Appendix 5

Sewerage Impact Assessment

Issue No. : 2

Issue Date : Nov 2024

Project No. : 2244EA

SEWERAGE IMPACT ASSESSMENT

FOR

PROPOSED NEW SCIENCE BUILDING AT LINGNAN UNIVERSITY, TUEN MUN, HONG KONG

Prepared by

Allied Environmental Consultants Limited

COMMERCIAL-IN-CONFIDENCE

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Document Verification

Project Title	Proposed New Science Building at Lingnan University, Tuen Mun, Hong Kong	**Project No.**	2244EA
Document Title	Sewerage Impact Assessment		

Issue No.	Issue Date	Description	Prepared by	Checked by	Approved by
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1. Introduction

1.1. Project Background

1.1.1. The Applicant intends to develop a New Science Building in Lingnan University (hereafter as "the proposed development"), a new academic and research building centred within the campus' Wing On Plaza in the North, Leung Kau Kui Building in the East, the Main Building in the West (hereafter as "the Project Site").

1.1.2. According to the draft Tuen Mun Outline Zoning Plan (OZP No.: S/TM/40), the Project Site is currently zoned as "Government, Institution or Community" ("G/IC") Zone.

1.1.3. Allied Environmental Consultants Limited (AEC) is commissioned by the Applicant to conduct a Sewerage Impact Assessment (SIA) to meet the land lease's condition (60) of the captioned project. The proposed development is expected to be completed in 2028.

1.2. Objectives of the SIA

1.2.1. The objectives of this SIA are to assess whether the capacity of the existing sewerage networking to the Project Site is sufficient to cope with the sewage flow from proposed development.

1.3. Report Structure

1.3.1. The remaining chapters of this report are shown below:

Chapter 2 – Site Context
Chapter 3 – Sewerage Impact Assessment
Chapter 4 – Estimation of Sewage Flow from Proposed Development
Chapter 5 – Sewage Capacity
Chapter 6 – Result and Discussion
Chapter 7 – Conclusion

2. Site Context

2.1. Site Location and Its Environs

2.1.1. The proposed development is located at Castle Peak Road – Lingnan, within Lingnan University Campus. It is bounded by Wing On Plaza to the North, Leung Kau Kui Building to the East, the Main Building in the West, and an existing terrain in the South Side.

2.1.2. ***Figure 2.1*** shows the Site location and its environs.

2.2. Proposed Development Scheme

2.2.1. The proposed site area of the subject site is 2,302.28 m^2. The proposed development will be of 7-storey in height. The proposed development serves for general education purpose and specialized space such as computer laboratories, acoustic laboratories within Lingnan University Campus. It comprises of Canteen (LG/F), Wet and Dry Laboratories (3/F to 4/F), Teaching Venues, Function Rooms (LG/F and 5/F) and Offices (1/F to 2/F).

2.2.2. The development schedule of the proposed development is tabulated in ***Table 2-1***. The GBP of the proposed development are shown in Appendix A.

Table 2-1 Development Schedule

Floor	Use
LG/F	Canteen & Multi-purpose Room
G/F	Lecture Rooms
1/F-2/F	Office
3/F-4/F	Lab
5/F	Exhibition Area & Multi-purpose Room

2.3. Existing Sewerage Condition

2.3.1. Drainage information was obtained from the GeoInfo Map services of the Lands Department in July 2024 to gather background information on sewerage infrastructure in the vicinity of the Project Site. Concerned sewage network was identified for estimation of the potential sewage impact to the downstream sewers associated with the proposed development. A series of public sewers with diameters 450mm were found along Fu Tei Road, towards Castle Peak Road - Lingnan. Sewage generated from the Project Site will be conveyed through existing Lingnan University's internal sewage system (at E-33) indicated in ***Figure 3.1*** and discharged to public sewer manhole at FMH1015210 and conveyed Northwest toward Castle

Peak Road - Lingnan.

3. Sewerage Impact Assessment

3.1. Legislation, Standards and Guidelines

3.1.1. With reference to ProPECC PN 1/23 Drainage Plans Subject to Comment by the Environmental Protection Department ("EPD"), foul water should be discharged to a foul sewer under the Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations 40(1) and 41(1).

3.1.2. The following standards and guidelines are adopted for estimation, assessment and evaluation of sewerage implication of the proposed development:

- "Hong Kong Planning Standards and Guidelines" issued by the Planning Department;
- "Sewerage Manual Part 1" published by DSD; and
- "Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning Version 1.0 (Report No.: EPD/TP1/05)" ("GESF") published by Environmental Protection Department ("EPD").

3.2. Assessment Methodology and Assessment

3.2.1. As shown in the drainage plan of proposed development, the sewage generated from the proposed development will be discharged through the terminal manhole (FTMH) at the Project Site and conveyed towards Lingnan University's internal manhole, connected to the existing public sewer manhole (S1: FMH1015120) at Castle Peak Road-Lingnan. ***Figure 3.1*** illustrates an overview of corresponding catchment areas and existing sewerage network for this study. The catchments are divided into 4 upstream catchments and 1 downstream catchment to facilitate estimation of sewage discharge.

- **Downstream Catchment A**: Ho Sin Hang Building, Leung Kau Kui Building, B.Y. Lam Building, Dorothy Y.L. Wong Building, Lau Lee Yuen Hann Amenities Building, Lau Chung Him Building, Patrick Lee Wan Keung Academic Building, Main Building and Swimming Pool;
- **Upstream Catchment B**: Indoor Sports Complex;
- **Downstream Catchment D**: Parkland Villas Block 1-3 (East of Castle Peak Road – Lingnan, 300mm sewers along Castle Peak Road – Lingnan);
- **Downstream Catchment E**: Parkland Villas Block 4-6 and swimming pool (East of Castle

Peak Road – Lingnan, 300mm sewers along Castle Peak Road – Lingnan).

3.2.2. The sewage flow from proposed development, Sewage flow from downstream catchment A will be discharge along the internal manhole and sewer from E33 to last FMH-E and discharge to public manhole at FMH1015210. The Sewage flow of Catchment A and the Site then conveyed towards the public sewer series. Upstream catchment D will be discharged to manhole FMH1015204, while catchment B and E will be discharged to FMH1015206 located at Castle Peak Road – Lingnan and collected by the 450mm diameter sewer.

3.2.3. A hydraulic assessment, which will take into account of the sewage discharge from proposed development as well as the surrounding developments will be conducted.

3.2.4. According to the "Sewerage Manual – Key Planning issues and Gravity Collection System" published by DSD in 2013, the capacities of respective sewers have been calculated based on Colebrook-White equation for circular pipes:

$$V = -2\left(2gDS\right)^{0.5}\log\left(\frac{k}{3.7D}+\frac{2.5\nu}{D\left(2gDS\right)^{0.5}}\right)$$

Where,

V = mean velocity (m/s)

g = gravitational acceleration (m/s^2)

D = pipe diameter (m)

ks = hydraulic pipeline roughness (m) (0.006m is adopted for the "poor" condition of concrete slimed sewers as worst-case scenario)

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

s = frictional slope (energy gradient due to frictional loss)

3.2.5. The detailed calculations of sewage generation have been provided in ***Appendix C*** and ***Appendix D*** for reference.

4. Estimation of Sewage Flow from Proposed Development

4.1. Methodology for Estimation of Average Dry Weather Flow

4.1.1. The global unit flow factors as recommended in the *Guideline for Estimating Sewage Flows for Sewage Infrastructure Planning* (hereafter as "GESF") published by EPD in 2005 has been adopted in the assessment to estimate sewage flow. Relative unit flow factors applied for the sewage generation estimation are tabulated in ***Table 4-1*** below.

Table 4-1 Unit Flow Factors Adopted for the Assessment

Type of People	**Unit Flow Factor [2]**	**Category [1]**
Within Proposed Development		
Staff of Community, Social & Personal Services	0.28 m^3/person/day	Commercial Employee + Commercial activities (J11 Community, Social & Personal Services)
Student	0.04 m^3/person/day	School Student
Food Store	1.58 m^3/person/day	Commercial Employee + Commercial activities (J10 Restaurants & Hotels)
Surrounding Catchments		
Residents of the Residential Development R1	0.19 m^3/person/day	Domestic (housing type specific) – R1
Staff of Community, Social & Personal Services	0.28 m^3/person/day	Commercial Employee + Commercial activities (J11 Community, Social & Personal Services)
School Students	0.04 m^3/person/day	School Students
Food Store	1.58 m^3/person/day	Commercial Employee + Commercial activities (J10 Restaurants & Hotels)

Notes:
[1] Environmental Protection Department, HKSARG [EPD] (2005). Guidelines for estimating sewage flows for sewage infrastructure planning (EPD/TP 1/05). Hong Kong
[2] UFF for various occupancy types are adopted according to Table T-1 and Table T-2 of the GESF.

4.2. Estimation of Sewage Flow from Proposed Development

4.2.1. The sewage generated from the proposed development will be collected at FTMH and conveyed to Lingnan University's internal sewerage system, and discharged into the existing

450mm diameter public sewers via Manhole S1 (No.: FMH1015210) as shown in ***Figure 3.1***.

4.2.2. The proposed project comprises of a 7-storey building with an estimated GFA of 11,000m^2. The estimated sewerage flow for proposed development is given in ***Table 4-2*** and ***Appendix C***.

4.2.3. With reference to ***Table 4-2***, the total estimated Average Dry Weather Flow ("ADWF") from the proposed development is 100.3 m^3/day, and peak flow is 0.0102 m^3/s. The population estimated ADWF of proposed development is summarized in Table 1 of ***Appendix C***.

Table 4-2 Sewage Flow Estimation for the Proposed Development and Existing

Proposed Development		
Generation from Operation		**Remark**
Generation from Laboratory		
Total Number of Person	210 persons	Based on submitted GBP
Total Number of Staff	30 persons	Based on ratio of staff to student:https://www.ln.edu.hk/about-lu/facts-and-figures/university-statistics-booklet
Unit Flow Factor [2]	0.28 m^3/person/day	Commercial Employee + Community, Social and Personal Services - J11 in Table T-2 of GESF.
Total Number of Student	180 persons	Based on ratio of staff to student:https://www.ln.edu.hk/about-lu/facts-and-figures/university-statistics-booklet
Unit Flow Factor [2]	0.04 m^3/person/day	School Student in Table T-2 of GESF
Average Sewage Discharge	15.6 m^3/day	
Generation from Multi-Function Room		
Total Number of Person	71 persons	Based on submitted GBP
Total Number of Staff	11 persons	Based on ratio of staff to student:https://www.ln.edu.hk/about-lu/facts-and-figures/university-statistics-booklet
Unit Flow Factor [2]	0.28 m^3/person/day	Commercial Employee + Community, Social and Personal Services - J11 in Table T-2 of GESF.
Total Number of Student	61 persons	Based on ratio of staff to student:https://www.ln.edu.hk/about-lu/facts-and-figures/university-statistics-booklet
Unit Flow Factor [2]	0.04 m^3/person/day	School Student in Table T-2 of GESF
Average Sewage Discharge	5.52 m^3/day	

Generation from Lecture Room		
Total Number of Person	287 persons	Based on submitted GBP
Total Number of Staff	41 persons	Based on ratio of staff to student:https://www.ln.edu.hk/about-lu/facts-and-figures/university-statistics-booklet
Unit Flow Factor [2]	0.28 m^3/person/day	Commercial Employee + Community, Social and Personal Services - J11 in Table T-2 of GESF.
Total Number of Student	246 persons	Based on ratio of staff to student:https://www.ln.edu.hk/about-lu/facts-and-figures/university-statistics-booklet
Unit Flow Factor [2]	0.04 m^3/person/day	School Student in Table T-2 of GESF
Average Sewage Discharge	21.32 m^3/day	
Generation from Food Store & Kitchen		
Total Floor Area	162 m^2	
Worker Density per GFA (in 100 m2)	5.1 person/100m^2	
Total capacity	9 persons	Referred to submitted GBP.
Unit Flow	1.58 m^3/person/day	Commercial Employee + Restaurants & Hotels - J10 in Table T-2 of GESF.
Average Sewage Discharge	14.22 m^3/day	
Generation from Office		
Total capacity	156 persons	Referred to submitted GBP.
Unit Flow	0.28 m^3/person/day	Commercial Employee + Community, Social and Personal Services - J11 in Table T-2 of GESF.
Average Sewage Discharge	43.68 m^3/day	
Total ADWF of the Proposed Development	**100.34 m^3/day**	
Catchment Inflow Factor (Tuen Mun)	**1.1**	
Revised ADWF of the Proposed Development	**110.37 m^3/day**	
Peaking Factor	**8**	
Peak Flow	**0.0102 m^3/s**	

4.2.4. The laboratories are for educational purposes only and the chemical tests will be conducted in small scale, occasionally and in short duration. No extra discharge of wastewater will be

generated during operation.

