Annex A

Revised Sewerage Impact Assessment

Prepared for

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PROPOSED RESIDENTIAL DEVELOPMENT AT VARIOUS LOTS IN D.D.107 AND ADJOINING GOVERNMENT LAND, FUNG KAT HEUNG, YEUN LONG

SEWERAGE IMPACT ASSESSMENT

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CHAPTERS

Page

1. INTRODUCTION 1
1.1 Project Background 1
1.2 Application Site and its Environs 1
1.3 Proposed Development 1
2. SEWERAGE IMPACT ASSESSMENT 2
2.1 Scope of Work 2
2.2 Assessment Criteria and Methodology 2
2.3 Existing and Future Sewerage System 2
2.4 Wastewater Generated by the Proposed Development 3
2.5 Assessment of Sewerage Impact under Preferred Option 3
2.6 Assessment of Sewerage Impact under Fallback Option 4
3. OVERALL CONCLUSION 6
3.1 Conclusion 6

TABLES

Table 2.1 Estimated Peak Flow 3

FIGURES

Figure 1 Location of the Application Site and its Environs
Figure 2 Proposed Sewerage System in the Vicinity of the Application Site

APPENDICES

Appendix 1 Master Layout Plan
Appendix 2 Detailed Sewerage Impact Assessment Calculations
Appendix 3 Proposed Sewerage Layout Plan and Proposed Local Road Network extracted from Engineering Feasibility Study Report for Proposed Public Housing Developments at Sha Po

1. INTRODUCTION

1.1 Project Background

1.1.1 The Application Site is located within an area in Fung Kat Heung primarily zoned "Industrial (Group D)" ("I(D)") with a minor portion of it falling within R(A) and "Agriculture" ("AGR") zone on the Approved Kam Tin North Outline Zoning Plan No. S/YL-KTN/11 (OZP) near the Proposed Sha Po Public Housing Development (SPPHD).

1.1.2 A S12A application for rezoning of the site to enable a private residential development at the site is submitted to the Town Planning Board for consideration.

1.1.3 Ramboll Hong Kong Limited is commissioned to provide sewerage impact assessment (SIA) consultancy services for the Proposed Development.

1.2 Application Site and its Environs

1.2.1 The site area is about 7,290 sq.m. It is located in Fung Kat Heung, currently bounded by access roads on north and east sides. It is surrounded by Lam Tsuen Country Park to the north, and existing warehouse and industrial uses to the east and south.

1.2.2 A Public Housing Development at Sha Po (SPPHD) is proposed to the immediate west of the Application Site. An engineering feasibility study (EFS) of the SPPHD was submitted as one of the supporting documents for the OZP amendment (RNTPC Paper No. 9/22). Its findings have been referenced to where appropriate (hereafter referred as "EFS").

1.2.3 The location of the Application Site and its surrounding environs are shown in **Figure 1**.

1.3 Proposed Development

1.3.1 The Proposed Development comprises 2 residential towers – Tower 1 and Tower 2, of 48 storeys (including 1 refuge floor) and 50 storeys (including 1 refuge floor) respectively, which gives a total of 1439 units. A clubhouse (GFA of about 1,253m^2) and an outdoor swimming pool is planned.

1.3.2 Proposed Development is tentatively completed in 2035, after the completion of SPPHD.

1.3.3 The Proposed Development scheme is shown in **Appendix 1**.

2. SEWERAGE IMPACT ASSESSMENT

2.1 Scope of Work

2.1.1 The aim of this SIA is to assess whether the capacity of the existing sewerage network serving the Application Site is sufficient to cope with the sewage flow from the Proposed Development. Drainage Record Plans from Drainage Services Department (DSD) were obtained for the purposes of this SIA.

2.2 Assessment Criteria and Methodology

2.2.1 Environmental Protection Department's (EPD's) Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning, Version 1 (GESF) has been referred to for the purposes of estimating the quantity of the sewage generated from the Proposed Development and the existing catchment area. Sewage flow parameters and global peaking factors in this document have been adopted for this SIA.

2.2.2 Based on the building types in the area, the following unit flow factors are used in the SIA calculation:

- Residents: 0.27 m^3/person/day (R2)
- Clubhouse Staff: 0.28 m^3/employee/day (J11 - Community, Social & Personal Services)

2.2.3 Catchment Inflow Factor (P_{CIF}) of Yuen Long (1.00) has been applied in the assessment.

2.3 Existing and Future Sewerage System

2.3.1 According to the Drainage Record Plans obtained from DSD, the Application Site is not currently served by the public sewerage system. Based on the EFS of the SPPHD, Ø560mm and Ø710mm sewers will be newly constructed and connected to the Sha Po Sewage Pumping Station (SPSPS) (see **Appendix 3**). Following the same regime, the Proposed Development will also be connected to the sewers constructed by SPPHD and ultimately to SPSPS. For the purpose of the assessment, the invert level of the sewers proposed for the SPPHD (which is not specified in the EFS) is assumed tentatively.

2.3.2 The design capacity of the existing SPSPS is 8,795m^3/day. According to the EFS, in order to cater for the additional sewage generated from SPPHD, the capacity of SPSPS will be upgraded from 8,795m^3/day to 16,750m^3/day. According to follow-up with Civil Engineering and Development Department (CEDD), it is understood that the proposal for upgrade of SPSPS is still under review and not determined yet.

2.3.3 Two options, namely the Preferred Option and Fallback Option, are proposed to handle sewage generation from the Proposed Development. The option of discharging sewage from the Proposed Development to the public sewerage system is preferable (Preferred Option). The option of adopting onsite STP (Fallback Option) would only be opted for under certain circumstances as stated below.

- Preferred Option: to convey sewage by connecting the new sewer from the Application Site to future nearby manhole to be implemented under SPPHD project;
- Fallback Option: to provide onsite treatment facilities within the Application Site to treat wastewater and with the treated effluent discharged to public drainage system afterwards (in case of slippage of programme of SPPHD or unresolved problems with respect to relevant upgrading work proposed under Preferred Option).

2.3.4 Since there are no existing sewers near the Application Site, based on the Preferred Option, new Ø300mm sewer pipelines (Manholes T1 to T4) are proposed to convey

sewage generated from the Application Site to Manhole M6 of the planned sewer, which is constructed by SPPHD. The project proponent will ensure the proposed terminal manhole would have sufficient freeboard to the ground floor and should be of cover level higher than that of the downstream public manhole.

2.3.5 **Figure 2** shows the alignment of the new Ø300mm sewers and the subsequent sewer connections (including those constructed by SPPHD) in the area under the Preferred Option.

2.4 Wastewater Generated by the Proposed Development

2.4.1 Wastewater arising from the Proposed Development based on the updated scheme will be primarily contributed by the residents and clubhouse staff. The estimated peak flow is given in **Table 2.1** below while detailed calculation for the Proposed Development is given in **Appendix 2**.

