

Appendix 6

Drainage and Sewerage Impact Assment

Prepared for

International Trademart Company Limited

Prepared by

Ramboll Hong Kong Limited

**PROPOSED COMPOSITE REDEVELOPMENT WITH TRADE
MART/EXHIBITION AND COMMERCIAL, RESIDENTIAL,
SOCIAL WELFARE FACILITIES AND SCHOOL USES AND
MINOR RELAXATION OF BUILDING HEIGHT RESTRICTION,
NEW KOWLOON INLAND LOT NO. 6032, 1 TRADEMART
DRIVE, KOWLOON BAY, KOWLOON**

DRAINAGE & SEWERAGE IMPACT ASSESSMENT

Date **January 2025**

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Project Reference **HQIKITECEI00**

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1. INTRODUCTION

1.1 Project Background

- 1.1.1 The background in relation to the project and this Section 16 planning application is included in the planning statement.
- 1.1.2 Ramboll Hong Kong Limited is commissioned to provide Drainage and Sewerage Impact Assessment (DSIA) consultancy services for the Proposed Development.

1.2 Application Site and its Environs

- 1.2.1 The Application Site is located in Kowloon Bay area with surrounding context described under Section 2.1.1 of the planning statement. It is at the western fringe of Kowloon Bay business area. Kai Fuk Road is connecting to the existing Kai Tak Tunnel with tunnel portal located on west side of the Application Site. The planned Central Kowloon Route would have the future alignment running along and to the further southwest.
- 1.2.2 The surrounding area is generally developed and the site is in the midst of commercial (at KBBA) and Residential (at Kai Tak Development) setting.
- 1.2.3 The location of the Application Site and its surrounding environs are shown in **Figure 1.1**.
- 1.2.4 The Application Site itself is currently occupied by a commercial cum trade mart building with nearly 100% site coverage.

1.3 Proposed Development

- 1.3.1 Residential, retail, office and GIC developments are proposed at the Application Site.
- 1.3.2 There are a podium building, office and mixed blocks and 4 residential towers (Tower 1 to 5¹). Ancillary facilities include car park, clubhouse (with 1 outdoor swimming pool), E&M rooms for residential portion. GIC consists of a kindergarten, a day care centre for the elderly (DCCE), a residential care home for the elderly (RCHE) housed in the podium building. The office tower and mixed block (with commercial uses and hotel use) consists of trademart exhibition uses and showroom/exhibition related uses housed in mixed block.
- 1.3.3 There are altogether 1,495 flat units and 720 hotel rooms provided. The GFA of Showroom/ Exhibition related uses/ spaces, retail (assuming 20% F&B), office, clubhouse, G/IC facilities and kindergarten are 23,273 m², 13,403 m², 35,600 m², 2,638 m² (4% of total Domestic GFA), 2,090m² and 557m² respectively.
- 1.3.4 The tentative completion year is 2029.
- 1.3.5 The Master Layout Plan (MLP) of the Proposed Development are shown in planning statement.

1.4 Appraisal of Drainage Impact

- 1.4.1 The existing Application Site is currently an exhibition and commercial building with 100% paved area. The Proposed Development is planned to include not less than 30% of greenery area. As the vegetated area increases the surface runoff will decrease. The loading to the existing public drainage system will be reduced when compared to the existing situation. Therefore, it is expected the Proposed Development at the Application Site has no adverse drainage impact on the existing drainage system. Drainage submission will be provided in the next stage upon detailed design after

¹ Exclude Tower 4

2. SEWERAGE IMPACT ASSESSMENT

2.1 Scope of Work

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

2.2 Assessment Criteria and Methodology

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

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

- Residents: 0.27 m³/person/day (R2)
- G/IC Staff: 0.28 m³/day (J11 – Community, Social & Personal Services)
- Retail employee: 0.28 m³/day (J4 – Wholesale & Retail)
- F&B employee: 1.58 m³/day (J10 – Restaurants & Hotels)
- Office employee: 0.08 m³/day (J12 – Public Administration)
- Student: 0.04 m³/day (School Student)
- Trademart employee: 0.28 m³/day (J4 – Wholesale & Retail)

2.2.3 Catchment Inflow Factor (P_{CIF}) of East Kowloon (1.1) has been applied in the assessment.

2.3 Existing and Future Sewerage System

2.3.1 According to the Drainage Record Plans obtained from DSD, there is one sewer serving the Application Site. The terminal manhole of the Application Site is on the east side and then connected to existing sewer manhole (FMH4039760). The Ø300mm sewer run from west to east along Lam Hing Street and with diameter increased to Ø450mm after manhole (FMH4033701), and then connected to the main trunk sewer along Wang Kwong Road. Related catchment downstream of the Application Site along Lam Hing Street includes HSBC Main Treasury Building only while other buildings do connect to another sewer running in parallel.

2.3.2 As confirmed in the existing drainage plan (**Appendix 2.2**), the invert level of existing terminal manhole is 4.05mPD. Yet, there is no invert level information available from drainage record for manholes FMH4039760 to FMH4033701. For the purpose of assessment, it is assumed in this study that the sewer pipe from terminal manhole to FMH4033701 is of same gradient. The actual invert level at each manhole location is to be investigated in later stage.

