

Proposed Minor Relaxation of Plot Ratio Restriction for Permitted Flat and Proposed Shop and Services Uses at Lots 4614 and 4615 RP in D.D. 116, Lots 1753 S.B ss.3 (Part), 1753 S.B RP (Part), 1756 S.A (Part), 1756 RP (Part), 1757, 1758 RP and 1760 RP in D.D. 120, and Adjoining Government Land, Tai Kei Leng, Yuen Long, New Territories

Sewerage Impact Assessment (Revision A) August 2023

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1 Introduction

1.1 Background

- 1.1.1 Mott MacDonald Hong Kong Limited (hereinafter as "MMHK") was commissioned by the Applicant to prepare a Sewerage Impact Assessment (SIA) in support of the proposed minor relaxation of statutory planning control of plot rate of PR3.5 up to PR4.287 for additional residential development and small retail service application abutting Tai Tong Road and Tai Shu Ha Road East, Yuen Long. The location of the development is shown in Appendix A.
- **1.1.2** This report will demonstrate that the additional flats of 55 together with the planned residential development is feasible in terms of its impact on the sewerage system.

1.2 Key Development Parameters

1.2.1 The location and layout of the proposed development is provided in **Appendices A** and **B** and the Development data is given in **Table 1.1** and **Table 1.2** below:-

Items	Details		
Area	Approximately 2,540 m ²		
Proposed Domestic GFA	10,668 m ²		
Proposed Plot Ratio	4.287 (minor relaxation of DPR0.6 and NDPR0.087above permitted 3.5)		
No. of Blocks	1		
Nos. of Units	Approximately 345 (including 55 additional flats)		

Table 1.1: Data of the Proposed Residential Development

Table 1.2: Data of the Proposed Retail Building

Items	Details	
Area	Approximately 220 m ²	
No. of Blocks	1	
No. of storey	1	

1.3 Objectives of Report

1.3.1 This SIA report aims to identify the existing and planned sewerage systems in vicinity of the proposed development, to assess the sewerage impacts arising from the proposed development and to identify the required sewerage works, if required, to support the development.

1.4 Structure of the Report

1.4.1 This SIA report contains the following sections in addition to this introduction (Section 1):-

Section 2 – Methodology and Design Parameters for Sewerage Impact Assessment

Covers the approach of the SIA and the parameters used in the assessment.

Section 3 – Existing Sewerage and Estimation of Sewage Flow for the Existing Condition

Discuss the sewage flow under the existing condition and the existing sewerage system.

Section 4 – Estimation of Sewage Flow for the Proposed Development

Discuss the sewage flow generated from the Development.

Section 5 – Sewerage Impact Assessment and Sewage Discharge Arrangement

Discuss the sewerage impact arising from the Development and the potential sewage disposal option for the Development.

Section 6 – Conclusion

Summarise the findings and conclude the sewerage impact arising from the Development.

2 Methodology and Design Parameters for Sewerage Impact Assessment

2.1 General Approach

2.1.1 The SIA is carried out to identify and assess if there are any potential adverse sewerage impacts arising from the proposed development.

2.2 Methodology

Assessment Approach

- **2.2.1** The following approach and methodology have been adopted in this sewerage impact assessment:-
 - Carry out desktop study to collect the relevant information for the assessment. Relevant information for the assessment collected included drainage record plans from Drainage Services Department (DSD) and information as listed in Section 2.2.3;
 - Estimate the sewage flow generated from the existing site and the proposed development; and
 - Assess the sewerage impacts arising from the proposed development and formulate option to mitigate the sewerage impacts identified. Sewage disposal arrangement for the proposed development will also be proposed.
- **2.2.2** For the existing and proposed sewerage in vicinity of the proposed development, Colebrook-White equation has been used to assess the hydraulic conditions of the sewerage network.

Design Standards, Guidelines and Reference

- **2.2.3** The sewage flow generated from the proposed development is estimated based on the following standards, guidelines and references for the sewerage design:-
 - Sewerage Manual published by Drainage Services Department (DSD);
 - Guidelines for Estimating Sewage Flows (GESF) for Sewerage Infrastructure published by Environmental Protection Department (EPD); and
 - Commercial and Industrial Floor Space Utilisation Survey conducted by Planning Department (PlanD).

2.3 Design Parameters and Assumptions

Unit Flow Factors

2.3.1 The category of the components of the Unit Flow Factors adopted in the assessment are indicated in **Table 2.1**.

Table 2.1: Unit Flow Factors

Scenario	Category / Use	Unit	Unit Flow Factor	
For existing developments and	Domestic Flow for Private Housing (R2)	m ³ /d per resident	0.27	(i)
proposed	J4 Wholesale & Retail	m ³ /d per employee	0.28	(ii)
development	J11 Community, Social & Personal Services	m ³ /d per employee	0.28	(iii)
Remark:-				

- According to the Guidelines for Estimating Sewage Flows (GESF) issued by EPD, unit flow factor for private housing unit (R2) are 0.27 m³/d.
- According to the Guidelines for Estimating Sewage Flows (GESF) issued by EPD, unit flow factor for Wholesale & Retail (J4) is 0.28 m³/h/d.
- (iii) According to the Guidelines for Estimating Sewage Flows (GESF) issued by EPD, unit flow factor for Community, Social & Personal Services (J11) is 0.28 m³/h/d.

Catchment Inflow Factors

- 2.3.2 The Catchment Inflow Factors (P_{CIF}) cater for the net overall ingress of water or wastewater to the sewerage system. They are catchment-dependent and applicable to major sewerage facilities of a catchment. It is not applicable to new catchments which have no connection from existing sewerage system which are deemed to be free from misconnections and pipe defects. Therefore, the PCIF is not applicable in estimating the total flows from the new development project.
- **2.3.3** With reference to EPD Technical Paper Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (GESF) Table T-4, for the existing sewerage system in Yuen Long, the P_{CIF} of 1.0 for catchments will be adopted.

Peaking Factors

2.3.4 Peaking factors cater for seasonal / diurnal fluctuation and normal amount of infiltration and inflow. The peaking factors shall be in accordance with Table T-5 of the GESF and are shown in **Table 2.2**.

Population Range (a) Sewers	Peaking Factor (including stormwater allowance) for facility with existing upstream sewerage	Peaking Factor (excluding stormwater allowance) for facility with new upstream sewerage
< 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)	Max (6/N ^{0.0175} , 1.6)
(b) Sewage Treatment	Works, Preliminary Treatment Works and P	umping 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)	Max (2.6/N ^{0.065} , 1.6)

Table 2.2: Peaking Factors for Various Population Ranges

Note:

N = Contributing population in thousands

Contributing Population = $\frac{\text{Calculated total average flow (m³/day)}}{0.27 (m³/\text{person/day)}}$

2.3.5 Peaking factors (excluding stormwater allowance) are applicable to planning sewerage facilities flow from new upstream sewerage systems which essentially have no misconnections and defects for infiltration. Thus, peaking factor excluding stormwater allowance has been used for the proposed sewers. For existing sewers, peaking factor including stormwater allowance has been adopted.

Roughness

2.3.6 For the proposed sewerage network, polyethylene pipe will be used. A roughness value of 1.5 mm, similar to uPVC material pipe under poor slimed condition in accordance with Sewerage Manual – Table 5, has been adopted for polyethylene pipe. For existing clayware sewer, a roughness value of 3mm for slimed sewer in poor condition has been adopted.

2.4 Planned Population and Employee Data of the Proposed Development

2.4.1 The development parameters and design population of the proposed development are shown in **Table 2.3** and **Table 2.4** below. The layout plan of the proposed development could be referred to **Appendix A1**.

Table 2.3: Design Parameters for the Proposed Development

About 2,540
4.2
About 345
966
About 220 (Retail)

Remarks:

Table 2.4: Estimated Employee Number and Serving Population for the Development

Category / Use	Population / No. of Staff			
Proposed Residential Development				
R2	966			
J11	18 ⁽ⁱ⁾ ⁽ⁱⁱ⁾			
Proposed Retail Building				
J4	8 ⁽ⁱⁱⁱ⁾			
	R2 J11			

Remarks:-

(i) It is assumed there would be 2 security guards and 2 managing staffs for housing block.

 (ii) For the club house, it is assumed there would be 3.3 workers per GFA (in 100 m²) for Community, Social & Personal Services according to Figure 9: Worker Density by Industry Group of "Commercial and Industrial Floor Space Utilization Survey" published by Plannings Department.