Table 2.1 Estimated Peak Flow

Development Parameters	Proposed Development	
	Residential	**Clubhouse**
Number of flats	1439	NA
GFA (m^2)	NA	1253
Assumed Population	3886(1)	41(2)
Design Flow (m^3/person/day)	0.27(3)	0.28(4)
Flow Rate (m^3/day)	**1049.2**	**11.6**
Total Flow Rate (m^3/day)	**1060.8(5)**	
Peak Flow for Sewer (L/s)	**73.7**	
Peak Flow with Swimming Pool for Sewer (L/s)	**79.6**	
Peak Flow for STP (L/s)	**49.1**	
Peak Flow with Swimming Pool for STP (L/s)	**55.1**	

(1) 2021 Population Census: Average Household Size of 2.7 in Kam Tin

(2) 30.3m^2/employee – based on Table 8 of CIFSUS – Community & Social Services

(3) Refer to Table T-1 of GESF – R2

(4) Refer to Table T-2 of GESF - J11

(5) With Catchment Inflow Factor for Yuen Long (1.0) in Table T-4 of GESF

2.5 Assessment of Sewerage Impact under Preferred Option

2.5.1 The potential sewerage impact due to the Proposed Development have been quantitatively addressed. Sewage generation rate is estimated to be 1060.8 m^3/day (i.e. peak flow 73.7 litre/sec, peak flow with swimming pool 79.6 litre/sec).

2.5.2 **Appendix 2** shows the detailed calculation on the estimated hydraulic capacity of the proposed sewer sections and the calculation of the amount of the sewage entering each segment of the said sewer network. Total flow from the Proposed Development is assessed in the calculations.

2.5.3 The estimated sewage flow from the Proposed Development has been compared with the capacity of the proposed sewerage system to determine whether it has adequate spare capacity.

Gravity Sewer

2.5.4 According to Table 4a of **Appendix 2**, regarding the sewage generation rate from Proposed Development, it is found that six of the pipe segments (M7 to M13) proposed under SPPHD do not have adequate capacity.

2.5.5 To cater for the flow from SPPHD and this Proposed Development, the Ø710mm pipes (M7 to M13) proposed by SPPHD are recommended to be upgraded to Ø900mm. To avoid any backflow, the next segment (M13-M14) shall also be upgraded to Ø900mm. **Table 2.2** below summarizes the required upgraded design. The applicant will liaise with CEDD (project proponent of SPPHD) afterwards to ensure proper implementation of the proposed upgraded design.

Table 2.2 Upgraded Design to be implemented by SPPHD

Segment	Upgraded Diameter (mm)
M7-M8	900
M8-M9	900
M9-M10	900
M10-M11	900
M11-M12	900
M12-M13	900
M13-M14	900

2.5.6 Also, it is assumed that further SIA report for SPPHD will be conducted in later stage, which will determine the detailed design of the sewerage system by taking into consideration related catchment including both existing and planned developments at upstream and downstream of SPPHD so that no adverse sewerage impact will be anticipated in future.

SPSPS

2.5.7 As mentioned above, the capacity of SPSPS will be upgraded from 8,795m^3/day to 16,750m^3/day. According to Table 4 of **Appendix 2**, sewage discharge from the Application Site amounts to 6.3% of the proposed upgraded design capacity.

2.5.8 With reference to the latest information from SPPHD, the Average Dry Weather Flow (ADWF) for SPSPS after SPPHD will be increased to 16,727m^3/day. As such, the cumulative ADWF (SPPHD and the Proposed Development) would be 17,788m^3/day. There is no sufficient capacity to cater the additional flow from the Proposed Development based on originally planned upgrading proposal of SPPHD. Instead of upgrading from 8,795m3/day to 16,750m3/day, it is counter-proposed to upgrade capacity of the SPSPS to 18,000m^3/day to cater the sewage generated from the site as well. According to the advice from CEDD, the upgrading proposal is still under study. The applicant will approach CEDD in the next stage after the application approved to make sure that the proposed development will be accounted in detailed design of SPSPS upgrading work for SPPHD by CEDD. The applicant will liaise with CEDD afterwards so that CEDD can implement the future sewerage system with account of the proposed development (e.g. as recommended in this SIA report).

2.6 Assessment of Sewerage Impact under Fallback Option

2.6.1 On the other hand, onsite sewerage treatment plant (STP) would be proposed if the SPPHD and the upgrading work are delayed or there is any unresolved problem regarding the proposed upgrading work above. The onsite STP is proposed to cater for

sewerage discharge based on design capacity of 55.1L/s. The treated effluent will be discharged to the stormwater system and discharged to public drainage system.

2.6.2 The exact treatment process would be subject to later detailed design and submissions. It will be necessary for the treatment facilities to achieve 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.

2.6.3 Membrane bioreactor with ultra-filtration (MBR) is generally recommended to achieve required effluent discharge standard and sludge dewatering system will be provided and designed in accordance with the requirement in the "Guidelines for the Design of Small Sewage Treatments Plants" issued by EPD. **Appendix 1** shows the location of the proposed STP.

2.6.4 Sludge storage tank with deodorisation facilities will be provided. Exhaust fan will be located and facing away from existing and planned air sensitive uses. 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. As good practice for sewage treatment facilities, measures will be incorporated into the design to minimize the risk of emergency overflow from the treatment plant. These measures will include standby pumps, 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-hours of ADWF discharge) to minimise 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 immediately. 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 repeat until it is acknowledged. In addition, the on-call crews will ensure the standby pump is switched on and contain the overflowed sewage using temporary weirs or vacuum trucks, where applicable.

2.6.5 The Project Proponent will be responsible for the construction, operation and maintenance of the STP. When there is a public sewer available in close proximity to the Application Site in future, the Applicant will make connection to the public sewer and dismantle the proposed underground STP subject to the agreement of DSD and EPD. As the sewage generated from the Application Site will be discharged to the public sewer in accordance with the Water Pollution Control (Sewerage) Regulation, no adverse quality impact is anticipated.

2.6.6 The Project Proponent will be responsible for the future sewer connection upon its availability in future and STP decommissioning with connection details subject to agreement of DSD.

3. OVERALL CONCLUSION

3.1 Conclusion

3.1.1 A residential development is proposed in D.D.107, Fung Kat Heung, Yuen Long. The potential sewerage impact has been quantitatively addressed. Under the Preferred Option, wastewater generated from the Application Site will be conveyed to public sewerage system.

3.1.2 Based on the sewerage impact assessment results, it is found that the hydraulic capacity of Ø710mm sewers (proposed and constructed by SPPHD) would not be sufficient to cater for the sewage generation from SPPHD and Proposed Development.

3.1.3 A total of seven Ø710mm sewer segments is recommended to be upgraded to Ø900mm and assumed to be constructed under SPPHD (the applicant will liaise with the proponent of SPPHD on this matter). New Ø300mm sewers will be constructed to connect from the Application Site to SPPHD sewer manhole (M6).

3.1.4 It is assumed that the further assessment of SPPHD in later stage should consider the sewage from related catchment including the Proposed Development, the potential sewerage impact for their proposed sewerage system and connection downstream should be assessed in the subsequent SIA report for SPPHD.

3.1.5 The applicant will be responsible for the implementation of the proposed new Ø300mm connection pipes whereas the section of the new pipes (all within government land) downstream of the proposed terminal manhole is assumed to be handed over to DSD for future maintenance (**Figure 2**). For the proposed sewerage pipes in the SPPHD project, the maintenance parties will be maintained by DSD according to the EFS of SPPHD (**Appendix 3**).

3.1.6 Besides, the proposed upgraded SPSPS under SPPHD EFS is found not having sufficient capacity to cater the additional flow from the Proposed Development. Further upgrade will be required. It is proposed to upgrade from 8,795m^3/day to 18,000m^3/day (instead of 16,750m^3/day originally proposed in EFS) to cater the sewage flow from both the Application Site and SPPHD.

3.1.7 With the proposed sewerage pipeline in place, this SIA confirms the feasibility of the Proposed Development in terms of impacts to the public sewerage system.

3.1.8 It is noted that the proposed connection would convey sewage from the proposed development to the planned sewer of SPPHD. Since the proposed development will be tentatively completed 1 year after SPPHD, the proposal is considered practicable.