2.3.3 The existing sewers in the vicinity of the Application Site are shown in **Figure 2.1**.

2.4 Wastewater Generated by the Proposed Development

2.4.1 Wastewater arising from the proposed redevelopment will be primarily contributed by the residential population, clubhouse staff, office area and retail area (F&B) employee. One outdoor swimming pool will be provided.

- 2.4.2 The proposed development includes a swimming pool so that there will be additional discharge during backwashing operation. Yet, it is noted that the backwashing operation can be practicably avoided during peak discharge period. For example, by administrative mean, backwashing operation and discharge would be restricted to during non-peak sewage discharge period (e.g. during 0000-0600) only. It is committed that backwash would not discharge during the peak sewage discharge period.
- 2.4.3 Detailed calculation for the proposed development is given in **Table 2.1** below and **Appendix 2.1**.

Table 2.1 Estimated Peak Flow of Proposed Development

Development Parameters	Proposed Development										
	Residential	Clubhouse	Hotel	Commercial Area (Retail)	Commercial Area (F&B)	Office	Showroom/ Exhibition related uses/ spaces	Kindergarten	Day Care Unit	RCHE	Office Base of Social Work Service for Pre-primary Institutions (SWSPPI)
Number of flats	1494	-	-	-	-	-	-	-	-	-	-
Assumed Area (m ²)	-	2,638	24,000	10,723	2,680	35,600	23,273	-	365	1560	165
Assumed Population	4034 ⁽¹⁾	87 ⁽³⁾	768 for staff ⁽¹⁷⁾	375 ⁽⁵⁾	137 ⁽⁷⁾	1958 ⁽⁹⁾	512 ⁽⁹⁾	120 Students ⁽¹³⁾ 15 employees ⁽¹⁴⁾	30 elderly ⁽¹³⁾ 12 employees ⁽³⁾	60 beds ⁽¹³⁾ 51 employees ⁽³⁾	5 ⁽⁹⁾
Design Flow (m ³ /person/day)	0.27 ⁽²⁾	0.28 ⁽⁴⁾	1.58 ⁽⁶⁾	0.28 ⁽⁶⁾	1.58 ⁽⁶⁾	0.08 ⁽¹⁰⁾	0.28 ⁽⁶⁾	0.04 for students ⁽¹⁵⁾ 0.28 for employees ⁽⁴⁾	0.19 for elderly ⁽¹⁶⁾ 0.28 for employees ⁽⁴⁾	0.19 for elderly ⁽¹⁶⁾ 0.28 for employees ⁽⁴⁾	0.28 ⁽⁴⁾
Flow Rate (m³/day)	1089.2	24.4	1213.4	105.0	216.5	156.6	143.4	9.0	9.1	25.7	1.4
Total Flow Rate (m³/day)	2993.6										
Total Flow Rate with P_{CIF} (m³/day)	3292.9⁽¹¹⁾										
Peak Flow (L/s)	152.5										
Peak Flow with Swimming Pool (L/s)	171.2⁽¹²⁾										

- (1) 2.7 person/flat – based on "2021 Population Census: Average Household Size of 2.7 in Kwun Tong
- (2) Refer to Table T-1 of GESF – R2
- (3) 30.30 m² per worker – based on Table 8 of CIFSUS – Community, Social & Personal Services
- (4) Refer to Table T-2 of GESF – J11
- (5) 28.57 m² per worker – based on Table 8 of CIFSUS – Retail Trade
- (6) Refer to Table T-2 of GESF – J4
- (7) 19.61 m² per worker – based on Table 8 of CIFSUS – Restaurants
- (8) Refer to Table T-2 of GESF – J10
- (9) 18.18 m² per worker – based on Table 8 of CIFSUS- Financial, Insurance, Real Estate & Business Services
- (10) Refer to Table T-2 of GESF – J12
- (11) 1.1 of P_{CIF} for East Kowloon is adopted
- (12) Backwash discharge from the proposed swimming pool will be carried out outside peak hour
- (13) Provided by project architect
- (14) 8:1 student to teacher ratio in 2021/22 according to Education Bureau
- (15) Refer to Table T-2 of GESF – Student
- (16) 31.25m² per worker – based on Table 8 of CIFSUS - Hotel and Boarding Houses
- (17) Refer to Table T-1 of GESF – R1

2.5 Assessment of Sewerage Impact

- 2.5.1 **Appendix 2.1** shows the detailed calculation on the estimated hydraulic capacity of the proposed sewer sections and existing downstream sewers and the calculation of the amount of the sewage entering each segment of the said sewer network. Total flow from the proposed development is assessed in the calculations.

- 2.5.2 As mentioned, for the purpose of assessment, it is assumed in this study that the sewer pipe from terminal manhole to FMH4033701 is of same gradient. Underground survey will be conducted in the next stage upon detailed design to ascertain the invert level. Where necessary, hydraulic calculation will be further supplemented/ updated.

