Appendix C

Revised Sewerage Impact Assessment

ARUP

Application for Planning Permission Under Section 16 of the Town Planning Ordinance (Cap. 131) for Proposed Residential Development in Area Shown as 'Road', Various Lots in D.D. 221 and Adjoining Government Land, Sha Ha, Sai Kung

Sewerage Impact Assessment Report

Draft 4 | June 2025

Job number 302260

Arup Hong Kong Limited
Level 5 Festival Walk
80 Tat Chee Avenue
Kowloon Tong
Kowloon, Hong Kong
arup.com

Contents

Drawings

Appendices

1. Introduction

1.1 Project Background

1.1.1 This Sewerage Impact Assessment ("SIA"), appended to the Supporting Planning Statement, is prepared in support of the Planning Application under Section 16 of the Town Planning Ordinance (Cap. 131) for Proposed Residential Development at Various Lots in D.D. 221 and adjoining Government Land, Sha Ha, Sai Kung ("the Application Site").

1.2 Proposed Development

1.2.1 The Proposed Development is located in the existing temporary open storage area within Sha Ha. There would be 3 blocks of residential buildings and an access road adjoining Tai Mong Tsai Road.

1.2.2 The Proposed Development comprises private housing and clubhouse. The Application Site area is approximately 9,038 m^2, while the design parameters are shown in **Table 1.1** below.

Table 1.1 Key development Parameters

Parameter	Proposed Scheme
District Location	Sai Kung
Site Location	Sha Ha
Application Site Area (1)	About 9,038m^2
Development Site Area	About 7,614m^2
Plot Ratio (2)	About 1.5
Domestic Gross Floor Area (GFA)	About 11,421m^2
Building Height (No. of Storeys) (3)	10 storeys
Site Coverage	Not more than 42%
No. of Residential Blocks	3
No. of Units (about)	280
Average Unit Size	About 40.79m^2
Anticipated Population (4)	Domestic: About 756 Clubhouse: 19 (6)
Local Open Space	Not less than 756m^2
Target Completion Year	2032
Residents' Clubhouse (5)	GFA of about 571m^2

(1) The Application Site includes the Development Site and empty area within the limit of works area of the planned Hiram's Highway Improvement Stage 2 adjoining the Development Site for better rationalisation of boundary.

(2) Plot ratio calculation is based on the area of Development Site.

(3) The number of storeys excludes l-storey basement carpark.

(4) Person per flat (PPF) ratio of 2.7 is assumed, with reference to the average household size in the District Council Constituency Area Q01 Sai Kung Central in 2021 Population Census.

(5) According to APP-104, a maximum 5% of total Domestic GFA can be applied for GFA concession for a development with Domestic GFA up to 25,000m^2. The clubhouse GFA is proposed to be exempted from GFA calculation.

(6) Community, Social & Personal Services = 3.3 employee per 100m^2 of GFA based on PlanD's Commercial and Industrial Floor Space Utilization Survey "CIFSUS" Table 8.

1.3 Purpose of this Report

1.3.1 The aim of this Sewerage Impact Assessment (SIA) is to define the sewerage network arising from proposed development. The impacts on the existing sewerage network are assessed and mitigation measures (if found necessary) are formulated.

1.3.2 The scope of the Project comprises private housing development with a clubhouse in Sha Ha.

1.3.3 This SIA Report has been prepared to:

(a) fully satisfy the requirements of this Scope in respect of the prediction and assessment of impacts, the identification of sewerage impact mitigation measures and the associated residual impacts;

(b) provide assessment and evaluation of the sewerage impact and cumulative effects arising from the Project sufficient to identify those issues of key concern during the construction and operation of the Project;

(c) define measurable sewerage parameters and features likely to be affected by the Project;

(d) recommend optimum sewerage scheme for the Project;

(e) prescribe the specification for detailed design, construction and operation requirements of the recommended sewerage scheme;

(f) provide the assessment findings, conclusions, recommendations and a mechanism for implementation; and

(g) include any revisions or supplements to the above as might be required by the EPD and DSD.

1.3.4 The SIA Report shall be submitted for approval by EPD and DSD on the methodologies, findings, proposals, recommendations and conclusions of the SIA.

1.3.5 This Sewerage Impact Assessment Report is structured as follows:

Section 1 – **Introduction**, introduces the Project Background, Objectives and Scope of the Project.

Section 2 – **Methodology and Design Criteria,** presents the Methodology and Design Criteria.

Section 3 – **Sewerage Impact Assessment**, presents the Sewerage Impact Assessment.

Section 4 – **Construction, Operation and Maintenance of New Sewerage Facilities**, presents Construction, Operation and Maintenance of New Sewerage Facilities.

Section 5 – **Conclusion,** summarises the Conclusions.

2. Methodology and Design Criteria

2.1 Methodology

2.1.1 The following methodology is adopted in carrying out the SIA:

- Identify the scope, parameters and programme of the development;
- Estimate the sewage flow generation of the development;
- Identify the existing and planned sewerage systems within and near the proposed development boundary;
- Examine the impact arising from new sewage generation from the proposed development on the existing sewerage network; and
- Identify new and upgrading sewerage works to support the proposed development.

2.1.2 The SIA has been carried out in accordance with the following guidelines set out in EPD Report No. EPD/TP1/05 "*Guidelines for Estimating Sewage Flows (GESF) for Sewerage Infrastructure Planning Version 1.0*" and DSD's Sewerage Manual.

2.2 Parameters and Assumptions

2.2.1 The key parameters used for flow estimation in this SIA are: the unit flow factor; the peak flow factor; and the population/ employee density.

Unit Flow Factor – Domestic Flows

2.2.2 The Unit flow factors (UFF) for domestic sewage flow due to residential population of the proposed development and the existing sewerage catchment are shown in **Table 2.1** based on the Table T-1 of GESF.

Table 2.1 Unit Flow Factor for Domestic Flows

Residential Type	Unit Flow Factor (m^3/person/day)[(1)]
Private R3	0.37
Private R4	0.37
Modern Village	0.27

(1) GESF Table T-1 values for "Planning for Future" have conservatively been adopted.

Unit Flow Factor – Commercial Flows

2.2.3 The UFFs for commercial sewage flows due to employed population of the proposed development and the existing sewerage catchment are shown in **Table 2.2** based on the Table T-2 of GESF.

2.2.4 The total unit flow generated from an employee in a particular trade is the sum of the UFF of the employee and the UFF of commercial activities of a particular trade under consideration.

Table 2.2 Unit Flow Factor for Commercial Flows

Commercial Type	UFF (m^3/employee/day)
Commercial Employee(1)	0.080
Commercial Activities	
(a) Specific trades:	
J11 – Community, Social & Personal Services	0.200

(1) Commercial employees refer to sewage generation arising from the staff of the clubhouse ancillary to the residential development.

Peaking Factors

2.2.5 The peaking factors to cater for seasonal/diurnal flow variations, and infiltration and inflow due to storm events are referenced to EPD's GESF and shown in **Table 2.3** .

Table 2.3 Peaking Factors for Various Population Ranges

Population Range	Peaking Factor (Including Stormwater Allowance) for Facility with Existing Upstream Sewerage	Peaking Factor (Excluding Stormwater Allowance) for Facility with Existing Upstream Sewerage
Sewers		
< 1,000	8	6
1,000 – 5,000	6	5
5,000 – 10,000	5	4
10,000 – 50,000	4	3
> 50,000	Max ($7.3/N^{0.15}$, 2.4) [1]	Max ($6/N^{0.175}$, 1.6) [1]
Sewage Treatment Works, Preliminary Treatment Works and Pumping Stations		
< 10,000	4	3
10,000 – 25,000	3.5	2.5
25,000 – 50,000	3	2
> 50,000	Max ($3.9/N^{0.065}$, 2.4) [1]	Max ($2.6/N^{0.065}$, 1.6) [1]
Note: [1] N = Contributing population in thousands		

2.2.6 With consideration of the reduced hydraulic performance due to the deterioration of sewer pipes with time, peaking factors (including stormwater allowance) is adopted in this Study.

Population Density

2.2.7 A person per flat (PPF) ratio of 2.9 is adopted for the estimating the existing population based on the average household size in Sai Kung District Council in "*Table 130-06806: Average household size and median monthly household income of households by District Council district*" of General Household Survey (GHS) from January to December of the year 2023[1].

2.2.8 The employment population density has been referenced to Table 8 of PlanD's Commercial and Industrial Floor Space Utilization Survey "CIFSUS":

- Community, Social & Personal Services: Assume 3.3 employee per 100m^2 of GFA

Hydraulic Analysis

2.2.9 Colebrook-White equation is applied for pipe hydraulic analysis. The design roughness coefficients (Ks) for existing pipeline system are assumed to be 0.3mm (Slimed sewer slimed to about half depth; velocity when flowing half full approximately 1.2 m/s, uPVC, under normal condition). The design roughness coefficients (Ks) for proposed pipeline system are 0.3mm in consideration of its reduced hydraulic performance in future due to degradation of material.

