

Annex A Revised Sewerage Impact Assessment

Issue No. : 4
Issue Date : Apr 2024
Project No. : 2127



SEWERAGE IMPACT ASSESSMENT

FOR

APPLICATION FOR AMENDMENT OF PLAN UNDER SECTION 12A FOR THE TOWN PLANNING ORDINANCE (CAP. 131) FOR MIXED USE DEVELOPMENT AT LOTS 796 AND 1008RP IN D.D. 77 AND ADJOINING GOVERNMENT LAND IN PING CHE, TA KWU LING, NEW TERRITORIES

Prepared by

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COMMERCIAL-IN-CONFIDENCE

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Document Verification



Project Title	APPLICATION FOR AMENDMENT OF PLAN UNDER SECTION 12A FOR THE TOWN PLANNING ORDINANCE (CAP. 131) FOR MIXED USE DEVELOPMENT AT LOTS 796 AND 1008RP IN D.D. 77 AND ADJOINING GOVERNMENT LAND IN PING CHE, TA KWU LING, NEW TERRITORIES	Project No. 2127
Document Title	SEWERAGE IMPACT ASSESSMENT	

Issue No.	Issue Date	Description	Prepared by	Checked by	Approved by
1	Oct 2023	1st Submission	Various	Cathy Man	Grace Kwok
2	Dec 2023	2nd Submission	NGAN Chun Sang	Cathy Man	Grace Kwok
3	Feb 2024	3rd Submission	NGAN Chun Sang	Cathy Man	Grace Kwok
4	Apr 2024	4th Submission	NGAN Chun Sang	Cathy Man	Grace Kwok

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1. INTRODUCTION

1.1. Background

1.1.1. Allied Environmental Consultants Limited (“AEC”) has been appointed to conduct a Sewerage Impact Assessment (“SIA”) to support of a Section 12A application for the mixed use development at Lot 796 & 1008RP at D.D. 77 and adjoining government land in Ping Che, Ta Kwu Ling, New territories (hereinafter referred to as “Application Site”).

1.1.2. According to the approved Ping Che and Ta Kwu Ling Outline Zoning Plan (OZP No.: S/NE-TKL/14) gazette on 12/03/2010, the Application Site is currently zoned as “Open Storage” (“OS”) Zone, the southern part of the Application Site is zoned as “Agriculture” (“AGR”) and a minor portion of the Application Site is shown as “Road”.

1.2. Objectives

1.2.1. The objectives of this SIA are to assess whether the capacity of the existing sewerage networking to the Application Site is sufficient to cope with the sewage flow from proposed development.

1.3. Report Structure

1.3.1. The remaining chapters of this report are shown below:

Chapter 2 – Site Context

Chapter 3 – Relevant Guidelines & Standards

Chapter 4 – Sewerage Impact Assessment

Chapter 5 – Conclusion

2. SITE CONTEXT

2.1. Site Location

2.1.1. The proposed development is located at Ping Che Road from the north to northeast, the unnamed village road to the east, village, agricultural land and open storage area to the south and west.

2.2. Proposed Development Scheme and Existing Environment

2.2.1. The proposed site area of the subject site is 17,822m², with a plot ratio of 5.9 for domestic use and 1.1 for non-domestic use. The total GFA for domestic use is 105,145 m², and the 19,603 m² for non-domestic use. The proposed development will consist of 5 blocks of residential tower ranging from 47 to 48-storey (excluding basement) in height, provided 2,205 residential unit, and 1 block of commercial tower with 35-storey (excluding basement) in height. The non-domestic use consisted of retail, office, hotel or service apartment, clubhouse, day care centre for the elderly and child care centre.

2.2.2. Drainage information was obtained from the GeoInfo Map services of the Lands Department in Aug 2023 to gather the background information on sewerage infrastructure in the vicinity of the Application Site. A series of rising main public sewers with diameters of 200 mm were found along Ping Che Road, towards Southeast direction and further downstream. Furthermore, there are 2 pumping stations around the Application Site, which are Ng Chow South Road Sewage Pumping Station and Hung Leng Sewage Pumping Station are located 250 m and 1 km away from Application Site respectively.

2.2.3. However, there is no public foul sewer identified along Ping Che Road and around Application Site. Therefore, on-site Sewerage Treatment Plant (STP) are proposed for the proposed development.

2.2.4. The expected completion year and operation year of the Proposed Project is in 2032. **Figure 2.1** shows the Site location and its environs. The Master Layout Plan and sectional drawings proposed development are shown in **Appendix A**.

3. RELEVANT GUIDELINES & STANDARDS

3.1. Legislation, Standards and Guidelines

3.1.1. Water quality in Hong Kong is legislated by the provisions of 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 Deep Bay WCZ. A Technical Memorandum on Standards for Effluents discharged into Drainage and Sewerage Systems, Inland and Coastal Water (TMES) 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.

3.1.2. With reference to Table 7 of the Technical Memorandum, as the Proposed Development is located within Deep Bay 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 3-1 Standards for Effluents Discharge under TM

Load Type	Standards for Effluents Discharge (mg/L)	
	Flow rate ≤1000 m ³ /day	Flow rate >1000 m ³ /day and ≤6000 m ³ /day
BODs	20	10
SS	50	25

3.1.3. With reference to ProPECC PN 1/23 Drainage Plans Subject to Comment by the Environmental Protection Department (“EPD”), 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, under the Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations 40(1), 40(2), 41(1) and 90.

3.1.4. The following standards and guidelines are adopted for estimation, assessment and evaluation of sewerage implication of the proposed development:

- “Water Pollution Control Ordinance” (“WPCO”)
- “Hong Kong Planning Standards and Guidelines” issued by the Planning Department;
- “Technical Memorandum on Standards for Effluents Discharged into Drainage and

Sewerage Systems, Inland and Coastal Waters (TM-DSS)”;

- “Sewerage Manual Part 1” published by DSD;
- “Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning Version 1.0 (Report No.: EPD/TP1/05)” (“GESF”) published by Environmental Protection Department (“EPD”);
- Water Supplies Department (WSD) Water Quality Criteria; and
- Guidelines for the Design of Small Sewage Treatment Plants issued by EPD.

