

Appendix E

Sewage Impact Assessment

**APPLICATION FOR PERMISSION UNDER
SECTION 16 OF THE TOWN PLANNING
ORDINANCE (CAP. 131) FOR SUBMISSION
OF LAYOUT PLAN AND PROPOSED MINOR
RELAXATION OF BUILDING HEIGHT
RESTRICTION FOR PERMITTED FLAT AT
“RESIDENTIAL (GROUP C)7” ZONE AT THE
EBENEZER SCHOOL AND HOME FOR THE
VISUALLY IMPAIRED, 131 POK FU LAM
ROAD, POK FU LAM, HONG KONG**

**Sewerage Impact Assessment
Report**

183437/LILY/003/Issue 3

Binnies Hong Kong Limited
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Kowloon
Hong Kong

June 2024

*The Registered Recipient is responsible for destroying or marking as 'superseded' all superseded documents.

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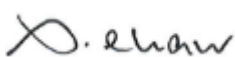
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	Name	Signature	Date
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1. INTRODUCTION

- 1.1 Binnies Hong Kong Limited (Binnies) has been commissioned to carry out sewerage impact assessment to support a Section 16 planning application for layout plan submission and proposed minor relaxation of building height restriction for permitted flat use (Proposed Development) at 131 Pok Fuk Lam Road, Hong Kong, RBL 136RP (Application Site). This report presents the findings of the sewerage impact assessment for the Proposed Development at the Application Site.
- 1.2 The Application Site is currently the Ebenezer School and Home for the Visually Impaired. Access to the Application Site is via Pok Fu Lam Road as shown in **Drawing No. LILY16/LP/001**.
- 1.3 The Proposed Development consists of residential flats, clubhouse facilities and carpark area. The Application Site occupies an area of approximately 0.65 ha.
- 1.4 The Proposed Development consists of four residential blocks with 9-10 residential storeys excluding one level of lobby, car parking facilities and 4 club houses. The Proposed Development layout is shown in **Drawing No. LILY16/MLP/001**. A summary of key information of the Proposed Development is shown below in **Table 1**.

Table 1--- Development Schedule

	Proposed Development
Site Area	About 6,460 m ²
Plot Ratio	1.9
No. of Storey	9-10 residential storeys excluding one level of lobby
Total Gross Floor Area (GFA)	Not more than 12,274 m ²
No. of Residential Units	135
Total Non-Domestic GFA (Residential Clubhouse)	Not more than 614 m ²

- 1.5 This SIA report comprises the following sections after this introduction:
- **Section 2** discusses the sewage flow under the existing conditions;
 - **Section 3** presents the estimation of sewage generated from the Proposed Development;
 - **Section 4** assesses the potential impacts arising from the Proposed Development and proposed mitigation measures;
 - **Section 5** evaluates the impact arising from the construction of the proposed sewerage works; and
 - **Section 6** provides conclusion and recommendation of the SIA report.

2. ESTIMATION OF SEWAGE FLOW UNDER THE EXISTING CONDITIONS

Existing Sewerage and Sewage Treatment Facilities

- 2.1 According to the latest Drainage Record Plan from Drainage Services Department (DSD), there are 300 mm dia. sewers at Pok Fu Lam Road in the vicinity of the Application Site.
- 2.2 The Application Site is located within the sewage catchment of Sandy Bay Preliminary Treatment Works (SBPTW). Sewage generated from the Application Site is currently collected and conveyed through the existing sewer along Pok Fu Lam Road, Sasoon Road and Victoria Road to SBPTW for treatment and disposal. The existing public sewerage system is shown in **Drawing No. LILY16/SIA/001**.
- 2.3 The capacity of the SBPTW has been upgraded to 34,560 m³/day (ADWF) in 2018 under Contract No. DC/2009/24 - Upgrading of Preliminary Treatment Works at Sandy Bay, Cyberport, Wah Fu, Aberdeen and Ap Lei Chau under Harbour Area Treatment Scheme Stage 2A.

Existing Sewage Flow

- 2.4 The 300 mm dia. sewers at Pok Fu Lam Road serve the Application Site, which is currently the Ebenezer School and Home for the Visually Impaired. The existing sewage flow from the Application Site was estimated by the number of students, teacher and staff as shown in **Table 2**.

Table 2 --- Number of Students, Teacher and Specialist Staff

	No. of Students	No. of Teacher and Staff
Ebenezer School	59	105
New Hope School	66	102
Child Care Centre	50	30
Resource Support Programme to visually impaired students	322	32
TOTAL	497	269

- 2.5 The existing Average Dry Weather Flow (ADWF) was estimated by referencing to the "Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (Version 1.0)" (GESF) published by Environmental Protection Department (EPD) in 2005. Sewage flow is estimated by the following equations:
- Average Dry Weather Flow (ADWF) = Population × Unit Flow Factor × Catchment Inflow Factor*

Table 3 --- Estimation of Existing Sewage Flow

	No.	Unit Flow	ADWF
Community, Social & Personal Services (J11)	269	0.280 m ³ /day/employee	75.32 m ³ /day
School student	497	0.040 m ³ /day/person	19.88 m ³ /day
Catchment Inflow Factor			1.00
TOTAL			95.20 m ³ /day

- 2.6 For the existing swimming pool in the Application site, the estimation of backwash flow is summarized in **Table 4**.

Table 4 --- Estimation of Sewage Flow from Existing Swimming Pool

Pool Area	130 m ²
Pool Depth	1.3 m
Pool Volume	169 m ³
Turnover Rate	4 hrs
Surface Loading Rate of Filter	20 m ³ /m ² /hr
Filter Areas Required	169 / 4 / 20 = 2.11 m ²
Backwash Duration	3 min /day
Backwash Flow Rate	30 m ³ /m ² /hr
Design Flow for Swimming Pool Backwashing	30 x 2.11 x 3 /60 = 3.17 m ³ /day (0.037 l/s)

- 2.7 Peak flows are estimated by multiplying the average dry weather flows by appropriate peaking factors. The peaking factors established in the GESF are adopted to assess the performance of the sewerage systems. The peaking factors used in this SIA are reproduced in **Table 5**.

Table 5 --- Adopted Peaking Factors

Population Range	Peaking Factor (including stormwater allowance) for facility with existing upstream sewerage	Peaking Factor (excluding stormwater allowance) for facility with new upstream sewerage
(a) For sewers		
< 1,000	8	6
1,000 – 5,000	6	5
5,000 – 10,000	5	4
10,000 – 50,000	4	3
> 50,000	Max (7.3 / N ^{0.15} , 2.4)	Max (6 / N ^{0.175} , 1.6)

Population Range	Peaking Factor (including stormwater allowance) for facility with existing upstream sewerage	Peaking Factor (excluding stormwater allowance) for facility with new upstream sewerage
(b) Sewage Treatment Works, Preliminary Treatment Works and Pumping Stations		
<10,000	4	3
10,000 – 25,000	3.5	2.5
25,000 – 50,000	3	2
> 50,000	Max (3.9 / N ^{0.065} , 2.4)	Max (2.6 / N ^{0.065} , 1.6)
Note: N is the contributing population in thousands		

- 2.8 In view that there is existing upstream sewerage, peaking factor (including stormwater allowance) of 8 (contributing population = $(95.20 / 0.27 = 353)$ will be adopted. The existing total design sewage flow generated is summarized in **Table 6**.