2.2.10 For small diameter sewers of diameter less than 300mm, the flow velocity of at least 0.7m/s shall occur daily, or that a gradient of at least 1:DN (i.e. Nominal diameter of the sewer in mm) is provided, provided that a flow of 2 times of Average Dry Weather Flow (ADWF) is assumed to occur at least once daily. For larger diameter sewers of diameter up to 900mm, a self-cleansing velocity of 1.0m/s in full pipe condition shall be achieved. The maximum flow velocity at peak flow shall be 3m/s.

[1] https://www.censtatd.gov.hk/en/web_table.html?id=130-06806

3. Sewerage Impact Assessment

3.1 Existing and Planned Sewerage Infrastructure

Existing Sewerage System

3.1.1 Based on the DSD Drainage records, there is an existing sewerage network with sewers with 300mm dia. along Tai Mong Tsai Road which discharges to SKSPS2 and flows ultimately to SKSTW.

3.1.2 SKSTW is a secondary treatment works facility for Sai Kung District. The ADWF received at the facility is approximately 8,000 m^3/day[2].

Planned Sewerage System

3.1.3 SKSTW is under plan for an upgrade in order to cater for the increased demand from projected ultimate population and planned developments in Sai Kung.

3.1.4 Under PWP Item No. 4226DS[3], the followings are included as planned improvement:

(i) The project will increase the treatment capacity of the existing SKSTW from 8,000 m^3/day to 22,000 m^3/day.

3.1.5 Under PWP Item No. 4431DS[4], the followings are included as planned improvement:

(i) Construction of about 4.2 km of gravity sewers for 3 unsewered areas (including Wong Chuk Wan, Wo Mei and Heung Chung), one sewage treatment works, one sewage pumping station, about 1.2 km of rising mains and ancillary works in Sai Kung.

3.2 Sewage Generation from the Existing Development

3.2.1 The sewage flow generated from the existing development (upstream of proposed development) is about 626.6m^3/day (ADWF), while the peak flow is 43.5L/s (peak factor = 6). The detailed calculations for sewage flow estimation are included in **Appendix A** and summarised in **Table 3.1**.

Table 3.1 Sewage Flow Estimation for the Existing Development

Existing Development[(1)]	Estimated ADWF (m^3/day) [(3)]
Sea View Villa	45.1
Shinji Shumeikai Hong Kong Church	16.0
Lotus Villas	16.3
Hilldon	3.3
Arcadia	8.9

[2] https://www.dsd.gov.hk/others/saikungstwtocaverns/en/existing-sai-kung-sewage-treatment-facilities.html

[3] https://www.epd.gov.hk/eia/register/profile/latest/esb067.pdf

[4] https://www.dsd.gov.hk/EN/Our_Projects/All_Projects/4431DS.html

Existing Development[1]	Estimated ADWF (m^3/day) [3]
Hilllock	10.0
Burlingame Garden	16.3
Hunlicar Garden	3.3
Remaining discrete houses along Chuk Yeung Road	22.6
Tai Wan Village	286.7
Luna House	2.2
Violet Garden	8.9
Sha Ha Village	42.4
Peak Catchment Inflow Factor	1.30[4]
Total ADWF (m^3/day)	**482.0**
Total ADWF including Catchment Inflow Factor (m^3/day)	**626.6**
Contributing population	2321
Peaking Factor [2]	6
Peak Flow (L/s)	**43.5**
Additional Flow from Wong Chuk Wan SPS (L/s) [5]	**64.0**
Additional Flow from Swimming Pools Backwashes (L/s)	**13.9**

Remarks:

(1) Existing upstream development have been estimated based on the sewerage network information available on government website https://www.map.gov.hk/gm/

(2) Peaking Factor =6 for contributing population >1000 and <5000 based on EPD's Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning Version 1.0 (GESF) Table T-5.

(3) Numbers are rounded to 1 decimal place.

(4) Catchment Inflow Factor = 1.3 based on Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning Version 1.0 Table T-4 Sai Kung catchment.

(5) The additional flow from Wong Chuk Wan SPS was advised by the project team and the consultant of PWP Item No. 4431 DS via email and telephone conversation; the design on-duty pump rate is 64 L/s.

3.3 Sewage Generation from the Proposed Development

3.3.1 The sewage flow generated from the proposed development is about 285.0 m^3/day (ADWF), while the peak flow is 19.8 L/s (peaking factor = 6 [3]), while the additional flow from outdoor swimming pool is 9.8 L/s. The detailed calculations for sewage flow estimation are included in **Appendix A** and summarised in **Table 3.2**.

Table 3.2 Sewage Flow Estimation for the Proposed Development

Proposed Development	Estimated ADWF (m^3/day) [4]
Residential	279.7
Clubhouse	5.3
Total ADWF(m^3/day)[1]	**285.0**
Contributing population[2]	1,056
Peaking Factor[3]	6
Peak Flow (L/s)	**19.8**
Additional Flow from Outdoor Swimming Pool (L/s)	**9.8**[5]

Remarks:
(1) Catchment Inflow Factor = 1.0, for new catchments which are deemed to be free from misconnections and pipe defects based on EPD's GESF Section 10.1.
(2) From GESF section 12, contributing population is calculated as ADWF/0.27
(3) Peaking Factor (including stormwater allowance) = 6 for contributing population = 1,000 – 5,000 based on EPD's GESF Table T-5 for facilities with existing upstream sewerage.
(4) Numbers are rounded to 1 decimal place
(5) Refer to Appendix A Sheet No. 2 Estimation of Sewerage Discharge from Proposed Development

3.4 Proposed Development Sewerage System

Sewerage Connection Proposal

3.4.1 To accommodate the sewage generation from Proposed Development, a new 225mm dia. sewage branch is proposed laying along the access road and connect to the existing manhole on Tai Mong Tsai Road. The proposed sewers are shown in **Table 3.3**, from the proposed terminal manhole (TMH) to the existing manhole ID (FMH4042114). Proposed connection drawing is in **Appendix B**.

Table 3.3 Proposed Sewage pipe connection from Terminal Manhole to Existing Sewerage Network

Location	Upstream Manhole	Downstream Manhole	Sewer size (mm)	Upstream Invert Level (mPD)	Downstream Invert Level (mPD)
Proposed Development	TMH	FMH4042114	225	8.30	8.20

Hydraulic Check

3.4.2 Hydraulic capacity check has been undertaken for the downstream sewerage system and results are presented in **Table 3.4**. The network under existing condition already exceeds its own capacity. Detailed calculations are included in **Appendix A**.

Table 3.4 Sewers Capacity Check

Location option	Upstream Manhole	Downstream Manhole	Sewer size (mm)	Upstream Invert Level (mPD)	Downstream Invert Level (mPD)	% of Max. Peak flow to sewer capacity
Existing Scheme	FMH4042114	FMH4042126	300	8.01	7.78	125%
	FMH4042126	FMH4042115	300	7.76	7.45	115%
	FMH4042115	FMH4042116	300	7.42	7.16	123%
	FMH4042116	FMH4042117	300	7.15	7.03	123%
	FMH4042117	FMH4042118	300	7.02	6.85	88%
	FMH4042118	FMH4042119	300	6.83	6.75	117%
	FMH4042119	FMH4042120	300	6.72	6.57	117%
	FMH4042120	FMH4042121	300	6.55	6.39	122%
	FMH4042121	FMH4042122	300	6.28	5.72	63%
	FMH4042122	FMH4042123	300	5.66	5.10	58%
	FMH4042123	FMH4042124	300	4.98	4.87	68%
Proposed Development	TM	FMH4042114	225	8.30	8.20	52%
	FMH4042114	FMH4042126	300	8.01	7.78	155%
	FMH4042126	FMH4042115	300	7.76	7.45	143%
	FMH4042115	FMH4042116	300	7.42	7.16	152%
	FMH4042116	FMH4042117	300	7.15	7.03	153%
	FMH4042117	FMH4042118	300	7.02	6.85	109%
	FMH4042118	FMH4042119	300	6.83	6.75	146%
	FMH4042119	FMH4042120	300	6.72	6.57	145%
	FMH4042120	FMH4042121	300	6.55	6.39	152%
	FMH4042121	FMH4042122	300	6.28	5.72	79%
	FMH4042122	FMH4042123	300	5.66	5.10	72%
	FMH4042123	FMH4042124	300	4.98	4.87	84%

3.4.3 Parts of the sewerage system along Tai Mong Tsai Road are under surcharge condition. Freeboard calculation was also conducted to check whether there are sufficient freeboards for the sewage flow from Subject Site. Detailed calculations are included in **Appendix A**. As there are no sufficient freeboard, it is proposed

Table 3.5 Freeboard Checking

Scenario	Upstream Manhole	Downstream Manhole	Sewer size (mm)	Upstream Invert Level (mPD)	Downstream Invert Level (mPD)	Freeboard at upstream manhole (m)
Peak flow x 1.0 while	FMH4042114	FMH4042126	300	8.01	7.78	-3.61
	FMH4042126	FMH4042115	300	7.76	7.45	-2.69

Scenario	Upstream Manhole	Downstream Manhole	Sewer size (mm)	Upstream Invert Level (mPD)	Downstream Invert Level (mPD)	Freeboard at upstream manhole (m)
freeboard >= 1m	FMH4042115	FMH4042116	300	7.42	7.16	-1.73
	FMH4042116	FMH4042117	300	7.15	7.03	-0.77
	FMH4042117	FMH4042118	300	7.02	6.85	-0.17
	FMH4042118	FMH4042119	300	6.83	6.75	0.35
	FMH4042119	FMH4042120	300	6.72	6.57	0.88
	FMH4042120	FMH4042121	300	6.55	6.39	1.25
Peak flow x 1.15 FOS while Freeboard >= 0m	FMH4042114	FMH4042126	300	8.01	7.78	-6.12
	FMH4042126	FMH4042115	300	7.76	7.45	-4.81
	FMH4042115	FMH4042116	300	7.42	7.16	-3.43
	FMH4042116	FMH4042117	300	7.15	7.03	-2.06
	FMH4042117	FMH4042118	300	7.02	6.85	-1.20
	FMH4042118	FMH4042119	300	6.83	6.75	-0.45
	FMH4042119	FMH4042120	300	6.72	6.57	0.30
	FMH4042120	FMH4042121	300	6.55	6.39	0.95

3.4.4 As there are no sufficient freeboard in the concerned manholes, sewerage upgrade is proposed by upgrading the sewers from manhole FMH4042114 to FMH4042124, from 300mm dia. to 375mm dia. HDPE pipes. As the maximum velocity of the sewerage from manhole FMH4042121 to FMH4042124 exceed 3 m/s, new invert levels are proposed to keep the maximum within 3 m/s. Detailed calculation is supplemented in Appendix A.