2.6 Discussion

- 2.6.1 The potential sewerage impact due to the Proposed Development has been quantitatively addressed. Sewage generation rate from the Proposed Development is estimated to be 3296.6m³/day (i.e. peak flow 152.6 litre/sec, peak flow with swimming pool 171.4 litre/sec).
- 2.6.2 After calculating the appropriate capacities as mentioned above, the estimated sewage flow from the Application Site has been compared with the capacity of the sewerage system to determine whether it has adequate spare capacity to accommodate the flow from the proposed development and existing catchment areas.
- 2.6.3 According to Table 4a of **Appendix 2.1**, regarding the sewage generation rate from the Proposed Development and surrounding areas (**Figure 2.1**), the concerned sewer pipe based on assumption would not have adequate capacity to receive the flow under worst case scenario (assume backwash in place in peak sewage discharge period).
- 2.6.4 As such, upgrading work is proposed and summarized in below:

Table 2.2 Proposed Upgrading Work

Segment	Manhole Reference	Original Diameter (mm)	Diameter after Upgrading (mm)
T1-S3	Terminal manhole – FMH4033701	300	450

- 2.6.5 With the proposed new connection and upgrading works in place, the sewerage system will have adequate capacity to cater the surface runoff from the Proposed Development and nearby catchments. It is noted that survey will be conducted in detailed design stage and upgrading proposal will be revised if necessary and submitted for approval.

3. OVERALL CONCLUSION

3.1 Conclusion

- 3.1.1 A residential cum commercial and trademart development is proposed at New Kowloon Island Lot No. 6032, 1 Trademart Drive, Kowloon Bay. The potential drainage and sewerage impact have been qualitatively or quantitatively addressed.
- 3.1.2 The Application Site is almost 100% paved under existing condition. After development, at least 30% of greenery will be provided so that the surface runoff will be reduced. As the loading to the existing drainage system will be reduced, no adverse drainage impact is anticipated. Drainage submission will be provided in the next stage upon detailed design after terminal manhole(s) and discharge points has been determined. Detailed hydraulic calculation will be provided upon request in the next stage.
- 3.1.3 As there is no invert level from manhole FMH4039760 to FMH4033701, it is assumed that the Terminal Manhole (T1) will connect to the FMH4033701(S3) and the gradient from T1 to S3 is the same in this study. An underground survey will be conducted in detailed design stage. Assessment will be updated where necessary.
- 3.1.4 The sewage discharge arrangement will be same as the existing condition. Based on the sewerage impact assessment results, it is found that the capacity of the existing sewerage system serving the area would not be sufficient to cater for the sewage generation from the Proposed Development and nearby catchment areas.
- 3.1.5 Therefore, the upgrading work of T1 - S3 (FMH4033701) is proposed.
- 3.1.6 With the proposed upgrading works in place, the assessment confirms the feasibility of the Proposed Development in terms of impacts to the public sewerage system.

