PROPOSED RCHE AND RESIDENTIAL DEVELOPMENT AT 42 GRAMPIAN ROAD, KOWLOON CITY

SEWERAGE IMPACT ASSESSMENT

27 October 2026

Report No: RT25382-SIA-04r2

Prepared By:

BeeXergy Consulting Limited (BXG)
Phone: (852) 3568-4701
Address: Unit 2501, 2503 & 2504,
25/F, AIA Financial Centre,
712 Prince Edward Road East
Kowloon, Hong Kong
Email: info@beexergy.com

Project:	PROPOSED RCHE AND RESIDENTIAL DEVELOPMENT AT 42 GRAMPIAN ROAD, KOWLOON CITY SEWERAGE IMPACT ASSESSMENT
Report No.:	RT25382-SIA-04r2

Version	Issue Date	Description	Author	Checker	Approver
01	28/10/2025	Issued for Comment	Various	Various	HM
02r2	10/03/2026	Issued for Comment	Various	Various	HM
03r1	10/07/2026	Issued for Comment	Various	HC	HM
04r2	27/10/2026	Issued for Comment	Various	HC	HM

Prepared By:

Various

Checked by

Harmony Chuh

Senior Engineer

Approved by:

Henry Mak

Director

Disclaimer:

- This report is prepared and submitted by Beexergy Consulting Limited with all reasonable skill to the best of our knowledge, incorporating our Terms and Conditions and taking account of the resources devoted to it by agreement with the client.
- We disclaim any responsibility to the client and others in respect of any matters outside the project scope.
- This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.

TABLE OF CONTENTS

1 INTRODUCTION 4

1.1 PROJECT BACKGROUND 4

1.2 PROJECT LOCATION 4

1.3 DESCRIPTION OF THE SUBJECT SITE AND PROPOSED DEVELOPMENT 4

2 SEWERAGE IMPACT ASSESSMENT 5

2.1 SCOPE OF WORKS 5

2.2 EXISTING SEWERAGE FACILITIES 5

2.3 ASSESSMENT CRITERIA, METHODOLOGY AND ASSUMPTIONS 5

2.4 RESULTS AND DISCUSSION 8

3 CONCLUSION 8

APPENDIX A MASTER LAYOUT PLAN

APPENDIX B EXISTING SEWERAGE SYSTEM

APPENDIX C PROPOSED SEWERAGE CONNECTION AND CATCHMENT AREA

APPENDIX D SEWAGE CALCULATION AND HYDRAULIC CAPACITY CHECK

1 INTRODUCTION

1.1 PROJECT BACKGROUND

BeeXergy Consulting Limited was commissioned by KLS International Architects and Planners Limited to conduct a Sewerage Impact Assessment (SIA) for the Proposed Development. Latest architectural drawings and technical information on the Project Site were provided by the Project Architect.

1.2 PROJECT LOCATION

The Project Site is located at 42 Grampian Road, Kowloon City, and it is bounded by Gar Fook Court to the north, J17 to the east, and Grampian Road Substation to the south. **Figure 1.1** shows the location of Project Site and its environs.



Figure 1.1 Location of the Project Site (Source: Geoinfo map)

1.3 DESCRIPTION OF THE SUBJECT SITE AND PROPOSED DEVELOPMENT

The Project Site covers an area of approximately 345.13m^2, and comprises a 15-storey residential tower and 4-storey podium. The master layout plan provided by Project Architect is enclosed in **Appendix A**. The tentative population intake year is 2030.

2 SEWERAGE IMPACT ASSESSMENT

2.1 SCOPE OF WORKS

The objective of this SIA is to assess whether the existing capacity of the sewerage networking is sufficient to cope with the peak sewage flow arising from the Proposed Development during its operation stage and to recommend appropriate mitigation measure(s) to alleviate unacceptable sewerage impact, if any.

2.2 EXISTING SEWERAGE FACILITIES

The existing sewerage record from the GeoInfo Map of the Lands Department (LandsD) and Drainage Services Department (DSD) are obtained for this SIA and attached in **Appendix B**.

The foul manhole (FMH4048796) collected the sewage discharge from upstream to FMH4048798 via a 525mm sewer along Grampian Road. The foul water will further flow to FMH4048801 through two 300mm sewer.

The Project Proponent would like to construct a foul terminal manhole (FTMH-01) connect to FMH4048796 via a 225mm sewer. Location of the terminal manhole, proposed sewer connection and catchments are shown in **Appendix B.**

2.3 ASSESSMENT CRITERIA, METHODOLOGY AND ASSUMPTIONS

The Unit Flow Factors and Global Peaking Factor are adopted from the figures in the Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (Version 1.0)[1] (GESF) issued by the Environmental Protection Department (EPD) in March 2005 to estimate the sewage flows generated from the Subject Site.

The Unit Flow Factors and Catchment Inflow Factors as shown in **Table 2.1** below are adopted in the assessment. Relevant catchment can be found in **Appendix C**.

[1] http://www.epd.gov.hk/epd/sites/default/files/epd/english/environmentinhk/water/guide_ref/files/gesf.pdf

Table 2.1 Unit Flow Factors and Catchment Inflow Factors extracted from GESF

Parameter	Value	Justification
Population		
Proposed Development (Residential)	120 people	Occupancy as advised by project proponent: Total number of flats = 30 Designed population per flat = 4 Total population = 30 x 4 = 120 people
Catchment A (Residential)	5104 people	2.7 and 3.7 Number of persons in average domestic household size for "Wong Tai Sin - Lok Fu" and "Kowloon City - Kowloon Tong" based on 2021 Population Census's Main Table D304, subject to the location of the building.
Catchment A (Student)	4762 people	Various online sources as stated in Appendix C. Assumed 1 class has 30 students if not specified.
Catchment A (Teacher)	324 people	Various online sources as stated in Appendix C.
Catchment A (Institution – Visitor & Staff)	626 people	3.3 employee per 100m2 GFA for 'Community, Social & Personal Services' based on CIFSUS published by PlanD
Catchment B (Residential)	10262 people	2.7 Number of persons in average domestic household size for "Wong Tai Sin - Lok Fu" and "Wong Tai Sin - Tung Mei" based on 2021 Population Census's Main Table D304
Catchment B (Student)	720 people	Various online sources as stated in Appendix C. Assumed 1 class has 30 students if not specified.
Catchment B (Teacher)	49 people	Various online sources as stated in Appendix C.
Catchment B (Institution – Visitor & Staff)	52 people	3.3 employee per 100m2 GFA for 'Community, Social & Personal Services' based on CIFSUS published by PlanD
Catchment C (Residential)	464 people	3.6 Number of persons in average domestic household size for "Kowloon City - Prince" based on 2021 Population Census's Main Table D304
Catchment C (Student)	31 people	Various online sources as stated in Appendix C. Assumed 1 class has 30 students if not specified.
Catchment C (Teacher)	6 people	Various online sources as stated in Appendix C.
Catchment C (Institution – Visitor & Staff)	172 people	3.3 employee per 100m2 GFA for 'Community, Social & Personal Services' based on CIFSUS published by PlanD

Parameter	Value	Justification
Catchment D (Residential)	302 people	3.6 Number of persons in average domestic household size for "Kowloon City - Prince" based on 2021 Population Census's Main Table D304.
Catchment D (Institution – Visitor & Staff)	103 people	3.3 employee per 100m2 GFA for 'Community, Social & Personal Services' based on CIFSUS published by PlanD
Catchment E (Residential)	325 people	3.6 Number of persons in average domestic household size for "Kowloon City - Prince" based on 2021 Population Census's Main Table D304.
Catchment F (Residential)	65 people	
Catchment G (Student)	180 people	Various online sources as stated in Appendix C. Assumed 1 class has 30 students if not specified.
Catchment G (Teacher)	24 people	Various online sources as stated in Appendix C.
Catchment H (Residential)	11 people	3.6 Number of persons in average domestic household size for "Kowloon City - Prince" based on 2021 Population Census's Main Table D304.
Unit Flow Factors		
Residents in residential buildings	0.27 m^3/day	"Domestic Private R2" based on EPD's GESF Table T-1
Employees in clubhouse & school	0.28 m3/day	"J11 Community, Social & Personal Services" based on EPD's GESF Table T-2
Residents in public rental housing	0.19 m3/day	"Public Rental" based on EPD's GESF Table T-1
Student	0.04 m3/day	'School Student' based on EPD's GESF Table T-2
Catchment Inflow Factor (P_{CIF})		
Discharge from Project Site	1.0	Catchment based on EPD's GESF Table T-4

With reference to Table 5 in the Sewerage Manual (Part 1)[2] issued by the DSD in May 2013, k_s of 0.6mm is used for clayware and 0.3mm is used for PE pipe for both the sewers from the Subject Site and existing sewerage system. The Colebrook-White Equation will be used to analyse the flow conditions. Equation (ii) for circular pipes flowing partially full is adopted to estimate the sewage flow for the Subject Site and following sewers.

