

Appendix V
Drainage & Sewerage Impact Assessment

Prepared for

Couture Homes Properties Limited

Prepared by

Ramboll Hong Kong Limited

**S16 PLANNING APPLICATION FOR PROPOSED COMPOSITE
REDEVELOPMENT AT 152-164 WELLINGTON STREET,
CENTRAL**

DRAINAGE AND SEWERAGE IMPACT ASSESSMENT

Date **December 2023**

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Signed _____

Project Reference **CHPWELTNEI00**

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1. INTRODUCTION

1.1 Project Background

- 1.1.1 The purpose of this Section 16 application is to propose a composite redevelopment at 152-164 Wellington Street, Central. The Application Site is currently zoned as "Commercial" under the Approved Sai Ying Pun and Sheung Wan Outline Zoning Plan (OZP) No. S/H3/34.
- 1.1.2 Ramboll Hong Kong Limited is commissioned by the Applicant to conduct this Drainage and Sewerage Impact Assessment (DSIA) based on the Proposed Development. The design parameters of the Proposed Development are provided by project proponent.

1.2 Application Site and its Environs

- 1.2.1 The Application Site amounts to about 612m². It is bounded by Wellington Street to the northeast and Aberdeen Street to the northwest. The Wa On Lane Sitting-out Area is located to the south of the Application Site.
- 1.2.2 The location of the Application Site and its surrounding environs are shown in **Figure 1.1**.

1.3 Proposed Development

- 1.3.1 The proposed development is a composite building comprising residential and retail use. It includes a residential tower with 25 residential storeys with a total of 150 flat units, 2 clubhouse storeys, and 2 storeys allocated for retail space. A 78.6 m² indoor swimming pool is planned.
- 1.3.2 It is tentatively completed in 2030.
- 1.3.3 Master layout plan of the proposed development is included in **Appendix 1.1**.

1.4 Appraisal of Drainage Impact

- 1.4.1 The Application Site is served by existing public drainage system. A Ø300mm drainage pipe on east side receives runoff from the Application Site. The Application Site is already developed and currently occupied by existing buildings and are fully paved.
- 1.4.2 According to Building Department's (BD) Practice Note (APP-152), the minimum greenery coverage for residential developments is 20%. In other words, there will be reduction of surface runoff when compared with the existing condition. The surface runoff generated from the Application Site will be collected by the same drainage pipe tentatively so that there is no change of flow regime.
- 1.4.3 As such, it is expected that the Proposed Development (with reduced surface runoff and same flow regime) would not result in worsened drainage impact. Drainage submission including assessment where required will be provided in detailed design stage.

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 Sewerage 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)
- Clubhouse employee: 0.28 m³/day (J11 - Community, Social & Personal Services)
- Retail employee: 0.28 m³/day (J4 - Wholesale & Retail)
- Office employee: 0.08 m³/day (J6 - Finance, Insurance, Real Estate & Business Services)

2.2.3 Catchment Inflow Factor (P_{CF}) of Central (1.00) 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 are two existing Ø150mm pipes (Manhole reference no. FMH7029762 and FMH7029760 in respectively) connected from the Application Site to the Ø400mm sewage pipe along Wellington Street. The pipe is then connected to the Ø600mm to Ø750mm sewerage pipe along the Queen's Road Central and Bonham Strand.

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

2.3.3 Two existing Ø150mm pipes (FWD70133374 and FWD7033376) will be abandoned; a new sewer will be constructed to connect from the Application Site to manhole no.: FMH7030011 (S1) as shown in **Figure 2.1**.

2.4 Wastewater Generated by the Proposed Development

2.4.1 Wastewater arising from the proposed development will be primarily contributed by the residents, clubhouse staff and retail employee.

2.4.2 Detailed calculation for the proposed development is given in **Table 2.1** below and **Appendix 2.1**.

Table 2.1 Estimated Peak Flow

Development Parameters	Proposed Development		
	Residential	Clubhouse	Retail
Area (m ²)	-	278	826
Number of flats	150	-	-
Assumed Household Size	2.1 ⁽¹⁾	-	-
Assumed Population	315	9	29
Design Flow (m ³ /person/day)	0.27 ⁽²⁾	0.28 ⁽⁴⁾	0.28 ⁽³⁾
Flow Rate (m³/day)	85.1	2.6	8.1
Flow Rate with P_{CF} (m³/day)	95.7		
Peak Flow (L/s)	13.4⁽⁵⁾		

(1) 2.1 person/flat – based on statistical figure

(2) Refer to Table T-1 of GESF – R2

(3) Refer to Table T-2 of GESF – J4 Wholesale & Retail

(4) Refer to Table T-2 of GESF – J11 Community, Social & Personal Services

(5) Backwash discharge from swimming pool will be included in the peak flow

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.

2.6 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 95.7 m³/day (i.e. peak flow with backwash from swimming pool is 13.4 litre/sec).

2.6.2 According to Table 4a of **Appendix 2.1**, regarding the sewage generation rate from the proposed development and surrounding areas (**Figure 2.2**), the new connection and existing sewer pipe would be of adequate capacity to receive the flow.

3. OVERALL CONCLUSION

3.1 Conclusion

- 3.1.1 A residential development is proposed at 152-164 Wellington Street, Central. The potential drainage and sewerage impact has been quantitatively addressed.
- 3.1.2 the Proposed Development would result in reduced surface runoff and follow the same flow regime as under existing condition. It would not result in worsened drainage impact. Drainage submission including assessment where required will be provided in detailed design stage.
- 3.1.3 New sewer will be constructed to connect from the Application Site to manhole no.: FMH7030011. The project proponent will be responsible for the implementation of the proposed new connection pipes (T1) while the section of the new pipes (all within government land) downstream of the proposed terminal manhole is assumed to be handed over to DSD for future maintenance. Two existing sewers (FWD70133374 and FWD7033376) will be abandoned.
- 3.1.4 Based on the sewerage impact assessment results, it is found that the capacity of the existing sewerage system serving the area would be sufficient to cater for the sewage generation from the proposed development and nearby catchment areas.
- 3.1.5 With the proposed sewerage pipeline in place, this SIA confirms the feasibility of the proposed development in terms of impacts to the public sewerage system.