(iii) It is assumed there would be 3.5 workers per GFA (in 100 m²) for Retail Trade according to Figure 9: Worker Density by Industry Group of "Commercial and Industrial Floor Space Utilization Survey" published by Plannings Department.

⁽i) The population is estimated with the average number of occupants, 2.8 occupants per unit for Yuen Long according to 2021 Population Census.

3 Existing Sewerage and Estimation of Sewage Flow for the Existing Condition

3.1 Existing Sewerage System

- **3.1.1** There is no existing public sewerage system serving the Site. Based on sewerage record from DSD, there is a 200mm to 450mm diameter sewage pipeline located along Tai Tong Road (ID: FWD1042941, FWD1043890 and FWD1043891) at the north of the proposed site. The existing sewage pipeline along Tai Tong Road collects sewage from The Brand (via Existing Manhole FMH1035400) and joins with another set of 200mm to 300mm diameter sewage pipeline along Shap Pat Heung Road at existing manhole FMH1036051. The sewage collected by two sets of sewage pipeline along Tai Tong Road and along Shap Pat Heung Road will be discharged to 750mm diameter sewers along Shap Pat Heung Road via a 300mm diameter sewer (ID: FWD1043910) and a 450mm diameter sewer (ID: FWD1043909).
- 3.1.2 According to drawings from Building Department, there is a sewage treatment plant within Sereno Verde to handle and treat the sewage generated from Sereno Verde. The treated effluent from Sereno Verde is then discharged to the existing channel next to Tai Shu Ha Road East. It is also observed that the sewage generated from Reach Summit is discharged to existing manhole FMH1064703 for discharge based on drawings from Building Department.
- 3.1.3 The existing sewerage system near to the proposed development is shown in AppendixB. The catchments of existing sewerage system are presented in Appendix B1.

3.2 Estimated Sewage Flow from the Existing Site Area

3.2.1 At present, the site area is a paved car park with no sewerage facilities. Thus, no sewage flow generation is expected under existing condition within the site area.

4 Estimation of Sewage Flow for the Proposed Development

4.1 Estimated Sewage Flow for the Proposed Development

4.1.1 Based on the Development parameters and sewage unit flow factors as mentioned in Section 2, the estimated Average Dry Weather Flow (ADWF) for the proposed development with associated facilities is approximately 268.1 m³/day. Details of the sewage flow estimation are given in **Table 4.1** below.

Table 4.1: Sewage Flow Estimation for Proposed Development

Туре	Population / No. of Staff (nos.)	Unit Flow Factor (m³/h/d)	Average Dry Weather Flow (m³/d)
Proposed Residential Develo	pment		
Residential (R2)	966	0.27	260.82
Residential - Employee (J11)	18	0.28	5.04
		Sub-total =	265.86
Proposed Retail Building			
Retail - Employee (J4)	8	0.28	2.24
		Sub-total =	2.24
		Total =	268.10

5 Sewerage Impact Assessment and Sewage Discharge Arrangement

5.1 Sewage Discharge Arrangement

- **5.1.1** As discussed in Section 3, there is a 200mm to 450mm diameter sewage pipeline located along Tai Tong Road at the north of the proposed site.
- **5.1.2** Also, as mentioned in Section 4, the ADWF generated from the proposed development is 268.1 m³/d. The sewage generated from the proposed residential development is proposed to be discharged to the proposed manhole FMH-01 and the sewage generated from the retail building will be discharged to the proposed manhole FMH-02.
- **5.1.3** For conveying the sewage flow from the Development to the existing manhole FMH1035400, new polyethylene sewers of 300 mm diameter are proposed to collect sewage from the proposed development to the existing manhole FMH1035400 via proposed pipes FMD-P1 and FMD-P2. The proposed sewage discharge arrangement refers to **Appendix C**.

5.2 Sewerage Impact Assessment

5.2.1 The hydraulic capacities of the proposed sewers for the proposed development have been assessed using Colebrook-White equation. The results are summarised in Table
 5.1 below and details of the calculation are attached in Appendix D.

Table 5.1: Hydraulic Capacities of Existing Sewers along Tai Tong Road under Existing and Proposed Flow Condition

Upstream Manhole	Downstream Manhole	Pipe Size (mm)	Utilization under Existing Flow Condition	Utilization under Proposed Flow Condition	
Sewerage Network	along Tai Tong Road	d (Sub-catchment 1)			
FMH1035400*	FMH1035401	200	9%	91%	
FMH1035401	FMH1036053	450	7%	11%	
FMH1036053	FMH1036051	450	27%	42%	
Sewerage Network	along Shap Pat Heu	ng Road (Sub-catchn	nent 2)		
FMH1060002	FMH1060022	250	10%	10%	
FMH1060022	FMH1060023	250	12%	12%	
FMH1060023	FMH1060024	250	11%	11%	
FMH1060024	FMH1060062	250	9%	9%	
FMH1060062	FMH1060063	250	1%	1%	
FMH1060063 [@]	FMH1036052	200	10%	10%	
FMH1036052	FMH1036051	300	1%	1%	
300mm and 450mm diameter sewers (ID: FWD1043910 & FWD1043909) along Shap Pat Heung Road (Sub-catchments 1 & 2)					
FMH1036051	FMH1036050	300	450/#	000/#	
FMH1036051	FMH1036049	450	15%#	23%#	
Dementu					

Remark: -

1. * The downstream existing manhole connected to the proposed pipe (i.e. FMD-P1 and FMD-P2).

2. @ For FMD1002480, it consists of two 200mm pipes. it is assumed that the cumulative peak sewage flow is equally divided between 2 pipes.

3. # Combined capacity of the 300mm and 450mm diameter sewers (ID: FWD1043910 & FWD1043909).

- 5.2.2 Based on the hydraulic calculation, the existing sewers along Tai Tong Road and Shap Pat Heung Road are below 50% except the 200mm sewer between manholes FMH1035400 and FMH1035401 which is about 91% and the sewers are capable of discharging sewage flow generated from the proposed Development.
- 5.2.3 For the proposed sewers (PE pipes) connecting the proposed Development to the existing sewers along Tai Tong Road, the hydraulic result is summarised in Table 5.2 below and details of the calculation are attached in Appendix D. A reduction in flow area has also been added to check for the proposed sewers for future rehabilitation if necessary.

Table 5.2: Hydraulic Capacities of Proposed Sewers to Sewers along Tai Tong **Road under Proposed Flow Condition**

Upstream Manhole	Downstream Node	Pipe Size (mm)	Utilization under Proposed Flow Condition	Utilization under Proposed Flow Condition with Flow Area Reduced for Rehabilitation
FMH-01*	FMH-02	300	50%	56%
FMH-02 [@]	FMH1035400	300	51%	57%
Remark: -				

1.* The discharge manhole for the proposed residential development.

2. @ The discharge manhole for the proposed retail building.

5.2.4 Based on the hydraulic calculation, the sewage flow from the proposed development is well within the capacity of the existing and proposed sewage pipelines with utilisation below or equal to 60% even taking account of reduced size for proposed sewers taking account of future rehabilitation. Thus, it is considered that there is no adverse sewerage impact arising from the Development.

