Prepared by

Ramboll Hong Kong Limited

REDEVELOPMENT OF MIDDLETON TOWERS AT POK FU LAM

DRAINAGE AND SEWERAGE IMPACT ASSESSMENT

Date	**May 2026**
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Signed	
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CHAPTERS

TABLES

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1. INTRODUCTION

1.1 Project Background

1.1.1 The Subject Site is mainly zoned as "Residential (Group C)" ("R(C)") with minor portion zoned as "Green Belt" ("GB") under the Approved Pok Fu Lam Outline Zoning Plan (OZP) (No. S/H10/23). It is generally surrounded by University Hall to the Southeast, Woodbury Court to the southwest, and Alberose to the northwest.

1.1.2 **Figure 1.1** shows the location of the Subject Site and its environment.

1.1.3 Ramboll Hong Kong Limited has been appointed to conduct the sewerage impact assessment for the Subject Site.

1.2 Proposed use

1.2.1 It consists of student hostel. Development Parameters for the Proposed use is summarised in **Table 1.1**.

Table 1.1 Development Parameters of the Proposed use

	Parameters
Site Area (m^2)	About 8,900
No. of Student Hostel (Rooms)	900

1.2.2 The typical floor plans of the planning statement of the Proposed use are shown in **Appendix 1.1**.

1.2.3 The tentative completion year for the Proposed use is 2028.

1.3 Sewerage Impact

1.3.1 The potential sewerage impact arising from the operation phase should be assessed and mitigated to fulfil the requirements under the relevant legislations and guidelines. The details will be discussed in **Section2.**

1.4 Drainage Impact

1.4.1 The potential drainage impact arising from the operation phase should be assessed and mitigated to fulfil the requirements under the relevant legislations and guidelines. The details will be discussed in **Section 3**.

2. SEWERAGE IMPACT ASSESSMENT

2.1 Scope of Work

2.1.1 The aim of this study is to compare the sewage flow generated from the Subject Site with the sewage flow from the existing usage, and to determine whether adverse sewerage impact is anticipated.

2.2 Assessment Criteria and Methodology

2.2.1 According to the Drainage Record obtained from the Geoinfo map and the approved SIA report of Student Residences and Residential Development for the University of Hong Kong at 142 Pok Fu Lam Road prepared by Ramboll (Report No. R7842_v4.0), there is public sewer network serving the Subject Site and the surrounding environment. **Figure 2.1** shows the location of the sewer sections concerned.

2.2.2 The Environmental Protection Department's (EPD's) Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning, Version 1 (GESF) is referred to estimate the quantity of the sewage generated from the Subject Site and the existing development. Sewage flow parameters and global peaking factors in this document are adopted.

2.2.3 The Commercial and Industrial Floor Space Utilization Survey (CIFSUS) conducted by the Planning Department is used to determine the worker density for various economic activities and planned usage type.

2.2.4 In order to represent worst-case scenario, the sewerage impact assessment was conducted based on the assumption that all phases of the Subject Site have been completed.

2.2.5 Based on the designed use, the sewage flow from the proposed hotel development is determined and compared with the capacity of the existing sewerage system in order to investigate the necessity of sewerage system upgrading work.

2.3 Sewerage System

2.3.1 With reference to the approved SIA report of Student Residences and Residential Development for the University of Hong Kong at 142 Pok Fu Lam Road prepared by Ramboll (Report No. R7842_v4.0) and the sewerage system shown in Geoinfo Map, the sewage generated from the Proposed use will be discharged to the manhole FMH1.

2.3.2 The sewerage system is shown in **Figure 2.1**.

2.4 Wastewater Generated by the Proposed Use

2.4.1 The sewage generated by the Proposed use is given in **Table 2.1** shown below. Detailed Calculation refers to **Appendix 2.1**.

Table 2.1 Estimated Peak Flow

Calculation for Sewage Generation Rate of the Proposed use			
1. Dormitory for Student and Staff			
Number of residents	=	900	people
Unit Flow Factors	=	0.19	m^3/people/day (refer to Table T-1 of GESF – Institutional and Special Class)
Sewage generation rate	=	171	m^3/ day

Total Flow from the Proposed use			
Flow rate	=	171.0	m^3/day
Flow rate with P_{CIF}	=	171.0	m^3/day (refer to Table T-4 of GESF – Sandy Bay - 1.0)
Contributing Population	=	633	people
Peaking Factor	=	8	Refer to Table T-5 of GESF for population 1,000-5,000 incl. stormwater allowance
Peak Flow	=	**15.8**	L/s

2.5 Assessment of Sewerage Impact

2.5.1 As shown in **Figure 2.1**, sewerage generated from the Proposed use will be discharged from the 3 proposed terminal manholes located within the Subject Site to Manhole MH7022565 which is located at the Pok Fu Lam Road.

2.5.2 Catchments in the vicinity of the Application Site are shown in **Figure 2.2**. Detailed calculation of sewage generation, peak flow estimation and the capacity of the public sewer can be referred to **Appendix 2.1**. Based on the assessment results, the capacity sufficient for the sewerage generated from the Proposed use and the surrounding catchment. Therefore, no upgrading works on the public sewers are required.

3. DRAINAGE IMPACT ASSESSMENT

3.1 Discussion

3.1.1 Surface runoff is mainly from rainfall and it will be directed to existing public storm drains. As the existing site is currently on hard-paved ground, it is anticipated that the proposed development will not affect the drainage path or lead to any changes in the runoff behaviour.

3.1.2 There is no change or abandonment of existing drains and hence no extra stormwater discharge is imposed. Therefore, adverse impact on the existing drainage system is not anticipated and a detailed drainage impact assessment is therefore unnecessary.

4. CONCLUSION

4.1.1 The Subject Site is mainly zoned as "R(C)" with minor portion zoned as "GB" on the Approved Pok Fu Lam Outline Zoning Plan (OZP) (No. S/H10/23).

4.1.2 The Proposed use consists of student hostel. The estimated sewage generation rate of the Proposed use has been quantitatively addressed.

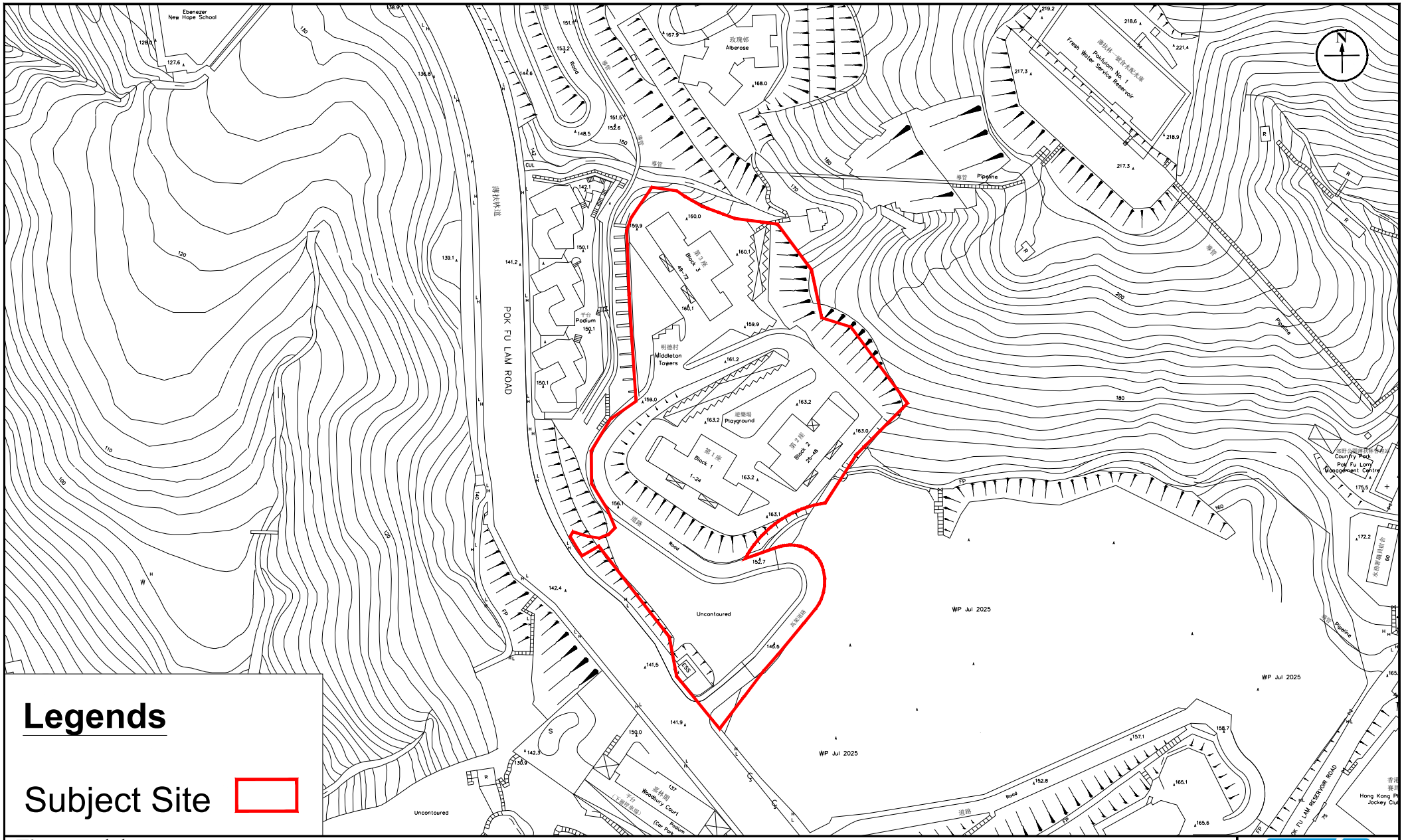
4.1.3 The estimated peak sewage generation from the Proposed use is about 15.8 litre/sec.

4.1.4 Based on the calculations, as shown in **Appendix 2.1**, the capacity of existing sewers are sufficient to cater for the sewage generated from the Proposed use. No upgrading works on the existing public sewers are required and therefore there would not have any adverse impact on the public sewerage system.

4.1.5 Surface runoff is mainly from rainfall and it will be directed to existing public storm drains. As the existing site is currently on hard-paved ground, it is anticipated that the proposed development will not affect the drainage path or lead to any changes in the runoff behaviour.

4.1.6 There is no change or abandonment of existing drains and hence no extra stormwater discharge is imposed. Therefore, adverse impact on the existing drainage system is not anticipated and a detailed drainage impact assessment is therefore unnecessary.

Figures



Legends

Subject Site

Figure: 1.1	RAMBOLL
Title: Location of Subject Site and its Environs	Drawn by: SC
	Checked by: TC
Project: Redevelopment of Middleton Towers at Pok Fu Lam	Rev.: 1.0
	Date: Feb 2026