Table 3.6 Sewerage Capacity Checking after Proposed Upgrading Works

Location option	Upstream Manhole	Downstream Manhole	Sewer size (mm)	Upstream Invert Level (mPD)	Downstream Invert Level (mPD)	% of Max. Peak flow to sewer capacity
Proposed Sewerage Upgrading Works	FMH4042114	FMH4042126	375	8.01	7.78	86%
	FMH4042126	FMH4042115	375	7.76	7.45	80%
	FMH4042115	FMH4042116	375	7.42	7.16	85%
	FMH4042116	FMH4042117	375	7.15	7.03	85%
	FMH4042117	FMH4042118	375	7.02	6.85	61%
	FMH4042118	FMH4042119	375	6.83	6.75	81%
	FMH4042119	FMH4042120	375	6.72	6.57	81%
	FMH4042120	FMH4042121	375	6.55	6.39	84%
	FMH4042121	FMH4042122	375	6.13	5.72	51%
	FMH4042122	FMH4042123	375	5.45	5.10	51%
	FMH4042123	FMH4042124	375	4.91	4.87	78%

3.5 Potential Sewerage Impact

3.5.1 The sewerage network will discharge to the SKSPS2 located downstream and finally will be treated at SKSTW located at Wa Fuk Street. In addition to the verification of the existing sewer downstream of the connection location also the impacts on SKSPS2 and SKSTW have been assessed. The further downstream the assessed infrastructure, the less the proposed development will generate any impact as the additional flow will become progressively a smaller portion of the overall sewage flows.

3.5.2 The SKSPS2 has sufficient capacity to accommodate the additional sewage flows from the proposed development as shown in **Table 3.5** and **Appendix A**. No capacity upgrade of sewage pumping station no.2 is required.

Table 3.7 SKSPS2 Capacity Check

	ADWF (m^3/day)	SKSPS2 Capacity (m^3/day)	SKSPS2 Utilisation (%)	SKSPS2 Spare Capacity (m^3/day)	SKSPS2 Spare Capacity (%)
Existing Sewage Flow	1,776.0	6,480	27%	4,704	73%
Proposed Sewage Flow	2,061.0		32%	4,419	68%

3.5.3 The SKSTW is planned to be upgraded, increasing its treatment capacity from the existing 8,000 m^3/day to 22,000 m^3/day. The increase in utilisation rate due to the additional sewage flow generated by the proposed development has been assessed against both conditions. As shown in **Table 3.6** and **Appendix A**, the utilisation increase is insignificant compared the treatment works capacity. No capacity upgrade of sewage treatment works is required.

Table 3.8 SKSTW Capacity Check

	Capacity (m^3/day)	Development Proposed Sewage Flow (m^3/day)	Utilisation Increase of SKSTW
Existing SKSTW	8,000	285	3.6%
Upgraded SKSTW	22,000		1.3%

3.5.4 The SKSPS2 and SKSTW are designed to cater for the regional sewage generation, thus no adverse impact to SKSPS2 and SKSTW is caused by the proposed development.

4. Construction, Operation and Maintenance of New Sewerage Facilities

4.1.1 The proposed sewerage works within the development boundary including the construction of new sewers connection and the proposed terminal manhole (TMH) will be constructed, operated and maintained by the future management agent.

4.1.2 The proposed sewerage connection mentioned in **Section 3.4** will be undertaken by the project proponent. The portion of sewers downstream of terminal manhole will be handed over to DSD upon completion of construction works for future maintenance as part of the public network.

5. Conclusion

5.1.1 A sewerage impact assessment has been carried out for the proposed development of at Sai Kung.

5.1.2 The sewage flows under existing and proposed conditions have been assessed. To discharge sewage generated from the proposed location, a new sewerage branch is proposed. Sewage from the Proposed Development will be discharged through a 225 mm dia. sewer from a new terminal manhole (i.e. TMH) into the existing sewerage network at manhole FMH4042114. The existing sewerage network is proposed to be upgraded to 375mm dia. to provide sufficient capacity to cater for the proposed additional flow. The proposed upgrading works extend from existing sewer manhole FMH4042114 to existing sewer manhole FMH4042124.

5.1.3 The SKSPS2 and SKSTW are deemed to be designed to cater for the regional sewage generation, thus it is not anticipated for any adverse impact on SKSPS2 and SKSTW due to the proposed development.

Abbreviation List

Abbreviation	Definition
ADWF	Average Dry Weather Flow
DSD	Drainage Services Department
EPD	Environmental Protection Department
GESF	Guidelines for Estimating Sewage Flows
GFA	Gross Floor Area
PWP	Public Works Programme
PPF	Person Per Flat
SIA	Sewerage Impact Assessment
SKSPS2	Sai Kung Sewage Pumping Station No. 2
SKSTW	Sai Kung Sewage Treatment Works
UFF	Unit Flow Factor

Appendix A

Sewage Generation Estimation

ARUP

Job No.	Sheet No.	Rev.
302260	1	4

Job Title: **Application for Planning Permission Under Section 16 of the Town Planning Ordinance (Cap. 131) for Proposed Residential Development in Area Shown as 'Road', Various Lots in D.D. 221 and Adjoining Government Land, Sha Ha, Sai Kung**

Made by JP Date 06/2025 Chd. NP

Calculation: **Estimation of Sewage Discharge from Existing Development**

Exisiting Development along Chuk Yeung Road		
Sea View Villa 西沙小築 (Catchment 1)		
Number of Houses	42	
Number of Flats	42	Flats
Size of household/flat (1)	2.9	Persons/flat
Population	122	Persons
Per Capita Flow (2) - R4	0.37	m^3/day/person
Estimated Dry Weather Flow	**45.1**	m^3/day
Swimming Pool Flow Assume: - Pool size = 100m^2 with 1.5m water depth. - Pool volume = 100 x 1.5 = 150 m^3. - Turnover rate = 6 hours. - Filter loading rate = 48 m^3/m^2/hr. - Filter area required = 150 / 6 / 48 = 0.521 m^2. - Backwash flow rate = 0.5 m^3/m^2/min. - Backwash flow = 0.521 x 0.5 = 0.26 m^3/min = 4.3 L/s	4.3	L/s
Shinji Shumeikai Hong Kong Church 香港神慈秀明會 (Catchment 1)		
Building Area (measured on GeoInfo Map)	1715	m^2
Employee per GFA (in 100 m^2)(7)	3.3	Persons
Employee Population	57	Persons
Per Capita Flow (5) - J11 (commercial employees + J11)	0.28	m^3/day
Estimated Dry Weather Flow	**16.0**	m^3/day
Lotus Villas 樂濤居 (Catchment 1)		
Number of Houses	15	
Number of Flats	15	Flats
Size of household/flat (1)	2.9	Persons/flat
Population	44	Persons
Per Capita Flow (2) - R4	0.37	m^3/day/person
Estimated Dry Weather Flow	**16.3**	m^3/day
Swimming Pool Flow Assume: - Pool size = 80m^2 with 1.5m water depth. - Pool volume = 80 x 1.5 = 120 m^3. - Turnover rate = 6 hours. - Filter loading rate = 48 m^3/m^2/hr. - Filter area required = 120 / 6 / 48 = 0.417 m^2. - Backwash flow rate = 0.5 m^3/m^2/min. - Backwash flow = 0.417 x 0.5 = 0.21 m^3/min = 3.5 L/s	3.5	L/s
Hilldon 浩瀚臺 (Catchment 1)		
Number of Houses	3	
Number of Flats	3	Flats
Size of household/flat (1)	2.9	Persons/flat
Population	9	Persons
Per Capita Flow (2) - R4	0.37	m^3/day/person
Estimated Dry Weather Flow	**3.3**	m^3/day
Swimming Pool Flow Assume: - Pool size = 55m^2 with 1.5m water depth. - Pool volume = 55 x 1.5 = 82.5 m^3. - Turnover rate = 6 hours. - Filter loading rate = 48 m^3/m^2/hr. - Filter area required = 82.5 / 6 / 48 = 0.286 m^2. - Backwash flow rate = 0.5 m^3/m^2/min. - Backwash flow = 0.286 x 0.5 = 0.14 m^3/min = 2.4 L/s	2.4	L/s
Arcadia 龍嶺 (Catchment 1)		
Number of Houses	8	
Number of Flats	8	Flats