Table 6 --- Existing Total Design Total Sewage Flow

Item	Units	ADWF	Peaking Factor	Swimming Pool	Peak Flow
Total Design Sewage Flow	m ³ /day	95.20	8	3.17	764.77
	l/s	1.10	8	0.04	8.85

3. ESTIMATION OF SEWAGE FLOW FOR THE PROPOSED DEVELOPMENT

Population Forecast

- 3.1 A population forecast was undertaken to identify the design population of the Proposed Development. The design residential population is estimated by the following equation:

$$\text{Design Residential Population} = \text{Number of Residential Unit} \times \text{Person-Per-Unit Ratio}$$

- 3.2 As a conservative estimation, Person-Per-Unit Ratio of 3.7 was adopted, which was estimated based on the average domestic household size in Tertiary Planning Unit 171 in 2021 published by Census and Statistics Department.

- 3.3 Based on the above assumption, the design residential population is summarized in **Table 7** below:

Table 7 --- Estimation of Residential Population

No. of Residential Units	135
Person-Per-Unit Ratio	3.7
Design Population	
<i>Residential</i>	500
<i>Management Staff (J11)*</i>	25
Remark: -	
*assume no. management staff = 5% of no. of residents	

Estimation of Sewage Flow of the Proposed Development

- 3.4 The Average Dry Weather Flow (ADWF) of the Proposed Development was estimated by referencing to the GESF.
- 3.5 The Proposed Development is shown on **Drawing No. LILY16/MLP/001** and the design assumptions are summarized in **Table 8**.

Table 8 --- Estimation of Sewage Flow for Proposed Development

	No.	Unit Flow	ADWF
Residential	500	0.370 m ³ /day/employee	185 m ³ /day
Management Staff (I11)	25	0.280 m ³ /day/person	7 m ³ /day
Catchment Inflow Factor			1.00
TOTAL			192 m ³ /day

- 3.6 For the swimming pool in the Proposed Development, the estimation of backwash flow from the swimming pool is summarized in **Table 9**.

Table 9 --- Estimation of Sewage Flow from Proposed Swimming Pool

Pool Area	25 m x 6 m
Pool Depth	1.3 m
Pool Volume	195 m ³
Turnover Rate	4 hrs
Surface Loading Rate of Filter	20 m ³ /m ² /hr
Filter Areas Required	195 / 4 / 20 = 2.44 m ²
Backwash Duration	3 min /day
Backwash Flow Rate	30 m ³ /m ² /hr
Design Flow for Swimming Pool Backwashing	30 x 2.44 x 3 /60 = 3.66 m ³ /day (0.042 l/s)

- 3.7 Similar with existing condition, peaking factors (including stormwater allowance) of 8 (contributing population = 192 / 0.27 = 711) will be adopted. The design total sewage flow generated from the Proposed Development is summarized in **Table 10**.

Table 10 --- Design Total Sewage Flow of the Proposed Development

Item	Units	ADWF	Peaking Factor	Swimming Pool	Peak Flow
Total Design Sewage Flow	m ³ /day	192	8	3.66	1,539.66
	l/s	2.22	8	0.04	17.82

4. POTENTIAL IMPACTS ON SEWERAGE NETWORKS & PROPOSED MITIGATION MEASURES

- 4.1 The peak flow increased from the Application Site is approximately 2% of the capacity of SBPTW. It is expected that the SBPTW will be able to handle the increased sewage flow from the Application Site.
- 4.2 The sewage generated from the Proposed Development is estimated to be 192 m³/day (ADWF) and 3.66 m³/day design flow for swimming pool backwashing, with total peak discharge of 17.82 l/s. It is proposed to discharge the sewage flow to the public sewerage system at Pok Fu Lam Road.
- 4.3 It is understood that a student hostel is constructing at rural building lot no. 925 under application no. A/H10/94 now. The estimation of existing sewage flow at Pok Fu Lam Road have been assessed and presented in **Appendix A**. It is observed that one sewer at Pok Fu Lam Road (from FMH7022538 to FMH7022536) do not have adequate capacity.
- 4.4 To minimize the impact to the public sewer, the sewage generated from the Proposed Development will be discharged to further downstream (manhole no. FMH7038820), which has spare capacity (Current utilization is approximately 39 %).
- 4.5 As the proposed formation level of the Application Site (approximately +120 mPD) is located below the level of the existing public sewerage system at Pok Fu Lam Road. A sump pit (with size 0.5m x 1m x 1.5m) and sewage pump (with pump rate of 24,804 l/h or 0.00689 m³/s) are proposed to pump the sewage generated from the Proposed Development to a new manhole (MH001) and further discharge to manhole no. FMH7038820 via a new 225 mm dia. sewer. **Drawing No. LILY16/SIA/002** shows the proposed sewage disposal scheme. The estimation of proposed sewage flows at Pok Fu Lam Road as well as calculation of sump pit size and sewer size is enclosed in **Appendix B**.
- 4.6 One sewer (FWD702447 between manholes FMH7022432 and FMH7022445) appears to be under-capacity (future flow represents nearly 200% of capacity), although it is noted that there is missing level information for the upstream manhole and the sewer is very short (only 4.7m in length). For the purposes of this assessment, it has been necessary to calculate the missing invert level, based on adjacent manhole data, although it is noted that the resultant gradient and capacity are incongruous with the rest of the local sewerage system. A preliminary freeboard check enclosed in **Appendix C** indicates that undesirable surcharging may occur under peak flow conditions. The sewers in Sassoon Road are mostly significantly deeper than 1m, so there would probably be more than 1m freeboard under surcharged conditions. It is therefore reasonable to conclude that the future peak flow can be accommodated in the existing public sewerage system, without unacceptable impacts or the need for significant upgrading.
- 4.7 Regular maintenance on sewers and manholes should be implemented to maintain their optimal condition, such as monitoring the capacity of the system and restoring the flow capacity by removal of excessive accumulation of silt and grease, and thereby mitigate any negative impacts on surcharge conditions.

5. EVALUATION OF THE STRATEGY AND RECOMMENDATIONS

Land matters

- 5.1 The proposed sewerage work will be within the area of the Application Site. No requisition of extra land is envisaged.