4.3. Estimation of Sewage Flow from Catchment Areas

4.3.1. Different catchment areas are defined as shown in ***Figure 3.1*** to consider existing sewage generation. There are 3 upstream catchments and 1 downstream catchment. Sewage generated from upstream Catchments D will be discharged to manhole FMH1015204 located at the Castle Peak Road-Lingnan. Sewage discharge from Catchment B and E will be collected by manhole FMH1015206. Catchment A consisted of Ho Sin Hang Building, Leung Kau Kui Building, B.Y. Lam Building, Dorothy Y.L. Wong Building, Lau Lee Yuen Hann Amenities Building, Lau Chung Him Building, Patrick Lee Wan Keung Academic Building, Main Building and Swimming Pool within Lingnan Campus located at the downstream of Site FMH, manhole FMH1015210 collects the discharge from Catchment A and the proposed development. The sewage is then conveyed into the series of existing 450mm public sewerage pipes along the Castle Peak Road-Lingnan.

4.3.2. The number of employees is estimated with reference to the submitted GBP. Where such information is unavailable from the mentioned reference, "Commercial and Industrial Floor Space Utilization Survey" issued by the Planning Department is used for the estimation of staff. Different worker densities per 100m^2 of Gross Floor Area (GFA) have been adopted in the assessment to estimate the number of employees within the study area. Relative worker density applied for the sewage generation estimation are tabulated in ***Table 4-3*** below.

Table 4-3 Worker Density Adopted for the Assessment

Economic Activities	**Worker Density (worker per GFA, in 100m^2)**
Community, Social & Personal Services (All Types)	3.3 worker/100m^2
Restaurants (All Types)	5.1 worker/100m^2

4.3.3. Based on information collected from desktop study, sewage flow from different catchments at the study area under proposed developments are calculated as given in ***Appendix D***.

4.4. Estimation of Peak Discharge

4.4.1. Catchment inflow factor ("P_{CIF}") caters for the net overall ingress of wastewater to the sewerage system. They are catchment-dependent and applicable to major sewerage facilities of a catchment.

4.4.2. In accordance with Table T-4 of the GESF, P_{CIF} of 1.10 is adopted for existing sewerage as

concerned sewerage system is identified in "Tuen Mun".

4.4.3. Revised average dry weather flow ("revised ADWF") is determined by production of average dry weather flow and catchment inflow factor. Contributing population is then calculated by dividing the revised ADWF by 0.27. The calculated contributing population is finally used for selection of peaking factors.

4.4.4. Based on ***Table 4-4*** which is also presented in Table T-5 in GESF, the peaking factors for each sewer are chosen in the hydraulic calculation for peak flow estimation.

Table 4-4 Peaking Factors

Population Range for Sewers [1] [2]	**Peaking Factor (including storm water allowance) for facility with existing upstream sewerage**	**Peaking Factor (excluding storm water allowance) for facility with new upstream sewerage**
< 1000	8	6
1000 - 5000	6	5
5000 - 10000	5	4
10000 - 50000	4	3
> 50000	Max (7.3 / $N^{0.15}$, 2.4)	Max (6 / $N^{0.175}$, 1.6)

4.5. Peak Discharge from Study Areas

4.5.1. Flow rates of peak discharge from the proposed development and other catchment areas are estimated in accordance with the DSD's "Sewerage Manual Part 1". Peak flows from different catchments at the study area are summarized in ***Table 4-5*** and detailed calculation for proposed developments are given in ***Appendix C*** and ***Appendix D***.

Table 4-5 Population and Sewage Flow Estimation

Proposed Development					
Contributing Catchment Area	**Connected Manhole**	**Revised ADWF (m^3/day)**	**Contributing Population**	**Peaking factor**	**Total Peak Discharge (m^3/s)**
Proposed Development	E-33	110.4	409	8.0	0.010
Proposed Development + Catchment A	E-32	829.0	3070	6.0	0.058
Proposed Development + Catchment A	E-28	829.0	3070	6.0	0.058

Proposed Development + Catchment A	E-16	829.0	3070	6.0	0.058
Proposed Development + Catchment A	E-12	829.0	3070	6.0	0.058
Proposed Development + Catchment A	E-8	829.0	3070	6.0	0.058
Proposed Development + Catchment A1-8	E-1A	829.0	3070	6.0	0.082
Proposed Development + Catchment A1-8	E-1	829.0	3070	6.0	0.082
Proposed Development + Catchment A to E	FMH1015211	1475.8	5466	5.0	0.182
Proposed Development + Catchment A to E	FMH1015265	1475.8	5466	5.0	0.182

Notes:
[1] Revised ADWF (m^3/day) = ADWF (m^3/day) × Catchment Inflow Factor
[2] According to Section 12.1 of GESF,
Contributing Population = Calculated Total Average Flow (m^3/day) ÷ 0.27 (m^3/person/day)
[3] According to Table T-5 of GESF
[4] Total Peak Discharge (m^3/s) = (Revised ADWF (m^3/day) × Peaking Factor ÷ 86400s/day)

5. Sewerage Capacity

5.1.1. According to the "Sewerage Manual – Key Planning Issues and Gravity Collection System" (Sewerage Manual) published by DSD in 2013, the capacities of respective sewers have been calculated based on the Colebrook White's equation. The roughness coefficients (ks) of 3.0mm for clayware slimed sewer in poor condition are adopted in the assessment in accordance with Table 5 of DSD's "Sewerage Manual Part 1".

5.1.2. The sewerage impact on various segments of the sewer were evaluated by comparing the estimated peak flow against the capacity of the respective sewer segments. The detailed calculations are provided in ***Appendix E2***.

6. Results and Discussion

6.1. Daily Flow and Peak Flow from Proposed Development

6.1.1. The estimated daily flow and peak flow of the proposed development will be 100.3 m^3/day and 0.008 m^3/s. ***Table 6-1*** tabulates the sewage generated from proposed development.

Table 6-1 Sewage Generated from Existing and Proposed Development

Developments	Daily Flow (m^3/day)	Peak Flow (m^3/s)
Proposed Development	100.3	0.0102

6.2. Sewage Generation before development

6.2.1. The percentages of used capacity for sewers with existing condition before Proposed Development range from 6.0% to 89.2%. The detailed calculation of flow estimation and capacity are presented in ***Appendix D*** and ***Appendix E1*** . The summary of used capacity of existing condition is presented in ***Table 6-2*** below.

Table 6-2 Used Capacity of Existing Development

Pipe Segments	Maximum Capacity of Sewer (m^3/s)	Total Discharge through Manhole (m^3/s)	Used Capacity (%) After Development
E33 – E32	0.098	0.048	48.7%
E32 – E28	0.097	0.048	49.3%
E18 – E16	0.244	0.048	19.6%
E13 – E12	0.079	0.048	60.7%
E9 – E8	0.213	0.048	22.5%
E2 – E1A	0.087	0.073	83.5%
E1A – E1	0.187	0.073	38.8%
FMH1015210 – FMH1015211	0.236	0.189	80.0%
FMH1015211- FMH1015265	0.212	0.189	89.2%

6.3. Sewage Generation after development

6.3.1. After the development, the percentages of used capacity for the existing sewers range from 9.7% to 94.7%. Flow estimation and capacity checking are detailed in ***Appendix D*** and ***Appendix E2***, respectively. Used capacity of proposed development is presented in ***Table 6-3***

below.

Table 6-3 Used Capacity from Proposed Development

Pipe Segments	Maximum Capacity of Sewer (m^3/s)	Total Discharge through Manhole (m^3/s)	Used Capacity (%) After Development
Site – E33	0.105	0.010	9.7%
E33 – E32	0.098	0.058	58.6%
E32 – E28	0.097	0.058	59.3%
E18 – E16	0.244	0.058	23.6%
E13 – E12	0.079	0.058	73.0%
E9 – E8	0.213	0.058	27.1%
E2 – E1A	0.087	0.082	94.7%
E1A – E1	0.187	0.082	44.0%
FMH1015210 – FMH1015211	0.236	0.182	76.9%
FMH1015211- FMH1015265	0.212	0.182	85.7%

6.3.2. Based on the results shown in the above ***Table 6-2*** and ***Appendix E2***, no sewer pipe exceeded its used capacity.

6.4. Liability

6.4.1. The project proponent will be responsible for the construction works for the pipe convey sewerage from terminal manhole to existing public sewer. All drainage facilities shall be designed and constructed to conform to the requirements laid down in below while future maintenance of the sewers outside the Project Site boundary will be carried out by the DSD.

a. The Drainage Manual, DSD

b. The General Specification for Civil Engineering Works, Hong Kong Government

c. The DSD Standard Drawings

6.4.2. During operational phase, regular inspection of the sewers within the Project Site should be conducted by the property management office to ensure proper performance. Regular maintenance should also be carried out in accordance with standard practices stated in the

DSD's "Sewerage Manual Part 1".