4. SEWERAGE IMPACT ASSESSMENT

4.1. Methodology for Estimation of Average Dry Weather Flow

4.1.1. The global unit flow factors as recommended in the *Guideline for Estimating Sewage Flows for Sewage Infrastructure Planning* (hereafter as “GESF”) published by EPD in 2005 has been adopted in the assessment to estimate sewage flow. Relative unit flow factors applied for the sewage generation estimation are tabulated in **Table 4-1** below.

Table 4-1 Unit Flow factors Adopted for the Assessment

Type of People	Unit Flow Factors ^[2]	Category ^[1]
Within Proposed Development ^[3]		
Residents of the Residential Development R2	0.270 m ³ /person/day	Domestic (housing type specific) – R2
Residents of Elderly Day Care Centre	0.190 m ³ /person/day	Domestic: Institutional and Special class
Students of Childcare Centre	0.040 m ³ /person/day	School Student
Staff of Clubhouse	0.280 m ³ /person/day	Commercial Employee + Commercial activities (J11 Community, Social & Personal Services)
Staff of Office	0.080 m ³ /person/day	Commercial Employee
Staff of Retail	0.280 m ³ /person/day	Commercial Employee + Commercial activities (J4 Wholesale & Retail)
Staff of Hotel/Service apartment	1.580 m ³ /person/day	Commercial Employee + Commercial activities (J10 Restaurants & Hotels)
Staff of Elderly Day Care Centre	0.280 m ³ /person/day	Commercial Employee + Commercial activities (J11 Community, Social & Personal Services)
Staff of Childcare Centre	0.280 m ³ /person/day	Commercial Employee + Commercial activities (J11 Community, Social & Personal Services)

Notes:

[1] Environmental Protection Department, HKSARG [EPD] (2005). *Guidelines for estimating sewage flows for sewage infrastructure planning (EPD/TP 1/05)*. Hong Kong

[2] UFF for various occupancy types are adopted according to Table T-1 and Table T-2 of the GESF.

[3] Type of Residential Development is determined by the average area per flat of the residential development and referred to Table 8 of *The Hong Kong Planning Standards and Guidelines (HKPSG) Ch.2 Residential Densities*. For Hong Kong & Kowloon area, flat with GFA less than 50 m² will be categorized as R1; GFA between 50-110 m² will be categorized as R2; GFA between 110-210 m² will be categorized as R3; GFA greater than 210 m² will be categorized as R4.

4.2. Estimation of Sewage Flow from Proposed Developments

4.2.1. The proposed project comprises of 5 blocks of residential tower ranging from 46 to 47-storey in height, provided 2,205 residential unit, 1 block of commercial tower with 35-storey in height, clubhouse, day care centre for elderly and child care centre. The estimated sewerage flow for proposed developments is given in **Table 4-2** and **Appendix B**.

Table 4-2 Sewage Flow Estimation for the Proposed Development and Existing

Proposed Development		
Generation from operation		Remark
Generation from Residential – R2		
Total Number of Residents	6174 persons	Referred to submitted GBP.
Unit Flow Factor	0.27 m ³ /person/day	Domestic (housing type specific) – R2 in Table T-1 of GESF.
Average Sewage Discharge	1667.0m ³ /day	
Generation from Residential – Day Care Centre for the Elderly		
Total Number of Residents	60 persons	Referred to submitted GBP.
Unit Flow Factor	0.19 m ³ /person/day	Domestic (housing type specific) – Temporary and non-domestic in Table T-1 of GESF.
Average Sewage Discharge	11.4 m ³ /day	
Generation from Residential – Child Care Centre		
Total Number of Residents	100 persons	Referred to submitted GBP.
Unit Flow Factor	0.04 m ³ /person/day	School Students in Table T-2 of GESF.
Average Sewage Discharge	4.0 m ³ /day	
Generation from staff (Retail)		
Floor Area	2400.0 m ²	Referred to submitted GBP.
Worker Density	3.5 person/100m ²	Retail Trade (All Types) in Table 8 of CIFSUS.
Total Number of Persons	84 persons	
Unit Flow Factor	0.28 m ³ /person/day	Commercial Employee + Wholesale & Retail – J4 in Table T-2 of GESF.
Average Sewage Discharge	23.5 m ³ /day	
Generation from staff (Office)		
Floor Area	11500.0 m ²	Referred to submitted GBP.
Worker Density	3.4 person/100m ²	All Economic Activities (All Types) in Table 8 of CIFSUS.
Total Number of Persons	391 persons	
Unit Flow Factor	0.08 m ³ /person/day	Commercial Employee in Table T-2 of GESF.
Average Sewage Discharge	31.3 m ³ /day	
Generation from staff (Hotel/Service Apartment)		
Floor Area	5703.0 m ²	Referred to submitted GBP.
Worker Density	3.2 person/100m ²	Hotels & Boarding Houses (All Types) in Table 8 of CIFSUS.
Total Number of Persons	183 persons	
Unit Flow Factor	1.58 m ³ /person/day	Commercial Employee + Restaurants & Hotels - J10 in Table T-2 of GESF.
Average Sewage Discharge	289.1 m ³ /day	
Generation from staff (Clubhouse)		
Floor Area	3500.0 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	116 persons	
Unit Flow Factor	0.28 m ³ /person/day	Commercial Employee + Community, Social & Personal Services - J11 in Table T-2 of GESF.
Average Sewage Discharge	32.5 m ³ /day	
Generation from staff (Day Care Centre for the Elderly)		
Floor Area	787.6 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	26 persons	
Unit Flow Factor	0.28 m ³ /person/day	Commercial Employee + Community, Social & Personal Services - J11 in Table T-2 of GESF.
Average Sewage Discharge	7.3 m ³ /day	
Generation from staff (Child Care Centre)		
Floor Area	1166.0 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	39 persons	
Unit Flow Factor	0.28 m ³ /person/day	Commercial Employee + Community, Social & Personal Services - J11 in Table T-2 of GESF.
Average Sewage Discharge	10.9 m ³ /day	
Generation from Swimming Pool Backflow		
Swimming Pool Volume	511 m ³	
Maximum Backwash Volume	6 m ³ /day	
Total Average dry weather flow of the Proposed Development	2077.0 m³/day	
Catchment Inflow Factor	1.0	
Revised Total Average dry weather flow of the Proposed Development	2077.0 m³/day	
Generation from Swimming Pool Backflow	6 m³/day	
Contributing Population	7693	
Peaking Factor	3	
Peak Flow	0.072 L/s	

4.3. Evaluation of Sewerage Impact

4.3.1. With reference to **Table 4-2**, the total estimated Average Dry Weather Flow (“ADWF”) from the proposed development is 2083.0 m³/day. The population estimated ADWF of proposed development is summarized in **Appendix B**. As mentioned in **Section 2.2.3**, there is no public sewer identified along Ping Che Road and around Application Site. Therefore, on-site STP are proposed for the proposed development. The sewage generated onsite will be treated by the STP and discharged to the public drainage system at the end. Hence, no sewage generated

will be discharged to the public sewerage system and impact is not envisaged.