3.1.9 However, in case there is any slippage of the project programme of SPPHD or any unresolved problem with respect to the proposed upgrading work, the Fallback Option utilising onsite STP will be adopted. The treated effluent will be discharged to the stormwater system. The on-site STP, if adopted, will be subject to later detailed design and submissions and the discharge will need to be licenced. The project proponent will be responsible for the construction, operation and maintenance of the proposed on-site STP. The on-site STP will be equipped with necessary preventive measures including but not limited to those recommended in this report. The on-site STP will need to be operated and maintained by appropriately qualified and experienced personnel with adequate devices and spare parts. In addition, the Discharge Licence will almost certainly require regular monitoring and reporting of test results, which will also require appropriate personnel. The Project Proponent will also be responsible for the future sewer connection upon its availability in future and STP decommissioning with connection details subject to agreement of DSD.

3.1.10 A SIA will be submitted at later stage to confirm the sewage disposal option that would be pursued. If the option of discharging to the sewerage system under SPPHD is to be implemented, an updated SIA will be submitted to assessing the potential sewerage impact to the proposed sewerage system based on the latest SPPHD sewerage scheme for conducting the hydraulic assessment and verifying the assumptions adopted in the current assessment.

Figures

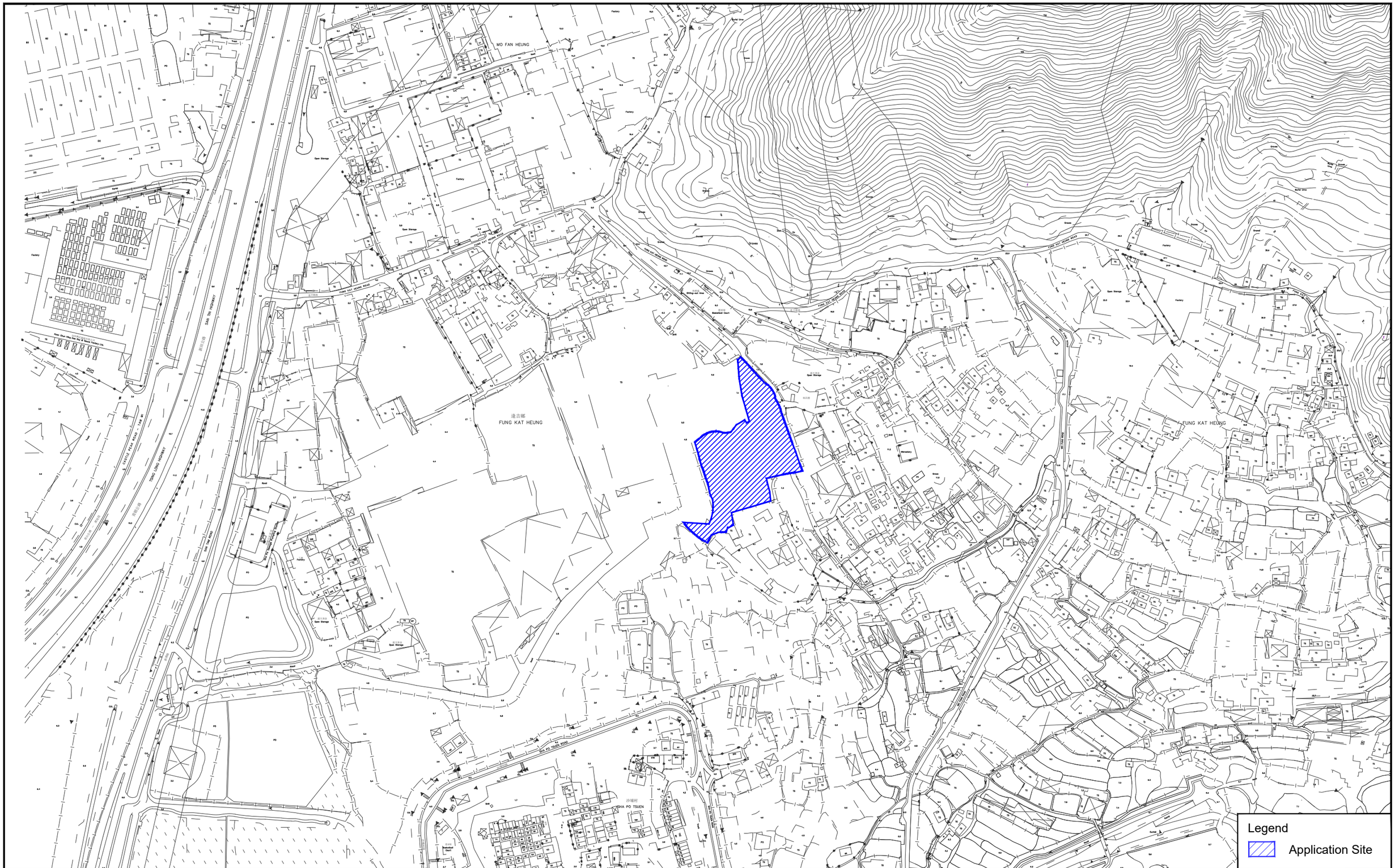

Figure: 1

Title: Location of the Application Site and its Environs

Project: Proposed Rezoning of the Site from "Industrial (Group D)" , "Residential (Group A)" and "Agriculture" to "Residential (Group A)1" for Residential Development at Various Lots and Adjoining Government Land in D.D. 107, Fung Kat Heung, Yuen Long

RAMBOLL

Drawn by:	MW
Checked by:	CC
Rev.:	1.0
Date:	Mar 2024

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Note

1. The downstream of the proposed terminal manhole (T1) falls within government land will be handed over to DSD for future maintenance.
2. According to the EFS of SPPHD, M6 to M14 will be handed over to DSD.
3. The tentative invert levels of the proposed manholes are used for calculation purpose only. The exact invert levels will be confirmed during detailed design stage.