Construction

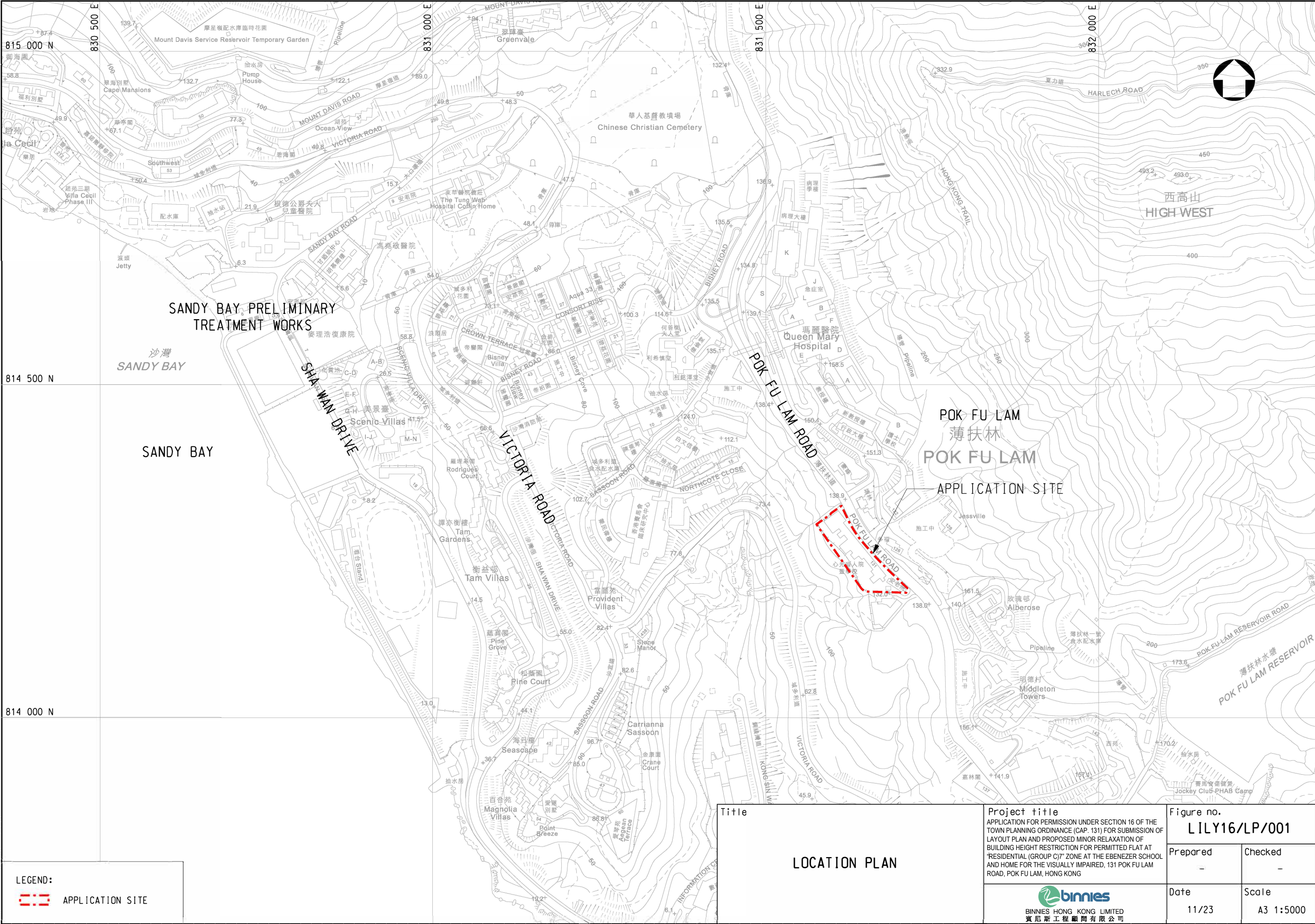
- 5.2 Construction of the connection from the Application Site to the existing public sewers would mainly involve conventional technology such as cut and cover techniques. There is no significant constraint in terms of complexity by a general civil works contractor.

6. CONCLUSION

- 6.1 The existing sewage flow within the Application Site is approximately 95.20 m³/day (ADWF) and 3.17 m³/day design flow for swimming pool backwashing, with total peak discharge of 8.85 l/s. The estimated sewage to be generated from the Proposed Development is approximately 192 m³/day (ADWF) and 3.66 m³/day design flow for swimming pool backwashing, with total peak discharge of 17.82 l/s.
- 6.2 Sewage generated from the Proposed Development would be conveyed to the public sewerage networks by pumping within the Application Site, leading to the SBPTW. The treatment capacity of SBPTW is considered sufficient to handle the flow from the Application Site.
- 6.3 The proposed strategy is considered feasible in terms of regional sewerage strategy, land and construction considerations. The Proposed Development is considered sustainable in terms of sewerage.

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Drawings



Plot date : 2023/11/9

LEGEND:
--- APPLICATION SITE

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Title

LOCATION PLAN

Project title
APPLICATION FOR PERMISSION UNDER SECTION 16 OF THE TOWN PLANNING ORDINANCE (CAP. 131) FOR SUBMISSION OF LAYOUT PLAN AND PROPOSED MINOR RELAXATION OF BUILDING HEIGHT RESTRICTION FOR PERMITTED FLAT AT "RESIDENTIAL (GROUP C)" ZONE AT THE EBENEZER SCHOOL AND HOME FOR THE VISUALLY IMPAIRED, 131 POK FU LAM ROAD, POK FU LAM, HONG KONG


BINNIES HONG KONG LIMITED
賓尼士工程顧問有限公司

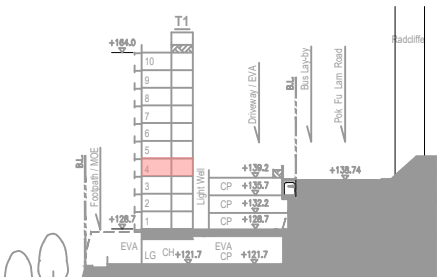
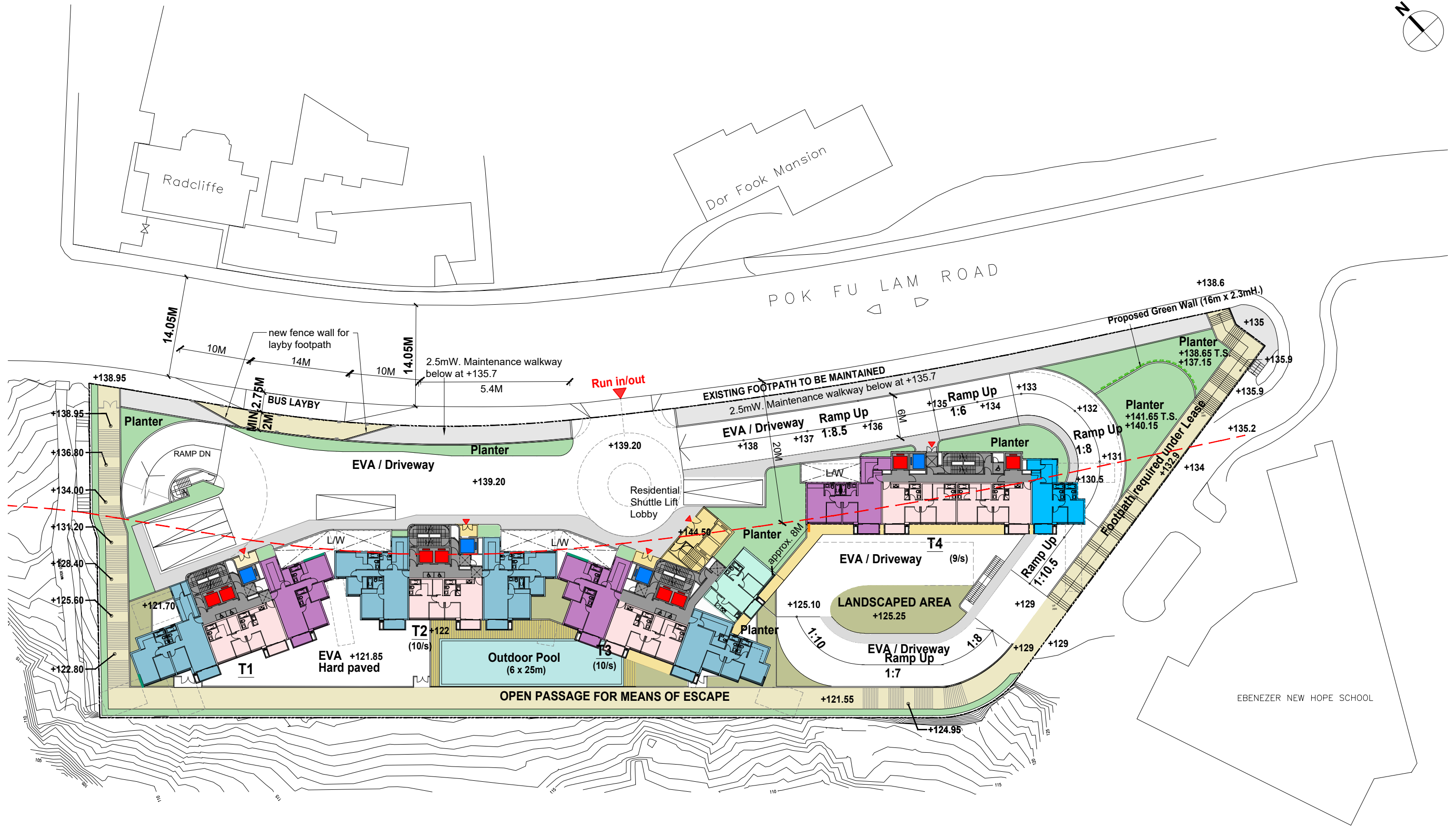
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LEGEND	
—	FIXED GLAZING (1-10/F)
—	ACOUSTIC FIN (2-10/F)