Figures

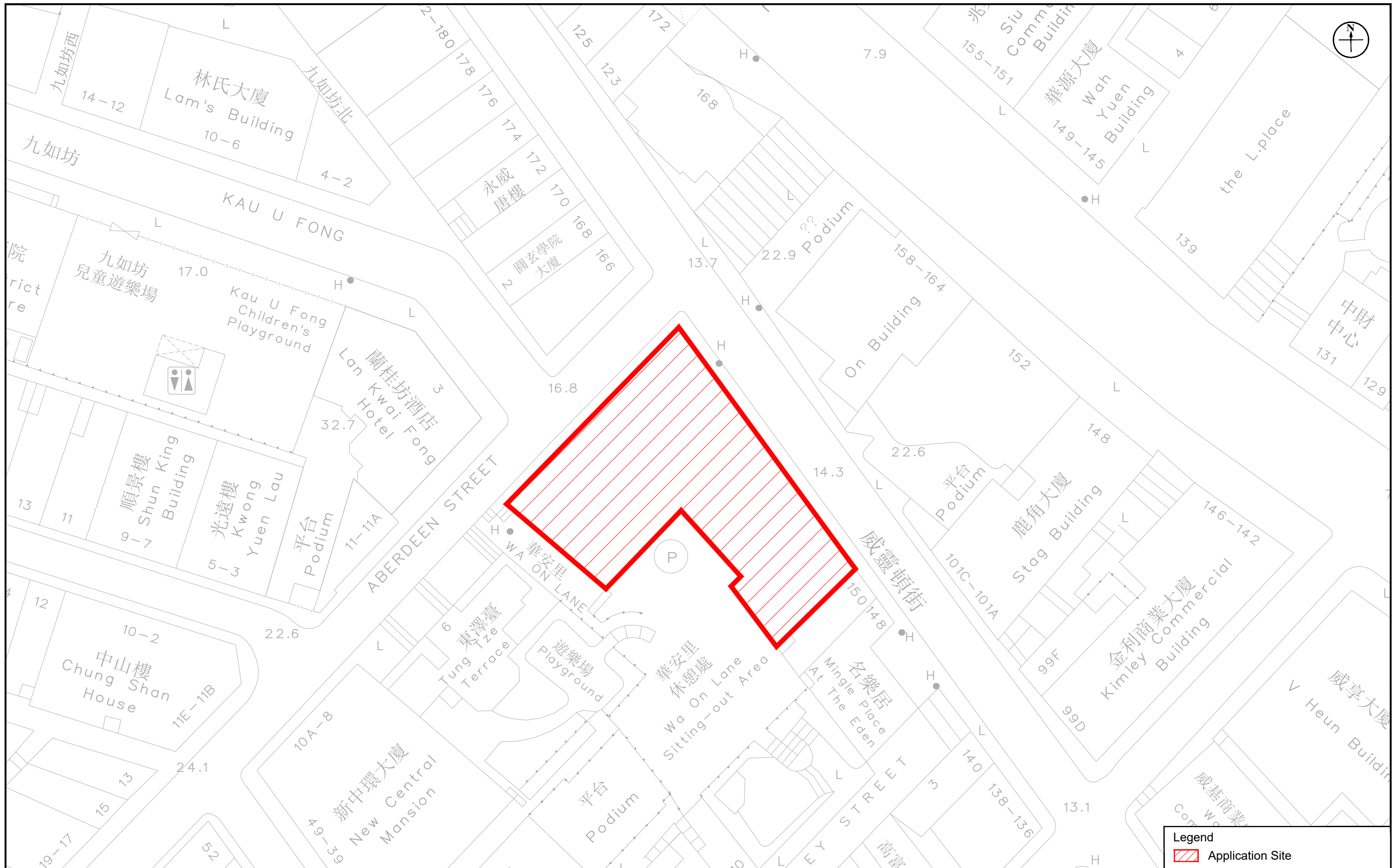



Figure: 1.1
Title: Location of the Application Site and its Environs

Project: S16 Planning Application for Proposed Composite Redevelopment at 152-164 Wellington Street, Central

Legend	
	Application Site
RAMBOLL	
Drawn by:	MW
Checked by:	CC
Rev.:	1.0
Date:	Dec 2023

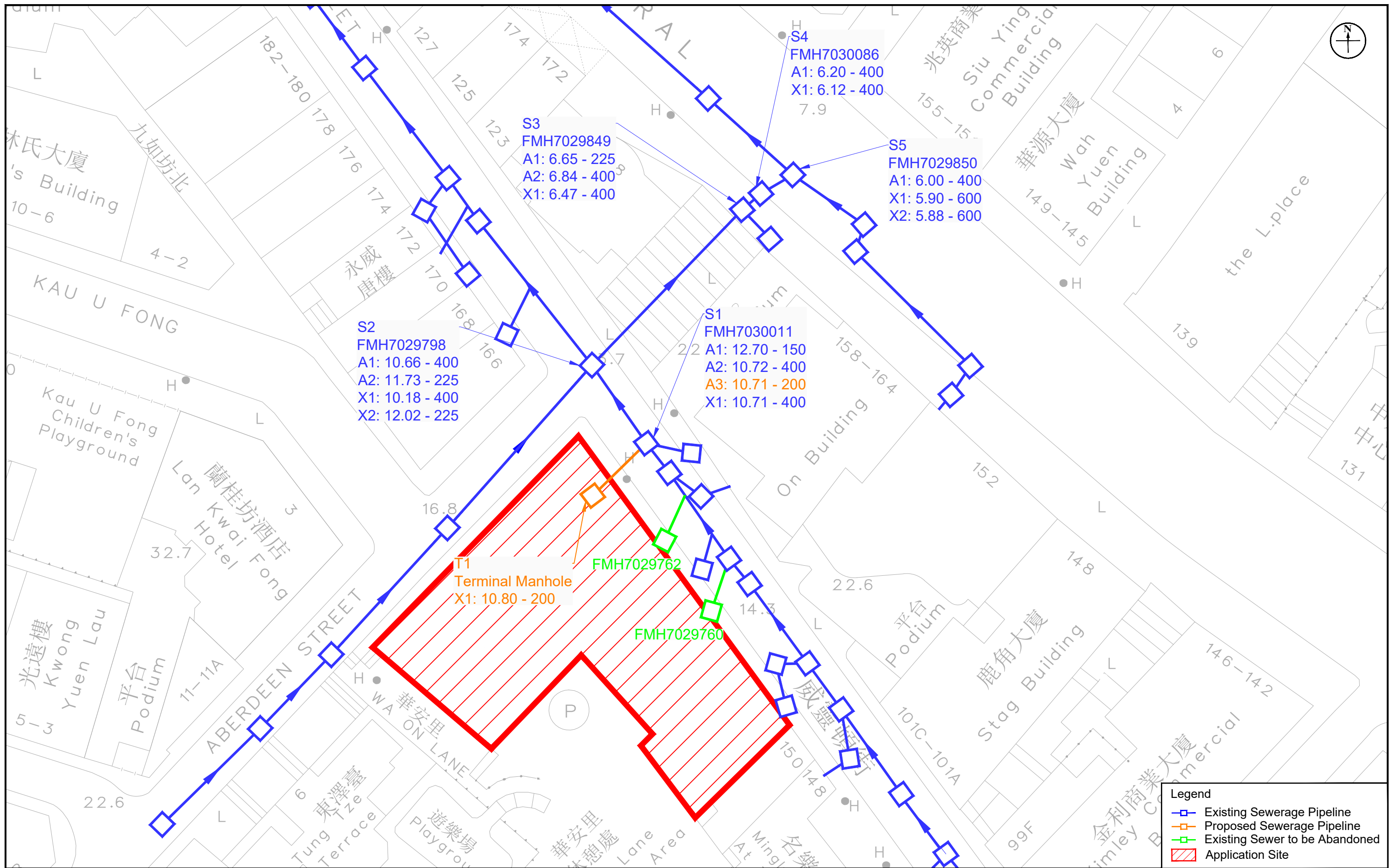


Figure: 2.1

Title: Existing and Proposed Sewerage System in the Vicinity of the Application Site

Project: S16 Planning Application for Proposed Composite Redevelopment at 152-164 Wellington Street, Central