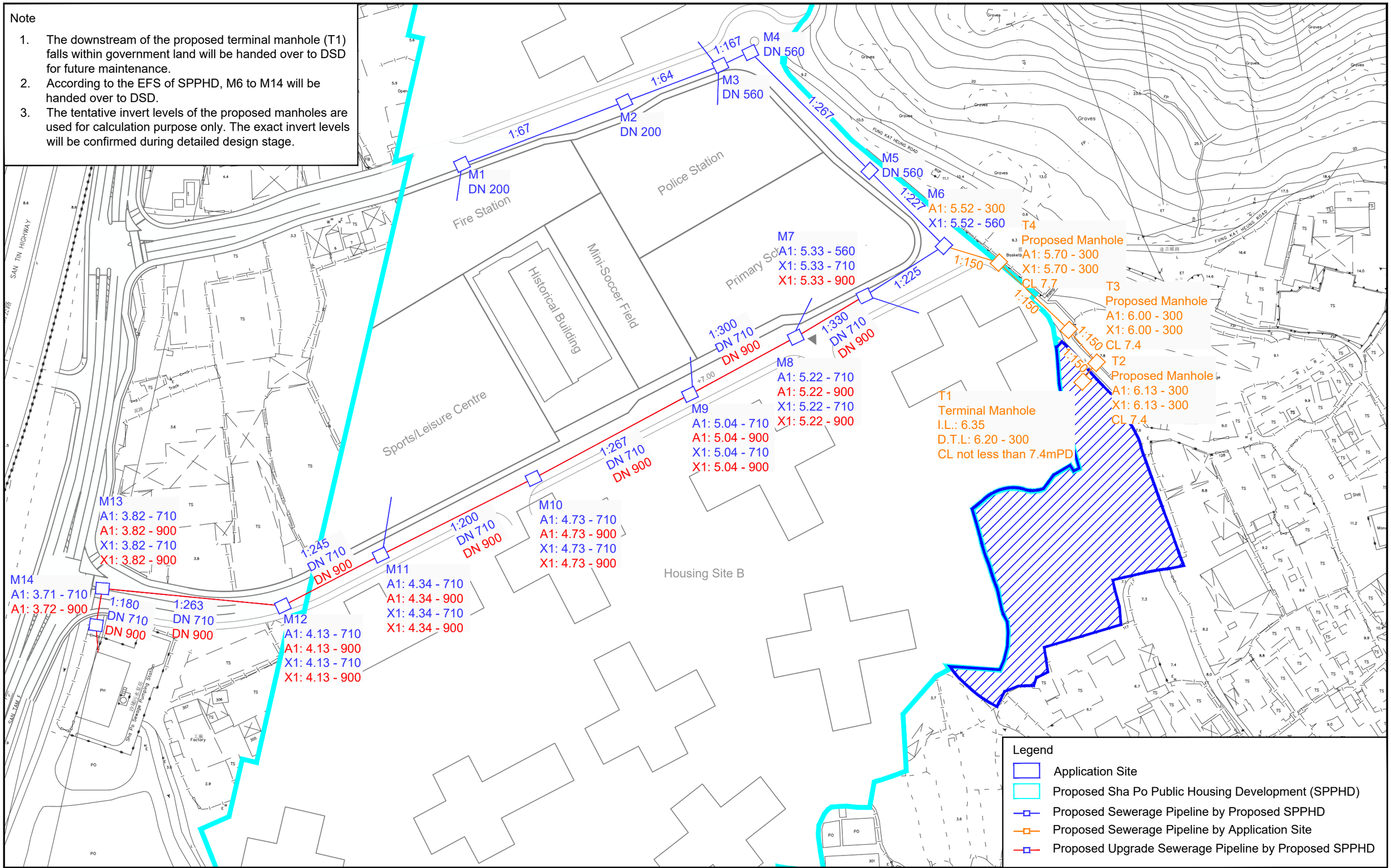

Figure: 2

Title: Proposed Sewerage System in the Vicinity of the Application Site

Project: Proposed Rezoning of the Site from "Industrial (Group D)" , "Residential (Group A)" and "Agriculture" to "Residential (Group A)1" for Residential Development at Various Lots and Adjoining Government Land in D.D. 107, Fung Kat Heung, Yuen Long

RAMBOLL

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Date:	Jan 2026

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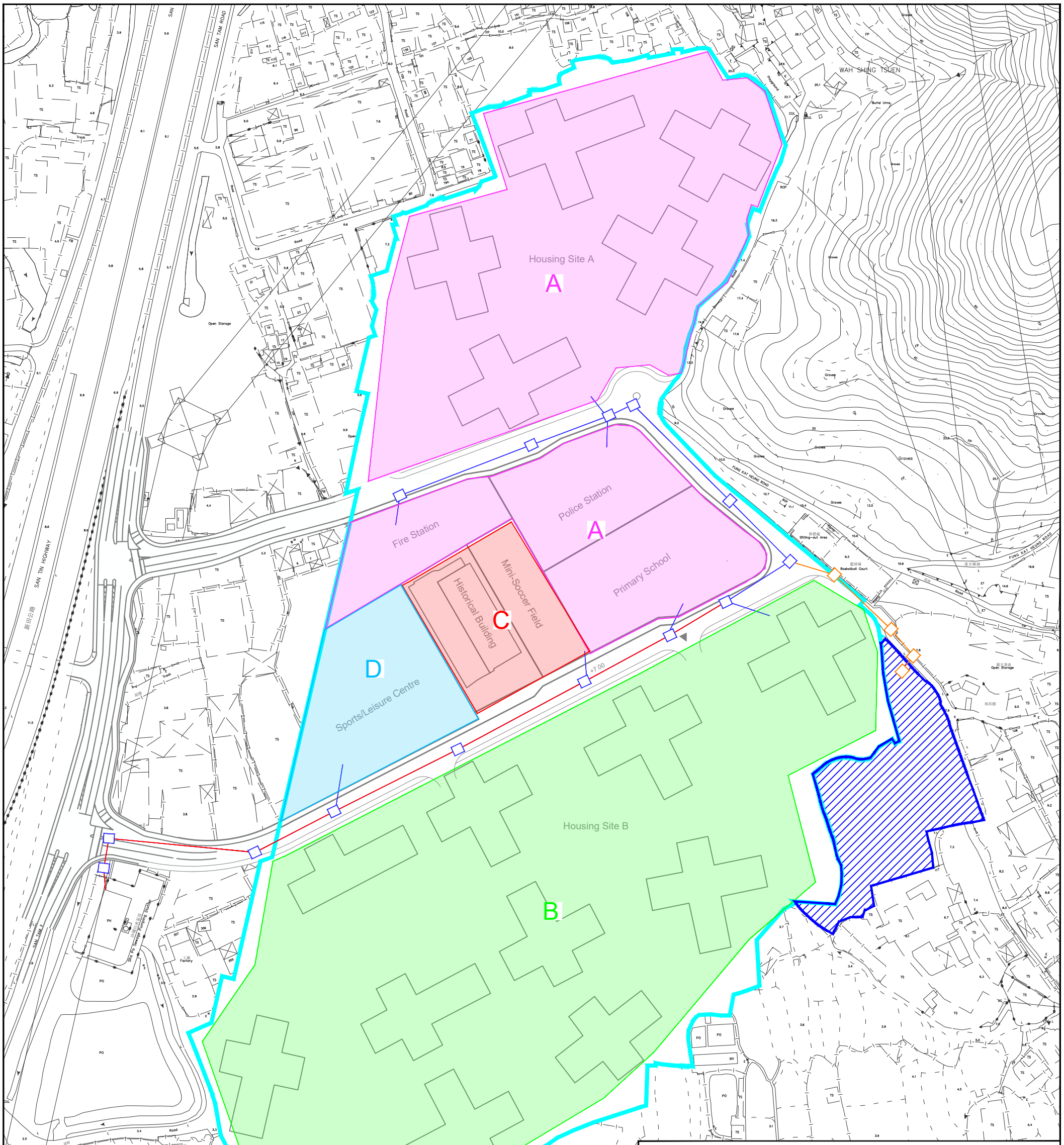


Figure: 3	RAMBOLL
Title: Catchment Area in the Vicinity of the Application Site	Drawn by: MW Checked by: CC
Project: Proposed Rezoning of the Site from "Industrial (Group D)" , "Residential (Group A)" and "Agriculture" to "Residential (Group A)1" for Residential Development at Various Lots and Adjoining Government Land in D.D. 107, Fung Kat Heung, Yuen Long	Rev.: 1.5 Date: Dec 2025

Appendix 1 Master Layout Plan

LEGENDS:

Site Boundary

Third Party Lot to be Acquired

Driveway / EVA

N

CLUBHOUSE
10.5mPD

TOWER 2
156.0mPD

TOWER 1
150.0mPD

DRIVEWAY/EVA

SEWAGE TREATMENT PLANT ROOM

15000

5000

7.0

Road

Ramp

裕昌園

露天貨倉
Open Storage

Proposed Residential Development at Various Lot in D.D. 107, Fung Kat Heung, Yuen Long.