Floor	Nos. of Carpark
3/F	25
2/F	34
1/F	38
G/F	15
Total	112

Handi Architects Limited

UNIT 2010, 20/F, TOWER 1, GRAND CENTURY PLACE,
193 PRINCE EDWARD ROAD WEST, KOWLOON

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PROJECT TITLE
Application for Permission under Section 16 of the Town Planning Ordinance (Cap. 131) for Submission of Layout Plan and Proposed Minor Relaxation of Building Height Restriction for Permitted Flat at "Residential (Group C)" zone at the Ebenezer School and Home for the Visually Impaired, 131 Pok Fu Lam Road, Pok Fu Lam, Hong Kong

DRAWING TITLE
LAYOUT PLAN - 4/F
SECTION 16 SUBMISSION (2ND) - SCHEME 24

DRAWING NO.	SCALE	REV. NO.	DATE / REVISION NO.	APPROVAL BY
A-01	1:500	-	FEB 2026	DATE OF APPROVAL



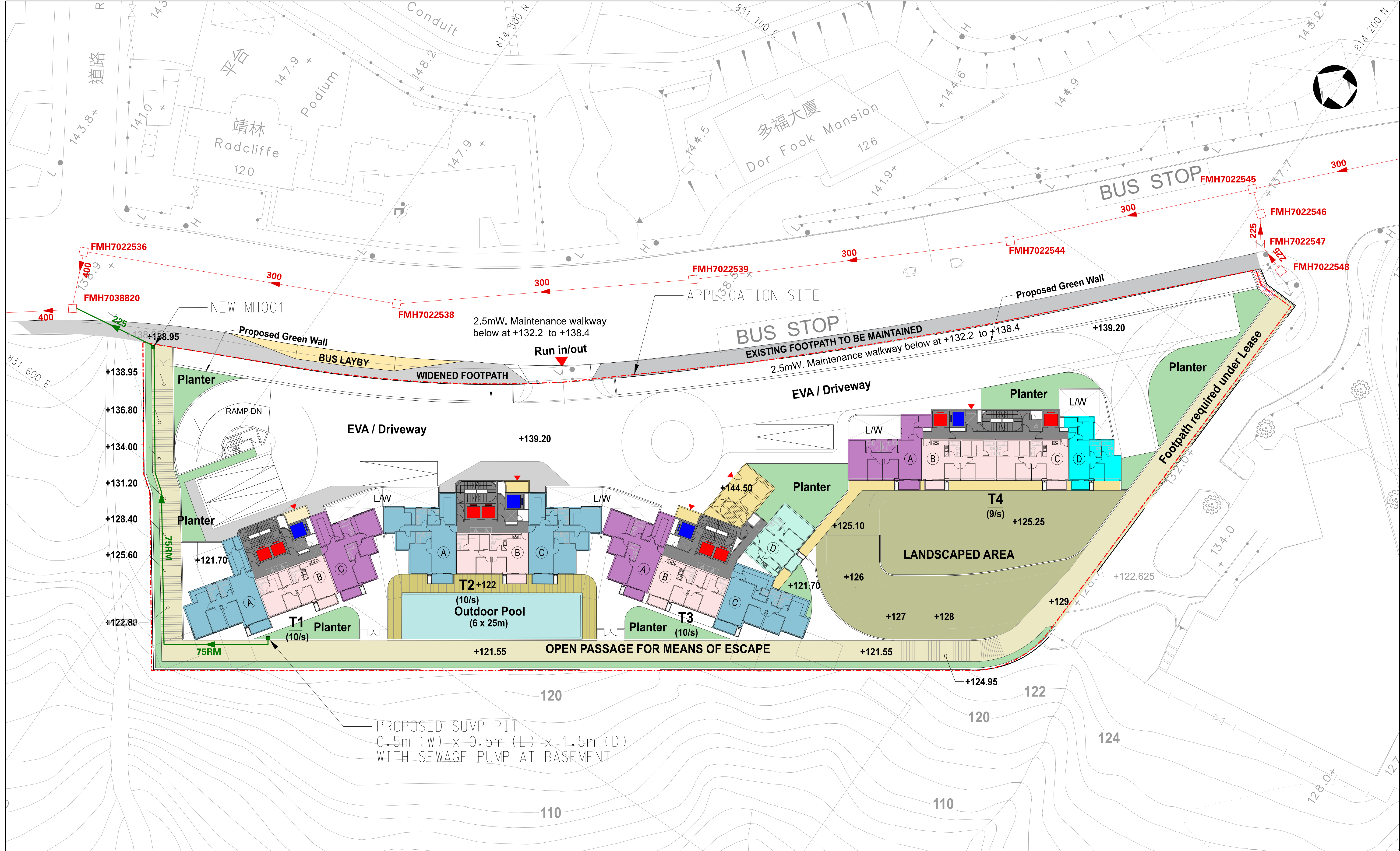
LEGEND:

APPLICATION SITE

→ EXISTING SEWER

Title	Project title		Figure no.	
	LAYOUT PLAN SUBMISSION AND PROPOSED MINOR RELAXATION OF BUILDING HEIGHT RESTRICTION FOR PERMITTED FLAT USE AT 131 POK FU LAM ROAD, HONG KONG, RBL 136RP		LILY16/SIA/001	
EXISTING PUBLIC SEWERAGE SYSTEM	BINNIES HONG KONG LIMITED 賓尼士工程顧問有限公司		Prepared	Checked
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Plot date : 2024/1/4



Plot date : 2024/6/14

LEGEND:

APPLICATION SITE

EXISTING SEWER

PROPOSED SEWER

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Title	Project title		Figure no.	
	PROPOSED SEWAGE DISPOSAL SCHEME		LILY16/SIA/002	
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	06/24		A3 1:500	

Appendix A

Hydraulic Calculation of Sewage Flow at Existing Condition

Project

Application for Permission under Section 16 of the Town Planning Ordinance (Cap. 131) for Submission of Layout Plan and Proposed Minor Relaxation of Building Height Restriction for Permitted Flat at "Residential (Group C)7" zone at the Ebenezer School and Home for the Visually Impaired, 131 Pok Fu Lam Road, Pok Fu Lam, Hong Kong

Subject

Estimation of Existing Sewage Flow at Pok Fu Lam Road

Sewerage Catchment (From FMH7022574 to FMH7022415)