4.4. On-site Sewage Treatment Plant

4.4.1. “Guidelines for the Design of Small Sewage Treatment Plants” (The STP Guidelines) and WPCO should be followed in designing the on-site STPs 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 Technical Memorandum – Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters.

4.4.2. 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 Deep Bay WCZ is given in **Table 4-3**. 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 4-3 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

4.4.3. 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.

- 4.4.4. The on-site STP will be constructed to cater for the design peak flow of 6237 m³/d (6231 m³/d +6 m³/d), with the provision of an equalization tank with minimum capacity of 519.75 m³ to ensure it fulfills the Guidelines for the Design of Small Sewage Treatment Plant. The calculation is given in **Table 4-4** and **Appendix C**. The preliminary layout plan for the on-site STP is given in **Figure 4.1**.

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

Average Dry Weather Flow (ADWF) (m ³ /day)		Total ADWF (m ³ /day)	Peaking Factor ^[1]	Design Peak Flow Rate from Proposed Project (m ³ /day)	Swimming Pool Backwash (m ³ /day)	Design Flow Rate from Proposed Project (m ³ /hr)
Sewage (Residents)	Sewage (Staff)					
1682.4	394.6	2077.0	3	6231	6	260

Note:

[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) is adopted, with equalization tank provided to equalize excess flow.

- 4.4.5. Sludge storage tank with deodorization facilities will be provided in the STP. The sludge after having been dewatered and thickened will be tanked 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.
- 4.4.6. As for good practice for STP, measures will be incorporated into the design to minimize the risk of emergency overflow from 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 pump 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 will 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, on-call crews will follow the overflow emergency response plan and proceed with the best response to correct the problem at once. For

example, the alarm system will be activated once overflow occurs. The on-call crews will provide instant response by acknowledging the alarm, to investigate the cause of overflow and correct the problem. The alarm system will be repeated until it is acknowledged. In addition, the on-call crews will ensure the standby pump is switched on and contains the overflow sewage using temporary weirs or vacuum trucks, where applicable.

- 4.4.7. 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. Property Management will be responsible for the construction and maintenance of the STP. In addition, regular self-monitoring will be conducted 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. Necessary discharge standards, as set out in EPD's Technical Memorandum – Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters will be adopted.

4.5. Estimation of Pollutants Loading from Proposed Project

- 4.5.1. With reference to the EPD's Guidelines, the following unit load factors ("ULFs") for different types of pollutant generated from the Proposed Development as shown in **Table 4-5** have been used in calculation of total pollutant loads from the Proposed Development.

Table 4-5 Unit Load Factors

Load Type	Unit Load Factor ^[1]	
	Residents	Staff
BODs (kg/day/person)	0.055	0.007
SS (kg/day/person)	0.055	0.007

Noted:

[1]: The recommended loadings for BOD and SS for Office (not including canteen) refer to Appendix 2 in "Guidelines for the Design of Small Sewage Treatment Plants" by EPD are adopted for the calculation for worst case scenario for pollutant loadings generated from the Application Site

- 4.5.2. The loadings of pollutants generated from the raw sewage from the proposed project is summarized in **Table 4-6**.

Table 4-6 Estimated Pollutant Loadings from Proposed Project

Population	Unit Load Factor (kg/day/person)	Pollutant Loadings (kg/day)
------------	-------------------------------------	--------------------------------

		BODs	SS	BODs	SS
Residents	6334	0.055	0.055	348.37	348.37
Staff	839	0.007	0.007	6.11	6.11
Total				354.48	354.48

4.6. Pollutant Loads Removal Requirements

4.6.1. According to WPCO-TM, sewage shall be treated to acceptable standards prior discharge to stormwater drainage, before discharging to the Deep Bay WCZ. The STP shall be designed to remove sufficient BOD and SS in the sewage generated from proposed project to the effluent standards set out, for Group II Coastal Waters, in the Technical Memorandum before discharging into the drainage network. The pollutants loading generated from the proposed project, and the standards for effluents discharge are illustrated in **Table 4-7**.

Table 4-7 Loading from the Proposed Project

Load Type	Loading from the Proposed Project (kg/day)	Sewage Flow Rate (m ³ /day)	Loading from the Proposed Project (mg/L) / (CFU/100ml)	Standards for Effluent discharge (mg/L) ^[1]
BOD	354.48	2082.96	170.18	10
SS	354.48	2082.96	170.18	25

Noted:

[1] Reference to Table 8, Standards for effluents discharged into the coastal waters of Deep Bay Water Control Zones, Technical Memorandum - Standards of Effluent Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters

4.6.2. The treated effluent from STP will be discharged to the terminal stormwater manhole onsite (STMH-01) and meet the acceptable standards prior to the discharge to the proposed storm water manhole (SMH1003243) along North side of the Application Site. The proposed drainage connection between Subject Site, proposed storm water drainage and existing storm water manhole is illustrated in Drainage Impact Assessment (“DIA”).

4.7. Liability

4.7.1. The project proponent will be responsible for the construction and maintenance works for the proposed sewage treatment plant. The STP will be designed in accordance to “Guidelines for the Design of Small Sewage Treatment Plants”.

4.7.2. During the operational phase, regular inspections of the STP within the Application Site

should be conducted by the property management to ensure proper performance. Regular maintenance should also be carried out in accordance with standard practices stated in the EPD's Guidance Notes and Guidelines.