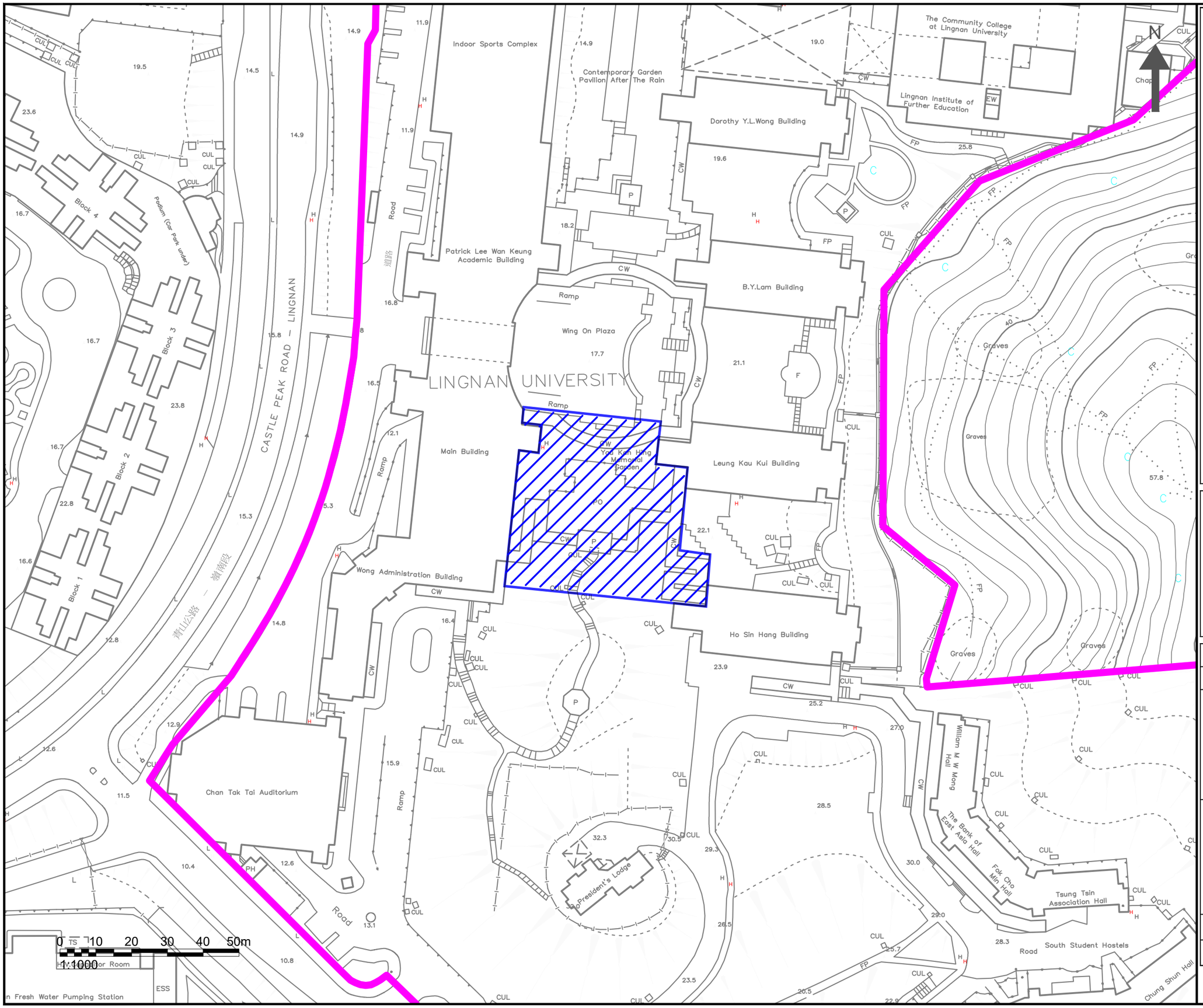
7. Conclusion

7.1.1. A Sewerage Impact Assessment (SIA) has been conducted to evaluate the possible impacts on the public sewerage network due to the proposed development. The sewage generated from the proposed development will be collected by the proposed Manhole (FTMH) and conveyed towards Lingnan University's internal sewerage system, then discharged to public manhole (FMH1015210). The result showed that 100.3 m^3/day of average sewage discharge and 0.0102 m^3/s of peak sewage discharge are expected to be generated from the proposed development.

7.1.2. The assessment results demonstrated that all sewers have sufficient capacity to cater with the sewage flow from catchments and the proposed development. Therefore, significant sewerage impact arising from the proposed development on the existing sewers is not expected, no mitigation measures are considered necessary for the existing sewers.

7.1.3. Based on the above, it is concluded that the sewerage impact arising from the proposed development should be acceptable.

Figures



NOTES :

PROJECT SITE

LOT BOUNDARY

Consultant

Allied Environmental Consultants Limited

Project No. :	2244EA
Drawing By :	LL

Project :

PROPOSED NEW SCIENCE BUILDING OF LINGNAN UNIVERSITY

Drawing Title :

PROJECT SITE LOCATION

Drawing No :	Revision :
FIGURE 2.1	0
Scale : AS SHOWN	Date : JUN 2024

A3 420 x 297

C:\USERS\NGANCHUNSANG\SYNOLOGYDRIVE\2244EA LINGNAN P&T\05 REPORT\01 AEC REPORT\SIA\ISSUE 2\FIGURE\FIG2.1_PROJECT SITE LOCATION_ISSUE 2 (LOT BOUNDARY).DWG

NOTES :

PROJECT SITE

EXISTING SEWER AND MANHOLE

INTERNAL MANHOLE AND SEWERS OF LINGNAN UNIVERSITY

PROPOSED MANHOLE AND SEWER

CATCHMENT A

CATCHMENT B

CATCHMENT D

CATCHMENT E

LOT BOUNDARY

N

0 15 30 30 60 75m

1:1500

Consultant

AEC

Allied Environmental Consultants Limited

Project No. : 2244EA

Drawing By : LL

Project :

PROPOSED NEW SCIENCE BUILDING OF LINGNAN UNIVERSITY

Drawing Title :

OVERVIEW OF EXISTING SEWAGE NETWORK AND CATCHMENT

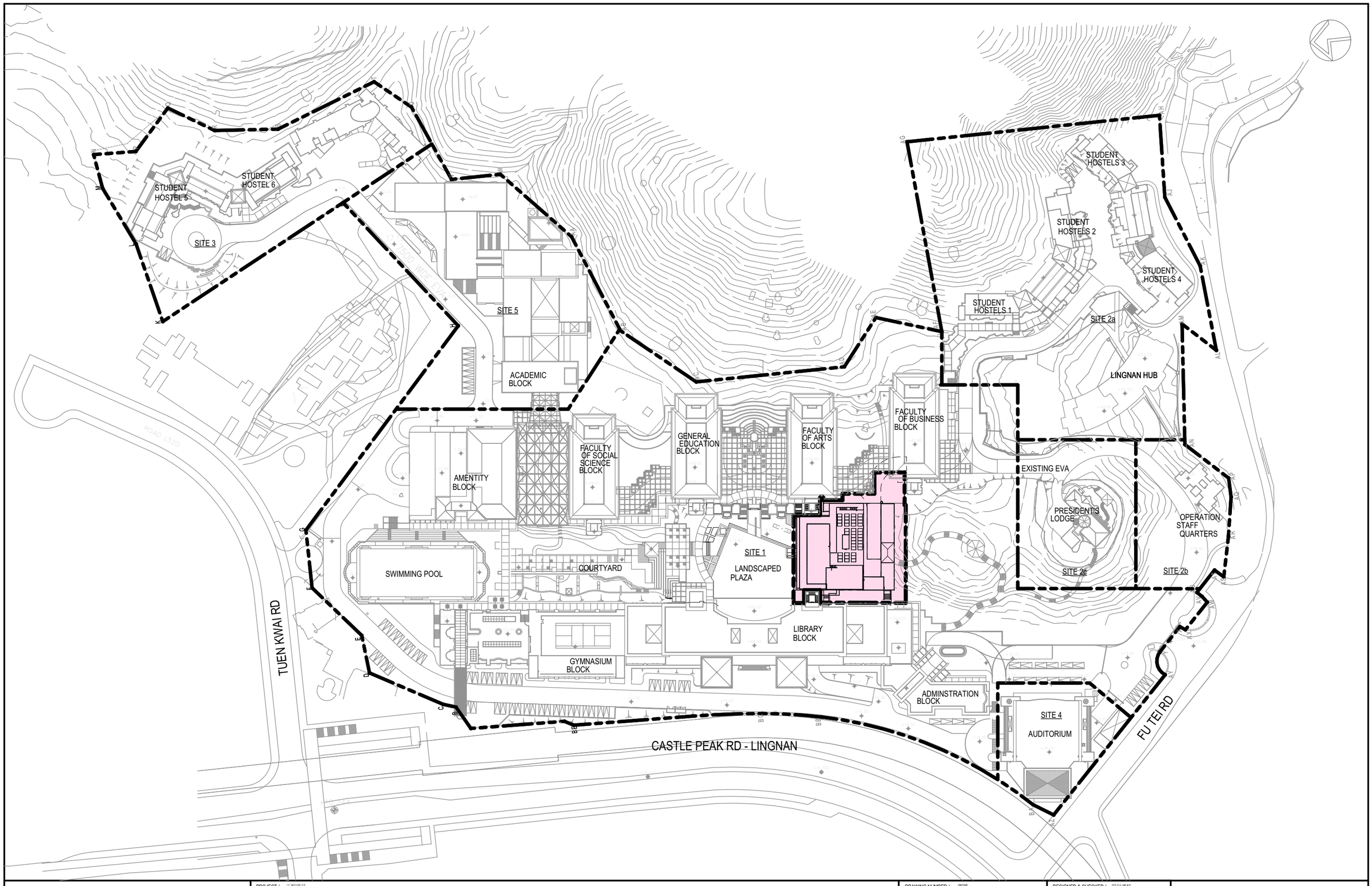
Drawing No :	Revision :
FIGURE 3.1	0
Scale :	Date :
AS SHOWN	JUN 2024

A3 420 x 297

C:\USERS\NGANCHUNSANG\SYNOLOGYDRIVE\2244EA LINGNAN P&T\05 REPORT\01 AEC REPORT\SIA\ISSUE 2\FIGURE\FIG3.1_NEARBY SEWAGE_STREAM A_NEW BOUNDARY_20241115.DWG

Appendix A

General Building Plans of the Proposed Development



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PROJECT / 工程項目
LINGNAN UNIVERSITY - NEW SCIENCE BUILDING

DRAWING / 圖名
MASTER LAYOUT PLAN

DRAWING NUMBER / 圖號
SK-100

REV.
-

DESIGNED & CHECKED / 設計審核
P&T

SCALE / 比例
@A3

DATE / 日期
SEP 2024

- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
除特別註明外，所有尺寸均以毫米為單位
- DO NOT SCALE DRAWING
圖中以所有標注尺寸為準，不應量度
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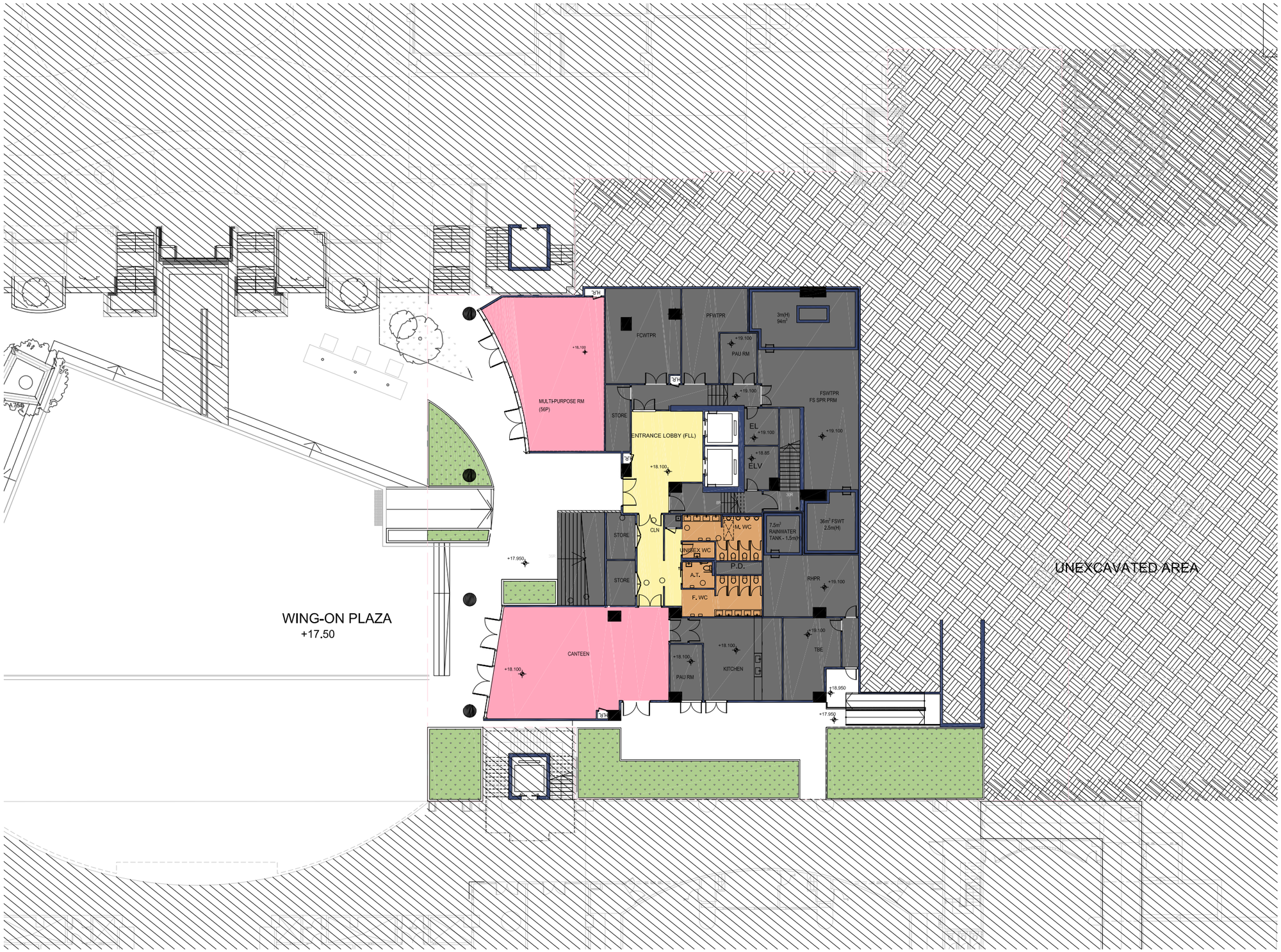