MASTER LAYOUT PLAN (1:500)

LEGENDS:

Site Boundary

Third Party Lot to be Acquired

Driveway / EVA

N

CLUBHOUSE

TOWER 2

ENTRANCE LOBBY

TOWER 1

ENTRANCE LOBBY

DRIVEWAY/EVA

SEWAGE TREATMENT PLANT ROOM

Road

Ramp

裕昌園

露天貨倉
Open Storage

Proposed Residential Development at Various Lot in D.D. 107, Fung Kat Heung, Yuen Long.

G/F PLAN (1:500)

CLUBHOUSE

CARPARK SPACE

CLUBHOUSE

SEWAGE TREATMENT
PLANT ROOM

裕昌園

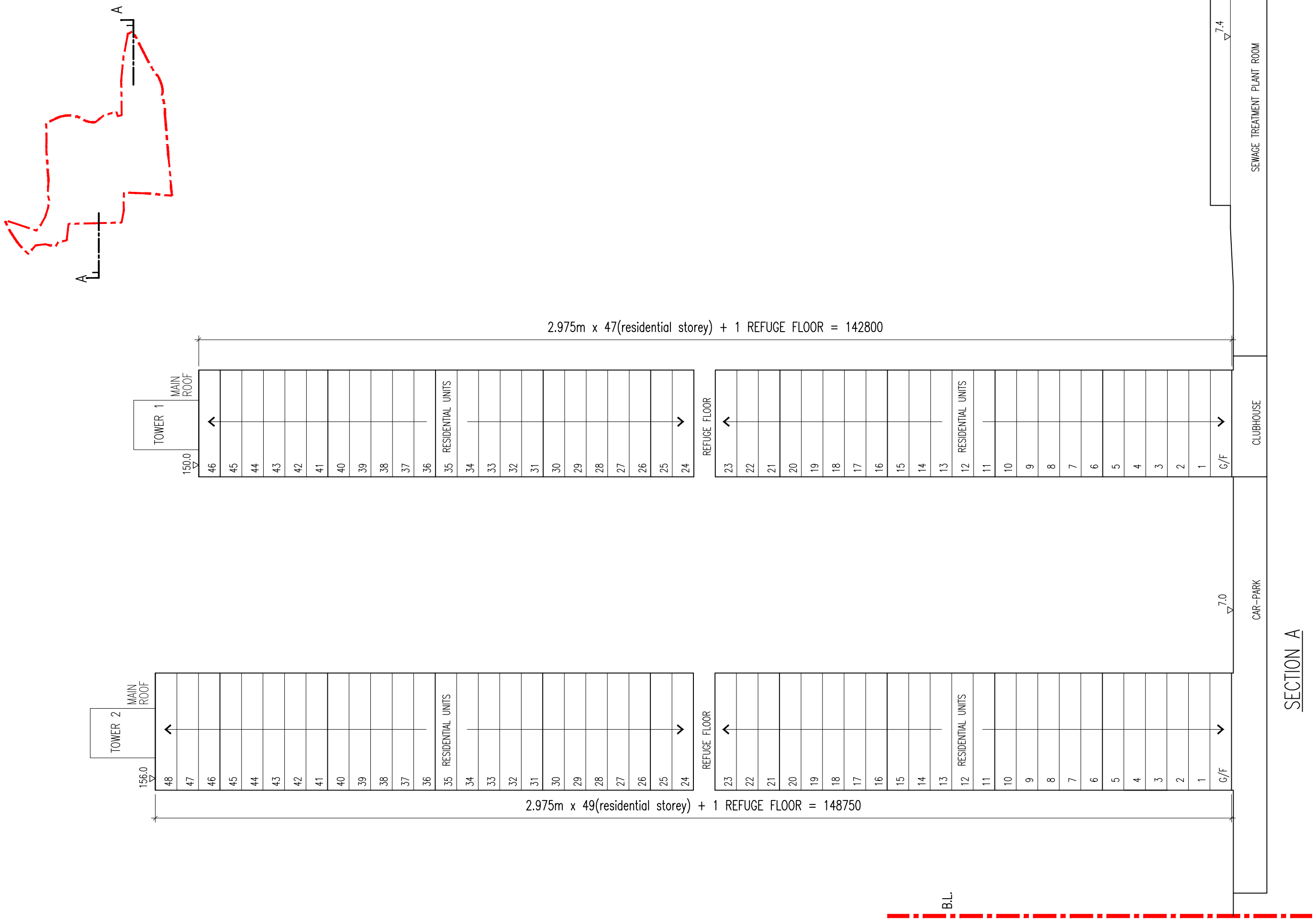
露天貨倉
Open Storage

Ramp

Road

Proposed Residential Development at Various Lot in D.D. 107, Fung Kat Heung, Yuen Long.

BASEMENT PLAN (1:500)



Proposed Residential Development at Various Lot in D.D. 107, Fung Kat Heung, Yuen Long.

SCHEMATIC SECTION (1:500)

Appendix 2 Detailed Sewerage Impact Assessment Calculations

Table 1 Calculation for Sewage Generation Rate of the Proposed Development at the Application Site

Residential Tower			
Total number of residential units	=	1439	units
Total number of residents	=	3886	people -- (2021 Population Census: Average Household Size of 2.7 in Kam Tin)
Design flow	=	0.27	m^3/person/day -- (Private R2 in Table T-1 of GESF)
Sewage Generation rate	=	**1049.2**	m^3/day
Clubhouse			
Assumed Area	=	1253	m^2
Assumed floor area per employee	=	30.3	m^2 per worker -- (refer to Table 8 of CIFSUS - Community, Social & Personal Services)
Total number of employees	=	41	employees
Design flow for commercial activities	=	0.28	m^3/employee/day -- (refer to Table T-2 of GESF - J11)
Sewage Generation rate	=	**11.6**	m^3/day
Swimming Pools (Outdoor)			
Assumed Area of Swimming Pool	=	179	m^2
Average Depth of Water	=	1.2	m (ordinary assumption)
Volume of Swimming Pool (Ordinary Assumption)	=	214.3	m^3
Turnover Rate	=	6	hr
Required Surface Loading Rate of Filter	=	36	$m^3/m^2/hr$
Filter Areas required	=	1.0	m^2
Adopted Surface Loading Rate of Filter	=	50	$m^3/m^2/hr$
Adopted Filter Area	=	0.7	m^2
Backwash Duration	=	3	min/d
Backwash flow rate	=	30	$m^3/m^2/hr$
Design flow for Swimming Pool Backwashing (Backwash flowrate*Adopted Filter Area*(Backwash Duration/60))	=	1.1	m^3/day
Flowrate for Swimming Pool Backwashing in 3 mins (Design flow*1000/(Backwash Duration*60))	=	**6.0**	litre/sec
Total Flow from Proposed Development			
Flow Rate (without Catchmnet Inflow Factor)	=	1060.8	m^3/day
Catchment Inflow Factor	=	1.00	Catchment Inflow Factor for Yuen Long in Table T-4 of GEFS
Flow Rate (with Catchment Inflow Factor)	=	**1060.8**	m^3/day
Contributing Population	=	3929	people
Peaking factor for Sewer	=	6	Refer to Table T-5 of GESF for population 1,000-5,000 incl. stormwater allowance
Peak Flow for Sewer	=	**73.7**	litre/sec
Peak Flow with Backwash from Swimming Pool for Sewer	=	**79.6**	litre/sec
Peaking factor for STP		4	Refer to Guideline for the Design of Small Sewage Treatment Plants for population over 1,000 but not less than that based on 2,000 population
Peak Flow for STP		**49.1**	litre/sec
Peak Flow with Backwash from Swimming Pool for STP		**55.1**	litre/sec