6 Conclusion

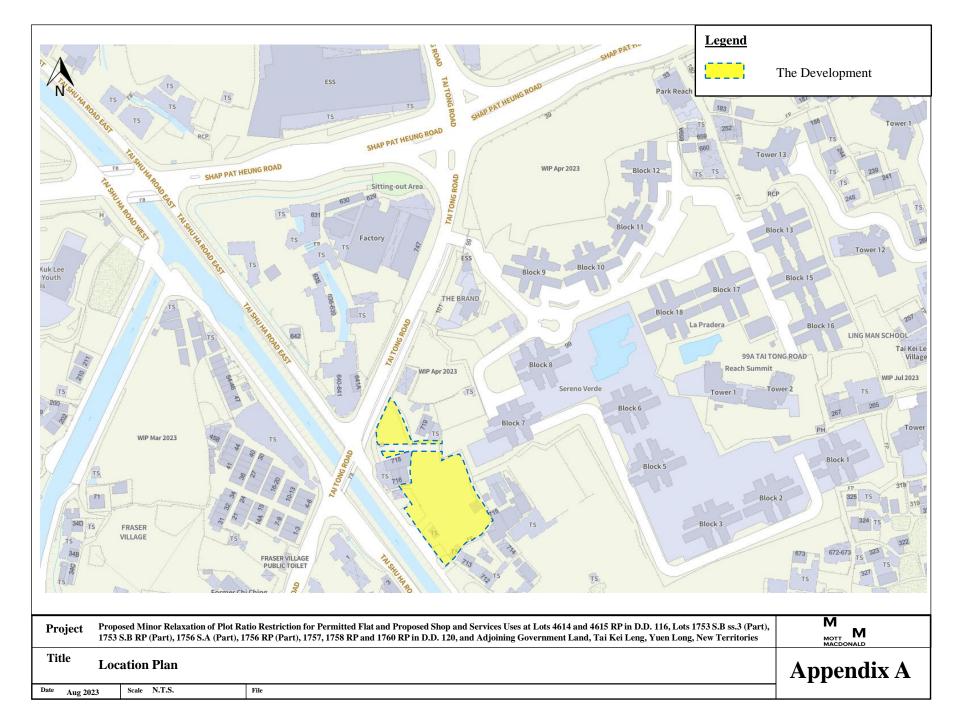
- **6.1.1** The estimated Average Dry Weather Flow (ADWF) for the proposed whole development is approximately 268.1 m³/day. The sewage generated will be discharged at a proposed manhole FMH-01. Sewage flow is then conveyed by two proposed 300mm sewers (PE pipes) connecting the existing manhole FMH1035400, and then to 200mm to 450mm diameter sewage pipeline along Tai Tong Road and Shap Pat Heung Road.
- **6.1.2** Based on the hydraulic calculation, the sewage flow from the proposed development is within the capacity of the existing and proposed sewage pipelines. However, it should be noted that the additional impact for the 55 flats and 220m² retails generate sewage flow of 43.8 m³/d only which is 16% of the whole planned development. In view of the nearby development, possible upgrade is anticipated. The minor increase in the sewerage flow of 43.8m³/d is very minor and thus, it is considered that there is no adverse sewerage impact arising from the Development site.

Mott MacDonald | Proposed Minor Relaxation of Plot Ratio Restriction for Permitted Flat and Proposed Shop and Services Uses at Lots 4614 and 4615 RP in D.D. 116, Lots 1753 S.B ss.3 (Part), 1753 S.B RP (Part), 1756 S.A (Part), 1756 RP (Part), 1757, 1758 RP and 1760 RP in D.D. 120, and Adjoining Government Land, Tai Kei Leng, Yuen Long, New Territories Sewerage Impact Assessment (Revision A)

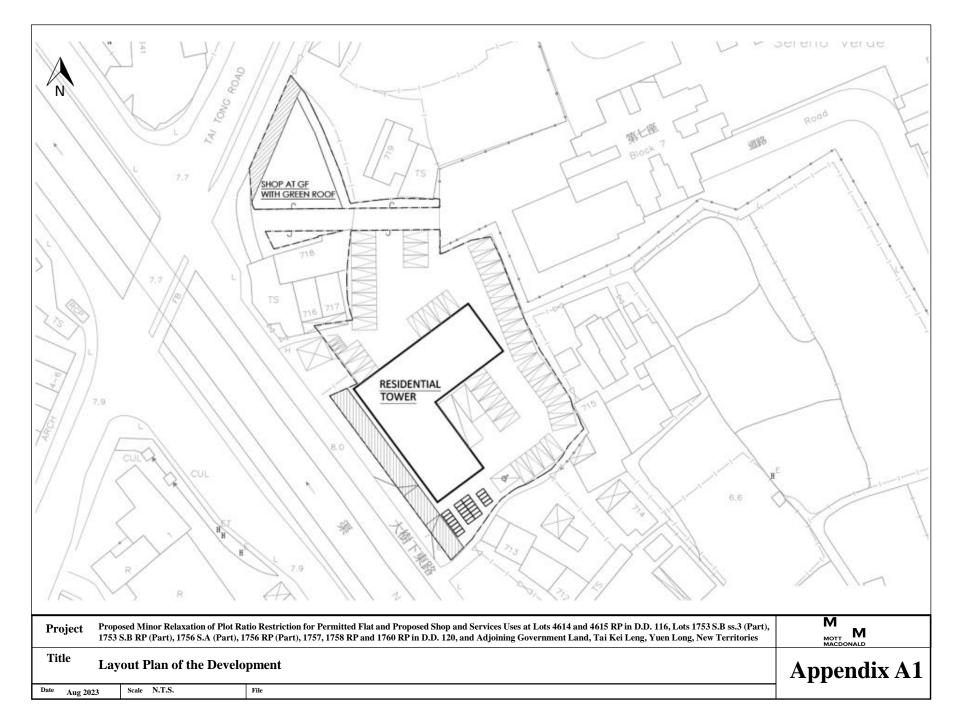
Appendices

- Appendix A Location Plan of the Development
- Appendix A1 Layout Plan of the Development
- Appendix B Existing Sewerage System
- Appendix B1 Existing Catchment Plan
- Appendix C Proposed Sewerage System
- Appendix D Hydraulic Calculation

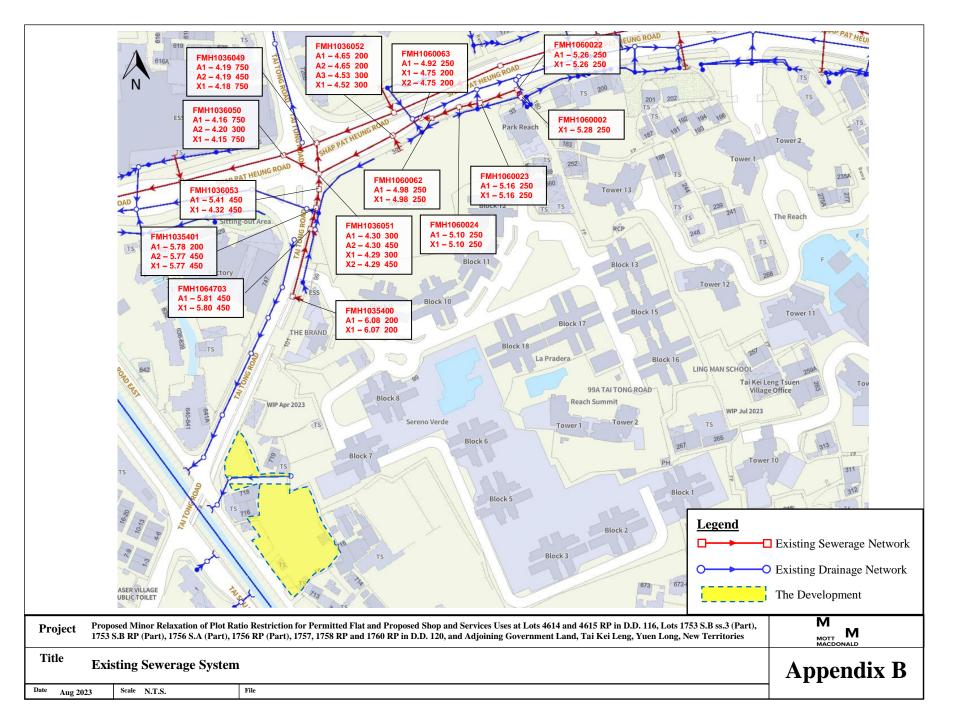
Appendix A Location Plan of the Development



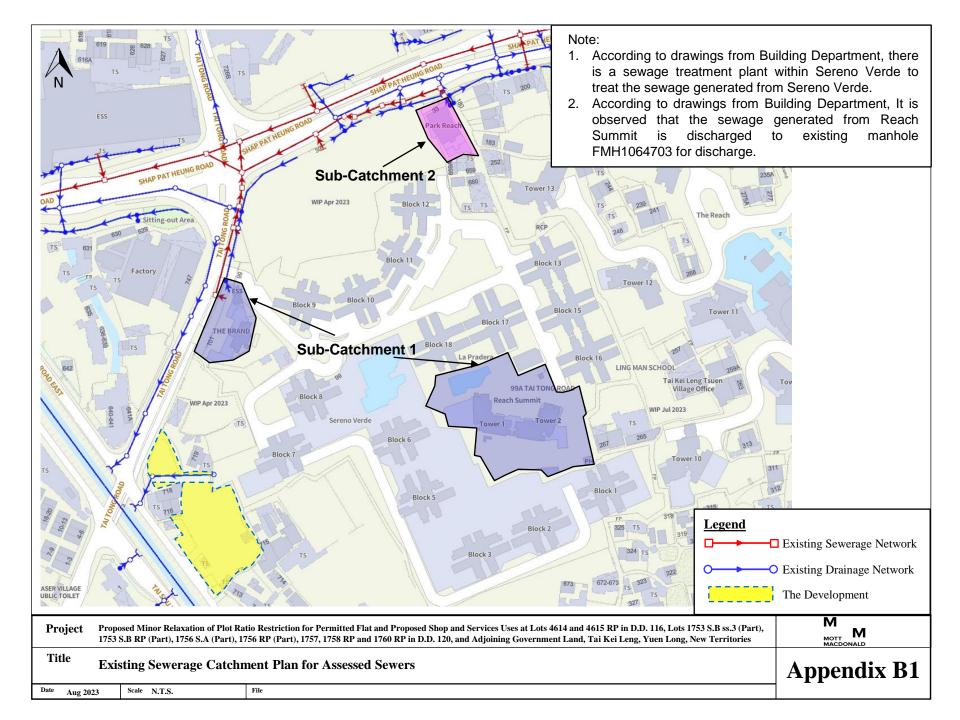
Appendix A1 Layout Plan for the Development



