

Appendix H Sewerage Impact Assessment

Issue No. : 1
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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

Allied Environmental Consultants Limited

COMMERCIAL-IN-CONFIDENCE

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

www.asecg.com T: +852 2815 7028 F: +852 2815 5399

沛然環境評估工程顧問有限公司

沛然環保集團成員 (港交所股份代號: 8320.HK)

香港灣仔告士打道 160 號海外信託銀行大廈 27 樓

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
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CHE, TA KWU LING, NEW
TERRITORIES

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1	Oct 2023	1st Submission	Various	Cathy Man	Grace Kwok

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

www.asecg.com T: +852 2815 7028 F: +852 2815 5399

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香港灣仔告士打道 160 號海外信託銀行大廈 27 樓

Table of Contents

1. INTRODUCTION	5
1.1. Background	5
1.2. Objectives.....	5
1.3. Report Structure	5
2. SITE CONTEXT.....	6
2.1. Site Location.....	6
2.2. Proposed Development Scheme and Existing Environment.....	6
3. RELEVANT GUIDELINES & STANDARDS.....	7
3.1. Legislation, Standards and Guidelines	7
4. SEWERAGE IMPACT ASSESSMENT	8
4.1. Methodology for Estimation of Average Dry Weather Flow	8
4.2. Estimation of Sewage Flow from Proposed Developments.....	9
4.3. Evaluation of Sewerage Impact	10
4.4. On-site Sewage Treatment Plant	10
4.5. Estimation of Pollutants Loading from Proposed Project.....	12
4.6. Pollutant Loads Removal Requirements.....	13
4.7. Liability	13
5. CONCLUSION.....	15

List of Tables

Table 4-1 Unit Flow factors Adopted for the Assessment	8
Table 4-2 Sewage Flow Estimation for the Proposed Development and Existing	9
Table 4-3 Estimation of the Required Volume for the Sewage Treatment Plant	11
Table 4-4 Unit Load Factors	12
Table 4-5 Estimated Pollutant Loadings from Proposed Project	12
Table 4-6 Loading from the Proposed Project	13

List of Figures

Figure 2.1	Application Site Location & Its Environs
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List of Appendices

Appendix A	Master Layout Plan and Sectional Drawings
Appendix B	Sewage Flow Calculation
Appendix C	Pollutants Load and Required Volume for Proposed STP

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. **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. With reference to ProPECC PN 5/93 Drainage Plans Subject to Comment by the Environmental Protection Department (“EPD”), foul water should be discharged to a foul sewer under the Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations 40(1) and 41(1).

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

- “Hong Kong Planning Standards and Guidelines” issued by the Planning Department;
- “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;
- Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (WPCO-TM); 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	0.150 m ³ /person/day	Domestic (housing type specific) – Temporary and non-domestic
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	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	0.15 m ³ /person/day	Domestic (housing type specific) – Temporary and non-domestic in Table T-1 of GESF.
Average Sewage Discharge	9.0 m ³ /day	
Generation from Residential – Child Care Centre		
Total Number of Residents	100 persons	Referred to submitted GBP.
Unit Flow	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	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	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	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	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	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	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	
Total Average dry weather flow of the Proposed Development	2074.6 m³/day	

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 2074.6 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. The capacity of the STP shall be designed to cater for the design flow rate from the proposed

project, the design flow factor of 3 times of the ADWF is adopted for the proposed project, with provision of equalization tank. Two duty and one standby pump 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 average flow rate during off-peak periods.

- 4.4.3. The on-site STP will be constructed to cater for the design peak flow of 2074.6 m³/d, with the provision of an equalization tank. The calculation is given in **Table 4-3** and **Appendix C**.

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

Average Dry Weather Flow (ADWF) (m ³ /day)		Total ADWF (m ³ /day)	ADWF factor ^[1]	Design Peak Flow Rate from Proposed Project (m ³ /day)	Design Flow Rate from Proposed Project (m ³ /hr)
Sewage (Residents)	Sewage (Staff)				
1680.0	394.6	2074.6	3	6224	259

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.

- 4.4.4. 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.
- 4.4.5. As is 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.

4.4.6. 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 4-4** have been used in calculation of total pollutant loads from the Proposed Development.

Table 4-4 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 4-5**.

Table 4-5 Estimated Pollutant Loadings from Proposed Project

Population		Unit Load Factor (kg/day/person)		Pollutant Loadings (kg/day)	
		BODs	SS	BODs	SS
Residents	6114	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 4-6**.

Table 4-6 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	2074.6	170.87	10
SS	354.48	2074.6	170.87	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 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

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

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 2074.6 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 259 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 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.