[2] http://www.dsd.gov.hk/EN/Files/Technical_Manual/technical_manuals/Sewerage_Manual_1_Eurocodes.pdf

2.4 RESULTS AND DISCUSSION

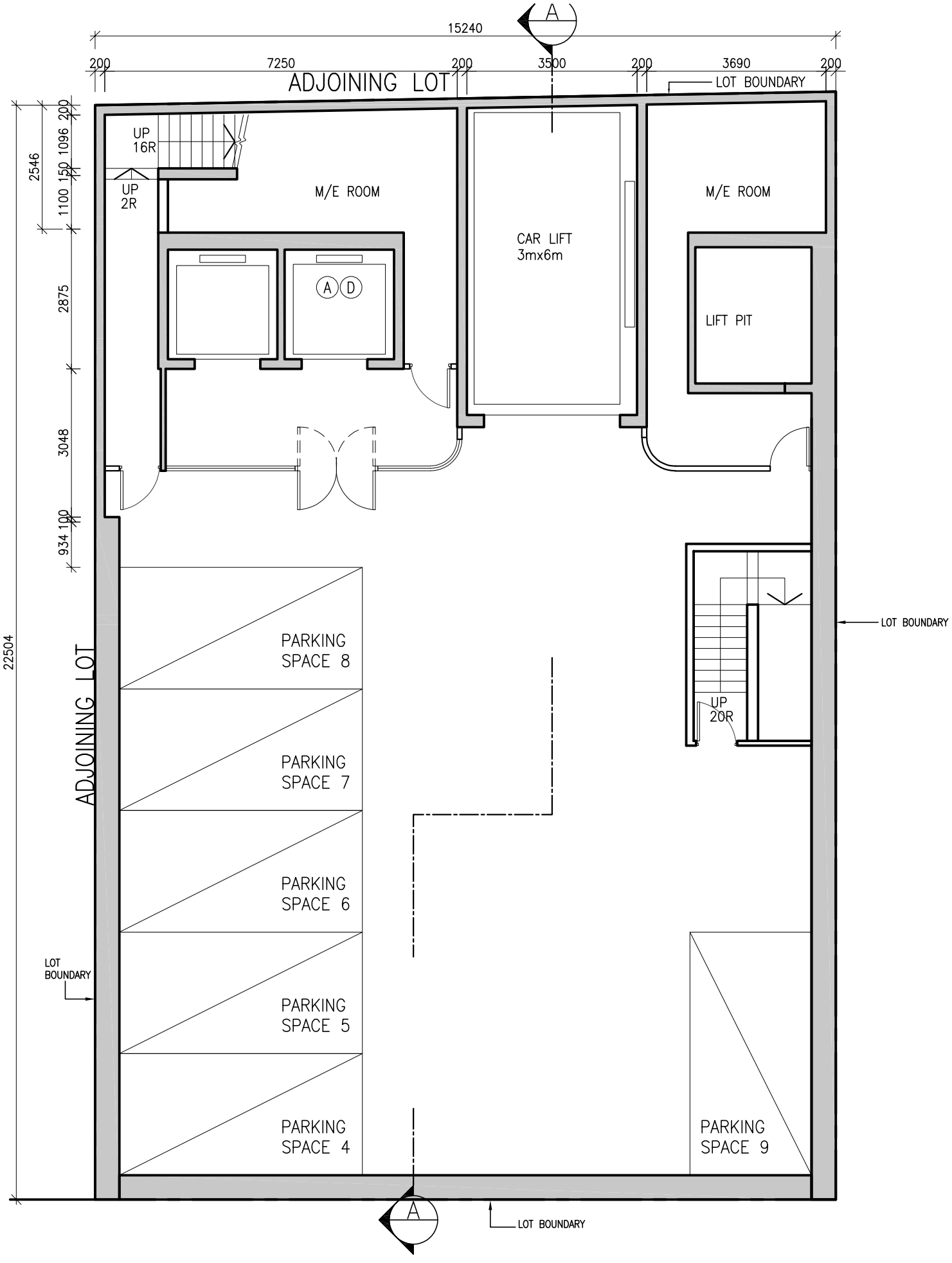
The estimated average flow rate and total peak flow of the Proposed Development are 32.40 m^3/day and 3.00 L/s respectively. Sewage generated from the Proposed Development and surrounding catchment areas will be connected at the downstream of sewage network. The cumulative flow is generally no more than 61.2% of sewer capacity which no adverse sewerage impacts to the existing sewerage system are identified. Therefore, no upgrading or improvement works of the sewerage system are required. Details of the sewage calculation are included in **Appendix D**.

3 CONCLUSION

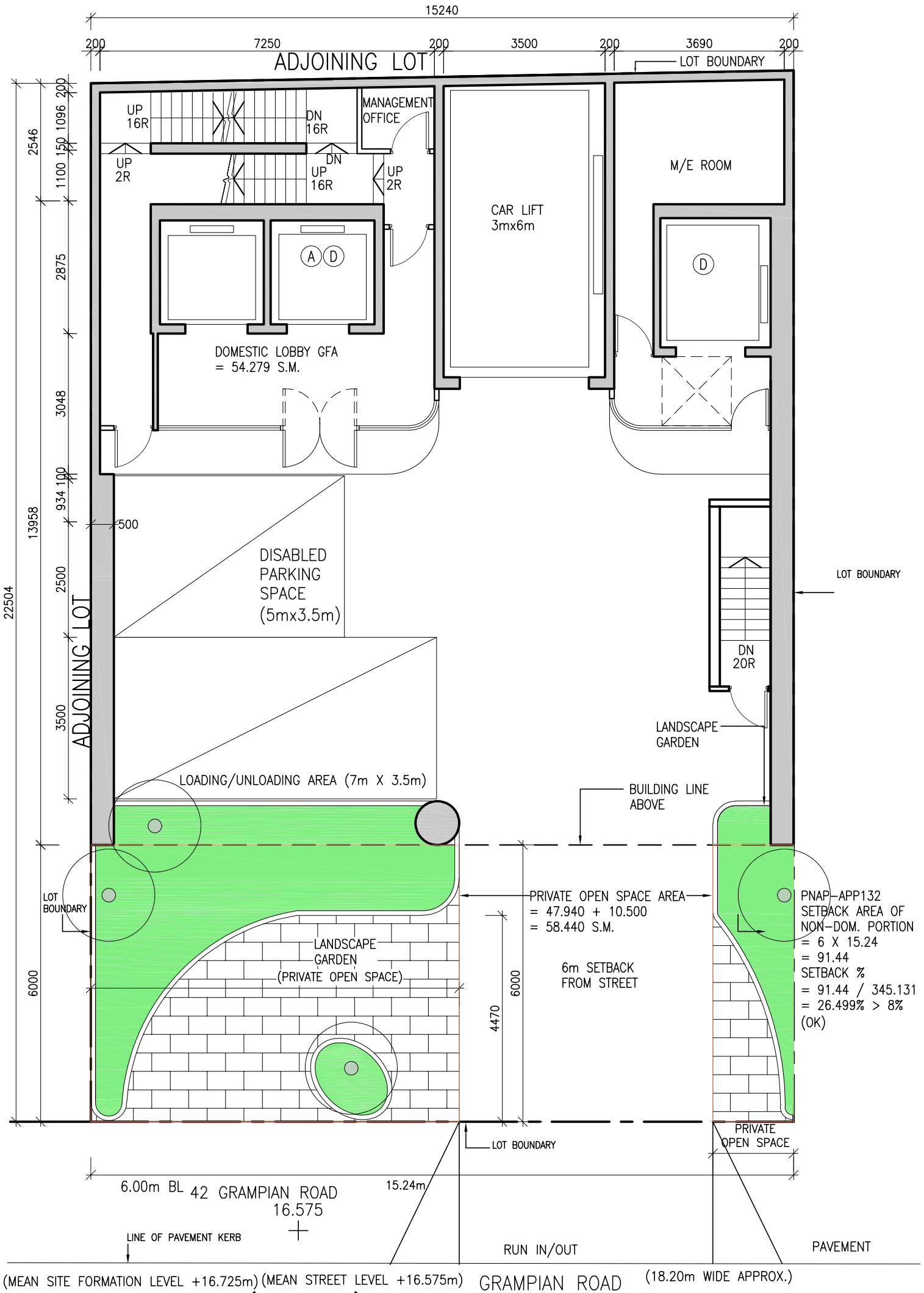
A composite development comprised of an 15-storey residential tower and 4-storey podium is proposed at 42 Grampian Road, Kowloon City. This is the SIA to assess whether the existing capacity of the sewerage networking is sufficient to cope with the peak sewage flow arising from the Proposed Development during its operation stage and to recommend appropriate mitigation measure(s) to alleviate unacceptable sewerage impact, if any.

Based on the SIA results, it is found that the proposed and existing sewage system serving the area have sufficient capacity to cater for the sewage generated from the Proposed Development and the surrounding catchment areas. Adverse sewerage impacts are not anticipated, and thus no upgrading or improvement works are required.