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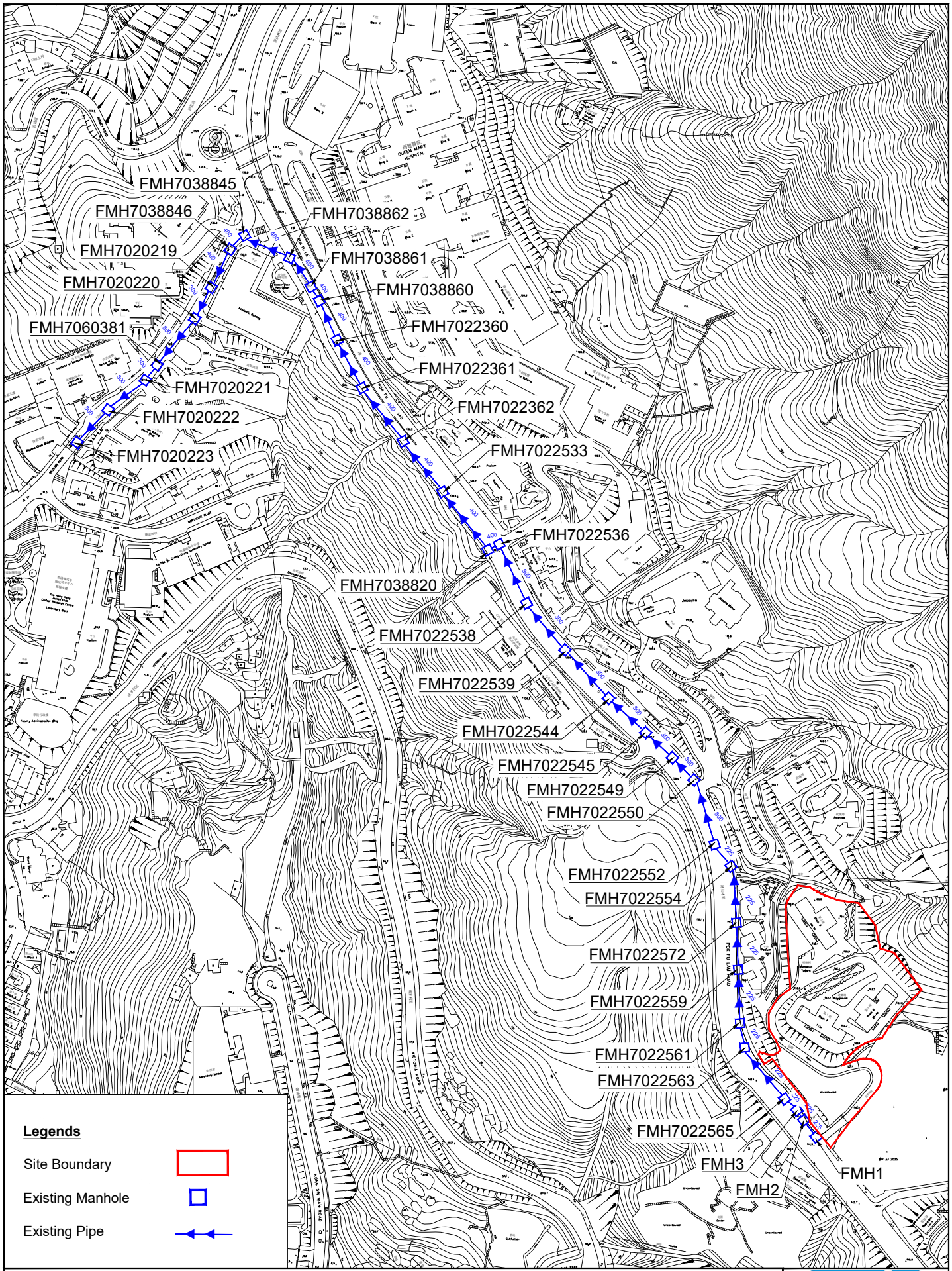

Figure: 2.1

Title: Existing Sewerage System in the Vicinity of the Subject Site

Project: Proposed Redevelopment of Middleton Towers at Pok Fu Lam

RAMBOLL

Drawn by:	SC
Checked by:	TC
Rev.:	1.0
Date:	Feb 2026

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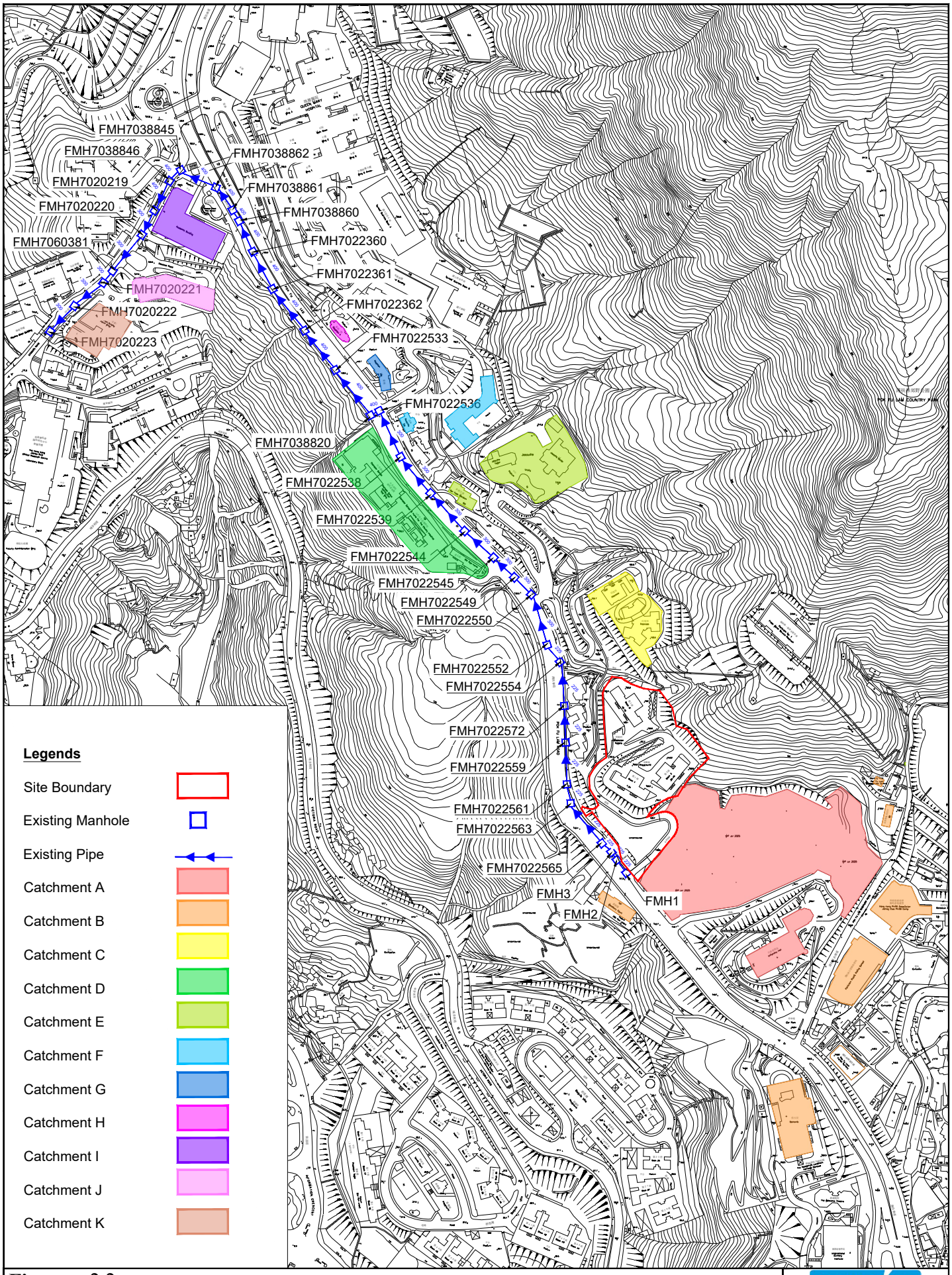

Figure: 2.2

Title: Existing Sewerage System and Catchment Areas in the Vicinity of the Subject Site

Project: Proposed Redevelopment of Middleton Towers at Pok Fu Lam

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Checked by:	TC
Rev.:	1.0
Date:	Feb 2026

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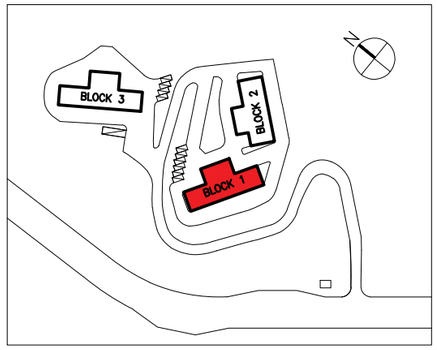
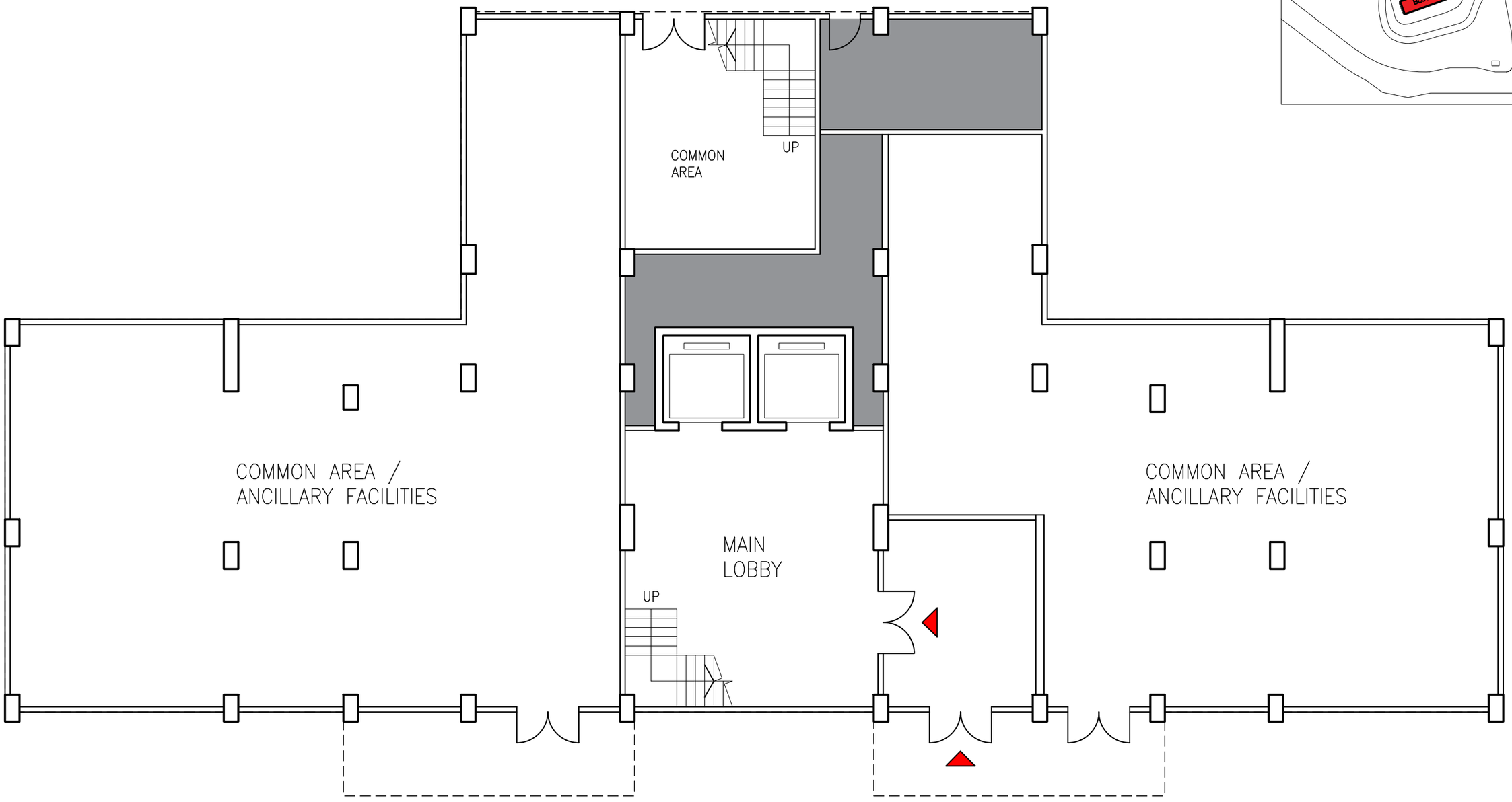
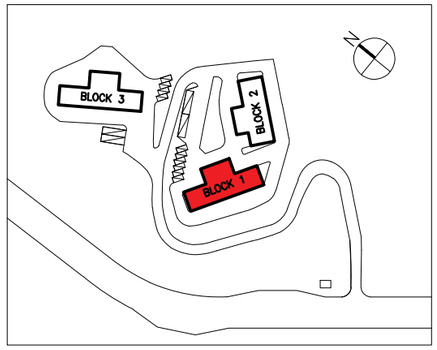
Appendix 1.1 The Typical Floor Plans of the Planning Statement





BLOCK 1 – G/F LAYOUT

SCALE 1:100



B = BATH ROOM / SHARED BATH ROOM

BLOCK 1 TYPICAL (1/F – 12/F ; 12 STOREYS)

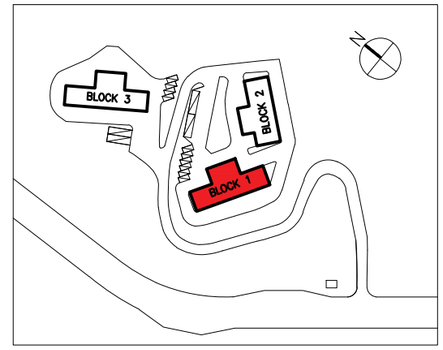
SCALE 1:100

BLOCK A TYPICAL FLOOR = 26 UNITS APPROX.

