Annex F

Revised Report of the Drainage and Sewerage Impact Assessment

Issue No. : Issue 4
Issue Date : May 2024
Project No. : 2039

DRAINAGE AND SEWERAGE IMPACT ASSESSMENT IN SUPPORT OF PRELIMINARY ENVIRONMENTAL ASSESSMENT

FOR

PROPOSED REZONING FROM "GOVERNMENT, INSTITUTION OR COMMUNITY" TO "RESIDENTIAL (GROUP B)6" ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B, AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

Prepared by

Allied Environmental Consultants Limited

COMMERCIAL-IN-CONFIDENCE

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Document Verification

Project Title	Proposed Rezoning from "Government, Institution or Community" to "Residential (Group B)6" Zone to Include Social Welfare Facilities (RCHE cum DCU only) and Public Vehicle Park (excluding container vehicle) at Lots Nos. 148 S.A RP (Part), 148 S.B RP (Part), 149 RP, 150 S.A, 150 S.B, and 151 in D.D. 206 and Adjoining Government Land, West of Wu Kai Sha Road, Ma On Shan, New Territories	**Project No.**	2039
Document Title	Drainage and Sewerage Impact Assessment		

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Issue 1	Feb 2023	1st Submission	Helen Siu	Cathy Man	Grace Kwok
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Table of Contents

List of Tables

List of Figures

List of Appendices

1 Introduction

1.1.1 Allied Environmental Consultants Limited ("AEC") has been appointed to conduct this drainage and sewerage impact assessment ("DSIA") for a proposed private residential development with residential care homes for the elderly ("RCHE") cum day care unit for the elderly ("DCU") and public vehicle park ("PVP") facilities under the S.12A of the Town Planning Ordinance, in west of Wu Kai Sha Road, Ma On Shan (hereafter called the "Proposed Development").

2 Relevant Government Standards

2.1.1 Water quality in Hong Kong is legislated by the provisions of the *Water Pollution Control Ordinance (Cap 358), 1980 ("WPCO")*. Territorial Water has been subdivided into ten Water Control Zones ("WCZ") and four supplementary water control zones. The study area lies within the Tolo Harbour and Channel Water WCZ. A Technical Memora ndum on Standards for Effluents discharged into Drainage and Sewerage Systems, Inland and Coastal Water (TM-DSS) has been issued, which requires licensing of all discharges into all public sewers and drains. The water quality standards will have to be met during the construction and operation stages.

2.1.2 With reference to Table 7 of the Technical Memorandum, as the Proposed Development is located within Tolo Harbour and Channel WCZ, the pollutant loading for effluents discharged into coastal waters of the respective WCZ shall be considered. The standards of effluents discharge of Biochemical Oxygen Demand (BOD) and Suspended Solids (SS) are extracted below.

Table 2-1 Standards for Effluents Discharge under TM

Load Type	Standards for effluents discharge (mg/L)	
	Flow rate <=1000 m3/day	**Flow rate >1000 m3/day and <=6000m3/day**
BODs	20	10
SS	30	15

2.1.3 Besides as stipulated in the *Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations 41(1), 40(2), 41(1), 90* and recap in ProPECC PN 1/23, domestic sewage should be discharged to a foul water sewer whilst commercial and industrial wastewater should be pretreated before being discharged to foul water sewer. Surface water should be discharged via rainwater pipes to stormwater drains during operational phase.

2.1.4 With reference to ProPECC PN 1/23 item (6), suitable treatment facilities may be required to be provided if trade waste may be discharged into any drain or sewer. Moreover, as stated in item (9) of the same Practice Note, the design of small sewage treatment plant should in general meet the requirements given in the "Guidelines for the Design of Small Sewage Treatment Plants" published by EPD. The recommendations in designing small sewage treatment plant shall be considered and followed.

2.1.5 Other relevant guidelines include:

- Water Pollution Control Ordinance (WPCO);
- Hong Kong Planning Standards and Guidelines issued by the Planning Department;
- Water Supplies Department (WSD) Water Quality Criteria;
- Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS);
- Practice Note for Professional Persons on Construction Site Drainage (ProPECC PN 2/23);
- Practice Note for Professional Persons on Drainage Plans subject to Comment by the Environmental Protection Department (ProPECC PN 1/23);
- Sewerage Manual (SM) and the Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (GESF); and
- Guidelines for the Design of Small Sewage Treatment Plants issued by EPD.

3 The Proposed Development

3.1.1 The Project Site is currently used as a temporary convenient vehicles' holding area. It covers a total land area of about 4,255m^2 in land area. The proponent intends to develop the Project Site into a private residential development with RCHE cum DE and PVP. Upon completion by 2027, the whole development yield a total of 184 residential units, 162 RCHE bed space, 40 DE places and 124 PVP space. The Project Site is currently zoned "Government, Institution or Community" ("G/IC") on the Approved Ma On Shan Outline Zoning Plan No. S/MOS/28 ("Approved OZP"). Location of the site and its surroundings are presented in ***Figure 3-1***.

3.1.2 The Proposed Development comprises 4 building blocks, i.e. two 16-storey residential blocks, one 2-storey Clubhouse and one 7-storey RCHE cum DE. All their blocks will be erected on top of 3 levels of basement carpark. The schematic layout plans of the Proposed Development are shown in ***Appendix 3-1***.

3.1.3 For the 2-storey clubhouse, active facilities (including children's play area, fitness room and gymnasium), passive facilities (including sitting area/ lounge and function room) and ancillary facilities (including clubhouse staff room and lavatories toilets) will be provided. No swimming pool nor restaurant/ canteen will be provided on site.

3.1.4 The Proposed Development will provide about 20% greenery area, i.e. achieve 20% required under the Hong Kong Planning Standards and Guidelines (HKPSG).

4 Sewerage Impact Assessment

4.1 Existing, Committed and Planned Sewerage Facilities

4.1.1 Drainage information was obtained from the GeoInfo Map services of the Lands Department and various Government Departments and site inspection was carried out in January 2024 to gather background information on sewerage infrastructure in the vicinity of the Project Site. One existing 250mm rising main (FRD4004761) and a pair of 200mm twin rising mains (FRD4003520 and FRD4003521) have been identified along Yiu Sha Road and Wu Kai Sha Road to the east of Project Site.

4.1.2 Under contract number DC/2019/13 "Tolo Harbour Sewerage of Unsewered Areas, Stage 2 Phase 2", a new sewage pumping station in connection with about 300m twin rising mains will be constructed at Cheung Kang to serve sewage flow from the currently unsewered Cheung

Kang Village. With reference to the information provided by DSD, the design capacity of Cheung Kang Sewage Pumping Station ("CKSPS") will be 113 m^3/day. A layout plan and relevant information of the planned sewerage system are shown in ***Appendix 4-1***. ***Figure 4-1*** illustrates an overview of the existing and planned sewerage system in the vicinity of the Project Site.

4.1.3 The planned sewerage system running from west to east along Cheung Kang area will contain a series of 200mm diameter gravity sewers to collecting sewage from Cheung Kang Village and to discharge them into CKSPS; and a rising main conveying sewage from CKSPS to Wu Kai Sha Sewage Pumping Station. Wu Kai Sha Sewerage Pumping Station collects sewage generated from the CKSPS and Wu Kai Sha Village then eventually diverts to the Sha Tin Sewerage Treatment Works ("STSTW").

4.1.4 The estimated sewage generated from Proposed Development is expected to have an average dry whether flow beyond design capacity of CKSPS, thus the capacity of CKSPS is not sufficient to cater for the sewage flow from the Proposed Development. In addition, in view of the schedule of CKSPS having a risk to fall behind the programme of the Proposed Development, connection to the CKSPS is considered not feasible. It is necessary to consider the provision of STP as an interim measure to handle sewage generated from the Proposed Development before the availability of public sewerage for connection, interim arrangement will be considered and discussed in later sections. It is considered to be the most effective and reliable way to dispose the on-site sewage.

4.1.5 The decommissioning of on-site STP to be determined at later stage. Separate SIA shall be submitted for approval when decommissioning of the interim on-site STP is proposed to assess the potential sewerage impact on the existing public sewerage system at that time.

4.2 Assessment Methodology

4.2.1 Sewage generation is calculated with reference to the Environmental Protection Department Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning ("GESF") and DSD Sewerage Manual Part 1. The global unit flow factors ("UFF") for different domestic flows are shown in ***Table 4-1*** and have been adopted in the calculation. Peaking factors (including stormwater allowance) have also been extracted from the GESF.

Table 4-1 Global Unit Flow Factors

Residents / Job types	Global Unit Flow Factors (m^3/persons/d)
Domestic Flow: Private R2 (for Residential Tower)	0.270
Domestic Flow: Institutional and special class (for RCHE)	0.190
Domestic Flow: Temporary & non-domestic (for DE)	0.150
Commercial Flow: Staffs in Clubhouse, RCHE, DE, PVP and securities Commercial Employee + Personal Services - J11	0.280

4.3 Populations and Sewerage Flows

4.3.1 The sewage to be generated by the Proposed Development including the residents from residential towers and RCHE; the staffs working in the clubhouse, RCHE, DE, PVP and securities. The total resident units to be provided by the Proposed Development will be 184, 162 bed spaces are proposed in RCHE, 40 places are proposed in DE, and the estimated number of staffs for the proposed clubhouse, RCHE cum DE, PVP and security will be 17, 95, 3 and 3 respectively.

4.3.2 The design capacity of the on-site STP to cater for the discharge generated from the Proposed Development is calculated in this SIA.

4.3.3 For population estimation, residential density is referred to the "2021 Population Census – Household Characteristics of Population" issued by the Census and Statistics Department. An average household size of 2.9 persons is deployed for Tertiary Planning Units (741 – 744 and 757) for estimating residential population in the vicinity. With regard to the staffs in clubhouse and RCHE, the number of staffs is estimated with reference to the Commercial and Industrial Floor Space Utilization Survey (CIFSUS) issued by the Planning Department. Worker density of 3.3 persons per 100m^2 GFA is assumed for Community, Social & Personal Services (All Types) in Table 8 of the Survey. The number of staff in PVP and securities is estimated with reference to submitted information.

4.4 Sewage from Proposed Development

4.4.1 Toilet flushing and kitchen wastewater are the major sewage arising from the Proposed Development. All sewage will be collected and discharged through internal foul sewers and connected to the proposed on-site sewage treatment plant (STP) at southeast of the Project Site. The drainage plan of the Proposed Development is given in ***Appendix 4-2***. The location of the proposed STP is illustrated in ***Figure 4-1***.

4.4.2 The peak flow rate from the Proposed Development and catchments is estimated in accordance with the GESF. The detailed calculation is shown in ***Appendix 4-3***. The ADWF generated from the Proposed Development is 213.7 m^3/day. The daily peak sewage to be generated by the residential towers, RCHE and clubhouse is estimated to be 0.02 m^3/s.

4.5 Proposed On-site Sewage Treatment Plant

4.5.1 "Guidelines for the Design of Small Sewage Treatment Plants" (The STP Guidelines) and WPCO should be followed in designing the on-site STP in the later detail design stage. The exact treatment process would be subject to later detailed design. It will be necessary for the STP to achieve adequate treatment capacity and the necessary discharge standards, as set out in EPD's TM-DSS.

4.5.2 With reference to clause 2.1.2 of Annex 6 of the Technical Memorandum on Environmental Impact Assessment Process, the acceptable sewage treatment level for Tolo Harbour and Channel Water WCZ is given in ***Table 4-2***. The proposed STP will be designed to meet the acceptable treatment levels. Detailed design of the proposed STP is not yet available subject to feasibility investigation and water quality assessment. Tentatively, the proposed STP will be provided with Membrane Bioreactor (MBR) technology with ultra-filtration to achieve the acceptable sewage treatment level, with following conditions:

- For nitrogen removal, the target is 75% total inorganic nitrogen reduction with respect to the annual average influent nitrogen loads or concentrations;
- For phosphorus removal, the target is 80% phosphorus reduction with respect to the annual average influent phosphorus loads or concentrations; and
- Disinfection may not be required if membrane filtration is provided which can meet the relevant discharge standards for bacteria.

Table 4-2 Acceptable Sewage Treatment Level of Water Control Zone

Water Control Zone/ Waters Receiving the discharge	Acceptable Sewage Treatment Level
Tolo Harbour and Channel, Deep bay	Secondary treatment, nitrogen removal, phosphorus removal, and disinfection
Other Water Control Zones	Secondary treatment, nitrogen removal, and disinfection

4.5.3 The capacity of the STP shall be designed to cater for the design flow rate from the Proposed Development, the design flow factor of 3 times of the ADWF is adopted for the Proposed

Development, with provision of equalization tank. Two duty and one standby pumps will be provided in equalization tanks as far as practicable to limit the flow through the treatment units to within 1.5 times the daily average flow rate during off-peak periods.

4.5.4 The STP will be constructed to cater for the design peak flow of 641 m^3/d, with the provision of an equalization tank. The calculation is given in ***Table 4-3*** and ***Appendix 4-3***.

Table 4-3 Estimation of the Required Volume for the Sewage Treatment Plant

Average Dry Weather Flow (ADWF) (m^3/day)	ADWF factor [1]	Design Peak Flow Rate from Proposed Development (m^3/day)
213.7	3	641

[1] The design peak flow factor is reference from EPD's '"Guidelines for the Design of Small Sewage Treatment Plants". For the Proposed Development, 3 times Average Dry Weather Flow (ADWF) has been adopted, with equalization tank provided to equalize excess flow.

4.5.5 Sludge storage tank with deodorization facilities will be provided in the STP. The sludge after having been dewatered and thickened will be tankered away to the landfill for disposal, subject to confirmation with future licensed collector/ contractor. All wastewater, if any, generated from the sludge dewatering process should be treated properly by the proposed on-site STP.

4.5.6 As is good practice for STP, measures will be considered in the design to minimize the risk of emergency overflow from the STP. As the STP is designed to cater for a peak flow of 3 times the daily average flow rate, 2 duty and 1 standby pumps should be provided in equalization tanks as far as practicable to limit the flow through the treatment units within 1.5 times the daily average flow rate during off-peak periods. This is to even out the flow as much as possible. Other measures include secure power supplies and appropriate alarms, as well as comprehensive Operation and Maintenance procedures, to keep the facilities in good working order. Holding tank for emergency storage/retention may also be included with adequate capacity (e.g. to store 6-hour of ADWF discharge) to minimize need of emergency discharge. In the event of any emergency overflow, overflow emergency response plan should be followed such as arrangement for dispatched and discharge the holding tank appropriately and proceed with the best response to correct the problem at once.

4.5.7 The STP will also be subject to regular maintenance to ensure it functions in designed condition and optimal performance, and can minimize any emergency situation. The future end-users of the Proposed Development will undertake the long-term maintenance of the on-site STP. In addition, regular self-monitoring will be conducted by the future management

office to ensure the quality of the treated effluent shall meet the applicable standard before discharge. Monitoring program will be devised for Terms & Conditions of the system. A discharge license will be applied prior to the development commencement and monitoring requirements under the license would be strictly followed as per WPCO. All site discharge will be pre-treated as necessary, in accordance with the WPCO, the conditions of the WPCO discharge license and the relevant standards listed in the TM-DSS.

4.5.8 With reference to the STP Guidelines, the following unit load factors ("ULFs") for different types of pollutant generated from the proposed project as shown in ***Table 4-4*** have been used in calculation of total pollutant loads.

Table 4-4 Unit Load Factors

Load Type	Unit Load Factor [1]	
	Resident	Services
BODs (kg/day/person)	0.055	0.023
SS (kg/day/person)	0.055	0.023

[1]: The recommended loadings for BODs and SS for Office (not including canteen) Appendix 2 in "Guidelines for the Design of Small Sewage Treatment Plants" by EPD has been adopted for the calculation as a worst case scenario for pollutant loadings to be generated from the Project Site.

4.5.9 The loadings of pollutants to be generated from the raw sewage from the Proposed Development is summarized in ***Table 4-5***.