Figures

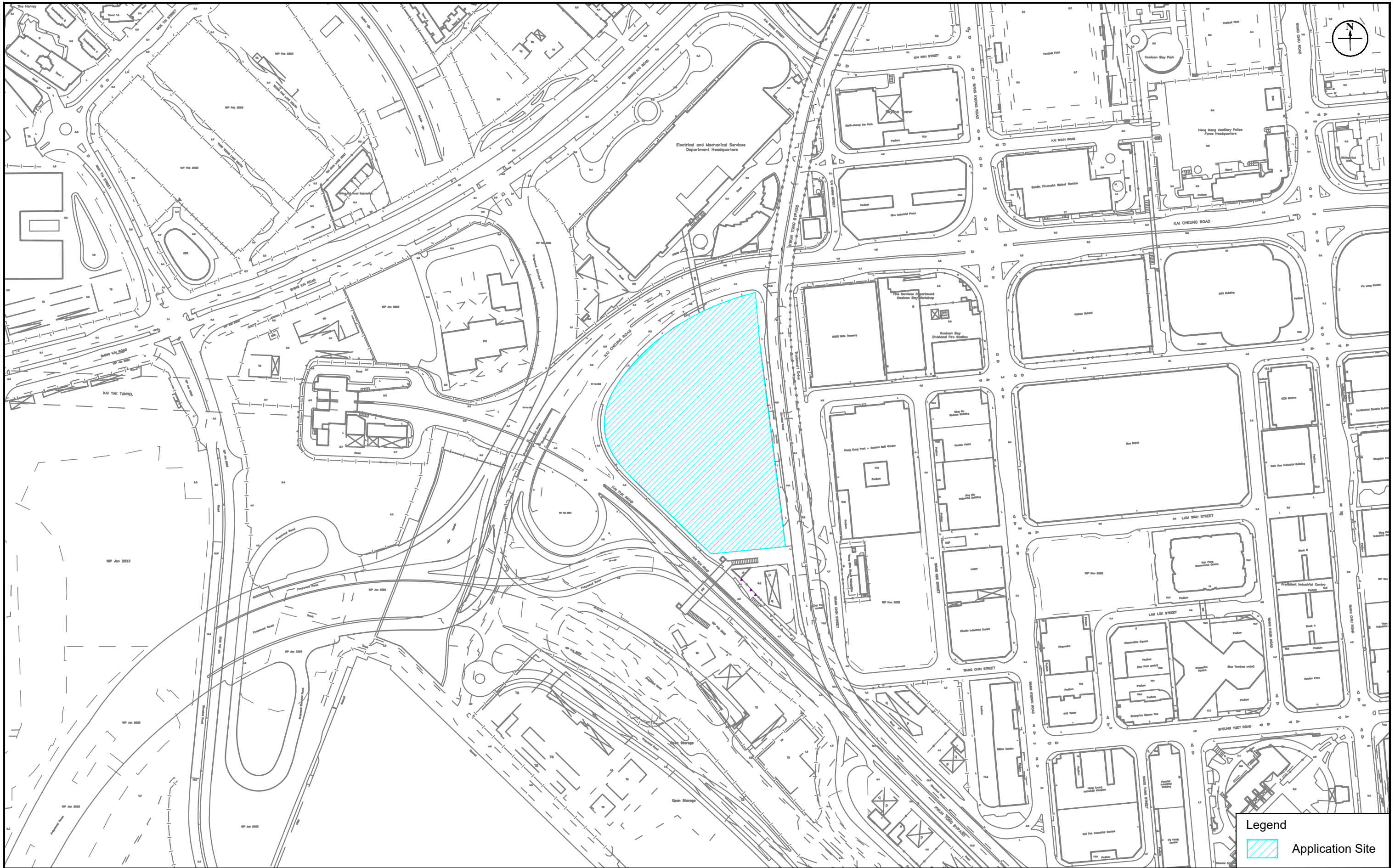


Figure: 1.1
Title: Location of the Application Site and its Environs

Project: Proposed Composite Redevelopment with Trade Mart/ Exhibition and Commercial, Residential, Social Welfare Facilities and School Uses and Minor Relaxation of Building Restriction, New Kowloon Inland Lot No. 6032, 1 Trademart Drive, Kowloon Bay, Kowloon

Legend
 Application Site

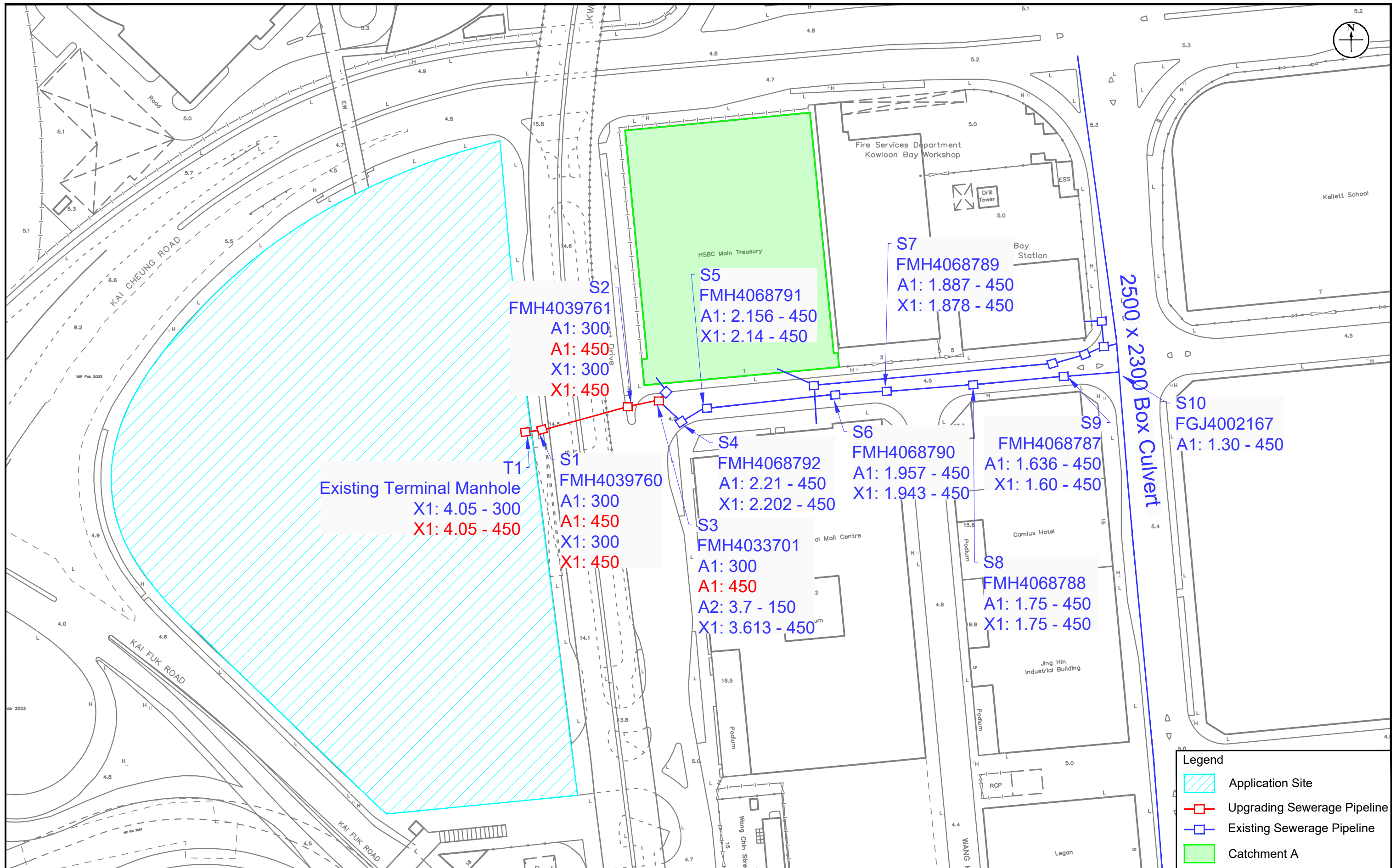
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Rev.: 2.0