5. CONCLUSION

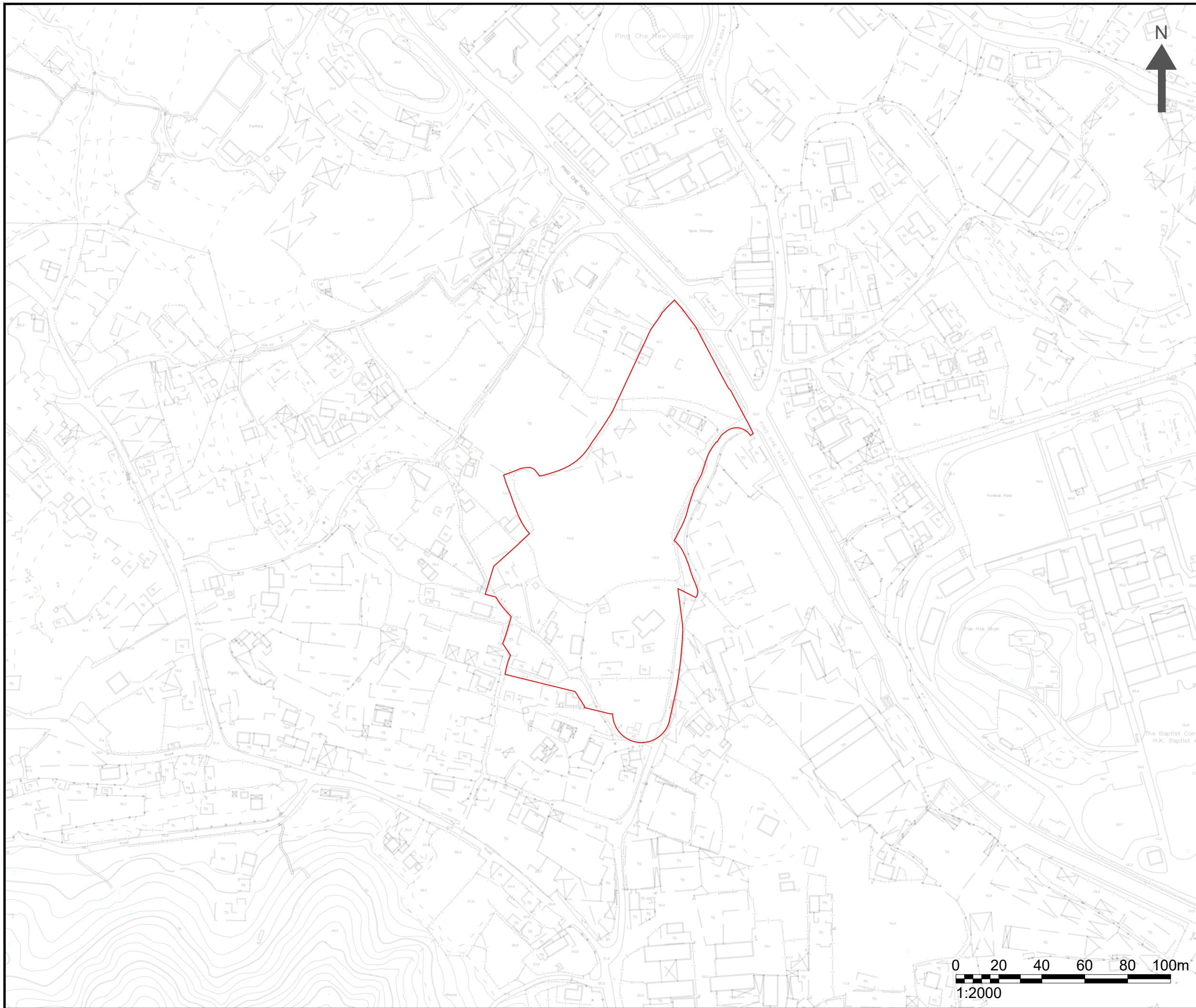
- 5.1.1. A Sewerage Impact Assessment (SIA) has been conducted to evaluate the possible impacts on the public sewerage network due to the proposed development. Since there is no public foul sewer identified at the surrounding of Application Site. Therefore, on-site Sewerage Treatment Plant are proposed for the proposed development. The sewage generated from the proposed development will be collected and treated on-site by STP and discharged into the stormwater manhole (STMH-01). The result showed that 2083.0 m³/day of average sewage discharge are expected to be generated from the proposed development and treated by STP.
- 5.1.2. The on-site STP provided with the provision of an equalization tank cater for the design peak flow of 260.4 m³/hr is proposed to treat the effluent from daily operation. Details of the proposed STP design and exact treatment process, including emergency discharge, emergency storage/retention arrangement and the sludge disposal arrangement would be subject to later detailed design.
- 5.1.3. The project proponent will be responsible for the implementation, operation and maintenance of the proposed STP.
- 5.1.4. The treated effluent will be collected in the storm water terminal manhole on site and then diverted to the proposed public stormwater drainage system via proper connections. Therefore, adverse sewerage impact due to the proposed project is not anticipated.

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Figure 2.1

Application Site Location and Its Environs



NOTES :

 APPLICATION SITE

Consultant



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Project No. : 2127

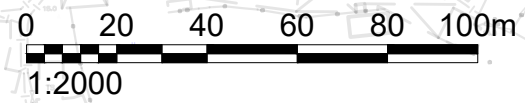
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Drawing Title :
 APPLICATION SITE LOCATION & ITS ENVIRONS