Table 4-5 Estimated Pollutant Loadings from Proposed Development

Population		Unit Load Factor (kg/day/person) [1]		Pollutant Loadings (kg/day)	
		BODs	SS	BODs	SS
Domestic (Residential + RCHE + DE)	736	0.055	0.055	40	40
Staff (Clubhouse + RCHE + DE + PVP)	118	0.023	0.023	3	3
			Total	43	43

4.6 Polluting Loads Removal Requirements

4.6.1 According to TM-DSS, sewage shall be treated to acceptable standards prior discharge to stormwater drainage, before discharging to the Tolo Harbor and Channel WCZ. The STP shall be designed to remove sufficient BODs and SS in the sewage generated from proposed project to the effluent standards set out, for Group I Coastal Waters, in the Technical Memorandum before discharging into the drainage network. The pollutants loading to be generated from the proposed project, and the standards for effluents discharge are illustrated in ***Table 4-6***.

Table 4-6 Loading of Pollutants from the Proposed Development

Load Type	Loading from Proposed Development (kg/day)	Sewage Flow Rate (m^3/day)	Loading from Proposed Development (mg/L)	Standards for Effluents Discharge (mg/L) [1]
BODs	43	213.7	202	20
SS	43	213.7	202	30

Note:

[1]: Reference to Table 7, Standards for effluents discharged into the coastal waters of Tolo and Port Shelter Water Control Zones, Technical Memorandum - Standards of Effluent Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters.

5 Drainage Impact Assessment

5.1 Existing Site and Drainage System

5.1.1 The Project Site is currently used as a temporary convenient vehicles' holding area with no proper on-site surface channel. According to the DSD drainage record plans, public storm water drains are identified in the vicinity along Yiu Sha Road, as shown in ***Figure 5-1***. The nearest stormwater manholes are SMH4083015 and SMH4083017 which are located about 10m away to the east of Project Site. The ground level of the manholes will be around 6.9mPD while the site formation level will be 5.0mPD, thus it is not practicable to convey the surface runoff from the Proposed Development into the existing public stormwater manhole by gravity.

5.1.2 With reference to EPD Centralised Environmental Database (CED), there is a watercourse founded at the southern part within the Project Site. As verified on site, the watercourse is identified as Seasonal channelized Open Channel.

5.2 Flood Protection Standards

5.2.1 In accordance with DSD's Stormwater Drainage Manual (SDM) (Fifth Edition, January 2018), the flood protection standards for drainage system are as follows: -

Table 5-1 Flood Protection Standards

Intensively Used Agricultural Land	2 – 5 years
Village Drainage including Internal Drainage System under a Polder Scheme	10 years [1, 3]
Main Rural Catchment Drainage Channels	50 years [2, 3]
Urban Drainage Trunk Systems	200 years [4]
Urban Drainage Branch Systems	50 years [4]

Notes:
1. The impact of a 50-year event should be assessed in each village to check whether a *higher standard than 10 years can be justified.*
2. Embanked channels must be capable of passing a 200-year flood within banks.
3. For definitions of Village Drainage and Main Rural Catchment Drainage Channels, *refer to Section 6.61 of SDM.*
4. For definitions of Urban Drainage Branch and Urban Drainage Trunk Systems, refer *to Section 6.6.2 of SDM*

5.2.2 With reference to definitions of Urban Drainage Branch System as stated in Section 6.6.2 of SDM, flood protection standards for connection pipes less than 1.8m in diameter would adopt 1 in 50 years.

5.2.3 With reference to the Section 3.2.2 of SDM and TC(W) No. 9/2020 Blue-Green Drainage Infrastructure, in order of relieve the pressure of the drainage system and enhance to flood prevention measures, provision of the blue-green drainage infrastructure is being explored and proposed to be implemented subject to further investigation. Based on the preliminary studies, the following blue-green drainage infrastructure are under consideration:

- Flood retention tank
- Floodable area
- Green roof
- Rainwater harvesting

The detail of implementation of the Blue-green drainage infrastructure will be designed in later detailed design stage.

5.3 Assessment Methodology

5.3.1 The surface runoff discharged from the identified drainage catchment areas was determined to estimate the potential drainage impact to the existing stormwater drainage system.

5.3.2 With reference to the *Storm water Drainage Manual, Planning, Design and Management* published by Drainage Services Department (DSD), Rational Method shall be applied to estimate the peak surface runoff values. The idea behind the Rational Method is that for a spatially and temporally uniform intensity *i*, which continues indefinitely, the runoff at the outlet of a catchment will increase until the time concentration t_c, when the whole catchment is contributing flow to the outlet. The peak runoff is given by the following expression:

$$Q_P = 0.278\ C\ i\ A \quad \text{..... (1)}$$

Where

Q_p = peak runoff in m^3/s

C = runoff coefficient (dimensionless)

i = rainfall intensity in mm/hr

A = catchment area in km^2

5.3.3 Runoff coefficient C depends on the permeability, slope and pond character of the surface; rainfall intensity *i*, is the average rainfall intensity selected on the basis of the design rainfall duration and return period.

5.3.4 Considering the effect of climate change, the projection of rainfall increase percentage is added to the design rainfall intensities in hydraulic calculation in ***Appendix 5-2***. In accordance with Table 28 of *Stormwater Drainage Manual and Corrigendum No.1/2022*, 16.0% for the end of 21st Century (2081 – 2100) is being adopted as worst-case scenario.

5.4 Catchment Areas

5.4.1 A new drainage network is proposed to cater the site surface runoff; no catchment area outside the site boundary shall be included.

5.5 Peak Flow Estimation

5.5.1 The surface runoff discharged from the Project Site and existing condition is calculated from *equation (1)* as mentioned in 5.3.2.

5.5.2 Detailed calculation is tabulated in Appendix 5-2 and summarised in **Table 5-2** below:

Table 5-2 Estimated Peak Flow for Project Site

Source	Peak Flow (m^3/s)
Surface runoff from Existing Site	
Total:	***0.217***
Peak Flow from Project Site	
Surface runoff from Project Site	0.221
Treated effluent discharged from STP	0.007
Total:	***0.229***

5.6 Drainage Proposal

5.6.1 At present, there is no stormwater manhole within the Project Site to collect surface runoff. As mentioned in S5.1.1, it is also not practicable to convey surface runoff from the Project Site to public stormwater manhole. Surface channel will be provided within the Project Site and along the perimeter of site boundary to collect surface runoff from the proposed development. Surface runoff within the Project Site together with the treated effluent from STP will be collected and discharged to the proposed stormwater terminal manhole M1 to M2 through 300mm diameter stormwater pipes, and eventually to be discharged into the Tolo Harbour directly. A preliminary layout of drainage system is provided in ***Appendix 5-1*** for indicative purpose and subject to review and confirm during detailed design stage. The indicative proposed stormwater pipes are presented in ***Table 5-3***.

Table 5-3 Proposed Stormwater Connection

Stormwater pipe	Diameter (mm)	Length (m)	Inlet Invert Level (mPD)	Outlet Invert Level (mPD)
M1 to M2	0.300	3.0	4.0	3.0

5.7 Hydraulic Capacity of the Drainage System

5.7.1 The Manning frictional resistance equations with reference to the Stormwater Drainage Manual (Fifth Edition) are being used to calculate the hydraulic capacities of the stormwater drainage pipes.

5.7.2 As defined in Section 6.6.2 in Stormwater Drainage Manual, 50 years of the return periods for an Urban Drainage Branch System is adopted for the assessment. According to the calculation as tabulated in ***Appendix 5-2,*** the total flows from the Project Site under 1 in 50 years storm event are found to be 0.229 m^3/s (0.221 m^3/s from surface runoff and 0.007 m^3/s from STP) after the Proposed Development, as summarized in ***Table 5-4***:

Table 5-4 Estimation of Peak Flow and Capacity Check

Stormwater pipe		Total Flow from catchment (m^3/s)	Percentage of capacity
From	To		
M1	M2	0.229	39%

5.7.3 No significant adverse stormwater drainage impact due to the Proposed Development on existing drainage system is anticipated. In addition, the cumulative occupancies of pipes are predicted to be below 80% of the full capacity over 50 years return period.

5.7.4 Layout of major drainage channels within the Proposed Development will be submitted to the relevant authorities for approval at the detailed design stage. All drainage facilities shall be designed and constructed to conform to the requirements laid down in:

- The Stormwater Drainage Manual, DSD;
- The General Specification for Civil Engineering Works, HKSAR; and
- The DSD Standard Drawings

5.7.5 The stormwater drainage system will be equipped with silt trap to remove the particles and associated pollutants prior to discharging into the stormwater drainage system. The stormwater discharge will satisfy the effluent standards and requirements stipulated in the *Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage*

Systems, Inland and Coastal Waters ("TM-DSS"). The detailed design of silt traps will be reviewed and confirmed at the detailed design stage so that TM-DSS will be complied with.

5.7.6 Since the stormwater will be properly treated to satisfy the effluent standards prior to discharge and complies with the clearance requirements as listed in the *Water Pollution Control Ordinance* and its TM, no significant adverse water quality impact on the public stormwater drainage system due to the Proposed Development is anticipated.

5.8 Impact to Existing Seasonal Channel

5.8.1 As mentioned in *Section 5.1.2*, with reference to EPD Centralised Environmental Database (CED), there is an existing watercourse founded at the southern part within the Project Site. As verified on site, the watercourse has been identified as a seasonal channelized open channel, and the entire channel is a manmade concrete channel. Upon inspection, it was observed that the current condition of the channel was then found out to accommodates a small water flow, with rubbish deposited along its course. The existing condition of the channel is presented in ***Appendix 5-3***.

5.8.2 As the watercourse encroaches into the subject site and in order to minimize the potential impact on the watercourse, the option of deck over approach is proposed without interfere the existing stream. This method involves the construction of a structure or platform over the open channel and covering it. The deck over works is anticipated to enclose the entire open channel falls within the site, spanning approximately 33m in length. The construction works of deck over will be proposed to be undertaken prior to the commencement of construction stage of the project. The decking over the watercourse will not affect the cross section area and the storm water conveyance capacity of the watercourse. In this connection, no drainage channel or river training and diversion works requiring Environmental Permit for its construction and operation will be involved.

5.8.3 The details of deck over will be submitted to the DSD for approval prior construction. In addition, the following mitigation measures will be implemented:

- Implementation of mitigation measures specified in ProPECC PN 2/23 to control site runoff and drainage at all work sites during construction;
- Construction debris and spoil should be covered up and/or properly disposed of as soon as possible to avoid being washed into nearby waterbodies by rain;
- Providing sand/silt removal facilities such as sand traps, silt traps and sediment basins to remove sand/silt particles from runoff to meet the requirements of the standard in TM-

DSS under the WPCO. These facilities shall be properly and regularly maintained; and

- Good site practice and precautionary measures will also be implemented to avoid the potential impact due to site runoff. Construction effluent, site run-off and sewage should be properly collected and/or treated.

5.8.4 Given the seasonal nature of the open channel, construction works causing obstruction to normal water flow in the channel will be avoided during wet season (i.e. peak flow time). The recommended period of the construction of the deck over will be proposed to take place during dry season, to ensure the optimal conditions for construction activities while minimizing potential disruptions to water flow.

5.8.5 Furthermore, deck over of the open channel will impose the constraints and difficulties on routine inspection and maintenance activities. To prevent that, the maintenance provisions, such as desilting openings and access shafts, will be designed on the deck to facilitate the operation and maintenance. Thus, also ensure the safety of maintenance workers.

5.8.6 The effluent produced from construction and operation stages will be pre-treated to comply with WPCO requirement and sited away from natural section of water courses.

6 Conclusion

6.1.1 DSIA has been conducted for the Proposed Development at the Project Site.

Sewerage Impact Assessment

6.1.2 An ADWF of 213.7 m^3/day is expected to be generated from the Proposed Development. The daily peak sewage generated by the Project Site is estimated to be 0.020 m^3/s. An on-site sewage treatment plant will be provided to treat the wastewater to be generated from the Proposed Development. The treated effluent will be discharged to the terminal stormwater manhole via proper connections. No unacceptable impacts are expected from the proposed discharge from STP where the sewage will be treated to acceptable standards prior discharge to stormwater drainage. Details design arrangements of the proposed STP will be provided at the later stage, the proposal will be submitted to relevant departments for approval.

Drainage Impact Assessment

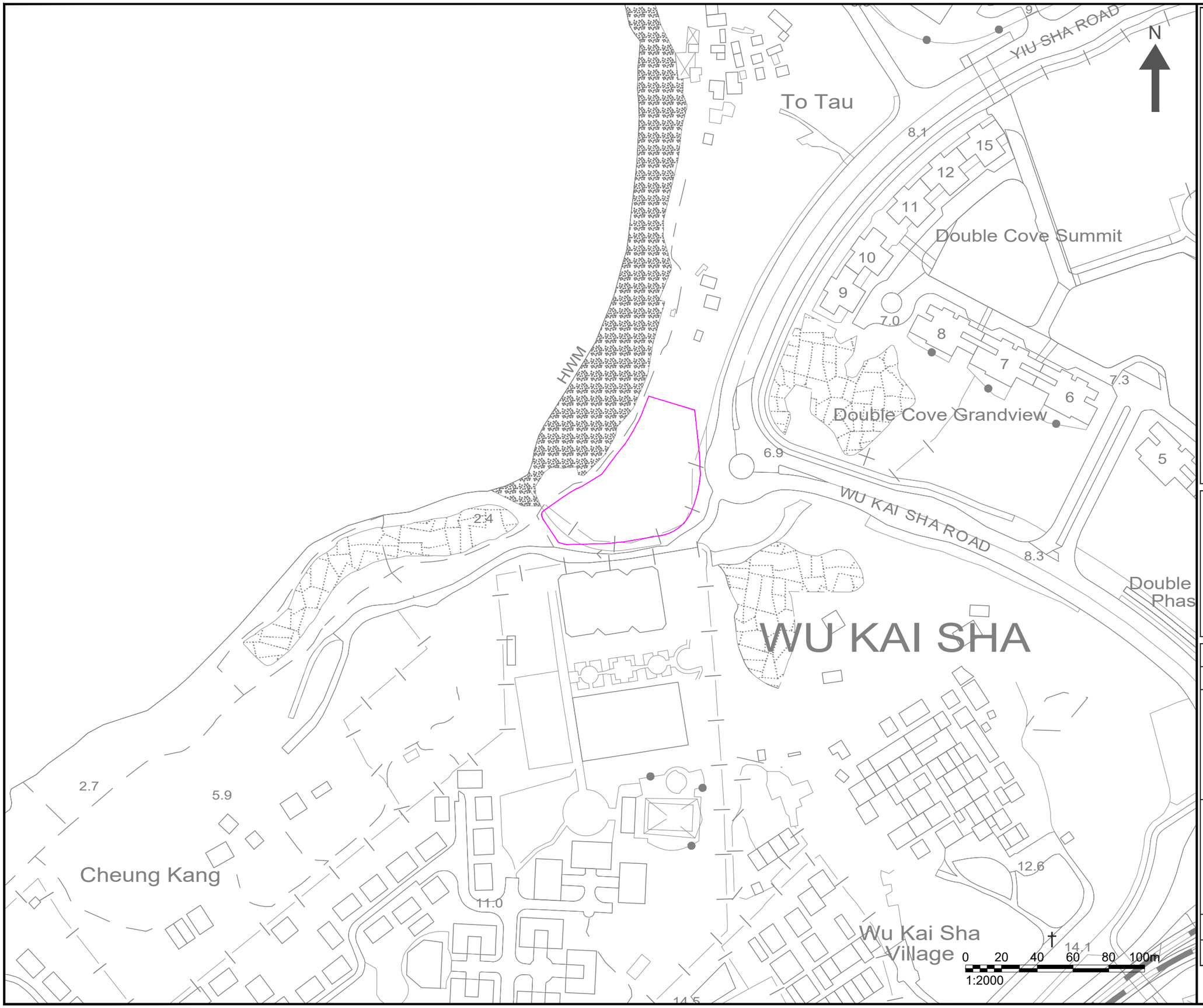
6.1.3 Stormwater to be collected from the Proposed Development will be discharged into the proposed 300mm drainage pipes at the southwest of Project Site. The stormwater flow generated by the Project Site is estimated to be 0.229 m^3/s and take up 39% in capacity of the proposed drainage pipe. The treated effluent from STP and surface runoff will be collected at stormwater terminal manhole M1 and discharged into Tolo Harbour.