Date: Jan 2025



Legend	
	Application Site
	Upgrading Sewerage Pipeline
	Existing Sewerage Pipeline
	Catchment A

Figure: 2.1 Title: Existing Sewerage System and Catchment Areas in the Vicinity of the Application Site Project: Proposed Composite Redevelopment with Trade Mart/ Exhibition and Commercial, Residential, Social Welfare Facilities and School Uses and Minor Relaxation of Building Restriction, New Kowloon Inland Lot No. 6032, 1 Trademart Drive, Kowloon Bay, Kowloon	
	Drawn by: MW
	Checked by: CC
	Rev.: 2.0 Date: Jan 2025

Appendix 2.1 Detailed Sewerage Impact Assessment Calculation

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

1. Residential Tower	
1a. Total number of residential units	= 1494 units
1b. Total number of residents	= 4034 people -- (2021 Population Census: Average Household Size of 2.7 in Kwun Tong)
1c. Design flow	= 0.27 m ³ /person/day -- (Private R2 in Table T-1 of GESF)
1d. Sewage Generation rate	= 1089.2 m³/day
2. Clubhouse	
2a. Assumed Area	= 3000 m ²
2b. Assumed floor area per employee	= 30.30 m ² per worker -- (refer to Table 8 of CIFSUS - Community, Social & Personal Services)
2c. Total number of employees	= 99 employees
2d. Design flow for commercial activities	= 0.28 m ³ /employee/day -- (refer to Table T-2 of GESF - J11)
2e. Sewage Generation rate	= 27.7 m³/day
3. Hotel	
2a. Assumed Area	= 24000 m ²
2b. Assumed floor area per employee	= 31.25 m ² per worker -- (refer to Table 8 of CIFSUS - Hotels and Boarding Houses)
2c. Total number of employees	= 768 employees
2d. Design flow for commercial activities	= 1.58 m ³ /employee/day -- (refer to Table T-2 of GESF Job Type J10)
2e. Sewage Generation rate	= 1213.4 m³/day
3. Commercial Area (Retail)	
3a. Assumed Area	= 10723 m ²
3b. Assumed floor area per employee	= 28.57 m ² per worker -- (refer to Table 8 of CIFSUS - Retail Trade)
3c. Total number of employees	= 375 employees
3d. Design flow for commercial activities	= 0.28 m ³ /employee/day -- (refer to Table T-2 of GESF - J4)
3e. Sewage Generation rate	= 105.0 m³/day
4. Commercial Area (F&B)	
4a. Assumed Area	= 2680 m ²
4b. Assumed floor area per employee	= 19.61 m ² per worker -- (refer to Table 8 of CIFSUS - Restaurants)
4c. Total number of employees	= 137 employees
4d. Design flow for commercial activities	= 1.58 m ³ /employee/day -- (refer to Table T-2 of GESF - J10)
4e. Sewage Generation rate	= 216.5 m³/day
5. Office	
5a. Assumed Area	= 35600 m ²
5b. Assumed floor area per employee	= 18.18 m ² per worker -- (refer to Table 8 of CIFSUS -Financial, Insurance, Real Estate & Business Services)
5c. Total number of employees	= 1958 employees
5d. Design flow for commercial activities	= 0.08 m ³ /employee/day -- (refer to Table T-2 of GESF - J12)
5e. Sewage Generation rate	= 156.6 m³/day
6. Showroom/ Exhibition related uses/ spaces	
6a. Assumed Area	= 23273 m ²
6b. Assumed floor area per employee	= 45.45 m ² per worker -- (refer to Table 8 of CIFSUS -Wholesale Trade)
6c. Total number of employees	= 512 employees
6d. Design flow for commercial activities	= 0.28 m ³ /employee/day -- (refer to Table T-2 of GESF - J4)
6e. Sewage Generation rate	= 143.4 m³/day
7. Proposed Kindergarten	
7a. No. of classroom	= 6 classes
7b. No. of students	= 120 students (provided by the project architect)
7c. Design flow for student	= 0.04 m ³ /employee/day -- (refer to Table T-2 of GESF - student)
7d. Number of teachers and staff	= 15 employees (8.0:1 student to teacher ratio in 2021/22 according to Education Bureau)
7e. Design flow for teacher and staff	= 0.28 m ³ /employee/day -- (refer to Table T-2 of GESF - J11)
7f. Sewage Generation rate	= 9.0 m³/day

8. Day Care Unit

Elderly

8a. Total number of places	=	30 elderly
8b. Design flow	=	0.19 m ³ /person/day -- (Private R1 in Table T-1 of GESF)
8c. Sewage Generation rate (Residence)	=	5.7 m ³ /day

Staff

8d. Assumed Area of PE	=	365 m ²
8e. Assumed floor area per employee	=	30.3 m ² per worker -- (refer to Table 8 of CIFSUS - Community, Social & Personal Services)
8f. Total number of employees	=	12 employees
8g. Design flow for commercial activities	=	0.28 m ³ /employee/day -- (refer to Table T-2 of GESF - J11)
8h. Sewage Generation rate	=	3.4 m ³ /day
Total	=	9.1 m ³ /day