BLOCK 1 TO 3

TOTAL PROPOSED UNITS	=	900 UNITS
BLOCK 1 TYP	=	26 APPROX.
BLOCK 2 TYP	=	23 APPROX.
BLOCK 3 TYP	=	26 APPROX.

SUBJECT TO FUTURE DETAIL DESIGN



B = BATH ROOM / SHARED BATH ROOM

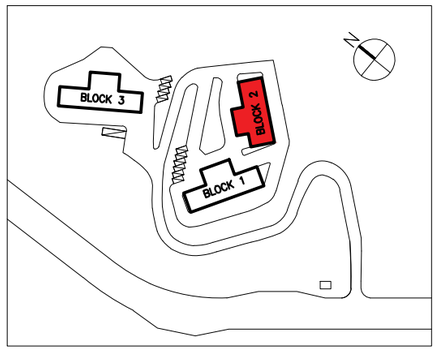
BLOCK 1 WITH ACCESSIBLE ROOM

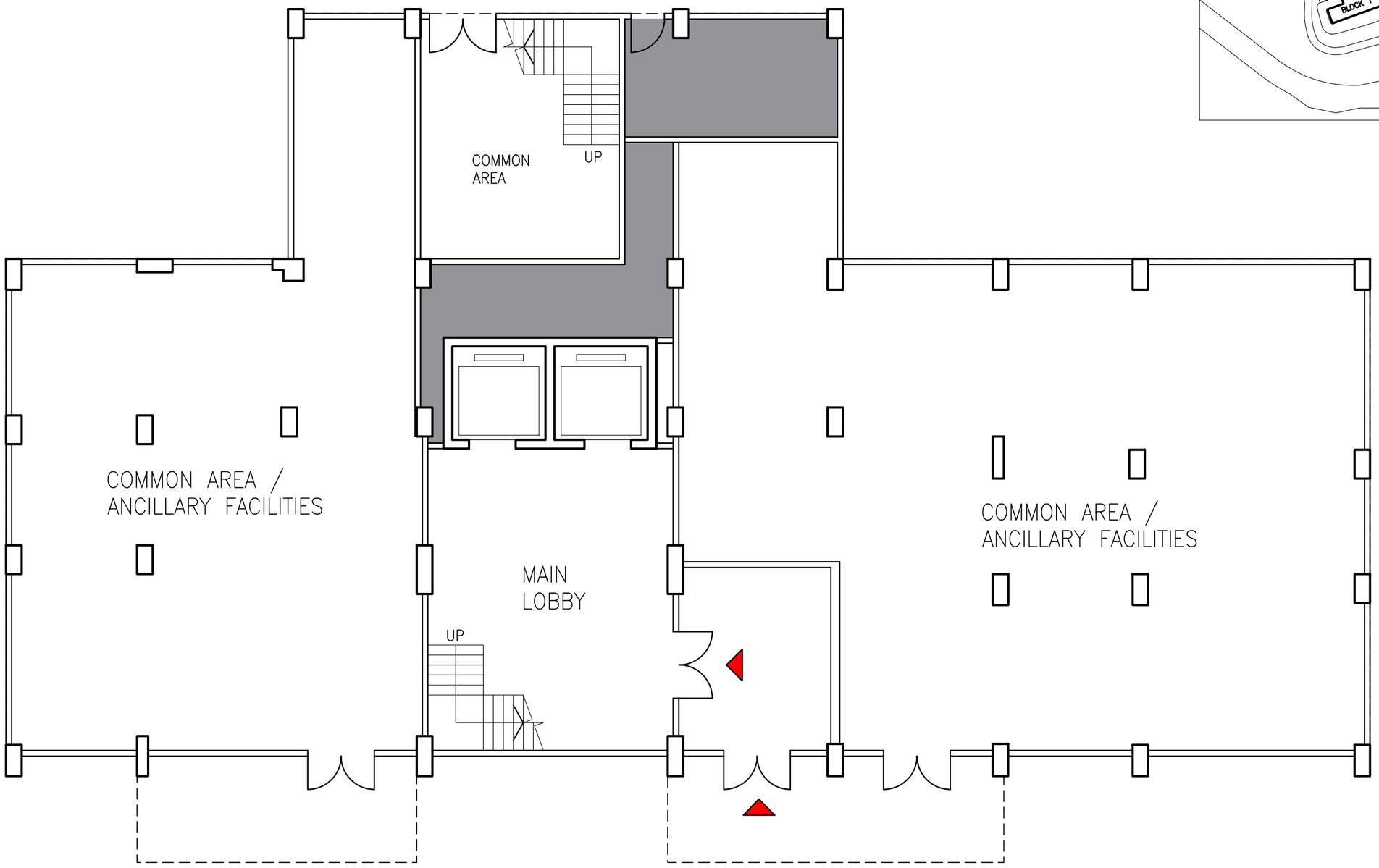
SCALE 1:100

BLOCK A TYPICAL FLOOR = 26 UNITS APPROX.

BLOCK 1 TO 3

TOTAL PROPOSED UNITS = 900 UNITS
BLOCK 1 TYP = 26 APPROX.
BLOCK 2 TYP = 23 APPROX.
BLOCK 3 TYP = 26 APPROX.
SUBJECT TO FUTURE DETAIL DESIGN





BLOCK 2 – G/F LAYOUT

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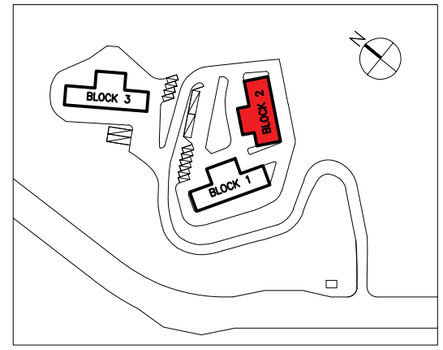


BLOCK 2 TYPICAL (1/F – 12/F ; 12 STOREYS)

SCALE 1:100

BLOCK B TYPICAL FLOOR = 23 UNITS APPROX.

BLOCK 1 TO 3

TOTAL PROPOSED UNITS	=	900 UNITS
BLOCK 1 TYP	=	26 APPROX.
BLOCK 2 TYP	=	23 APPROX.
BLOCK 3 TYP	=	26 APPROX.

SUBJECT TO FUTURE DETAIL DESIGN

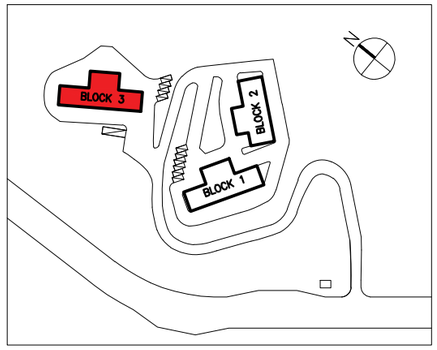
BLOCK 2 WITH ACCESSIBLE ROOM

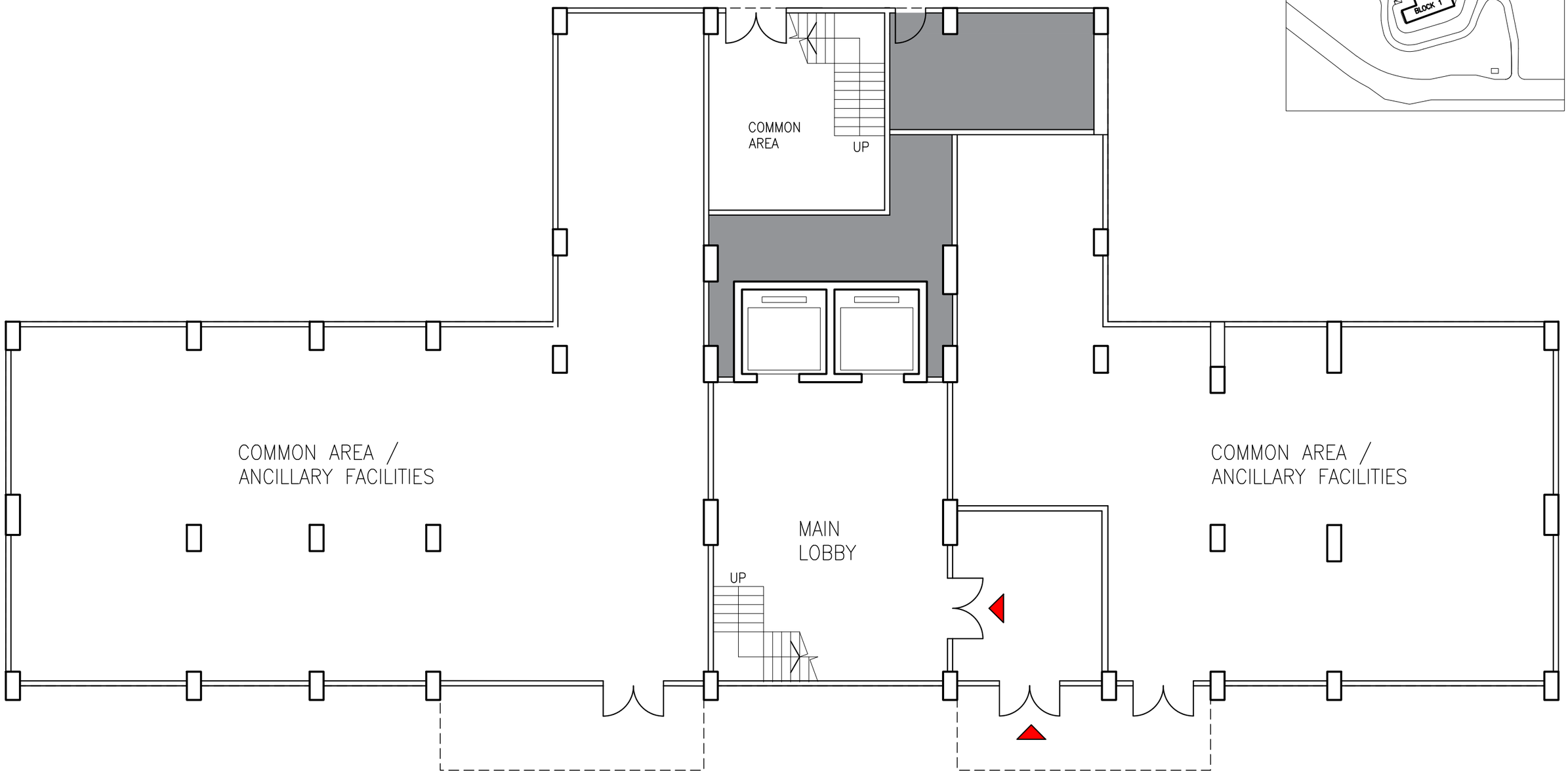
SCALE 1:100

BLOCK B TYPICAL FLOOR = 23 UNITS APPROX.

BLOCK 1 TO 3

TOTAL PROPOSED UNITS = 900 UNITS
BLOCK 1 TYP = 26 APPROX.
BLOCK 2 TYP = 23 APPROX.
BLOCK 3 TYP = 26 APPROX.
SUBJECT TO FUTURE DETAIL DESIGN





BLOCK 3 – G/F LAYOUT

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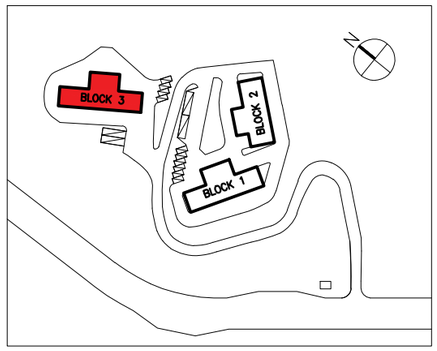


B = BATH ROOM / SHARED BATH ROOM

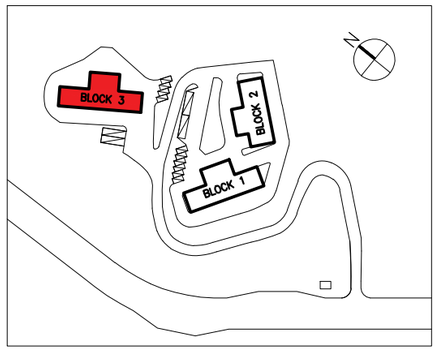
BLOCK 3 TYP (1/F – 12/F ; 12 STOREYS)

SCALE 1:100

BLOCK C TYPICAL FLOOR = 26 UNITS APPROX.