ARUP

Job No.	Sheet No.	Rev.
302260	1	4

Job Title: **Application for Planning Permission Under Section 16 of the Town Planning Ordinance (Cap. 131) for Proposed Residential Development in Area Shown as 'Road', Various Lots in D.D. 221 and Adjoining Government Land, Sha Ha, Sai Kung**

Made by JP Date 06/2025 Chd. NP

Calculation: **Estimation of Sewage Discharge from Existing Development**

Size of household/flat (1)	2.9	Persons/flat
Population	24	Persons
Per Capita Flow (2) - R4	0.37	m^3/day/person
Estimated Dry Weather Flow	**8.9**	m^3/day
Swimming Pool Flow Assume: - Pool size = 85m^2 with 1.5m water depth. - Pool volume = 85 x 1.5 = 127.5 m^3. - Turnover rate = 6 hours. - Filter loading rate = 48 m^3/m^2/hr. - Filter area required = 127.5 / 6 / 48 = 0.443 m^2. - Backwash flow rate = 0.5 m^3/m^2/min. - Backwash flow = 0.443 x 0.5 = 0.22 m^3/min = 3.7 L/s	3.7	L/s
Hillock 樂居 (Catchment1)		
Number of Houses	9	
Number of Flats	9	Flats
Size of household/flat (1)	2.9	Persons/flat
Population	27	Persons
Per Capita Flow (2) - R4	0.37	m^3/day/person
Estimated Dry Weather Flow	**10.0**	m^3/day
Burlingame Garden 柏寧頓花園 (Catchment 2)		
Number of Houses	15	
Number of Flats	15	
Size of household/flat (1)	2.9	Persons
Population	44	
Per Capita Flow (2) - R4	0.37	m^3/day
Estimated Dry Weather Flow	**16.3**	m^3/day
Hunlicar Garden 雄愉花園 (Catchment 2)		
Number of Houses	3	
Number of Flats	3	Flats
Size of household/flat (1)	2.9	Persons/flat
Population	9	Persons
Per Capita Flow (2) - R4	0.37	m^3/day/person
Estimated Dry Weather Flow	**3.3**	m^3/day
Remaining discrete houses along Chuk Yeung Road (till 109 Chuk Yeung Road) (Catchment 2)		
Number of Houses	7	
Number of Storeys per Houses (Assueming 3 Storeys per Houses)	3	
Number of Flats (assueming 1 flat per storey)	21	Flats
Size of household/flat (1)	2.9	Persons/flat
Population	61	Persons
Per Capita Flow (2) - R4	0.37	m^3/day/person
Estimated Dry Weather Flow	**22.6**	m^3/day

ARUP

Job No.	Sheet No.	Rev.
302260	1	4

Job Title: **Application for Planning Permission Under Section 16 of the Town Planning Ordinance (Cap. 131) for Proposed Residential Development in Area Shown as 'Road', Various Lots in D.D. 221 and Adjoining Government Land, Sha Ha, Sai Kung**

Made by JP Date 06/2025 Chd. NP

Calculation: **Estimation of Sewage Discharge from Existing Development**

Exisiting Development along Tai Mong Tsai Road (from Tai Wan Village to Sha Ha Village)		
Tai Wan Village (Catchment 3)		
Number of Houses	122	
Number of Storeys per Houses (Assueming 3 Storeys per Houses)	3	
Number of Flats (assueming 1 flat per storey)	366	Flats
Size of household/flat (1)	2.9	Persons/flat
Population	1062	Persons
Per Capita Flow (3) - Modern Village	0.27	m^3/day/person
Estimated Dry Weather Flow	**286.7**	m^3/day
Luna House 愛月樓 (Catchment 4)		
Number of Blocks	1	
Number of Flats	2	Flats
Size of household/flat (1)	2.9	Persons/flat
Population	6	Persons
Per Capita Flow (2) - R4	0.37	m^3/day/person
Estimated Dry Weather Flow	**2.2**	m^3/day
Violet Garden 紫蘭花園 (Catchment 4)		
Number of Blocks	8	
Number of Flats	8	Flats
Size of household/flat (1)	2.9	Persons/flat
Population	24	Persons
Per Capita Flow (2) - R4	0.37	m^3/day/person
Estimated Dry Weather Flow	**8.9**	m^3/day
Sha Ha Village (Catchment 5)		
Number of Houses	18	
Number of Storeys per Houses (Assueming 3 Storeys per Houses)	3	
Number of Flats (assueming 1 flat per storey)	54	Flats
Size of household/flat (1)	2.9	Persons/flat
Population	157	Persons
Per Capita Flow (3) - Modern Village	0.27	m^3/day/person
Estimated Dry Weather Flow	**42.4**	m^3/day
Total Estimate Dry Weather Flow	**482.0**	
Catchment Inflow Factor P_{CIF} (6) - Sai Kung	1.30	
Total Estimated Dry Weather Flow (including catchment inflow factor)	**626.6**	m^3/day
Contributing Population	2321	Persons
Peaking Factor (7)	6	
Total Estimated Peak Flow	**43.5**	**L/s**
Dry Weather Flow from Wong Chuk Wan SPS (PWP Item No. 4431 DS)(9) (Catchment 6)	1350	m^3/day
Additional Flow from Wong Chuk Wan SPS (PWP Item No. 4431 DS)(10)	**64.0**	**L/s**
Additional Flow from Swimming Pools Backwashes	**13.9**	**L/s**

1. A person per flat (PPF) ratio of 2.9 is adopted based on the average house hold size in Sai Kung District Council in Table 130-06806 : Average household size and median monthly household income of households by District Council district of 2023 General Household Survey.
2. Unit flow factor per resident = 0.37 m^3/day for domestic housing population R4 based on EPD's GESF Table T-1.
3. Unit flow factor per resident = 0.27 m^3/day for modern village based on EPD's GESF Table T-1.
4. Unit Flow Factor per employee = 0.28 m^3/day (0.08m^3/day for Commercial Employee + 0.20m^3/day for J11 specific trades for community, social and personal services) based on EPD's GESF Table T-2.
5. Unit Flow Factor per person = 0.04 m^3/day for school students based on EPD's GESF Table T-2 .
6. Catchment Inflow Factor = 1.3, for Sai Kung District based on EPD's GESF Table T-4.
7. Peaking Factor = 6, for contributing population >1000 and <5000 (including stormwater allowance) based on EPD's GESF Table T-5.
8. Peaking Factor = 5, for contributing population >5000 and <10000 (including stormwater allowance) based on EPD's GESF Table T-5.
9. The flow from Wong Chuk Wan SPS is taken from:
https://www.gld.gov.hk/egazette/tc_chi/gazette/file.php?year=2020&vol=24&no=13&extra=0&type=0&number=1498
10. The additional flow from Wong Chuk Wan SPS was advised by the project team and the consultant of PWP Item No. 4431 DS via email and telephone conversation, which the design on-duty pump rate is 64 L/s.

ARUP

Job No.	Sheet No.	Rev.
302260	2	3

Job Title: **Application for Planning Permission Under Section 16 of the Town Planning Ordinance (Cap. 131) for Proposed Residential Development in Area Shown as 'Road', Various Lots in D.D. 221 and Adjoining Government Land, Sha Ha, Sai Kung**

Made by JP Date 06/2025 Chd. NP

Calculation: **Estimation of Sewage Discharge from Proposed Development**

Proposed Site		
Residential		
Domestic GFA	11421.0	m^2
Number of Units	280	
Size of Unit [1]	2.7	Persons/unit
Per Capita Flow [2] - R3	0.37	m^3/day/person
Total Population	756	Persons
Estimated Dry Weather Flow	**279.7**	m^3/day
Clubhouse		
GFA	571.05	m^2
Employee per GFA (in 100 m^2)[5]	3.3	Persons/GFA
Employee Population	19	Persons
Per Capita Flow[4] - J11	0.28	m^3/day/person
Estimated Dry Weather Flow	**5.3**	m^3/day
Swimming Pool		
Assume: - Pool size = 225m^2 with 1.5m water depth. - Pool volume = 225 x 1.5 = 337.5 m^3. - Turnover rate = 6 hours. - Filter loading rate = 48 m^3/m^2/hr. - Filter area required = 337.5 / 6 / 48 = 1.172 m^2. - Backwash flow rate = 0.5 m^3/m^2/min. - Backwash flow = 1.172 x 0.5 = 0.59 m^3/min = 9.8 L/s	**9.8**	L/s
Total Estimate Dry Weather Flow	**285.0**	m^3/day
Catchment Inflow Factor [6] - Sai Kung	1.00	
Total Estimated Dry Weather Flow (including catchment inflow factor)	**285.0**	m^3/day
Contributing Population	1056	
Peaking Factor [7]	6	
Total Estimated Peak Flow	**19.8**	**L/s**
Additional Flow from Swimming Pools Backwashes	**9.8**	**L/s**

Note:

1. A person per flat (PPF) ratio of 2.7 is adopted based on the PPF in Sai Kung District Council in 2021 Population Census.
2. Unit flow factor per resident = 0.37 m^3/day for domestic housing population R3 based on EPD's GESF Table T-1.
3. Unit Flow Factor per employee = 0.28 m^3/day (0.08m^3/day for Commercial Employee + 0.20m^3/day for J11 specific trades for community, social and personal services) based on EPD's GESF Table T-2.
4. Unit Flow Factor per employee = 0.28 m^3/day (0.08m3/day for Commercial Employee + 0.20m^3/day for J4) based on EPD's GESF Table T-2.
5. Community, Social & Personal Services = 3.3 employee per 100m^2 of GFA based on PlanD's Commercial and Industrial Floor Space Utilization Survey "CIFSUS" Table 8.
6. Catchment Inflow Factor = 1.0, for new catchments which are deemed to be free from misconnections and pipe defects based on EPD's GESF Sectiom 10.1.
7. Peaking Factor = 6, for contributing population >1000 and <5000 (including stormwater allowance) based on EPD's GESF Table T-5.