Drawing No : FIGURE 2.1	Revision : 1
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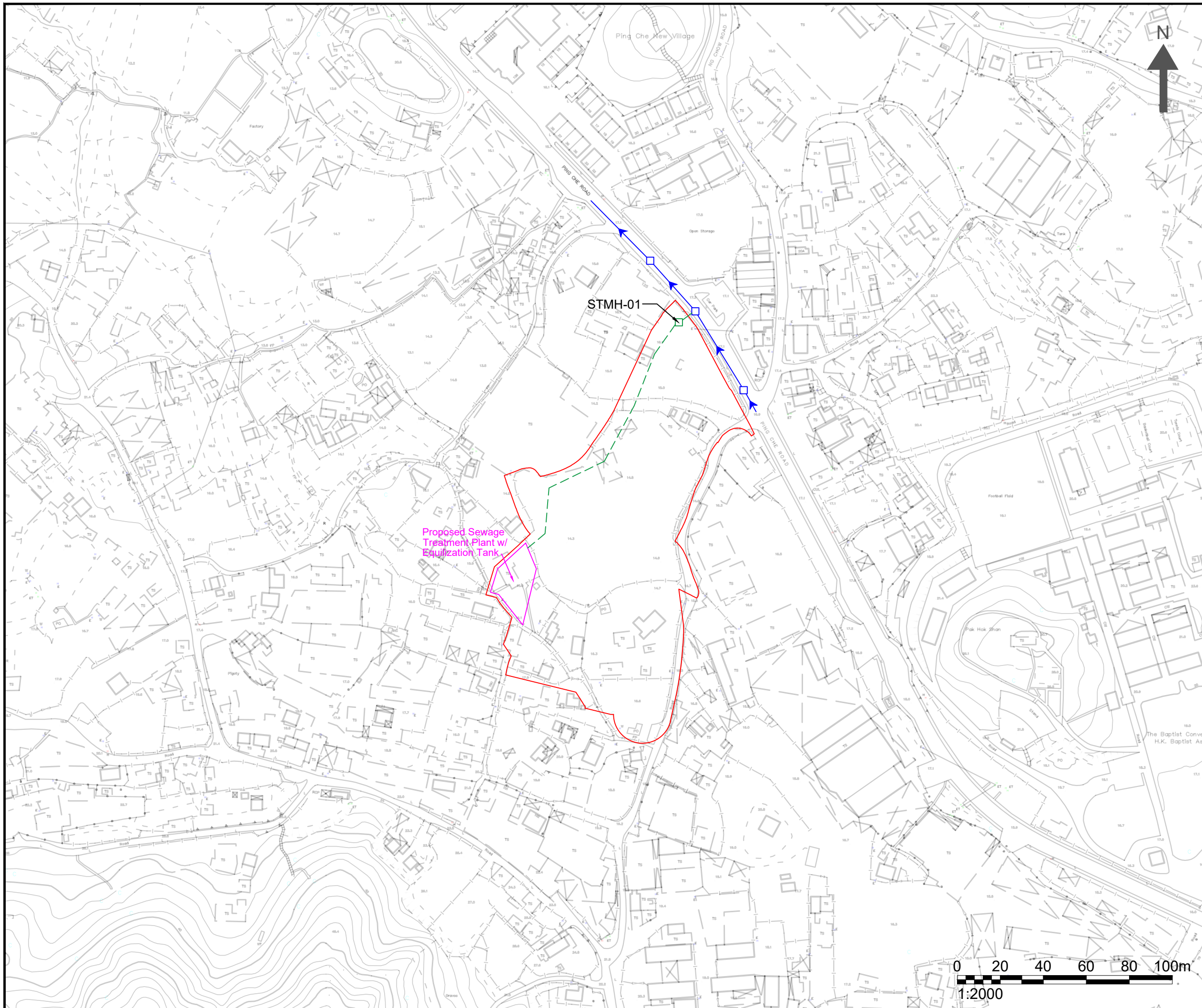
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Figure 2.1

Preliminary Desing of On-site Sewage Treatment Plant



NOTES :

- APPLICATION SITE
- PROPOSED STP
- PROPOSED DRAINAGE
- EXISTING DRAINAGE & MANHOLE

Consultant



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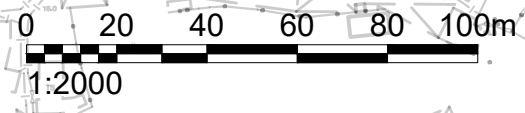
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Project :
 APPLICATION FOR AMENDMENT OF PLAN UNDER SECTION 12A FOR THE TOWN PLANNING ORDINANCE (CAP. 131) FOR MIXED USE DEVELOPMENT AT LOT 796 AND 1008RP IN D.D. 77 AND ADJOINING GOVERNMENT LAND IN PING CHE, TA KWU LING, NEW TERRITORIES

Drawing Title :
 OVERVIEW OF PROPOSED SEWAGE TREATMENT PLANT, PROPOSED DRAINAGE & EXISTING DRAINAGE

Drawing No : FIGURE 4.1	Revision : 1
Scale : AS SHOWN	Date : DEC 2023

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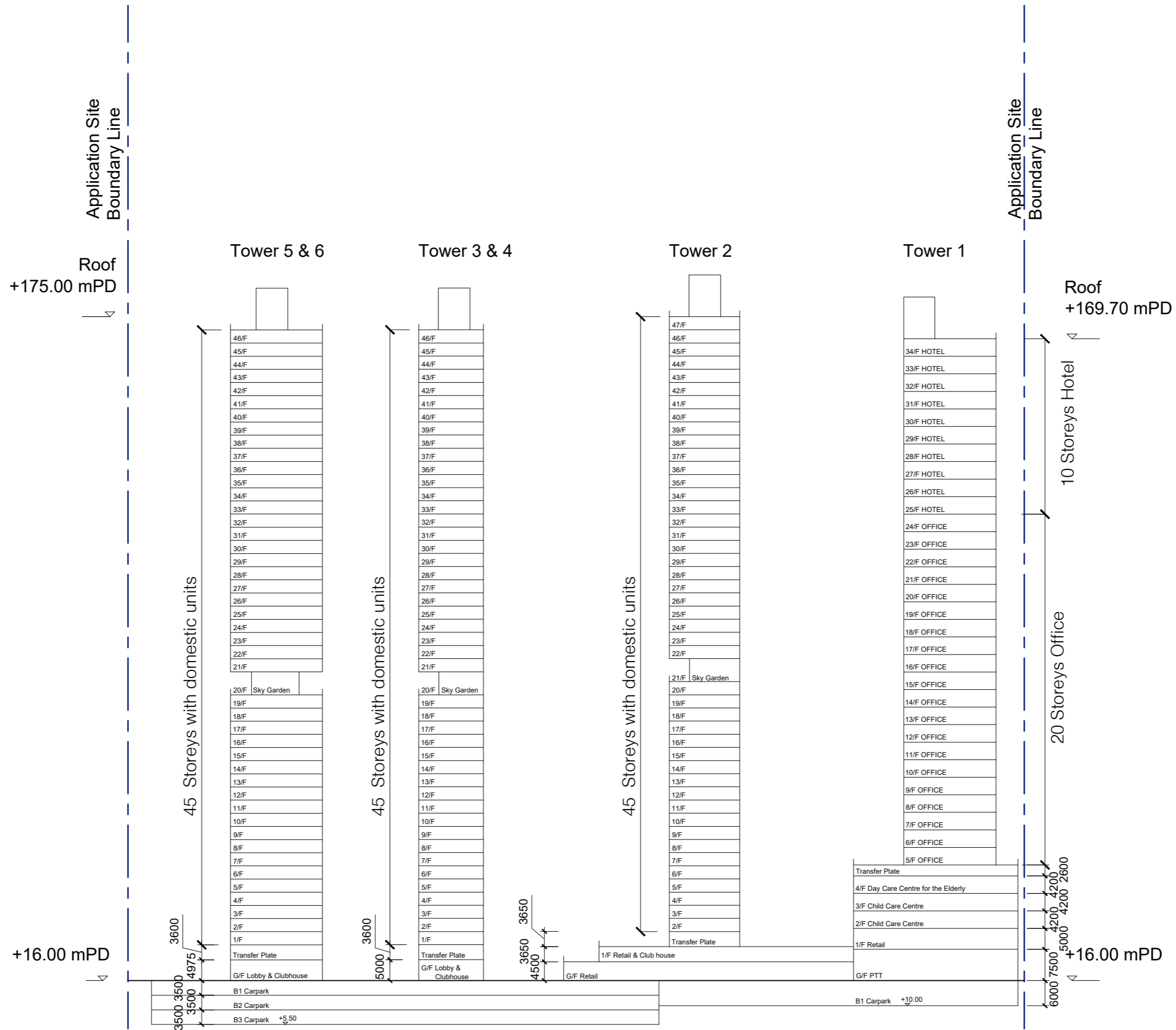
Project No. 2127