BLOCK 1 TO 3

TOTAL PROPOSED UNITS = 900 UNITS
BLOCK 1 TYP = 26 APPROX.
BLOCK 2 TYP = 23 APPROX.
BLOCK 3 TYP = 26 APPROX.
SUBJECT TO FUTURE DETAIL DESIGN



B = BATH ROOM / SHARED BATH ROOM

BLOCK 3 WITH ACCESSIBLE ROOM

SCALE 1:100

BLOCK C TYPICAL FLOOR = 26 UNITS APPROX.

BLOCK 1 TO 3

TOTAL PROPOSED UNITS = 900 UNITS
BLOCK 1 TYP = 26 APPROX.
BLOCK 2 TYP = 23 APPROX.
BLOCK 3 TYP = 26 APPROX.
SUBJECT TO FUTURE DETAIL DESIGN

Appendix 2.1 Detailed Sewerage Impact Assessment Calculations

Table 1 Calculation for Sewage Generation Rate of the Proposed Development

Estimated Sewage Flow from Proposed Development				
1a. Dormitory for Student and Staff				
Number of residents	=	900	people	
Unit Flow Factors	=	0.19	m^3/day	(Institutional and Special Class in Table T-1 of GESF)
Sewage generation rate	=	171	m^3/day	
Total Flow from Proposed Development				
Total ADWF in Catchment A1	=	171.0	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Total ADWF with Catchment Inflow Factor PCIF	=	**171.0**	m^3/day	
				(refer to Section 12 of GESF -- Contributing population is the Flow rate with PCIF ÷ 0.27, while 0.27 is the average unit flow factor of all typical residents plus employees)
Contributing Population	=	633	people	
Peaking factor	=	8		Refer to Table T-5 of GESF for population <1,000 incl. stormwater allowance
Peak Flow	=	**15.8**	L/s	

Table 2 - Estimated Sewage Flow for Catchment Areas (Catchment A)

Catchment A -

1a. Unviveraity Hall				
Number of residents	=	110	people	
Unit Flow Factors	=	0.19	m^3/day	(Institutional and Special Class in Table T-1 of GESF)
Sewage generation rate	=	**20.9**	m^3/day	
1b. Unviveraity Hall				
Total number of staff	=	20	people	
Design flow for staff	=	0.28	m^3/person/day	(refer to Table T-2 of GESF , Community, Social & Personal Services)
Sewage generation rate	=	**5.6**	m^3/day	
2a. High West- Students Hostels				
Number of residents	=	984	people	
Unit Flow Factors	=	0.19	m^3/day	(Institutional and Special Class in Table T-1 of GESF)
Sewage generation rate	=	**187.0**	m^3/day	
2b. High West- Staff Quarters 1&2				
Number of residents	=	819	people	
Unit Flow Factors	=	0.27	m^3/day	(Institutional and Special Class in Table T-1 of GESF)
Sewage generation rate	=	**221.1**	m^3/day	
2c. High West- Student Canteen				
Total number of staff	=	31	people	
Design flow for staff	=	1.58	m^3/day	(Institutional and Special Class in Table T-1 of GESF)
Sewage generation rate	=	**49.0**	m^3/day	
2d. High West- Student Canteen				
Total number of staff	=	35	people	
Design flow for staff	=	0.28	m^3/day	(Institutional and Special Class in Table T-1 of GESF)
Sewage generation rate	=	**9.8**	m^3/day	
Estimated Sewage Flow from Catchment A				
Catchment A				
Total ADWF in Catchment A	=	466.9	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Total ADWF with Catchment Inflow Factor PCIF	=	**466.9**	m^3/day	
Contributing Population	=	1729	people	Refer to S12.1 of GESF, Contributing Population = Calculated total average flow/ UFF
Peaking factor	=	6		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak Flow in Catchment A	=	**32.4**	L/s	
Total Flow from the Proposed Development and Catchment A				
Total ADWF with Catchment Inflow Factor P_{CIF}	=	637.9	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Flow rate with P_{CIF}	=	637.9	m^3/day	
Contributing population	=	2362		(refer to Section 12 of GESF -- Contributing population is the Flow rate with PCIF ÷ 0.27, while 0.27 is the average unit flow factor of all typical residents plus emp
Peaking factor	=	6		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak flow	=	**44.3**	litre/sec	

Table 3 - Estimated Sewage Flow for Catchment Areas (Catchment B)

Catchment B				
1. Bethanie				
Number of residents	=	50	people	
Unit Flow Factors	=	0.28	m^3/day	(R2 in Table T-1 of GESF)
Sewage generation rate	=	**14.0**	m^3/day	
2a. Po Fu Lam Transit Nursery				
Total number of staff	=	10	people	
Design flow for staff	=	0.28	m^3/person/day	(refer to Table T-2 of GESF , Community, Social & Personal Services)
Sewage generation rate	=	**2.8**	m^3/day	
3a.Country Park Pok Fu Lam Management Centre				
Number of residents	=	5	people	
Unit Flow Factors	=	0.19	m^3/day	(Institutional and Special Class in Table T-1 of GESF)
Sewage generation rate	=	**1.0**	m^3/day	
3b.Country Park Pok Fu Lam Management Centre- Swimming pool				
Instant Peak Flow	=	**46.2**	L/s	
4. Woodbury Court	=	**30.8**		
5. WSD Staff Quarters				
Number of residents	=	24	people	
Unit Flow Factors	=	0.19	m^3/day	(Institutional and Special Class in Table T-1 of GESF)
Sewage generation rate		**4.6**	m^3/day	
6a.Hong Kong PHAB Association Jockey Club PHAB Camp				
Number of residents	=	160	people	
Unit Flow Factors	=	0.19	m^3/day	(Institutional and Special Class in Table T-1 of GESF)
Sewage generation rate	=	**30.4**	m^3/day	
6b.Hong Kong PHAB Association Jockey Club PHAB Camp				
Number of residents	=	20	people	
Unit Flow Factors	=	0.28	m^3/day	(Institutional and Special Class in Table T-1 of GESF)
Sewage generation rate	=	**5.6**	m^3/day	
7.Hong Kong PHAB Association Jockey Club PHAB Camp- Swimming pool				
Instant Peak Flow	=	**45.1**	L/s	
8.Pokfulam Public Riding School				
Number of residents	=	170	people	
Unit Flow Factors	=	0.28	m^3/day	(Institutional and Special Class in Table T-1 of GESF)
Sewage generation rate	=	**47.6**	m^3/day	
Estimated Sewage Flow from Catchment B				
Total ADWF in Catchment B	=	136.7	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Total ADWF with Catchment Inflow Factor PCIF	=	**136.7**	m^3/day	
Contributing Population	=	506	people	Refer to S12.1 of GESF, Contributing Population = Calculated total average flow/ UFF
Peaking factor	=	8		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak Flow in Catchment B	=	**12.7**	L/s	
Total Flow from the Proposed Development and Catchment A and B				
Total ADWF with Catchment Inflow Factor P_{CIF}	=	774.6	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Flow rate with P_{CIF}	=	774.6	m^3/day	
Contributing population	=	2869		(refer to Section 12 of GESF -- Contributing population is the Flow rate with PCIF ÷
Peaking factor	=	6		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak flow	=	**53.8**	litre/sec	

Table 4 - Estimated Sewage Flow for Catchment Areas (Catchment C)

Catchment C

1. Alberose

Number of residents	=	8	people	
Unit Flow Factors	=	0.37	m^3/day	(R3 in Table T-1 of GESF)
Sewage generation rate	=	**3.0**	m^3/day	

Estimated Sewage Flow from Catchment C

Total ADWF in Catchment C	=	3.0	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Total ADWF with Catchment Inflow Factor PCIF	=	**3.0**	m^3/day	
Contributing Population	=	11	people	Refer to S12.1 of GESF, Contributing Population = Calculated total average flow/ UFF
Peaking factor	=	8		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak Flow in Catchment C	=	**0.3**	L/s	

Total Flow from the Proposed Development and Catchment A, B and C

Total ADWF with Catchment Inflow Factor P_{CIF}	=	777.6	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Flow rate with P_{CIF}	=	777.6	m^3/day	
Contributing population	=	2880		(refer to Section 12 of GESF -- Contributing population is the Flow rate with PCIF ÷
Peaking factor	=	6		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak flow	=	**54.0**	litre/sec	

Table 5 - Estimated Sewage Flow for Catchment Areas (Catchment D)

Catchment D

1a. Ebenezer New Hope School & Home for the Visually imparier (Residents)

Number of residents	=	259	people	
Unit Flow Factors	=	0.19	m^3/day	(Institutional and Special Class in Table T-1 of GESF)
Sewage generation rate	=	**49.2**	m^3/day	

1b. Ebenezer New Hope School & Home for the Visually imparier (Staff)

Total number of staff	=	8	people	
Design flow for staff	=	0.28	m^3/person/day	(refer to Table T-2 of GESF , Community, Social & Personal Services)
Sewage generation rate	=	**2.2**	m^3/day	

Estimated Sewage Flow from Catchment D

Total ADWF in Catchment D	=	51.5	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Total ADWF with Catchment Inflow Factor PCIF	=	**51.5**	m^3/day	
Contributing Population	=	191	people	Refer to S12.1 of GESF, Contributing Population = Calculated total average flow/ UFF
Peaking factor	=	8		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak Flow in Catchment D	=	**4.8**	L/s	

Total Flow from the Proposed Development and Catchment A, B, C and D

Total ADWF with Catchment Inflow Factor P_{CIF}	=	829.0	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Flow rate with P_{CIF}	=	829.0	m^3/day	
Contributing population	=	3070		(refer to Section 12 of GESF -- Contributing population is the Flow rate with PCIF ÷
Peaking factor	=	6		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak flow	=	**57.6**	litre/sec	

Table 6 - Estimated Sewage Flow for Catchment Areas (Catchment E)

Catchment E

1a. Dor Fook Mansion (Residents)

Number of residents	=	93	people	
Unit Flow Factors	=	0.27	m^3/day	(R2 in Table T-1 of GESF)
Sewage generation rate	=	**25.1**	m^3/day	

1b. Dor Fook Mansion (Staff)

Total number of staff	=	3	people	
Design flow for staff	=	0.28	m^3/person/day	(refer to Table T-2 of GESF , Community, Social & Personal Services)
Sewage generation rate	=	**0.8**	m^3/day	

2a. Jessville Manor (Residents)

Number of residents	=	15	people	
Unit Flow Factors	=	0.27	m^3/day	(R2 in Table T-1 of GESF)
Sewage generation rate	=	**4.1**	m^3/day	

2b. Jessville Manor (Staff)

Total number of staff	=	5	people	
Design flow for staff	=	0.28	m^3/person/day	(refer to Table T-2 of GESF , Community, Social & Personal Services)
Sewage generation rate	=	**1.4**	m^3/day	

3a. Jessville Tower (Residents)

Number of residents	=	104	people	
Unit Flow Factors	=	0.27	m^3/day	
Sewage generation rate	=	**28.1**	m^3/day	

3b. Jessville Manor (Staff)

Total number of staff	=	5	people	
Design flow for staff	=	0.28	m^3/person/day	
Sewage generation rate	=	**1.4**	m^3/day	

Estimated Sewage Flow from Catchment E

Total ADWF in Catchment E	=	60.9	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Total ADWF with Catchment Inflow Factor PCIF	=	**60.9**	m^3/day	
Contributing Population	=	225	people	Refer to S12.1 of GESF, Contributing Population = Calculated total average flow/ UFF
Peaking factor	=	8		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak Flow in Catchment E	=	**5.6**	L/s	

Total Flow from the Proposed Development and Catchment A, B, C, D and E

Total ADWF with Catchment Inflow Factor P_{CIF}	=	889.9	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Flow rate with P_{CIF}	=	889.9	m^3/day	
Contributing population	=	3296		(refer to Section 12 of GESF -- Contributing population is the Flow rate with PCIF ÷
Peaking factor	=	6		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak flow	=	**61.8**	litre/sec	

Table 7 - Estimated Sewage Flow for Catchment Areas (Catchment F)