RAMBOLL

Drawn by: MW

Checked by: CC

Rev.: 1.0

Date: Dec 2023

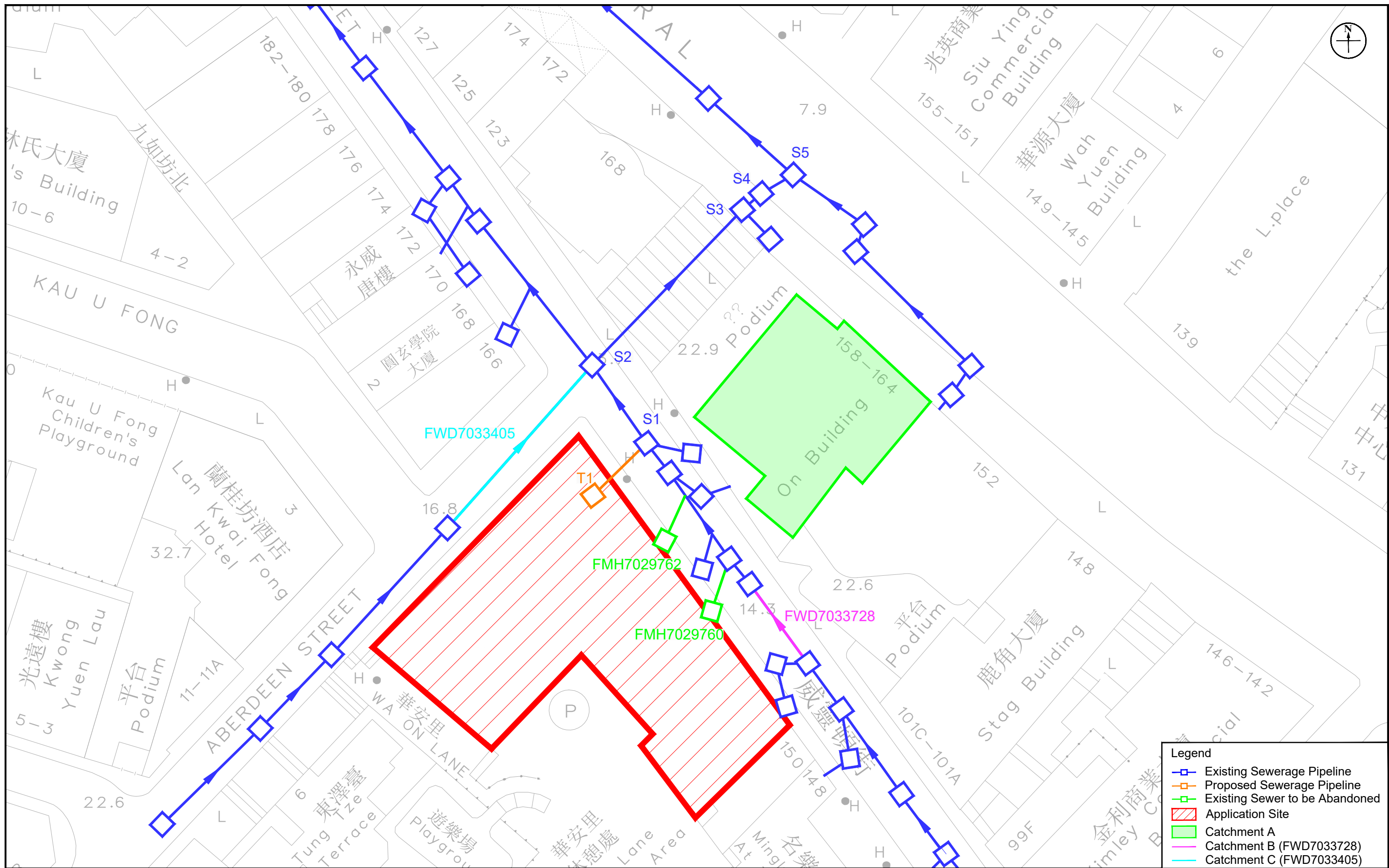


Figure: 2.2

Title: Catchment Areas in the Vicinity of the Application Site

Project: S16 Planning Application for Proposed Composite Redevelopment at 152-164 Wellington Street, Central

Legend	
	Existing Sewerage Pipeline
	Proposed Sewerage Pipeline
	Existing Sewer to be Abandoned
	Application Site
	Catchment A
	Catchment B (FWD7033728)
	Catchment C (FWD7033405)

RAMBOLL

Drawn by: MW

Checked by: CC

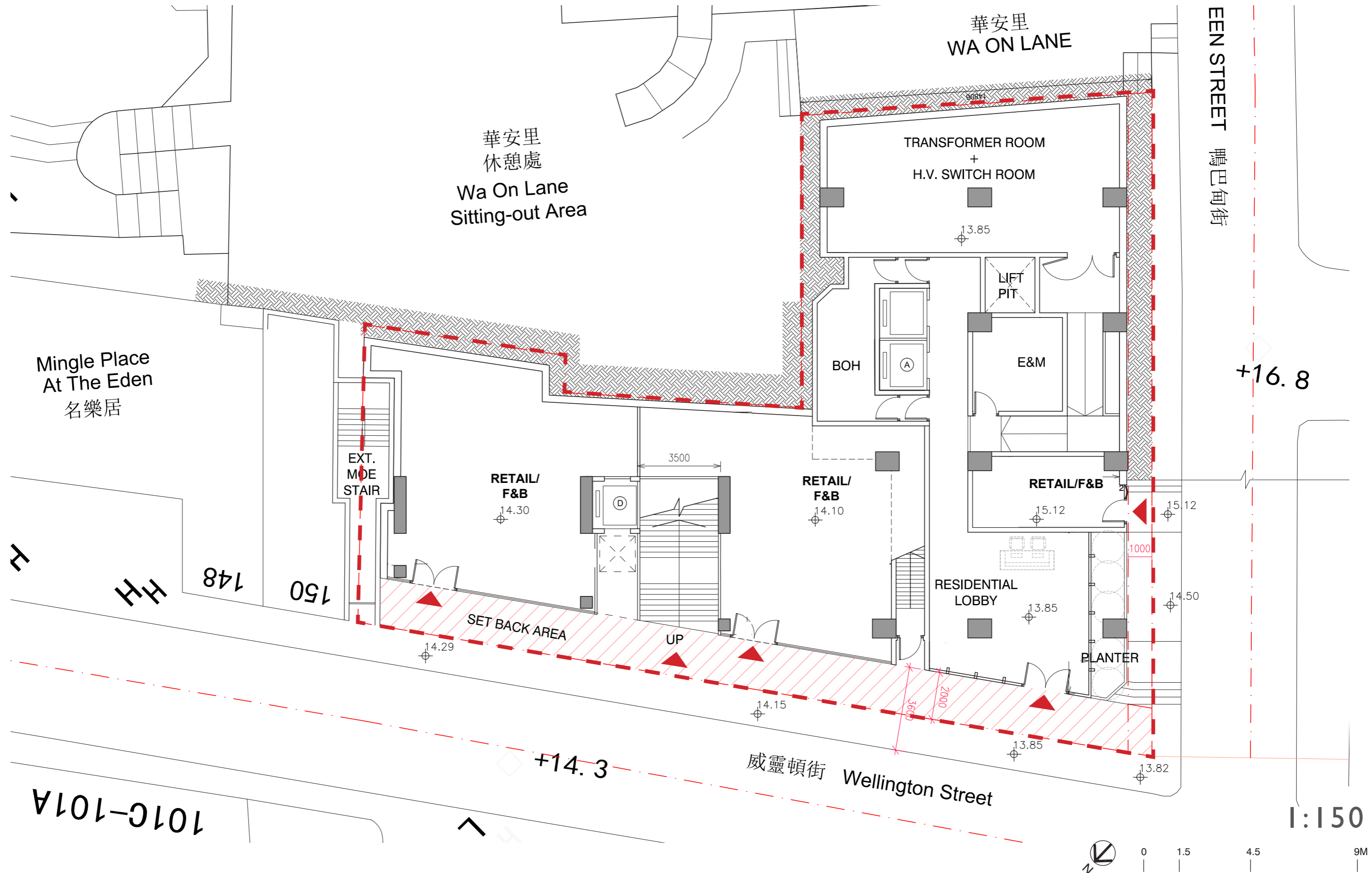
Rev.: 1.0

Date: Dec 2023

Appendix 1.1 Master Layout Plan (MLP)