6.1.4 Given the insignificant stormwater generation from the Project Site, it is anticipated that no significant adverse stormwater drainage impact on the local drainage system due to the Proposed Development.

6.1.5 Silt trap will be installed to remove particles / pollutants from the drainage collected within the Project Site prior to discharging into the stormwater drainage system. The effluent standards and requirement stipulated in the *TM-DSS* will be satisfied.

6.1.6 There is an open channel identified within the site boundary during the site inspection. The option of deck over of the open channel is proposed. There are approximately 33m of open channel in length is proposed to deck over running at southwest side of the project site. The details of the construction for deck over will be submitted at detailed design stage.

Figures



NOTES :

PROJECT SITE

Consultant

Allied Environmental Consultants Limited

Project No. :	2039
Drawing By :	HS

Project :

Proposed Rezoning from "Government, Institution or Community" to “Residential (Group B)6” Zone to Include Social Welfare Facilities (RCHE and DE only) and Public Vehicle Park (excluding container vehicle) at Lots Nos. 148 S.A RP (Part), 148 S.B RP (Part), 149 RP, 150 S.A,150 S.B and 151 in D.D. 206 and Adjoining Government Land, West of Wu Kai Sha Road, Ma On Shan, New Territories

Drawing Title :

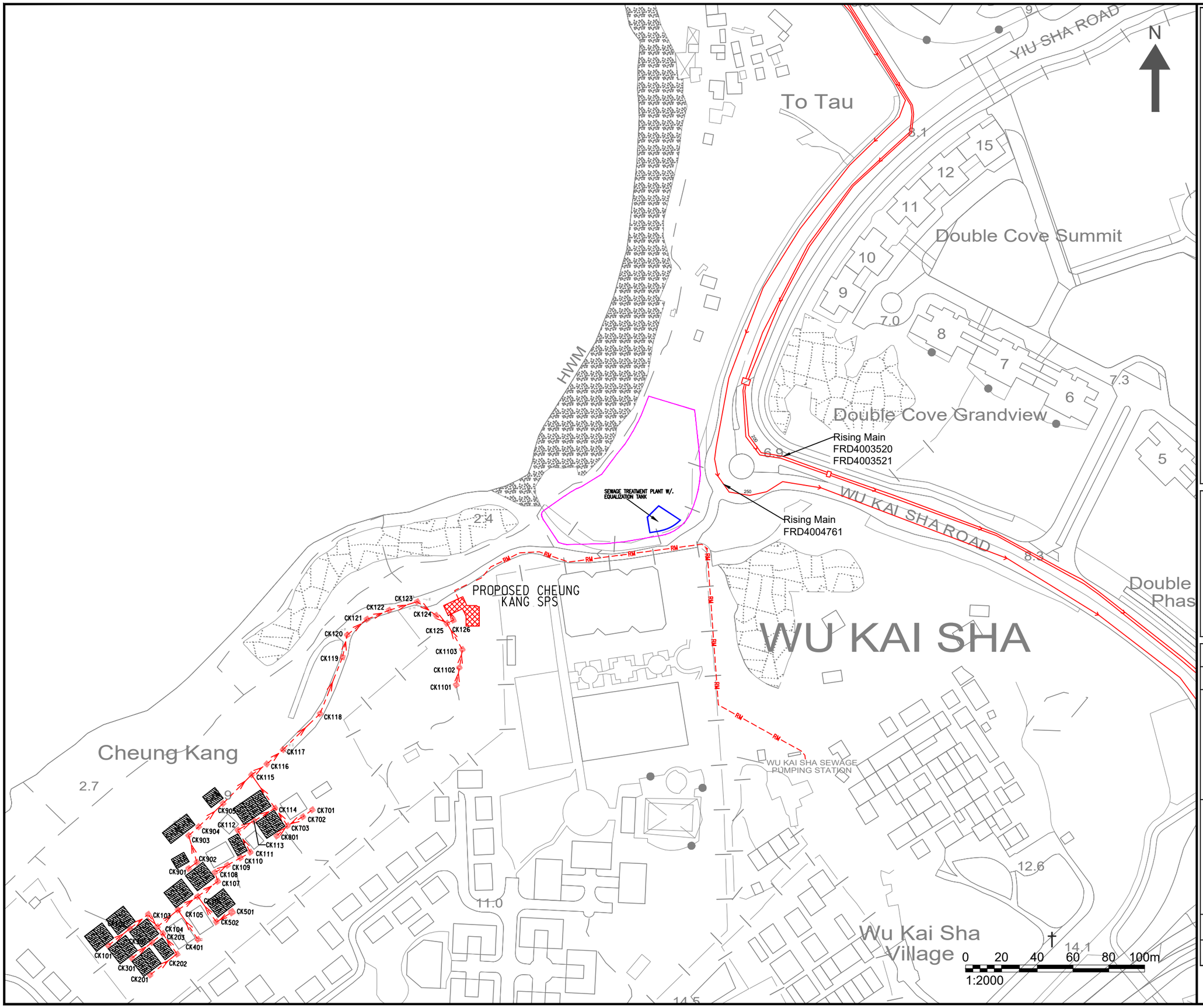
Site Location and its Environs

Drawing No : FIGURE 3-1	Revision : 2
Scale : AS SHOWN	Date : JAN 2024

DO NOT SCALE OFF DRAWING. THIS DRAWING IS NOT FOR CONSTRUCTION PURPOSES UNLESS EXPRESSLY STATED
ALL RIGHTS RESERVED AND REPRODUCTION IN ANY FORM MUST BE APPROVED BY ALLIED ENVIRONMENTAL CONSULTANTS LIMITED.

A3 420 x 297

C:\USERS\NGANCHUNSANG\SYNOLOGYDRIVE\2039 WU KAI SHA\05 REPORT\01 AEC REPORT\ISSUE 2 DRAFT 3\DSIA\FIG\FIG 3.1.DWG



NOTES :

PROJECT SITE

EXISTING AND PLANNED PUBLIC SEWERAGE SYSTEM

Consultant

Allied Environmental Consultants Limited

Project No. :	2039
Drawing By :	HS

Project :

Proposed Rezoning from "Government, Institution or Community" to "Residential (Group B)6" Zone to Include Social Welfare Facilities (RCHE and DE only) and Public Vehicle Park (excluding container vehicle) at Lots Nos. 148 S.A RP (Part), 148 S.B RP (Part), 149 RP, 150 S.A,150 S.B and 151 in D.D. 206 and Adjoining Government Land, West of Wu Kai Sha Road, Ma On Shan, New Territories

Drawing Title :

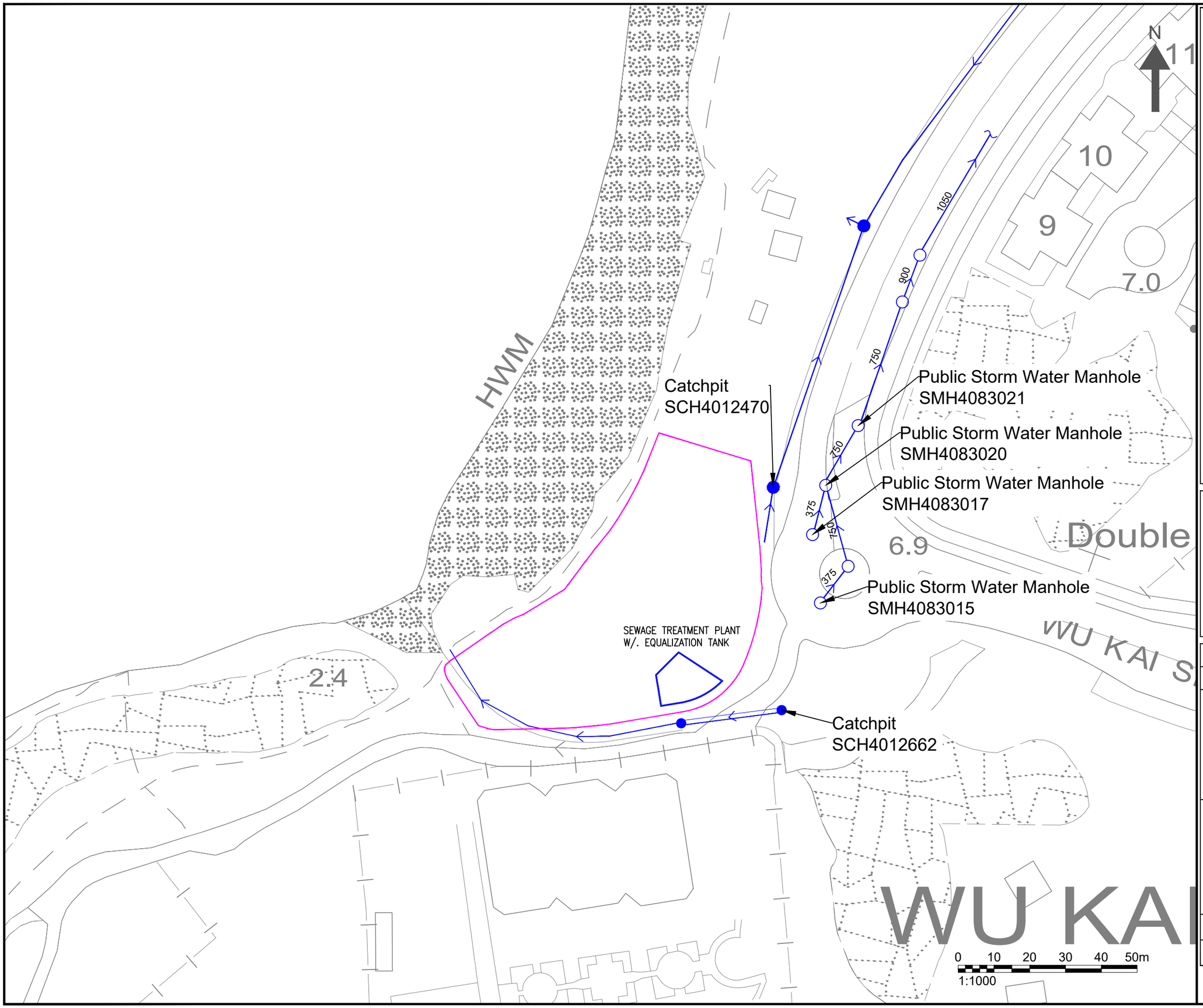
Overview of Existing and Planned Sewerage System

Drawing No :	Revision :
FIGURE 4-1	2
Scale : AS SHOWN	Date : JAN 2024

DO NOT SCALE OFF DRAWING. THIS DRAWING IS NOT FOR CONSTRUCTION PURPOSES UNLESS EXPRESSLY STATED ALL RIGHTS RESERVED AND REPRODUCTION IN ANY FORM MUST BE APPROVED BY ALLIED ENVIRONMENTAL CONSULTANTS LIMITED.

A3 420 x 297

C:\USERS\NGANCHUNSANG\SYNOLOGYDRIVE\2039 WU KAI SHA\05 REPORT\01 AEC REPORT\ISSUE 2 DRAFT 3\DSIA\FIG\FIG 4.1.DWG



NOTES :

PROJECT SITE

EXISTING AND PLANNED PUBLIC DRAINAGE SYSTEM

Consultant

Allied Environmental Consultants Limited

Project No. :	2039
Drawing By :	HS

Project :

Proposed Rezoning from "Government, Institution or Community" to "Residential (Group B)6" Zone to Include Social Welfare Facilities (RCHE and DE only) and Public Vehicle Park (excluding container vehicle) at Lots Nos. 148 S.A RP (Part), 148 S.B RP (Part), 149 RP, 150 S.A,150 S.B and 151 in D.D. 206 and Adjoining Government Land, West of Wu Kai Sha Road, Ma On Shan, New Territories

Drawing Title :

Overview of Existing Stormwater System

Drawing No :	Revision :
FIGURE 5-1	2
Scale :	Date :
AS SHOWN	JAN 2024

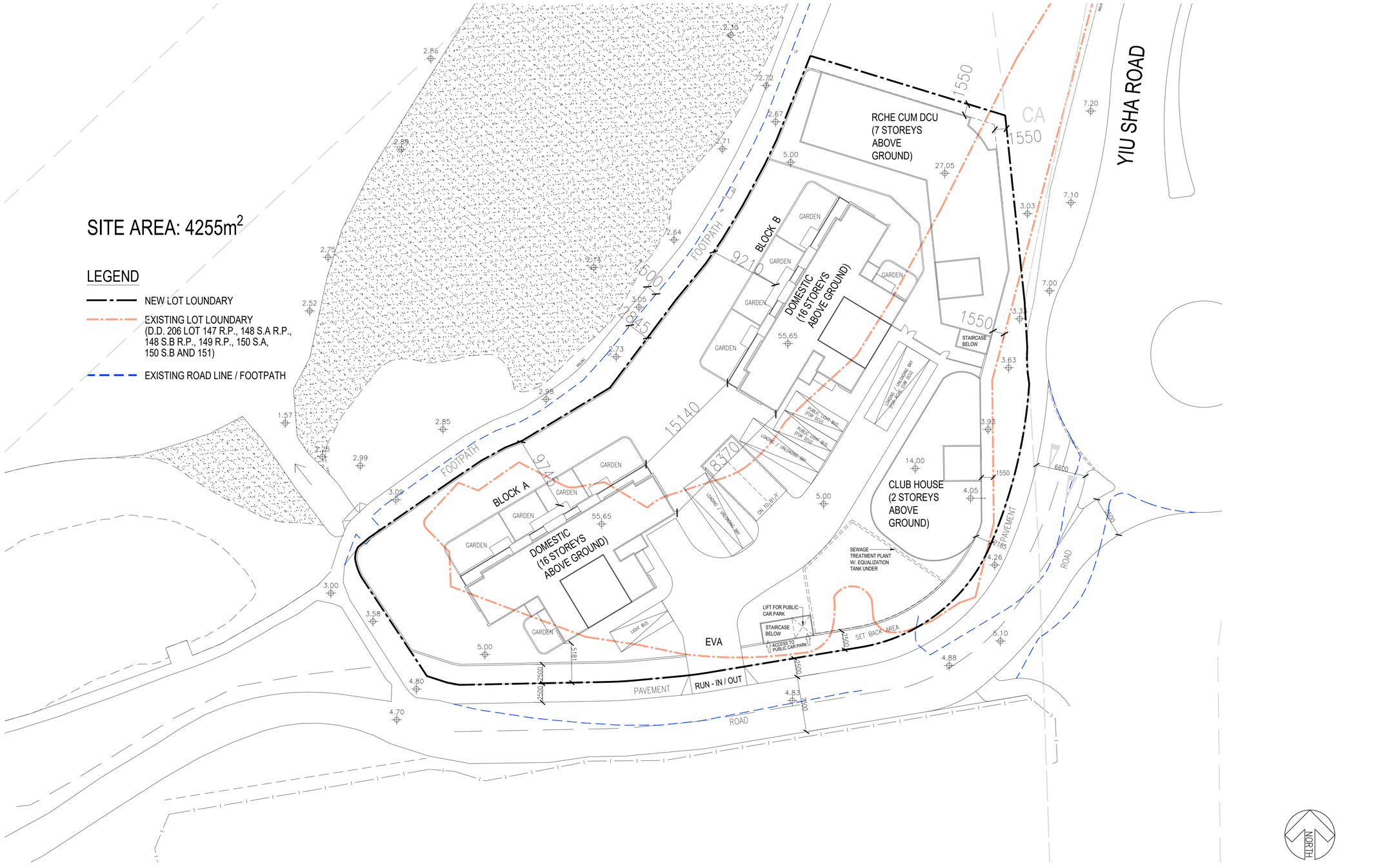
DO NOT SCALE OFF DRAWING. THIS DRAWING IS NOT FOR CONSTRUCTION PURPOSES UNLESS EXPRESSLY STATED. ALL RIGHTS RESERVED AND REPRODUCTION IN ANY FORM MUST BE APPROVED BY ALLIED ENVIRONMENTAL CONSULTANTS LIMITED.