ARUP	Job No.	Sheet No.	Rev.
	302260	3	3
	Member/Location		
Job Title: **Application for Planning Permission Under Section 16 of the Town Planning Ordinance (Cap. 131) for Proposed Residential Development in Area Shown as 'Road', Various Lots in D.D. 221 and Adjoining Government Land, Sha Ha, Sai Kung**	Drg. Ref.		
Calculation: Hydraulic Assessment on Existing and Proposed Sewerage System After Proposed Development	Made by: JP	Date: 05/2025	Chd.: NP

Key Equations and Assumptions

Pipe Design Capacity $Q_P = VA$

Pipe Full-bore Velocity

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

(By Colebrook-White Equation)

Roughness Coeff.,	Ks =	0.15	mm	(for slimed uPVC pipe material, normal condition)
	Ks=	0.3	mm	(for slimed uPVC pipe material, poor condition)
Acceleration due to gravity,	g =	9.81	m/s^2	
Kinematic Viscosity,	v =	0.000001	m^2/s	

Key Notes

(*) Peaking factor is extracted from EPD's GESF Table T-5, under the scenario of "including stormwater allowance").
(**) Catchment Inflow Factor is extracted from EPD's GESF Table T-4, under Catchment Sai Kung.

Backwater Analysis (for freebaoard calculation)