9. RCHE

Resident

9a. Total number of places	=	60 beds
9b. Design flow	=	0.19 m ³ /person/day -- (Private R1 in Table T-1 of GESF)
9c. Sewage Generation rate (Residence)	=	11.4 m ³ /day

Staff

9d. Assumed Area of RCHE	=	1560 m ²
9e. Assumed floor area per employee	=	30.3 m ² per worker -- (refer to Table 8 of CIFSUS - Community, Social & Personal Services)
9f. Total number of employees	=	51 employees
9g. Design flow for commercial activities	=	0.28 m ³ /employee/day -- (refer to Table T-2 of GESF - J11)
9h. Sewage Generation rate	=	14.3 m ³ /day
Total	=	25.7 m ³ /day

10. Office Base of Social Work Service for Pre-primary Institutions (SWSPPI)

10a. Assumed Area of SWSPPI	=	165 m ²
10b. Assumed floor area per employee	=	30.3 m ² per worker -- (refer to Table 8 of CIFSUS - Community, Social & Personal Services)
10c. Total number of employees	=	5 employees
10d. Design flow for commercial activities	=	0.28 m ³ /employee/day -- (refer to Table T-2 of GESF - J11)
10e. Sewage Generation rate	=	1.4 m ³ /day

11. Swimming Pools (Outdoor)

11a. Assumed Area of Swimming Pool	=	562 m ²
11b. Average Depth of Water	=	1.2 m (ordinary assumption)
11c. Volume of Swimming Pool (Ordinary Assumption)	=	674 m ³
11d. Turnover Rate	=	6 hr
11e. Required Surface Loading Rate of Filter	=	112 m ³ /m ² /hr
11f. Filter Areas required	=	1.0 m ²
11g. Adopted Surface Loading Rate of Filter	=	50 m ³ /m ² /hr
11h. Adopted Filter Area	=	2.2 m ²
11i. Backwash Duration	=	7 min/d
11j. Backwash flow rate	=	30 m ³ /m ² /hr
11k. Average Daily Flow Rate for Swimming Pool Backwashing	=	7.9 m ³ /day
11l. Flowrate for Swimming Pool Backwashing in 7 mins	=	18.73 litre/sec

Total Flow from Proposed Development

Flow Rate (without Catchment Inflow Factor)	=	2996.9 m ³ /day
Catchment Inflow Factor	=	1.1 Catchment Inflow Factor for East Kowloon in Table T-4 of GEFS
Flow Rate (with Catchment Inflow Factor)	=	3296.6 m ³ /day
Contributing Population	=	12210 people
Peaking factor	=	4 Refer to Table T-5 of GESF for population 10,000-50,000 incl. stormwater allowance
Peak Flow	=	152.6 litre/sec
Peak Flow with Swimming Pool	=	171.4 litre/sec

** Backwash discharge from the proposed swimming pool will be carried out outside peak hour

**The swimming pool backwash calculation is based on the backwash average daily flow duration (7mins/day).

Table 2a Hydraulic Capacity of Existing Sewers

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k _s	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s ²	m	m ² /s	m/s	m ²	m ³ /s	L/s	
T1-S3	-	FMH4033701	300	46.4	4.05	3.61	9.81	0.00060	0.009	0.000001	1.53	0.07	0.11	108
S3-S4	FMH4033701	FMH4068792	450	9.0	3.61	2.21	9.81	0.00060	0.155	0.000001	8.05	0.16	1.28	1280
S4-S5	FMH4068792	FMH4068791	450	9.1	2.20	2.16	9.81	0.00060	0.005	0.000001	1.44	0.16	0.23	230
S5-S6	FMH4068791	FMH4068790	450	41.2	2.14	1.96	9.81	0.00060	0.004	0.000001	1.35	0.16	0.21	215
S6-S7	FMH4068790	FMH4068789	450	16.2	1.94	1.89	9.81	0.00060	0.003	0.000001	1.19	0.16	0.19	189
S7-S8	FMH4068789	FMH4068788	450	27.5	1.87	1.75	9.81	0.00060	0.004	0.000001	1.34	0.16	0.21	213
S8-S9	FMH4068788	FMH4068787	450	29.3	1.75	1.63	9.81	0.00060	0.004	0.000001	1.30	0.16	0.21	206
S9-S10	FMH4068787	FGJ4002167	450	16.4	1.60	1.30	9.81	0.00060	0.018	0.000001	2.75	0.16	0.44	438

Table 2b Hydraulic Capacity of Existing Sewers (after upgrade)