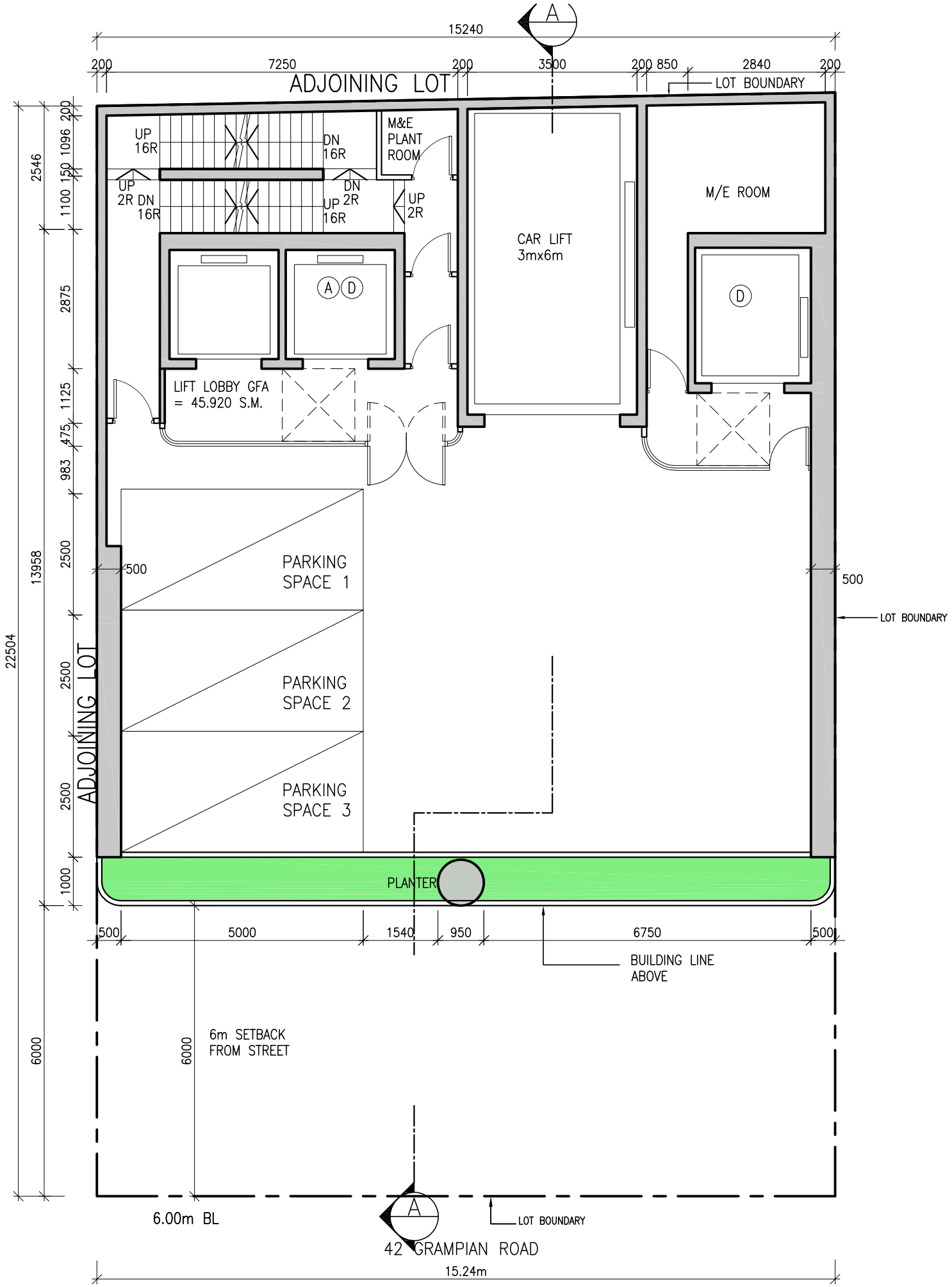
APPENDIX A
MASTER LAYOUT PLAN



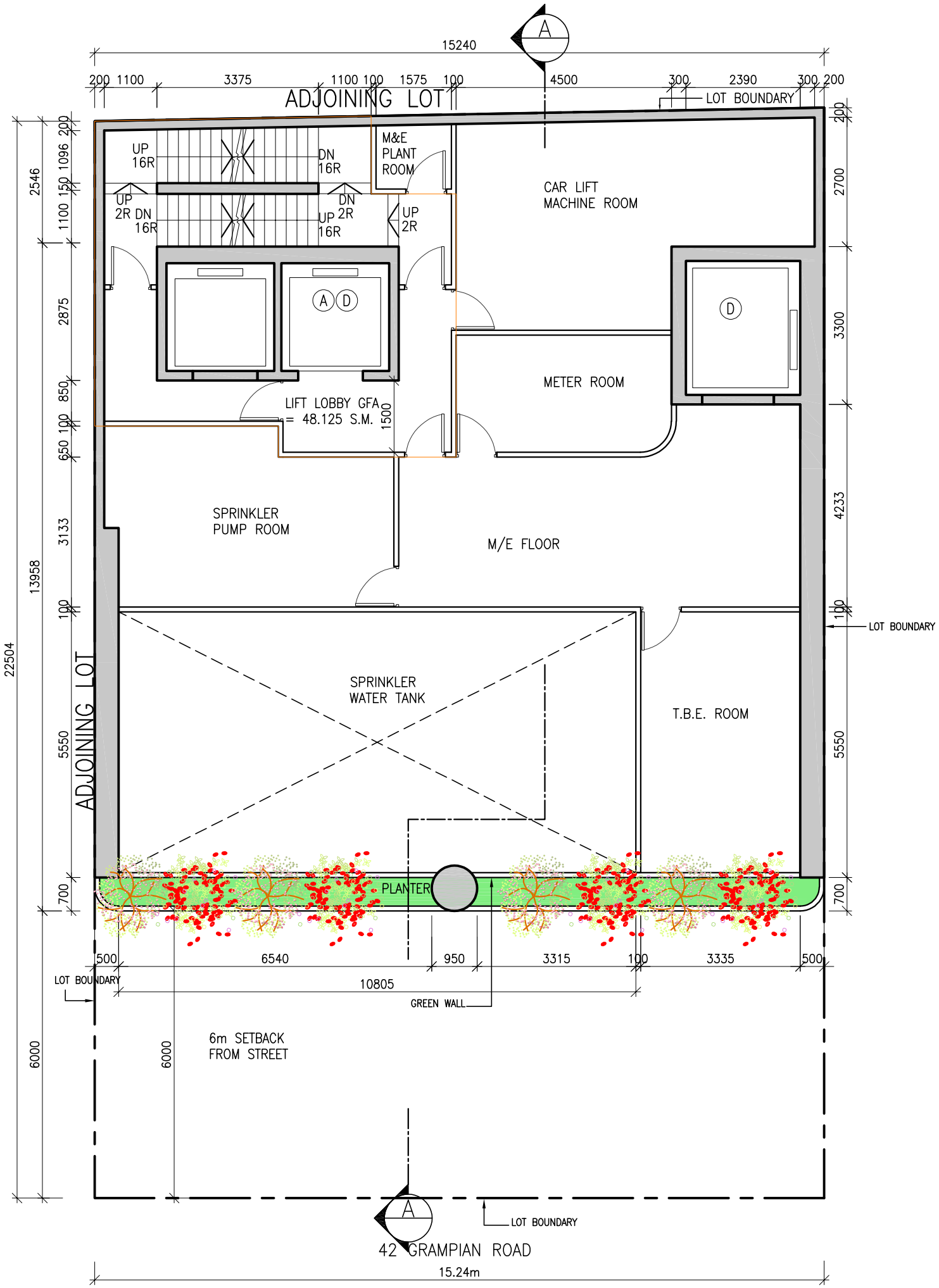
BASEMENT FLOOR PLAN (A4 1:100)



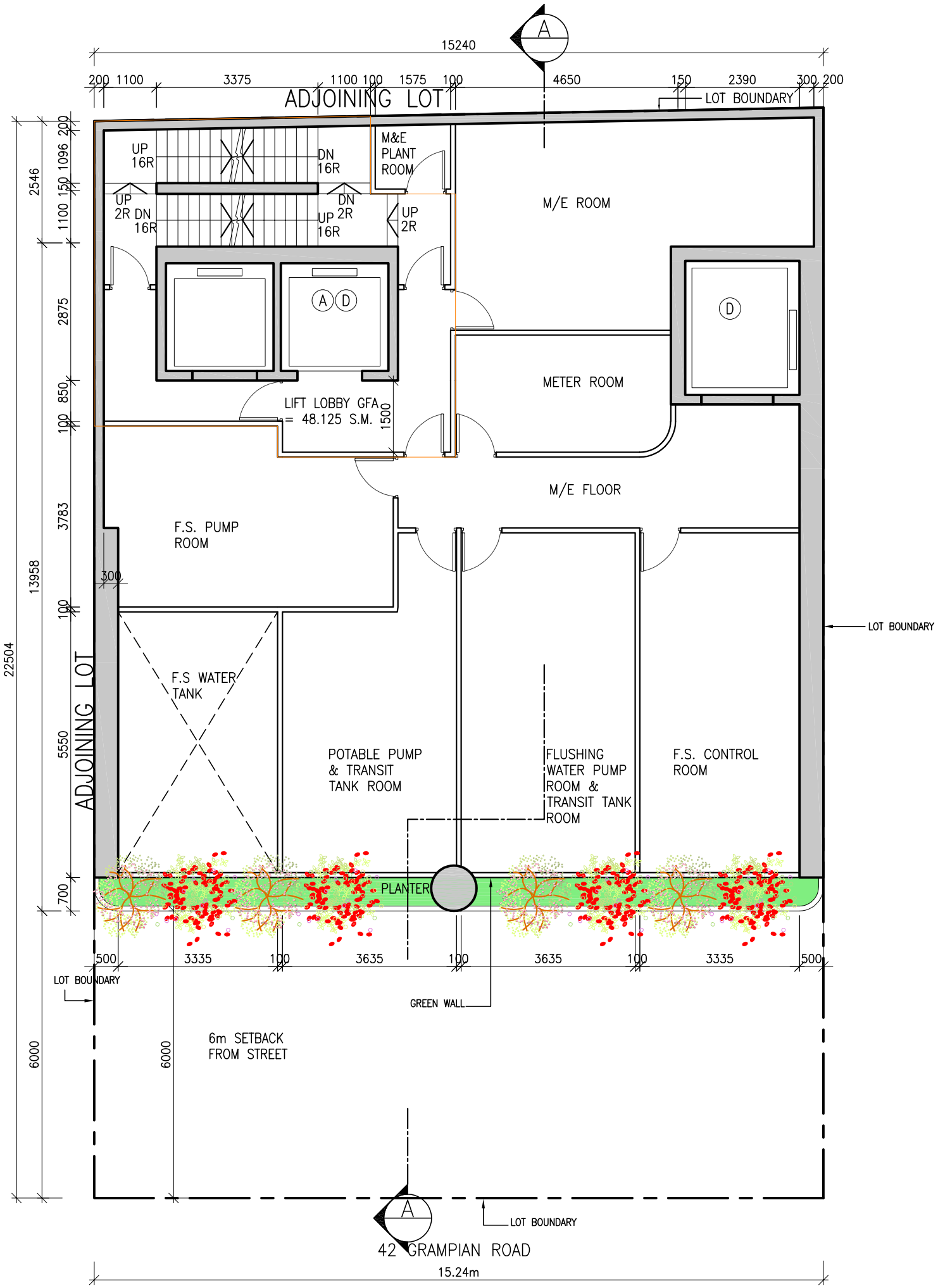
GROUND FLOOR PLAN (A4 1:100)



1ST FLOOR PLAN (A4 1:100)