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

Figure 2.1

Application Site Location and Its Environs



NOTES :

APPLICATION SITE

Consultant



Allied Environmental Consultants Limited

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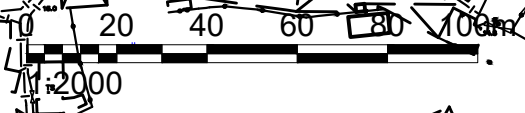
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Drawing Title :
 APPLICATION SITE LOCATION & ITS ENVIRONS

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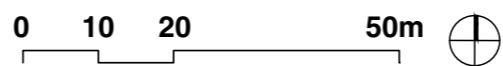


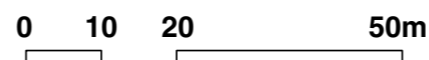
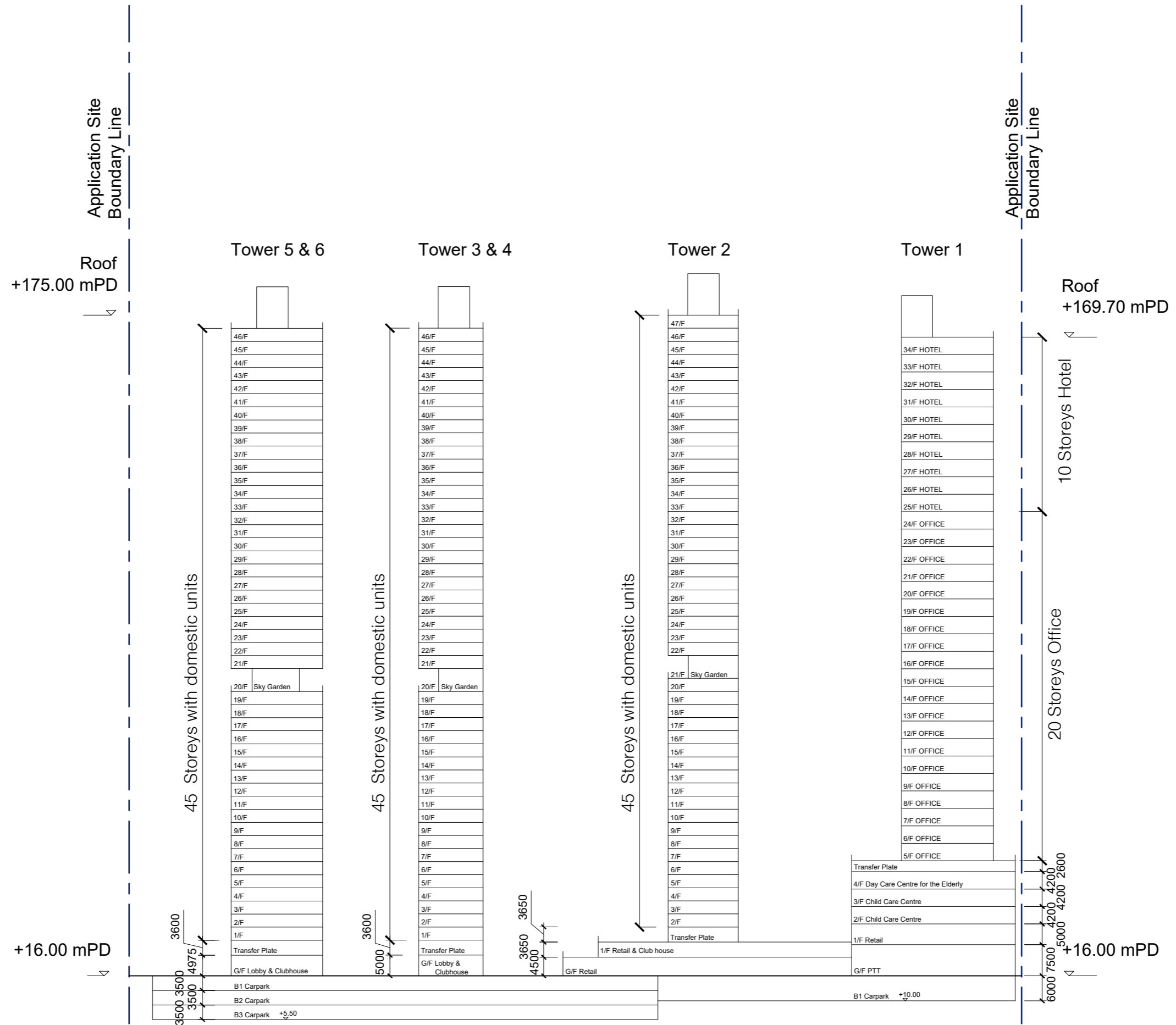
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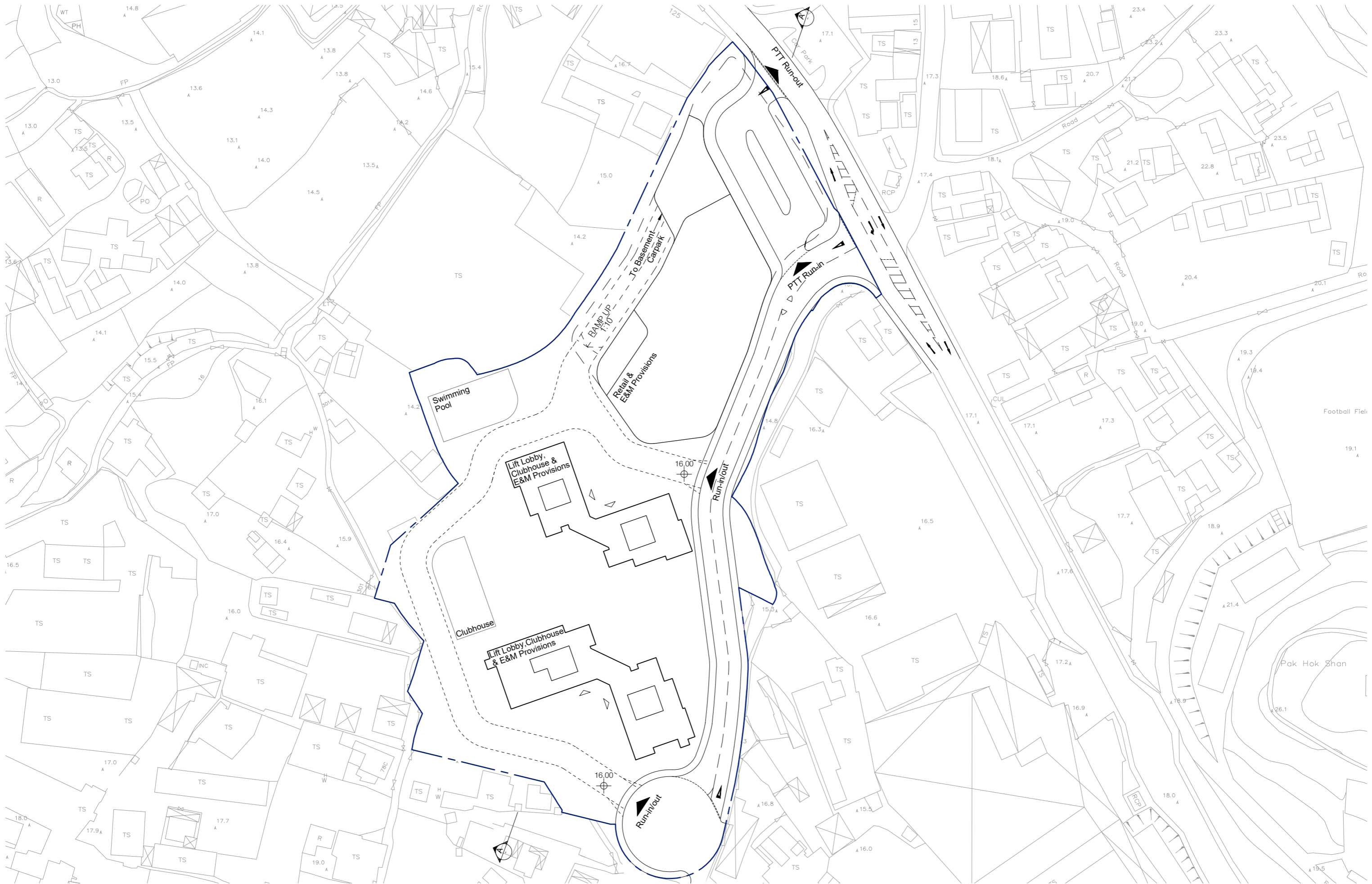
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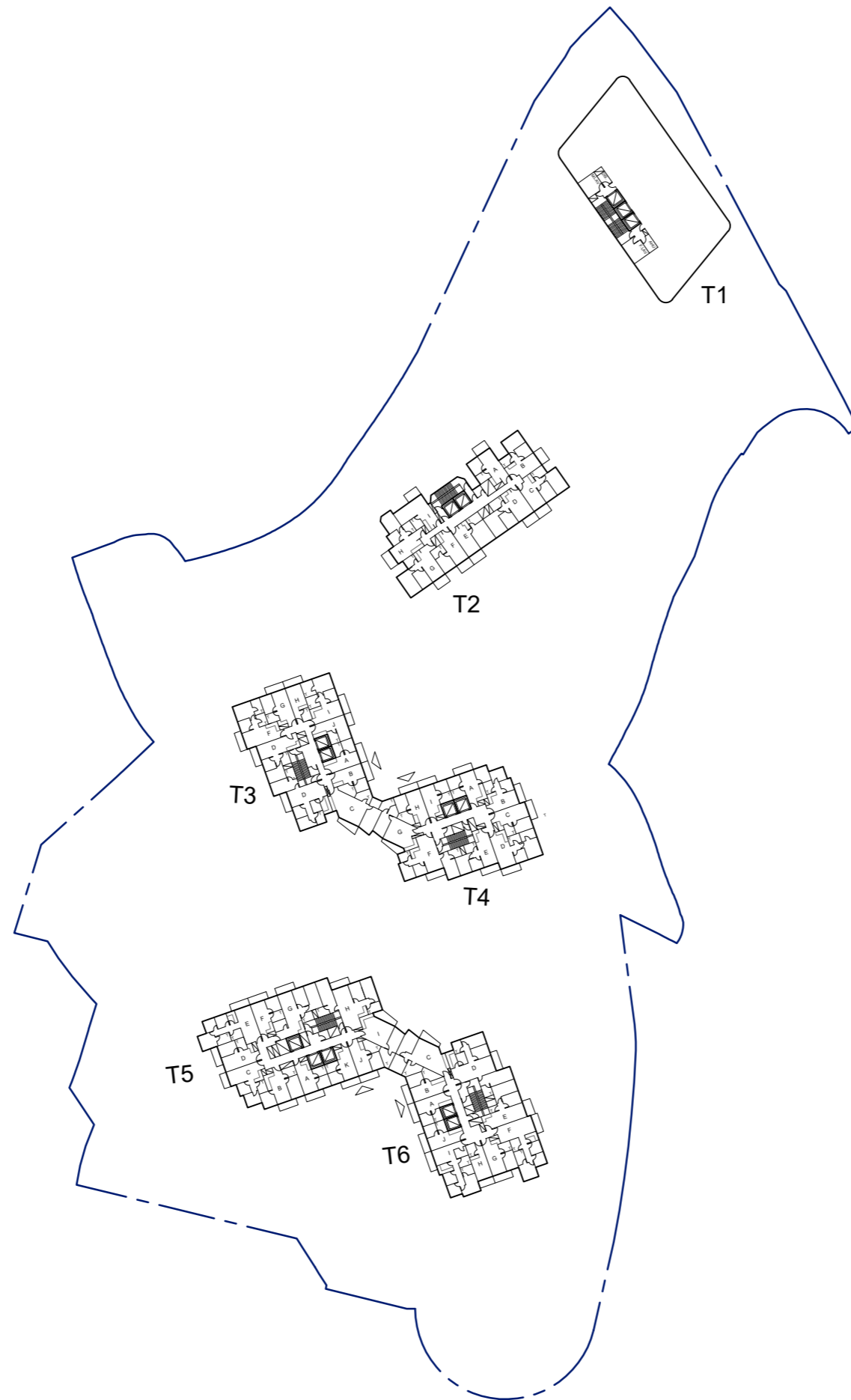
Appendix A