A3 420 x 297

C:\USERS\NGANCHUNSANG\SYNOLOGYDRIVE\2039 WU KAI SHA\05 REPORT\01 AEC REPORT\ISSUE 2 DRAFT 3\DSIA\FIG\FIG 5.1.DWG

Appendix 3-1

Layout Plans of the Proposed Development



GENERAL NOTES
1. DO NOT SCALE DRAWINGS. DIMENSIONS GOVERN.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK.
4. ARCHITECT SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.

2024.6.5

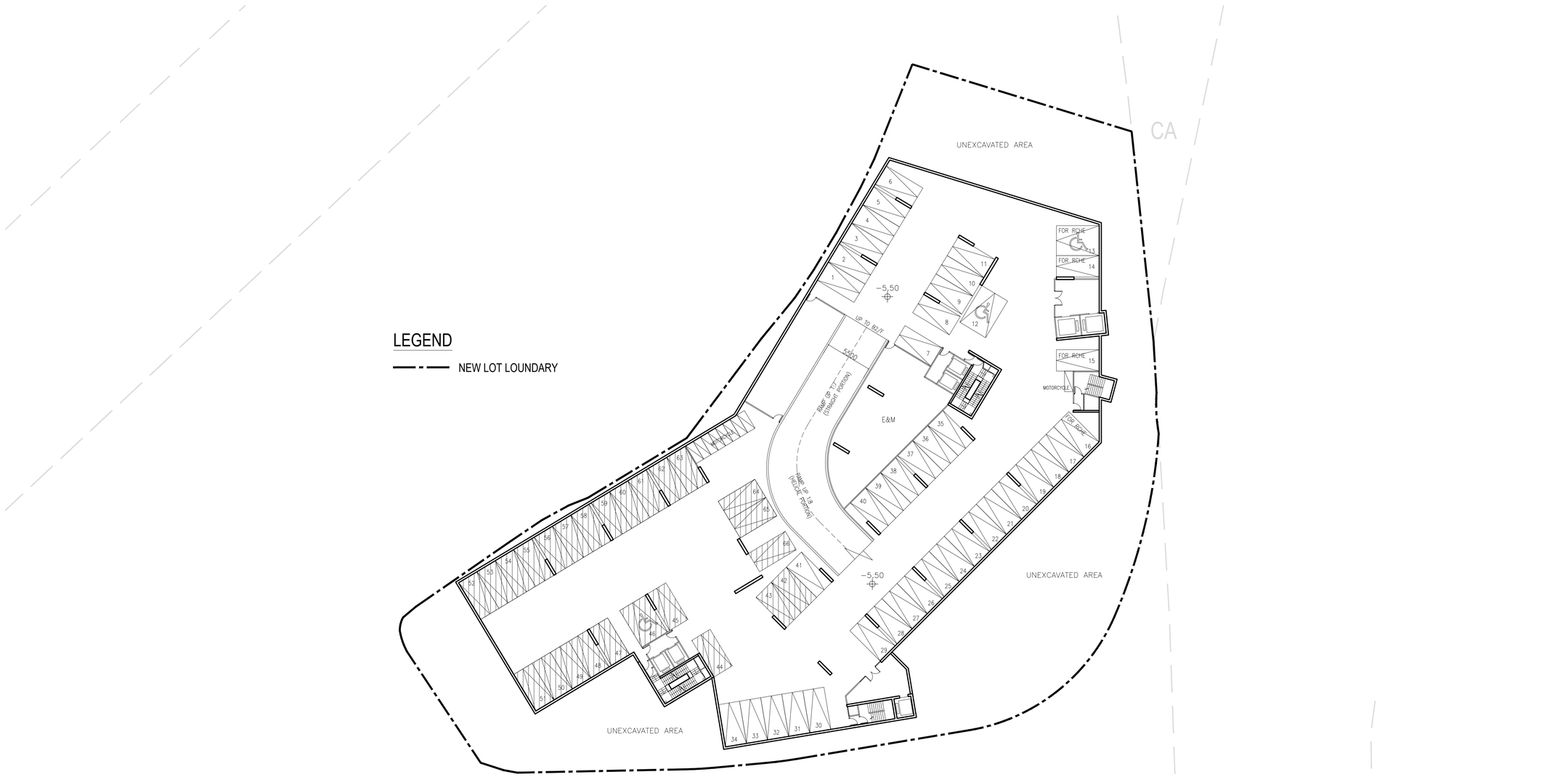
Project:
REZONING APPLICATION FROM “GOVERNMENT, INSTITUTION OR COMMUNITY” TO “RESIDENTIAL (GROUP B)6” ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

Drawing Title:
MASTER LAYOUT PLAN

Drawing No.:
MP-01

Architect:

樑安建築師有限公司
L&N Architects Ltd.
Rooms 1203-1204, 12/F Belgian Bank Building,
721-725 Nathan Road, Kowloon
Tel: (852) 3422 3082, Fax: (852) 3428 2269



LEGEND

NEW LOT LOUNDARY

EV CHARGING-ENABLINGS

NO. OF PUBLIC CARPARKS : 62 (INCLUDING 2 ACCESSIBLE CARPARKS AND 25 EV CHARGING-ENABLINGS)
NO. OF RHCE CARPARKS : 4 (INCLUDING 1 ACCESSIBLE CARPARK)
NO. OF MOTORCYCLES: 9

NORTH

0 5 10 15 20 25M

2024.6.18

GENERAL NOTES
1. DO NOT SCALE DRAWINGS. DIMENSIONS GOVERN.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK.
4. ARCHITECT SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.

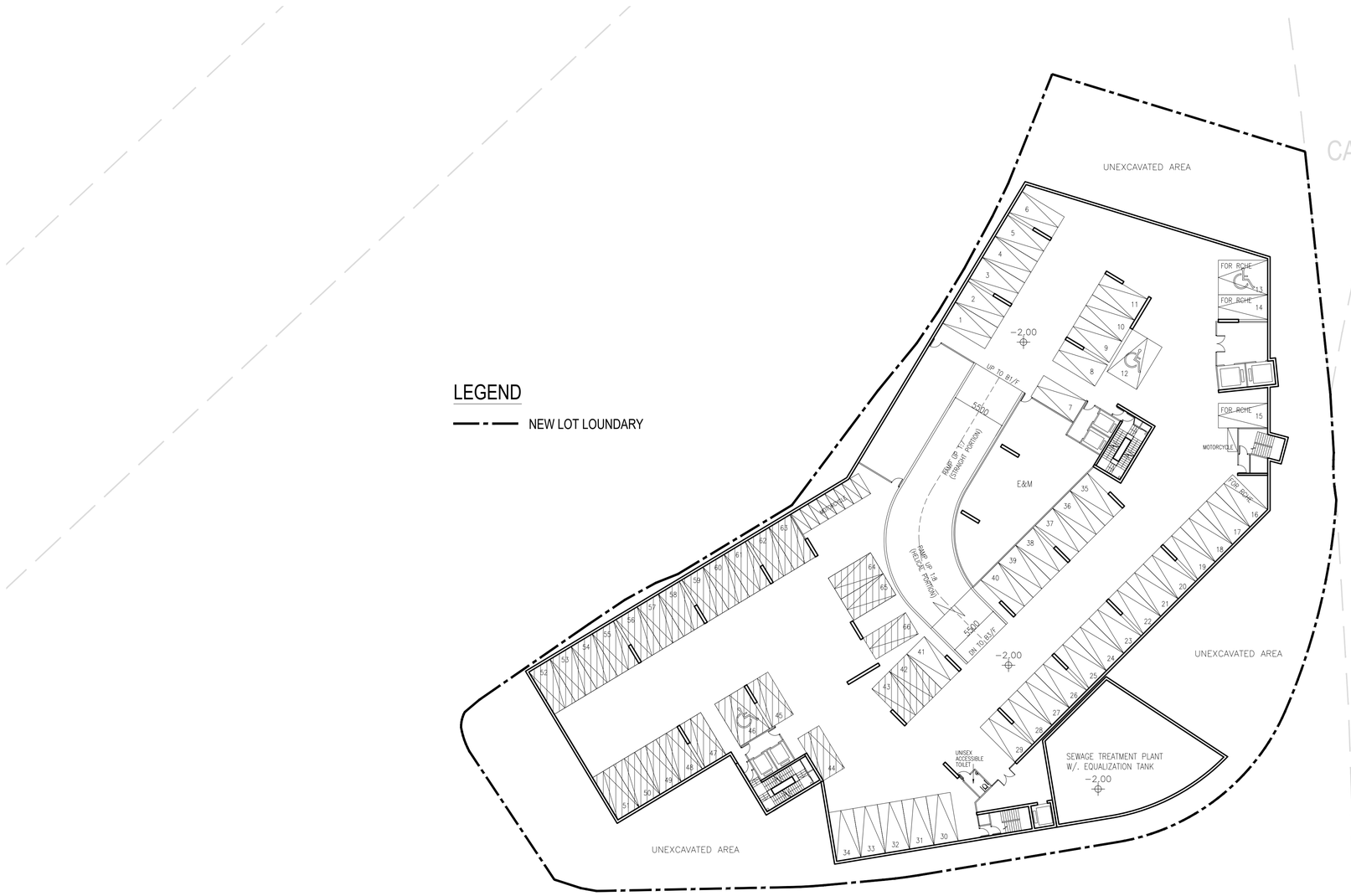
Project:
REZONING APPLICATION FROM “GOVERNMENT, INSTITUTION OR COMMUNITY” TO “RESIDENTIAL (GROUP B)6” ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

Drawing Title:
B3/F PLAN

Drawing No.:
GP-01

Architect:

樑安建築師有限公司
L&N Architects Ltd.
Rooms 1203-1204, 12/F Belgian Bank Building,
721-725 Nathan Road, Kowloon
Tel: (852) 3422 3082, Fax: (852) 3428 2269



EV CHARGING-ENABLINGS

NO. OF PUBLIC CARPARKS : 62 (INCLUDING 2 ACCESSIBLE CARPARKS AND 25 EV CHARGING-ENABLINGS)
NO. OF RHCE CARPARKS : 4 (INCLUDING 1 ACCESSIBLE CARPARK)
NO. OF MOTORCYCLES: 9

NORTH

0 5 10 15 20 25M

2024.6.18

GENERAL NOTES
1. DO NOT SCALE DRAWINGS. DIMENSIONS GOVERN.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK.
4. ARCHITECT SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.

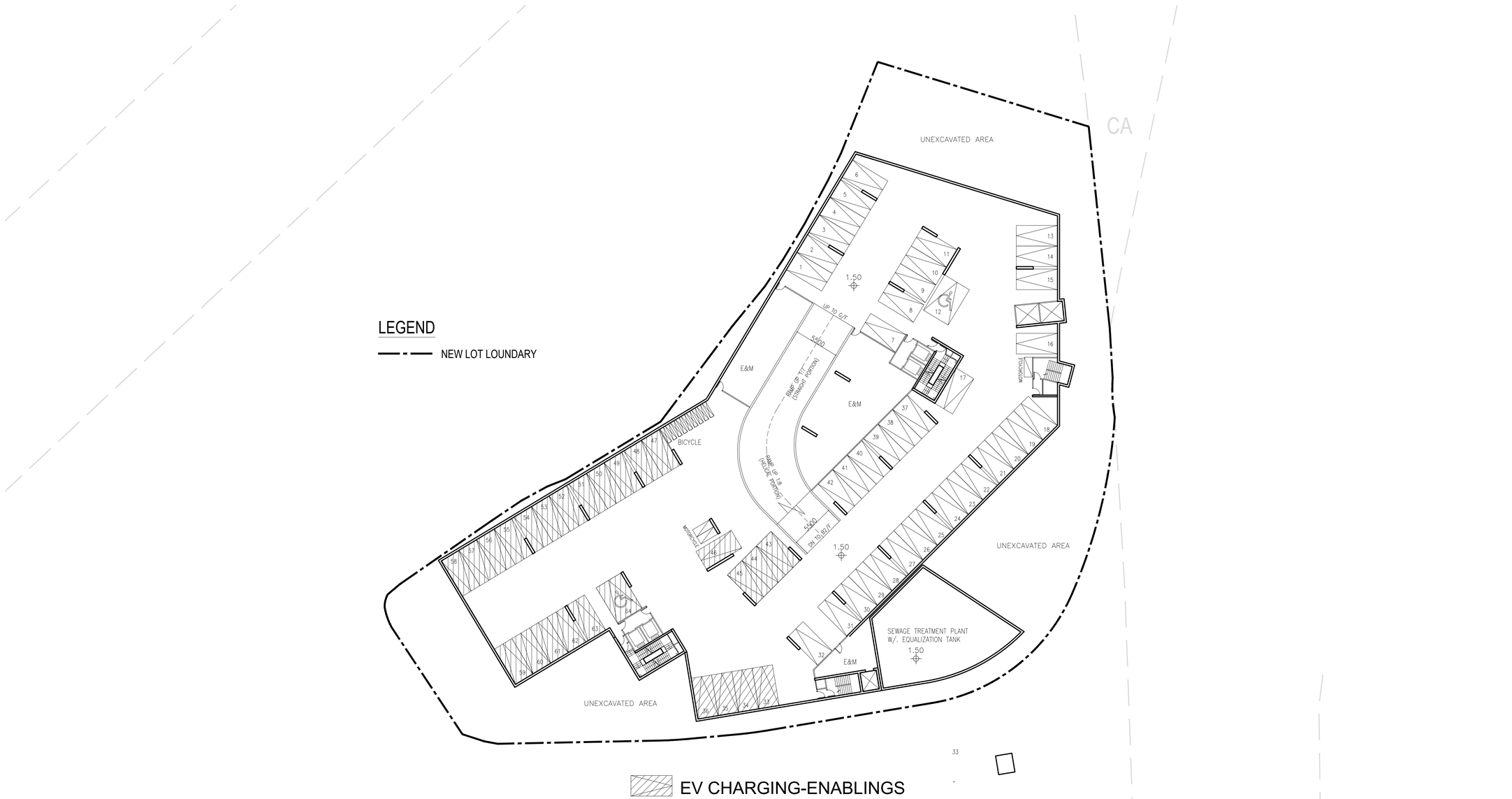
Project:
REZONING APPLICATION FROM “GOVERNMENT, INSTITUTION OR COMMUNITY” TO “RESIDENTIAL (GROUP B)6” ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

Drawing Title:
B2/F PLAN

Drawing No.:
GP-02

Architect:

樑安建築師有限公司
L&N Architects Ltd.
Rooms 1203-1204, 12/F Belgian Bank Building,
721-725 Nathan Road, Kowloon
Tel: (852) 3422 3082, Fax: (852) 3428 2269



NO. OF CARPARK: 54 (INCLUDING 2 ACCESSIBLE CARPARKS AND 26 EV CHARGING-ENABLINGS)
NO. OF VISITOR CARPARK: 10
NO. OF MOTORCYCLES: 3
NO. OF BICYCLE: 9

NORTH

0 5 10 15 20 25M

2024.6.18

GENERAL NOTES
1. DO NOT SCALE DRAWINGS. DIMENSIONS GOVERN.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK.
4. ARCHITECT SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.