SEWERAGE IMPACT ASSESSMENT for APPLICATION FOR AMENDMENT OF PLAN UNDER SECTION 12A FOR THE TOWN PLANNING ORDINANCE (CAP. 131) FOR MIXED USE DEVELOPMENT AT LOTS 796 AND 1008RP IN D.D. 77 AND ADJOINING GOVERNMENT LAND IN PING CHE, TA KWU LING, NEW TERRITORIES

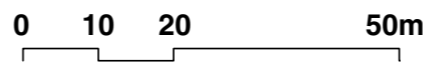
Appendix A

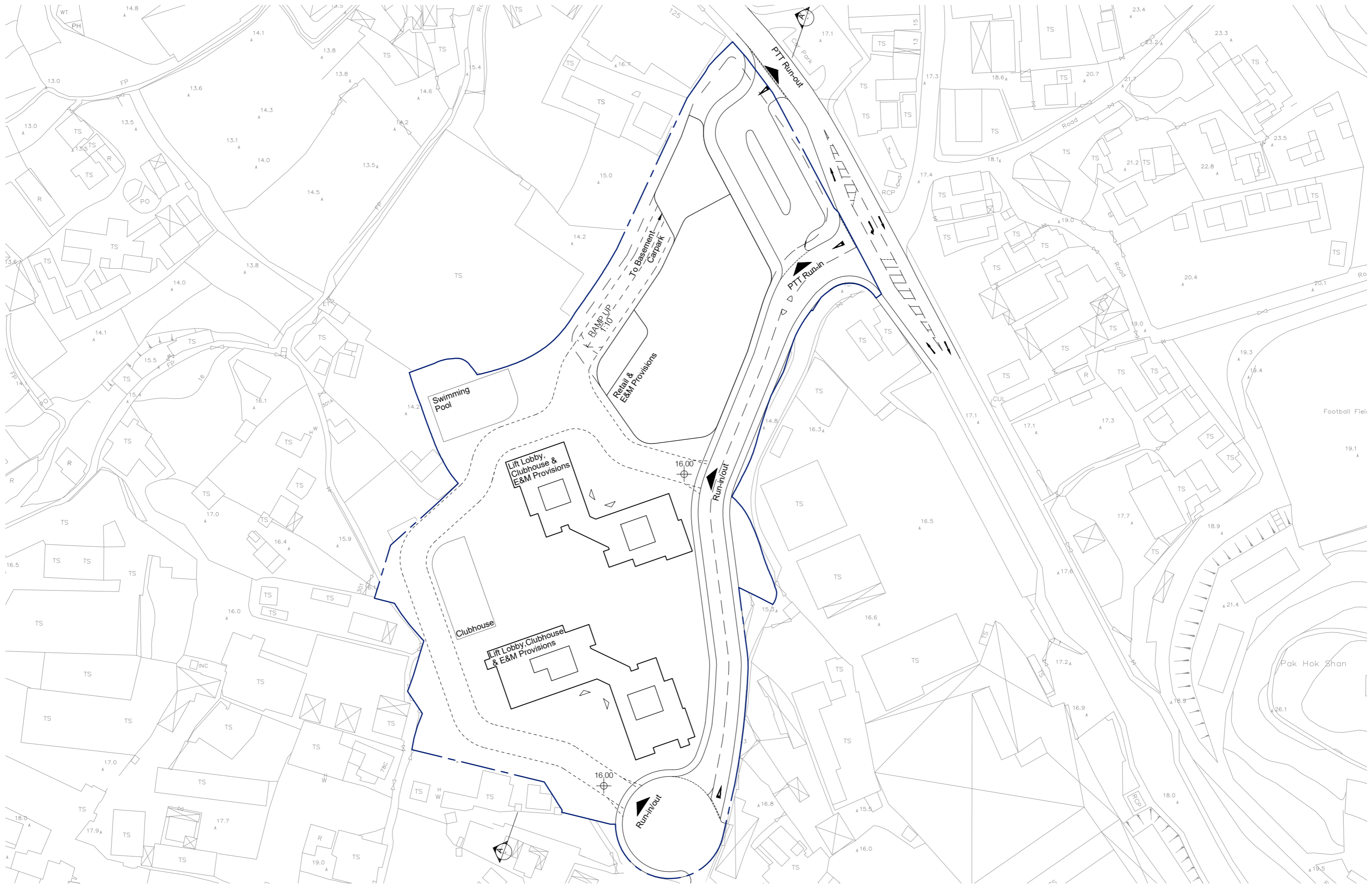
Master Layout Plan and Sectional Drawings

