adjoining environment. The buildings should be look as much compatible to the Lantau Link as possible; and
  - Building deployment and massing control shall aim to minimize the adverse impact to the overall permeability, ventilation, sunlight penetration and views of the area as possible; and
  - Sufficient open space would allow incorporation of range of facilities in the future, which could accommodate leisure activities, active and/or passive recreation use for the population. Quality open space will be incorporated in proportion to the target population for each Housing Development Site. The project proponent will ensure their target open space area for the Project is provided with adequate greening. There would be a minimum of 20% green coverage within the housing sites and that landscape opportunities would be maximised where possible.

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## **6 DEVELOPMENT IMPLEMENTATION CONSIDERATIONS**

### **6.1 Implementation Strategy, Development Programme**

#### Implementation Strategy for the Optimal Scheme

- 6.1.1 Apart from construction of the new Fresh Water Service Reservoir MW3FWSR and the associated watermains from reservoir to Pak Lam Road, the infrastructure is proposed to be constructed mainly by the private developer under the Optimal Scheme, including roadworks, site formation and pumping stations.
- 6.1.2 The proposed infrastructure works are located within government lot or private lot on which government has the right for utility laying. No resumption of private land is anticipated.
- 6.1.3 As the Site will be developed by a single Developer, the proposed infrastructure works is recommended to be carried out by a single contract. Multi-contract is not recommended to avoid non-necessary contract interfaces.

#### Development Programme

- 6.1.4 Major activities are identified for the infrastructure implementations. Details of the programme are subjected to refinement by the relevant B/Ds and the private development after the land is granted. The implementation program of the Site is subject to review; hence the first intake year of the private development is yet to be affirmative. Nevertheless, in view of the size of the development, additional three years is allowed to reach full population intake after the first population intake.
- 6.1.5 The critical path is identified as rezoning exercise, followed by construction works by private development for first population intake. For full population intake, as essential infrastructure is completed, the critical path shall be on remaining residential tower building and ancillary works.

## 6.2 Land Requirement

### Existing Land Use

- 6.2.1 In terms of land use zoning, major portion of the site currently zoned as “Other Specified Use” annotated “recreation and tourism related uses” while the remaining portion is zoned as “Green Belt” on the approved Ma Wan Outline Zoning Plan (OZP) and is proposed for private housing development.
- 6.2.2 Lot Index Plan was obtained from Land Information Centre (LIC) of Lands Department. One government land allocation and one temporary license land are identified within the proposed CLP substation and its associated access roads. Majority of the Site including infrastructure are identified as vacant government site within the site boundary of this project.

### Affected land area

- 6.2.3 The Development Site is located entirely within government land including the Main site for private housing development, proposed CLP substation and proposed new freshwater service reservoir by Water Supplies Department. However, the Short Term Tenancy and government allocated land may have to be partially terminated /terminated to ensure the government lands are acquired.
- 6.2.4 Based on the current works area boundary, Ma Wan Lot 392 (Lot 392) is identified to be potentially affected by the proposed development. The proposed utilities including sewage rising main and watermain shall pass through portion of Lot 392 Pink area and portion of Lot 392 Brown Area. Junction widening is also proposed to be within portion of Brown area of Lot 392.
- 6.2.5 This said Brown area will serve as permanent public vehicular access to Ma Wan South Development. Besides, road improvement is proposed in this area including junction widening works. Moreover, public utilities including sewage rising main and watermain will pass through the Brown area. Potential redelivery of a partial colored area of the private lot has been proposed.

### Effect on manmade features

- 6.2.6 Based on the information from CEDD slope information system, 13 Nos. of registered geotechnical features that may affect or be affected by the proposed developments in the site, or in their failure could affect lives and property within the site have been identified.
- 6.2.7 A pavilion and associated resting facilities maintained by Home Affairs Department is identified and would be demolished as a result of the development.
- 6.2.8 Permitted burial ground is identified in the land status plan at the southwestern side near the site. Based on site preliminary topographic survey, clearance of graves is not anticipated as they are located outside of the development boundary with considerable distances. Further detailed grave and urns survey shall be carried out with potential requirement of vegetation clearance.
- 6.2.9 Section of existing roads and roadside footpath will be permanently closed while the roads and footpath are re-directed to suit proposed road. Existing hiking trail is identified within the site. Section of the existing hiking trail would be cleared as a result of the development and new hiking trail would be re-provided within working boundary.