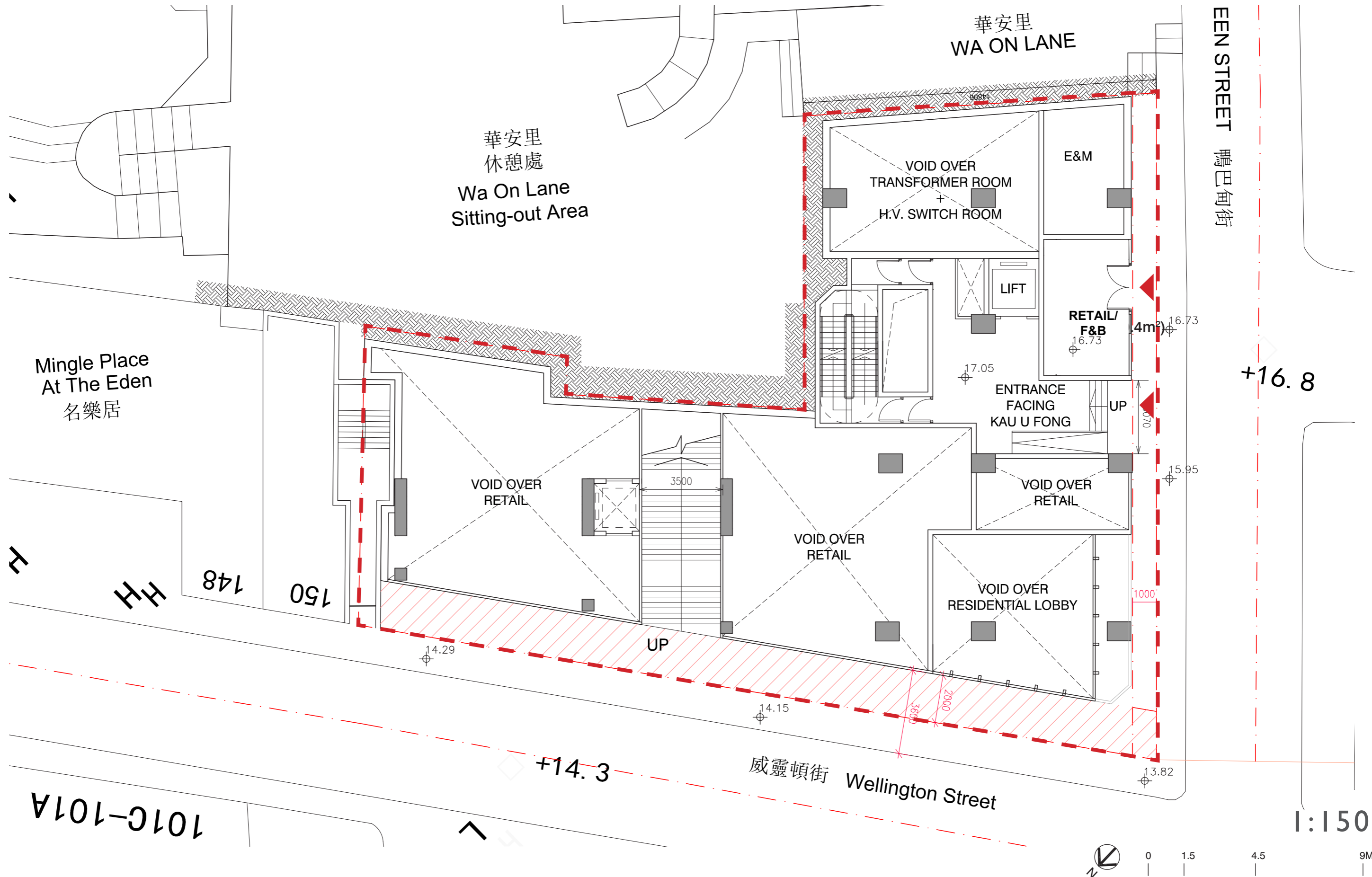
PODIUM PLANS

GF



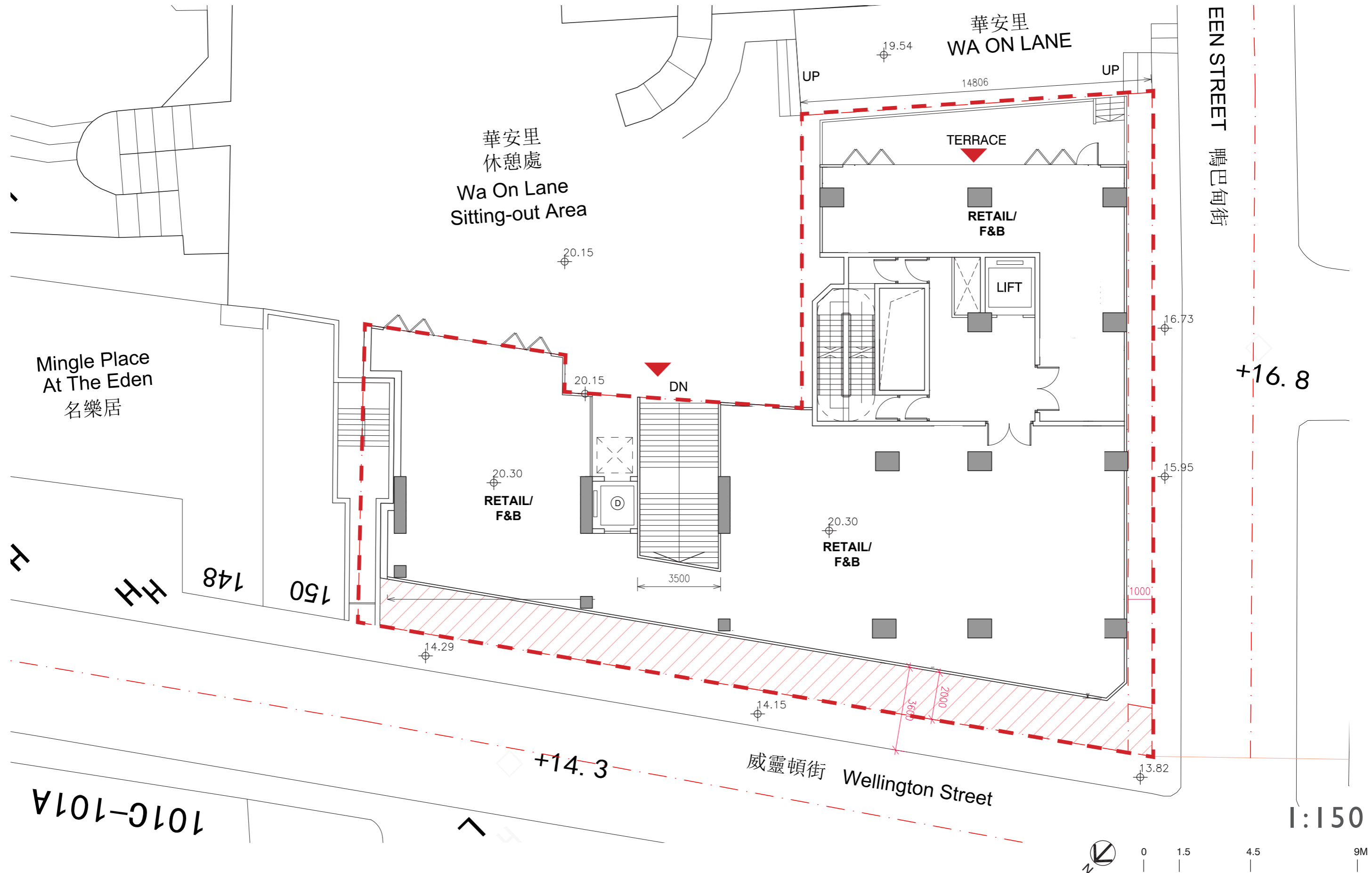
PODIUM PLANS

MF



PODIUM PLANS

IF

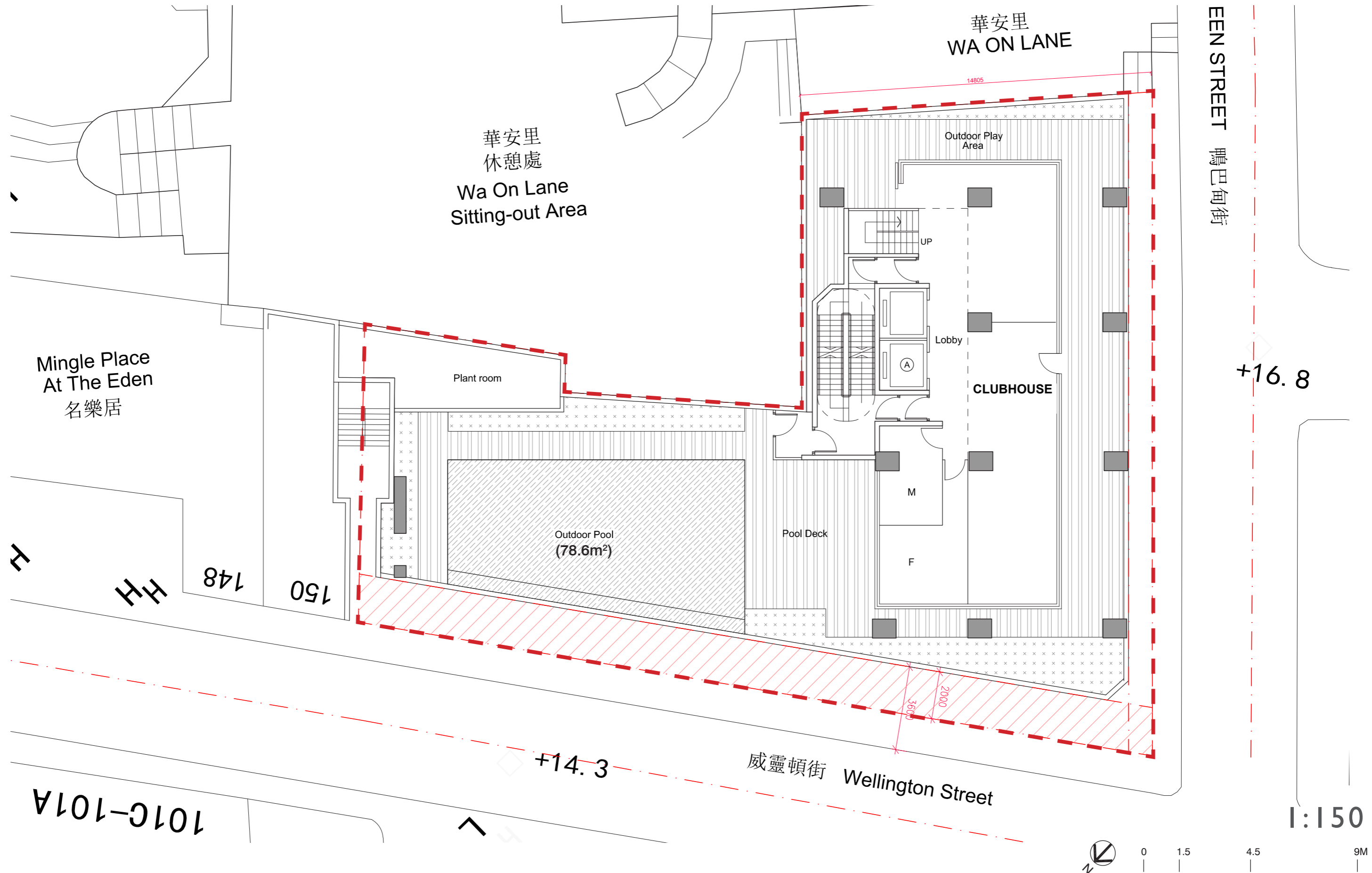


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PODIUM PLANS

2F (CLUBHOUSE)



華安里
WA ON LANE

華安里
休憩處
Wa On Lane
Sitting-out Area

Mingle Place
At The Eden
名樂居

Plant room

Outdoor Pool
(78.6m²)