USMH	DSMH	USGL(mPD)	DSGL(mPD)	USIL(mPD)	DSIL(mPD)	US Cover (m)	DS Cover (m)	Length (m)	Gradient	Gradient (1 in)	Pipe size (mm)	Area (m^2)	Siltation	Reduced Area (m2)	sqrt(32gRs)	Perimeter (m)	R (m)	ks (mm)	Pipe Full-bore Velocity, V (m/s)	Pipe Design Capacity, Q_P (m^3/s)	Additional ADWF (m^3/day) (1)	Accumulated ADWF (m^3/day)	Contributing Population	Peaking Factor (2)	Peak Flow (m^3/s)	Additional Flow (m^3/s)	Capacity Check	Hydraulic Diameter (m)	k (entry)	k (exit)	H (entry) (m)	H (exit) (m)	Reynold number Re	1/f^(1/2)	friction ceof f	friction H (m)	Total H (m)	Sewage level at upstream manhole *	Crown level of inlet pipe at upstream manhole	Free board at upstream manhole X (m)	Adequate Freeboard? X >= 1m
Existing Sewerage System Checking																																								
FMH4042114	FMH4042126	10.88	10.60	8.01	7.78	2.57	2.52	35.0	0.007	152.2	300	0.071	10%	0.064	0.393	0.942	0.075	0.300	1.379	0.097	626.6	626.6	2,321	6	0.044	0.0779	125%	0.2700	0.5	1	0.0928	0.1856	4.52E+05	7	0.02	5.03E-01	0.78	11.47	0.00	-0.59	review
FMH4042126	FMH4042115	10.60	10.24	7.76	7.45	2.54	2.49	40.4	0.008	130.3	300	0.071	10%	0.064	0.425	0.942	0.075	0.300	1.492	0.105	0.0	626.6	2,321	6	0.044	0.0779	115%	0.2700	0.5	1	0.0928	0.1856	4.52E+05	7	0.02	5.80E-01	0.86	10.68	8.08	-0.08	review
FMH4042115	FMH4042116	10.24	9.92	7.42	7.16	2.52	2.46	38.3	0.007	147.3	300	0.071	10%	0.064	0.400	0.942	0.075	0.300	1.402	0.099	0.0	626.6	2,321	6	0.044	0.0779	123%	0.2700	0.5	1	0.0928	0.1856	4.52E+05	7	0.02	5.50E-01	0.83	9.82	7.75	0.42	review
FMH4042116	FMH4042117	9.92	9.70	7.15	7.03	2.47	2.37	17.8	0.007	148.3	300	0.071	10%	0.064	0.398	0.942	0.075	0.300	1.397	0.099	0.0	626.6	2,321	6	0.044	0.0779	123%	0.2700	0.5	1	0.0928	0.1856	4.52E+05	7	0.02	2.56E-01	0.53	9.00	7.46	0.92	review
FMH4042117	FMH4042118	9.70	9.50	7.02	6.85	2.38	2.35	13.0	0.013	76.5	300	0.071	10%	0.064	0.555	0.942	0.075	0.300	1.954	0.138	0.0	626.6	2,321	6	0.044	0.0779	88%	0.2700	0.0	0	0.0000	0.0000	4.52E+05	7	0.02	1.87E-01	0.19	8.46	7.33	1.24	freeboard >1, OK
FMH4042118	FMH4042119	9.50	9.36	6.83	6.75	2.37	2.31	10.8	0.007	135.0	300	0.071	10%	0.064	0.418	0.942	0.075	0.300	1.465	0.104	0.0	626.6	2,321	6	0.044	0.0779	117%	0.2700	0.5	1	0.0928	0.1856	4.52E+05	7	0.02	1.55E-01	0.43	8.28	7.15	1.22	freeboard >1, OK
FMH4042119	FMH4042120	9.36	8.86	6.72	6.57	2.34	1.99	20.1	0.007	134.0	300	0.071	10%	0.064	0.419	0.942	0.075	0.300	1.471	0.104	0.0	626.6	2,321	6	0.044	0.0779	117%	0.2700	0.5	1	0.0928	0.1856	4.52E+05	7	0.02	2.89E-01	0.57	7.84	7.05	1.52	freeboard >1, OK
FMH4042120	FMH4042121	8.86	8.32	6.55	6.39	2.01	1.63	23.4	0.007	146.3	300	0.071	10%	0.064	0.401	0.942	0.075	0.300	1.407	0.099	0.0	626.6	2,321	6	0.044	0.0779	122%	0.2700	0.5	1	0.0928	0.1856	4.52E+05	7	0.02	3.36E-01	0.61	7.27	6.87	1.59	freeboard >1, OK
FMH4042121	FMH4042122	8.32	7.84	6.28	5.72	1.74	1.82	22.4	0.025	40.0	300	0.071	10%	0.064	0.767	0.942	0.075	0.300	2.712	0.192	0.0	626.6	2,321	6	0.044	0.0779	63%														
FMH4042122	FMH4042123	7.84	7.52	5.66	5.1	1.88	2.12	18.7	0.030	33.4	300	0.071	10%	0.064	0.840	0.942	0.075	0.300	2.970	0.210	0.0	626.6	2,321	6	0.044	0.0779	58%														
FMH4042123	FMH4042124	7.52	7.35	4.98	4.87	2.24	2.18	5.0	0.022	45.5	300	0.071	10%	0.064	0.720	0.942	0.075	0.300	2.542	0.180	0.0	626.6	2,321	6	0.044	0.0779	68%														
Existing Sewerage System Checking (with FOS 1.15 Peak Flow)																																								
FMH4042114	FMH4042126	10.88	10.60	8.01	7.78	2.57	2.52	35.0	0.007	152.2	300	0.071	10%	0.064	0.393	0.942	0.075	0.300	1.379	0.097	626.6	626.6	2,321	6	0.044	0.0779	125%	0.2700	0.5	1	0.1227	0.2455	5.20E+05	7	0.02	6.62E-01	1.03	13.00	0.00	-2.12	review
FMH4042126	FMH4042115	10.60	10.24	7.76	7.45	2.54	2.49	40.4	0.008	130.3	300	0.071	10%	0.064	0.425	0.942	0.075	0.300	1.492	0.105	0.0	626.6	2,321	6	0.044	0.0779	115%	0.2700	0.5	1	0.1227	0.2455	5.20E+05	7	0.02	7.65E-01	1.13	11.97	0.00	-1.37	review
FMH4042115	FMH4042116	10.24	9.92	7.42	7.16	2.52	2.46	38.3	0.007	147.3	300	0.071	10%	0.064	0.400	0.942	0.075	0.300	1.402	0.099	0.0	626.6	2,321	6	0.044	0.0779	123%	0.2700	0.5	1	0.1227	0.2455	5.20E+05	7	0.02	7.25E-01	1.09	10.84	8.08	-0.60	review
FMH4042116	FMH4042117	9.92	9.70	7.15	7.03	2.47	2.37	17.8	0.007	148.3	300	0.071	10%	0.064	0.398	0.942	0.075	0.300	1.397	0.099	0.0	626.6	2,321	6	0.044	0.0779	123%	0.2700	0.5	1	0.1227	0.2455	5.20E+05	7	0.02	3.37E-01	0.71	9.74	7.75	0.18	freeboard >0, OK
FMH4042117	FMH4042118	9.70	9.50	7.02	6.85	2.38	2.35	13.0	0.013	76.5	300	0.071	10%	0.064	0.555	0.942	0.075	0.300	1.954	0.138	0.0	626.6	2,321	6	0.044	0.0779	88%	0.2700	0.0	0	0.0000	0.0000	5.20E+05	7	0.02	2.46E-01	0.25	9.04	7.46	0.66	freeboard >0, OK
FMH4042118	FMH4042119	9.50	9.36	6.83	6.75	2.37	2.31	10.8	0.007	135.0	300	0.071	10%	0.064	0.418	0.942	0.075	0.300	1.465	0.104	0.0	626.6	2,321	6	0.044	0.0779	117%	0.2700	0.5	1	0.1227	0.2455	5.20E+05	7	0.02	2.04E-01	0.57	8.79	7.33	0.71	freeboard >0, OK
FMH4042119	FMH4042120	9.36	8.86	6.72	6.57	2.34	1.99	20.1	0.007	134.0	300	0.071	10%	0.064	0.419	0.942	0.075	0.300	1.471	0.104	0.0	626.6	2,321	6	0.044	0.0779	117%	0.2700	0.5	1	0.1227	0.2455	5.20E+05	7	0.02	3.80E-01	0.75	8.22	7.15	1.14	freeboard >0, OK
FMH4042120	FMH4042121	8.86	8.32	6.55	6.39	2.01	1.63	23.4	0.007	146.3	300	0.071	10%	0.064	0.401	0.942	0.075	0.300	1.407	0.099	0.0	626.6	2,321	6	0.044	0.0779	122%	0.2700	0.5	1	0.1227	0.2455	5.20E+05	7	0.02	4.43E-01	0.81	7.47	7.05	1.39	freeboard >0, OK
FMH4042121	FMH4042122	8.32	7.84	6.28	5.72	1.74	1.82	22.4	0.025	40.0	300	0.071	10%	0.064	0.767	0.942	0.075	0.300	2.712	0.192	0.0	626.6	2,321	6	0.044	0.0779	63%														
FMH4042122	FMH4042123	7.84	7.52	5.66	5.1	1.88	2.12	18.7	0.030	33.4	300	0.071	10%	0.064	0.840	0.942	0.075	0.300	2.970	0.210	0.0	626.6	2,321	6	0.044	0.0779	58%														
FMH4042123	FMH4042124	7.52	7.35	4.98	4.87	2.24	2.18	5.0	0.022	45.5	300	0.071	10%	0.064	0.720	0.942	0.075	0.300	2.542	0.180	0.0	626.6	2,321	6	0.044	0.0779	68%														
Proposed Sewerage System Checking																																							
TM	FMH4042114	11.00	10.88	8.30	8.20	2.48	2.46	10.0	0.010	100.0	225	0.040	10%	0.036	0.420	0.707	0.056	0.300	1.422	0.057	285.0	285.0	1,056	6	0.020	0.0098	52%														
FMH4042114	FMH4042126	10.88	10.60	8.01	7.78	2.57	2.52	35.0	0.007	152.2	300	0.071	10%	0.064	0.393	0.942	0.075	0.300	1.379	0.097	626.6	911.6	3,376	6	0.063	0.0877	155%	0.2700	0.5	1	0.1435	0.2870	5.62E+05	7	0.02	7.73E-01	1.20	14.49	8.43	-3.61	review
FMH4042126	FMH4042115	10.60	10.24	7.76	7.45	2.54	2.49	40.4	0.008	130.3	300	0.071	10%	0.064	0.425	0.942	0.075	0.300	1.492	0.105	0.0	911.6	3,376	6	0.063	0.0877	143%	0.2700	0.5	1	0.1435	0.2870	5.62E+05	7	0.02	8.92E-01	1.32	13.29	8.08	-2.69	review
FMH4042115	FMH4042116	10.24	9.92	7.42	7.16	2.52	2.46	38.3	0.007	147.3	300	0.071	10%	0.064	0.400	0.942	0.075	0.300	1.402	0.099	0.0	911.6	3,376	6	0.063	0.0877	152%	0.2700	0.5	1	0.1435	0.2870	5.62E+05	7	0.02	8.46E-01	1.28	11.97	7.75	-1.73	review
FMH4042116	FMH4042117	9.92	9.70	7.15	7.03	2.47	2.37	17.8	0.007	148.3	300	0.071	10%	0.064	0.398	0.942	0.075	0.300	1.397	0.099	0.0	911.6	3,376	6	0.063	0.0877	153%	0.2700	0.5	1	0.1435	0.2870	5.62E+05	7	0.02	3.93E-01	0.82	10.69	7.46	-0.77	review
FMH4042117	FMH4042118	9.70	9.50	7.02	6.85	2.38	2.35	13.0	0.013	76.5	300	0.071	10%	0.064	0.555	0.942	0.075	0.300	1.954	0.138	0.0	911.6	3,376	6	0.063	0.0877	109%	0.2700	0.5	1	0.1435	0.2870	5.62E+05	7	0.02	2.87E-01	0.72	9.87	7.33	-0.17	review
FMH4042118	FMH4042119	9.50	9.36	6.83	6.75	2.37	2.31	10.8	0.007	135.0	300	0.071	10%	0.064	0.418	0.942	0.075	0.300	1.465	0.104	0.0	911.6	3,376	6	0.063	0.0877	146%	0.2700	0.5	1	0.1435	0.2870	5.62E+05	7	0.02	2.38E-01	0.67	9.15	7.15	0.35	review
FMH4042119	FMH4042120	9.36	8.86	6.72	6.57	2.34	1.99	20.1	0.007	134.0	300	0.071	10%	0.064	0.419	0.942	0.075	0.300	1.471	0.104	0.0	911.6	3,376	6	0.063	0.0877	145%	0.2700	0.5	1	0.1435	0.2870	5.62E+05	7	0.02	4.44E-01	0.87	8.48	7.05	0.88	review
FMH4042120	FMH4042121	8.86	8.32	6.55	6.39	2.01	1.63	23.4	0.007	146.3	300	0.071	10%	0.064	0.401	0.942	0.075	0.300	1.407	0.099	0.0	911.6	3,376	6	0.063	0.0877	152%	0.2700	0.5	1	0.1435	0.2870	5.62E+05	7	0.02	5.17E-01	0.95	7.61	6.87	1.25	freeboard >1, OK
FMH4042121	FMH4042122	8.32	7.84	6.28	5.72	1.74	1.82	22.4	0.025	40.0	300	0.071	10%	0.064	0.767	0.942	0.075	0.300	2.712	0.192	0.0	911.6	3,376	6	0.063	0.0877	79%														
FMH4042122	FMH4042123	7.84	7.52	5.66	5.1	1.88	2.12	18.7	0.030	33.4	300	0.071	10%	0.064	0.840	0.942	0.075	0.300	2.970	0.210	0.0	911.6	3,376	6	0.063	0.0877	72%														
FMH4042123	FMH4042124	7.52	7.35	4.98	4.87	2.24	2.18	5.0	0.022	45.5	300	0.071	10%	0.064	0.720	0.942	0.075	0.300	2.542	0.180	0.0	911.6	3,376	6	0.063	0.0877	84%														
Proposed Sewerage System Checking (Freeboard Checking with 1.15 FOS)																																							
TM	FMH4042114	11.00	10.88	8.30	8.20	2.48	2.46	10.0	0.010	100.0	225	0.040	10%	0.036	0.420	0.707	0.056	0.300	1.422	0.057	285.0	285.0	1,056	6	0.020	0.0098	52%														
FMH4042114	FMH4042126	10.88	10.60	8.01	7.78	2.57	2.52	35.0	0.007	152.2	300	0.071	10%	0.064	0.393	0.942	0.075	0.300	1.379	0.097	626.6	911.6	3,376	6	0.063	0.0877	155%	0.2700	0.5	1	0.1898	0.3796	6.46E+05	7	0.02	1.02E+00	1.59	17.00	8.43	-6.12	review
FMH4042126	FMH4042115	10.60	10.24	7.76	7.45	2.54	2.49	40.4	0.008	130.3	300	0.071	10%	0.064	0.425	0.942	0.075	0.300	1.492	0.105	0.0	911.6	3,376	6	0.063	0.0877	143%	0.2700	0.5	1	0.1898	0.3796	6.46E+05	7	0.02	1.18E+00	1.75	15.41	0.00	-4.81	review