Table 2a Hydraulic Capacity of Proposed Sewers Constructed by Sha Po Public Housing

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k_s	s	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s^2	m		1 in	m^2/s	m/s	m^2	m^3/s	L/s
M6 - M7	-	-	560	43.0	5.52	5.33	9.81	0.00300	0.004	225	0.000001	1.25	0.25	0.31	308
M7 - M8	-	-	710	36.8	5.33	5.22	9.81	0.00300	0.003	330	0.000001	1.21	0.40	0.48	478
M8 - M9	-	-	710	55.1	5.22	5.04	9.81	0.00300	0.003	300	0.000001	1.27	0.40	0.50	501
M9 - M10	-	-	710	81.3	5.04	4.73	9.81	0.00300	0.004	267	0.000001	1.34	0.40	0.53	531
M10 - M11	-	-	710	78.3	4.73	4.34	9.81	0.00300	0.005	200	0.000001	1.55	0.40	0.61	614
M11 - M12	-	-	710	50.5	4.34	4.13	9.81	0.00300	0.004	245	0.000001	1.40	0.40	0.55	554
M12 - M13	-	-	710	83.0	4.13	3.82	9.81	0.00300	0.004	263	0.000001	1.35	0.40	0.54	535
M13 - M14	-	-	710	17.0	3.82	3.72	9.81	0.00300	0.006	180	0.000001	1.63	0.40	0.65	647

Table 2b Hydraulic Capacity of Proposed Sewers Constructed by Sha Po Public Housing (Upgraded by Public Housing Development)

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k_s	s	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s^2	m		1 in	m^2/s	m/s	m^2	m^3/s	L/s
M6 - M7	-	-	560	43.0	5.52	5.33	9.81	0.00300	0.004	225	0.000001	1.25	0.25	0.31	308
M7 - M8	-	-	900	36.8	5.33	5.22	9.81	0.00300	0.003	330	0.000001	1.41	0.64	0.89	895
M8 - M9	-	-	900	55.1	5.22	5.04	9.81	0.00300	0.003	300	0.000001	1.47	0.64	0.94	938
M9 - M10	-	-	900	81.3	5.04	4.73	9.81	0.00300	0.004	267	0.000001	1.56	0.64	0.99	995
M10 - M11	-	-	900	78.3	4.73	4.34	9.81	0.00300	0.005	200	0.000001	1.81	0.64	1.15	1150
M11 - M12	-	-	900	50.5	4.34	4.13	9.81	0.00300	0.004	245	0.000001	1.63	0.64	1.04	1039
M12 - M13	-	-	900	83.0	4.13	3.82	9.81	0.00300	0.004	263	0.000001	1.58	0.64	1.00	1002
M13 - M14	-	-	900	17.0	3.82	3.72	9.81	0.00300	0.006	180	0.000001	1.90	0.64	1.21	1212

Table 2c Hydraulic Capacity of Proposed Sewers

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k_s	s	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s^2	m		1 in	m^2/s	m/s	m^2	m^3/s	L/s
T1-T2	-	-	300	10.4	6.20	6.13	9.81	0.00030	0.007	150	0.000001	1.39	0.07	0.10	98
T2-T3	-	-	300	19.6	6.13	6.00	9.81	0.00030	0.007	150	0.000001	1.39	0.07	0.10	98
T3-T4	-	-	300	44.9	6.00	5.70	9.81	0.00030	0.007	150	0.000001	1.39	0.07	0.10	98
T4-M6	-	-	300	26.3	5.70	5.52	9.81	0.00030	0.007	150	0.000001	1.39	0.07	0.10	98

Notes: (1) The invert levels of the proposed manholes are tentatively used for calculation purposes only. The exact invert levels will be confirmed during the detailed design stage.

Remarks: (1) g=gravitational acceleration; k_s=equivalent sand roughness; s=gradient; v=kinematic viscosity of water; V=mean velocity

(2) Table 2a: The value of k_s = 0.3mm is used for the calculation of slimed polyethelyene for the proposed sewers, poor condition (based on Table 5: Recommended roughness values in Sewerage Manual)

(4) The value of velocity (V) is referred to the Tables for the hydraulic design of pipes, sewers and channels (8th edition)

(5) Equation used: $V = -\sqrt{(8gDs)}\log\left(\frac{k_s}{3.7D} + \frac{2.51v}{D\sqrt{(2gDs)}}\right)$

Table 3 Calculation for Sewage Generation Rate of the Existing Surrounding Building

Catchment A
Proposed Public Housing Development at Sha Po (M6)
Residential (SSF)

ADWF	=	0.0493	m^3/s -- (from an engineering feasibility study (EFS) of the proposed Sha Po Public Housing Development (SPPHD))
ADWF	=	4259.5	m^3/day

Retail

ADWF	=	0.0025	m^3/s -- (from an EFS of the proposed SPPHD)
ADWF	=	216.0	m^3/day

Welfare

ADWF	=	0.0041	m^3/s -- (from an EFS of the proposed SPPHD)
ADWF	=	354.2	m^3/day

Police Station

ADWF	=	0.0005	m^3/s -- (from an EFS of the proposed SPPHD)
ADWF	=	43.2	m^3/day

Fire Station

ADWF	=	0.0004	m^3/s -- (from an EFS of the proposed SPPHD)
ADWF	=	34.6	m^3/day

Primary School

ADWF	=	0.0004	m^3/s -- (from an EFS of the proposed SPPHD)
ADWF	=	34.6	m^3/day

Total Flow to M6	=	**4942.1**	m^3/day

Catchment B
Proposed Public Housing Development at Sha Po (M7)
Residential (PRH)

ADWF	=	0.0808	m^3/s -- (from an EFS of the proposed SPPHD)
ADWF	=	6981.1	m^3/day

Total Flow to M7	=	**6981.1**	m^3/day

Catchment C
Proposed Public Housing Development at Sha Po (M9)
Mini-soccer Fields

ADWF	=	0.0003	m^3/s -- (from an EFS of the proposed SPPHD)
ADWF	=	25.9	m^3/day

Total Flow to M9	=	**25.9**	m^3/day

Catchment D
Proposed Public Housing Development at Sha Po (M11)
Sports Center

ADWF	=	0.0008	m^3/s -- (from an EFS of the proposed SPPHD)
ADWF	=	69.1	m^3/day

Total Flow to M11	=	**69.1**	m^3/day

Table 4a Comparision of the Hydraulic Capacity of Proposed Sewers Constructed by Sha Po Public Housing Development (SPPHD)and Proposed Development according to EFS

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	ADWF (m^3/day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
M6 - M7	560	43.0	0.004	308	6002.9	22233	4	6.0	283.9	92.0%	OK
M7 - M8	710	36.8	0.003	478	12984.0	48089	4	6.0	607.1	127.1%	Not OK
M8 - M9	710	55.1	0.003	501	12984.0	48089	4	6.0	607.1	121.2%	Not OK
M9 - M10	710	81.3	0.004	531	13009.9	48185	4	6.0	608.3	114.5%	Not OK
M10 - M11	710	78.3	0.005	614	13009.9	48185	4	6.0	608.3	99.1%	Not OK
M11 - M12	710	50.5	0.004	554	13079.0	48441	4	6.0	611.5	110.3%	Not OK
M12 - M13	710	83.0	0.004	535	13079.0	48441	4	6.0	611.5	114.3%	Not OK
M13 - M14	710	17.0	0.006	647	13079.0	48441	4	6.0	611.5	94.5%	OK