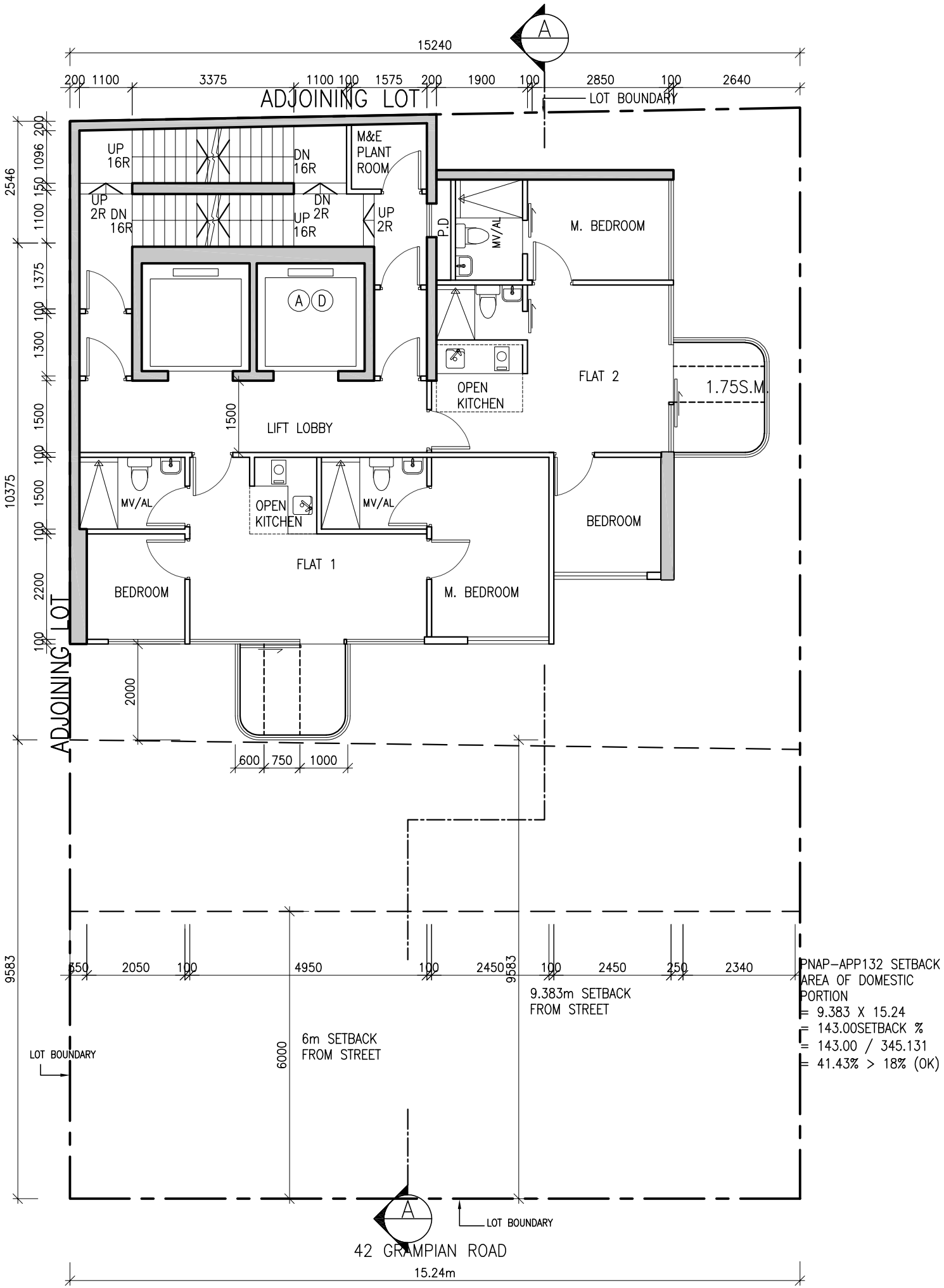
2ND FLOOR PLAN (A4 1:100)



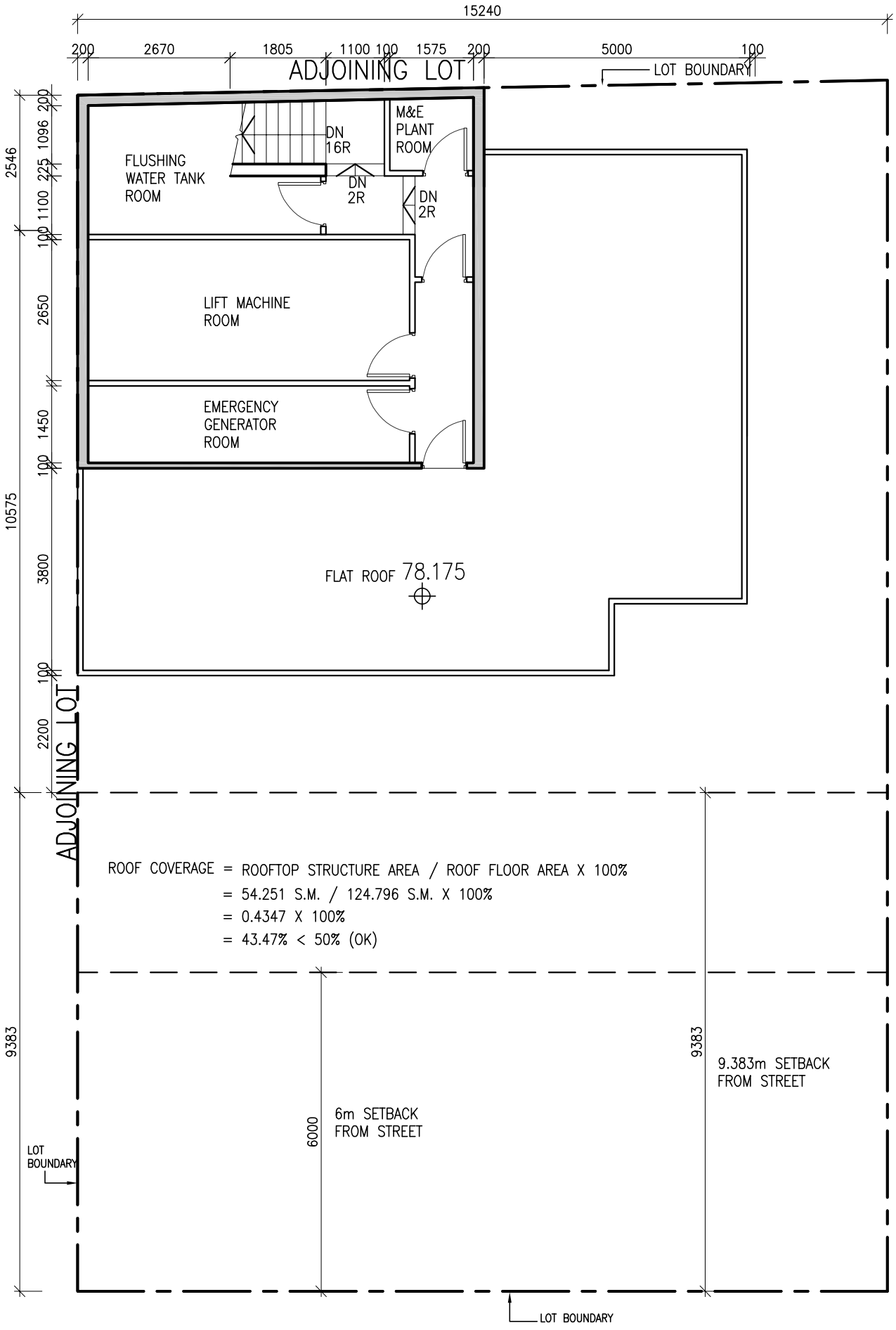
3RD FLOOR PLAN (A4 1:100)



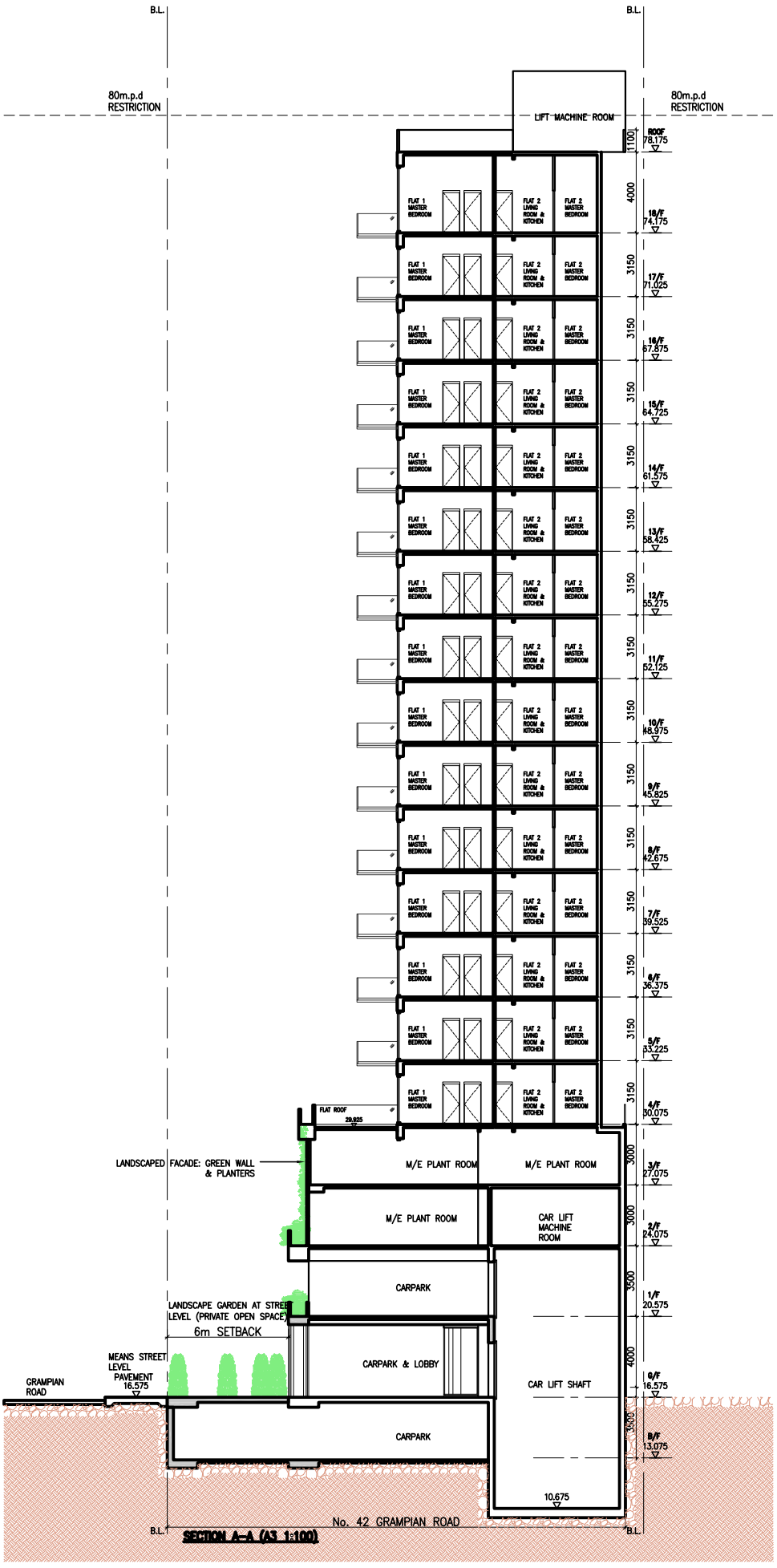
4 FLOOR PLAN (A4 1:100)