Pool Deck

Outdoor Play
Area

UP

Lobby

CLUBHOUSE

M

F

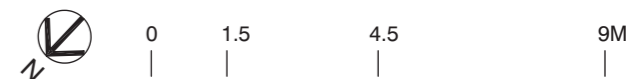
+16.8

+14.3

威靈頓街
Wellington Street

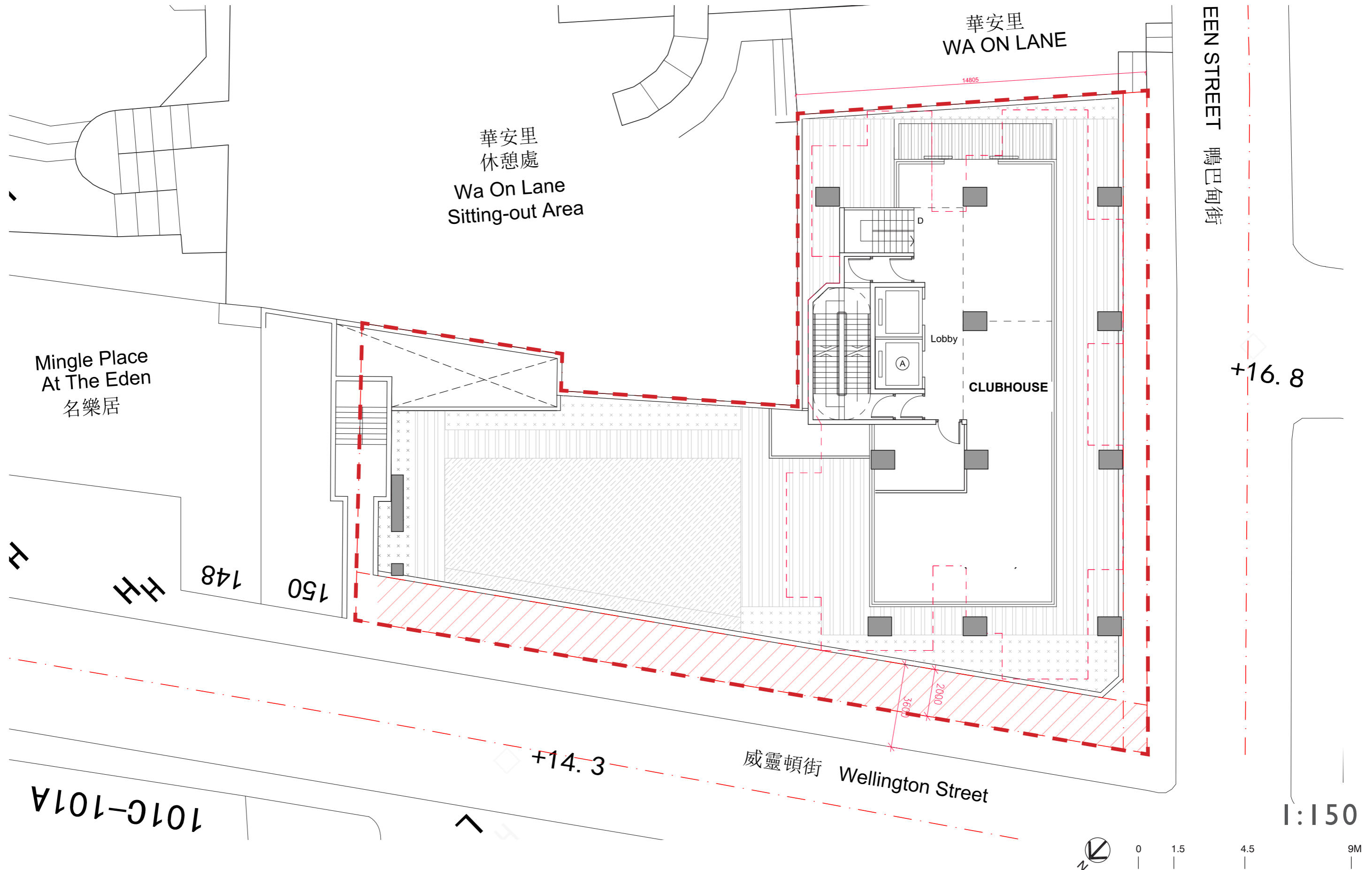
101C-101A

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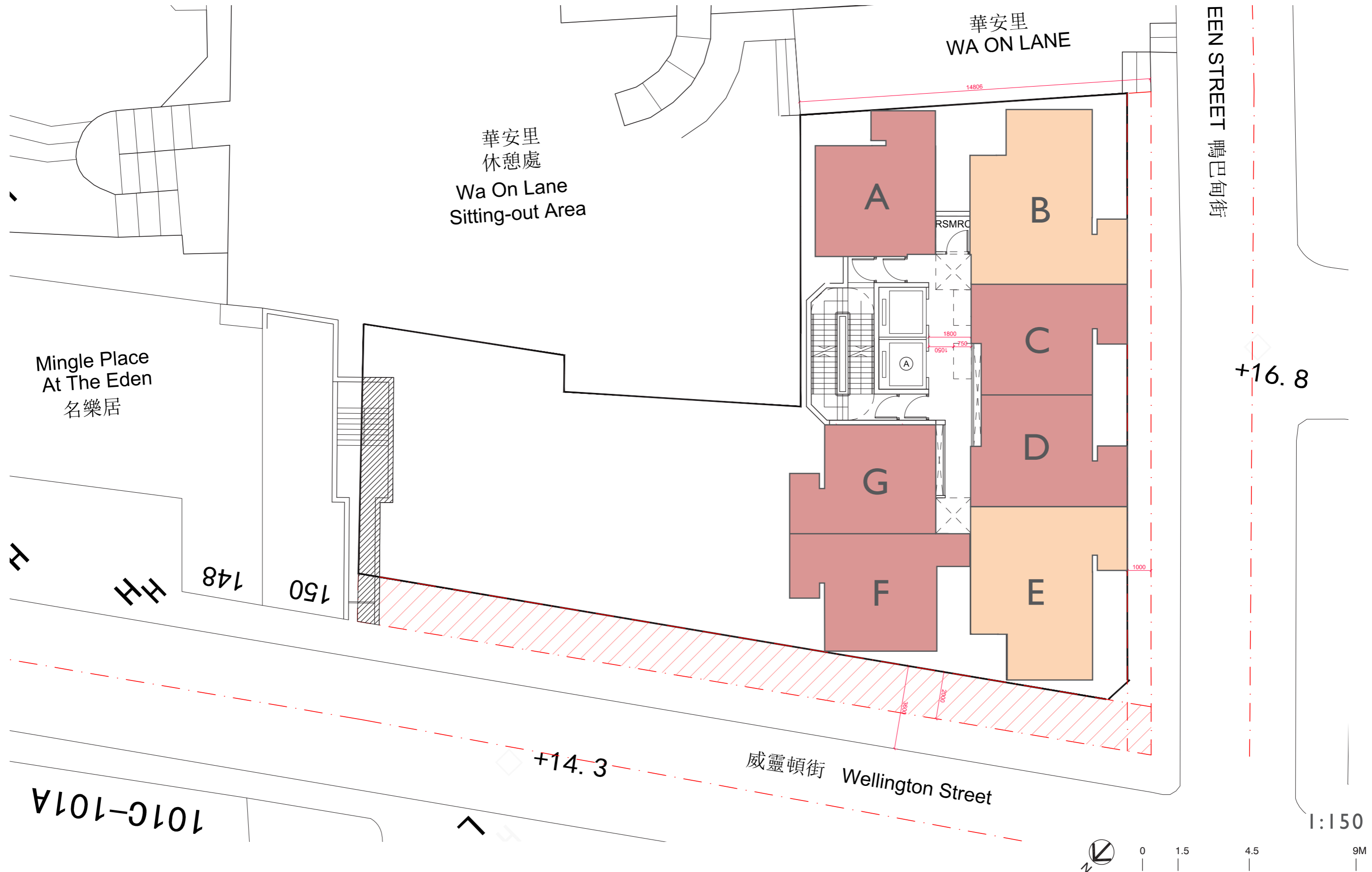
PODIUM PLANS

3F (CLUBHOUSE)