	Source	Category	Population	Unit Flow (m3/h/d)	Daily Flow (m3/d)	Cumulative Daily Flow (excluding pools) (m3/d)	Cumulative population	Peaking Factor	Cumulative Peak Flow (m3/s)	Remark
A	Pok Fu Lam Park Management Centre									
	Park Personnel	J11	5	0.28	1.4	1.4	5	8	0.00013	Estimated Population
	Swimming Pool (515m2)				12.55				0.00027	
B	WSD Staff Quarters	Institutional	24	0.19	4.56	5.96	22	8	0.00070	12Units x 2PPF, say
C	HKJC PHAB Camp	Institutional	124	0.19	23.56	29.52	109	8	0.00288	Data from website
D	University Hall	Institutional	110	0.19	20.9	50.42	187	8	0.00481	Data from website
E	Planned Development A/H10/94-1*	Institutional			461.2	511.62	1895	6	0.03567	Flow provided by EPD
F	HKJC Riding School	J11			97.53	609.15	2256	6	0.04245	Flow provided by EPD
G	Woodbury Court									30 Units from Centadata, average occupancy 3.7 PPF
	Residents	R2	111	0.27	29.97	639.12	2367	6	0.04453	
	Management Staff	J11	6	0.28	1.68	640.80	2373	6	0.04465	
	Swimming Pool (105m2)				2.56				0.04467	
H	Middleton Towers									70 Units from Centadata, average occupancy 3.7 PPF
	Residents	R2	259	0.27	69.93	710.73	2632	6	0.04953	
	Management Staff	J11	13	0.28	3.64	714.37	2646	6	0.04978	
I	Alberose	R3	4	0.37	1.48	715.85	2651	6	0.04989	1 Units from Centadata, average occupancy 3.7 PPF
J	Jessville Manor									4 Units from website, average occupancy 3.7 PPF
	Residents	R2	15	0.27	4.05	719.90	2666	6	0.05017	
	Management Staff	J11	1	0.28	0.28	720.18	2667	6	0.05019	
K	Jessville Tower									28 Units from website, average occupancy 3.7 PPF
	Residents	R2	104	0.27	28.08	748.26	2771	6	0.05214	
	Management Staff	J11	6	0.28	1.68	749.94	2778	6	0.05225	
	Swimming Pool (240m2)				5.85				0.05232	
P	Ebenezer New Hope School									Data from Ebenezer
	Student	Student	66	0.04	2.64	752.58	2787	6	0.05251	
	Teacher & Staff	J11	102	0.28	28.56	781.14	2893	6	0.05449	
Q	Ebenezer School & Home for the Visually Impaired									
	Student	Student	431	0.04	17.24	798.38	2957	6	0.05569	
	Teacher & Staff	J11	167	0.28	46.76	845.14	3130	6	0.05893	
	Swimming Pool (130m2)				3.17				0.05897	
L	Dor Fook Mansion									25 Units from Centadata, average occupancy 3.7 PPF
	Residents	R2	93	0.27	25.11	870.25	3223	6	0.06071	
	Management Staff	J11	5	0.28	1.4	871.65	3228	6	0.06081	
M	Government Quarters									
	Residents	R2	592	0.27	159.84	1031.49	3820	6	0.07191	Estimated population (20 floors x 8 flats/floor = 160 Units)
	Management Staff	J11	30	0.28	8.4	1039.89	3851	6	0.07249	
N	Hospital Authority	J11	126	0.28	35.28	1075.17	3982	6	0.07494	Building Area 1.907m2 x 2 floors = 3.814m2
O	Radcliffe									10 Units from Centadata, average occupancy 3.7 PPF
	Residents	R2	37	0.27	9.99	1085.16	4019	6	0.07564	
	Management Staff	J11	2	0.28	0.56	1085.72	4021	6	0.07568	
	Swimming Pool (290m2)				7.07				0.07576	
R	Royalton									30 Units from Centadata, average occupancy 3.7 PPF
	Residents	R2	111	0.27	29.97	1115.69	4132	6	0.07784	
	Management Staff	J11	6	0.28	1.68	1117.37	4138	6	0.07796	
	Swimming Pool (70m2)				1.71				0.07798	
S	Royalton II									17 Units from Centadata, average occupancy 3.7 PPF
	Residents	R2	63	0.27	17.01	1134.38	4201	6	0.07916	
	Management Staff	J11	4	0.28	1.12	1135.50	4206	6	0.07924	
	Swimming Pool (105m2)				2.56				0.07926	
AH	No. 3 Sassoon Road Academic Building									
	Student	Student	960	0.04	38.4	1173.90	4348	6	0.08193	Data from HKU
	Teacher & Staff	J11	44	0.28	12.32	1186.22	4393	6	0.08279	Data from HKU
U	No.5 Sassoon Road HKU HKJC Building for Interdisciplinary Research									
	Student**	Student	1728	0.04	69.12	1255.34	4649	6	0.08759	Data from HKU, total population 1,800 persons. Estimated Staff are 4% of Overall Population
	Teacher & Staff**	J11	72	0.28	20.16	1275.50	4724	6	0.08899	
V	No.7 Sassoon Road Patrick Manson Building (North Wing)									
	Student**	Student	522	0.04	20.88	1296.38	4801	6	0.09044	Data from HKU, total population 745 persons. Estimated Staff are 4% of Overall Population
	Teacher & Staff**	J11	30	0.28	8.4	1304.78	4833	6	0.09102	
W	Proposed Development at No. 6 Sassoon Road	Institutional			285	1589.78	5888	5	0.09241	Flow provided by EPD
X	Wei Lun Hall	Institutional			72.6	1662.38	6157	5	0.09661	Flow provided by EPD
Y	Lee Hysan Hall	Institutional			72.6	1734.98	6426	5	0.10081	Flow provided by EPD
Z	The University of Hong Kong R.C. Lee Hall	Institutional			72.6	1807.58	6695	5	0.10502	Flow provided by EPD
AA	Bay View Restaurant	J10			75.5	1883.08	6974	5	0.10939	Flow provided by EPD
AB	Madam S.H. Ho Residence for Medical Student	Institutional			55.3	1938.38	7179	5	0.11259	Flow provided by EPD
AC	Dexter H.C Man Building	J11	107	0.28	29.96	1968.34	7290	5	0.11432	Data from HKU
AD	The University of Hong Kong Institute of Molecular Biology	J11	69	0.28	19.32	1987.66	7362	5	0.11544	Data from HKU
AE	The University of Hong Kong Estates Building	J11	103	0.28	28.84	2016.50	7469	5	0.11711	Data from HKU
AF	Pauline Chan Building								0.00041	
	Student	Student	162	0.04	6.48	2022.98	7493	5	0.11748	Data from HKU
	Teacher & Staff	J11	402	0.28	112.56	2135.54	7909	5	0.12399	Data from HKU
	Kitchen	J10	18	1.58	28.44	2163.98	8015	5	0.12564	Data from HKU
AG	Victoria Road Fresh Water Service Reservoir	J11	3	0.28	0.84	2164.82	8018	5	0.12569	Estimated Population
Total Flow					2200.3					Inflow Factor = 1.00 GESF Table T-4
Average Flow (l/s)					25.47					

*Estimated sewage flow of Planned Development A/H10/94-1 is being incorporated into the existing estimation of sewage flow as it is under construction.