### 6.3 Rezoning

#### Rezoning Proposal

- 6.3.1 The Development Site, located in the south of Ma Wan Island, is considered suitable for medium-density private housing development. Under the approved Ma Wan OZP No. S/I-MW/14, the Site is currently zoned “OU(Recreation and Tourism Related Uses)”, and “Green Belt” which are intended for low-rise and low-density recreation (tourism) related development and the conservation of existing natural environment respectively. To realize the proposed private housing development, the Site is proposed to rezone to “Residential (Group B) (“R(B)”) with the intention for medium density housing development. To support the future and existing communities, supporting uses including commercial uses, kindergarten, social welfare facilities, and PTI etc, shall be permitted to support the private housing development as ancillary facilities. Two associated small pieces of site is proposed to rezone to “G/IC” with the intention for accommodating some essential infrastructure facilities.
- 6.3.2 Considering the proposed housing development will be implemented by a private developer(s), controls on GFA and building height are proposed to be incorporated to the Site to ensure the future development will not create adverse impact to surrounding area in Ma Wan. A maximum accountable domestic GFA of 320,400 sqm and a maximum accountable non-domestic GFA of 4,400 sqm are proposed to accommodate the needs of the future population. The development of the Development Scheme also takes into account the building height profile of the existing and planning development in the surrounding. Surrounding developments varying from +60 mPD of the deck level of Tsing Ma Bridge to the restriction on Park island’s development at 105mPD, with the highest locating in the north of the Island. The Optimal scheme and Development Scheme 2-4 have demonstrated that a building height of not more than 105mPD can be maintained to achieve a compatible building height profile with the surrounding. However, one building height restriction at 105mPD instead of having different height restriction bands is recommended for the whole site in the OZP to allow for development flexibility subjected to final decision by government authority for rezoning exercise and land sale conditions.
- 6.3.3 The Site is also subjected to air ventilation, odour and noise impact from the existing development. As a mitigation measure to minimize potential roadside air impact, all air sensitive buildings should maintain a minimum 20m setback from Tsing Ma Bridge. To ensure the potential noise impact from Tsing Ma Bridge were well mitigated, single aspect domestic footprint design might be adopted, building separations shall be well-maintained to enable the wind flows in consideration of prevailing wind directions. As for the potential wind corridors and noise impact, consider the extent of the site area, further planning controls would limit the design flexibility for the future developers. It may be more appropriate to incorporate these constraints as part of the lease conditions to allow flexibility to the future developers to overcome through other innovative designs.

#### Rezoning Items

- 6.3.4 To take forward the proposed private housing development, The following proposed amendments to the Ma Wan OZP are proposed:
- Rezoning of a site from “Other Specified Uses (Recreation and Tourism Related Uses) (“OU (Recreation And Tourism Related Uses)”, “Green Belt” (“GB”) to “Residential (Group B) (“R(B)”);
  - Rezoning two sites from OU (Recreation and Tourism Related Uses)” to “Government, Institution or Community” (“G/IC”) to facilitate the provision of the proposed sewerage pumping station and the proposed salt water pumping station for the proposed private housing development at Ma Wan south;
  - Rezoning two sites from “GB” to “G/IC”;

- Rezoning three sites from “OU (Recreation and Tourism Related Uses)” to “Open Space” (“O”);
- Rezoning one site from “OU (Recreation and Tourism Related Uses)” to “OU (Public Transport Terminus, Commercial and Community Facilities)”;
- With the proposed rezoning of a major part of the current “OU (Recreation and Tourism Related Uses) site at the southern part of Ma Wan Island to facilitate the proposed private housing development, the remaining part of this “OU (Recreation and Tourism Related Uses) site is proposed to be rezoned to “Green Belt” (“GB”) taking into consideration its steep topography and vegetation state; and
- Rezoning a site from “GB” to “G/IC” to facilitate a proposed new fresh water reservoir to be constructed by WSD.

## **7 ALTERNATIVE SCHEMES**

### **7.1 Alternative Schemes**

7.1.1 Further to Scheme 1 denoted as the Optimal Scheme as discussed, Scheme 2-4 as alternative development options were proposed. The alternative schemes are formed based on mentioned design parameters and provide an option for sub-division of the Site into 2, 3 and 4 residential lots.

7.1.2 The proposed Development Schemes 2 to 4 aimed to produce the same number of residential units (i.e. 5,340 units) as the Optimal Scheme. To maintain 5,340 residential units for all the schemes, the overall plot ratio for Development Schemes 2 to 4 will be 4.0 which is higher than the Plot Ratio 3.6 of Optimal Scheme. The higher plot ratio of Development Schemes 2-4 is resulted from their smaller net site area after sub-division of the site into two to four residential lots.