FMH4042115	FMH4042116	10.24	9.92	7.42	7.16	2.52	2.46	38.3	0.007	147.3	300	0.071	10%	0.064	0.400	0.942	0.075	0.300	1.402	0.099	0.0	911.6	3,376	6	0.063	0.0877	152%	0.2700	0.5	1	0.1898	0.3796	6.46E+05	7	0.02	1.11E+00	1.68	13.67	8.08	-3.43	review
FMH4042116	FMH4042117	9.92	9.70	7.15	7.03	2.47	2.37	17.8	0.007	148.3	300	0.071	10%	0.064	0.398	0.942	0.075	0.300	1.397	0.099	0.0	911.6	3,376	6	0.063	0.0877	153%	0.2700	0.5	1	0.1898	0.3796	6.46E+05	7	0.02	5.18E-01	1.09	11.98	7.75	-2.06	review
FMH4042117	FMH4042118	9.70	9.50	7.02	6.85	2.38	2.35	13.0	0.013	76.5	300	0.071	10%	0.064	0.555	0.942	0.075	0.300	1.954	0.138	0.0	911.6	3,376	6	0.063	0.0877	109%	0.2700	0.5	1	0.1898	0.3796	6.46E+05	7	0.02	3.78E-01	0.95	10.90	7.46	-1.20	review
FMH4042118	FMH4042119	9.50	9.36	6.83	6.75	2.37	2.31	10.8	0.007	135.0	300	0.071	10%	0.064	0.418	0.942	0.075	0.300	1.465	0.104	0.0	911.6	3,376	6	0.063	0.0877	146%	0.2700	0.5	1	0.1898	0.3796	6.46E+05	7	0.02	3.14E-01	0.88	9.95	7.33	-0.45	review
FMH4042119	FMH4042120	9.36	8.86	6.72	6.57	2.34	1.99	20.1	0.007	134.0	300	0.071	10%	0.064	0.419	0.942	0.075	0.300	1.471	0.104	0.0	911.6	3,376	6	0.063	0.0877	145%	0.2700	0.5	1	0.1898	0.3796	6.46E+05	7	0.02	5.85E-01	1.15	9.06	7.15	0.30	freeboard >0, OK
FMH4042120	FMH4042121	8.86	8.32	6.55	6.39	2.01	1.63	23.4	0.007	146.3	300	0.071	10%	0.064	0.401	0.942	0.075	0.300	1.407	0.099	0.0	911.6	3,376	6	0.063	0.0877	152%	0.2700	0.5	1	0.1898	0.3796	6.46E+05	7	0.02	6.81E-01	1.25	7.91	7.05	0.95	freeboard >0, OK
FMH4042121	FMH4042122	8.32	7.84	6.28	5.72	1.74	1.82	22.4	0.025	40.0	300	0.071	10%	0.064	0.767	0.942	0.075	0.300	2.712	0.192	0.0	911.6	3,376	6	0.063	0.0877	79%														
FMH4042122	FMH4042123	7.84	7.52	5.66	5.1	1.88	2.12	18.7	0.030	33.4	300	0.071	10%	0.064	0.840	0.942	0.075	0.300	2.970	0.210	0.0	911.6	3,376	6	0.063	0.0877	72%														
FMH4042123	FMH4042124	7.52	7.35	4.98	4.87	2.24	2.18	5.0	0.022	45.5	300	0.071	10%	0.064	0.720	0.942	0.075	0.300	2.542	0.180	0.0	911.6	3,376	6	0.063	0.0877	84%														

Proposed Sewerage Upgrading

TM	FMH4042114	11.00	10.88	8.30	8.20	2.48	2.46	10.0	0.010	100.0	225	0.040	10%	0.036	0.420	0.707	0.056	0.300	1.422	0.057	285.0	285.0	1,056	6	0.020	0.0098	52%
FMH4042114	FMH4042126	10.88	10.60	8.01	7.78	2.50	2.45	35.0	0.007	152.2	375	0.110	10%	0.099	0.440	1.178	0.094	0.300	1.587	0.175	626.6	911.6	3,376	6	0.063	0.0877	86%
FMH4042126	FMH4042115	10.60	10.24	7.76	7.45	2.47	2.42	40.4	0.008	130.3	375	0.110	10%	0.099	0.475	1.178	0.094	0.300	1.716	0.190	0.0	911.6	3,376	6	0.063	0.0877	80%
FMH4042115	FMH4042116	10.24	9.92	7.42	7.16	2.45	2.39	38.3	0.007	147.3	375	0.110	10%	0.099	0.447	1.178	0.094	0.300	1.613	0.178	0.0	911.6	3,376	6	0.063	0.0877	85%
FMH4042116	FMH4042117	9.92	9.70	7.15	7.03	2.40	2.30	17.8	0.007	148.3	375	0.110	10%	0.099	0.445	1.178	0.094	0.300	1.607	0.178	0.0	911.6	3,376	6	0.063	0.0877	85%
FMH4042117	FMH4042118	9.70	9.50	7.02	6.85	2.31	2.28	13.0	0.013	76.5	375	0.110	10%	0.099	0.620	1.178	0.094	0.300	2.248	0.248	0.0	911.6	3,376	6	0.063	0.0877	61%
FMH4042118	FMH4042119	9.50	9.36	6.83	6.75	2.30	2.24	10.8	0.007	135.0	375	0.110	10%	0.099	0.467	1.178	0.094	0.300	1.686	0.186	0.0	911.6	3,376	6	0.063	0.0877	81%
FMH4042119	FMH4042120	9.36	8.86	6.72	6.57	2.27	1.92	20.1	0.007	134.0	375	0.110	10%	0.099	0.469	1.178	0.094	0.300	1.692	0.187	0.0	911.6	3,376	6	0.063	0.0877	81%
FMH4042120	FMH4042121	8.86	8.32	6.55	6.39	1.94	1.56	23.4	0.007	146.3	375	0.110	10%	0.099	0.449	1.178	0.094	0.300	1.619	0.179	0.0	911.6	3,376	6	0.063	0.0877	84%
FMH4042121	FMH4042122	8.32	7.84	6.13	5.72	1.82	1.75	22.4	0.018	54.6	375	0.110	10%	0.099	0.734	1.178	0.094	0.300	2.664	0.294	0.0	911.6	3,376	6	0.063	0.0877	51%
FMH4042122	FMH4042123	7.84	7.52	5.45	5.1	2.02	2.05	18.7	0.019	53.4	375	0.110	10%	0.099	0.742	1.178	0.094	0.300	2.694	0.298	0.0	911.6	3,376	6	0.063	0.0877	51%
FMH4042123	FMH4042124	7.52	7.35	4.91	4.87	2.24	2.11	5.0	0.008	125.0	375	0.110	10%	0.099	0.485	1.178	0.094	0.300	1.753	0.194	0.0	911.6	3,376	6	0.063	0.0877	78%

Notes:
(1) Refer to Catchment calculations.

ARUP	Job No.	Sheet No.	Rev.
	302260	4	3
	Member/Location		
Job Title: **Application for Planning Permission Under Section 16 of the Town Planning Ordinance (Cap. 131) for Proposed Residential Development in Area Shown as 'Road', Various Lots in D.D. 221 and Adjoining Government Land, Sha Ha, Sai Kung**	Drg. Ref.		
Calculation: **Estimation of Sewerage Discharge from Proposed Development**	Made by: JP	Date: 05/2025	Chd.: NP

Proposed downstream sewage facilities capacity check:

a) Change in Maximum Sewer Utilisation (1)

	ADWF (m^3/day)	Peak Flow (L/s)	Existing/Proposed Sewer Size (mm)	Max. Utilisation at Downstream Pipeline
Existing Sewage Flow (Sewage Estimation of Existing Catchment)	1,976.6	121.4	225	/
			300	124.6%
Proposed Sewage Flow + Existing Sewage Flow (Sewage Estimation of Existing Catchment)	2,261.6	151.0	225	52.3%
			375	86.1%

b) Change in Maximum SKSPS2 Utilisation (2)

	ADWF (m^3/day)	SKSPS2 Capacity (m^3/day)	SKSPS2 Utilisation (%)	SKSPS2 Spare Capacity (m^3/day)	SKSPS2 Spare Capacity (%)
Existing Sewage Flow	1,776.0	6,480	27%	4,704	73%
Proposed Sewage Flow + Existing Sewage Flow	2,061.0		32%	4,419	68%

c) Change in SKSTW Utilisation

	Capacity (m^3/day)	Development Proposed Sewage Flow (m^3/day)	Utilisation Increase of SKSTW
Existing SKSTW	8,000	285	3.6%
Upgraded SKSTW	22,000		1.3%

Note:
1. The existing sewage flow ADWF and peak flow adopted are from the sewage estimation calculation (with WCWSPS flow).
2. The existing sewage flow and design capacity of SKSPS2 adopted here were provided by DSD/ST via email conversation.