** With reference to Source T (No. 3 Sassoon Road Academic Building), the population of teacher & staff is approximately 4% of the total population

The estimation of backwash flow from swimming pool is based on following assumption

Turnover Rate	4 hr	
Surface Loading Rate of Filter	20 m3/m2/hr	0.011904
Backwash Duration	3 min /day	
Backwash Flow Rate	30 m3/m2/hr	

Project

Application for Permission under Section 16 of the Town Planning Ordinance (Cap. 131) for Submission of Layout Plan and Proposed Minor Relaxation of Building Height Restriction for Permitted Flat at "Residential (Group C)" zone at the Ebenezer School and Home for the Visually Impaired, 131 Pok Fu Lam Road, Pok Fu Lam, Hong Kong

Subject

Estimation of Sewage Flow at Pok Fu Lam Road (Existing Scenario)

From Manhole No.	To Manhole No.	Upstream CL (mPD)	Downstream CL (mPD)	Upstream I.L. (mPD) ¹	Downstream I.L. (mPD) ¹	Distance (m)	Diameter (mm)	Gradient (1 in)	Capacity (m ³ /s)	Peak Discharge (existing) (m ³ /s)	% of Capacity (existing)	Remark
FMH7022550	FMH7022549	139.22	138.78	137.32	137.23	20.6	300	228.9	0.074	0.05232	70.67%	Existing Flow from Source A to K
FMH7022549	FMH7022545	138.62	138.62	137.22	137.07	24.3	300	162.0	0.088	0.05897	67.01%	Connection Point from P (Ebenezer New Hope School), Q (Ebenezer School & Home for the Visually Impaired)
FMH7022545	FMH7022544	138.74	138.74	137.07	136.89	33.6	300	186.7	0.082	0.05897	71.93%	
FMH7022544	FMH7022539	138.89	138.89	136.89	136.74	44.3	300	295.3	0.065	0.06081	93.31%	Connection Point from L (Dor Fook Mansion)
FMH7022539	FMH7022538	139.02	139.02	136.74	136.52	41.5	300	188.6	0.082	0.06081	74.56%	
FMH7022538	FMH7022536	138.98	138.98	136.52	136.35	42.7	300	251.2	0.071	0.07576	107.20%	Connection Point from A to O (Radcliffe)
FMH7022536	FMH7038820	138.71	138.71	136.33	136.26	7.7	400	110.0	0.228	0.07576	33.28%	
FMH7038820	FMH7022533	138.37	138.37	136.25	135.91	50.6	400	148.8	0.196	0.07576	38.71%	
FMH7022533	FMH7022362	138.00	138.00	135.89	135.55	42.7	400	125.6	0.213	0.07798	36.60%	Connection Point from R (Royalton)
FMH7022362	FMH7022361	138.40	138.40	135.54	135.26	45	400	160.7	0.188	0.07926	42.09%	Connection Point from S (Royalton II)
FMH7022361	FMH7022360	138.43	138.43	135.54	134.65	36.9	400	41.5	0.371	0.07926	21.37%	
FMH7022360	FMH7038860	138.24	138.24	134.65	134.11	29.4	400	54.4	0.324	0.07926	24.49%	
FMH7038860	FMH7038861	137.63	137.63	134.11	133.63	10.5	400	21.9	0.511	0.07926	15.52%	
FMH7038861	FMH7038862	135.42	135.42	133.63	133.00	24.3	400	38.6	0.384	0.07926	20.62%	
FMH7038862	FMH7038845	135.42	135.34	133.00	132.50	34.7	400	69.4	0.287	0.07926	27.65%	
FMH7038845	FMH7038846	135.34	134.18	132.50	131.76	13.5	400	18.2	0.559	0.07926	14.18%	
FMH7038846	FMH7020219	134.18	131.89	131.76	129.79	29.7	400	15.1	0.615	0.07926	12.89%	
FMH7020219	FMH7020220	131.89	130.45	129.79	128.35	24.1	300	16.7	0.274	0.07926	28.94%	
FMH7020220	FMH7060381	130.45	126.53	128.35	124.46	41.6	300	10.7	0.343	0.08279	24.16%	Connection Point from AH (No. 3 Sassoon Road Academic Building)
FMH7060381	FMH7020221	126.53	124.48	124.46	122.68	13.1	300	7.4	0.413	0.08899	21.54%	Connection Point from U (HKU HKJC Building for Interdisciplinary Research)
FMH7020221	FMH7020222	124.48	119.51	122.68	117.41	32.7	300	6.2	0.450	0.09102	20.23%	Connection Point from V (Patrick Manson Building (North Wing))
FMH7020222	FMH7020223	119.51	115.59	117.41	112.89	31.3	300	6.9	0.426	0.09102	21.38%	
FMH7020223	FMH7022433	115.59	113.59	112.89	110.99	15.7	300	8.3	0.390	0.09102	23.35%	
FMH7022433	FMH7022444	113.59	109.95	110.99	108.21	30.1	300	10.8	0.341	0.09102	26.73%	
FMH7022444	FMH7022432*	109.95	110.04	108.21	108.08	6	300	46.2	0.165	0.09102	55.19%	
FMH7022432*	FMH7022445	110.04	109.47	108.08	107.98	4.7	225	47.0	0.077	0.12569	164.17%	Connection Point from W to AG (Victoria Road Fresh Water Service Reservoir)
FMH7022445	FMH7023281	109.47	104.54	107.98	101.96	48.2	225	8.0	0.186	0.12569	67.75%	
FMH7023281	FMH7022459	104.54	101.40	101.96	99.27	29.8	225	11.1	0.158	0.12569	79.69%	
FMH7022459	FMH7022410	101.40	99.20	99.27	98.20	12	225	11.2	0.157	0.12569	80.18%	
FMH7022410	FMH7022415	99.20	77.70	98.00	73.83	32	250	1.3	0.602	0.12569	20.86%	

Surface roughness k_s 0.6 mm (Slimed sewers - Clayware in poor condition)
 kinematic viscosity ν 1.14 mm²/s

$$\text{Mean velocity (Colebrook-White)} \quad \bar{V} = -\sqrt{32gRS_f} \log \left[\frac{k_s}{14.8R} + \frac{1.255\nu}{R\sqrt{(32gRS_f)}} \right]$$

Capacity provided $Q = V \times \text{Cross Section Area of Drain}$

1. All invert levels are extracted from GEOINFO MAP and only the invert levels of the main alignment are presented.

2. Drainage record plan refers to Drawing No. LILY16/SIA/001

* Assume mid-way between upstream and downstream manholes

Appendix B

Hydraulic Calculation of Sewage Flow of Proposed Development

Project

Application for Permission under Section 16 of the Town Planning Ordinance (Cap. 131) for Submission of Layout Plan and Proposed Minor Relaxation of Building Height Restriction for Permitted Flat at "Residential (Group C)" zone at the Ebenezer School and Home for the Visually Impaired, 131 Pok Fu Lam Road, Pok Fu Lam, Hong Kong

Subject

Estimation of Sewage Flow at Pok Fu Lam Road (After Development)

Sewerage Catchment (From FMH7022574 to FMH7022415)