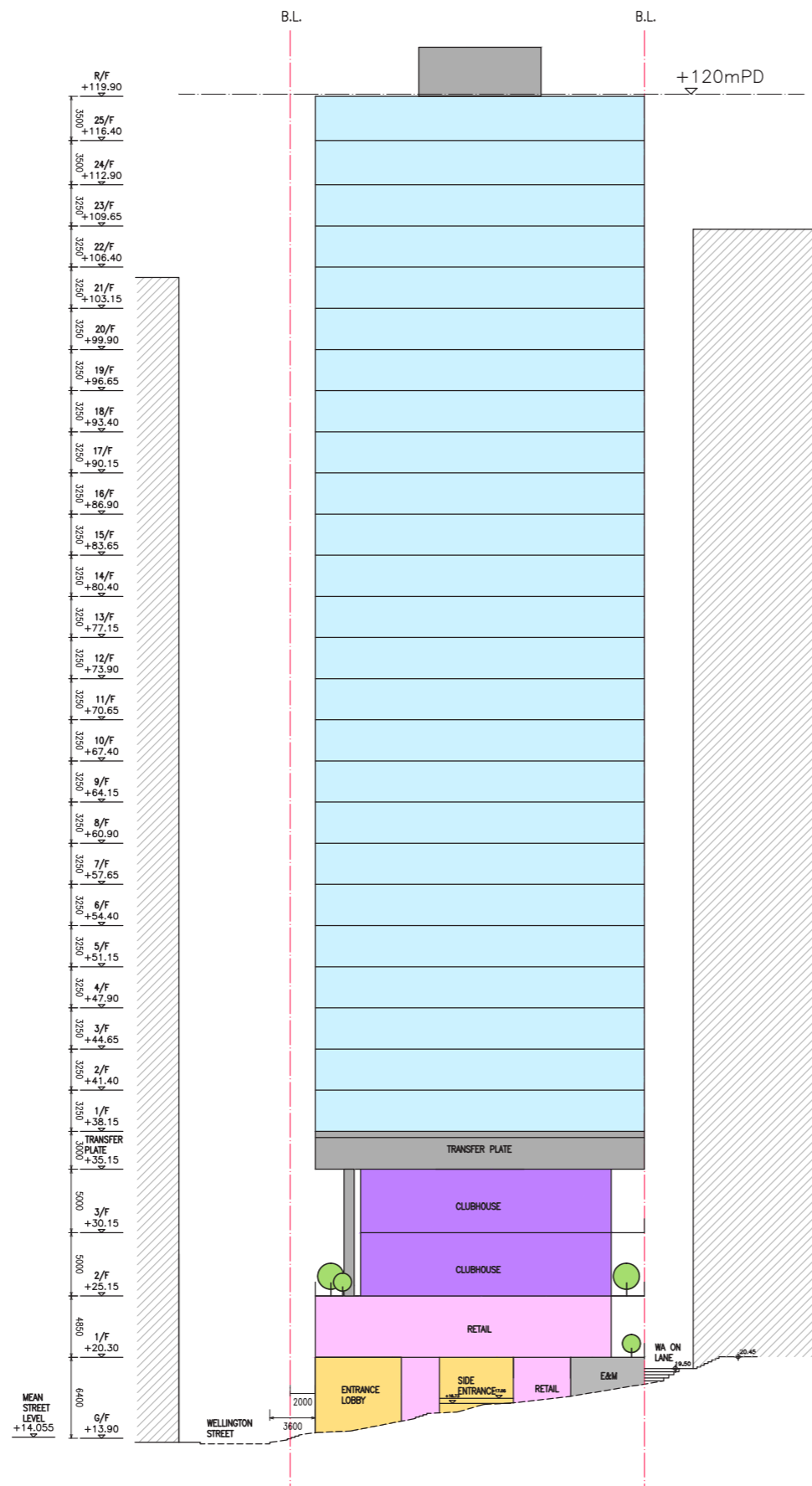
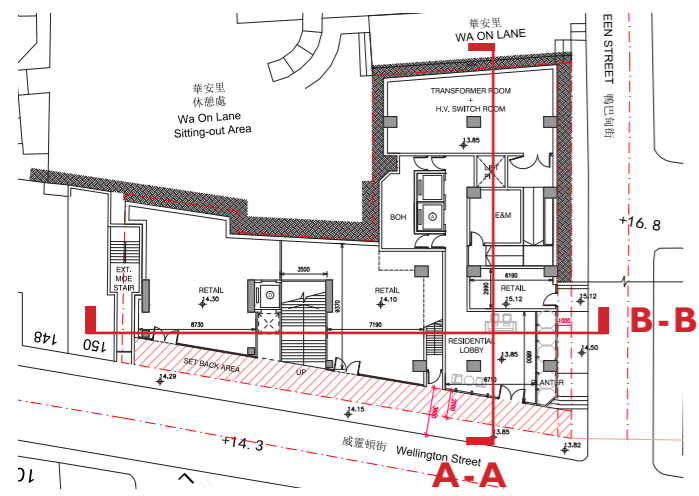
TOWER SIMPLIFIED PLAN

- 1 Bedroom (Open Kitchen)
- 2 Bedroom (Open Kitchen)

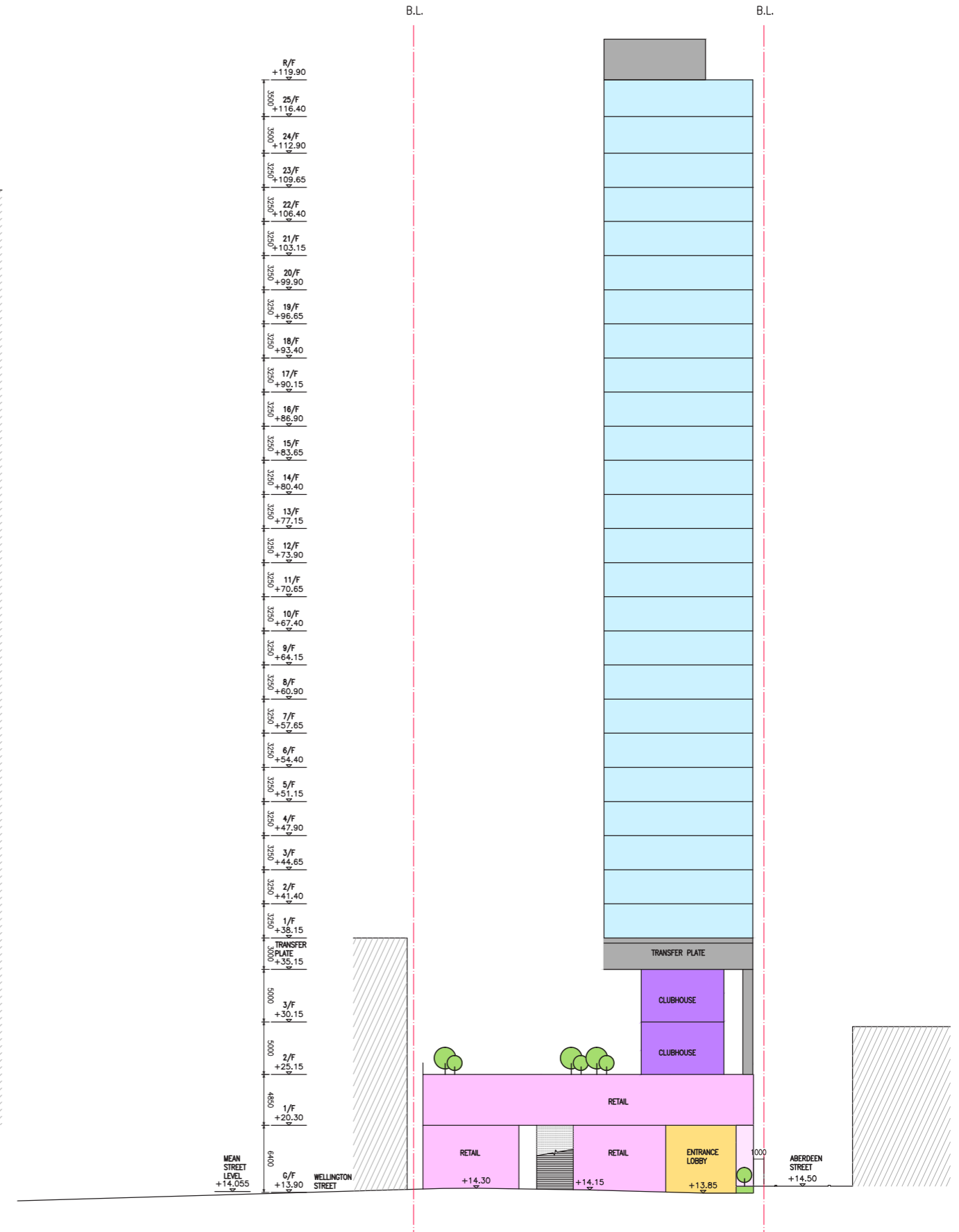


SECTION

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SECTION A-A



SECTION B-B

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

Total number of residential units	=	150 units
Total number of residents	=	315 people -- (Assumed Average Household Size of 2.1)
Design flow	=	0.27 m ³ /person/day -- (Private R2 in Table T-1 of GESF)
Sewage Generation rate	=	85.1 m³/day