LEGEND

- MULTI-PURPOSE
- CIRCULATION
- PLANT ROOM/ BOH
- WC

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PROJECT / 工程項目
LINGNAN UNIVERSITY - NEW SCIENCE BUILDING

DRAWING / 圖名
LOWER GROUND FLOOR PLAN

DRAWING NUMBER / 圖號
SK-101

REV.
-

DESIGNED & CHECKED / 設計審核
P&T

SCALE / 比例
1:300@A3

DATE / 日期
SEP 2024

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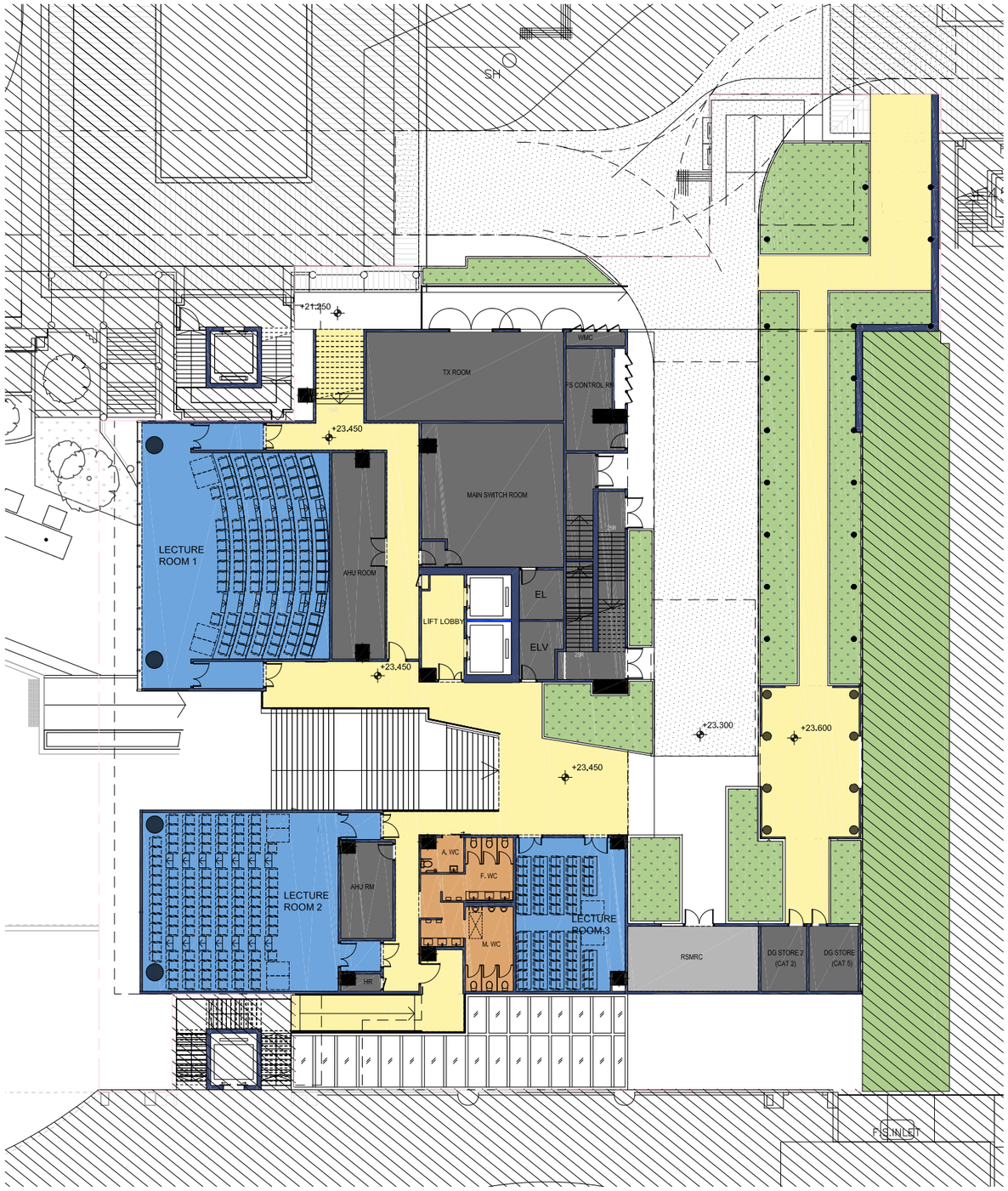
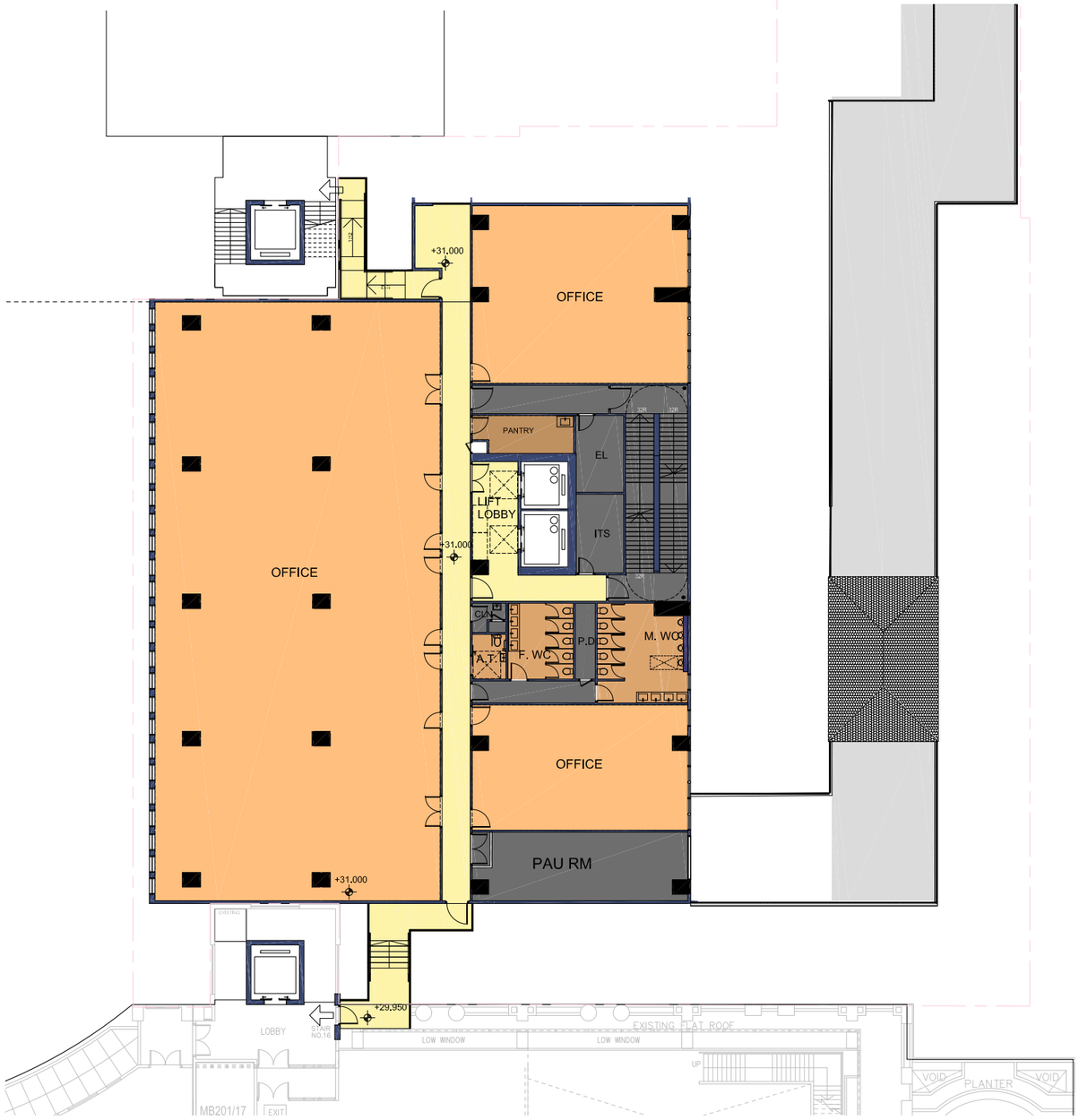
  除特別注明外,所有尺寸是以毫米計
- DO NOT SCALE DRAWING
  圖中以所有標注尺寸為準,不應量度
- ALL MEASUREMENTS SHOULD BE VERIFIED ON SITE
  處時尺寸須在現場核對準確

LEGEND

- LECTURE ROOMS
- CIRCULATION
- PLANT ROOM/ BOH
- OFFICES/ PANTRY
- WC
- PLANTERS/ LAWN



1 GROUND FLOOR LAYOUT PLAN



2 1/F LAYOUT PLAN

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PROJECT / 工程項目
LINGNAN UNIVERSITY - NEW SCIENCE BUILDING
DRAWING / 圖名
GROUND & 1/F FLOOR PLAN