	Source	Category	Population	Unit Flow (m3/h/d)	Daily Flow (m3/d)	Cumulative Daily Flow (excluding pools) (m3/d)	Cumulative population	Daily Flow (m3/s)	Peaking Factor	Cumulative Peak Flow (m3/s)	Remark
A	Pok Fu Lam Park Management Centre										
	Park Personnel	J11	5	0.28	1.4	1.4	5	1.62E-05	8	0.00013	Estimated Population
	Swimming Pool (515m2)				12.55			0.000145		0.00027	
B	WSD Staff Quarters	Institutional	24	0.19	4.56	5.96	22	5.28E-05	8	0.00070	12Units x 2PPF, say
C	HKJC PHAB Camp	Institutional	124	0.19	23.56	29.52	109	0.000273	8	0.00288	Data from website
D	University Hall	Institutional	110	0.19	20.9	50.42	187	0.000242	8	0.00481	Data from website
E	Planned Development A/H10/94-1	Institutional			461.2	511.62	1895	0.005338	6	0.03567	Flow provided by EPD
F	HKJC Riding School	J11			97.53	609.15	2256	0.001129	6	0.04245	Flow provided by EPD
G	Woodbury Court										30 Units from Centadata, average occupancy 3.7 PPF
	Residents	R2	111	0.27	29.97	639.12	2367	0.000347	6	0.04453	
	Management Staff	J11	6	0.28	1.68	640.80	2373	1.94E-05	6	0.04465	
	Swimming Pool (105m2)				2.56			2.96E-05		0.04467	
H	Middleton Towers										70 Units from Centadata, average occupancy 3.7 PPF
	Residents	R2	259	0.27	69.93	710.73	2632	0.000809	6	0.04953	
	Management Staff	J11	13	0.28	3.64	714.37	2646	4.21E-05	6	0.04978	
I	Planned Development Lot No. RBL 757										
	Residents	R3	12	0.37	4.44	718.81	2662	5.14E-05	6	0.05009	3 Units from Midland Realty data, average occupancy 3.7 PPF
	Management Staff	J11	1	0.28	0.28	719.09	2663	3.24E-06	6	0.05011	
J	Alberose	R3	4	0.37	1.48	720.57	2669	1.71E-05	6	0.05021	1 Units from Centadata, average occupancy 3.7 PPF
K	Jessville Manor					720.57	2669				4 Units from website, average occupancy 3.7 PPF
	Residents	R2	15	0.27	4.05	724.62	2684	4.69E-05	6	0.05050	
	Management Staff	J11	1	0.28	0.28	724.90	2685	3.24E-06	6	0.05052	
L	Jessville Tower					724.90	2685				28 Units from website, average occupancy 3.7 PPF
	Residents	R2	104	0.27	28.08	752.98	2789	0.000325	6	0.05247	
	Management Staff	J11	6	0.28	1.68	754.66	2795	1.94E-05	6	0.05258	
	Swimming Pool (240m2)				5.85			6.77E-05		0.05265	
M	Dor Fook Mansion										25 Units from Centadata, average occupancy 3.7 PPF
	Residents	R2	93	0.27	25.11	779.77	2888	0.000291	6	0.05439	
	Management Staff	J11	5	0.28	1.4	781.17	2893	1.62E-05	6	0.05449	
N	Government Quarters					781.17					
	Residents	R2	592	0.27	159.84	941.01	3485	0.00185	6	0.06559	Estimated population (20 floors x 8 flats/floor = 160 Units)
	Management Staff	J11	30	0.28	8.4	949.41	3516	9.72E-05	6	0.06617	
O	Hospital Authority	J11	126	0.28	35.28	984.69	3647	0.000408	6	0.06862	Building Area 1.907m2 x 2 floors = 3.814m2
	Radcliffe					984.69					10 Units from Centadata, average occupancy 3.7 PPF
	Residents	R2	37	0.27	9.99	994.68	3684	0.000116	6	0.06932	
	Management Staff	J11	2	0.28	0.56	995.24	3686	6.48E-06	6	0.06936	
	Swimming Pool (290m2)				7.07			8.18E-05		0.06944	
P	Existing Facilities (to be relocated)										
	Student	Student	0	0.04	0	995.24	3686		6	0.06944	
	Teacher & Staff	J11	0	0.28	0	995.24	3686		6	0.06944	
Q	Proposed Development										
	Residents	R3	500	0.37	185	1180.24	4371	0.002141	6	0.08229	
	Management Staff*	J11	25	0.28	7	1187.24	4397	8.1E-05	6	0.08277	
	Swimming Pool (150m2)				3.66			4.23E-05		0.08281	
R	Royalton										30 Units from Centadata, average occupancy 3.7 PPF
	Residents	R2	111	0.27	29.97	1217.21	4508	0.000347	6	0.08490	
	Management Staff	J11	6	0.28	1.68	1218.89	4514	1.94E-05	6	0.08501	
	Swimming Pool (70m2)				1.71			1.97E-05		0.08503	
S	Royalton II										17 Units from Centadata, average occupancy 3.7 PPF
	Residents	R2	63	0.27	17.01	1235.90	4577	0.000197	6	0.08621	
	Management Staff	J11	4	0.28	1.12	1237.02	4582	1.3E-05	6	0.08629	
	Swimming Pool (105m2)				2.56			2.96E-05		0.08632	
AH	No. 3 Sassoon Road Academic Building										
	Student	Student	960	0.04	38.4	1275.42	4724	0.000444	6	0.08899	Data from HKU
	Teacher & Staff	J11	44	0.28	12.32	1287.74	4769	0.000143	6	0.08984	Data from HKU
U	No.5 Sassoon Road HKU HKJC Building for Interdisciplinary Research										
	Student**	Student	1728	0.04	69.12	1356.86	5025	0.0008	5	0.07894	Data from HKU, total population 1,800 persons. Estimated Staff are 4% of Overall Population
	Teacher & Staff**	J11	72	0.28	20.16	1377.02	5100	0.000233	5	0.08010	
V	No.7 Sassoon Road Patrick Manson Building (North Wing)										
	Student**	Student	715	0.04	28.6	1405.62	5206	0.000331	5	0.08176	Data from HKU, total population 745 persons. Estimated Staff are 4% of Overall Population
	Teacher & Staff**	J11	30	0.28	8.4	1414.02	5237	9.72E-05	5	0.08225	
W	Proposed Development at No. 6 Sassoon Road	Institutional			285	1699.02	6293	0.003299	5	0.09874	Flow provided by EPD
X	Wei Lun Hall	Institutional			72.6	1771.62	6562	0.00084	5	0.10294	Flow provided by EPD
Y	Lee Hysan Hall	Institutional			72.6	1844.22	6830	0.00084	5	0.10714	Flow provided by EPD
Z	The University of Hong Kong R.C. Lee Hall	Institutional			72.6	1916.82	7099	0.00084	5	0.11134	Flow provided by EPD
AA	Bay View Restaurant	J10			75.5	1992.32	7379	0.000874	5	0.11571	Flow provided by EPD
AB	Madam S.H. Ho Residence for Medical Student	Institutional			55.3	2047.62	7584	0.00064	5	0.11891	Flow provided by EPD
AC	Dexter H.C. Man Building	J11	107	0.28	29.96	2077.58	7695	0.000347	5	0.12065	Data from HKU
AD	The University of Hong Kong Institute of Molecular Biology	J11	69	0.28	19.32	2096.90	7766	0.000224	5	0.12176	Data from HKU
AE	The University of Hong Kong Estates Building	J11	103	0.28	28.84	2125.74	7873	0.000334	5	0.12343	Data from HKU
AF	Pauline Chan Building										
	Student	Student	162	0.04	6.48	2132.22	7897	0.000075	5	0.12381	Data from HKU
	Teacher & Staff	J11	402	0.28	112.56	2244.78	8314	0.001303	5	0.13032	Data from HKU
	Kitchen	J10	18	1.58	28.44	2273.22	8419	0.000329	5	0.13197	Data from HKU
AG	Victoria Road Fresh Water Service Reservoir	J11	3	0.28	0.84	2274.06	8422	9.72E-06	5	0.13202	Estimated Population
Total Flow					2310.0						Inflow Factor = 1.00 GESF Table T-4
Average Flow (l/s)					26.74						