Catchment F

1a. Radcliffe (Residents)				
Number of residents	=	37	people	
Unit Flow Factors	=	0.27	m^3/day	(R2 in Table T-1 of GESF)
Sewage generation rate	=	**10.0**	m^3/day	
1b. Radcliffe (Staff)				
Total number of staff	=	2	people	
Design flow for staff	=	0.28	m^3/person/day	(refer to Table T-2 of GESF , Community, Social & Personal Services)
Sewage generation rate	=	**0.6**	m^3/day	
2a. Government Quarters (Residents)				
Number of residents	=	320	people	
Unit Flow Factors	=	0.19	m^3/day	(Institutional and Special Class in Table T-1 of GESF)
Sewage generation rate	=	**60.8**	m^3/day	
2b. Government Quarters (Staff)				
Total number of staff	=	30	people	
Design flow for staff	=	0.28	m^3/person/day	(refer to Table T-2 of GESF , Community, Social & Personal Services)
Sewage generation rate	=	**8.4**	m^3/day	
3. Hospital Authority				
Total number of staff	=	126	people	
Design flow for staff	=	0.28	m^3/person/day	(refer to Table T-2 of GESF , Community, Social & Personal Services)
Sewage generation rate	=	**35.3**	m^3/day	
Estimated Sewage Flow from Catchment F				
Total ADWF in Catchment F	=	115.0	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Total ADWF with Catchment Inflow Factor PCIF	=	**115.0**	m^3/day	
Contributing Population	=	426	people	Refer to S12.1 of GESF, Contributing Population = Calculated total average flow/ UFF
Peaking factor	=	8		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak Flow in Catchment F	=	**10.7**	L/s	
Total Flow from the Proposed Development and Catchment A, B, C, D, E and F				
Total ADWF with Catchment Inflow Factor P_{CIF}	=	1004.9	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Flow rate with P_{CIF}	=	1004.9	m^3/day	
Contributing population	=	3722		(refer to Section 12 of GESF -- Contributing population is the Flow rate with PCIF ÷
Peaking factor	=	6		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak flow	=	**69.8**	litre/sec	

Table 8 - Estimated Sewage Flow for Catchment Areas (Catchment G)

Catchment G

1a. Roytalton (Residents)

Number of residents	=	111	people	
Unit Flow Factors	=	0.27	m^3/day	(R2 in Table T-1 of GESF)
Sewage generation rate	=	**30.0**	m^3/day	

1b. Royalton (Staff)

Total number of staff	=	6	people	
Design flow for staff	=	0.28	m^3/person/day	(refer to Table T-2 of GESF , Community, Social & Personal Services)
Sewage generation rate	=	**1.7**	m^3/day	

Estimated Sewage Flow from Catchment G

Total ADWF in Catchment G	=	31.7	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Total ADWF with Catchment Inflow Factor PCIF	=	**31.7**	m^3/day	
Contributing Population	=	117	people	Refer to S12.1 of GESF, Contributing Population = Calculated total average flow/ UFF
Peaking factor	=	8		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak Flow in Catchment G	=	**2.9**	L/s	

Total Flow from the Proposed Development and Catchment A, B, C, D, E, F and G

Total ADWF with Catchment Inflow Factor P_{CIF}	=	1036.6	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Flow rate with P_{CIF}	=	1036.6	m^3/day	
Contributing population	=	3839		(refer to Section 12 of GESF -- Contributing population is the Flow rate with PCIF ÷
Peaking factor	=	6		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak flow	=	**72.0**	litre/sec	

Table 9 - Estimated Sewage Flow for Catchment Areas (Catchment H)

Catchment H

1a. Roytalton II (Residents)

Number of residents	=	63	people	
Unit Flow Factors	=	0.27	m^3/day	(R2 in Table T-1 of GESF)
Sewage generation rate	=	**17.0**	m^3/day	

1b. Royalton II (Staff)

Total number of staff	=	3	people	
Design flow for staff	=	0.28	m^3/person/day	(refer to Table T-2 of GESF , Community, Social & Personal Services)
Sewage generation rate	=	**0.8**	m^3/day	

Estimated Sewage Flow from Catchment H

Total ADWF in Catchment H	=	17.9	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Total ADWF with Catchment Inflow Factor PCIF	=	**17.9**	m^3/day	
Contributing Population	=	66	people	Refer to S12.1 of GESF, Contributing Population = Calculated total average flow/ UFF
Peaking factor	=	8		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak Flow in Catchment H	=	**1.7**	L/s	

Total Flow from the Proposed Development and Catchment A, B, C, D, E, F, G and H

Total ADWF with Catchment Inflow Factor P_{CIF}	=	1054.4	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Flow rate with P_{CIF}	=	1054.4	m^3/day	
Contributing population	=	3905		(refer to Section 12 of GESF -- Contributing population is the Flow rate with PCIF ÷
Peaking factor	=	6		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak flow	=	**73.2**	litre/sec	

Table 10 - Estimated Sewage Flow for Catchment Areas (Catchment I)

Catchment I

1a. HKU Med Academic Building

Total number of staff	=	40	people	
Design flow for staff	=	0.28	m^3/person/day	(refer to Table T-2 of GESF , Community, Social & Personal Services)
Sewage generation rate	=	**11.2**	m^3/day	

Estimated Sewage Flow from Catchment I

Total ADWF in Catchment I	=	11.2	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Total ADWF with Catchment Inflow Factor PCIF	=	**11.2**	m^3/day	
Contributing Population	=	41	people	Refer to S12.1 of GESF, Contributing Population = Calculated total average flow/ UFF
Peaking factor	=	8		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak Flow in Catchment I	=	**1.0**	L/s	

Total Flow from the Proposed Development and Catchment A, B, C, D, E, F, G, H and I

Total ADWF with Catchment Inflow Factor P_{CIF}	=	1065.6	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Flow rate with P_{CIF}	=	1065.6	m^3/day	
Contributing population	=	3947		(refer to Section 12 of GESF -- Contributing population is the Flow rate with PCIF ÷
Peaking factor	=	6		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak flow	=	**74.0**	litre/sec	

Table 11 - Estimated Sewage Flow for Catchment Areas (Catchment J)

Catchment J

1a. HKU Hong Kong Jockey Club Building for Interdisciplinary Research

Total number of staff	=	20	people	
Design flow for staff	=	0.28	m^3/person/day	(refer to Table T-2 of GESF , Community, Social & Personal Services)
Sewage generation rate	=	**5.6**	m^3/day	

Estimated Sewage Flow from Catchment J

Total ADWF in Catchment J	=	5.6	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Total ADWF with Catchment Inflow Factor PCIF	=	**5.6**	m^3/day	
Contributing Population	=	21	people	Refer to S12.1 of GESF, Contributing Population = Calculated total average flow/ UFF
Peaking factor	=	8		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak Flow in Catchment J	=	**0.5**	L/s	

Total Flow from the Proposed Development and Catchment A, B, C, D, E, F, G, H, I and J

Total ADWF with Catchment Inflow Factor P_{CIF}	=	1071.2	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Flow rate with P_{CIF}	=	1071.2	m^3/day	
Contributing population	=	3967		(refer to Section 12 of GESF -- Contributing population is the Flow rate with PCIF ÷
Peaking factor	=	6		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak flow	=	**74.4**	litre/sec	

Table 12 - Estimated Sewage Flow for Catchment Areas (Catchment K)

Catchment K

1a. Development at No.7 Sassoon

Number of Employee	=	933	people	
Unit Flow Factors	=	0.28	m^3/day	(Institutional and Special Class in Table T-1 of GESF)
Sewage generation rate	=	**261.2**	m^3/day	

1b. Development at No.7 Sassoon

Total number of staff	=	1400	people	
Design flow for staff	=	0.04	m^3/person/day	(refer to Table T-2 of GESF , Community, Social & Personal Services)
Sewage generation rate	=	**56.0**	m^3/day	

Estimated Sewage Flow from Catchment K

Total ADWF in Catchment K	=	317.2	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Total ADWF with Catchment Inflow Factor PCIF	=	**317.2**	m^3/day	
Contributing Population	=	1175	people	Refer to S12.1 of GESF, Contributing Population = Calculated total average flow/ UFF
Peaking factor	=	6		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak Flow in Catchment K	=	**22.0**	L/s	

Total Flow from the Proposed Development and Catchment A, B, C, D, E, F, G, H, I, J and K

Total ADWF with Catchment Inflow Factor P_{CIF}	=	1388.5	m^3/day	
Catchment Inflow Factor PCIF	=	1.0		Refer to Table T-4 of GESF - Sandy Bay
Flow rate with P_{CIF}	=	1388.5	m^3/day	
Contributing population	=	5142		(refer to Section 12 of GESF -- Contributing population is the Flow rate with PCIF ÷
Peaking factor	=	5		Refer to Table T-5 of GESF for population 1,000 - 5,000 incl. stormwater allowance
Peak flow	=	**80.4**	litre/sec	

Table 13 - Estimated Sewage Flow from Swimming Pools

PHAB

Assumed area	=	500	m^2
Assumed depth of water	=	1.5	m
Volume of water	=	750.0	m^3
Turnover Rate	=	6.0	hr (CAP132CA, Section 9 Swimming Pools Regulation (open air pool))
Surface loading rate of filter	=	50.0	$m^3/m^2/hr$
Filter areas required	=	2.5	m^2
Backwashing flow rate	=	30.0	$m^3/m^2/hr$
Design flow for backwashing	=	75.0	m^3/hr
Backwash duration	=	7.0	min/day
Backwash generation rate	=	8.75	m^3/day
Backwash generation rate	=	**20.8**	litre/sec

Woodbury Court

Assumed area	=	105	m^2
Assumed depth of water	=	1.5	m
Volume of water	=	157.5	m^3
Turnover Rate	=	6.0	hr (CAP132CA, Section 9 Swimming Pools Regulation (open air pool))
Surface loading rate of filter	=	50.0	$m^3/m^2/hr$
Filter areas required	=	0.5	m^2
Backwashing flow rate	=	30.0	$m^3/m^2/hr$
Design flow for backwashing	=	15.8	m^3/hr
Backwash duration	=	7.0	min/day
Backwash generation rate	=	1.84	m^3/day
Backwash generation rate	=	**4.4**	litre/sec

131 PFL Road

Assumed area	=	150	m^2
Assumed depth of water	=	1.5	m
Volume of water	=	225.0	m^3
Turnover Rate	=	6.0	hr (CAP132CA, Section 9 Swimming Pools Regulation (open air pool))
Surface loading rate of filter	=	50.0	$m^3/m^2/hr$
Filter areas required	=	0.8	m^2
Backwashing flow rate	=	30.0	$m^3/m^2/hr$
Design flow for backwashing	=	22.5	m^3/hr
Backwash duration	=	7.0	min/day
Backwash generation rate	=	2.63	m^3/day
Backwash generation rate	=	**6.3**	litre/sec

Royalton II

Assumed area	=	105	m^2
Assumed depth of water	=	1.5	m
Volume of water	=	157.5	m^3
Turnover Rate	=	6.0	hr (CAP132CA, Section 9 Swimming Pools Regulation (open air pool))
Surface loading rate of filter	=	50.0	$m^3/m^2/hr$
Filter areas required	=	0.5	m^2
Backwashing flow rate	=	30.0	$m^3/m^2/hr$
Design flow for backwashing	=	15.8	m^3/hr
Backwash duration	=	7.0	min/day
Backwash generation rate	=	1.84	m^3/day
Backwash generation rate	=	**4.4**	litre/sec

Jessville Tower

Assumed area	=	240	m^2
Assumed depth of water	=	1.5	m
Volume of water	=	360.0	m^3
Turnover Rate	=	6.0	hr (CAP132CA, Section 9 Swimming Pools Regulation (open air pool))
Surface loading rate of filter	=	50.0	$m^3/m^2/hr$
Filter areas required	=	1.2	m^2
Backwashing flow rate	=	30.0	$m^3/m^2/hr$
Design flow for backwashing	=	36.0	m^3/hr
Backwash duration	=	7.0	min/day
Backwash generation rate	=	4.20	m^3/day
Backwash generation rate	=	**10.0**	litre/sec

Radcliffe

Assumed area	=	290	m^2
Assumed depth of water	=	1.5	m
Volume of water	=	435.0	m^3
Turnover Rate	=	6.0	hr (CAP132CA, Section 9 Swimming Pools Regulation (open air pool))
Surface loading rate of filter	=	50.0	$m^3/m^2/hr$
Filter areas required	=	1.5	m^2
Backwashing flow rate	=	30.0	$m^3/m^2/hr$
Design flow for backwashing	=	43.5	m^3/hr
Backwash duration	=	7.0	min/day
Backwash generation rate	=	5.08	m^3/day
Backwash generation rate	=	**12.1**	litre/sec