2. Clubhouse

2a. Assumed Area	=	278 m ²
2b. Assumed floor area per employee	=	30.3 m ² per worker -- (refer to Table 8 of CIFSUS - Community, Social & Personal Services)
2c. Total number of employees	=	9 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	=	2.6 m³/day

3. Commercial Area (Retail)

3a. Assumed Area	=	826 m ²
3b. Assumed floor area per employee	=	28.6 m ² per worker -- (refer to Table 8 of CIFSUS - Retail Trade)
3c. Total number of employees	=	29 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	=	8.1 m³/day

Swimming Pool

Assumed Area of Swimming Pool	=	78.6 m ²
Average Depth of Water	=	1.25 m (ordinary assumption)
Volume of Swimming Pool (Ordinary Assumption)	=	98.3 m ³
Turnover Rate	=	6 hr
Required Surface Loading Rate of Filter	=	16 m ³ /m ² /hr
Filter Areas required	=	1.0 m ²
Adopted Surface Loading Rate of Filter	=	50 m ³ /m ² /hr
Adopted Filter Area	=	0.3 m ²
Backwash Duration	=	7 min/d
Backwash flow rate	=	50 m ³ /m ² /hr
Design flow for Swimming Pool Backwashing	=	1.9 m ³ /day
Design flow for Swimming Pool Backwashing	=	4.55 litre/sec

Total Flow from Proposed Development

Flow Rate (without Catchment Inflow Factor)	=	95.7 m³/day
Catchment Inflow Factor	=	1.0 Catchment Inflow Factor for Central in Table T-4 of GEFS
Flow Rate (with Catchment Inflow Factor)	=	95.7 m³/day
Contributing Population	=	354 people
Peaking factor	=	8 Refer to Table T-5 of GESF for population < 1,000 incl. stormwater allowance
Peak Flow	=	8.9 litre/sec
Peak Flow (With Swimming Pool)	=	13.4 litre/sec

Table 2a Hydraulic Capacity of Existing Sewers at 152 -164 Wellington Street, Central

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
S1-S2	FMH7030011	FMH7029798	400	8.0	10.71	10.66	9.81	0.00060	0.006	0.000001	1.49	0.13	0.19	187
S2-S3	FMH7029798	FMH7029849	400	19.7	10.18	6.84	9.81	0.00060	0.170	0.000001	7.81	0.13	0.98	982
S3-S4	FMH7029849	FMH7030086	400	1.2	6.47	6.20	9.81	0.00060	0.229	0.000001	9.08	0.13	1.14	1141
S4-S5	FMH7030086	FMH7029850	400	2.7	6.12	6.00	9.81	0.00060	0.044	0.000001	3.99	0.13	0.50	502

Table 2b Hydraulic Capacity of Proposed Sewers at 152 -164 Wellington Street, Central

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-S1	-	FMH7030011	200	5.5	10.80	10.71	9.81	0.00030	0.016	0.000001	1.70	0.03	0.05	53

- Remarks:
- (1) g=gravitational acceleration; k_s=equivalent sand roughness; s=gradient; v=kinematic viscosity of water; V=mean velocity
 - (2) Table 2a: 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 2c: The value of k_s = 0.3mm is used for the calculation of slimed polyethylene for the proposed sewers, poor condition (based on Table 5: Recommended roughness values in Sewerage Manual)
 - (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 3a Calculation for Sewage Generation Rate of the Existing Surrounding Building

Catchment A

On Building

Assumed Area	=	5942 m ²
Assumed floor area per employee	=	18.2 m ² per employee -- (refer to Table 8 of CIFSUS - Financial, Insurance, Real Estate & Business Services)
Total number of employees	=	327 employees
Design flow for commercial employee	=	0.08 m ³ /employee/day -- (refer to Table T-2 of GESF - J6)
Sewage Generation rate	=	26.1 m³/day

Overall Catchment A

Flow Rate (without Catchment Inflow Factor)	=	26.1 m ³ /day
Catchment Inflow Factor	=	1.0 Catchment Inflow Factor for Tuen Mun in Table T-4 of GEFS
Flow Rate (with Catchment Inflow Factor)	=	26.1 m³/day

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

Catchment B (FWD7033728) (upstream)

a. Assumed Pipe Capacity	=	100 %
b. Pipe Diameter	=	400 mm
c. Pipe Length	=	8.51 m
d. Invert Level 1	=	10.87 mPD
e. Invert Level 2	=	10.82 mPD
f. Invert Level Difference	=	0.05 m
g. Gravitational Acceleration	=	9.81 ms ⁻²
h. Equivalent Sand Roughness	=	0.006 m
i. Gradient	=	0.0059
j. Kinematic Viscosity of Water	=	0.000001 m ² /s
k. Mean Velocity	=	1.03 m/s
l. Cross Sectional Area of the Pipe	=	0.13 m ²
m. Velocity of the Concerned Pipe	=	0.13 m ³ /s
n. Estimated Capacity	=	128.9 litre/sec

Sub-total

Peak Flow	=	128.9 litre/sec
Peaking factor	=	4.00 Refer to Table T-5 of GESF for population 10,314 incl. stormwater allowance
Contributing Population	=	10314 people
Equivalent Flow Rate	=	2784.9 m ³ /day

Catchment C (FWD7033405)

a. Assumed Pipe Capacity	=	100 %
b. Pipe Diameter	=	225 mm
c. Pipe Length	=	19.89 m
d. Invert Level 1	=	13.98 mPD
e. Invert Level 2	=	11.73 mPD
f. Invert Level Difference	=	2.25 m
g. Gravitational Acceleration	=	9.81 ms ⁻²
h. Equivalent Sand Roughness	=	0.006 m
i. Gradient	=	0.1131
j. Kinematic Viscosity of Water	=	0.000001 m ² /s
k. Mean Velocity	=	3.03 m/s
l. Cross Sectional Area of the Pipe	=	0.08 m ²
m. Velocity of the Concerned Pipe	=	0.24 m ³ /s
n. Estimated Capacity	=	240.7 litre/sec

Sub-total

Peak Flow	=	240.7 litre/sec
Peaking factor	=	4.00 Refer to Table T-5 of GESF for population 19,253 incl. stormwater allowance
Contributing Population	=	19253 people
Equivalent Flow Rate	=	5198.3 m ³ /day

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)	ADWF (m ³ /day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (L/s)	Peak Flow from the Proposed Development and Catchment Areas (L/s)	Contribution from the Proposed Development and the Surrounding Catchment Areas (%)	Status
S1-S2	400	8.0	0.006	187	2906.7	10766	4	4.5	139.1	74.3%	OK
S2-S3	400	19.7	0.170	982	8105.0	30019	4	4.5	379.8	38.7%	OK
S3-S4	400	1.2	0.229	1141	8105.0	30019	4	4.5	379.8	33.3%	OK
S4-S5	400	2.7	0.044	502	8105.0	30019	4	4.5	379.8	75.7%	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)

Table 4b Comparison of the Hydraulic Capacity of Proposed Sewers from the Terminal Manhole of the Proposed Development for Sewage generated from the Proposed Development

Segment	Pipe Dia. (mm)	Pipe Length (m)	Gradient	Estimated Capacity (L/s)	ADWF (m ³ /day)	Contributing Population	Peaking Factor	Swimming Pool/Public Toilet (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-S1	200	5.5	0.016	53	95.7	354	8	4.5	13.4	25.2%	OK

Remarks: (1) The value of peaking factor = 8 is used for population <1,000 incl. stormwater allowance (refers to Table T-5 of GESF)