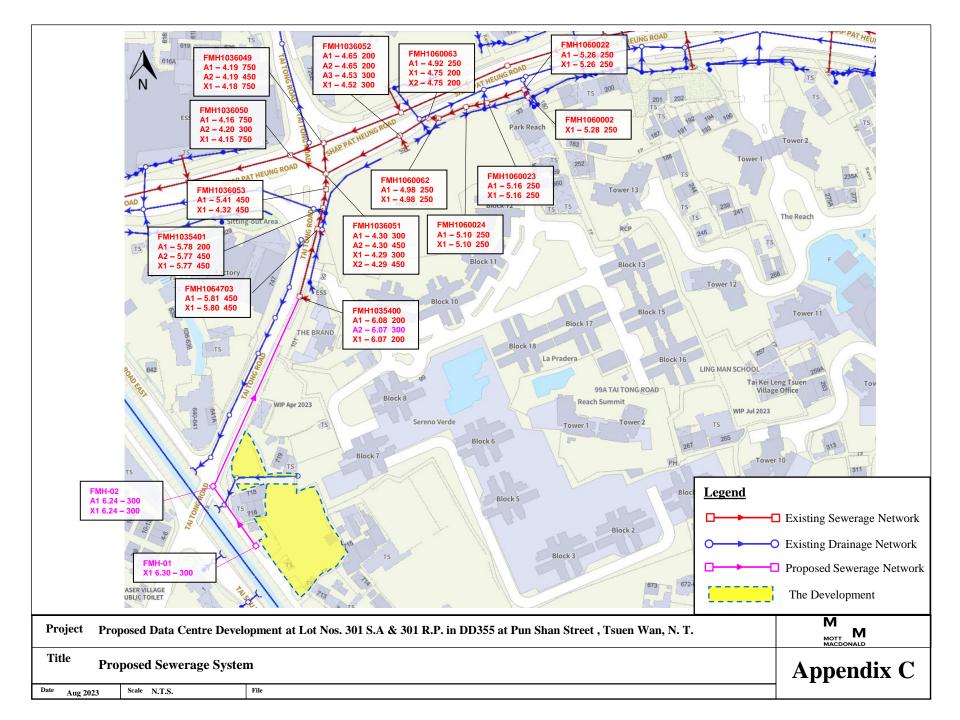
Appendix B Existing Sewerage System



Appendix B1 Existing Catchment Plan



Appendix C Proposed Sewerage System



Mott MacDonald | Proposed Minor Relaxation of Plot Ratio Restriction for Permitted Flat and Proposed Shop and Services Uses at Lots 4614 and 4615 RP in D.D. 116, Lots 1753 S.B ss.3 (Part), 1753 S.B RP (Part), 1756 S.A (Part), 1756 RP (Part), 1757, 1758 RP and 1760 RP in D.D. 120, and Adjoining Government Land, Tai Kei Leng, Yuen Long, New Territories Sewerage Impact Assessment (Revision A)

Appendix D Hydraulic Calculation

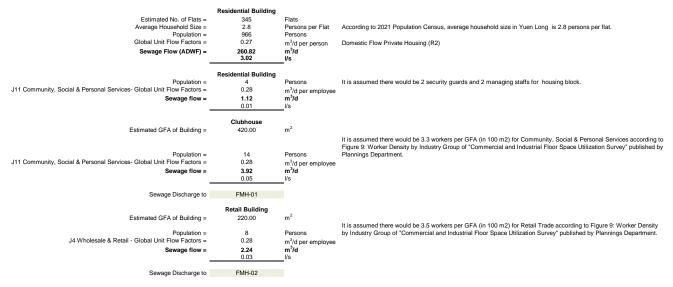
Appendix D.1 - Sewage Flow for Existing Condition Sub-Catchment 1