Royalton

Assumed area	=	70	m^2
Assumed depth of water	=	1.5	m
Volume of water	=	105.0	m^3
Turnover Rate	=	6.0	hr (CAP132CA, Section 9 Swimming Pools Regulation (open air pool))
Surface loading rate of filter	=	50.0	$m^3/m^2/hr$
Filter areas required	=	0.4	m^2
Backwashing flow rate	=	30.0	$m^3/m^2/hr$
Design flow for backwashing	=	10.5	m^3/hr
Backwash duration	=	7.0	min/day
Backwash generation rate	=	1.23	m^3/day
Backwash generation rate	=	**2.9**	litre/sec

Table 14 - Sewerage Capacity Calculation

A. Hydraulic Capacity of Sewers and Comparison of Sewer Capacity to Sewage Generated from Proposed Development under Surcharge Contidion with Safety Factor = 1.0

Sewer Pipe ID	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	US CL	DS CL	US IL	DS IL	Gradient	g	k_s	s	v	V	Area	Area	Perimeter	R=A/P (Full Bore Radius)	Q (Full)	Estimated Capacity	Remarks on Material Assumption
			mm	m	mPD	mPD	mPD	mPD	1 in	m/s^2	m		m^2/s	m/s	m^2	m^2	m	m	m^3/s	L/s	
S1-S2	FMH1	FMH2	225	15.0	141.86	142.43	140.20	140.05	100	9.81	0.0015	0.010	1.00E-06	1.15	0.04	0.04	0.71	0.06	0.05	**46**	Clay [1]
S2-S3	FMH2	FMH3	225	14.0	142.43	142.73	140.05	139.91	100	9.81	0.0015	0.010	1.00E-06	1.15	0.04	0.04	0.71	0.06	0.05	**46**	Clay [1]
S3-S4	FMH3	FMH7022565	225	4.0	142.73	143.01	139.91	139.87	100	9.81	0.0015	0.010	1.00E-06	1.15	0.04	0.04	0.71	0.06	0.05	**46**	Clay [1]
S4-S5	FMH7022565	FMH7022563	225	44.9	143.01	142.04	139.73	139.38	128	9.81	0.003	0.008	1.00E-06	0.90	0.04	0.04	0.71	0.06	0.04	**36**	Clay [1]
S5-S6	FMH7022563	FMH7022561	225	16.3	142.04	141.65	139.35	139.24	148	9.81	0.003	0.007	1.00E-06	0.84	0.04	0.04	0.71	0.06	0.03	**33**	Clay [1]
S6-S7	FMH7022561	FMH7022559	225	36.2	141.65	141.65	139.22	138.94	129	9.81	0.003	0.008	1.00E-06	0.90	0.04	0.04	0.71	0.06	0.04	**36**	Clay [1]
S7-S8	FMH7022559	FMH7022572	225	31.8	141.65	141.00	138.89	138.71	177	9.81	0.003	0.006	1.00E-06	0.77	0.04	0.04	0.71	0.06	0.03	**31**	Clay [1]
S8-S9	FMH7022572	FMH7022554	225	38.8	141.00	140.61	138.71	138.40	125	9.81	0.003	0.008	1.00E-06	0.92	0.04	0.04	0.71	0.06	0.04	**36**	Clay [1]
S9-S10	FMH7022554	FMH7022552	225	18.2	140.61	139.76	138.40	137.96	41	9.81	0.0006	0.024	1.00E-06	2.04	0.04	0.04	0.71	0.06	0.08	**81**	Clay [1]
S10-S11	FMH7022552	FMH7022550	300	45.9	139.76	139.22	137.96	137.47	94	9.81	0.0006	0.011	1.00E-06	1.63	0.07	0.07	0.94	0.08	0.11	**115**	Clay [1]
S11-S12	FMH7022550	FMH7022549	300	20.9	139.22	138.78	137.32	137.23	232	9.81	0.0006	0.004	1.00E-06	1.03	0.07	0.07	0.94	0.08	0.07	**73**	Clay [1]
S12-S13	FMH7022549	FMH7022545	300	24.8	138.78	138.62	137.22	137.07	165	9.81	0.003	0.006	1.00E-06	0.97	0.07	0.07	0.94	0.08	0.07	**68**	Clay [1]
S13-S14	FMH7022545	FMH7022544	300	34.1	138.62	138.74	137.07	136.89	189	9.81	0.003	0.005	1.00E-06	0.90	0.07	0.07	0.94	0.08	0.06	**64**	Clay [1]
S14-S15	FMH7022544	FMH7022539	300	44.3	138.74	138.89	136.89	136.74	295	9.81	0.003	0.003	1.00E-06	0.72	0.07	0.07	0.94	0.08	0.05	**51**	Clay [1]
S15-S16	FMH7022539	FMH7022538	300	41.2	138.89	139.02	136.74	136.52	187	9.81	0.003	0.005	1.00E-06	0.91	0.07	0.07	0.94	0.08	0.06	**64**	Clay [1]
S16-S17	FMH7022538	FMH7022536	300	44.1	139.02	138.98	136.52	136.35	259	9.81	0.003	0.004	1.00E-06	0.77	0.07	0.07	0.94	0.08	0.05	**55**	Clay [1]
S17-S18	FMH7022536	FMH7038820	400	7.4	138.98	138.71	136.33	136.26	106	9.81	0.0006	0.009	1.00E-06	1.84	0.13	0.13	1.26	0.10	0.23	**231**	Clay [1]
S18-S19	FMH7038820	FMH7022533	400	50.2	138.71	138.37	136.26	135.91	143	9.81	0.0006	0.007	1.00E-06	1.57	0.13	0.13	1.26	0.10	0.20	**198**	Clay [1]
S19-S20	FMH7022533	FMH7022362	400	44.0	138.37	138.00	135.89	135.55	129	9.81	0.0006	0.008	1.00E-06	1.66	0.13	0.13	1.26	0.10	0.21	**208**	Clay [1]
S20-S21	FMH7022362	FMH7022361	400	46.0	138.00	138.40	135.54	135.26	164	9.81	0.0006	0.006	1.00E-06	1.47	0.13	0.13	1.26	0.10	0.18	**185**	Clay [1]
S21-S22	FMH7022361	FMH7022360	400	38.0	138.40	138.43	135.54	134.65	43	9.81	0.0006	0.023	1.00E-06	2.90	0.13	0.13	1.26	0.10	0.36	**364**	Clay [1]
S22-S23	FMH7022360	FMH7038860	400	31.0	138.43	138.24	134.65	134.11	57	9.81	0.0006	0.017	1.00E-06	2.50	0.13	0.13	1.26	0.10	0.31	**314**	Clay [1]
S23-S24	FMH7038860	FMH7038861	400	11.0	138.24	137.63	134.11	133.63	23	9.81	0.0006	0.044	1.00E-06	3.96	0.13	0.13	1.26	0.10	0.50	**497**	Clay [1]
S24-S25	FMH7038861	FMH7038862	400	125.0	137.63	135.42	133.63	133.00	198	9.81	0.0006	0.005	1.00E-06	1.34	0.13	0.13	1.26	0.10	0.17	**168**	Clay [1]
S25-S26	FMH7038862	FMH7038845	400	35.0	135.42	135.34	133.00	132.50	70	9.81	0.0006	0.014	1.00E-06	2.26	0.13	0.13	1.26	0.10	0.28	**284**	Clay [1]
S26-S27	FMH7038845	FMH7038846	400	14.0	135.34	134.18	132.50	131.60	16	9.81	0.0006	0.064	1.00E-06	4.81	0.13	0.13	1.26	0.10	0.60	**604**	Clay [1]
S27-S28	FMH7038846	FMH7020219	400	30.0	134.18	131.89	131.76	129.79	15	9.81	0.0006	0.066	1.00E-06	4.86	0.13	0.13	1.26	0.10	0.61	**610**	Clay [1]
S28-S29	FMH7020219	FMH7020220	300	24.0	131.89	130.45	129.79	128.35	17	9.81	0.0006	0.060	1.00E-06	3.87	0.07	0.07	0.94	0.08	0.27	**274**	Clay [1]
S29-S30	FMH7020220	FMH7060381	300	42.0	130.45	126.53	128.35	124.46	11	9.81	0.0006	0.093	1.00E-06	4.81	0.07	0.07	0.94	0.08	0.34	**340**	Clay [1]
S30-S31	FMH7060381	FMH7020221	300	13.0	126.53	124.48	124.46	122.68	7	9.81	0.0006	0.137	1.00E-06	5.85	0.07	0.07	0.94	0.08	0.41	**414**	Clay [1]
S31-S32	FMH7020221	FMH7020222	300	33.0	124.48	119.51	122.68	117.41	6	9.81	0.0006	0.160	1.00E-06	6.32	0.07	0.07	0.94	0.08	0.45	**447**	Clay [1]
S32-S33	FMH7020222	FMH7020223	300	32.0	119.51	115.59	117.41	112.89	7	9.81	0.0006	0.141	1.00E-06	5.94	0.07	0.07	0.94	0.08	0.42	**420**	Clay [1]

Sewer Pipe ID	Catchment Carried												Sewage from Catchment (ADWF in m^3/day) including Catchment Inflow Factor (Cif) [2]											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
S1-S2	S	A											171.0	466.9										
S2-S3	S	A											171.0	466.9										
S3-S4	S	A											171.0	466.9										
S4-S5	S	A											171.0	466.9										
S5-S6	S	A											171.0	466.9										
S6-S7	S	A											171.0	466.9										
S7-S8	S	A											171.0	466.9										
S8-S9	S	A											171.0	466.9										
S9-S10	S	A											171.0	466.9										
S10-S11	S	A	B2	C									171.0	466.9	136.7	3.0								
S11-S12	S	A	B2	C									171.0	466.9	136.7	3.0								
S12-S13	S	A	B2	C	D								171.0	466.9	136.7	3.0	51.5							
S13-S14	S	A	B2	C	D								171.0	466.9	136.7	3.0	51.5							
S14-S15	S	A	B2	C	D	E							171.0	466.9	136.7	3.0	51.5	60.9						
S15-S16	S	A	B2	C	D	E							171.0	466.9	136.7	3.0	51.5	60.9						
S16-S17	S	A	B2	C	D	E	F						171.0	466.9	136.7	3.0	51.5	60.9	115.0					
S17-S18	S	A	B2	C	D	E	F						171.0	466.9	136.7	3.0	51.5	60.9	115.0					
S18-S19	S	A	B2	C	D	E	F	G					171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7				
S19-S20	S	A	B2	C	D	E	F	G	H				171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7	17.9			
S20-S21	S	A	B2	C	D	E	F	G	H				171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7	17.9			
S21-S22	S	A	B2	C	D	E	F	G	H				171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7	17.9			
S22-S23	S	A	B2	C	D	E	F	G	H				171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7	17.9			
S23-S24	S	A	B2	C	D	E	F	G	H				171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7	17.9			
S24-S25	S	A	B2	C	D	E	F	G	H				171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7	17.9			
S25-S26	S	A	B2	C	D	E	F	G	H				171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7	17.9			
S26-S27	S	A	B2	C	D	E	F	G	H				171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7	17.9			
S27-S28	S	A	B2	C	D	E	F	G	H				171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7	17.9			
S28-S29	S	A	B2	C	D	E	F	G	H	I			171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7	17.9	11.2		
S29-S30	S	A	B2	C	D	E	F	G	H	I	J		171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7	17.9	11.2	5.6	
S30-S31	S	A	B2	C	D	E	F	G	H	I	J	K	171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7	17.9	11.2	5.6	317.2
S31-S32	S	A	B2	C	D	E	F	G	H	I	J	K	171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7	17.9	11.2	5.6	317.2
S32-S33	S	A	B2	C	D	E	F	G	H	I	J	K	171.0	466.9	136.7	3.0	51.5	60.9	115.0	31.7	17.9	11.2	5.6	317.2