DRAWING NUMBER / 圖號
SK-102
REV.
-

DESIGNED & CHECKED / 設計審核
P&T
SCALE / 比例
1:300@A3
DATE / 日期
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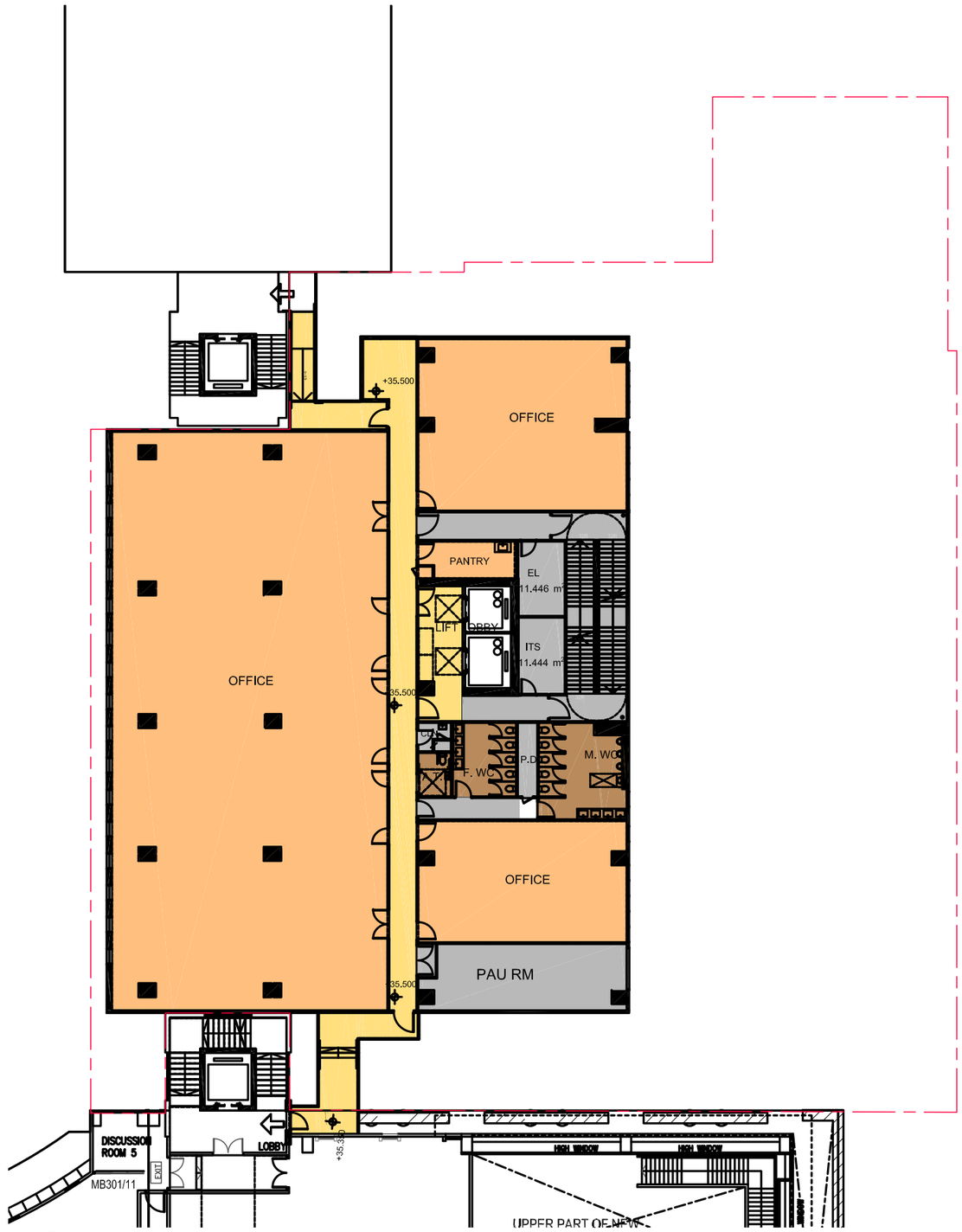
最終尺寸須在現場核對準確

LEGEND

- LECTURE ROOMS
- CIRCULATION
- PLANT ROOM/ BOH
- OFFICES/ PANTRY
- WC
- PLANTERS/ LAWN
- LABORATORIES
- COMPUTER SERVICES



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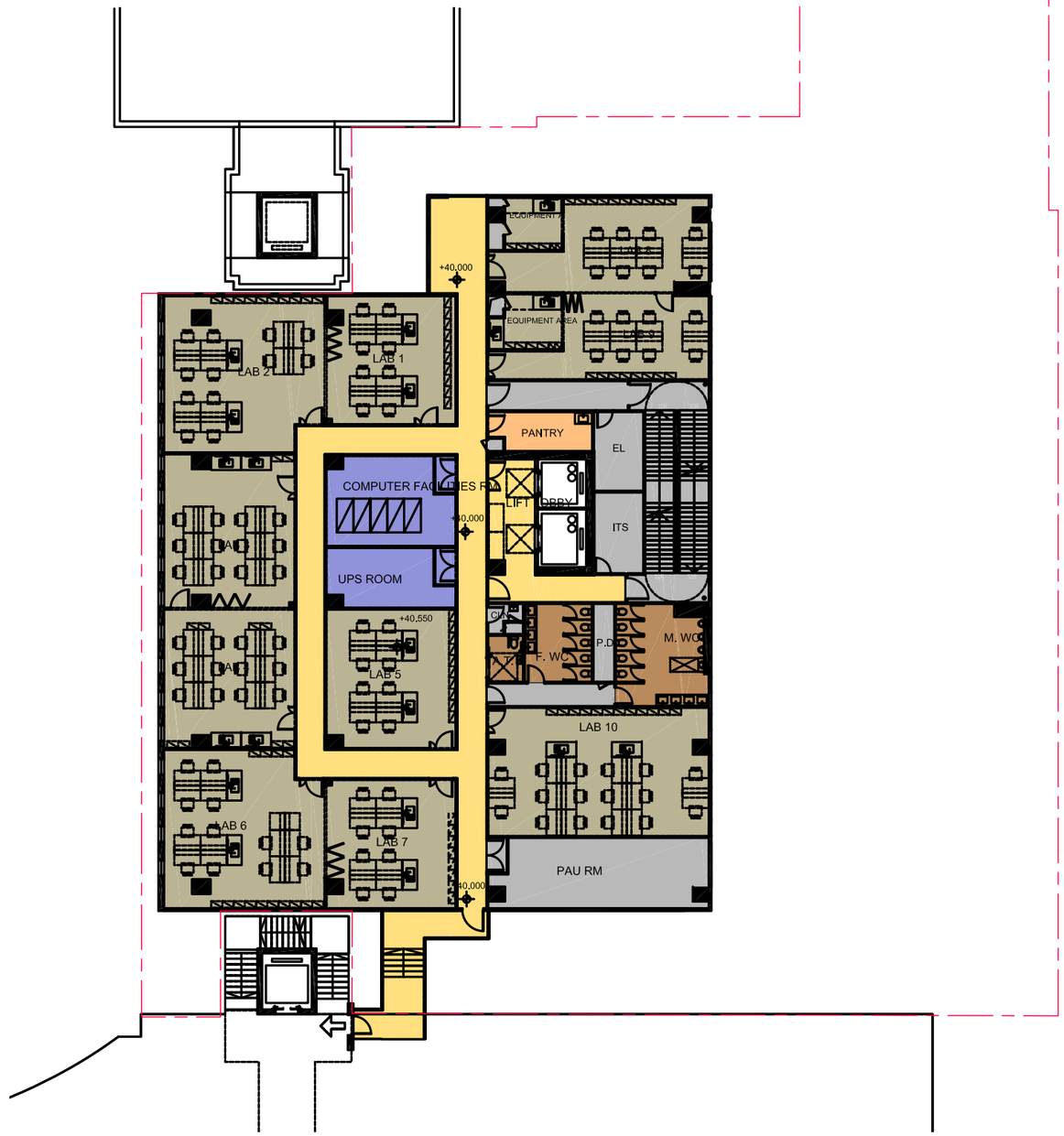

2 3/F LAYOUT PLAN

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PROJECT / 工程項目
LINGNAN UNIVERSITY - NEW SCIENCE BUILDING
DRAWING / 圖名
2/F & 3/F FLOOR PLAN

DRAWING NUMBER / 圖號
SK-103
REV.
-

DESIGNED & CHECKED / 設計審核
P&T
SCALE / 比例
1:300@A3
DATE / 日期
SEP 2024

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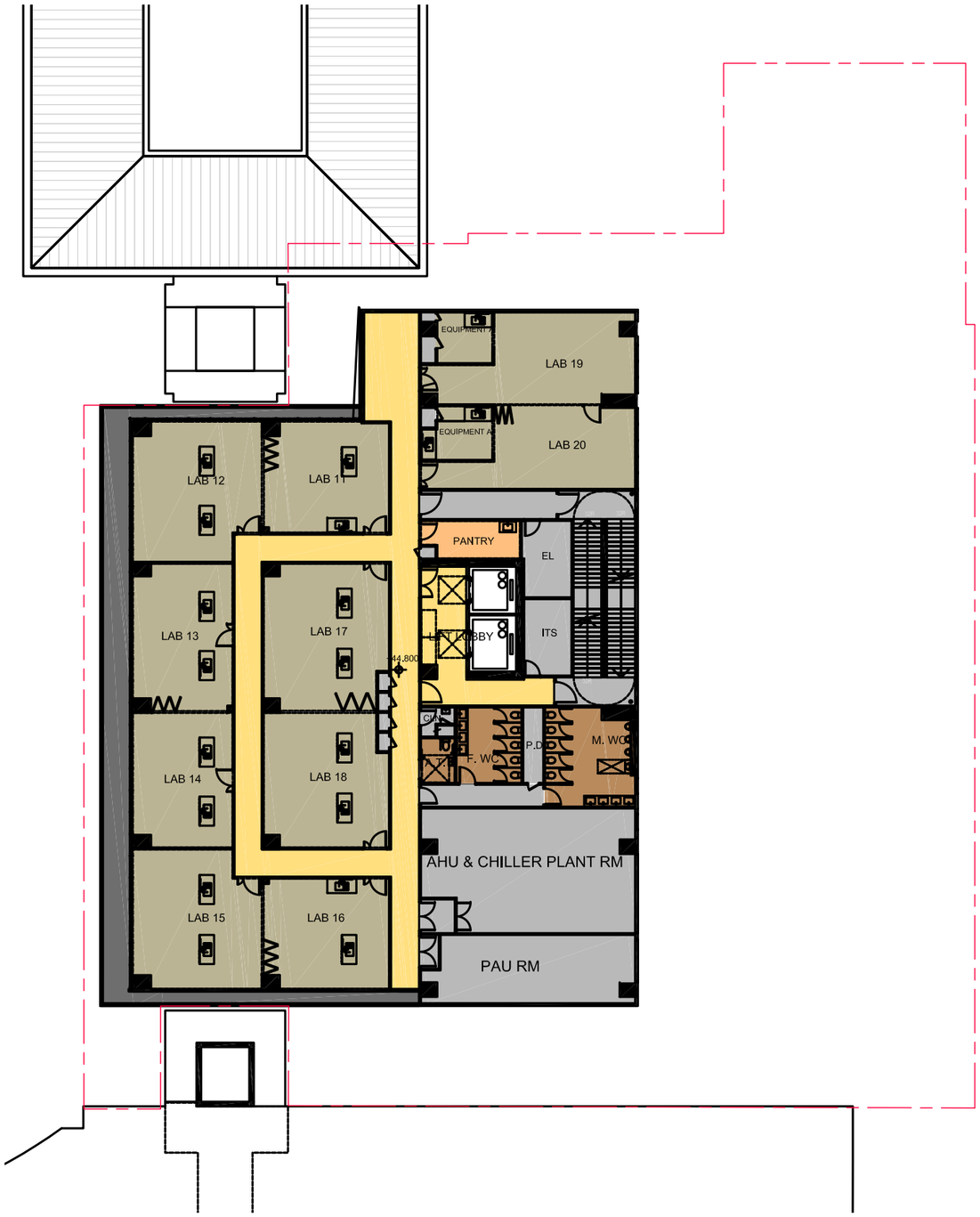
- ALL MEASUREMENTS SHOULD BE VERIFIED ON SITE
  承辦人士須在現場核對準確