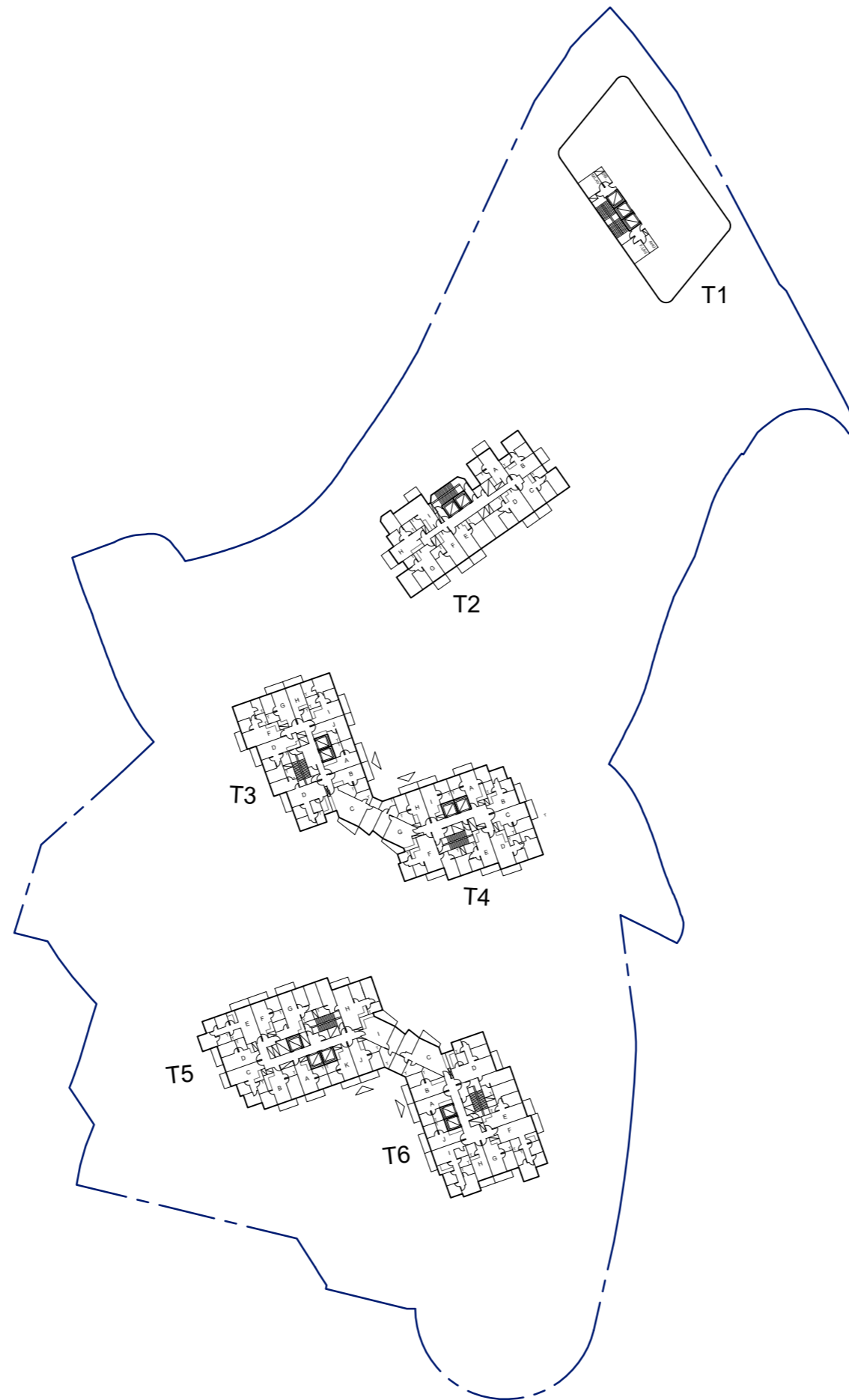




SCHEMATIC SECTION AA' SK-2
 PROPOSED DEVELOPMENT AT PING CHE DD77, N.T.







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Appendix B

Sewage Flow Calculation

Table 1 Total Average Sewage Discharge from Proposed Development

Proposed Development			
Residential			
Total Number of Residents	6174	persons	Referred to submitted GBP.
Unit Flow Factor ^[2]	0.27	m ³ /person/day	Referred to the planning unit flow for Domestic (Private - R2) in Table T-1 of GESF.
Average Sewage Discharge	1667.0	m ³ /dav	
Retail			
Total Floor Area	2400.0	m ²	Referred to submitted GBP.
Worker Density per GFA (in 100m ²)	3.5	person/100 m ²	Referred to the worker density of Retail Trade (All Types) in Table 8 of CIFSUS
Total number of person	84	persons	
Unit flow	0.28	m ³ /person/dav	Commercial Employee + Wholesale & Retail - J4 in Table T-2 of GESF.
Average Sewage Discharge	23.5	m ³ /dav	
Office			
Total Floor Area	11500.0	m ²	Referred to submitted GBP.
Worker Density per GFA (in 100m ²)	3.4	person/100 m ²	Referred to the worker density of All Economic Activities (All Types) in Table 8 of CIFSUS
Total number of person	391	persons	
Unit flow	0.08	m ³ /person/dav	Commercial Employee in Table T-2 of GESF.
Average Sewage Discharge	31.3	m ³ /dav	
Hotel/Service Apartment			
Total Floor Area	5703.3	m ²	Referred to submitted GBP.
Worker Density per GFA (in 100m ²)	3.2	person/100 m ²	Referred to the worker density of Hotels and Boarding Houses (All Types) in Table 8 of CIFSUS
Total number of person	183	persons	
Unit flow	1.58	m ³ /person/dav	Commercial Employee + Restaurants & Hotels - J10 in Table T-2 of GESF.
Average Sewage Discharge	289.1	m ³ /dav	
Clubhouse			
Total Floor Area	3500.0	m ²	Referred to submitted GBP.
Worker Density per GFA (in 100m ²)	3.3	person/100 m ²	Referred to the worker density of Community, Social & Personal Services (All Types) in Table 8 of CIFSUS
Total number of person	116	persons	
Unit flow	0.28	m ³ /person/dav	Commercial Employee + Community, Social & Personal Services - J11 in Table T-2 of GESF.
Average Sewage Discharge	32.5	m ³ /dav	
Day Care Centre for the Elderly			
Number of Residential Places	60	units	Referred to submitted GBP.
Unit flow	0.19	persons	Referred to the planning unit flow for Domestic: Institutional and Special Class
Total Floor Area	787.6	m ²	Referred to submitted GBP.
Worker Density per GFA (in 100m ²)	3.3	person/100 m ²	Referred to the worker density of Community, Social & Personal Services (All Types) in Table 8 of CIFSUS
Total number of person	26	persons	
Unit flow	0.28	m ³ /person/dav	Commercial Employee + Community, Social & Personal Services - J11 in Table T-2 of GESF.
Average Sewage Discharge	18.7	m ³ /dav	
Child Care Centre			
Number of Residential Places	100	units	Referred to submitted GBP.
Unit flow	0.04	persons	Referred to the planning unit flow for School Student in Table T-2 of GESF.
Total Floor Area	1166	m ²	Referred to submitted GBP.
Worker Density per GFA (in 100m ²)	3.3	person/100 m ²	Referred to the worker density of Community, Social & Personal Services (All Types) in Table 8 of CIFSUS
Total number of person	39	persons	
Unit flow	0.28	m ³ /person/dav	Commercial Employee + Community, Social & Personal Services - J11 in Table T-2 of GESF.
Average Sewage Discharge	14.9	m ³ /dav	
Swimming Pool			
Swimming pool area	340.7	m ²	Refre to MLP
Height of swimming pool	1.5	m	Assumed height of swimming pool is 1.5m
Estimated volume of the swimming pool	511.0	m ³	
Turnover rate	6.0	hour	General Specification for Swimming Pool Water Treatment Installation in Government Buildings of the Hong Kong Special Administrative Region (6hr for outdoor swimming pool)
Surface loading rate of filter	50.0	m ³ /m ² /hr	Swimming Pools: Design and Construction, Fourth Edition By Phillip H. Perkins (50 m ³ /m ² /hr adopted)
Required filter area	1.7	m ²	
Backwash duration	7.0	mins/day	With reference to Section B8.5.5 of General Specification for Swimming Pool Water Treatment Installation in Government Buildings of the HKSAR
Backwash flowrate	30.0	m ³ /m ² /hr	Technical Paper - Domestic Swimming Pool Filtration by European Union of Swimmingpool and Spa Associations
Maximum backwash volume	6.0	m ³ /day	
	0.0142	m ³ /s	
	14.19	L/s	
Total			
Total Sewage Generation Rate (ADWF)	2077.0	m ³ /dav	
Swimming Pool Backwash	6.0	m ³ /dav	
Catchment Inflow Factor	1.0		
Revised Total Sewage Generation Rate	2077.0	m ³ /dav	
Contributing Population	7693		
Peaking Factor	3		Refer to Section 3.3 of Guidelines for the Design of Small Sewerage Treatment Plant
Peak Flow	0.072	m ³ /s	