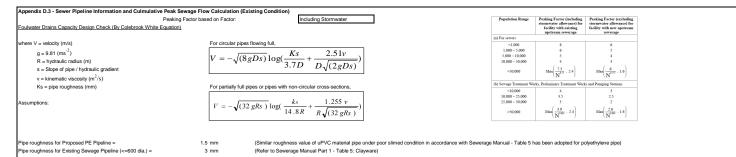
The Brand

Reach Summit Estimated No, of Flats = 2,8 Persons Clobal Unit Flow Factors = 2,8 Clobal Unit Flow Factors = 2,8 Persons Clobal Unit Flow Factors = 2,8 Clobal Unit Flow Flow Flow Flow Flow Flow Flow Flow	Estimated No. of Flats = Average Household Size = Population = Global Unit Flow Factors = Sewage Flow (ADWF) =	Residential 28 2.8 79 0.27 21.33 0.25	Flats Persons per Flat Persons m ³ /d per person m ³ /d I/s	According to 2021 Population Census, average household size in Yuen Long is 2.8 persons per flat. Domestic Flow Private Housing (R2)
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Summing Pool Pool Volume = 264 m³ Assumed 1.2m deep Tumover Rate = 6 hrs Filter Areas Required 0.92 m² Surface Loading Rate of Filter = 48 m³/m²/hr Filteration Rate = 48 m³/m²/h FilterAreas Required 0.92 m² Backwash Divartation = 3 min/day Backwash Divartation = 3 min/day Backwash Flow Rate = 30 m³/m²/hr Filteration Rate = 48 m³/m²/h Attrace Loading Rate of Filter = 48 m³/m²/h Average Design Flow for swimming pool backwashing = 0.02 I/s I/s I/s Instant peak flow = 27.50 m³/hr I/s I/s Sub-Catchment 2 7.64 I/s I/s I/s Park Reach 23 Filts According to 2021 Population Census, average household size in Yuen Long is 2.8 persons per flat. Average Household Size = 0.3 Persons per Sons Domestic Flow Private Housing (R2) Swage Flow (AUWF) = 0.77 m²/d per person Domestic Flow Private Housing (R2)	Sewage Flow (ADWF) =			
Swimming Pool Swimming Pool Assumed 1.2m deep Pool Volume = 6 hrs Surface Loading Rate of Filter = 48 m³/m²/hr Filteration Rate = 48 m³/m²/h Filter Areas Required = 0.92 m² Backwash Flow Rate = 30 m³/m²/hr Backwash Flow Rate = 30 m³/m²/hr Average Design Flow for swimming pool backwashing = 1.38 m³/day 0.02 /s /s 0.03 m³/hr /s Park Reach 27.50 m³/hr Sub-Catchment 2 /s /s Park Reach 63 Flats Sub-Catchment 2 /s /s Park Reach 63 Flats Subper Catchment 2 /s /s Population 177 Persons </td <td>-</td> <td></td> <td></td> <td></td>	-			
Pool Volume = 100 Volume = 264 m³ Assumed 1.2m deep Turnover Rate = 6 hrs Surface Loading Rate of Filter = 48 m³/m²/hr Filter Areas Required = 0.92 m² Backwash Duration = 3 mi/day Backwash Diow Rate = 30 m³/m²/hr Backwash Diow Rate = 30 m³/m²/hr Average Design Flow for swimming pool backwashing = 0.02 m³/day 0.02 U/s Instant peak flow = 27.50 m³/hr 7.64 U/s Sub-Catchment 2 park Reach Residential Estimated No. of Flats = 63 Flats Average Household Size = 2.8 Flats Average Household Size in Yuen Long is 2.8 persons per Flat According to 2021 Population Census, average household size in Yuen Long is 2.8 persons per flat. Population = 177 Persons er Flat According to 2021 Population Census, average household size in Yuen Long is 2.8 persons per flat. Population = 177 Persons er Flat According to 2021 Population Census, average household size in Yuen Long is 2.8 persons per flat. Sewage Flow (ADWF) = 47.79 m³/d M²/d	Reach Summit Swimming Pool			
$\frac{\text{Turnover Rate}}{\text{Surface Loading Rate of Filter}} = \frac{6}{48} & \text{m}^3/\text{m}^3/\text{hr} & \text{Filteration Rate} = 48 \text{ m}^3/\text{m}^2/\text{h}}$ $\frac{\text{Surface Loading Rate of Filter}}{\text{Backwash Duration}} = \frac{48}{3} & \text{m}^3/\text{day}}$ $\frac{3}{\text{Backwash Flow Rate}} = \frac{30}{3} & \text{m}^3/\text{day}}$ $\frac{1.38}{3} & \text{m}^3/\text{day}$ 1.38			2	
Surface Loading Rate of Filter = 48 m ³ /m ² /hr Filteration Rate = 48 m ³ /m ² /h Filter Areas Required = 0.92 m ² Backwash Duration = 3 min/day Backwash Flow Rate = 30 m ³ /m ² /hr Average Design Flow for swimming pool backwashing = 0.02 l/s 0.02 l/s 0.02 Instant peak flow = 27.50 m ³ /hr Verage Design Flow for swimming pool backwashing = 0.02 l/s 0.02 l/s l/s 7.64 l/s l/s Park Reach r.64 l/s Residential Sub-Catchment 2 2.8 Park Reach 63 Flats Average Household Size = 2.8 Persons per Flat According to 2021 Population Census, average household size in Yuen Long is 2.8 persons per flat. Population = 177 Persons Domestic Flow Private Housing (R2) Sewage Flow (ADWF) = 47.79 m ³ /d per person Domestic Flow Private Housing (R2)				Assumed 1.2m deep
Filter Areas Required = 0.92 m² Backwash Duration = 3 min/day Backwash Duration = 30 m³/m²/hr Average Design Flow for swimming pool backwashing = 0.02 l/s 0.02 l/s				Ethersetist Data $40 = \frac{3}{2} = \frac{2}{2}$
Backwash Duration = 3 min/day Backwash Flow Rate = 30 m ³ /m ² /hr Average Design Flow for swimming pool backwashing = 1.38 m ³ /day 0.02 l/s Instant peak flow = 27.50 m ³ /hr 7.64 l/s Sub-Catchment 2 Park Reach Sub-Catchment 2 Sub-Catchment 2 Sub-Catchmen				Filteration Rate = 48 m /m /n
Backwash Flow Rate = 30 m ³ /m ² /hr Average Design Flow for swimming pool backwashing = 1.38 m ³ /day 0.02 l/s 0.02 l/s 0.02 l/s 1.38 m ³ /day 0.02 l/s 0.02 l/s 7.64 l/s Sub-Catchment 2 Park Reach Sub-Catchment 2 Sub-Catchment 2 Sub-Catchm				
Average Design Flow for swimming pool backwashing = 1.38 m³/day 0.02 l/s 0.2 m³/hr 7.64 l/s Sub-Catchment 2 Park Reach Sub-Catchment 2 Sub-Catchment 2 Sub-Catchm				
0.02 I/s Instant peak flow = 27.50 27.50 m³/hr 7.64 I/s Sub-Catchment 2 Park Reach Residential Estimated No. of Flats = 63 Flats Average Household Size = 2.8 Population = 177 Persons Global Unit Flow Factors = Global Unit Flow Factors = 0.27 m³/d Domestic Flow Private Housing (R2)				
Instant peak flow = 27.50 m ³ /hr 7.64 l/s Sub-Catchment 2 Park Reach	Average Design Flow for swithining poor backwashing =			
Number 2 7.64 1/s Sub-Catchment 2 Park Reach Residential Residential Estimated No. of Flats = 63 Flats Average Household Size = 2.8 Persons per Flat According to 2021 Population Census, average household size in Yuen Long is 2.8 persons per flat. Population = 177 Persons Domestic Flow Private Housing (R2) Sewage Flow (ADWF) = 47.79 m ³ /d Domestic Flow Private Housing (R2)	Instant peak flow =			
Reach Residential Estimated No. of Flats = 63 Flats Average Household Size = 2.8 Persons per Flat According to 2021 Population Census, average household size in Yuen Long is 2.8 persons per flat. Population = 177 Persons Global Unit Flow Factors = 0.27 m³/d per person Domestic Flow Private Housing (R2) Sewage Flow (ADWF) = 47.79 m²/d Domestic Flow Private Housing (R2)			l/s	
Estimated No. of Flats = 63 Flats Average Household Size = 2.8 Persons per Flat According to 2021 Population Census, average household size in Yuen Long is 2.8 persons per flat. Population 177 Persons Global Unit Flow Factors = 0.27 m ³ /d per person Domestic Flow Private Housing (R2) Sewage Flow (ADWF) = 47.79 m ³ /d				
Average Household Size = 2.8 Persons per Flat According to 2021 Population Census, average household size in Yuen Long is 2.8 persons per flat. Population = 177 Persons Global Unit Flow Factors = 0.27 m³/d per person Domestic Flow Private Housing (R2) Sewage Flow (ADWF) = 47.79 m²/d		Residential		
Population = 177 Persons Global Unit Flow Factors = 0.27 m ³ /d per person Domestic Flow Private Housing (R2) Sewage Flow (ADWF) = 47.79 m ³ /d				
Global Unit Flow Factors = 0.27 m ³ /d per person Domestic Flow Private Housing (R2) Sewage Flow (ADWF) = 47.79 m ³ /d				According to 2021 Population Census, average household size in Yuen Long is 2.8 persons per flat.
Sewage Flow (ADWF) = 47.79 m ³ /d				
				Domestic Flow Private Housing (R2)
	Sewage Flow (ADWF) =			

Appendix D.2 - Sewage Flow for Proposed Condition

Sewage Flow from proposed residential and retail development





Transitional flow and water at 15 degree celsius, i.e. kinematic viscosity is 1.14 x 10 $^{-6}$ m^2/s

Hydraulic Calculation and Utilisation for 200mm to 450mm Existing Sewers along Tai Tong Road

							Pipe Inf	ormation									Re	sult	
Pipe no.	From	То	Size (mm)	Length (m)	U.S. Invert Level (mPD)	D.S. Invert Level (mPD)	Gradient 1 in	Culmulative Daily Sewage Flow (I/s)	Catchment Inflow Factor	Culmulative Daily Sewage Flow with Catchment Inflow Factor (I/s)	Contributing Population	Peaking Factor	Instant Peak Flow from Swimming Pool (l/s)	Culmulative Peak Sewage Flow (I/s)	Culmulative Peak Sewage Flow (m ³ /s)	Pipe Full Flow Capacity (I/s)	Pipe Full Flow Velocity (m/s)	Utilization (%)	Flow Capacity Check
Sewerage Network along Tai Tong Road	I (Sub-catchment 1)																		
FWD1042941	FMH1035400	FMH1035401	200	52.4	6.07	5.78	181	0.25	1.00	0.25	79	8.00	0.00	1.98	0.0020	22	0.70	9%	OK
FWD1043890	FMH1035401	FMH1036053	450	9.8	5.77	5.41	27	4.66	1.00	4.66	1491	6.00	7.64	35.60	0.0356	497	3.12	7%	OK
FWD1043891	FMH1036053	FMH1036051	450	7.9	4.32	4.30	393	4.66	1.00	4.66	1491	6.00	7.64	35.60	0.0356	130	0.82	27%	OK

Hydraulic Calculation and Utilisation for 200mm to 300mm Existing Sewers along Shap Pat Heung Road

							Pipe Info	ormation									Re	sult	
Pipe no.	From	То	Size	Length	U.S. Invert Level	D.S. Invert Level	Gradient 1 in	Culmulative Daily Sewage	Catchment Inflow	Culmulative Daily Sewage Flow	Contributing Population	Peaking Factor	Instant Peak Flow from	Culmulative Peak Sewage Flow	Culmulative Peak Sewage Flow	Pipe Full	Pipe Full	I In Ward and	Flow
			(mm)	(m)	(mPD)	(mPD)	1 In	Flow	Factor	with Catchment	Population	Factor	Swimming Pool	(I/s)	(m ³ /s)	Flow Capacity (I/s)	Flow Velocity (m/s)	Utilization (%)	Capacity Check
								(l/s)		Inflow Factor (I/s)			(l/s)			e - p - e - r) (. e)	(
Sewerage Network along Shap Pat Heung	g Road (Sub-catchment	t 2)																	
FWD1081043	FMH1060002	FMH1060022	250	3.2	5.28	5.26	159	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	43	0.87	10%	OK
FWD1081044	FMH1060022	FMH1060023	250	21.5	5.26	5.16	215	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	37	0.75	12%	OK
FWD1081062	FMH1060023	FMH1060024	250	11.3	5.16	5.10	189	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	39	0.80	11%	OK
FWD1081063	FMH1060024	FMH1060062	250	15.5	5.10	4.98	129	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	47	0.97	9%	OK
FWD1081064	FMH1060062	FMH1060063	250	4.8	4.98	4.92	80	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	60	1.23	1%	OK
FMD1002480 (1)	FMH1060063	FMH1036052	200	18.9	4.75	4.65	189	0.55	1.00	0.55	177	8.00	0.00	2.21	0.0022	22	0.69	10%	OK
FWD1043892	FMH1036052	FMH1036051	300	47.3	4.52	4.30	215	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	60	0.85	1%	OK