LEGEND

- LECTURE ROOMS
- CIRCULATION
- PLANT ROOM/ BOH
- EXHIBITION/ FUNCTION RMS
- WC
- LABORATORIES



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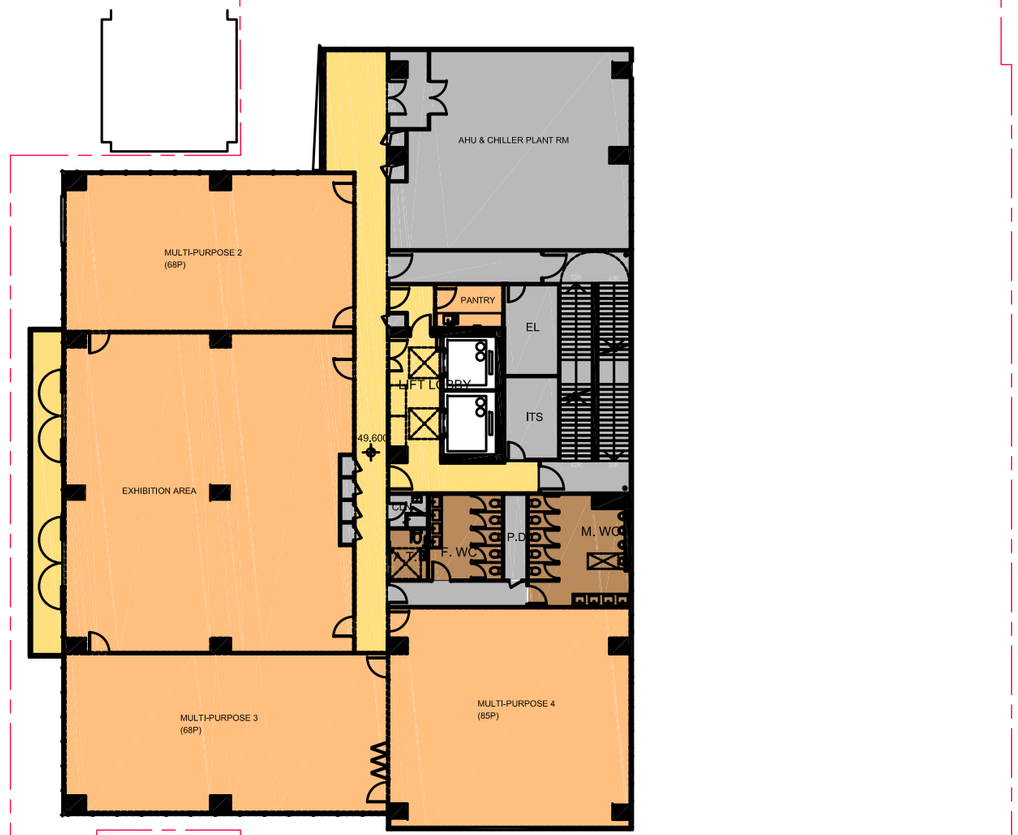

2 5/F LAYOUT PLAN

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PROJECT / 工程項目
LINGNAN UNIVERSITY - NEW SCIENCE BUILDING
DRAWING / 圖名
4/F & 5/F FLOOR PLAN

DRAWING NUMBER / 圖號
SK-104
REV.
-

DESIGNED & CHECKED / 設計審核
P&T
SCALE / 比例
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DATE / 日期
SEP 2024

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  最終尺寸須在現場核對準確

LEGEND

CIRCULATION

PLANT ROOM/ BOH

ROOF FLOOR AREA

500x500x150mm R.C. PLINTH FOR FLOOR MOUNTED MOBILE TYPE DAVIT ARM

COOLING TOWERS

130.610 m²

+56.650

+56.300

PV EQ.

ELR

MAKE-UP TANK & BLEED

M (OPEN AREA)

LIFT LOBBY

ELV

+57.850

+58.000

+56.300

GENSET ROOM

(FSI)

CHILLER WATER TANK &

+58.000

GENSET ROOM

(NON-FSI)

COVERED AREA

332.545 m²

COVERED AREA
= 332.545/ 1001.81 x 100%
= 33.19%

+63.45

+61.950

1 R/F LAYOUT PLAN

2 UR/F LAYOUT PLAN

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PROJECT / 工程項目

LINGNAN UNIVERSITY - NEW SCIENCE BUILDING

DRAWING / 圖名

R/F FLOOR PLAN

DRAWING NUMBER / 圖號

SK-105

REV.

- | A

DESIGNED & CHECKED / 設計審核

P&T

SCALE / 比例

1:300@A3

DATE / 日期

SEP 2024

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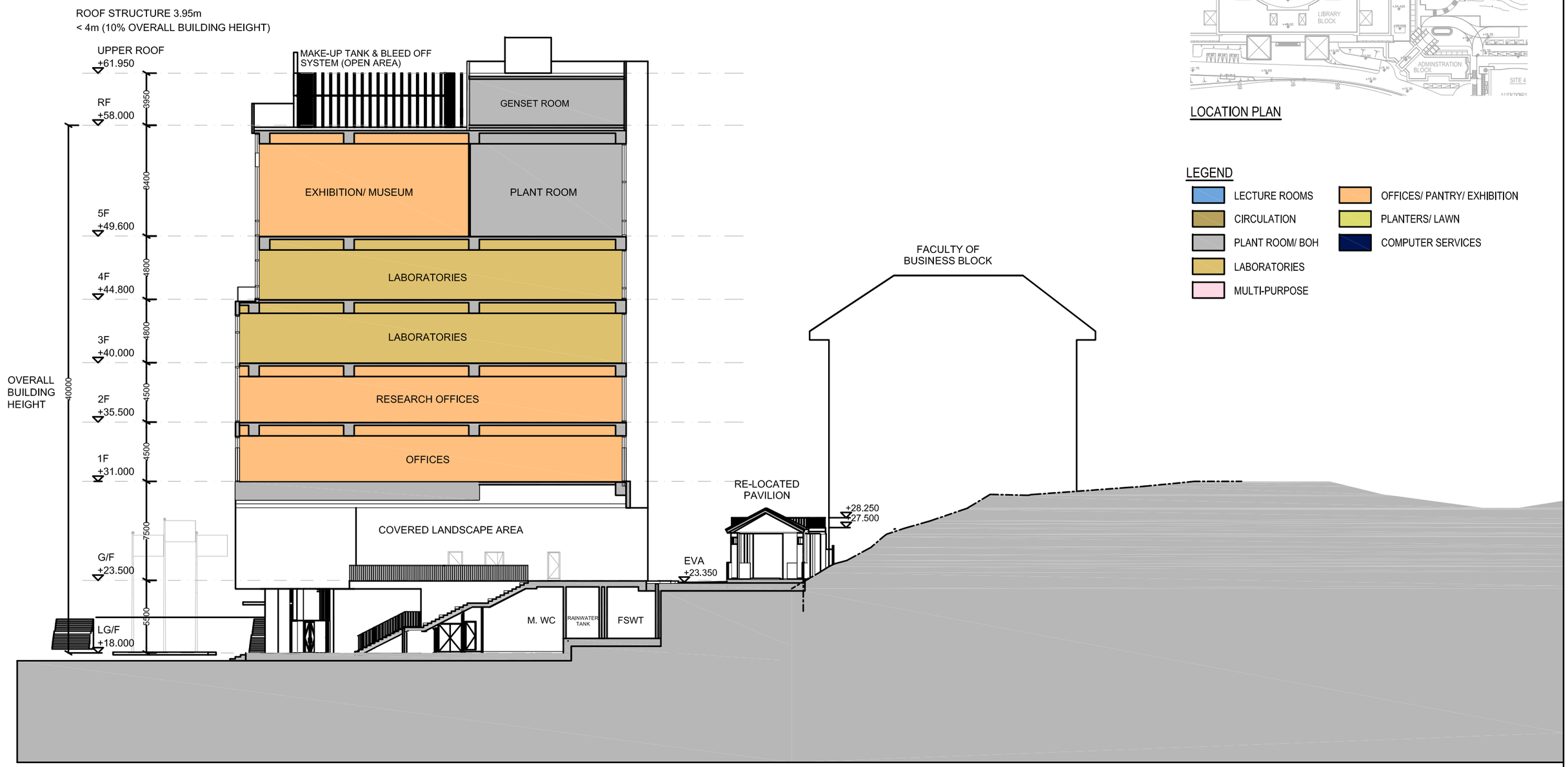
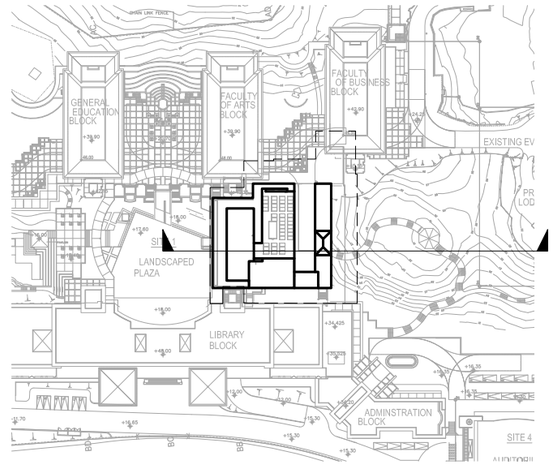
最終尺寸需在現場核對準確





LOCATION PLAN

LEGEND

- LECTURE ROOMS
- CIRCULATION
- PLANT ROOM/ BOH
- LABORATORIES
- MULTI-PURPOSE
- OFFICES/ PANTRY/ EXHIBITION
- PLANTERS/ LAWN
- COMPUTER SERVICES

SECTION A-A 1:200

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PROJECT / 工程項目

LINGNAN UNIVERSITY - NEW SCIENCE BUILDING

DRAWING / 圖名

SECTION A-A

DRAWING NUMBER / 圖號

SK-106

REV.

-

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1:300@A3

DATE / 日期

SEP 2024

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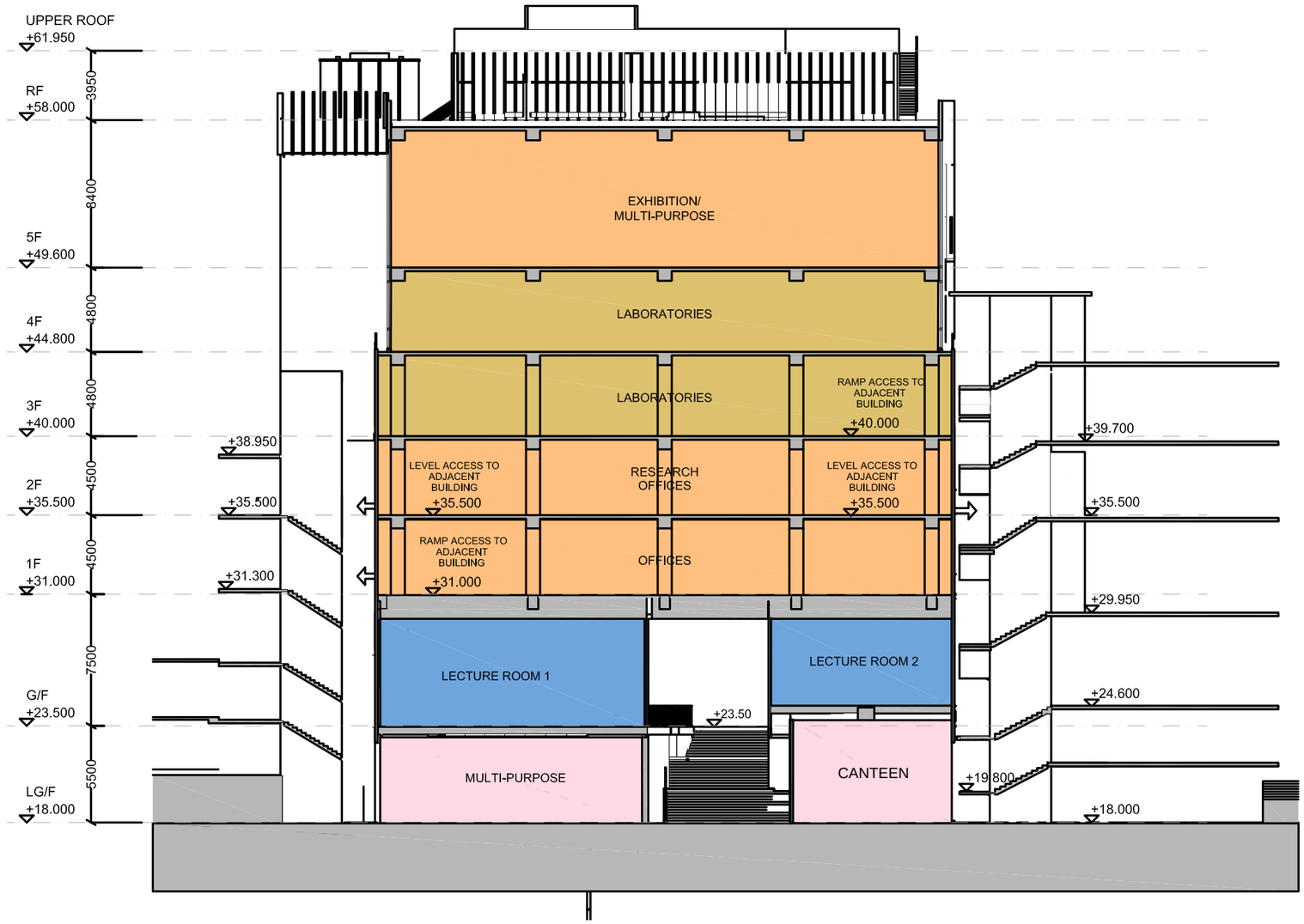
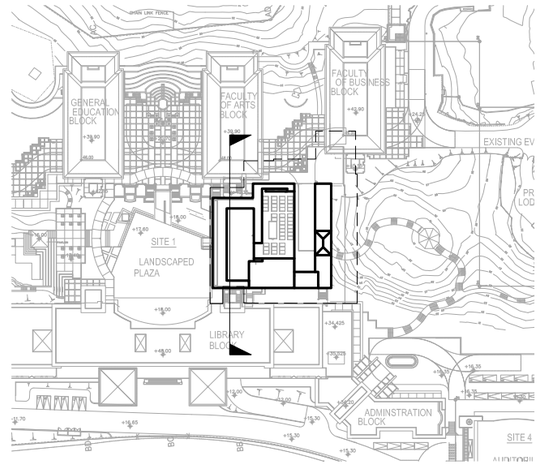