Appendix B

Existing and Proposed Sewerage Network Plan

Mark	Date	By	Rev.
B	12/24	JP	SECOND ISSUE
A	06/24	JP	FIRST ISSUE

LEGEND

PROPOSED DEVELOPMENT

APPLICATION SITE

Job Title

APPLICATION FOR PLANNING PERMISSION UNDER SECTION 16 OF THE TOWN PLANNING ORDINANCE (CAP. 131) FOR PROPOSED RESIDENTIAL DEVELOPMENT IN AREA SHOWN AS 'ROAD', VARIOUS LOTS IN D.D. 221 AND ADJOINING GOVERNMENT LAND, SHA HA, SAI KUNG

Drawing Title

MASTER LOCATION PLAN

Drawing Status

SUBMISSION

ARUP

Scale 1:2000 @ A1

Drn. RY Date 06/24 Chd. JW Passed KK

Job No. 302260

Drawing No. C/001

Rev. B

Printed by : $USER$
Filename : $FILE$
$DATE$

N

846000 E
846200 E
846400 E
827800 N
827600 N
827400 N

WANG KONG TSUEN
橫江灰

CHUK YEUNG ROAD
TAI MONG TSAI ROAD
WAI MAN ROAD
MEI YUEN STREET

SHA KOK MEI
沙角尾

INCOMING SEWERAGE FLOW FROM UPSTREAM CATCHMENTS

FMH4042104
CL 10.68
IA1 8.05-300
IA2 8.38-150
IA3 8.38-150
IA4 8.00-300

FMH4042125
CL 10.60
IA1 7.78-300
IA2 7.78-300

FMH4042115
CL 9.74
IA1 7.43-300

FMH4042116
CL 9.82
IA1 7.78-300
IA2 7.78-300

FMH4042117
CL 9.70
IA1 7.03-300
IA2 7.03-300

FMH4042118
CL 9.50
IA1 6.83-300
IA2 6.83-300

FMH4042119
CL 9.36
IA1 6.73-300
IA2 6.73-300

FMH4042120
CL 8.86
IA1 6.52-300
IA2 6.52-300

FMH4042121
CL 8.62
IA1 6.28-300

FMH4042122
CL 7.74
IA1 5.66-300
IA2 5.66-300

FMH4042123
CL 7.62
IA1 4.98-300

FMH4042124
CL 7.39
IA1 4.87-300

FMH4042125

DISCHARGES TO EXISTING MANHOLE FMH4042125

LEGEND

- PROPOSED DEVELOPMENT
- APPLICATION SITE
- EXISTING SEWER AND MANHOLE

Mark	Date	By	Rev.
B	12/24	JP	SECOND ISSUE
A	06/24	JP	FIRST ISSUE

Printed by : $USER$
Filename : $FILE$
$DATE$

Job Title
APPLICATION FOR PLANNING PERMISSION UNDER SECTION 16 OF THE TOWN PLANNING ORDINANCE (CAP. 131) FOR PROPOSED RESIDENTIAL DEVELOPMENT IN AREA SHOWN AS 'ROAD', VARIOUS LOTS IN D.D. 221 AND ADJOINING GOVERNMENT LAND, SHA HA, SAI KUNG

Drawing Title
EXISTING SEWERAGE NETWORK

Drawing Status
SUBMISSION

ARUP

Scale 1:1000 @ A1
Drn. RY Date 06/24 Chd. JW Passed KK
Job No. 302260
Drawing No. C/SIA/001
Rev. B

N

846000 E

846200 E

846400 E

827800 N

827600 N

827400 N

WANG KONG TSUEN

SHA KOK MEI

CHUK YEUNG ROAD

TAI MONG TSAI ROAD

WAI MAN ROAD

MEI YUEN STREET

INCOMING SEWERAGE FLOW FROM UPSTREAM CATCHMENTS

TM
CL 11.0
X1 8.30-225

DISCHARGES TO EXISTING MANHOLE FMH4042125

Mark	Date	By	Rev.
C	02/25	JP	THIRD ISSUE
B	12/24	JP	SECOND ISSUE
A	06/24	JP	FIRST ISSUE

LEGEND

- PROPOSED DEVELOPMENT
- APPLICATION SITE
- EXISTING SEWER AND MANHOLE
- PROPOSED SEWER AND MANHOLE
- EXISTING SEWER AND MANHOLE TO BE UPGRADED

Job Title
APPLICATION FOR PLANNING PERMISSION UNDER SECTION 16 OF THE TOWN PLANNING ORDINANCE (CAP. 131) FOR PROPOSED RESIDENTIAL DEVELOPMENT IN AREA SHOWN AS 'ROAD', VARIOUS LOTS IN D.D. 221 AND ADJOINING GOVERNMENT LAND, SHA HA, SAI KUNG

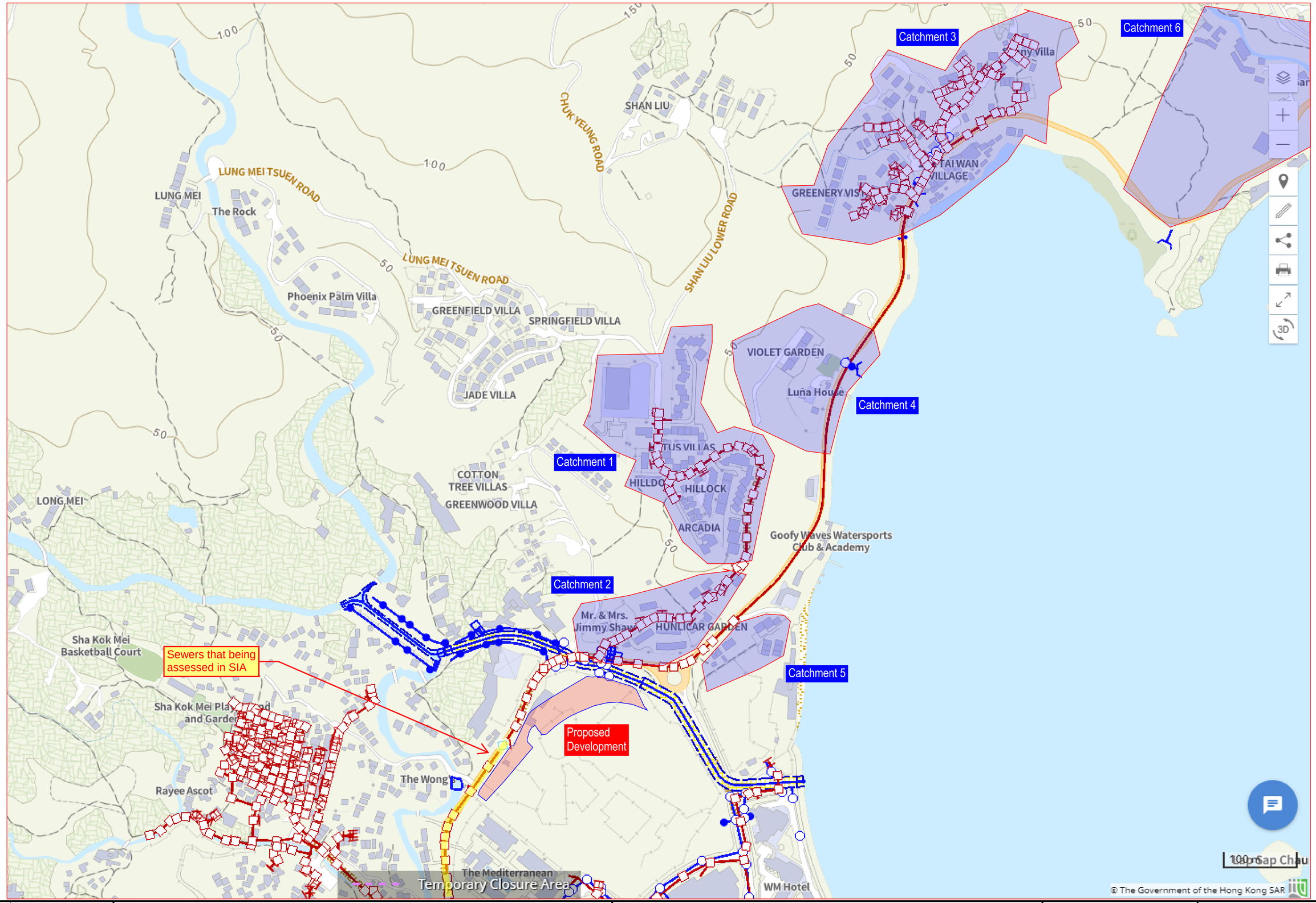
Drawing Title
PROPOSED SEWERAGE NETWORK

Drawing Status
SUBMISSION

ARUP

Scale	1:1000 @ A1		
Drn. RY	Date 06/24	Chd. JW	Passed KK
Job No. 302260	Drawing No. C/SIA/002	Rev. C	

Printed by : $USER$
Filename : $FILE$
$DATE$



LEGEND

PROPOSED DEVELOPMENT

SEWERAGE CATCHMENT

Mark	Date	By	Rev.
A	06/24	JP	FIRST ISSUE

Job Title: APPLICATION FOR PLANNING PERMISSION UNDER SECTION 16 OF THE TOWN PLANNING ORDINANCE (CAP. 131) FOR PROPOSED RESIDENTIAL DEVELOPMENT IN AREA SHOWN AS 'ROAD', VARIOUS LOTS IN D.D. 221 AND ADJOINING GOVERNMENT LAND, SHA HA, SAI KUNG

Drawing Title: SEWERAGE CATCHMENT PLAN

Drawing Status: SUBMISSION

ARUP

Scale 1:1000 @ A1 | Drn. RY | Date 06/24 | Chd. JW | Passed KK

Job No. 302260 | Drawing No. C/SIA/003 | Rev. A

Printed by : $USER$ $FILE$
Filename : $DATE$