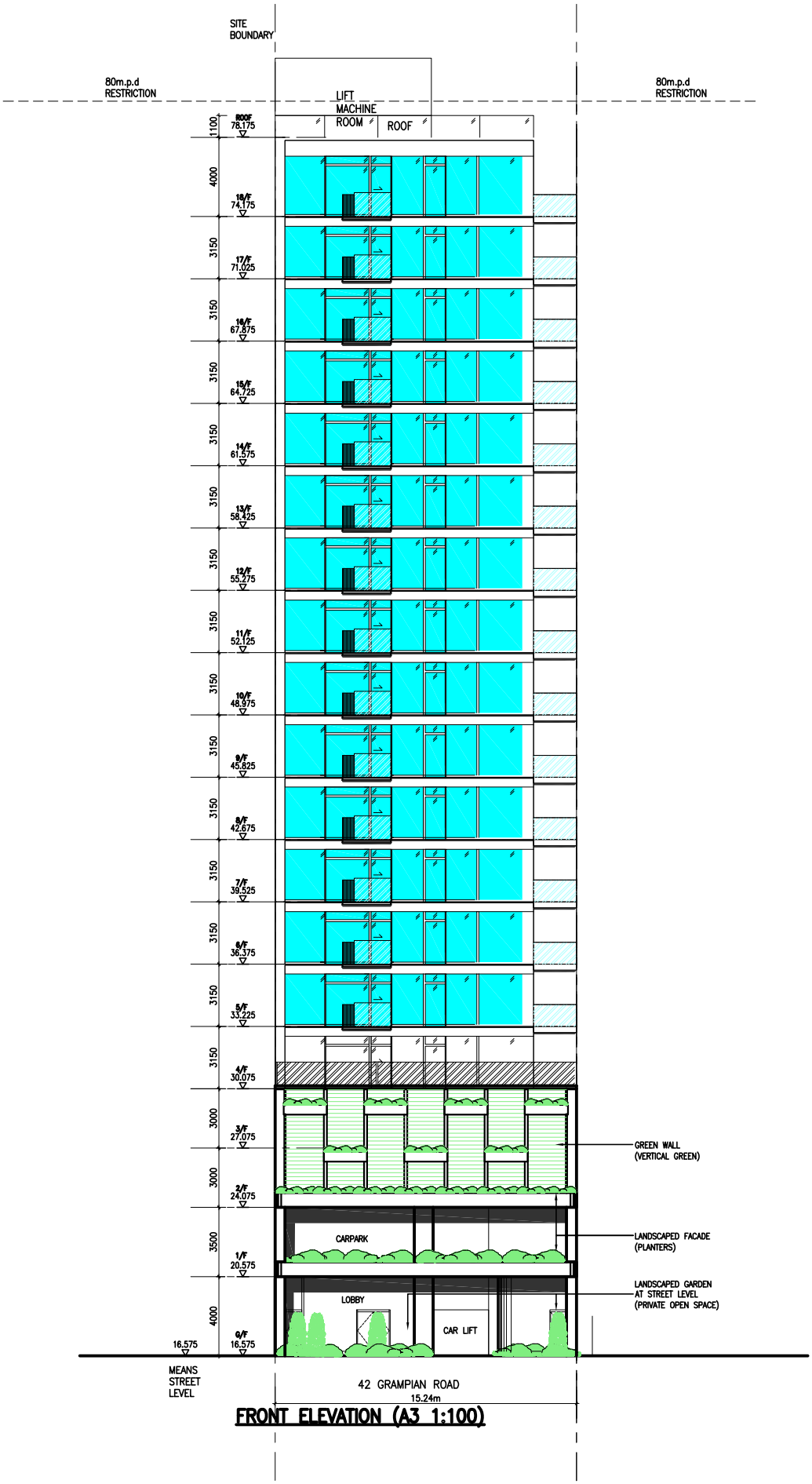


5-18 FLOOR PLAN (A4 1:100)



ROOF FLOOR PLAN (A4 1:100)

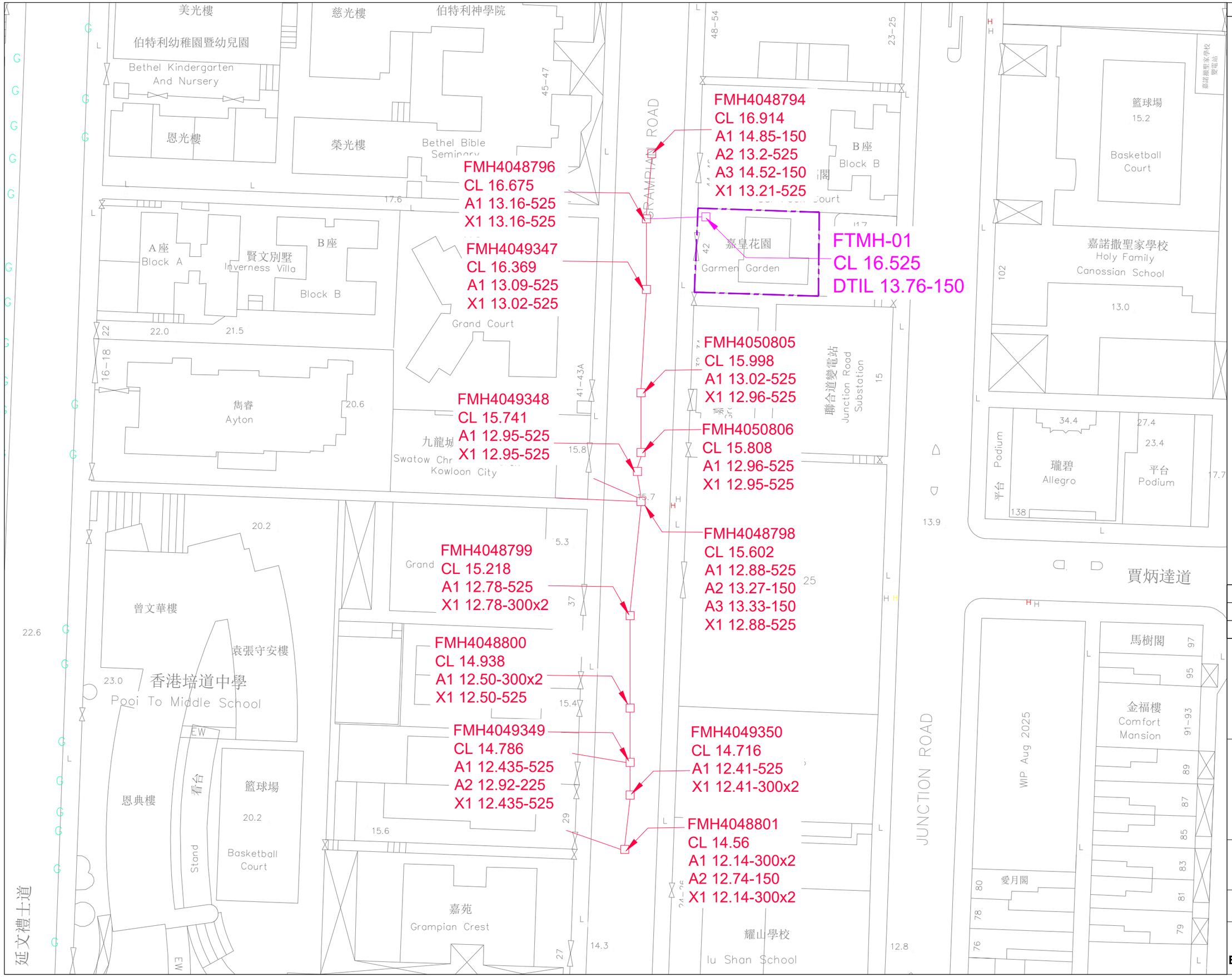

B.L.
B.L.
80m.p.d RESTRICTION
80m.p.d RESTRICTION
LIFT MACHINE ROOM
1100
ROOF 78.175
4000
18/F 74.175
3150
17/F 71.025
3150
16/F 67.875
3150
15/F 64.725
3150
14/F 61.575
3150
13/F 58.425
3150
12/F 55.275
3150
11/F 52.125
3150
10/F 48.975
3150
9/F 45.825
3150
8/F 42.675
3150
7/F 39.525
3150
6/F 36.375
3150
5/F 33.225
3150
4/F 30.075
FLAT 1 MASTER BEDROOM
FLAT 2 LIVING ROOM & KITCHEN
FLAT 2 MASTER BEDROOM
FLAT ROOF 29.925
LANDSCAPED FACADE: GREEN WALL & PLANTERS
M/E PLANT ROOM
M/E PLANT ROOM
3000
3/F 27.075
M/E PLANT ROOM
CAR LIFT MACHINE ROOM
3000
2/F 24.075
CARPARK
3500
1/F 20.575
LANDSCAPE GARDEN AT STREET LEVEL (PRIVATE OPEN SPACE)
6m SETBACK
MEANS STREET LEVEL PAVEMENT 16.575
GRAMPIAN ROAD
CARPARK & LOBBY
CAR LIFT SHAFT
4000
G/F 16.575
CARPARK
3600
B/F 13.075
10.675
B.L.
No. 42 GRAMPIAN ROAD
B.L.
SECTION A-A (A3 1:100)



FRONT ELEVATION (A3 1:100)