Hydraulic Calculation and Utilisation for downstream 450mm and 300mm pipes of manhole FMH1036051

	Pipe II	nformation					Ca	pacity
From	То	Size	Length	U.S.	D.S.	Gradient		
				Invert Level	Invert Level	1 in	Pipe Full Flow	Pipe Full Flow
		(mm)	(m)	(mPD)	(mPD)		Capacity (I/s)	Velocity (m/s)
ng Road (Downstream o	f Subcatchments 1 &	2)						
FMH1036051	FMH1036050	300	22.3	4.29	4.20	248	56	0.79
FMH1036051	FMH1036049	450	17.0	4.29	4.19	170	199	1.25
		Te	otal Pipe Full Flow C	apacity of FWD1	043910 and FW	D1081044 (l/s)		254
	Culmulative Daily	/ Sewage Flow with	Catchment Inflow F	actor from FWD	1043891 and FW	D1043892 (l/s)	1	5.21
					Contribu	ution Population	1	668
						Peaking Factor		5.00
		Instant Peak F	low from Swimming	Pool from FWD	1043891 and FW	D1043892 (l/s)		7.64
				Culi	mulative Peak Se	wage Flow (l/s)		39
						Utilization (%)		15%
	g Road (Downstream o FMH1036051	From To gRoad (Downstream of Subcatchments 1 & FMH1036051 FMH1036050 FMH1036051 FMH1036049	(mm) g Road (Downstream of Subcatchments 1 & 2) FMH1038051 FMH1038050 300 FMH1038051 FMH1038049 450 T Culmulative Daily Sewage Flow with	From To Size Length g Road (Downstream of Subcatchments 1 & 2) (mm) (m) (m) FMH1036051 FMH1036049 300 22.3 FMH1036051 FMH1036049 450 17.0 Total Pipe Full Flow Total Pipe Full Flow C Culmulative Daily Sewage Flow with Catchment Inflow F	From To Size Length U.S. Invert Level (mm) U.S. Invert Level (mPD) g Road (Downstream of Subcatchments 1 & 2) FMH1036050 300 22.3 4.29 FMH1036051 FMH1036050 300 22.3 4.29 Total Pipe Full Flow Capacity of FWD1 Culmulative Daily Sewage Flow with Catchment Inflew Factor from FWD Instant Peak Flow from Swimming Pool from FWD1	From To Size Length U.S. Invert Level D.S. Invert Level g Road (Downstream of Subcatchments 1 & 2) (mm) (m) (mPD) (mPD) FMH1038051 FMH1038050 300 22.3 4.29 4.20 FMH1038051 FMH1038050 300 22.3 4.29 4.19 Total Pipe Full Flow Capacity of PMD1043910 and FW Culmulative Daily Sewage Flow with Catchment Inflow Factor from FWD1043981 and FW Contribution Instant Peak Flow from Swimming Pool from FWD1043891 and FW Instant Peak Flow from Swimming Pool from FWD1043891 and FW	From To Size Length U.S. Invert Level D.S. (met Level Gradent g Road (Downstream of Subcatchments 1 & 2) (mm) (mm) (mm) (mm) (mm) (mm) 1 in FMH1036051 FMH1036050 300 22.3 4.29 4.20 248 FMH1036051 FMH1036049 450 17.0 4.29 4.19 170 Total Pipe Full Flow Capacity of FWD1043501 and FWD1043820 (a) Culmulative Daily Sewage Flow with Catchment Inflow Factor from FWD104381 and FWD1043820 (b) Contribution Population Instant Peak Flow from Swimming Pool from FWD104381 and FWD1043821 (k) Culmulative Paak Sewage Flow with Culmulative Paak Sewage Flow With Catchment Inflow Factor from FWD104381 and FWD1043820 (k) Culmulative Paak Flow from Swimming Pool from FWD104381 and FWD1043820 (k)	From To Size Length (mm) U.S. (mem) D.S. Invert Level (mPD) Gradent Invert Level (mPD) Pipe Full Flow (mPD) g Road (Downstream of Subcatchments 1 & 2) FMH1036051 FMH1036050 300 22.3 4.29 4.20 248 56 FMH1036051 FMH1036049 450 17.0 4.29 4.19 170 199 Total Pipe Full Flow Capacity of FWD1043810 and FWD1081044 (t/s) Culmulative Daily Sewage Flow with Catchment Inflow Factor from FWD1043810 and FWD1081004 Instant Peak Flow from Swimming Pool from FWD104382 (t/s) Culmulative Peak Sewage Flow (t/s)

Remarks:

1. For FMD1002480, it consists of two 200mm pipes. it is assumed that the cumulative peak sewage flow is equally divided between 2 pipes.

Peaking Factor Foulwater Drains Capacity Design Check (By Colebrook White Equation)	based on Factor:	Including Stormwater Not Including Stormwater for Proposed Pipes	Population Range	Peaking Factor (including stormwater allowance) for	Peaking Factor (excluding stormwater allowance) for
odiwater brains capacity besign check (by colebrook white Equation)		Not including biointwater for hoposed hipes		facility with existing upstream sewerage	facility with new upstream sewerage
	E	<pre>/ "</pre>	(a) For sewers		
where V = velocity (m/s)	For circular pipes flowing		<1,000	8	6
g = 9.81 (ms ⁻²)		$\frac{1}{1}\log(\frac{Ks}{3.7D} + \frac{2.51v}{D\sqrt{(2gDs)}})$	1.000 - 5.000	6	5
R = hydraulic radius (m)	$V = -\sqrt{(8gDs)}$	$\log(\frac{1100}{1000} + \frac{21000}{1000})$	5,000 - 10,000	5	4
	· • • • • • •	(3.7D D)(2aDs)'	10,000 - 50,000	4	3
s = Slope of pipe / hydraulic gradient		$D_{V}(28D3)$	>50,000	$Max\left(\frac{7.3}{N^{015}}, 2.4\right)$	$Max = \frac{6}{2 \pi^{0.175}}$, 1.6
v = kinematic viscosity (m ² /s)				(N ¹⁰)	(N)
Ks = pipe roughness (mm)	For partially full pipes or	pipes with non-circular cross-sections,	(b) Sewage Treatment Wor	ks, Preliminary Treatment Work	es and Pumping Stations
			<10,000	4	3
Assumptions:		$- k_s = 1.255 v$	10,000 - 25,000	3.5	2.5
asumptions.	$V = -\sqrt{(32 \ gRs)}$	$\log(\frac{\pi s}{1255 v})$	25,000 - 50,000	3	2
	•	$\overline{)} \log(\frac{ks}{14.8R} + \frac{1.255 v}{R\sqrt{(32 gRs)}})$	>50,000	$Max\left(\frac{3.9}{N^{0.007}} \cdot 2.4\right)$	$Max \left(\frac{2.6}{N^{6005}} , 1.6 \right)$
	1.5 mm (Sim		with Courses Manual Table 5 has		
ipe roughness for Proposed PE Pipeline =	,	ilar roughness value of uPVC material pipe under poor slimed condition in accordance	with Sewerage wahual - Table 5 has	s been adopted for por	yeunyiene pipe)
Pipe roughness for Existing Sewage Pipeline (<=600 dia.)	3 mm (Ref	er to Sewerage Manual Part 1 - Table 5: Clayware)			

Transitional flow and water at 15 degree celsius, i.e. kinematic viscosity is 1.14 x 10 $^{\rm -6}~m^2/s$