### **7.2 Technical Feasibility**

7.2.1 To support the development options under Alternative Scheme 2-4, technical aspects are to be considered to investigate if any pitfalls due to the alternative schemes as compared with Optimal Scheme and to recommend solutions accordingly.

7.2.2 The Public Transport Interchange is assumed with passenger access from the south-eastern corner and on the western side. In view of the distance of about 560m from the southeastern corner of the site to the proposed Public Transport Interchange located at the Joint-user complex and the slightly sloped pedestrian footpath of the said route, one bus stop for each bound shall be provided near the central cul-de-sac.

7.2.3 For Scheme 2-4, the flushing water supply for Development would be relying on the newly proposed saltwater pumping station at Ma Wan South. To uphold the government water supply resiliency under Scheme 2-4, there is a need to propose a contingency mechanism of salt water supply to minimize the impact of any system failure of the proposed salt water intake station at Ma Wan South.

7.2.4 Given the same overall site boundary and same population, no significant adverse impacts will be envisaged for other technical aspects including stormwater drainage, sewerage, fresh water supply, utilities, geotechnical, environmental and air ventilation and landscape.

### **7.3 Implementation Strategy**

7.3.1 Various aspects including technical considerations, funding arrangement, development programme and sustainability etc. were considered for infrastructure implementation strategy. More importantly, the considerations for infrastructure implementation strategy highly depend on the Development Schemes. Generally, government involvement will be higher if the Site is divided into multiple lots while private developer will be involved more in infrastructure implementation on the contrary.

7.3.2 There are options with more government involvement in infrastructure implementation. While in options with less government involvement, as less administrative procedures are involved and limited Government fund shall be allocated, an earlier land sale date may be achieved. Before putting up the Site for land sales, site clearance is required. Time required for site clearance shall be subject to actual site conditions, including findings from further detailed grave and urns survey.

7.3.3 The same rezoning exercise shall enable all infrastructure implementation strategy and development option including Scheme 1 to 4. The proposed public road suiting different development options will be zoned under residential use same as adjacent land lot(s).



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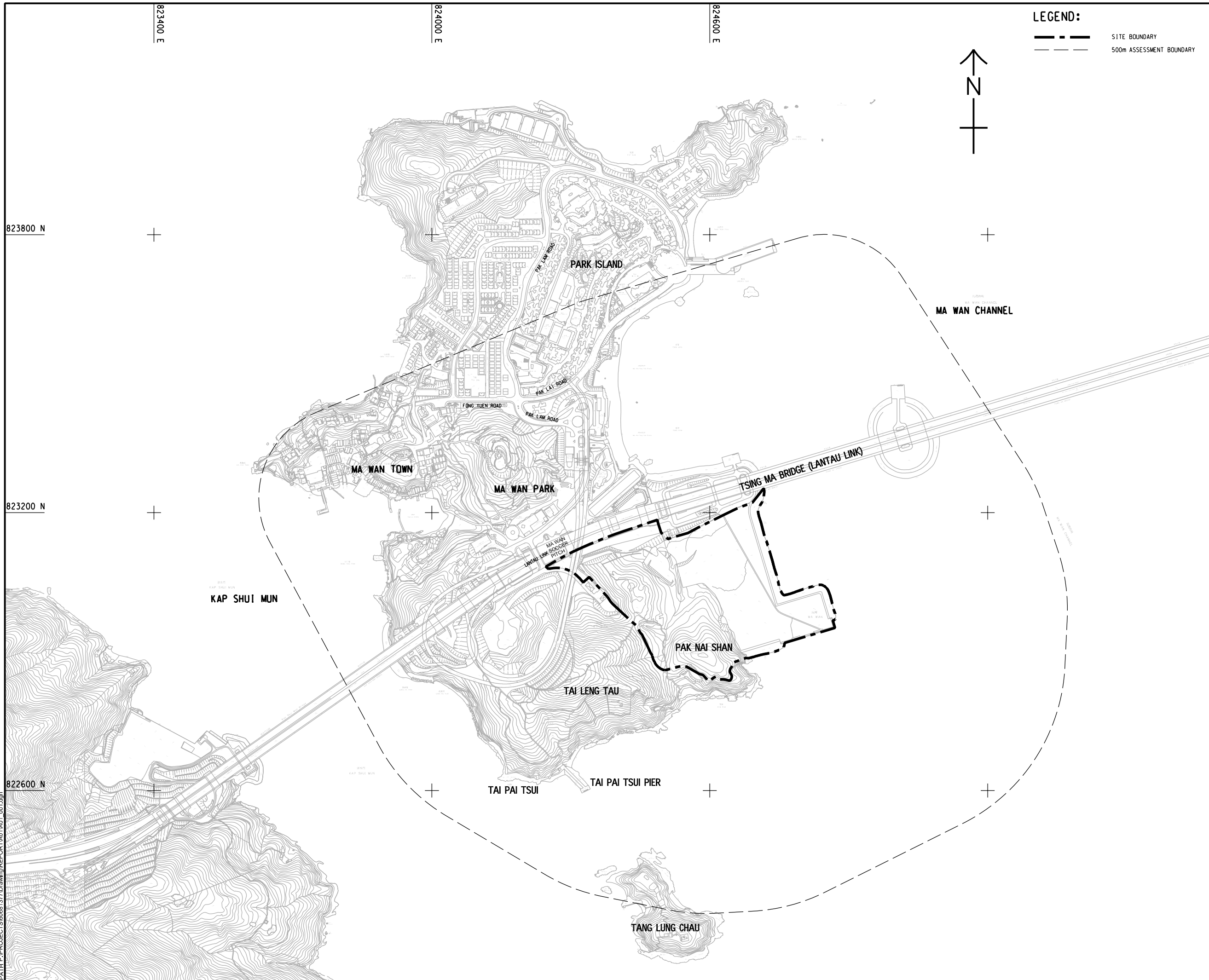
## **8 CONCLUSION AND WAY FORWARD**