Master Layout Plan and Sectional Drawings









Project No. 2127

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Appendix B

Sewage Flow Calculation

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
						(m3/persons/day) [b]	(m3/day)
Residential	R2 (45-60m2)	Units	2205	Population	6174	0.27	1667.0
	Elderly care	Person	60	Population	60	0.15	9.0
	Child care	Person	100	Population	100	0.04	4.0
Services	Clubhouse	m2	3500	Population	116	0.28	32.5
	Commercial	m2	11500	Population	391	0.08	31.3
	Retail	m2	2400	Population	84	0.28	23.5
	Hotel	m2	5703	Population	183	1.58	289.1
	Elderly care	m2	788	Population	26	0.28	7.3
	Child care	m2	1166	Population	39	0.28	10.9
SUM					7,173	SUM	2074.6

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

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 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)	DWF factor [1]	Minimum Sewage Treatment Plant Capacity Required (m3)
Sewage (Residents and Service)		
2075	3	6224

Estimation of the Required Volume for the Equalisation Tank

Dry Weather Flow (DWF) (m3/day)	DWF factor [1]	Time Required to Hold Excess Flow (hrs) [3]	Minimum Equalisation Tank Capacity Required (m3)
Sewage (Residents and Service)			
2075	3	2	519

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]: 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		Recommeded Loading Rate for BODs [4]	Loading Rate for BODs
			(g/persons/day) [b]	(kg/day)
Residential	Person	6334	55	348
Services	Person	839	7.29	6
		SUM	SUM	
		7,173		354

SS

Population Description	Estimated Population		Recommeded Loading Rate for SS [4]	Loading Rate for SS
			(g/persons/day) [b]	(kg/day)
Residential	Person	6334	55	348
Services	Person	839	7.29	6
		SUM	SUM	
		7,173		354

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