APPENDIX B

EXISTING AND PROPOSED SEWERAGE SYSTEM CONNECTION



Copyright by BeeXergy Consulting Limited

Project Site

Existing Sewage Connection

Proposed Sewage Connection

	Prepared	Checked	Approved
Initial	Various	TL	HM
Date	20260112	20260112	20260112

Project Title

PROPOSED RCHE AND RESIDENTIAL DEVELOPMENT AT 42 GRAMPIAN ROAD, KOWLOON CITY

Drawing Title

Sewage Connection

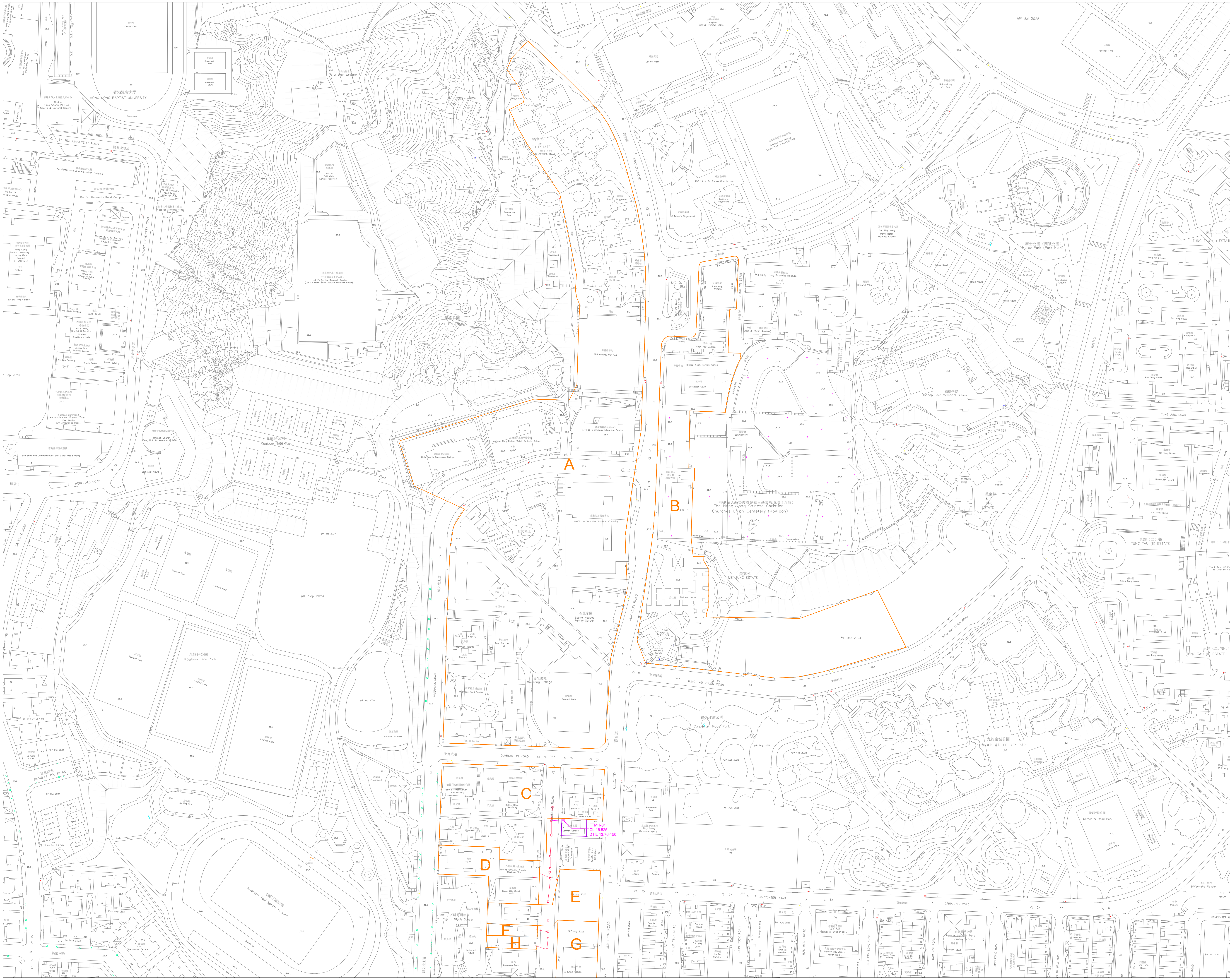
Drawing No.	Rev.
Appendix B	1

Scale: A3

BeeXergy Consulting Limited

APPENDIX C

PROPOSED SEWERAGE CONNECTION AND CATCHMENT AREA



Copyright by BeeXergy Consulting Limited

Project Site

Existing Sewage Connection

Proposed Sewage connection

Catchment

	Prepared	Checked	Approved
Initial	Various	TL	HM
Date	20260112	20260112	20260112

Project Title

PROPOSED RCHE AND RESIDENTIAL DEVELOPMENT AT 42 GRAMPIAN ROAD, KOWLOON CITY

Drawing Title

Proposed Sewage Connection & Catchment

Drawing No.

Appendix C

Rev.

1

Scale:

A3

BeeXergy Consulting Limited

APPENDIX C - CALCULATION OF SEWAGE FLOW

1) Proposed Development

Development	GFA (m^2)	No. of Flat	Occupancy Density [(a), (b)] (Number of Persons) (Workers per GFA in $100m^2$)	Estimated Population	Unit Flow Factor (m^3/day)	Estimated Average Dry Weather Flow (m^3/day)	Catchment Inflow Factor	Estimated Average Dry Weather Flow X Catchment Inflow Factor (m^3/day)	Remarks
Proposed Development (Resident)	-	-	-	120	0.27	32.400	1.00	32.400	Occupancy as advised by project proponent: Total number of flats = 30 Designed population per flat = 4 Total population = 30 x 4 = 120 people Unit Flow Factor: 0.270m3/day for 'Private R2' based on EPD's GESF Table T-1
Total Average Daily Dry Weather Flow of Proposed Development (m^3/day)								**32.400**	

2) Catchment A

Development	GFA (m^2)	No. of Flat	Occupancy Density [(a), (b)] (Number of Persons) (Workers per GFA in $100m^2$)	Estimated Population	Unit Flow Factor (m^3/day)	Estimated Average Dry Weather Flow (m^3/day)	Catchment Inflow Factor	Estimated Average Dry Weather Flow X Catchment Inflow Factor (m^3/day)	Remarks
A1: Lok Tai House	-	460	2.7	1242	0.19	235.980	1.00	235.980	No of flat: https://zh.wikipedia.org/wiki/%E6%A8%82%E5%AF%8C%E9%82%A8 Occupancy Density: 2.7 Number of persons in average domestic household size for "Wong Tai Sin - Lok Fu" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.190m3/day for 'Public rental' based on EPD's GESF Table T-1
A2: Lok Man House	-	469	2.7	1266	0.19	240.597	1.00	240.597	No of flat: https://zh.wikipedia.org/wiki/%E6%A8%82%E5%AF%8C%E9%82%A8 Occupancy Density: 2.7 Number of persons in average domestic household size for "Wong Tai Sin - Lok Fu" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.190m3/day for 'Public rental' based on EPD's GESF Table T-1
A3: Lok Him House	-	360	2.7	972	0.19	184.680	1.00	184.680	No of flat: https://zh.wikipedia.org/wiki/%E6%A8%82%E5%AF%8C%E9%82%A8 Occupancy Density: 2.7 Number of persons in average domestic household size for "Wong Tai Sin - Lok Fu" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.190m3/day for 'Public rental' based on EPD's GESF Table T-1
A4: Lok Tsui House	-	360	2.7	972	0.19	184.680	1.00	184.680	No of flat: https://zh.wikipedia.org/wiki/%E6%A8%82%E5%AF%8C%E9%82%A8 Occupancy Density: 2.7 Number of persons in average domestic household size for "Wong Tai Sin - Lok Fu" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.190m3/day for 'Public rental' based on EPD's GESF Table T-1
A5: Arts & Technology Education Centre	5369.0	-	3.3	177	0.28	49.610	1.00	49.610	Site area = 767m3, 7-storey building Occupancy Density: 3.3 employee per 100m2 GFA for 'Community, Social & Personal Services' based on Commercial and Industrial Floor Space Utilization Survey published by PlanD UFF: 0.280 m3/day for 'J11 Community, Social & Personal Services' based on EPD's GESF Table T-2
A6: Kowloon Tong Bishop Walsh Catholic School (student)	-	-	-	720	0.04	28.800	1.00	28.800	Occupancy: https://www.schooland.hk/ps/ktbwcs Assumed 1 class has 30 students. Unit Flow Factor: 0.04m3/day for 'School Student' based on EPD's GESF Table T-2
A6: Kowloon Tong Bishop Walsh Catholic School (teacher)	-	-	-	47	0.28	13.160	1.00	13.160	Occupancy: https://www.schooland.hk/ps/ktbwcs Unit Flow Factor: 0.28m3/day for 'J11 Community, Social & Personal Services' based on EPD's GESF Table T-2
A7: Holy Family Canossian College (student)	-	-	-	720	0.04	28.800	1.00	28.800	Occupancy: https://www.schooland.hk/ss/hfcc Assumed 1 class has 30 students. Unit Flow Factor: 0.04m3/day for 'School Student' based on EPD's GESF Table T-2
A7: Holy Family Canossian College (teacher)	-	-	-	54	0.28	15.120	1.00	15.120	Occupancy: https://www.schooland.hk/ss/hfcc Unit Flow Factor: 0.28m3/day for 'J11 Community, Social & Personal Services' based on EPD's GESF Table T-2
A8: HKICC Lee Shau Kee School of Creativity	12970.0	-	3.3	428	0.28	119.843	1.00	119.843	GFA = planning application: A/K18/224 Occupancy Density: 3.3 employee per 100m2 GFA for 'Community, Social & Personal Services' based on Commercial and Industrial Floor Space Utilization Survey published by PlanD UFF: 0.280 m3/day for 'J11 Community, Social & Personal Services' based on EPD's GESF Table T-2
A9: Munsang College (student)	-	-	-	3322	0.04	132.880	1.00	132.880	Occupancy: https://zh-yue.wikipedia.org/wiki/%E6%B0%91%E7%94%9F%E6%9B%B8%E9%99%A2 Unit Flow Factor: 0.04m3/day for 'School Student' based on EPD's GESF Table T-2
A9: Munsang College (teacher)	-	-	-	223	0.28	62.440	1.00	62.440	Occupancy: https://zh-yue.wikipedia.org/wiki/%E6%B0%91%E7%94%9F%E6%9B%B8%E9%99%A2 Unit Flow Factor: 0.28m3/day for 'J11 Community, Social & Personal Services' based on EPD's GESF Table T-2
A10: Parc Inverness	-	134	3.7	496	0.27	133.866	1.00	133.866	No. of flat: https://hk.centanet.com/estate/en/Parc-Inverness/2-EDWPWWPHWS Occupancy Density: 3.7 Number of persons in average domestic household size for "Kowloon City - Kowloon Tong" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.270m3/day for 'Private R2' based on EPD's GESF Table T-1
A11: Stone House Family Garden	638.6	-	3.3	21	0.28	5.901	1.00	5.901	GFA = planning application: A/K18/287 Occupancy Density: 3.3 employee per 100m2 GFA for 'Community, Social & Personal Services' based on Commercial and Industrial Floor Space Utilization Survey published by PlanD UFF: 0.280 m3/day for 'J11 Community, Social & Personal Services' based on EPD's GESF Table T-2
A12: Man Wah Heights	-	30	3.7	111	0.27	29.970	1.00	29.970	No. of flat: https://hk.centanet.com/estate/en/Man-Wah-Heights/2-MIHITHZRHT Occupancy Density: 3.7 Number of persons in average domestic household size for "Kowloon City - Kowloon Tong" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.270m3/day for 'Private R2' based on EPD's GESF Table T-1
A13: Louise Garden	-	12	3.7	44	0.27	11.988	1.00	11.988	No. of flat: https://www.house730.com/estate-21639/%E4%B9%9D%E9%BE%8D%E5%A1%98-%E6%80%A1%E8%8B%91/ Occupancy Density: 3.7 Number of persons in average domestic household size for "Kowloon City - Kowloon Tong" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.270m3/day for 'Private R2' based on EPD's GESF Table T-1
Total Average Daily Dry Weather Flow of Catchment A (m^3/day)								**1478.314**	