1 SECTION B-B



LOCATION PLAN

LEGEND

- LECTURE ROOMS
- CIRCULATION
- PLANT ROOM/ BOH
- LABORATORIES
- MULTI-PURPOSE
- OFFICES/ PANTRY/ EXHIBITION
- PLANTERS/ LAWN
- COMPUTER SERVICES

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PROJECT / 工程項目
LINGNAN UNIVERSITY - NEW SCIENCE BUILDING

DRAWING / 圖名
SECTION B-B

DRAWING NUMBER / 圖號
SK-107

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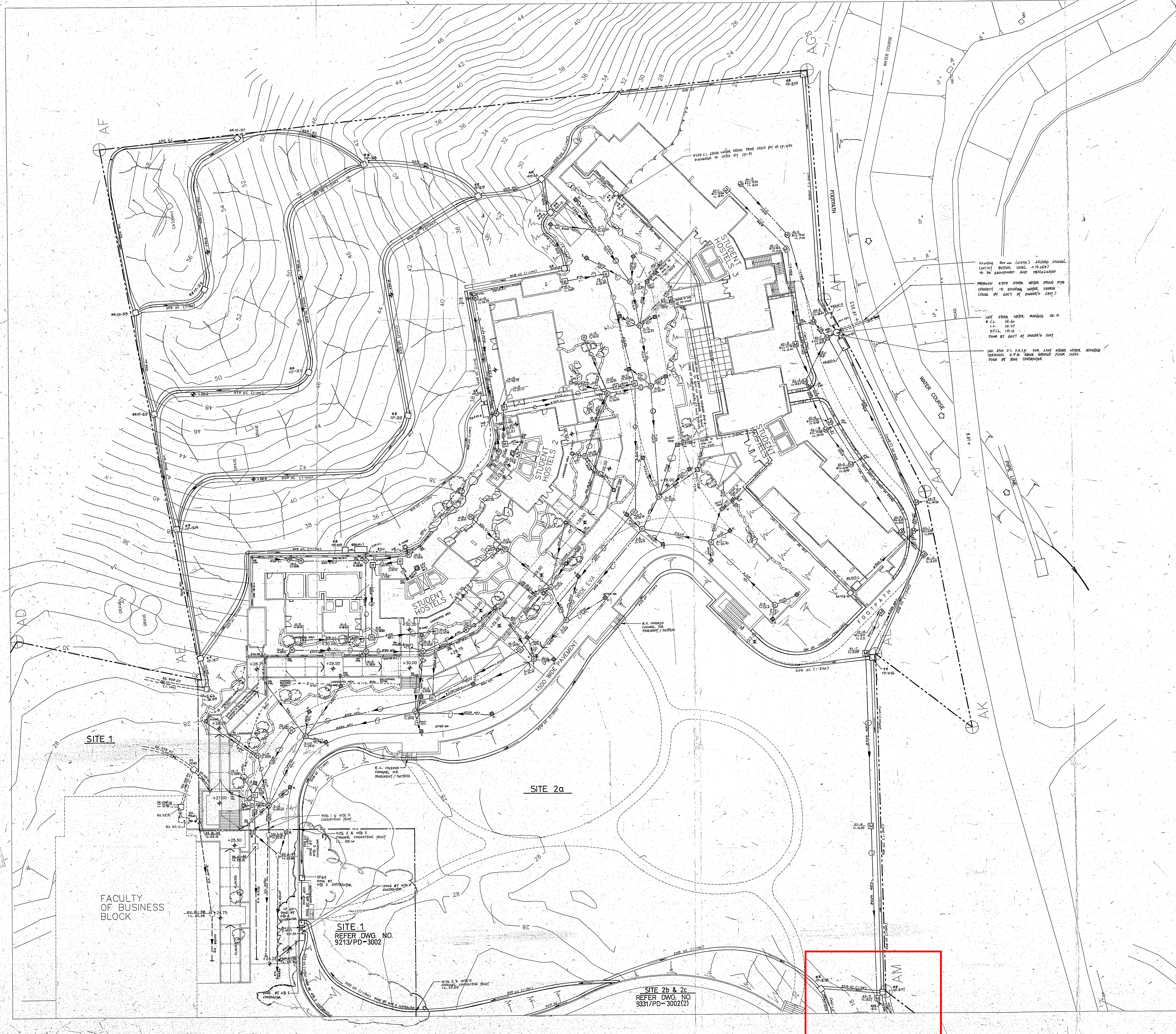
最終尺寸須在現場核對準確

Appendix B

Lingnan University Drainage Record Plan

NOTE:
* EXACT MANHOLE COVER LEVEL TO BE CHECKED ON SITE UNLESS OTHERWISE AS SHOW
** CATCH PIT / SAND TRAP INVERT LEVEL DEPEND ON CHANNEL GRADIENT, EXACT LEVEL TO BE CHECKED ON SITE



NO.	DATE	AMENDMENT
C	OCT 96	NOTE ADD FOR COVERED WALKWAY R.W.O.
B	SEPT 96	RAIN WATER DOWN PIPE ADDED FOR SKY LIGHT COVERED
A	JAN 96	REVISED SURFACE WATER DRAINAGE SYSTEM FOR PHASE CONNECTION
	JUL 95	FORMER DWG. NO. 9331/PD-3002

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MACAU: P&T GABINETE DE ARQUITECTURA E PLANEAMENTO LDA/ P&T GABINETE DE ESTUDOS TECNICOS LDA, 2003-6 CENTRO COMERCIAL DA PRAIA GRANDE — TEL: 550341 FAX: 853-314214
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TITLE
LINGNAN COLLEGE
NEW CAMPUS DEVELOPMENT
AT T.M.T.L. 376
TUEN MUN — **SITE 2**

DRAWING
SITE PLAN I
(DRAINAGE)

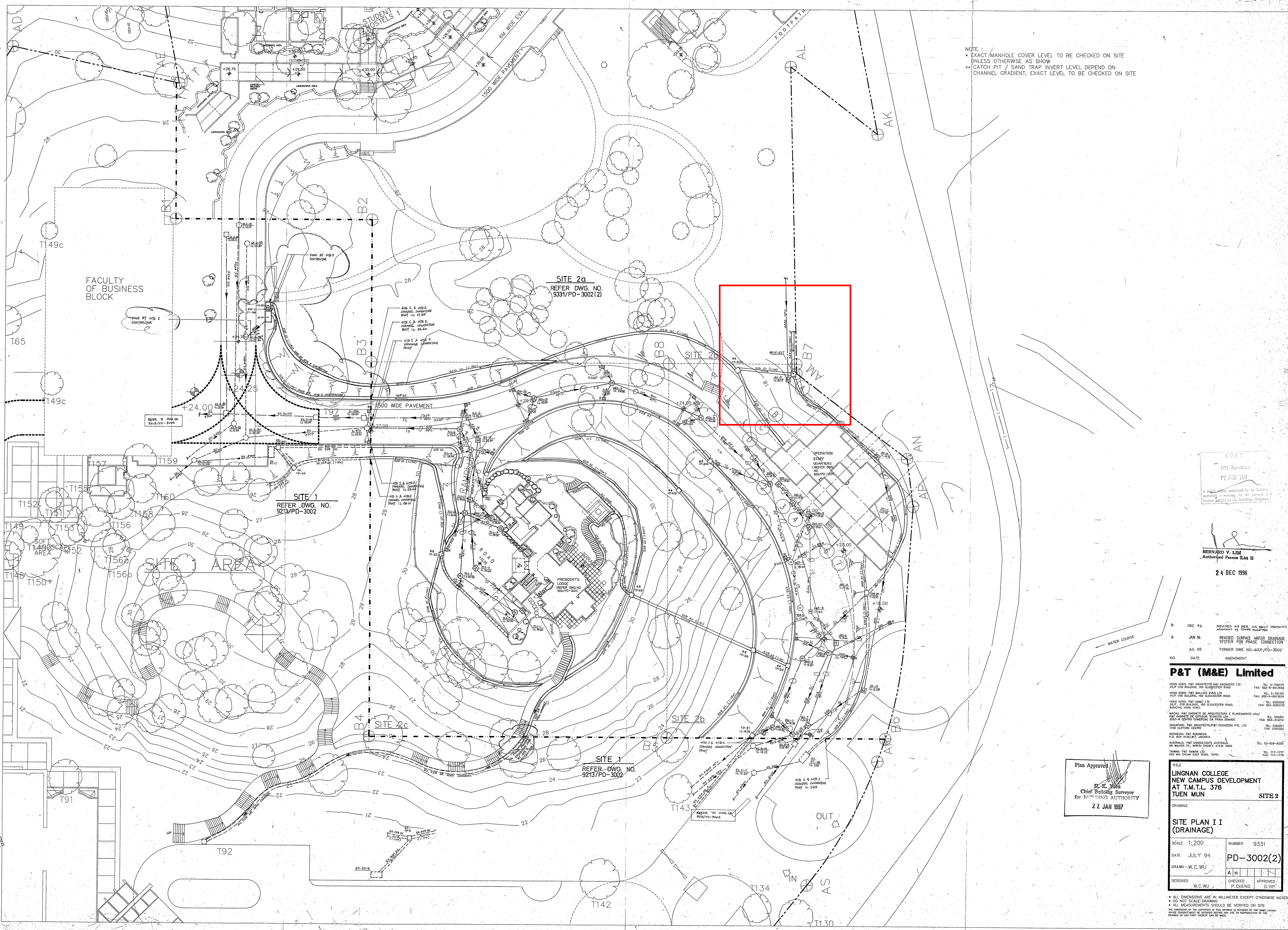
SCALE 1:200 — NUMBER 9331
DATE JULY 94 — PD-3002(1)
DRAWN W.C.WU — A B C
DESIGNED W.C.WU — CHECKED P.CHENG — APPROVED D.YIP

* ALL DIMENSIONS ARE IN MILLIMETER EXCEPT OTHERWISE NOTED
* DO NOT SCALE DRAWING
* ALL MEASUREMENTS SHOULD BE VERIFIED ON SITE