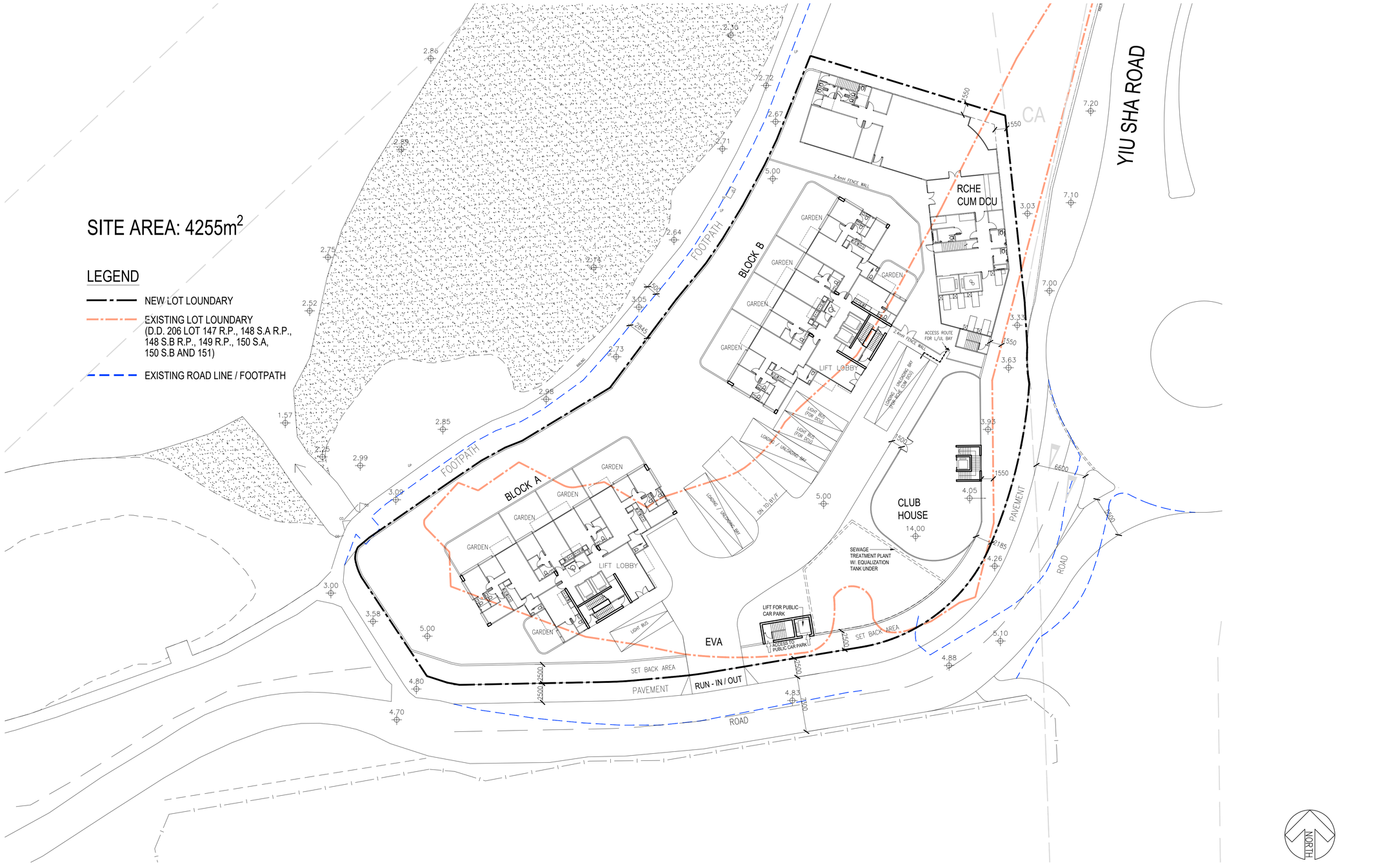
Project:
REZONING APPLICATION FROM “GOVERNMENT, INSTITUTION OR COMMUNITY” TO “RESIDENTIAL (GROUP B)6” ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

Drawing Title:
B1/F PLAN

Drawing No.:
GP-03

Architect:

樑安建築師有限公司
L&N Architects Ltd.
Rooms 1203-1204, 12/F Belgian Bank Building,
721-725 Nathan Road, Kowloon
Tel: (852) 3422 3082, Fax: (852) 3428 2269



GENERAL NOTES
1. DO NOT SCALE DRAWINGS. DIMENSIONS GOVERN.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK.
4. ARCHITECT SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.

2024.6.5

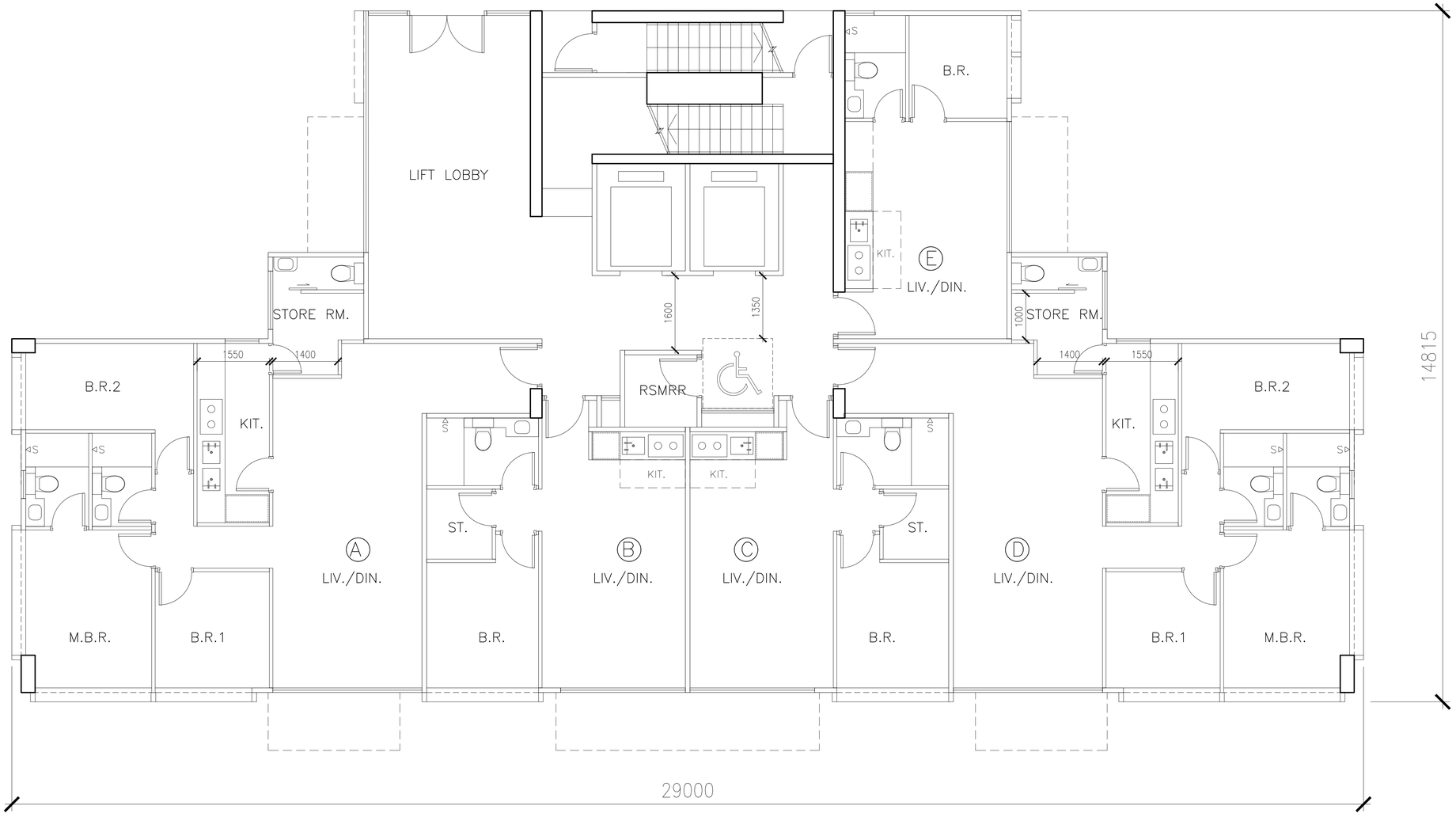
Project:
REZONING APPLICATION FROM “GOVERNMENT, INSTITUTION OR COMMUNITY” TO “RESIDENTIAL (GROUP B)6” ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

Drawing Title:
G/F PLAN

Drawing No.:
GP-04

Architect:

樑安建築師有限公司
L&N Architects Ltd.
Rooms 1203-1204, 12/F Belgian Bank Building,
721-725 Nathan Road, Kowloon
Tel: (852) 3422 3082, Fax: (852) 3428 2269



0 1 2 3 4 5M

2024.6.5

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2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK.
4. ARCHITECT SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.

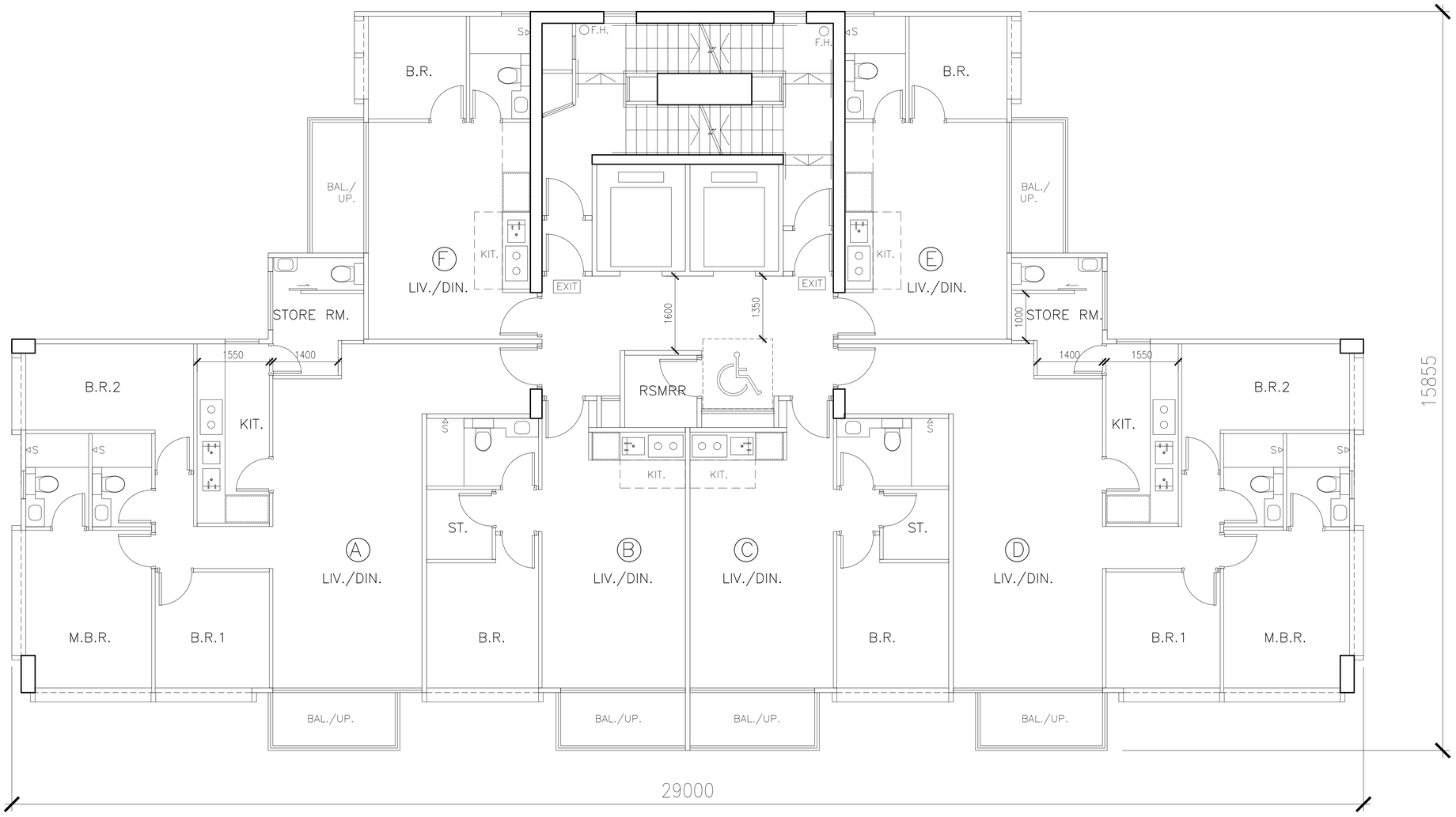
Project:
REZONING APPLICATION FROM “GOVERNMENT, INSTITUTION OR COMMUNITY” TO “RESIDENTIAL (GROUP B)6” ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

Drawing Title:
G/F PLAN
(FOR BLOCKS A & B)
(BLOCK B SAME AS BLOCK A BUT MIRRORED)

Drawing No.:
GP-05

Architect:

樑安建築師有限公司
L&N Architects Ltd.
Rooms 1203-1204, 12/F Belgian Bank Building,
721-725 Nathan Road, Kowloon
Tel: (852) 3422 3082, Fax: (852) 3428 2269



0 1 2 3 4 5M

2024.6.5

GENERAL NOTES
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2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK.
4. ARCHITECT SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.

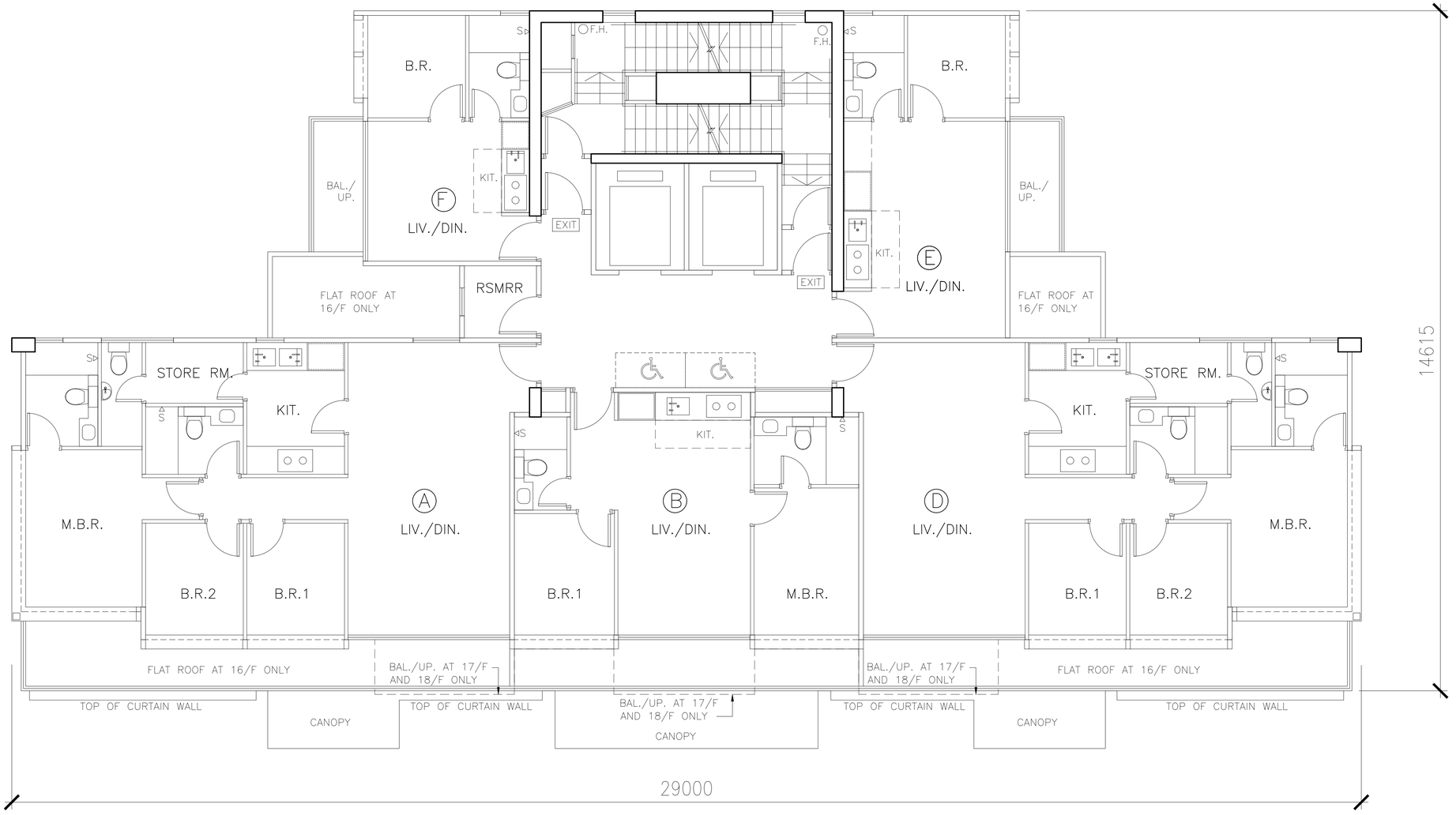
Project:
REZONING APPLICATION FROM “GOVERNMENT, INSTITUTION OR COMMUNITY” TO “RESIDENTIAL (GROUP B)6” ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

Drawing Title:
1/F - 15/F PLAN
(FOR BLOCKS A & B)
(BLOCK B SAME AS BLOCK A BUT MIRRORED)
(4/F, 13/F AND 14/F OMITTED)

Drawing No.:
GP-06

Architect:

樑安建築師有限公司
L&N Architects Ltd.
Rooms 1203-1204, 12/F Belgian Bank Building,
721-725 Nathan Road, Kowloon
Tel: (852) 3422 3082, Fax: (852) 3428 2269



0 1 2 3 4 5M

2024.6.5

GENERAL NOTES
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2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK.
4. ARCHITECT SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.