Proposed Sewer From The Development Site

									Pipe	Information									Re	sult	
Pip	pe no.		From	То	Size (mm)	Length (m)	U.S. Invert Level (mPD)	D.S. Invert Level (mPD)	Gradient 1 in	Culmulative Daily Sewage Flow (I/s)	Catchment Inflow Factor	Culmulative Daily Sewage Flow with Catchment Inflow Factor (I/s)	Contributing Population	Peaking Factor	Instant Peak Flow from Swimming Pool (l/s)	Culmulative Peak Sewage Flow (I/s)	Culmulative Peak Sewage Flow (m ³ /s)	Pipe Full Flow Capacity (I/s)	Pipe Full Flow Velocity (m/s)	Utilization (%)	Flow Capacity Check
										Propose	ed Sewer From The	Development Site									
	FMD-P1	(2)	FMH-01	FMH-02	300	42.2	6.30	6.24	703	3.08	1.00	3.08	985	6.00	0.00	18.47	0.02	37	0.52	50%	OK
	FMD-P2	(3)	FMH-02	FMH1035400	300	121.6	6.24	6.07	715	3.11	1.00	3.11	995	6.00	0.00	18.65	0.02	36	0.51	51%	OK

Hydraulic Calculation and Utilisation for 200mm to 450mm Existing Sewers along Tai Tong Road

							Pipe	Information									Re	sult	
Pipe no.	From	То	Size (mm)	Length (m)	U.S. Invert Level (mPD)	D.S. Invert Level (mPD)	Gradient 1 in	Culmulative Daily Sewage Flow (Vs)	Catchment Inflow Factor	Culmulative Daily Sewage Flow with Catchment Inflow Factor (I/s)	Contributing Population	Peaking Factor	Instant Peak Flow from Swimming Pool (I/s)	Culmulative Peak Sewage Flow (I/s)	Culmulative Peak Sewage Flow (m ³ /s)	Pipe Full Flow Capacity (I/s)	Pipe Full Flow Velocity (m/s)	Utilization (%)	Flow Capacity Check
Sewerage Network along Tai Tong	g Road (Sub-catchment	1)																	
FWD1042941	FMH1035400	FMH1035401	200	52.4	6.07	5.78	181	3.36	1.00	3.36	1074	6.00	0.00	20.13	0.0201	22	0.70	91%	OK
FWD1043890	FMH1035401	FMH1036053	450	9.8	5.77	5.41	27	7.77	1.00	7.77	2486	6.00	7.64	54.25	0.0542	497	3.12	11%	OK
FWD1043891	FMH1036053	FMH1036051	450	7.9	4.32	4.30	393	7.77	1.00	7.77	2486	6.00	7.64	54.25	0.0542	130	0.82	42%	OK

Hydraulic Calculation and Utilisation for 200mm to 300mm Existing Sewers along Shap Pat Heung Road

							Pipe	Information									R	esult	
Pipe no.	From	То	Size (mm)	Length (m)	U.S. Invert Level (mPD)	D.S. Invert Level (mPD)	Gradient 1 in	Culmulative Daily Sewage Flow (I/s)	Catchment Inflow Factor	Culmulative Daily Sewage Flow with Catchment Inflow Factor (I/s)	Contributing Population	Peaking Factor	Instant Peak Flow from Swimming Pool (l/s)	Culmulative Peak Sewage Flow (l/s)	Culmulative Peak Sewage Flow (m ³ /s)	Pipe Full Flow Capacity (I/s)	Pipe Full Flow Velocity (m/s)	Utilization (%)	Flow Capacity Check
Sewerage Network along Shap I	Pat Heung Road (Sub-ca	atchment 2)													•		•	•	
FWD1081043	FMH1060002	FMH1060022	250	3.2	5.28	5.26	159	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	43	0.87	10%	OK
FWD1081044	FMH1060022	FMH1060023	250	21.5	5.26	5.16	215	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	37	0.75	12%	OK
FWD1081062	FMH1060023	FMH1060024	250	11.3	5.16	5.10	189	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	39	0.80	11%	OK
FWD1081063	FMH1060024	FMH1060062	250	15.5	5.10	4.98	129	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	47	0.97	9%	OK
FWD1081064	FMH1060062	FMH1060063	250	4.8	4.98	4.92	80	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	60	1.23	1%	OK
FMD1002480 (1)	FMH1060063	FMH1036052	200	18.9	4.75	4.65	189	0.55	1.00	0.55	177	8.00	0.00	2.21	0.0022	22	0.69	10%	OK
FWD1043892	FMH1036052	FMH1036051	300	47.3	4.52	4.30	215	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	60	0.85	1%	OK

Hydraulic Calculation and Utilisation for downstream 450mm and 300mm pipes of manhole FMH1036051

		Pi	be Information					Ca	pacity
Pipe no.	From	To	Size	Length	U.S.	D.S.	Gradient		
			(mm)	(m)	Invert Level (mPD)	Invert Level (mPD)	1 in	Pipe Full Flow Capacity (l/s)	Pipe Full Flow Velocity (m/s)
Sewerage Network along Shap	Pat Heung Road (Downs	tream of Subcatchme	nts 1 & 2)						
FWD1043910	FMH1036051	FMH1036050	300	22.3	4.29	4.20	248	56	0.79
FWD1081044	FMH1036051	FMH1036049	450	17.0	4.29	4.19	170	199	1.25
			-	Total Pipe Full Flow	Capacity of FWD	1043910 and FW	D1081044 (l/s)		254
		Culmulative Da	ily Sewage Flow wit	h Catchment Inflow	Factor from FWD	1043891 and FW	/D1043892 (l/s)	1	3.32
						Contrib	ution Population	2	2663
							Peaking Factor		6.00
			Instant Peak	Flow from Swimmin	g Pool from FWD	1043891 and FW	/D1043892 (l/s)		7.64
					Cul	mulative Peak Se	wage Flow (l/s)		58
							Utilization (%)		23%

Remarks:

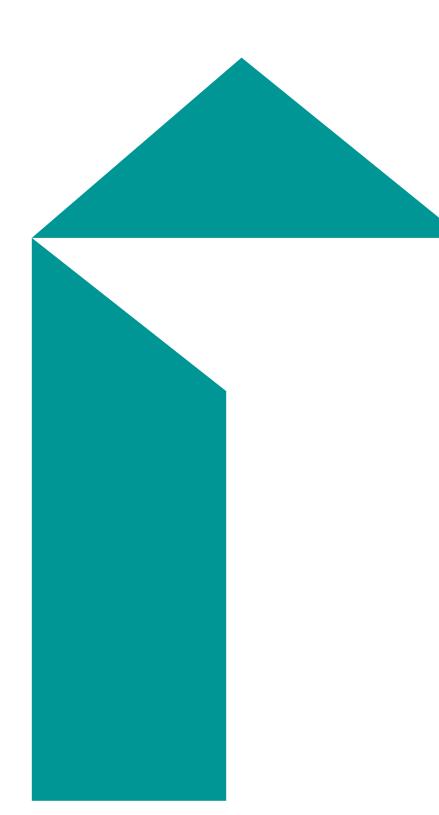
1. For FMD1002480, it consists of two 200mm pipes. it is assumed that the cumulative peak sewage flow is equally divided between 2 pipes.