- 8.1.1 Based on the Optimal Scheme, this Executive Summary summarizes the findings of relevant technical assessments for the Development in terms of infrastructures, utilities, geotechnical, site formation, environmental, landscape, visual, cost estimation and operation and maintenance requirements.
- 8.1.2 With the proposed infrastructure and mitigation measures implemented according to development programme and appropriate implementation strategy, the site is deemed feasible for the proposed used of medium-density private residential development housing around 14,000 people.
- 8.1.3 Alternative schemes for sub-division of land into sublots were studied. The development options in Optimal Scheme and in Alternative Schemes are considered feasible for government considerations in formulating onward development options.
- 8.1.4 Further procedures by respective government departments are required to enable the later stage of the development.

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# FIGURES

ISO A1 594mm x 841mm  
 Approved:  
 Checked:  
 Designer:  
 Project Management Initials:  
 11/12/2022  
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 Plot File by: Wuming.Zeng



**LEGEND:**  
 - - - - - SITE BOUNDARY  
 - - - - - 500m ASSESSMENT BOUNDARY



**PROJECT**  
 項目  
 PRIVATE HOUSING DEVELOPMENT IN MA WAN SOUTH - FEASIBILITY STUDY

**CLIENT**  
 業主  
 土木工程拓展署  
 Civil Engineering and Development Department

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 分庫土庫顧問公司

**ISSUE/REVISION**  
 修訂

I/R	DATE	DESCRIPTION	CHK.
修訂	日期	內容描述	核對

**STATUS**  
 階段

**SCALE**  
 比例  
 A3 1 : 7500

**DIMENSION UNIT**  
 尺寸單位  
 METRES

**KEY PLAN**  
 索引圖

**PROJECT NO.**  
 項目編號  
 60681377

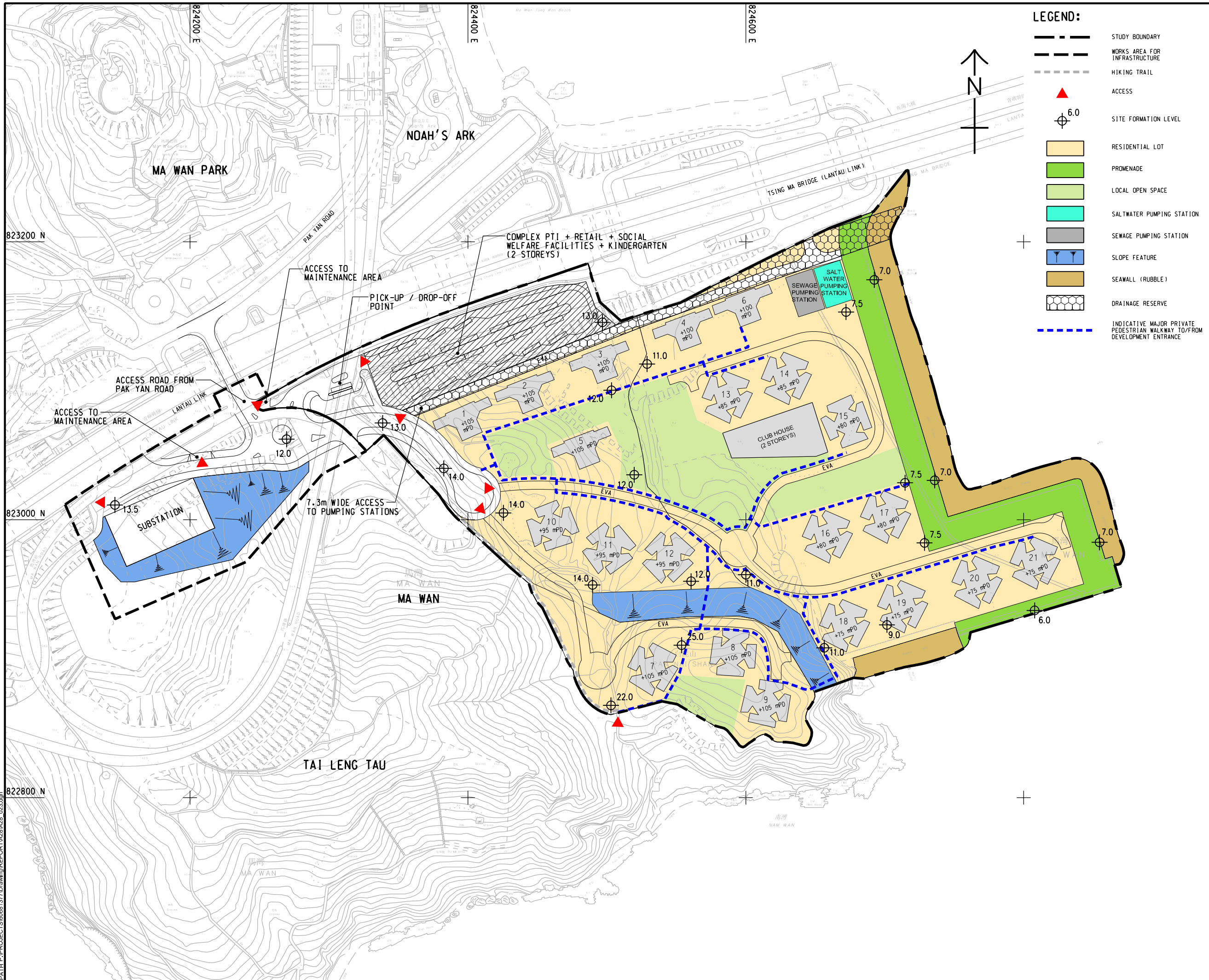
**AGREEMENT NO.**  
 協議編號  
 CE 50/2021 (CE)

**SHEET TITLE**  
 圖紙名稱  
 SITE LOCATION PLAN

**SHEET NUMBER**  
 圖紙編號  
 60681377/A24/001

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 PATH PROJECTS/0681377/Drawing/REPORT/A24/023.dwg



**LEGEND:**

- STUDY BOUNDARY
- WORKS AREA FOR INFRASTRUCTURE
- HIKING TRAIL
- ACCESS
- 6.0 SITE FORMATION LEVEL
- RESIDENTIAL LOT
- PROMENADE
- LOCAL OPEN SPACE
- SALT WATER PUMPING STATION
- SEWAGE PUMPING STATION
- SLOPE FEATURE
- SEAWALL (RUBBLE)
- DRAINAGE RESERVE
- INDICATIVE MAJOR PRIVATE PEDESTRIAN WALKWAY TO/FROM DEVELOPMENT ENTRANCE

**AECOM**

**PROJECT**  
 PRIVATE HOUSING DEVELOPMENT IN MA WAN SOUTH - FEASIBILITY STUDY

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**ISSUE/REVISION**

IR	DATE	DESCRIPTION	CHK.

**STATUS**

**SCALE**  
 A3 1 : 2500

**DIMENSION UNIT**  
 METRES

**KEY PLAN**  
 索引圖

<b>PROJECT NO.</b> 60681377	<b>AGREEMENT NO.</b> CE 50/2021 (CE)
<b>SHEET TITLE</b> OPTIMAL SCHEME	
<b>SHEET NUMBER</b> 60681377/A24/002	

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