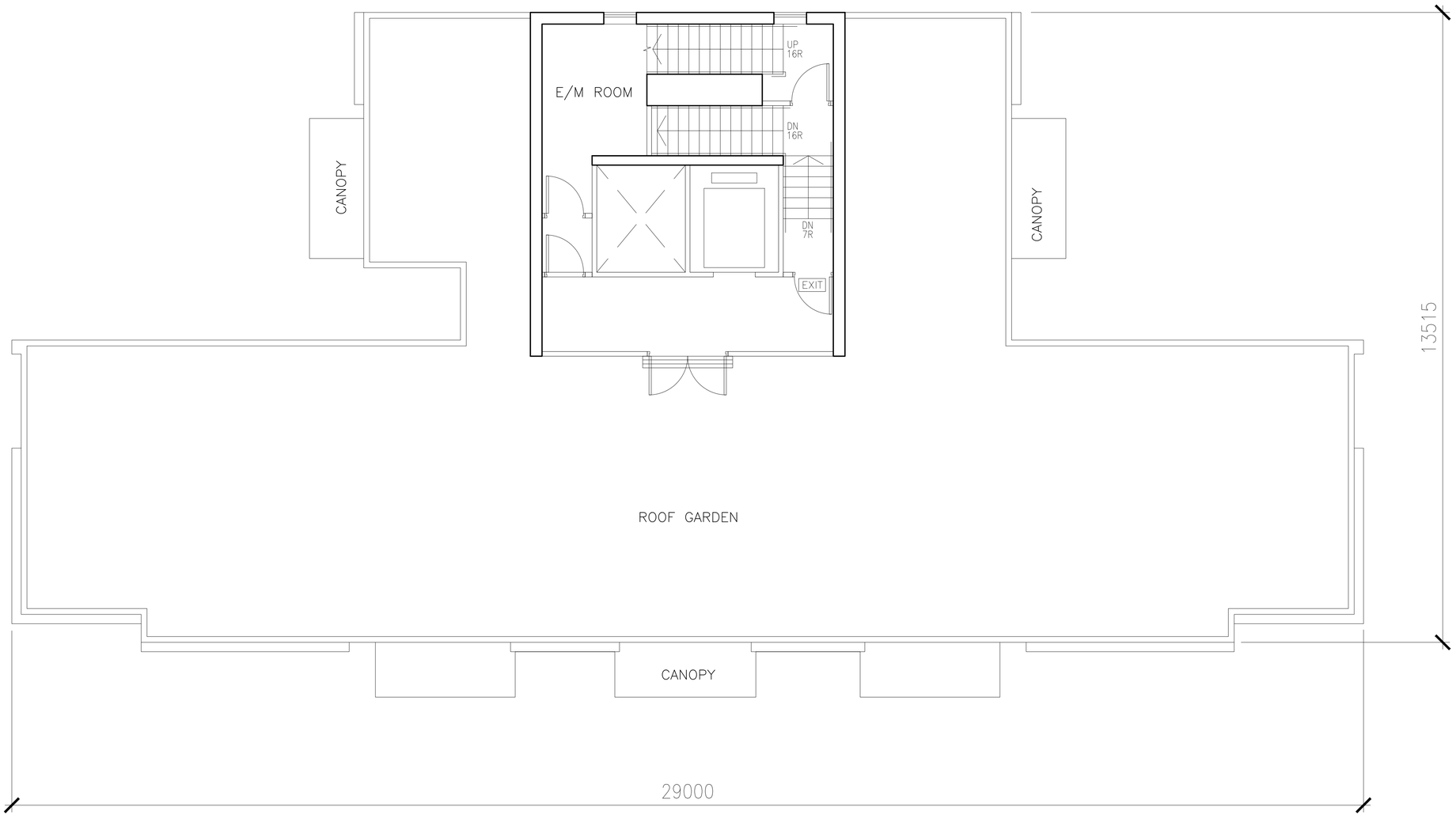
Project:
REZONING APPLICATION FROM “GOVERNMENT, INSTITUTION OR COMMUNITY” TO “RESIDENTIAL (GROUP B)6” ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

Drawing Title:
16/F - 18/F PLAN
(FOR BLOCKS A & B)
(BLOCK B SAME AS BLOCK A BUT MIRRORED)

Drawing No.:
GP-07

Architect:

樑安建築師有限公司
L&N Architects Ltd.
Rooms 1203-1204, 12/F Belgian Bank Building,
721-725 Nathan Road, Kowloon
Tel: (852) 3422 3082, Fax: (852) 3428 2269



0 1 2 3 4 5M

2024.6.5

GENERAL NOTES
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2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK.
4. ARCHITECT SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.

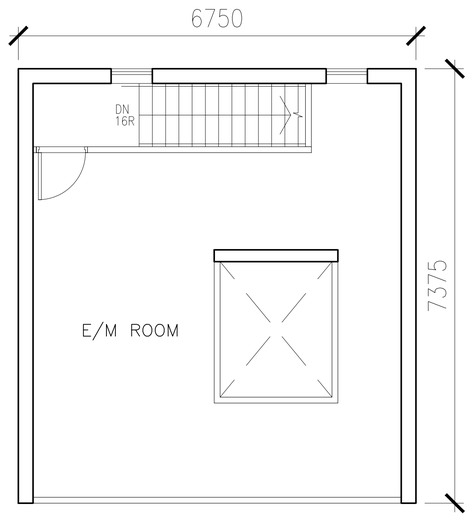
Project:
REZONING APPLICATION FROM “GOVERNMENT, INSTITUTION OR COMMUNITY” TO “RESIDENTIAL (GROUP B)6” ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

Drawing Title:
MR/F PLAN
(FOR BLOCKS A & B)
(BLOCK B SAME AS BLOCK A BUT MIRRORED)

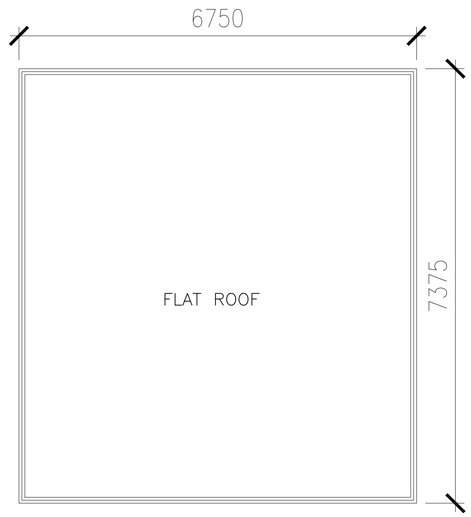
Drawing No.:
GP-08

Architect:

樑安建築師有限公司
L&N Architects Ltd.
Rooms 1203-1204, 12/F Belgian Bank Building,
721-725 Nathan Road, Kowloon
Tel: (852) 3422 3082, Fax: (852) 3428 2269



UR/F PLAN



TR/F PLAN

0 2 4
1 3 5M

2024.6.5

GENERAL NOTES
1. DO NOT SCALE DRAWINGS. DIMENSIONS GOVERN.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK.
4. ARCHITECT SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.

Project:
REZONING APPLICATION FROM “GOVERNMENT, INSTITUTION OR COMMUNITY” TO “RESIDENTIAL (GROUP B)6” ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

Drawing Title:
UR/F AND TR/F PLANS (FOR BLOCK A & B)
(BLOCK B SAME AS BLOCK A BUT MIRROR)

Drawing No.:
GP-9

Architect:

樑安建築師有限公司
L&N Architects Ltd.
Rooms 1203-1204, 12/F Belgian Bank Building,
721-725 Nathan Road, Kowloon
Tel: (852) 3422 3082, Fax: (852) 3428 2269

TOTAL NO. OF BED SPACES: 6

1. 2.5m MIN. CEILING HEIGHT AND 2.3m FROM UNDERSIDE OF ANY BEAM FOR RCHE PORTION

LEGEND:

40-PLACE DAY CARE CENTRE FOR THE ELDERLY (DCU)

O.W. OPENABLE WINDOW

GENERAL NOTES
1. DO NOT SCALE DRAWINGS. DIMENSIONS GOVERN.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK.
4. ARCHITECT SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.

2024.6.5

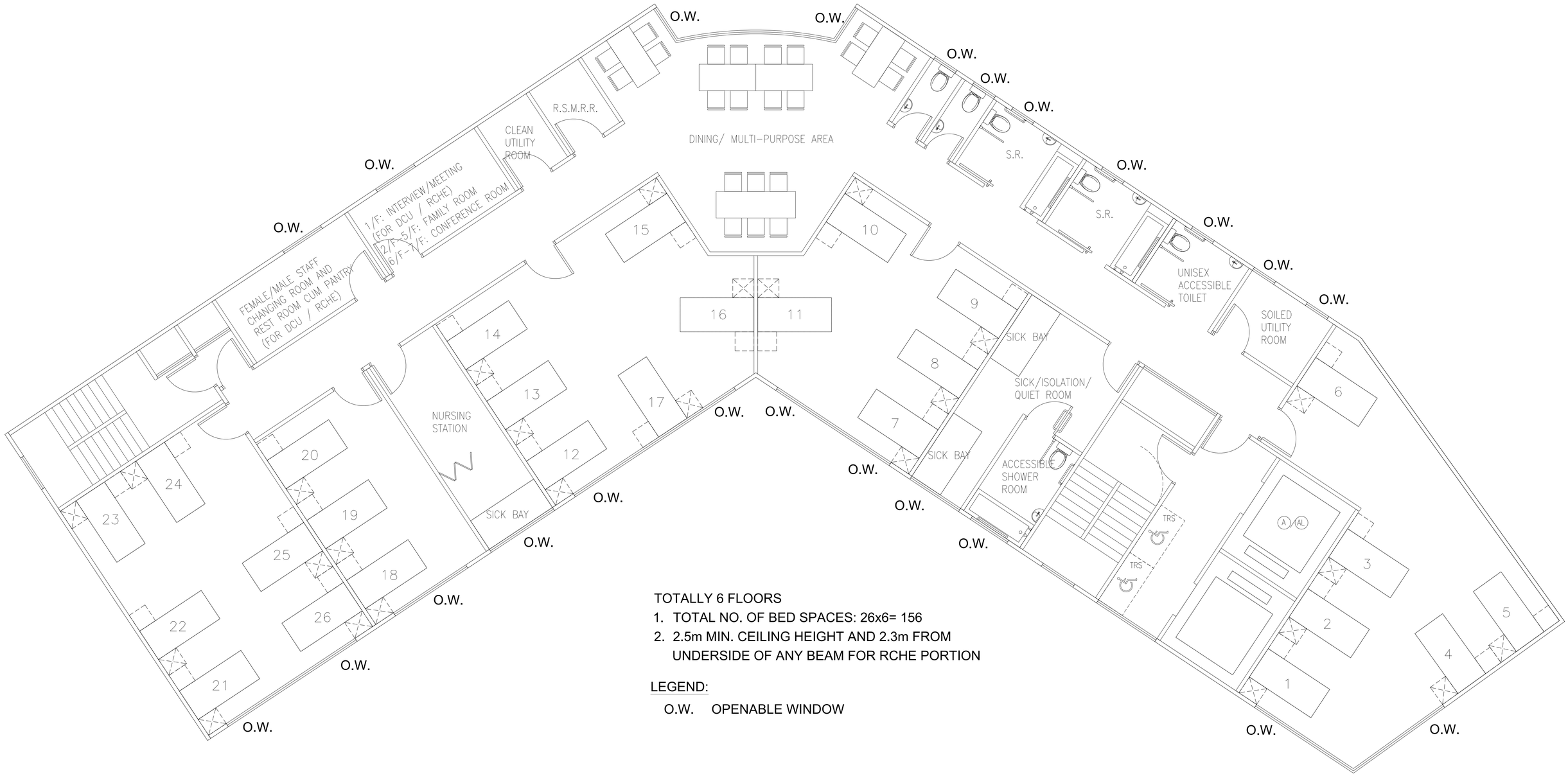
Project:
REZONING APPLICATION FROM “GOVERNMENT, INSTITUTION OR COMMUNITY” TO “RESIDENTIAL (GROUP B)6” ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

Drawing Title:
DCU / RCHE - G/F

Drawing No.:
GP-10

Architect:

樑安建築師有限公司
L&N Architects Ltd.
Rooms 1203-1204, 12/F Belgian Bank Building,
721-725 Nathan Road, Kowloon
Tel: (852) 3422 3082, Fax: (852) 3428 2269



TOTALLY 6 FLOORS

1. TOTAL NO. OF BED SPACES: 26x6= 156
2. 2.5m MIN. CEILING HEIGHT AND 2.3m FROM UNDERSIDE OF ANY BEAM FOR RCHE PORTION

LEGEND:

O.W. OPENABLE WINDOW

0 1 2 3 4 5M

2024.6.5

GENERAL NOTES
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2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK.
4. ARCHITECT SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.