*assume no. management staff = 5% of no. of residents

** With reference to Source T (No. 3 Sassoon Road Academic Building), the population of teacher & staff is approximately 4% of the total population

The estimation of backwash flow from swimming pool is based on following assumption

Turnover Rate	4 hr
Surface Loading Rate of Filter	20 m3/m2/hr
Backwash Duration	3 min /day
Backwash Flow Rate	30 m3/m2/hr

Project

Application for Permission under Section 16 of the Town Planning Ordinance (Cap. 131) for Submission of Layout Plan and Proposed Minor Relaxation of Building Height Restriction for Permitted Flat at "Residential (Group C)" zone at the Ebenezer School and Home for the Visually Impaired, 131 Pok Fu Lam Road, Pok Fu Lam, Hong Kong

Subject Estimation of Sewage Flow at Pok Fu Lam Road (After Development)

From Manhole No.	To Manhole No.	Upstream CL (mPD)	Downstream CL (mPD)	Upstream I.L. (mPD) ¹	Downstream I.L. (mPD) ¹	Distance (m)	Diameter (mm)	Gradient (1 in)	Capacity (m ³ /s)	Peak Discharge (existing) (m ³ /s)	% of Capacity (existing)	Peak Discharge (future) (m ³ /s)	% of Capacity (future)	Remark
New MH001	FMH7038820	138.95	138.71	137.00	136.80	13.5	225	67.5	0.064	-	-	0.01829	28.63%	Connection Point from Proposed Development. ²
FMH7038820	FMH7022533	138.71	138.37	136.25	135.91	50.6	400	148.8	0.196	0.07576	38.71%	0.08281	42.31%	Existing Flow from Source A to O, Q and T
FMH7022533	FMH7022362	138.37	138.00	135.89	135.55	42.7	400	125.6	0.213	0.07798	36.60%	0.08503	39.91%	Connection Point from R (Royalton)
FMH7022362	FMH7022361	138.00	138.40	135.54	135.26	45	400	160.7	0.188	0.07926	42.09%	0.08632	45.83%	Connection Point from S (Royalton II)
FMH7022361	FMH7022360	138.40	138.43	135.54	134.65	36.9	400	41.5	0.371	0.07926	21.37%	0.08632	23.28%	
FMH7022360	FMH7038860	138.43	138.24	134.65	134.11	29.4	400	54.4	0.324	0.07926	24.49%	0.08632	26.67%	
FMH7038860	FMH7038861	138.24	137.63	134.11	133.63	10.5	400	21.9	0.511	0.07926	15.52%	0.08632	16.91%	
FMH7038861	FMH7038862	137.63	135.42	133.63	133.00	24.3	400	38.6	0.384	0.07926	20.62%	0.08632	22.45%	
FMH7038862	FMH7038845	135.42	135.34	133.00	132.50	34.7	400	69.4	0.287	0.07926	27.65%	0.08632	30.12%	
FMH7038845	FMH7038846	135.34	134.18	132.50	131.76	13.5	400	18.2	0.559	0.07926	14.18%	0.08632	15.44%	
FMH7038846	FMH7020219	134.18	131.89	131.76	129.79	29.7	400	15.1	0.615	0.07926	12.89%	0.08632	14.03%	
FMH7020219	FMH7020220	131.89	130.45	129.79	128.35	24.1	300	16.7	0.274	0.07926	28.94%	0.08632	31.52%	
FMH7020220	FMH7060381	130.45	126.53	128.35	124.46	41.6	300	10.7	0.343	0.08279	24.16%	0.08984	26.22%	Connection Point from AH (No. 3 Sassoon Road Academic Building)
FMH7060381	FMH7020221	126.53	124.48	124.46	122.68	13.1	300	7.4	0.413	0.08899	21.54%	0.08010	19.39%	Connection Point from U (HKU HKJC Building for Interdisciplinary Research)
FMH7020221	FMH7020222	124.48	119.51	122.68	117.41	32.7	300	6.2	0.450	0.09102	20.23%	0.08225	18.28%	Connection Point from V (Patrick Manson Building (North Wing))
FMH7020222	FMH7020223	119.51	115.59	117.41	112.89	31.3	300	6.9	0.426	0.09102	21.38%	0.08974	23.19%	
FMH7020223	FMH7022433	115.59	113.59	112.89	110.99	15.7	300	8.3	0.390	0.09102	23.35%	0.10294	26.41%	
FMH7022433	FMH7022444	113.59	109.95	110.99	108.21	30.1	300	10.8	0.341	0.09102	26.73%	0.10714	31.46%	
FMH7022444	FMH7022432*	109.95	110.04	108.21	108.08	6	300	46.2	0.165	0.09102	55.19%	0.11134	67.52%	
FMH7022432*	FMH7022445	110.04	109.47	108.08	107.98	4.7	225	47.0	0.077	0.12569	164.17%	0.13202	172.43%	Connection Point from W to AG (Victoria Road Fresh Water Service Reservoir)
FMH7022445	FMH7023281	109.47	104.54	107.98	101.96	48.2	225	8.0	0.186	0.12569	67.75%	0.13202	71.16%	
FMH7023281	FMH7022459	104.54	101.40	101.96	99.27	29.8	225	11.1	0.158	0.12569	79.69%	0.13202	83.70%	
FMH7022459	FMH7022410	101.40	99.20	99.27	98.20	12	225	11.2	0.157	0.12569	80.18%	0.13202	84.22%	
FMH7022410	FMH7022415	99.20	77.70	98.00	73.83	32	250	1.3	0.602	0.12569	20.86%	0.13202	21.92%	

Surface roughness k_s 0.6 mm (Slimed sewers - Clayware in poor condition)
 kinematic viscosity ν 1.14 mm²/s

$$\bar{V} = -\sqrt{32gRS_f} \log \left[\frac{k_s}{148R} + \frac{1.255\nu}{R\sqrt{(32gRS_f)}} \right]$$

Capacity provided $Q = V \times \text{Cross Section Area of Drain}$

1. All invert levels are extracted from GEOINFO MAP and only the invert levels of the main alignment are presented.
 2. As this is new sewer proposed to connect to public sewerage system from the Proposed Development, peaking factor (excluding stormwater allowance) of 8 has been applied.
 3. Drainage record plan refers to Drawing No. LILY16/SIA/001
- * Assume mid-way between upstream and downstream manholes

Subject Proposed Sewerage Works for Application Site

ADWF	=	0.00232 m ³ /s
Peak Flow (Sewer)	=	0.01829 m ³ /s
Peak Flow (Pumping Station)	=	0.00689 m ³ /s

Capacity of Pipe

$$\begin{aligned}\text{Cross Section Area of Drain} &= Q / v \\ &= 0.00689 \text{ m}^2\end{aligned}$$

Design for Pipe Size < 93.63347 = 75 mm
OK

Volume of Pit

Minimum Volume

Volume of pit V = 0.75 m³ (0.5(L)x1(W)x1.5(D))
OK

Appendix C

Preliminary Freeboard Check for FMH7022432

Reference

- ### Assumption adopted in Hydraulic Analysis

- Preliminary Freeboard Check for FMH7022432

Note: refer to DSD drainage record plan for manhole references

[illegible]

* Head losses coefficient, K, is determined using Table 7 of DSD's SM Part 1 2013.