2. The sewage generated from the proposed residential development will be discharged into proposed manhole FMH-01.

3. The sewage generated from the proposed retail building will be discharged into proposed manhole FMH-02.

Appendix D.5 - Sewer Pipeline	Information and Culm			(Proposed Condition															
		Peaking Factor bas	sed on Factor:			water for Existing				Population Range	Peaking Factor (including stormwater allowance) for facility with existing	Peaking Factor (excluding stormwater allowance) for facility with new upstream							
Foulwater Drains Capacity Design	n Check (By Colebrook V	Vhite Equation)			Not Including S	tormwater for Pro	posed Pipes				facility with existing	facility with new upstream							
								_			upstream sewerage	sewerage							
where V = velocity (m/s)			For circular pipes f	flowina full.						(a) For sewers <1.000									
$q = 9.81 (ms^{-2})$				$(\frac{K}{3.7})\log(\frac{K}{3.7})$, <u>)</u>	51v				<1,000	6	5							
R = hydraulic radius (m)			$V = -\sqrt{(8s)}$	$\frac{K}{2Ds}$ log($\frac{K}{2}$	-+	<u>31v</u>)				5,000 - 10,000	5	4							
s = Slope of pipe / hydrau			V (***	3.7	$D \mid D \sqrt{(2)}$	2gDs)'				10,000 - 50,000	4	3							
					- V	-8*7				>50,000	$Max\left(\frac{7.3}{N^{415}}, 2.4\right)$	$Max\left(\frac{6}{N^{6115}}, 1.6\right)$							
v = kinematic viscosity (m																			
Ks = pipe roughness (mn	m)		For partially full pip	pes or pipes with non-	circular cross-se	ctions,				(b) Sewage Treatment W	orks, Preliminary Treatment Wor	ks and Pumping Stations							
										<10,000 10,000 - 25,000	4 3.5	3							
Assumptions:			$V = -\sqrt{(32)}$	$\frac{\alpha R_{E}}{k}$ log($\frac{k}{k}$	1.2	255 V				25,000 - 50,000	2	2							
			V V(32	$\frac{g_{13}}{14.8}$	RERICA	2 gRs)				>50.000	. (3.9)	2.6 1.7							
					ΛV (3	2 gros)				-50,000	$Max\left(\frac{3.9}{N^{566}}, 2.4\right)$	$Max\left(\frac{2.6}{N^{686}}, 1.6\right)$							
Pipe roughness for Proposed PE	Pipeline =	1	.5 mm	(Similar roughness	value of uPVC m	aterial pipe unde	poor slimed co	ndition in accorda	nce with Sewerage N	lanual - Table 5 has	been adopted for polye	thylene pipe)							
Pipe roughness for Existing Sewa			3 mm	(Refer to Sewerage															
1																			
1. Assumed the lining thickness	for rehabiliation is 6mm f	or 300mm diameter	nine																
Transitional flow and water at 1	15 degree celsius, i.e. kin	ematic viscosity is 1	.14 x 10 m /s																
Proposed Sewer From The	e Development Site															r			
								e Information									Re	sult	
Pipe no.	From	То	Size After	Length	U.S.	D.S.	Gradient	Culmulative	Catchment	Culmulative Da	aily Contributing	g Peaking	Instant Peak	Culmulative	Culmulative	Pipe Full	Pipe Full		Flow
		1	Rehabilitation		Invert Level	Invert Level	1 in	Daily Sewage	Inflow	Sewage Flow	w Population	Factor	Flow from	Peak Sewage Flow	Peak Sewage Flow	Flow	Flow Velocity	Utilization	Capacity
		1	(mm)	(m)	(mPD)	(mPD)	1	Flow	Factor	with Catchme	nt		Swimming Pool	(l/s)	(m ³ /s)	Capacity (I/s)	(m/s)	(%)	Check
		1				1	1	(l/s)	1	Inflow Factor (I	/s)		(l/s)		1	Supcony (1/5)	(inva)		511001
								Propos	sed Sewer From The			·							
FMD-P1 (2)	FMH-01	FMH-02	288	42.2	6.30	6.24	703	3.08	1.00	3.08	985	6.00	0.00	18.47	0.02	33	0.51	56%	OK
FMD-P2 (3)	FMH-02	FMH1035400	288	121.6	6.24	6.07	715	3.11	1.00	3.11	995	6.00	0.00	18.65	0.02	33	0.50	57%	OK
Hydraulic Calculation and	Utilisation for 200n	nm to 450mm Ex	disting Sewers ale	ong Tai Tong Roa	d														
							Pip	e Information									Re	sult	
Pipe no.	From	То	Size	Length	U.S.	D.S.	Gradient	Culmulative	Catchment	Culmulative Da	aily Contributing	g Peaking	Instant Peak	Culmulative	Culmulative				c.
					Invert Level	Invert Level	1 in	Daily Sewage	Inflow	Sewage Flov	v Population	Factor	Flow from	Peak Sewage Flow	Peak Sewage Flow	Pipe Full Flow	Pipe Full Flow Velocity	Utilization	Flow Capacity
			(mm)	(m)	(mPD)	(mPD)		Flow	Factor	with Catchme	nt		Swimming Pool	(l/s)	(m ³ /s)	Capacity (l/s)	(m/s)	(%)	Check
								(l/s)		Inflow Factor (I	/s)		(l/s)			Capacity (i/s)	(11/5)		CHECK
Sewerage Network along Tai Ton	g Road (Sub-catchment	1)	•		•														
FWD1042941	FMH1035400	FMH1035401	200	52.4	6.07	5.78	181	3.36	1.00	3.36	1074	6.00	0.00	20.13	0.0201	22	0.70	91%	OK
FWD1043890	FMH1035401	FMH1036053	450	9.8	5.77	5.41	27	7.77	1.00	7.77	2486	6.00	7.64	54.25	0.0542	497	3.12	11%	OK
FWD1043891	FMH1036053	FMH1036051	450	7.9	4.32	4.30	393	7.77	1.00	7.77	2486	6.00	7.64	54.25	0.0542	130	0.82	42%	OK
	•		•		•			•											·······
Hydraulic Calculation and	Utilisation for 200n	nm to 300mm Ex	disting Sewers ale	ong Shap Pat He	ing Road														
							Pip	e Information									Re	sult	
Pipe no.	From	То	Size	Length	U.S.	D.S.	Gradient	Culmulative	Catchment	Culmulative Da	aily Contributing	g Peaking	Instant Peak	Culmulative	Culmulative				
					Invert Level	Invert Level	1 in	Daily Sewage	Inflow	Sewage Flov	v Population	Factor	Flow from	Peak Sewage Flow	Peak Sewage Flow	Pipe Full Flow	Pipe Full Flow Velocity	Utilization	Flow
			(mm)	(m)	(mPD)	(mPD)		Flow	Factor	with Catchme	nt		Swimming Pool	(l/s)	(m ³ /s)			(%)	Capacity Check
		1				1	1	(l/s)	1	Inflow Factor (I	/s)		(l/s)		1	Capacity (I/s)	(m/s)		SHOLK
Sewerage Network along Shap Pa	at Heung Road (Sub-cat	chment 2)						See. 7											
FWD1081043	FMH1060002	FMH1060022	250	3.2	5.28	5.26	159	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	43	0.87	10%	OK
FWD1081044	FMH1060022	FMH1060023	250	21.5	5.26	5.16	215	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	37	0.75	12%	OK
FWD1081062	FMH1060022	FMH1060024	250	11.3	5.16	5.10	189	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	39	0.80	12%	OK
FWD1081062	FMH1060023	FMH1060062	250	15.5	5.10	4.98	129	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	47	0.80	9%	OK
FWD1081063	FMH1060024 FMH1060062	FMH1060062 FMH1060063	250	4.8	4.98	4.98	80	0.55	1.00	0.55	177	8.00	0.00	4.43	0.0044	60	1.23	9% 1%	OK
FMD1081064 FMD1002480 (1)	FMH1060062 FMH1060063	FMH1060063 FMH1036052	250	4.8	4.98	4.92				0.55					0.0044				OK
FMD1002480 (1) FWD1043892	FMH1060063 FMH1036052	FMH1036052 FMH1036051	200	18.9 47.3	4.75	4.65	189 215	0.55	1.00	0.55	177	8.00	0.00	2.21	0.0022	22 60	0.69	10%	OK
FWD1043892	FMH1036052	FMH1036051	300	47.3	4.52	4.30	215	0.55	1.00	0.55	177	8.00	U.00	4.43	0.0044	60	0.85	1%	UK
Understation On the state of the					14000071														
Hydraulic Calculation and	utilisation for dowi			es of manhole FM	H1036051				an a site -	٦									
Dine no	From	То	Pipe Information Size	Length	US	D.S.	Gradient	C	apacity	-									
Pipe no.	FIGH	10	Size	Length			1 in	Disc. E. H.E.	Dia 5 11 51	1									
		1			Invert Level	Invert Level	1 in	Pipe Full Flow	Pipe Full Flow	1									
		1	(mm)	(m)	(mPD)	(mPD)	1	Capacity (l/s)	Velocity (m/s)	1									
	1	1		1			1	1	1	-									
Sewerage Network along Shap Pa				1					1	4									
FWD1043910	FMH1036051	FMH1036050	300	22.3	4.29	4.20	248	56	0.79	1									
FWD1081044	FMH1036051	FMH1036049	450	17.0	4.29	4.19	170	199	1.25	1									
				Total Pipe Full Flow	Capacity of FWE	01043910 and FV	/D1081044 (l/s		254	1									
		Culmulative	Daily Sewage Flow v	with Catchment Inflow	Factor from FW			s)	8.32	J									
							oution Populatio	n	2663	1									
							Peaking Facto		6.00	1									
			Instant Pea	ak Flow from Swimmir	a Pool from FW	D1043891 and F			7.64	1									
			instant 1 of			ulmulative Peak \$			58	1									
							Utilization (%		23%	1									
							Junzauon (%	9/	2370	L									
	Demedia																		
	Remarks:																		
	1. For FMD1002480, it						ed between 2	pipes.											
	2. The sewage general																		
	3. The sewage general	ed from the propose	d retail building will be	e discharged into prop	osed manhole Fl	MH-02.													
1																			





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