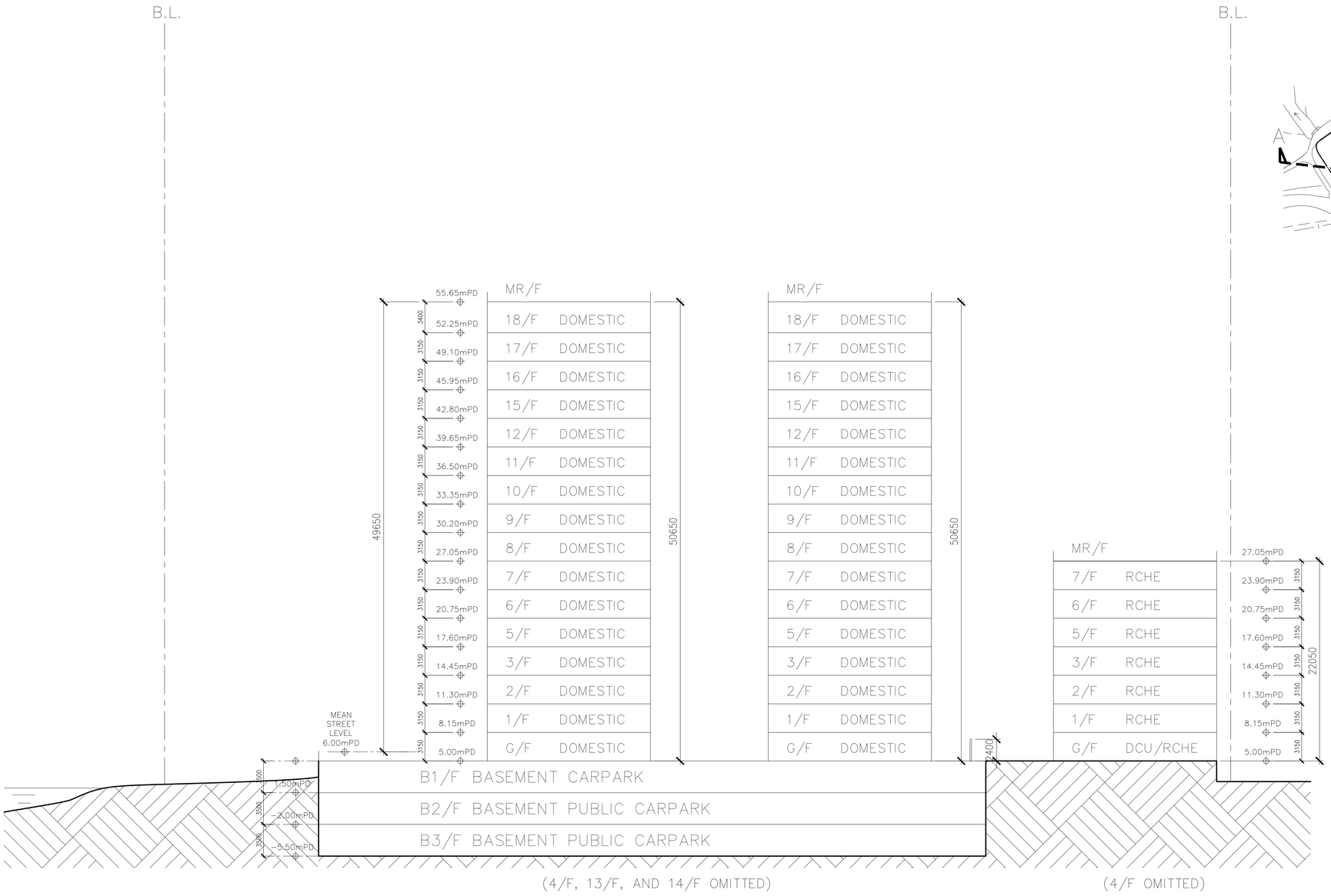
Project:
REZONING APPLICATION FROM “GOVERNMENT, INSTITUTION OR COMMUNITY” TO “RESIDENTIAL (GROUP B)6” ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

Drawing Title:
RCHE - 1/F-7/F
(4/F OMITTED)

Drawing No.:
GP-11

Architect:

樑安建築師有限公司
L&N Architects Ltd.
Rooms 1203-1204, 12/F Belgian Bank Building,
721-725 Nathan Road, Kowloon
Tel: (852) 3422 3082, Fax: (852) 3428 2269



GENERAL NOTES
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2024.6.5

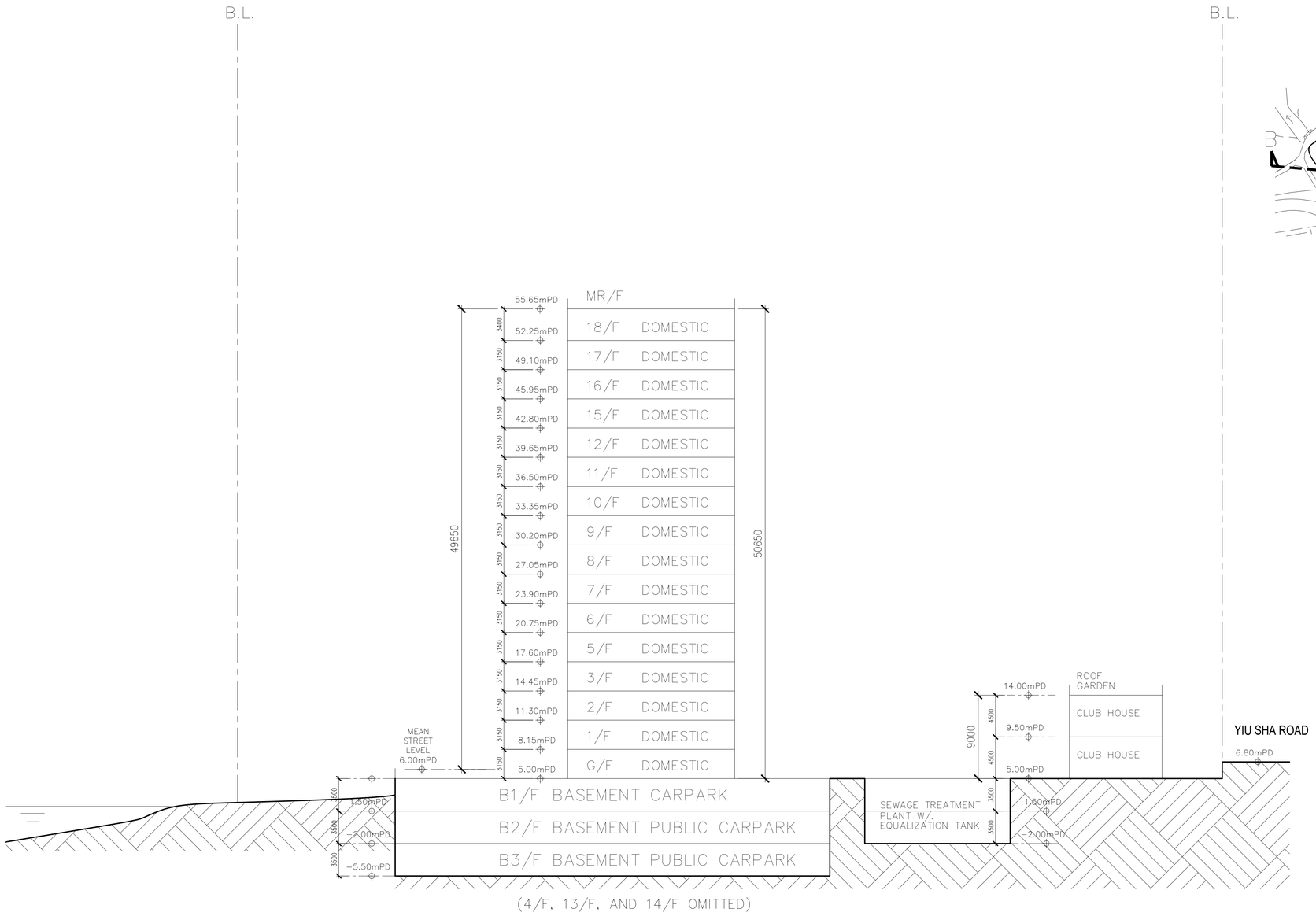
Project:
REZONING APPLICATION FROM “GOVERNMENT, INSTITUTION OR COMMUNITY” TO “RESIDENTIAL (GROUP B)6” ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

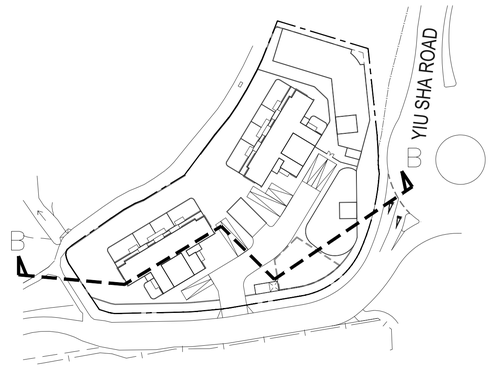
Drawing Title:
SCHEMATIC SECTION A-A

Drawing No.:
GP-12

Architect:

樑安建築師有限公司
L&N Architects Ltd.
Rooms 1203-1204, 12/F Belgian Bank Building,
721-725 Nathan Road, Kowloon
Tel: (852) 3422 3082, Fax: (852) 3428 2269





KEY PLAN

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3. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK.
4. ARCHITECT SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.

2024.6.5

Project:
REZONING APPLICATION FROM “GOVERNMENT, INSTITUTION OR COMMUNITY” TO “RESIDENTIAL (GROUP B)6” ZONE TO INCLUDE SOCIAL WELFARE FACILITIES (RCHE CUM DCU ONLY) AND PUBLIC VEHICLE PARK (EXCLUDING CONTAINER VEHICLE) AT LOTS NOS. 148 S.A RP (PART), 148 S.B RP (PART), 149 RP, 150 S.A, 150 S.B AND 151 IN D.D. 206 AND ADJOINING GOVERNMENT LAND, WEST OF WU KAI SHA ROAD, MA ON SHAN, NEW TERRITORIES

Drawing Title:
SCHEMATIC SECTION B-B

Drawing No.:
GP-13

Architect:

樑安建築師有限公司
L&N Architects Ltd.
Rooms 1203-1204, 12/F Belgian Bank Building,
721-725 Nathan Road, Kowloon
Tel: (852) 3422 3082, Fax: (852) 3428 2269

Appendix 4-1

Information of Cheung Kang Sewage Pumping Station from DSD

Helen Siu

From: kwlaw02@dsd.gov.hk
Sent: Monday, August 1, 2022 2:43 PM
To: Helen Siu
Cc: jasonchoi@dsd.gov.hk; sywchung@dsd.gov.hk; Cathy Man; Cherry Lee; ronaldlai@dsd.gov.hk
Subject: [Internet] [2039] S.16 Application for Residential Development in "G/IC" in Wu Kai Sha - Request for Information for Sewerage Impact Assessment
Attachments: I-DC_2019_13-1201-0.pdf; 22-0002-Fig1.pdf

==========
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Do not click the URLs or open the attachment unless you know it is safe to do so.
==========

Dear Ms. Helen Siu,
As requested, please find below the information extracted from our contract documents for your restricted information:

1. The design capacity of CKSPS is 113m³/ day
2. The catchment of CKSPS would be cover Cheung Kang Village only;
3. Contract drawing no. 60022486/C2/1201 showing the layout and direction of flow of our sewerage work at Cheung Kang.

SECTION 1

GENERAL

DESCRIPTION OF THE WORKS

The following clauses are added before GS Clause 1.01:

General description of the works 1.00A (1) The *works* to be executed under this contract include the following major items, inter alia:

(a) construction of about 5.6 km long gravity sewers with diameter ranging from 200mm to 450mm in four unsewered areas in Sha Tin and Tai Po, namely Cheung Kang, Ma Niu, Ha Wong Yi Au and CARE Village;

(b) Construction of a new Cheung Kang Sewage Pumping Station (CKSPS) with design capacity of about 113m³/day at Average Dry Weather Flow (ADWF), including construction of civil works, design, supply, delivery, installation, testing and commissioning of electrical and mechanical works and building services works necessary for the completion, operation and maintenance of CKSPS and associated rising mains;

Regards,

K.W. LAW
PC/SDD2, Special Duty Division, DSD

Tel no.: 2594 7263 / 9189 6591

From: CM CHOI/DSD/HKSARG
To: Kam Wah LAW/SDD/DSD/HKSARG@DSD
Cc: Simon Yiu Wing CHUNG/SDD/DSD/HKSARG@DSD
Date: 28/07/2022 16:47
Subject: Fw: [Internet] [2039] S.16 Application for Residential Development in “G/IC” in Wu Kai Sha - Request for Information for Sewerage Impact Assessment
Serial No.:

Dear KW,

Please follow up.

CM

----- Forwarded by CM CHOI/DSD/HKSARG on 28/07/2022 16:46 -----

From: Helen Siu <helensiu@aechk.com>
To: "jasonchoi@dsd.gov.hk" <jasonchoi@dsd.gov.hk>
Cc: Cathy Man <cm@aechk.com>, Cherry Lee <cherrylee@aechk.com>
Date: 28/07/2022 16:33
Subject: [Internet] [2039] S.16 Application for Residential Development in “G/IC” in Wu Kai Sha - Request for Information for Sewerage Impact Assessment
Serial No.:

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==========

Dear Mr. CHOI,

We are the environmental consultant engaged by Brand Star Limited, the project proponent, to prepare for the Drainage and Sewerage Impact Assessments in support of the S.16 Application under the Town Planning Ordinance. The location plan of the proposed project is enclosed in Figure 1.

Noted that there will be a new sewage pumping station constructed at Cheung Kang and the associated twin rising mains of about 300 m long under Contract No.: **DC/2019/13** - ***"Tolo Harbour Sewerage of Unsewered Areas, Stage 2 Phase 2"***. In order to obtain information of future sewerage condition associated with our proposed project for the assessment, it will be grateful if you could advise the following information: 1) capacity of the new sewage pumping station; 2) corresponding catchment areas covered and 3) the subsequent flow direction of the collected sewage.

Due to the tight schedule, it is highly appreciated if you would reply on or before 5 Aug 2022 for our follow up. Thank you very much for your kind attention. Should you have any queries, please feel free to contact the undersigned.

Regards,

Helen Siu – Assistant Consultant
Environmental Consultancy | Green & Healthy Building
T: (852) 2815 7028 | **D:** (852) 3915 7117 | **F:** (852) 2815 5399 | **E:** helensiu@aechk.com
Allied Environmental Consultants Limited *Member of AEC Group (HKEX Stock Code: 8320.HK)*

27/F, Overseas Trust Bank Building, 160 Gloucester Road, Wan Chai, Hong Kong
Follow us www.asecg.com

==========

This message has been analyzed by Deep Discovery Email Inspector.

Project Management Initials:
Designer: RYLH
Checked: YHH
Approved: RCYK
ISO A1 594mm x 841mm

842400 E
842600 E
842800 E
832500 N
832300 N
832100 N

LEGEND:

- RM — RM — PROPOSED TWIN RISING MAIN
- PROPOSED GRAVITY SEWER
- PROPOSED SITE FOR SEWAGE PUMPING STATION
- SHA — SMALL HOUSE APPLICATION

N

PROPOSED CHEUNG KANG SPS

CK123 CK122 CK121 CK120 CK119 CK118 CK117 CK116 CK115 CK114 CK113 CK112 CK111 CK110 CK109 CK108 CK107 CK105 CK104 CK103 CK202 CK201 CK203 CK301 CK401 CK101 CK102 CK124 CK125 CK126 CK1103 CK1102 CK1101 CK905 CK904 CK903 CK902 CK901 CK906 CK501 CK502 CK701 CK702 CK703 CK801

WU KAI SHA ROAD

WU KAI SHA YOUTH VILLAGE

WU KAI SHA NEW VILLAGE

CHEUNG KANG
長庚
(長徑)
Cheung Kang

WU KAI SHA
烏溪沙

WU KAI SHA VILLAGE
烏溪沙村

WU KWAI SHA SEWAGE PUMPING STATION
烏溪沙污水泵房

SAI SHA ROAD

WIP Nov 2014

Plot File by: ZHUMZ 2020/3/26
PATH: P:\PROJECTS\60022486\Drawing\CONTRACTC2\1000\C2_1201.dgn

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PROJECT
項目

TOLO HARBOUR SEWERAGE OF UNSEWERED AREAS STAGE 2 - INVESTIGATION, DESIGN AND CONSTRUCTION

CONTRACT TITLE:
TOLO HARBOUR SEWERAGE OF UNSEWERED AREAS, STAGE 2 PHASE 2

CLIENT
業主

渠務署
Drainage Services Department

CONSULTANT
工程顧問公司

AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS
分判工程顧問公司

ISSUE/REVISION
修訂

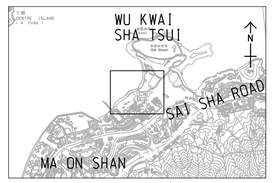
I/R 修訂	DATE 日期	DESCRIPTION 內容摘要	CHK. 複核
-	MAR. 20	TENDER DRAWING	YHH