3) Catchment B

Development	GFA (m^2)	No. of Flat	Occupancy Density [a], [b] (Number of Persons) (Workers per GFA in $100m^2$)	Estimated Population	Unit Flow Factor (m^3/day)	Estimated Average Dry Weather Flow (m^3/day)	Catchment Inflow Factor	Estimated Average Dry Weather Flow X Catchment Inflow Factor (m^3/day)	Remarks
B1: Luen Hop Building	-	224	2.7	605	0.27	163.296	1.00	163.296	No of flat: https://hk.centanet.com/estate/en/Luen%20Hop%20Building/2-EYEWPPDSPA Occupancy Density: 2.7 Number of persons in average domestic household size for "Wong Tai Sin - Lok Fu" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.270m3/day for 'Private R2' based on EPD's GESF Table T-1
B2: Bishop Walsh Primary School (student)	-	-	-	720	0.04	28.800	1.00	28.800	Occupancy: https://www.schooland.hk/ps/bishopwalsh Assumed 1 class has 30 students. Unit Flow Factor: 0.04m3/day for 'School Student' based on EPD's GESF Table T-2
B2: Bishop Walsh Primary School (teacher)	-	-	-	49	0.28	13.720	1.00	13.720	Occupancy: https://www.schooland.hk/ps/bishopwalsh Unit Flow Factor: 0.28m3/day for 'J11 Community, Social & Personal Services' based on EPD's GESF Table T-2
B3: The Hong Kong Chinese Christian Churches Union Building	1584	-	3.3	52	0.28	14.636	1.00	14.636	Site area = 396m3, 4-storey building Occupancy Density: 3.3 employee per 100m2 GFA for 'Community, Social & Personal Services' based on Commercial and Industrial Floor Space Utilization Survey published by PlanD UFF: 0.280 m3/day for 'J11 Community, Social & Personal Services' based on EPD's GESF Table T-2
B4: Mei Yan House	-	799	2.7	2157	0.19	409.887	1.00	409.887	No of flat: https://zh.wikipedia.org/wiki/%E7%BE%8E%E6%9D%B1%E9%82%A8 Occupancy Density: 2.7 Number of persons in average domestic household size for "Wong Tai Sin - Tung Mei" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.190m3/day for 'Public rental' based on EPD's GESF Table T-1
B5: Redevelopment of Mei Tung Estate	-	-	-	7500	0.19	1425.000	1.00	1425.000	Population: https://www.districtcouncils.gov.hk/wts/doc/2020_2023/en/committee_meetings_doc/HC/18124/HC_M1_007.pdf Unit Flow Factor: 0.190m3/day for 'Public rental' based on EPD's GESF Table T-1
Total Average Daily Dry Weather Flow of Catchment D (m^3/day)								**2055.339**	

4) Catchment C

Development	GFA (m^2)	No. of Flat	Occupancy Density [a], [b] (Number of Persons) (Workers per GFA in $100m^2$)	Estimated Population	Unit Flow Factor (m^3/day)	Estimated Average Dry Weather Flow (m^3/day)	Catchment Inflow Factor	Estimated Average Dry Weather Flow X Catchment Inflow Factor (m^3/day)	Remarks
C1: Mei Kwong Building	1196	-	3.3	39	0.28	11.051	1.00	11.051	Site area = 598m3, 2-storey building Occupancy Density: 3.3 employee per 100m2 GFA for 'Community, Social & Personal Services' based on Commercial and Industrial Floor Space Utilization Survey published by PlanD UFF: 0.280 m3/day for 'J11 Community, Social & Personal Services' based on EPD's GESF Table T-2
C2: Bethel Bible Seminary	4001.52	-	3.3	132	0.28	36.974	1.00	36.974	Site area = 1334m3, 3-storey building Occupancy Density: 3.3 employee per 100m2 GFA for 'Community, Social & Personal Services' based on Commercial and Industrial Floor Space Utilization Survey published by PlanD UFF: 0.280 m3/day for 'J11 Community, Social & Personal Services' based on EPD's GESF Table T-2
C3: Bethel Kindergarten and Nursery (student)	-	-	-	31	0.04	1.240	1.00	1.240	Occupancy: https://www.schooland.hk/kg/hkbcgk Unit Flow Factor: 0.04m3/day for 'School Student' based on EPD's GESF Table T-2
C3: Bethel Kindergarten and Nursery (teacher)	-	-	-	6	0.28	1.680	1.00	1.680	Occupancy: https://www.schooland.hk/kg/hkbcgk Unit Flow Factor: 0.28m3/day for 'J11 Community, Social & Personal Services' based on EPD's GESF Table T-2
C4: Grand Court	-	22	3.6	79	0.27	21.384	1.00	21.384	No. of flat: https://hk.centanet.com/estate/%E6%A0%BC%E8%98%AD%E5%A4%A7%E5%BB%88/1-UUDCFRSXRU Occupancy Density: 3.6 Number of persons in average domestic household size for "Kowloon City - Prince" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.270m3/day for 'Private R2' based on EPD's GESF Table T-1
C5: Inverness Villa	-	45	3.6	162	0.27	43.740	1.00	43.740	No. of flat: https://hk.centanet.com/estate/%E8%B3%A2%E6%96%87%E5%88%A5%E5%A2%85/2-MIDXTHZAHT Occupancy Density: 3.6 Number of persons in average domestic household size for "Kowloon City - Prince" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.270m3/day for 'Private R2' based on EPD's GESF Table T-1
C6: 48-54 Grampian Road	-	22	3.6	79	0.27	21.384	1.00	21.384	No. of flat: https://hk.centanet.com/estate/48-54%20Grampian%20Road/2-EYDEWPSJPB Occupancy Density: 3.6 Number of persons in average domestic household size for "Kowloon City - Prince" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.270m3/day for 'Private R2' based on EPD's GESF Table T-1
C7: Gar Fook Court	-	40	3.6	144	0.27	38.880	1.00	38.880	No. of flat: https://hk.centanet.com/estate/undefined/2-EYKSWPSXPB Occupancy Density: 3.6 Number of persons in average domestic household size for "Kowloon City - Prince" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.270m3/day for 'Private R2' based on EPD's GESF Table T-1
Total Average Daily Dry Weather Flow of Catchment D (m^3/day)								**176.333**	

5) Catchment D

Development	GFA (m^2)	No. of Flat	Occupancy Density [a], [b] (Number of Persons) (Workers per GFA in $100m^2$)	Estimated Population	Unit Flow Factor (m^3/day)	Estimated Average Dry Weather Flow (m^3/day)	Catchment Inflow Factor	Estimated Average Dry Weather Flow X Catchment Inflow Factor (m^3/day)	Remarks
D1: Ayton	-	60	3.6	216	0.27	58.320	1.00	58.320	No. of flat: https://hk.centanet.com/estate/%E9%9B%8B%E7%9D%BF/2-EDPPWPPHPS Occupancy Density: 3.6 Number of persons in average domestic household size for "Kowloon City - Prince" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.270m3/day for 'Private R2' based on EPD's GESF Table T-1
D2: Swatow Christian Church Kowloon City	3129	-	3.3	103	0.28	28.912	1.00	28.912	Site area = 447m3, 7-storey building Occupancy Density: 3.3 employee per 100m2 GFA for 'Community, Social & Personal Services' based on Commercial and Industrial Floor Space Utilization Survey published by PlanD UFF: 0.280 m3/day for 'J11 Community, Social & Personal Services' based on EPD's GESF Table T-2
D3: Grand City Court	-	24	3.6	86	0.27	23.328	1.00	23.328	No. of flat: https://hk.centanet.com/estate/undefined/1-MIIZIHDVHT Occupancy Density: 3.6 Number of persons in average domestic household size for "Kowloon City - Prince" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.270m3/day for 'Private R2' based on EPD's GESF Table T-1
Total Average Daily Dry Weather Flow of Catchment D (m^3/day)								**110.560**	