Sewer Pipe ID	Total ADWF (Catchment A2 & E are excluded)	Safety Factor [2]	Contributing Population	Peaking	Swimming Pool	Peak Flow (L/s)	% Capacity Occupied
	m^3/day	1		Factor			
S1-S2	637.9	637.9	2362.5	6		44.3	97%
S2-S3	637.9	637.9	2362.5	6		44.3	97%
S3-S4	637.9	637.9	2362.5	6		44.3	97%
S4-S5	637.9	637.9	2362.5	6		44.3	123%
S5-S6	637.9	637.9	2362.5	6		44.3	132%
S6-S7	637.9	637.9	2362.5	6		44.3	124%
S7-S8	637.9	637.9	2362.5	6		44.3	145%
S8-S9	637.9	637.9	2362.5	6		44.3	122%
S9-S10	637.9	637.9	2362.5	6		44.3	55%
S10-S11	777.6	777.6	2879.8	6	60.8	114.8	100%
S11-S12	777.6	777.6	2879.8	6	60.8	114.8	158%
S12-S13	829.0	829.0	3070.4	6	60.8	118.4	173%
S13-S14	829.0	829.0	3070.4	6	60.8	118.4	186%
S14-S15	889.9	889.9	3295.9	6	60.8	122.6	240%
S15-S16	889.9	889.9	3295.9	6	60.8	122.6	191%
S16-S17	1004.9	1004.9	3721.9	6	60.8	130.6	240%
S17-S18	1004.9	1004.9	3721.9	6	60.8	130.6	57%
S18-S19	1036.6	1036.6	3839.1	6	60.8	132.8	67%
S19-S20	1054.4	1054.4	3905.2	6	60.8	134.1	64%
S20-S21	1054.4	1054.4	3905.2	6	60.8	134.1	73%
S21-S22	1054.4	1054.4	3905.2	6	60.8	134.1	37%
S22-S23	1054.4	1054.4	3905.2	6	60.8	134.1	43%
S23-S24	1054.4	1054.4	3905.2	6	60.8	134.1	27%
S24-S25	1054.4	1054.4	3905.2	6	60.8	134.1	80%
S25-S26	1054.4	1054.4	3905.2	6	60.8	134.1	47%
S26-S27	1054.4	1054.4	3905.2	6	60.8	134.1	22%
S27-S28	1054.4	1054.4	3905.2	6	60.8	134.1	22%
S28-S29	1065.6	1065.6	3946.7	6	60.8	134.8	49%
S29-S30	1071.2	1071.2	3967.4	6	60.8	135.2	40%
S30-S31	1388.5	1388.5	5142.4	5	60.8	141.2	34%
S31-S32	1388.5	1388.5	5142.4	5	60.8	141.2	32%
S32-S33	1388.5	1388.5	5142.4	5	60.8	141.2	34%

Notes:

[1] Clayware (Clay) Pipe, reference to slimed clayware in poor condition in Sewerage Design Manual (SDM) Part 1, assumed Ks of 0.6mm

[2] Catchment Inflow Factor of 1.0 applied to existing catchments respectively

Table 3 - Sewerage Capacity Calculation

B. Backwater Analysis for Surcharged Sections

Sewer Sections	Flow Under the Assumed Hydraullic Gradient						Peak Flow w/ SF		Water Level		FreeBoard		Crown Level	
	Friction Loss	Local Loss	Velocty	Hydrallic Gradient S	Q		Q with Safety Factor	ΔQ	Up Stream	Down Stream	Up Stream	Down Stream	Up Stream	Down Stream
	m	m	m/s		m^3/s	L/s	1	L/s	mPD	mPD	m	m	mPD	mPD
FMH1 ~ FMH2	0.14	0.09	1.11	9E-03	0.044	44.3	44.3	0.0	132.18	131.95	9.68	10.48	140.43	140.28
FMH2 ~ FMH3	0.13	0.09	1.11	9E-03	0.044	44.3	44.3	0.0	131.95	131.72	10.48	11.01	140.28	140.14
FMH3 ~ FMH7022565	0.04	0.09	1.11	9E-03	0.044	44.3	44.3	0.0	131.72	131.59	11.01	11.42	140.14	140.10
FMH7022565 ~ FMH7022563	0.53	0.09	1.11	1E-02	0.044	44.3	44.3	0.0	131.59	130.96	11.42	11.08	139.96	139.61
FMH7022563 ~ FMH7022561	0.19	0.09	1.11	1E-02	0.044	44.3	44.3	0.0	130.96	130.67	11.08	10.98	139.58	139.47
FMH7022561 ~ FMH7022559	0.43	0.09	1.11	1E-02	0.044	44.3	44.3	0.0	130.67	130.15	10.98	11.50	139.45	139.17
FMH7022559 ~ FMH7022572	0.38	0.09	1.11	1E-02	0.044	44.3	44.3	0.0	130.15	129.68	11.50	11.32	139.12	138.94
FMH7022572 ~ FMH7022554	0.46	0.09	1.11	1E-02	0.044	44.3	44.3	0.0	129.68	129.13	11.32	11.48	138.94	138.63
FMH7022554 ~ FMH7022552	0.13	0.09	1.11	7E-03	0.04	44.3	44.3	0.0	129.13	128.90	11.48	10.86	138.63	138.19
FMH7022552 ~ FMH7022550	0.49	0.20	1.62	1E-02	0.11	114.8	114.8	0.0	128.90	128.21	10.86	11.01	138.26	137.77
FMH7022550 ~ FMH7022549	0.22	0.20	1.62	1E-02	0.11	114.8	114.8	0.0	128.21	127.78	11.01	11.00	137.62	137.53
FMH7022549 ~ FMH7022545	0.45	0.21	1.68	2E-02	0.12	118.4	118.4	0.0	127.78	127.12	11.00	11.50	137.52	137.37
FMH7022545 ~ FMH7022544	0.62	0.21	1.68	2E-02	0.12	118.4	118.4	0.0	127.12	126.29	11.50	12.45	137.37	137.19
FMH7022544 ~ FMH7022539	0.86	0.23	1.73	2E-02	0.12	122.6	122.6	0.0	126.29	125.19	12.45	13.70	137.19	137.04
FMH7022539 ~ FMH7022538	0.80	0.23	1.73	2E-02	0.12	122.6	122.6	0.0	125.19	124.16	13.70	14.86	137.04	136.82
FMH7022538 ~ FMH7022536	0.97	0.26	1.85	2E-02	0.13	130.6	130.6	0.0	124.16	122.93	14.86	16.05	136.82	136.65
FMH7022536 ~ FMH7038820	0.02	0.08	1.04	3E-03	0.13	130.6	130.6	0.0	122.93	122.82	16.05	15.89	136.73	136.66
FMH7038820 ~ FMH7022533	0.16	0.09	1.06	3E-03	0.13	132.8	132.8	0.0	122.82	122.58	15.89	15.79	136.66	136.31
FMH7022533 ~ FMH7022362	0.14	0.09	1.07	3E-03	0.13	134.1	134.1	0.0	122.58	122.35	15.79	15.65	136.29	135.95
FMH7022362 ~ FMH7022361	0.15	0.09	1.07	3E-03	0.13	134.1	134.1	0.0	122.35	122.12	15.65	16.28	135.94	135.66
FMH7022361 ~ FMH7022360	0.12	0.09	1.07	3E-03	0.13	134.1	134.1	0.0	122.12	121.91	16.28	16.52	135.94	135.05
FMH7022360 ~ FMH7038860	0.10	0.09	1.07	3E-03	0.13	134.1	134.1	0.0	121.91	121.72	16.52	16.52	135.05	134.51
FMH7038860 ~ FMH7038861	0.04	0.09	1.07	3E-03	0.13	134.1	134.1	0.0	121.72	121.60	16.52	16.03	134.51	134.03
FMH7038861 ~ FMH7038862	0.40	0.09	1.07	3E-03	0.13	134.1	134.1	0.0	121.60	121.11	16.03	14.31	134.03	133.40
FMH7038862 ~ FMH7038845	0.11	0.09	1.07	3E-03	0.13	134.1	134.1	0.0	121.11	120.91	14.31	14.43	133.40	132.90
FMH7038845 ~ FMH7038846	0.05	0.09	1.07	3E-03	0.13	134.1	134.1	0.0	120.91	120.77	14.43	13.41	132.90	132.00
FMH7038846 ~ FMH7020219	0.10	0.09	1.07	3E-03	0.13	134.1	134.1	0.0	120.77	120.59	13.41	11.30	132.16	130.19
FMH7020219 ~ FMH7020220	0.35	0.28	1.91	1E-02	0.13	134.8	134.8	0.0	120.59	119.96	11.30	10.49	130.09	128.65
FMH7020220 ~ FMH7060381	0.62	0.28	1.91	1E-02	0.14	135.2	135.2	0.0	119.96	119.06	10.49	7.47	128.65	124.76
FMH7060381 ~ FMH7020221	0.21	0.30	2.00	2E-02	0.14	141.2	141.2	0.0	119.06	118.55	7.47	5.93	124.76	122.98
FMH7020221 ~ FMH7020222	0.53	0.30	2.00	2E-02	0.14	141.2	141.2	0.0	118.55	117.71	5.93	1.80	122.98	117.71
FMH7020222 ~ FMH7020223	0.51	0.30	2.00	2E-02	0.14	141.2	141.2	0.0	117.71		1.80	115.59	117.71	113.19
										Min FreeBoard	*1.80*	*1.80*		

1 For this assessment, the Colebrook-White Equation has been used to calculate the friction loss. (Sewerage Mannual section 5.2.1)

2 According to DSD'sSewerage Manual (Part 1) section 5.2.2, local losses are usually small in relation to the pipeline head losses and are not normally considered. However, as a conservative

3 Freeboard > 1m will fufill the requirement of section 5.1.1 of minimum freeboard stipulated in DSD Sewerage Manual under Surcharged Condition.

4 Friction loss is deduced by required hydraulic gradient x pipe length, while the local loss is deduced by the equation:

$$h_f = K\frac{V^2}{2g}$$

Table 15 - Sewerage Capacity Calculation

A. Hydraulic Capacity of Sewers and Comparison of Sewer Capacity to Sewage Generated from Proposed Development under Surcharge Contidion with Safety Factor = 1.15