STATUS
階段

SCALE 比例
A1 1 : 1000

DIMENSION UNIT 尺寸單位
METRES

KEY PLAN
索引圖



PROJECT NO. 項目編號
60022486

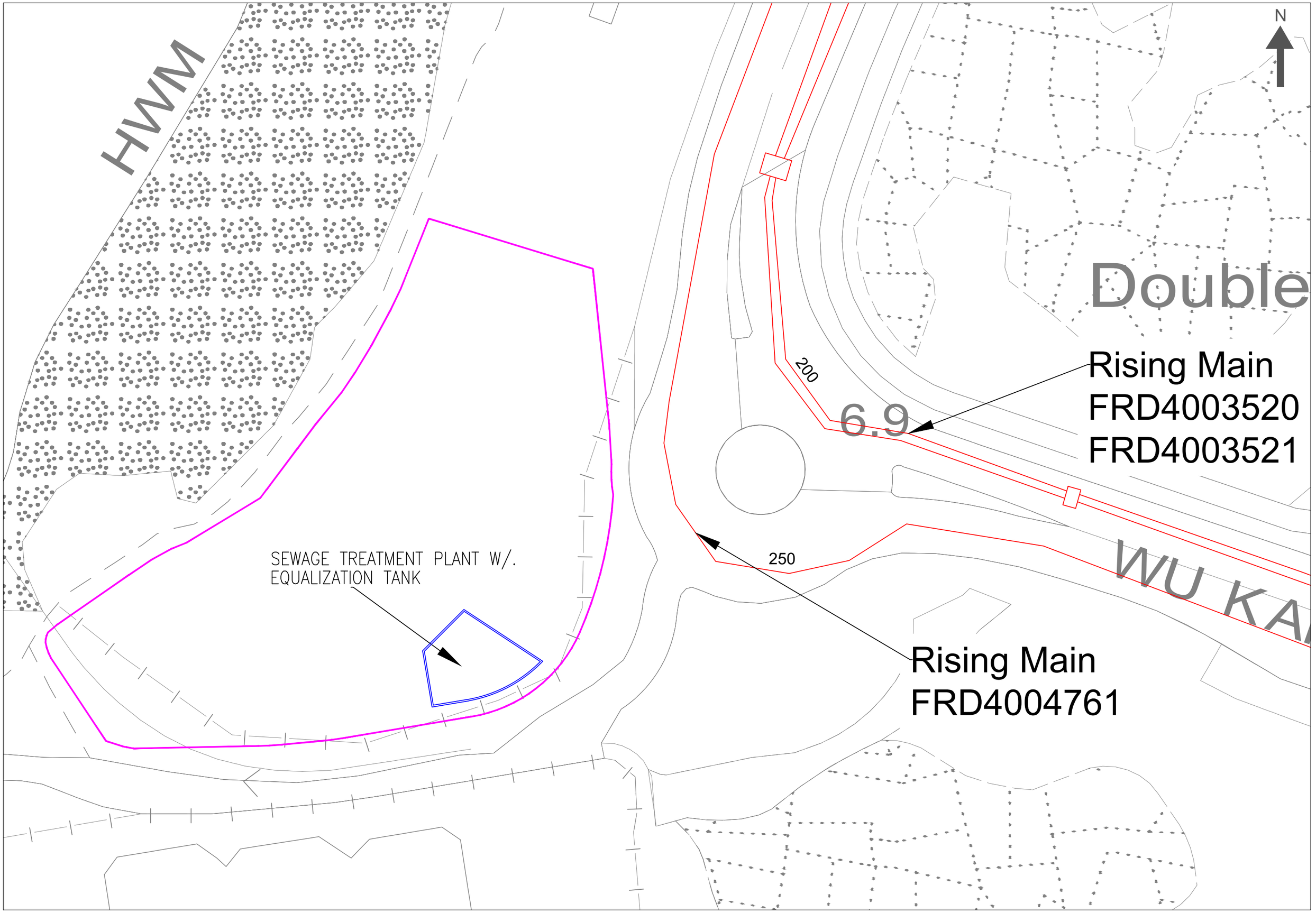
CONTRACT NO. 合約編號
DC/2019/13

SHEET TITLE
圖紙名稱
CHEUNG KANG - SEWERAGE LAYOUT PLAN

SHEET NUMBER
圖紙編號
60022486/C2/1201

Appendix 4-2

Proposed Sewerage Discharge



C:\USERS\NGANCHUNSANG\SYNOLOGYDRIVE\2039 WU KAI SHA\05 REPORT\01 AEC REPORT\ISSUE 2 DRAFT 3\DSIA\FIG\FIG 4.1.DWG

Appendix 4-3

Detailed Hydraulic Calculation of Sewerage Flow

S.12A Application for Residential Development in "G/IC" in Wu Kai Sha

Estimated Sewage Discharge from the Proposed Development (2023.07.07 Scheme)

			Remarks
1. Residential Tower			
No. of Units	184	Units	
Average Household Size	2.9	persons	Referred to "Household Characteristics of Population" in Sha Tin of 2021 Population Census
Unit Flow	0.27	m^3/person/day	Referred to the planning unit flow for Domestic (Private R2) in Table T-1 of GESF
ADWF	**144.1**	m^3/day	
2. Residents of RCHE and DE			
Residents (RCHE)			
No. of Bed Space	162		
Unit Flow	0.19	m^3/person/day	Referred to the planning unit flow for Domestic (housing type specific) - Institutional and special class in Table T-1 of GESF
ADWF	30.8	m^3/day	
Residents (DE)			
No. of Places	40.0		
Unit Flow	0.15	m^3/person/day	Referred to the planning unit flow for Domestic (housing type specific) - Temporary and Non-domestic in Table T-1 of GESF
ADWF	6.0	m^3/day	
Total ADWF	**36.8**	m^3/day	
2. Staff of RCHE and DE			
Estimated Area	2856	m^2	Referred to submitted GBP
Worker Density	3.3	person/100m^2	Community, Social & Personal Services (All Types) in Table 8 of CIFSUS
Total Number of Persons	95	persons	
Unit Flow Factor	0.28	m^3/person/day	Commercial Employee + Personal Services - J11 in Table T-2 of GESF
ADWF	**26.4**	m^3/day	
3. Lavatory			
Club House			
Estimated Area	500	m^2	Referred to submitted GBP
Worker Density	3.3	person/100m^2	Community, Social & Personal Services (All Types) in Table 8 of CIFSUS
Total Number of Workers in Club House	17	persons	
Estimated No. of Workers of PVP	3	persons	Referred to submitted GBP
Estimated No. of Security	3	persons	
Unit Flow Factor	0.28	m^3/person/day	Commercial Employee + Personal Services - J11 in Table T-2 of GESF
ADWF	**6.4**	m^3/day	
Total			
ADWF	**213.7**	m^3/day	
Contributing Population	791		Refer to Section 12.1 of GESF
Peaking Factor	8		Refer to Table T-5 of GESF
Peak Flow	**0.020**	m^3/s	

Proposal for Sewage Treatment Plant with Equalisation Tank

Estimation of the Required Volume for the Sewage Treatment Plant

Dry Weather Flow (DWF) (m3/day) Sewage (Residents and Service)	DWF factor [1]	Minimum Sewage Treatment Plant Capacity Required (m3)
213.7	3	641

Estimation of the Required Volume for the Equalisation Tank

Dry Weather Flow (DWF) (m3/day) Sewage (Residents and Service)	DWF factor [1]	Time Required to Hold Excess Flow (hrs) [2]	Minimum Equalisation Tank Capacity Required (m3)
213.7	3	2	53

Remarks:

[1]: With reference from EPD's "Guidelines for the Design of Small Sewage Treatment Plants". For the Proposed Development, the factor of 3 x DWF is adopted for development with population of under 1000, with the use of equalisation tank.

[2]: With reference to EPD's "Guidelines for the Design of Small Sewage Treatment Plants", if an equalisation tank is used, the equalisation tank shall be designed to hold excess flow for a period of 2 hours.

3.3 The design peak flow arriving at the STP as a proportion of dry weather flow (DWF) shall be taken as:

- 6 DWF for population equal to or under 1 000
- 4 DWF for population over 1 000 but not less than that based on 1 000 population.

Either the STP can be designed for the above peak flow rate or it can be designed to cater for a peak flow of 3 DWF, excess flow over 3 DWF being equalized in an equalization tank. In the latter case the feed pumps must be sized accurately to avoid excessive peak flow rate production.

Equalization tanks should be designed to hold the excess flow for a period of two hours. Only the tank volume above the duty pump cut-in level should be considered as effective equalization volume. Air ejectors should be provided to prevent septicity of sewage.

Estimation of the Loading Requirements for the Sewage Treatment Plant

BODs

Population Description	Estimated Population		Recommeded Loading Rate for BODs [3]	Loading Rate for BODs
			(kg/persons/day) [b]	(kg/day)
Residential	Person	736	0.055	40
Services	Person	118	0.023	3
	SUM	854	**SUM**	43

SS

Population Description	Estimated Population		Recommeded Loading Rate for SS [3]	Loading Rate for SS
			(kg/persons/day) [b]	(kg/day)
Residential	Person	736	0.055	40
Services	Person	118	0.023	3
	SUM	854	**SUM**	43

Remarks:

[3]: The recommended loadings for BOD and SS for Office (not including canteen) Appendix 2 in "Guidelinesfor the Design of Small Sewage Treatment Plants" by EPD are adopted for the calculation for worst casescenario for pollutant loadings generated from the Project Site.

Design Removal Percentage of Pollutant Loading

Load Type	**Loading from the Proposed Development (kg/day)**	**Sewage Flow Rate (m^3/day)**	**Loading from the Proposed Development (mg/L) / (CFU/100ml)**	**Standards for effluents discharge (mg/L) [4]**
SS	43	213.7	202	20
BOD	43	213.7	202	30

Remarks:

[4] Reference to Table 7, Group D, Technical Memorandum - Standards of Effluent Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters.

Appendix 5-1

Proposed Stormwater Discharge

HWM

Catchpit
SCH4012470

750

750

375

750

375

N

Public Storm W
SMH4083021

Public Storm Wa
SMH4083020

Public Storm Wate
SMH4083017

Public Storm Water M
SMH4083015

6.9

Outfall direct
discharge to
Tolo Harbour

Proposed Manhole M2
CL: 5.0mPD
IL: ~3.0mPD

300

Proposed Manhole M1
CL: 5.0mPD
IL: ~4.0mPD

SEWAGE TREATMENT PLANT
W/. EQUALIZATION TANK

2.4

Proper connection from STP

Catchpit
SCH4012662

C:\USERS\NGANCHUNSANG\SYNOLOGYDRIVE\2039 WU KAI SHA\05 REPORT\01 AEC REPORT\ISSUE 2 DRAFT 3\DSIA\FIG\FIG 5.1.DWG

Appendix 5-2

Detailed Hydraulic Calculation for Stormwater Flow

Peak Runoff Estimation of the Subject Site after the completion of Proposed Development

Catchment	Total Area of the Catchment (m^2)	Land Use		Topography		Average Slope, H (m per 100m)	Flow Distance, L (m)	Inlet Time, t_o (min) [1]	Flow Time, t_f (min) [2]	Duration, t_c (min) [3]	50 - year return period				Runoff Coefficient, C [6]	Rainfall Increase due to Climate Change, % [7]	50 - year return period	
		Surface Characteristics	Area (m^2)	Inlet invert level (mPD)	Outlet invert level (mPD)						Storm Constant, a [4]	Storm Constant, b [4]	Storm Constant, c [4]	Extreme Mean Intensity, i (mm/hr) [5]			Peak Runoff, Qp (m3/s) [8]	Total Peak Runoff, Qp (m3/s) [8]
Subject Site	4255	Concrete	3404	5.0	4.9	0.10	98	9.70	0	9.70	451.3	2.46	0.337	194.45	0.95	16.0	0.203	0.221
		Grass	851												0.35		0.019	
Treated effluent discharged from STP																		0.007
Existing Site	4255	Concrete	2553	4.8	3.4	1.50	98	5.67	0	5.67	451.3	2.46	0.337	222.74	0.95	16.0	0.174	0.217
		Grass	1702												0.35		0.043	

Note:

[1] Brandsby William's equation is referenced from Section 7.5.2 in DSD Stormwater Drainage Manual (Fifth Edition).

$$t_o = \frac{0.1446 L}{H^{0.2} A^{0.1}}$$

where t_o = time of concentration of a natural catchment (min.)

A = catchment area (m^2)

H = average slope (m per 100 m), measured along the line of natural flow, from the summit of the catchment to the point under consideration

L = distance (on plan) measured on the line of natural flow between the summit and the point under consideration (m)

[2] t_f is assumed to be 0 for conservative estimation.

[3] $t_c = t_o + t_f$

[4] Storm constants are referenced to Table 3a in DSD Stormwater Drainage Manual (Fifth Edition) based on corresponding return periods.

[5] Intensity-Duration-Frequency calculation is referenced from Section 4.3.3 in DSD Stormwater Drainage Manual (Fifth Edition).

$$i = \frac{a}{(t_d + b)^c}$$

where i = extreme mean intensity in mm/hr,

t_d = duration in minutes ($t_d \leq 240$), and

a, b, c = storm constants given in Tables 3a, 3b, 3c and 3d.

[6] Runoff coefficient is referenced from Section 7.5.2 in DSD Stormwater Drainage Manual (Fifth Edition). For conservative estimation, coefficient of 0.35 is assumed for unpaved area while that of 0.95 for paved area.

[7] Rainfall increase precentage due to climate change is referenced from Table 28 in DSD Stormwater Drainage Manual (Fifth Edition) and Corrigendum No. 1/2022 . 16.0% for End of 21st Century is adopted as worst case scenario.

[8] Rational method for peak runoff estimation is referenced from Section 4.3.3 in DSD Stormwater Drainage Manual (Fifth Edition).

$$Q_p = 0.278\, C\, i\, A$$

where Q_p = peak runoff in m^3/s

C = runoff coefficient (dimensionless)

i = rainfall intensity in mm/hr

A = catchment area in km^2

Peak Runoff Estimation from the Proposed Development

	From	To	Diameter, D (m) [1]	Cross-section Area, A (m^2) [2]	Wetted Perimeter, P (m) [2]	Hydraulic Radius, R (m) [3]	Length of Pipe, L (m) [1]	Inlet Invert Level (mPD) [1]	Outlet Invert Level (mPD) [1]	Slope, s [4]	Pipe Roughess, k (m) [5]	Velocity, V (m/s) [6]	Full Capacity, Q (m^3/s) [7]	Contributing Catchment Area [8]	Catchment Areas	Peak Flow, Q (m3/s)	Return Periods (Year) [9]	Occu-pancy (%)
	M1	M2	0.300	0.067	0.942	0.071	3	4.0	3.0	0.333	0.0006	8.84	0.594	Subject Site	Subject Site	0.229	50	39%

[1] Proposed settings for the new stormwater pipes, will be studied and reviewed at later stage.
[2] According to Section 9.3 in DSD Stormwater Drainage Manual (Fifth Edition), 5% / 10% reduction in flow area based on channel gradient is taken into account for the effects to flow capacity due to materials deposited on the bed.
[3] Hydraulic Radius = Cross-section Area / Wetted Perimeter
[4] Slope = (Inlet Invert Level - Outlet Invert Level) / Length of Pipe
[5] Surface roughness is assumed to be 3.0mm for slimed concrete pipe with poor condition as worst case scenario, with reference to Table 14 in DSD Stormwater Drainage Manual (Fifth Edition).
[6] Velocity is calculated based on Colebrook-White equations.
By Colebrook-White Equation,

$$\bar{V} = -\sqrt{32gRS_f}\log\left[\frac{k_s}{14.8R} + \frac{1.255\nu}{R\sqrt{32gRS_f}}\right]$$

Where
$\bar{V}$ = cross-sectional mean velocity (m/s)
R = hydraulic radius (m)
S_f = friction gradient (dimensionless)
C = Chézy coefficient ($m^{\frac{1}{2}}/s$)
n = Manning coefficient ($s/m^{1/3}$)
f = Darcy-Weisbach friction factor (dimensionless)
k_s = surface roughness (m)
ν = kinematic viscosity (m^2/s)
g = acceleration due to gravity (m/s^2)
C_{HW} = Hazen-William coefficient (dimensionless)

With Reference to Table 14 in DSD Stromwater Drainage Manual (Fifth Edition),
Kinematic viscosity is 0.000001306 m/s.
Gravitational acceleration is 9.8m/s^2.
[7] Capacity = Length of Pipe × Velocity
[8] Bold and underlined subcatchment ID stands for stormwater in those subcatchments flowing into the corresponding pipe.
[9] With reference to Table 3 of Section 6.6.2 in DSD Stormwater Drainage Manual (Fifth Edition), 50 years of return period has been adopted.

Appendix 5-3

Condition of Existing Open Channel within Site Boundary

Appendix 5-3 Condition of Existing Open Chennel