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k _s	s	v	V	Area	Q	Estimated Capacity
			mm	m	mPD	mPD	m/s ²	m	m ² /s	m/s	m ²	m ³ /s	L/s	
T1-S3	-	FMH4033701	450	46.4	4.05	3.61	9.81	0.00030	0.009	0.000001	2.13	0.16	0.34	339
S3-S4	FMH4033701	FMH4068792	450	9.0	3.61	2.21	9.81	0.00060	0.155	0.000001	8.05	0.16	1.28	1280
S4-S5	FMH4068792	FMH4068791	450	9.1	2.20	2.16	9.81	0.00060	0.005	0.000001	1.44	0.16	0.23	230
S5-S6	FMH4068791	FMH4068790	450	41.2	2.14	1.96	9.81	0.00060	0.004	0.000001	1.35	0.16	0.21	215
S6-S7	FMH4068790	FMH4068789	450	16.2	1.94	1.89	9.81	0.00060	0.003	0.000001	1.19	0.16	0.19	189
S7-S8	FMH4068789	FMH4068788	450	27.5	1.87	1.75	9.81	0.00060	0.004	0.000001	1.34	0.16	0.21	213
S8-S9	FMH4068788	FMH4068787	450	29.3	1.75	1.63	9.81	0.00060	0.004	0.000001	1.30	0.16	0.21	206
S9-S10	FMH4068787	FGJ4002167	450	16.4	1.60	1.30	9.81	0.00060	0.018	0.000001	2.75	0.16	0.44	438

Note: 1. Table 2a: According to the Geoinfo Map, the invert level of FMH4039760 to FMH4033701 are missing. Therefore, it is assumed that the terminal manhole (T1) invert level will be connected to FMH4033701 (S3).

- Remarks: (1) g=gravitational acceleration; k_s=equivalent sand roughness; s=gradient; v=kinematic viscosity of water; V=mean velocity
 (2) Table 2: The value of k_s = 0.6mm is used for the calculation of slimed clayware sewer, poor condition (based on Table 5: Recommended roughness values in Sewerage Manual)
 (3) Table 2: The value of k_s is interpolated for pipe velocities between 0.75 m/s and 1.2 m/s.
 (4) The value of velocity (V) is referred to the Tables for the hydraulic design of pipes, sewers and channels (8th edition)
 (5) Equation used:

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

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

Catchment A (S1)

1.HSBC Main Treasury⁽¹⁾

Assumed Area	=	25486 m ²
Assumed floor area per employee	=	18.18 m ² per worker -- (refer to Table 8 of CIFSUS - Financial, Insurance, Real Estate & Business Services)
Total number of employees	=	1402 employees
Design flow for commercial activities	=	0.08 m ³ /employee/day -- (refer to Table T-2 of GESF - J6)
Sewage Generation rate	=	112.1 m³/day

Overall Catchment A

Flow Rate (without Catchment Inflow Factor)	=	112.1 m ³ /day
Catchment Inflow Factor	=	1.1 Catchment Inflow Factor for East Kowloon in Table T-4 of GEFS
Flow Rate (with Catchment Inflow Factor)	=	123.4 m³/day

Note:

⁽¹⁾ Assumed as office type

Table 4a Comparison of the Hydraulic Capacity of Existing Sewers for Sewerage generated from the Proposed Development and Surrounding Catchment Areas