Sewer Pipe ID	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	US CL	DS CL	US IL	DS IL	Gradient	g	k_s	s	v	V	Area	Area	Perimeter	R=A/P (Full Bore Radius)	Q (Full)	Estimated Capacity	Remarks on Material Assumption
			mm	m	mPD	mPD	mPD	mPD	1 in	m/s^2	m		m^2/s	m/s	m^2	m^2	m	m	m^3/s	L/s	
S1-S2	FMH1	FMH2	225	15.0	141.86	142.43	140.20	140.05	100	9.81	0.0015	0.010	1.00E-06	1.15	0.04	0.04	0.71	0.06	0.05	**46**	Clay [1]
S2-S3	FMH2	FMH3	225	14.0	142.43	142.73	140.05	139.91	100	9.81	0.0015	0.010	1.00E-06	1.15	0.04	0.04	0.71	0.06	0.05	**46**	Clay [1]
S3-S4	FMH3	FMH7022565	225	4.0	142.73	143.01	139.91	139.87	100	9.81	0.0015	0.010	1.00E-06	1.15	0.04	0.04	0.71	0.06	0.05	**46**	Clay [1]
S4-S5	FMH7022565	FMH7022563	225	44.9	143.01	142.04	139.73	139.38	128	9.81	0.003	0.008	1.00E-06	0.90	0.04	0.04	0.71	0.06	0.04	**36**	Clay [1]
S5-S6	FMH7022563	FMH7022561	225	16.3	142.04	141.65	139.35	139.24	148	9.81	0.003	0.007	1.00E-06	0.84	0.04	0.04	0.71	0.06	0.03	**33**	Clay [1]
S6-S7	FMH7022561	FMH7022559	225	36.2	141.65	141.65	139.22	138.94	129	9.81	0.003	0.008	1.00E-06	0.90	0.04	0.04	0.71	0.06	0.04	**36**	Clay [1]
S7-S8	FMH7022559	FMH7022572	225	31.8	141.65	141.00	138.89	138.71	177	9.81	0.003	0.006	1.00E-06	0.77	0.04	0.04	0.71	0.06	0.03	**31**	Clay [1]
S8-S9	FMH7022572	FMH7022554	225	38.8	141.00	140.61	138.71	138.40	125	9.81	0.003	0.008	1.00E-06	0.92	0.04	0.04	0.71	0.06	0.04	**36**	Clay [1]
S9-S10	FMH7022554	FMH7022552	225	18.2	140.61	139.76	138.40	137.96	41	9.81	0.0006	0.024	1.00E-06	2.04	0.04	0.04	0.71	0.06	0.08	**81**	Clay [1]
S10-S11	FMH7022552	FMH7022550	300	45.9	139.76	139.22	137.96	137.47	94	9.81	0.0006	0.011	1.00E-06	1.63	0.07	0.07	0.94	0.08	0.11	**115**	Clay [1]
S11-S12	FMH7022550	FMH7022549	300	20.9	139.22	138.78	137.32	137.23	232	9.81	0.0006	0.004	1.00E-06	1.03	0.07	0.07	0.94	0.08	0.07	**73**	Clay [1]
S12-S13	FMH7022549	FMH7022545	300	24.8	138.78	138.62	137.22	137.07	165	9.81	0.003	0.006	1.00E-06	0.97	0.07	0.07	0.94	0.08	0.07	**68**	Clay [1]
S13-S14	FMH7022545	FMH7022544	300	34.1	138.62	138.74	137.07	136.89	189	9.81	0.003	0.005	1.00E-06	0.90	0.07	0.07	0.94	0.08	0.06	**64**	Clay [1]
S14-S15	FMH7022544	FMH7022539	300	44.3	138.74	138.89	136.89	136.74	295	9.81	0.003	0.003	1.00E-06	0.72	0.07	0.07	0.94	0.08	0.05	**51**	Clay [1]
S15-S16	FMH7022539	FMH7022538	300	41.2	138.89	139.02	136.74	136.52	187	9.81	0.003	0.005	1.00E-06	0.91	0.07	0.07	0.94	0.08	0.06	**64**	Clay [1]
S16-S17	FMH7022538	FMH7022536	300	44.1	139.02	138.98	136.52	136.35	259	9.81	0.003	0.004	1.00E-06	0.77	0.07	0.07	0.94	0.08	0.05	**55**	Clay [1]
S17-S18	FMH7022536	FMH7038820	400	7.4	138.98	138.71	136.33	136.26	106	9.81	0.0006	0.009	1.00E-06	1.84	0.13	0.13	1.26	0.10	0.23	**231**	Clay [1]
S18-S19	FMH7038820	FMH7022533	400	50.2	138.71	138.37	136.26	135.91	143	9.81	0.0006	0.007	1.00E-06	1.57	0.13	0.13	1.26	0.10	0.20	**198**	Clay [1]
S19-S20	FMH7022533	FMH7022362	400	44.0	138.37	138.00	135.89	135.55	129	9.81	0.0006	0.008	1.00E-06	1.66	0.13	0.13	1.26	0.10	0.21	**208**	Clay [1]
S20-S21	FMH7022362	FMH7022361	400	46.0	138.00	138.40	135.54	135.26	164	9.81	0.0006	0.006	1.00E-06	1.47	0.13	0.13	1.26	0.10	0.18	**185**	Clay [1]
S21-S22	FMH7022361	FMH7022360	400	38.0	138.40	138.43	135.54	134.65	43	9.81	0.0006	0.023	1.00E-06	2.90	0.13	0.13	1.26	0.10	0.36	**364**	Clay [1]
S22-S23	FMH7022360	FMH7038860	400	31.0	138.43	138.24	134.65	134.11	57	9.81	0.0006	0.017	1.00E-06	2.50	0.13	0.13	1.26	0.10	0.31	**314**	Clay [1]
S23-S24	FMH7038860	FMH7038861	400	11.0	138.24	137.63	134.11	133.63	23	9.81	0.0006	0.044	1.00E-06	3.96	0.13	0.13	1.26	0.10	0.50	**497**	Clay [1]
S24-S25	FMH7038861	FMH7038862	400	125.0	137.63	135.42	133.63	133.00	198	9.81	0.0006	0.005	1.00E-06	1.34	0.13	0.13	1.26	0.10	0.17	**168**	Clay [1]
S25-S26	FMH7038862	FMH7038845	400	35.0	135.42	135.34	133.00	132.50	70	9.81	0.0006	0.014	1.00E-06	2.26	0.13	0.13	1.26	0.10	0.28	**284**	Clay [1]
S26-S27	FMH7038845	FMH7038846	400	14.0	135.34	134.18	132.50	131.60	16	9.81	0.0006	0.064	1.00E-06	4.81	0.13	0.13	1.26	0.10	0.60	**604**	Clay [1]
S27-S28	FMH7038846	FMH7020219	400	30.0	134.18	131.89	131.76	129.79	15	9.81	0.0006	0.066	1.00E-06	4.86	0.13	0.13	1.26	0.10	0.61	**610**	Clay [1]
S28-S29	FMH7020219	FMH7020220	300	24.0	131.89	130.45	129.79	128.35	17	9.81	0.0006	0.060	1.00E-06	3.87	0.07	0.07	0.94	0.08	0.27	**274**	Clay [1]
S29-S30	FMH7020220	FMH7060381	300	42.0	130.45	126.53	128.35	124.46	11	9.81	0.0006	0.093	1.00E-06	4.81	0.07	0.07	0.94	0.08	0.34	**340**	Clay [1]
S30-S31	FMH7060381	FMH7020221	300	13.0	126.53	124.48	124.46	122.68	7	9.81	0.0006	0.137	1.00E-06	5.85	0.07	0.07	0.94	0.08	0.41	**414**	Clay [1]
S31-S32	FMH7020221	FMH7020222	300	33.0	124.48	119.51	122.68	117.41	6	9.81	0.0006	0.160	1.00E-06	6.32	0.07	0.07	0.94	0.08	0.45	**447**	Clay [1]
S32-S33	FMH7020222	FMH7020223	300	32.0	119.51	115.59	117.41	112.89	7	9.81	0.0006	0.141	1.00E-06	5.94	0.07	0.07	0.94	0.08	0.42	**420**	Clay [1]

Notes:

[1] Clayware (Clay) Pipe, reference to slimed clayware in poor condition in Sewerage Design Manual (SDM) Part 1, assumed Ks of 0.6mm

[2] Catchment Inflow Factor of 1.0 applied to existing catchments respectively

Table 3 - Sewerage Capacity Calculation

B. Backwater Analysis for Surcharged Sections

Sewer Sections	Flow Under the Assumed Hydraullic Gradient						Peak Flow w/ SF		Water Level		FreeBoard		Crown Level	
	Friction Loss	Local Loss	Velocty	Hydrallic Gradient S	Q		Q with Safety Factor	ΔQ	Up Stream	Down Stream	Up Stream	Down Stream	Up Stream	Down Stream
	m	m	m/s		m^3/s	L/s	1.15	L/s	mPD	mPD	m	m	mPD	mPD
FMH1 ~ FMH2	0.19	0.13	1.28	1E-02	0.051	50.9	50.9	0.0	136.83	136.52	5.03	5.91	140.43	140.28
FMH2 ~ FMH3	0.17	0.13	1.28	1E-02	0.051	50.9	50.9	0.0	136.52	136.22	5.91	6.51	140.28	140.14
FMH3 ~ FMH7022565	0.05	0.13	1.28	1E-02	0.051	50.9	50.9	0.0	136.22	136.05	6.51	6.96	140.14	140.10
FMH7022565 ~ FMH7022563	0.70	0.13	1.28	2E-02	0.051	50.9	50.9	0.0	136.05	135.22	6.96	6.82	139.96	139.61
FMH7022563 ~ FMH7022561	0.25	0.13	1.28	2E-02	0.051	50.9	50.9	0.0	135.22	134.84	6.82	6.81	139.58	139.47
FMH7022561 ~ FMH7022559	0.57	0.13	1.28	2E-02	0.051	50.9	50.9	0.0	134.84	134.15	6.81	7.50	139.45	139.17
FMH7022559 ~ FMH7022572	0.50	0.13	1.28	2E-02	0.051	50.9	50.9	0.0	134.15	133.53	7.50	7.47	139.12	138.94
FMH7022572 ~ FMH7022554	0.61	0.13	1.28	2E-02	0.051	50.9	50.9	0.0	133.53	132.79	7.47	7.82	138.94	138.63
FMH7022554 ~ FMH7022552	0.17	0.13	1.28	1E-02	0.05	50.9	50.9	0.0	132.79	132.49	7.82	7.27	138.63	138.19
FMH7022552 ~ FMH7022550	0.65	0.27	1.87	1E-02	0.13	132.1	132.1	0.0	132.49	131.58	7.27	7.64	138.26	137.77
FMH7022550 ~ FMH7022549	0.29	0.27	1.87	1E-02	0.13	132.1	132.1	0.0	131.58	131.02	7.64	7.76	137.62	137.53
FMH7022549 ~ FMH7022545	0.59	0.28	1.93	2E-02	0.14	136.2	136.2	0.0	131.02	130.14	7.76	8.48	137.52	137.37
FMH7022545 ~ FMH7022544	0.82	0.28	1.93	2E-02	0.14	136.2	136.2	0.0	130.14	129.04	8.48	9.70	137.37	137.19
FMH7022544 ~ FMH7022539	1.14	0.30	2.00	3E-02	0.14	141.0	141.02514	0.0	129.04	127.60	9.70	11.29	137.19	137.04
FMH7022539 ~ FMH7022538	1.06	0.30	2.00	3E-02	0.14	141.0	141.02514	0.0	127.60	126.23	11.29	12.79	137.04	136.82
FMH7022538 ~ FMH7022536	1.29	0.35	2.13	3E-02	0.15	150.2	150.21156	0.0	126.23	124.60	12.79	14.38	136.82	136.65
FMH7022536 ~ FMH7038820	0.03	0.11	1.20	4E-03	0.15	150.2	150.2	0.0	124.60	124.46	14.38	14.25	136.73	136.66
FMH7038820 ~ FMH7022533	0.21	0.11	1.22	4E-03	0.15	152.7	152.7	0.0	124.46	124.14	14.25	14.23	136.66	136.31
FMH7022533 ~ FMH7022362	0.19	0.12	1.23	4E-03	0.15	154.2	154.2	0.0	124.14	123.84	14.23	14.16	136.29	135.95
FMH7022362 ~ FMH7022361	0.20	0.12	1.23	4E-03	0.15	154.2	154.2	0.0	123.84	123.53	14.16	14.87	135.94	135.66
FMH7022361 ~ FMH7022360	0.16	0.12	1.23	4E-03	0.15	154.2	154.2	0.0	123.53	123.25	14.87	15.18	135.94	135.05
FMH7022360 ~ FMH7038860	0.13	0.12	1.23	4E-03	0.15	154.2	154.2	0.0	123.25	123.01	15.18	15.23	135.05	134.51
FMH7038860 ~ FMH7038861	0.05	0.12	1.23	4E-03	0.15	154.2	154.2	0.0	123.01	122.84	15.23	14.79	134.51	134.03
FMH7038861 ~ FMH7038862	0.53	0.12	1.23	4E-03	0.15	154.2	154.2	0.0	122.84	122.20	14.79	13.22	134.03	133.40
FMH7038862 ~ FMH7038845	0.15	0.12	1.23	4E-03	0.15	154.2	154.2	0.0	122.20	121.93	13.22	13.41	133.40	132.90
FMH7038845 ~ FMH7038846	0.06	0.12	1.23	4E-03	0.15	154.2	154.2	0.0	121.93	121.76	13.41	12.42	132.90	132.00
FMH7038846 ~ FMH7020219	0.13	0.12	1.23	4E-03	0.15	154.2	154.2	0.0	121.76	121.52	12.42	10.37	132.16	130.19
FMH7020219 ~ FMH7020220	0.47	0.37	2.19	2E-02	0.16	155.1	155.1	0.0	121.52	120.68	10.37	9.77	130.09	128.65
FMH7020220 ~ FMH7060381	0.82	0.37	2.20	2E-02	0.16	155.5	155.5	0.0	120.68	119.49	9.77	7.04	128.65	124.76
FMH7060381 ~ FMH7020221	0.28	0.40	2.30	2E-02	0.16	162.4	162.4	0.0	119.49	118.81	7.04	5.67	124.76	122.98
FMH7020221 ~ FMH7020222	0.70	0.40	2.30	2E-02	0.16	162.4	162.4	0.0	118.81	117.71	5.67	1.80	122.98	117.71
FMH7020222 ~ FMH7020223	0.68	0.40	2.30	2E-02	0.16	162.4	162.4	0.0	117.71		1.80	115.59	117.71	113.19
										Min FreeBoard	*1.80*	*1.80*		

1 For this assessment, the Colebrook-White Equation has been used to calculate the friction loss. (Sewerage Mannual section 5.2.1)

2 According to DSD'sSewerage Manual (Part 1) section 5.2.2, local losses are usually small in relation to the pipeline head losses and are not normally considered. However, as a conservative

3 Freeboard > 1m will fufill the requirement of section 5.1.1 of minimum freeboard stipulated in DSD Sewerage Manual under Surcharged Condition.

4 Friction loss is deduced by required hydraulic gradient x pipe length, while the local loss is deduced by the equation:

$$h_f = K\frac{V^2}{2g}$$