Table 4b Comparision of the Hydraulic Capacity of Proposed Sewers Constructed by SPPHD for Sewage generated from SPPHD and Proposed Development (After Upgrading) (1)

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	ADWF (m^3/day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
M6 - M7	560	43.0	0.004	308	6002.9	22233	4	6.0	283.9	92.0%	OK
M7 - M8	900	36.8	0.003	895	12984.0	48089	4	6.0	607.1	67.9%	OK
M8 - M9	900	55.1	0.003	938	12984.0	48089	4	6.0	607.1	64.7%	OK
M9 - M10	900	81.3	0.004	995	13009.9	48185	4	6.0	608.3	61.1%	OK
M10 - M11	900	78.3	0.005	1150	13009.9	48185	4	6.0	608.3	52.9%	OK
M11 - M12	900	50.5	0.004	1039	13079.0	48441	4	6.0	611.5	58.9%	OK
M12 - M13	900	83.0	0.004	1002	13079.0	48441	4	6.0	611.5	61.0%	OK
M13 - M14	900	17.0	0.006	1212	13079.0	48441	4	6.0	611.5	50.5%	OK

Table 4c Comparision of the Hydraulic Capacity of Proposed Sewers from the Terminal Manhole of the Proposed Development

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	ADWF (m^3/day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
T1-T2	300	-	0.007	98	1060.8	3929	6	6.0	79.6	81.1%	OK
T2-T3	300	-	0.007	98	1060.8	3929	6	6.0	79.6	81.1%	OK
T3-T4	300	-	0.007	98	1060.8	3929	6	6.0	79.6	81.1%	OK
T4-M6	300	-	0.007	98	1060.8	3929	6	6.0	79.6	81.1%	OK

Remarks: 1. The value of peaking factor = 6 is used for population 1,000-5,000 incl. stormwater allowance (refers to Table T-5 of GESF)
2. The value of peaking factor = 4 is used for population 10,000-50,000 incl. stormwater allowance (refers to Table T-5 of GESF)

Note: (1) The applicant will liaise with CEDD (project proponent of SPPHD) afterwards to ensure proper implementation of the proposed upgraded design.

Table 5 Existing & Future Flow to Sha Po Sewage Pumping Station (SPSPS)

ADWF

1. Future Situation with SPPHD in Place

ADWF including SPPHD	=	16,727	m^3/day (from EFS of SPPHD)

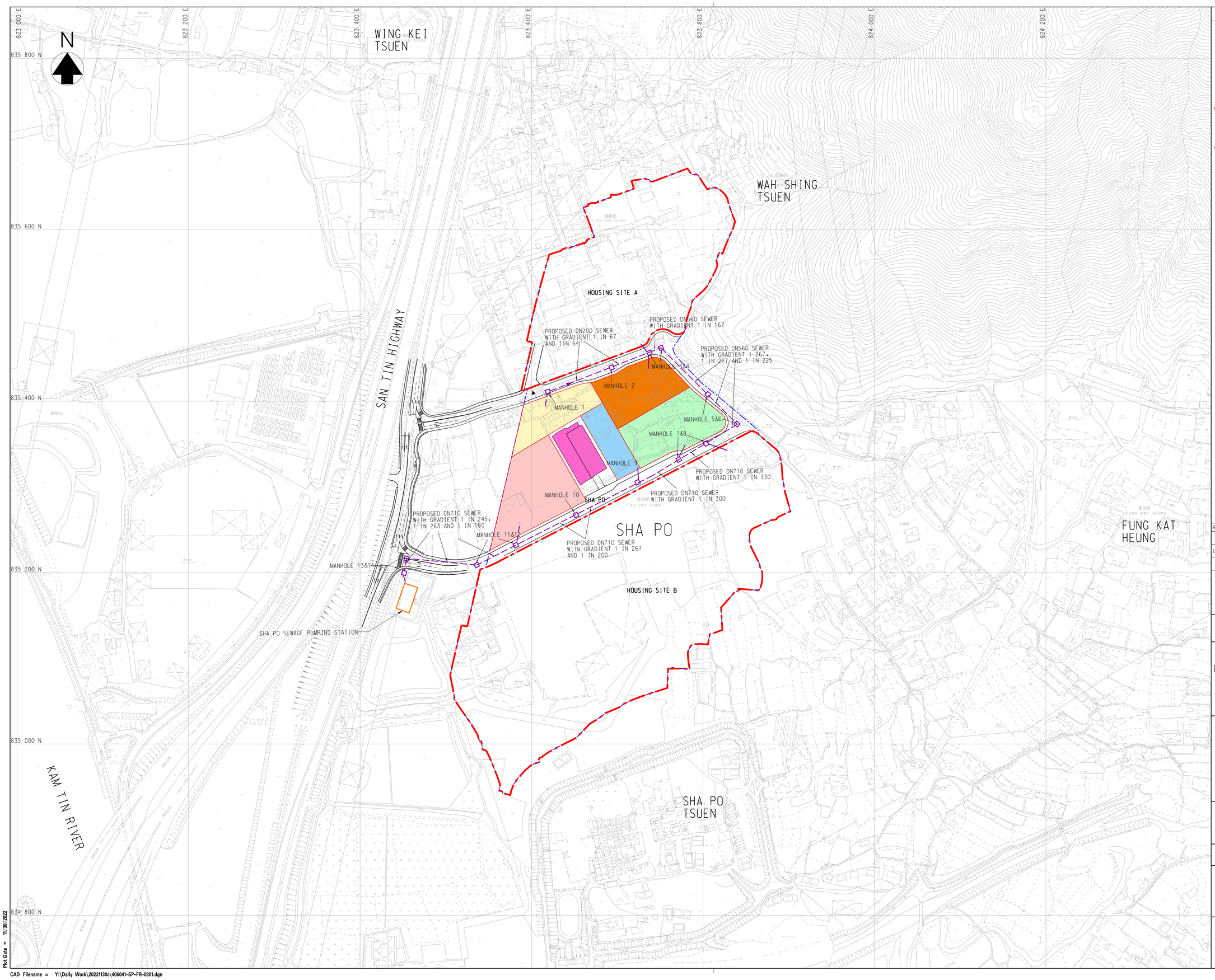
2. Proposed Design Capacity under EFS of SPPHD

Design Daily Flow	=	16,750	m^3/day (from EFS of SPPHD)

3. Undated Future Situation with SPPHD and Proposed Development in Place

Future ADWF with SPPHD	=	16,727	m^3/day
ADWF of Proposed Development	=	1060.8	m^3/day
Proposed Development	=	6.3	% of Upgraded Design Capacity
Total ADWF with SPPHD and Proposed Development	=	17,788	m^3/day
	=	106.2%	of Proposed Design Capacity under EFS of SPPHD

Appendix 3 **Proposed Sewerage Layout Plan extracted from Engineering Feasibility Study Report for Proposed Public Housing Developments at Sha Po**



NOTES:

1. GRID LINES ARE HONG KONG METRIC GRID 1980.
2. THE EXACT LOCATION AND LAYOUT OF THE SITES ARE SUBJECT TO CHANGE AND CONFIRMATION WITH RELEVANT PARTIES.