Notes:

- [1] The average household size is made reference to "2021 Population Census Summary Results", published by C&SD.
 [2] The unit flow factor is made reference to "Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (Version 1.0)", published by EPD.
 [3] The worker density is made reference to Table 8 of CIFSUS, published by PlanD.

Average Dry Weather Flow Estimation for Proposed Development

PROJECT SITE

Population Description	Type of Development	Estimated Residential Units / Service GFA [1]		Estimated Population [2]		Recommended Design Flow Rate	Dry Weather Flow
						(m ³ /persons/day) [b]	(m ³ /day)
Residential	R2 (45-60m ²)	Units	2205	Population	6174	0.27	1667.0
	Elderly care	Person	60	Population	60	0.19	11.4
	Child care	Person	100	Population	100	0.04	4.0
Services	Clubhouse	m ²	3500	Population	116	0.28	32.5
	Commercial	m ²	11500	Population	391	0.08	31.3
	Retail	m ²	2400	Population	84	0.28	23.5
	Hotel	m ²	5703	Population	183	1.58	289.1
	Elderly care	m ²	788	Population	26	0.28	7.3
	Child care	m ²	1166	Population	39	0.28	10.9
Swimming Pool	Swimming Pool	m ²	-	Population	-	-	6.0
SUM					7,173	SUM (Residential + Services)	2077.0

Notes:

[1] Information referred to development schedule_20230802

[2] Avg household size 2.7 (Refer to Average Domestic Household Size of North District Council in 2021 Population Census: Summary Result, published by Census and Statistics Department)

Worker Density per GFA (person/100 m²) for Commercial/office (3.4); for retail (3.5); for Hotels and Boarding Houses (3.2); for Community, Social & Personal Services (3.3) referred to the worker density of (All Types) in Table 8 of CIFSUS.

[2] The Recommended Design Flow Rate of the Proposed House reference to Appendix 3 of Guidelines for the Design of Small Sewage Treatment Plants by EPD.

Table 8 Initial Flat Size Assumptions

GFA per flat (m²)

	Hong Kong & Kowloon	Tsuen Wan, Kwai Chung & Tsing Yi	Other New Towns
R1	50	45	45
R2	110	60	60
R3	210	130	130

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Appendix C

Pollutants Load and Required Volume for Proposed STP

Proposal for Sewage Treatment Plant with Equalisation Tank

Estimation of the Required Volume for the Sewage Treatment Plant

Dry Weather Flow (DWF) (m3/day)	Peaking Factor[1]	Swimming Pool Backwash (m3/day)	Minimum Sewage Treatment Plant Capacity Required (m3)
Sewage (Residents and Service)			
2077	3	6	6237

Estimation of the Required Volume for the Equalisation Tank

Dry Weather Flow (DWF) (m3/day)	Peaking Factor [1]	Swimming Pool Backwash (m3/day)	Time Required to Hold Excess Flow (hrs) [3]	Minimum Equalisation Tank Capacity Required (m3)
Sewage (Residents and Service)				
2077	3	6	2	519.75

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 the use of equalisation tank.

[2]: This is reference from section 12 of the Guidance Notes on Discharges from Village Houses from the EPD. A maximum of 30 cm of sludge, or 1/4 of the sewage holding tank's volume of sludge is allowed, before desludging is required.

[3]: 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		Recommended Loading Rate for BODs [4]	Loading Rate for BODs
			(g/persons/day) [b]	(kg/day)
Residential	Person	6334	55	348.37
Services	Person	839	7	6.11
	SUM	7,173	SUM	354.48

SS

Population Description	Estimated Population		Recommended Loading Rate for SS [4]	Loading Rate for SS
			(g/persons/day) [b]	(kg/day)
Residential	Person	6334	55	348.37
Services	Person	839	7	6.11
	SUM	7,173	SUM	354.48

Remarks:

[4]: With reference to Appendix 2 of EPD's "Guidelines for the Design of Small Sewage Treatment Plants", the BODs and SS loads for Services shall be pro-rata to equivalent residential population