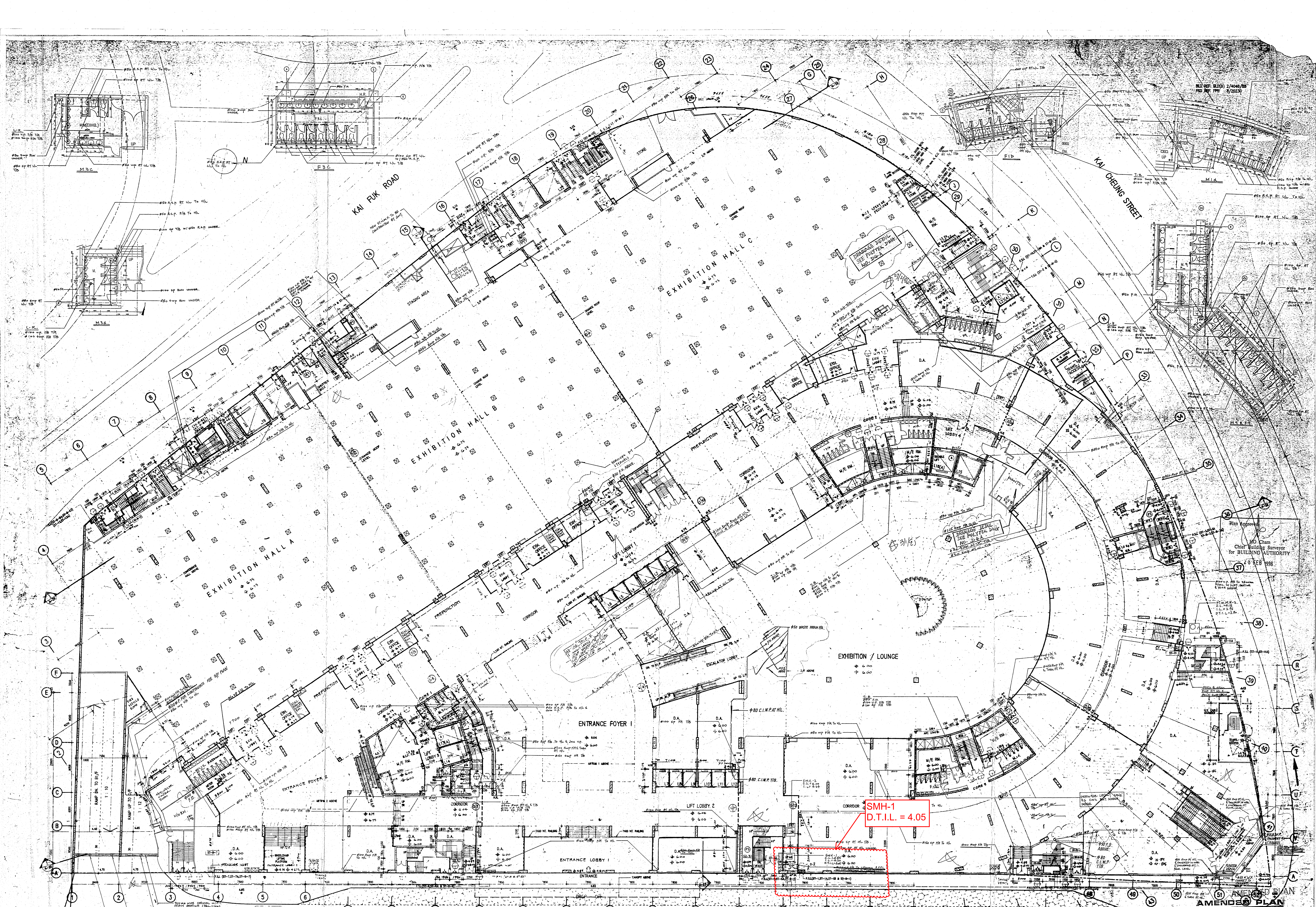
Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	Catchment	ADWF (m ³ /day)	Contributing Population	Peaking Factor	Swimming Pool (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
T1-S3	300	46.4	0.009	108	Application Site	3296.6	12210	4	18.7	171.4	158.9%	Not OK
S3-S4	450	9.0	0.155	1280	Application Site, Catchment A	3420.0	12667	4	18.7	177.1	13.8%	OK
S4-S5	450	9.1	0.005	230	Application Site, Catchment A	3420.0	12667	4	18.7	177.1	77.1%	OK
S5-S6	450	41.2	0.004	215	Application Site, Catchment A	3420.0	12667	4	18.7	177.1	82.5%	OK
S6-S7	450	16.2	0.003	189	Application Site, Catchment A	3420.0	12667	4	18.7	177.1	93.5%	OK
S7-S8	450	27.5	0.004	213	Application Site, Catchment A	3420.0	12667	4	18.7	177.1	83.2%	OK
S8-S9	450	29.3	0.004	206	Application Site, Catchment A	3420.0	12667	4	18.7	177.1	85.8%	OK
S9-S10	450	16.4	0.018	438	Application Site, Catchment A	3420.0	12667	4	18.7	177.1	40.5%	OK

Table 4b Comparison of the Hydraulic Capacity of Existing Sewers for Sewerage generated from the Proposed Development and Surrounding Catchment Areas (After Upgrading)

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	Catchment	ADWF (m ³ /day)	Contributing Population	Peaking Factor	Swimming Pool (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
T1-S3	450	46.4	0.009	339	Application Site	3296.6	12210	4	18.7	171.4	50.5%	OK
S3-S4	450	9.0	0.155	1280	Application Site, Catchment A	3420.0	12667	4	18.7	177.1	13.8%	OK
S4-S5	450	9.1	0.005	230	Application Site, Catchment A	3420.0	12667	4	18.7	177.1	77.1%	OK
S5-S6	450	41.2	0.004	215	Application Site, Catchment A	3420.0	12667	4	18.7	177.1	82.5%	OK
S6-S7	450	16.2	0.003	189	Application Site, Catchment A	3420.0	12667	4	18.7	177.1	93.5%	OK
S7-S8	450	27.5	0.004	213	Application Site, Catchment A	3420.0	12667	4	18.7	177.1	83.2%	OK
S8-S9	450	29.3	0.004	206	Application Site, Catchment A	3420.0	12667	4	18.7	177.1	85.8%	OK
S9-S10	450	16.4	0.018	438	Application Site, Catchment A	3420.0	12667	4	18.7	177.1	40.5%	OK

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

Appendix 2.2 Existing Drainage Plan



REV. NO. 1/10/89
REV. DATE 2/20/89

Rin Approved
Chief Building Surveyor
for BUILDING AUTHORITY
13 FEB 1995

SMH-1
D.T.I.L. = 4.05

興業建築師 HSN YEH ARCHITECTS & ASSOCIATES LTD. <small>BASED IN PRESENT OFFICE, 603A, 603B, 603C, 603D, 603E, 603F, 603G, 603H, 603I, 603J, 603K, 603L, 603M, 603N, 603O, 603P, 603Q, 603R, 603S, 603T, 603U, 603V, 603W, 603X, 603Y, 603Z</small>	PROJECT HONGKONG INTERNATIONAL TRADE & EXHIBITION CENTRE, N.K.I.L. 6032	DESIGNED BY: DRAWN BY: CHECKED BY: DATE: 18-11-1991	NOTES: DO NOT SCALE DRAWING. PLEASE REFER TO THE ORIGINAL DRAWING FOR ALL DIMENSIONS.	REVISIONS DATE: 30-5-1993 10 JUL 1993 12-11-95	TITLE: G/F PLAN DRAWING NO. 10101 SCALE: 1:200 SHEET NO. 12-1175
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