6) Catchment E

Development	GFA (m^2)	No. of Flat	Occupancy Density [a], [b] (Number of Persons) (Workers per GFA in $100m^2$)	Estimated Population	Unit Flow Factor (m^3/day)	Estimated Average Dry Weather Flow (m^3/day)	Catchment Inflow Factor	Estimated Average Dry Weather Flow X Catchment Inflow Factor (m^3/day)	Remarks
E1: 33-35 Grampian Road	-	6	3.6	22	0.27	5.832	1.00	5.832	No. of flat: https://hk.centanet.com/estate/%E5%98%89%E6%9E%97%E9%82%8A%E9%81%9335%E8%99%9F/1-MIIHZIHDXHT https://hk.centanet.com/estate/%E5%98%89%E6%9E%97%E9%82%8A%E9%81%9333%E8%99%9F/1-MIXMIHDAHT Occupancy Density: 3.6 Number of persons in average domestic household size for "Kowloon City - Prince" based on 2021 Population Census's Main Table D304.
E2: 30 Grampian Road	8420	-	3.6	303	0.27	81.842	1.00	81.842	Site area = 1684m3, plot ratio = 5 Occupancy Density: 3.6 Number of persons in average domestic household size for "Kowloon City - Prince" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.270m3/day for 'Private R2' based on EPD's GESF Table T-1
Total Average Daily Dry Weather Flow of Catchment D (m^3/day)								**87.674**	

7) Catchment F

Development	GFA (m^2)	No. of Flat	Occupancy Density [a], [b] (Number of Persons) (Workers per GFA in $100m^2$)	Estimated Population	Unit Flow Factor (m^3/day)	Estimated Average Dry Weather Flow (m^3/day)	Catchment Inflow Factor	Estimated Average Dry Weather Flow X Catchment Inflow Factor (m^3/day)	Remarks
F1: 31 Grampian Road	-	18	3.6	65	0.27	17.496	1.00	17.496	No. of flat: https://hk.centanet.com/estate/%E5%98%89%E6%9E%97%E9%82%8A%E9%81%9331%E8%99%9F/2-EYSPWWPXWB Occupancy Density: 3.6 Number of persons in average domestic household size for "Kowloon City - Prince" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.270m3/day for 'Private R2' based on EPD's GESF Table T-1
Total Average Daily Dry Weather Flow of Catchment D (m^3/day)								**17.496**	

8) Catchment G

Development	GFA (m^2)	No. of Flat	Occupancy Density [a], [b] (Number of Persons) (Workers per GFA in $100m^2$)	Estimated Population	Unit Flow Factor (m^3/day)	Estimated Average Dry Weather Flow (m^3/day)	Catchment Inflow Factor	Estimated Average Dry Weather Flow X Catchment Inflow Factor (m^3/day)	Remarks
G1: 28 Grampian Road (Student)	210.7	-	-	30	0.04	1.200	1.00	1.200	GFA: https://www.tpb.gov.hk/tc/plan_application/Attachment/20210302/s16_A_K10_268_0_gist.pdf Population: Assumed Unit Flow Factor: 0.04m3/day for 'School Student' based on EPD's GESF Table T-2
G1: 28 Grampian Road (Teacher)	210.7	-	-	6	0.28	1.680	1.00	1.680	GFA: https://www.tpb.gov.hk/tc/plan_application/Attachment/20210302/s16_A_K10_268_0_gist.pdf Population: Assumed Unit Flow Factor: 0.28m3/day for 'J11 Community, Social & Personal Services' based on EPD's GESF Table T-2
G2: Iu Shan School (Student)	-	-	-	150	0.04	6.000	1.00	6.000	Occupancy: https://www.schooland.hk/ps/iushan Unit Flow Factor: 0.04m3/day for 'School Student' based on EPD's GESF Table T-2
G2: Iu Shan School (Teacher)	-	-	-	18	0.28	5.040	1.00	5.040	Occupancy: https://www.schooland.hk/ps/iushan Unit Flow Factor: 0.28m3/day for 'J11 Community, Social & Personal Services' based on EPD's GESF Table T-2
Total Average Daily Dry Weather Flow of Catchment D (m^3/day)								**13.920**	

8) Catchment H

Development	GFA (m^2)	No. of Flat	Occupancy Density [a], [b] (Number of Persons) (Workers per GFA in $100m^2$)	Estimated Population	Unit Flow Factor (m^3/day)	Estimated Average Dry Weather Flow (m^3/day)	Catchment Inflow Factor	Estimated Average Dry Weather Flow X Catchment Inflow Factor (m^3/day)	Remarks
H1: 29 Grampian Road	-	3	3.6	11	0.27	2.916	1.00	2.916	No. of flat: https://hk.centanet.com/estate/%E5%98%89%E6%9E%97%E9%82%8A%E9%81%9329%E8%99%9F/1-EDWWGPAJPS Occupancy Density: 3.6 Number of persons in average domestic household size for "Kowloon City - Prince" based on 2021 Population Census's Main Table D304. Unit Flow Factor: 0.270m3/day for 'Private R2' based on EPD's GESF Table T-1
Total Average Daily Dry Weather Flow of Catchment D (m^3/day)								**2.916**	

APPENDIX D
SEWAGE CALCULATION AND HYDRAULIC CAPACITY CHECK

Appendix D - Hydraulic Capacity of the Proposed and Downstream Sewers

Manhole Reference	Cover Level	Manhole Reference	Cover Level	Pipe Dia.	Number of Pipe	Pipe Length	Upstream Invert Level	Downstream Invert Level	g [1]	Pipe Material	k_s [1], [3]	s [1]	v [1]	V [1], [2]	A	Q [4]	Estimated Capacity	ADWF	Contributing Population	Peaking Factor	Peak Flow	Capacity	Compliance	Remarks
	mPD		mPD	mm		m	mPD	mPD	m/s^2		m		m^2/s	m/s	m^2	m^3/s	L/s	m^3/day			L/s	%		
FTMH-01	+16.525	FMH4048796	+16.675	150	1	9.5	+13.76	+13.16	9.81	PE	0.0003	0.0635	1.306E-06	2.7906	0.0177	0.0493	49.31	32.40	120	8	3.00	6.1%	Yes	Catchment S (Project Site)
FMH4048794	+16.914	FMH4048796	+16.675	525	1	10.3	+13.21	+13.16	9.81	Clay	0.0006	0.0050	1.306E-06	1.5700	0.2165	0.3399	339.86	3709.99	13741	4	171.76	50.5%	Yes	Catchment A, B, C
FMH4048796	+16.675	FMH4049347	+16.369	525	1	12.9	+13.16	+13.09	9.81	Clay	0.0006	0.0053	1.306E-06	1.6300	0.2165	0.3528	352.85	3742.39	13861	4	173.26	49.1%	Yes	Catchment A, B, C, S
FMH4049347	+16.369	FMH4050805	+15.998	525	1	18.5	+13.09	+13.02	9.81	Clay	0.0006	0.0037	1.306E-06	1.3581	0.2165	0.2940	293.99	3742.39	13861	4	173.26	58.9%	Yes	Catchment A, B, C, S
FMH4050805	+15.998	FMH4050806	+15.808	525	1	9.4	+13.02	+12.96	9.81	Clay	0.0006	0.0059	1.306E-06	1.7176	0.2165	0.3718	371.82	3742.39	13861	4	173.26	46.6%	Yes	Catchment A, B, C, S
FMH4050806	+15.808	FMH4049348	+15.741	525	1	3.3	+12.96	+12.95	9.81	Clay	0.0006	0.0052	1.306E-06	1.6003	0.2165	0.3464	346.44	3742.39	13861	4	173.26	50.0%	Yes	Catchment A, B, C, S
FMH4049348	+15.741	FMH4048798	+15.602	525	1	5.0	+12.95	+12.88	9.81	Clay	0.0006	0.0133	1.306E-06	2.5792	0.2165	0.5583	558.33	3852.95	14270	4	178.38	31.9%	Yes	Catchment A, B, C, S, D
FMH4048798	+15.602	FMH4048799	+15.218	525	1	19.9	+12.88	+12.78	9.81	Clay	0.0006	0.0050	1.306E-06	1.5785	0.2165	0.3417	341.71	3852.95	14270	4	178.38	52.2%	Yes	Catchment A, B, C, S, D
FMH4048799	+15.218	FMH4048800	+14.938	300	2	15.9	+12.78	+12.50	9.81	Clay	0.0006	0.0180	1.306E-06	2.1071	0.0707	0.1489	297.88	3940.62	14595	4	182.44	61.2%	Yes	Catchment A, B, C, S, D, E
FMH4048800	+14.938	FMH4049349	+14.786	525	1	8.8	+12.50	+12.44	9.81	Clay	0.0006	0.0068	1.306E-06	1.8426	0.2165	0.3989	398.88	3958.12	14660	4	183.25	45.9%	Yes	Catchment A, B, C, S, D, E, F
FMH4049349	+14.786	FMH4049350	+14.716	525	1	4.8	+12.44	+12.41	9.81	Clay	0.0006	0.0062	1.306E-06	1.7577	0.2165	0.3805	380.50	3972.04	14711	4	183.89	48.3%	Yes	Catchment A, B, C, S, D, E, F, G
FMH4049350	+14.716	FMH4048801	+14.560	300	2	9.1	+12.41	+12.14	9.81	Clay	0.0006	0.0291	1.306E-06	2.6882	0.0707	0.1900	380.04	3974.95	14722	4	184.03	48.4%	Yes	Catchment A, B, C, S, D, E, F, G, H

Note:

(1) g=gravitational acceleration; k_s=equivalent sand roughness; s=gradient; v=kinematic viscosity of water; V=mean velocity

(2) The mean velocity (V) is claculated by the Colebrook-White Equation for circular pipes:

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

where V = mean velocity (m/s)

g = gravitational acceration (m/s^2)

D = internal pipe diameter (m)

s = slope

ks = roughness coefficient(m)

v = kinematic viscosity of fluid (m^2/s)

(3) For roughness value k_s 0.6mm is used for slimed sewers with velocity >1.2m/s and 3mm is used for slimed sewers with velocity <1.2m/s based on DSD's "Sewerage Manual" Table 5: Recommended roughness values.

(4) Peak flow (Q) is calculated by Q = V x A