LEGEND:

- INDICATIVE HOUSING DEVELOPMENT SITE BOUNDARY SUBJECT TO EFS STUDIES AND RELEVANT B/D'S DECISION
- PROPOSED DEVELOPMENT BOUNDARY (REVISED)
- HISTORICAL BUILDING
- PRIMARY SCHOOLS
- POLICE STATION
- FIRE STATION
- SPORTS/LEISURE CENTRE
- MINI-SOCCER FIELDS (5-A SIDE)
- PROPOSED SEWERAGE
- PROPOSED MANHOLE

Revision	Date	Description		Initial
	Designed	Checked	Drawn	Checked
Initial	BW	YKL	SZ	LCH
Date	12/20	12/20	12/20	12/20

Approved

Agreement no.
CE10/2020 (CE)

Project title
SITE FORMATION AND INFRASTRUCTURE WORKS FOR PROPOSED PUBLIC HOUSING DEVELOPMENTS AT SHA PO, SHAP PAT HEUNG AND TAI KEI LENG, YUEN LONG - FEASIBILITY STUDY

Drawing title
PROPOSED SEWERAGE LAYOUT PLAN

Drawing no.
406041/SP/FR/0801

Revision
-

Scale
A1 1 : 2000
A3 1 : 4000

土木工程拓展署
CEDD Civil Engineering and Development Department

BINNIES HONG KONG LIMITED
賓尼斯工程顧問有限公司

Plot Date = 11/30/2022

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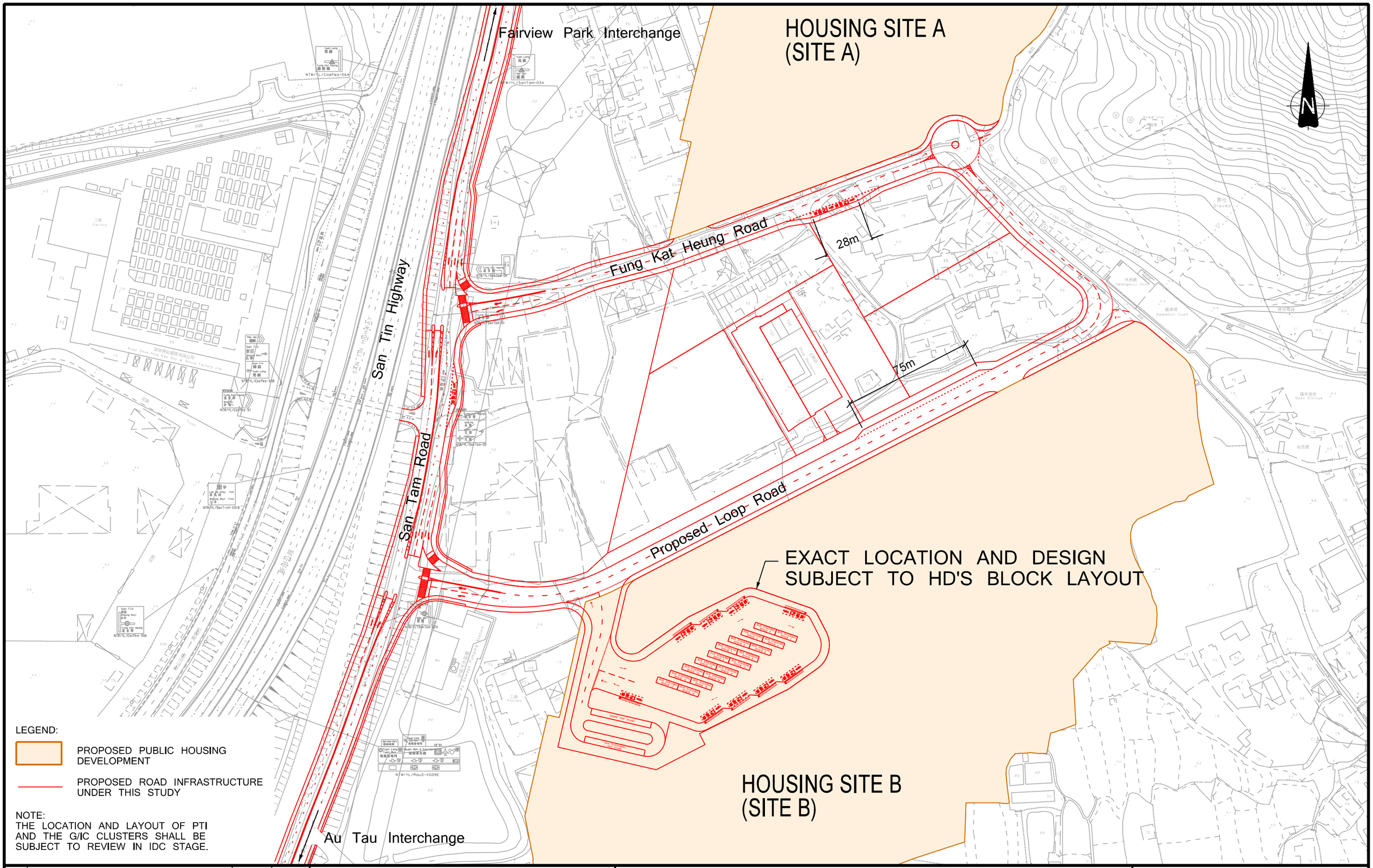

Rev.	Description	Checked	Date
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

Project Title

AGREEMENT NO. CE 10 / 2020 (CE) -
SITE FORMATION AND INFRASTRUCTURE WORKS FOR PROPOSED PUBLIC HOUSING DEVELOPMENTS AT SHA PO, SHAP PAT HEUNG AND TAI KEI LENG, YUEN LONG - FEASIBILITY STUDY

Drawing Title

PROPOSED LOCAL ROAD NETWORK

Designed	Checked	Scale	Date	Drawing No.	Rev.
CNS	YKP	1:2000(A3)	NOV 2022	406041/SP/FR/0403	-

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SYSTRA MVA

CHK50518210/TIA_SP/SK1.DGN/CNS/23NOV22

more information would be available. Further upgrade of the SP SPS or construction of new SPS would be required if necessary.

8.5 Mitigation Measures

8.5.1 New DN200 to DN710 gravity sewers are proposed along Fung Kat Heung Road and proposed road to the existing SP SPS.

8.5.2 The SP SPS requires upgrading to cater the sewage generated from the proposed Development. The capacity of the SP SPS is proposed to be upgraded from 8,795 m^3/day to 16,750 m^3/day in order to cater the sewage generated from the related sewage catchment including the Site.

8.5.3 It is anticipated that the sewerage upgrading works will be completed prior to the buildings completion for the Development. Close liaison with DSD and relevant parties will be required during the subsequent stages of the project.

8.6 Management and Maintenance Matrix for Proposed Sewerage Works

8.6.1 The parties responsible for construction and maintaining the proposed sewerage works are listed in **Table 8.4** which will be further reviewed in later stage.

Table 8.4 - Management and Maintenance Matrix

Description of Proposed Sewerage Works	Construction Party	Maintenance Party
Proposed new sewerage	CEDD	DSD
Internal sewerage for the proposed housing site within its site boundary	HD	HD
Internal sewerage for the proposed school sites	ArchSD	EDB
Upgrading of Sha Po Sewage Pumping Station	CEDD	DSD

8.7 Summary

8.7.1 Following the implementation of the proposed sewerage works, no insurmountable issue is anticipated for the proposed developments from sewerage viewpoints.

8.7.2 Detailed SIA will be conducted at the next stage by looking into the existing developments at upstream/downstream of the proposed housing development. A more accurate assessment on the cumulative impact of the flows from the proposed and existing developments on the capacity of the existing sewerage system will be provided.