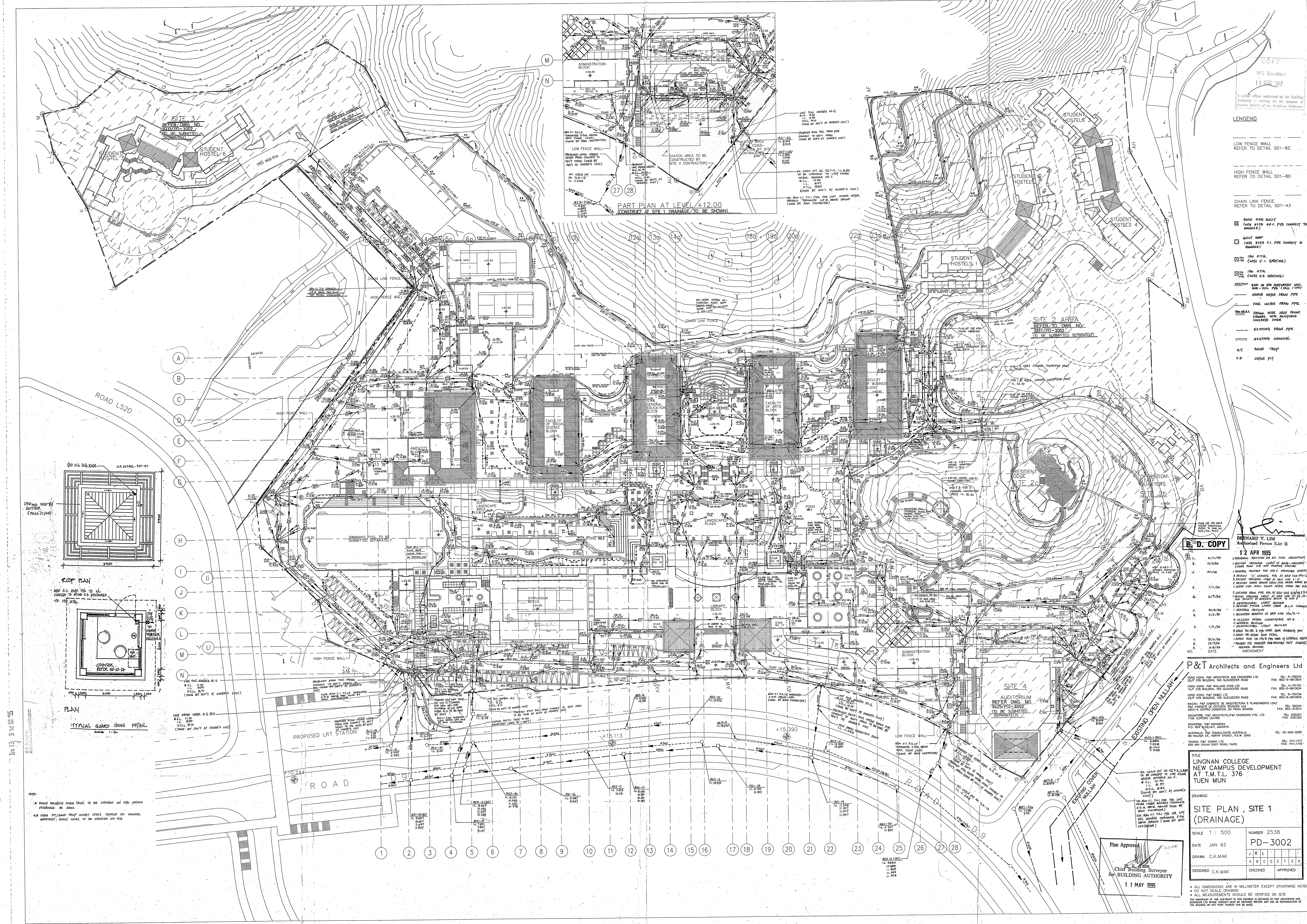
Plan Approved
H. K. Yuen
Chief Building Surveyor
for BUILDING AUTHORITY
21 NOV 1996

CHAN CHO SING JOEL
AP1 (01/93
08 NOV 1996

B. D. COPY



NOTE :
* EXACT MANHOLE COVER LEVEL TO BE CHECKED ON SITE UNLESS OTHERWISE AS SHOW
** CATCH PIT / SAND TRAP INVERT LEVEL DEPEND ON CHANNEL GRADIENT, EXACT LEVEL TO BE CHECKED ON SITE
FACULTY OF BUSINESS BLOCK
SITE 2a REFER DWG. NO. 9331/PD-3002(2)
SITE 1 REFER DWG. NO. 9213/PD-3002
SITE 2b
SITE 2c
SITE 1 AREA
PRESIDENT'S LODGE
OPERATION STAFF QUARTERS
1500 WIDE PAVEMENT
STUDENT HOSTELS 1
FOOTPATH
WATER COURSE
BERNARD V. LIM
Authorized Person (List 1)
24 DEC 1996
B DEC 96 REVISED AS PER AS BUILT DRAWING
A JAN 96 REVISED SURFACE WATER DRAINAGE SYSTEM FOR PHASE CONNECTION
JUL 95 FORMER DWG. NO.-9331/PD-3002
NO. DATE AMENDMENT
P&T (M&E) Limited
Plan Approved
Chief Building Surveyor for BUILDING AUTHORITY
22 JAN 1997
TITLE
LINGNAN COLLEGE NEW CAMPUS DEVELOPMENT AT T.M.T.L. 376 TUEN MUN
SITE 2
DRAWING
SITE PLAN I I (DRAINAGE)
SCALE 1:200
NUMBER 9331
DATE JULY 94
PD-3002(2)
DRAWN W.C.WU
DESIGNED W.C.WU
CHECKED P.CHENG
APPROVED D.YIP
* ALL DIMENSIONS ARE IN MILLIMETER EXCEPT OTHERWISE NOTED
* DO NOT SCALE DRAWING
* ALL MEASUREMENTS SHOULD BE VERIFIED ON SITE
COPY
17 FEB 1997



LENGEND
LOW FENCE WALL REFER TO DETAIL SD1-82
HIGH FENCE WALL REFER TO DETAIL SD1-80
CHAIN LINK FENCE REFER TO DETAIL SD1-43
SAND TRAP
CATCH PIT
SITE 2 AREA REFER TO DWG. NO. S931/PD-3002 (TO BE SUBMITTED SEPARATELY)
SITE 3 REFER DWG. NO.
STUDENT HOSTEL 6
STUDENT HOSTELS 1
STUDENT HOSTELS 4
STUDENT HOSTELS 5
PART PLAN AT LEVEL +12.00 (CONSTRUCT AT SITE 1 DRAINAGE/TO BE SHOWN)
ADMINISTRATION BLOCK
DRAINAGE RESERVE AREA
ROAD L52D
FACULTY OF BUSINESS BLOCK
FACULTY OF ARTS BLOCK
GENERAL EDUCATION BLOCK
FACULTY OF SOCIAL SCIENCE BLOCK
AMENITY BLOCK
SWIMMING POOL TO BE SUBMITTED SEPARATELY
LANDSCAPED PLAZA
GYMNASIUM BLOCK
LIBRARY BLOCK
RESIDENT LODGE SITE 2c
OPERATION STAFF QUARTERS SITE 2b
SITE 4 AUDITORIUM REFER DWG. NO. S425/PD-3002 (TO BE SUBMITTED SEPARATELY)
EXISTING OPEN NULLAH
EXISTING COVERED NULLAH
PROPOSED LRT STATION
ROAD
ROOF PLAN
PLAN
TYPICAL GUARD HOUSE DETAIL
B. D. COPY
BERNARD V. LIM Authorized Person (List 1)
12 APR 1995
AMENDMENT
P&T Architects and Engineers Ltd
TITLE LINGNAN COLLEGE NEW CAMPUS DEVELOPMENT AT T.M.T.L. 376 TUEN MUN
DRAWING SITE PLAN, SITE 1 (DRAINAGE)
SCALE 1 : 500
NUMBER 2538
PD-3002
DATE JAN 93
DRAWN C.K.MAK
DESIGNED C.K.MAK
CHECKED
APPROVED
Plan Approved
Chief Building Surveyor for BUILDING AUTHORITY
11 MAY 1995
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Appendix C

Estimation of Sewage Discharge from the Site

Project No. 819.5075

Sewerage Imapact Assessment for Proposed New Science Building at Lingnan University, Tuen Mun, Hong Kong

Table 1 Total Average Sewage Discharge from Proposed Development

Proposed Development	Lingnan Hub		
Laboratory			
Total Number of Person	210	persons	Based on submitted GBP
Total Number of Staff	30	persons	Based on ratio of staff to student:https://www.ln.edu.hk/about-lu/facts-and-figures/university-statistics-booklet
Unit Flow Factor [2]	0.28	m^3/person/day	Commercial Employee + Community, Social and Personal Services - J11 in Table T-2 of GESF.
Total Number of Student	180	persons	Based on ratio of staff to student:https://www.ln.edu.hk/about-lu/facts-and-figures/university-statistics-booklet
Unit Flow Factor [2]	0.04	m^3/person/day	School Student in Table T-2 of GESF
Average Sewage Discharge	15.6	m^3/day	
Multi-Function Room			
Total Number of Person	71	persons	Based on submitted GBP
Total Number of Staff	11	persons	Based on ratio of staff to student:https://www.ln.edu.hk/about-lu/facts-and-figures/university-statistics-booklet
Unit Flow Factor [2]	0.28	m^3/person/day	Commercial Employee + Community, Social and Personal Services - J11 in Table T-2 of GESF.
Total Number of Student	61	persons	Based on ratio of staff to student:https://www.ln.edu.hk/about-lu/facts-and-figures/university-statistics-booklet
Unit Flow Factor [2]	0.04	m^3/person/day	School Student in Table T-2 of GESF
Average Sewage Discharge	5.52	m^3/day	
Lecture Room			
Total Number of Person	287	persons	Based on submitted GBP
Total Number of Staff	41	persons	Based on ratio of staff to student:https://www.ln.edu.hk/about-lu/facts-and-figures/university-statistics-booklet
Unit Flow Factor [2]	0.28	m^3/person/day	Commercial Employee + Community, Social and Personal Services - J11 in Table T-2 of GESF.
Total Number of Student	246	persons	Based on ratio of staff to student:https://www.ln.edu.hk/about-lu/facts-and-figures/university-statistics-booklet
Unit Flow Factor [2]	0.04	m^3/person/day	School Student in Table T-2 of GESF
Average Sewage Discharge	21.32	m^3/day	
Office			
Total Number of Staff	156	persons	Based on submitted GBP
Unit Flow Factor [2]	0.28	m^3/person/day	Commercial Employee + Community, Social and Personal Services - J11 in Table T-2 of GESF.
Average Sewage Discharge	43.68	m^3/day	
Food Store & Kitchen			
Total Floor Area	162	m2	Based on submitted GBP
Worker Density per GFA (in 100m2)	5.1	person/100 m2	Referred to the worker density of Community, Social & Personal Services (All Types) in Table 8 of CIFSUS
Total number of person	9	persons	Based on submitted GBP
Unit flow Factor	1.58	m^3/person/day	Referred to the planning unit flow for Commercial Employee + Restaurants & Hotels J10 in Table T-2 of GESF.
Average Sewage Discharge	14.22	m3/day	
Total			
Total Sewage Generation Rate (DWF)	100.34	m^3/day	
Catchment Inflow Factlor (Tuen Mun)	1.1		Reference from Table T-4 of Guidelines for Estimating Sewage Flows for Sewerage Infrastructure Planning
Revised Dry Weather Flow	110.37	m^3/day	
Contributing Population	409		
Peaking Factor	8		Refer to Table T-5 of GESF
Peak Flow	0.0102	m^3/s	

Notes:

[1] The average household size is made reference to "*2021 Population Census Summary Results* ", published by C&SD.

[2] The unit flow factor is made reference to "*Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (Version 1.0)* ", published by EPD.

[3] The worker density is made reference to Table 8 of CIFSUS, published by PlanD.

Appendix D

Estimation of Sewage Discharge from Catchment Areas

Population Estimation for Catchment Areas

Catchment	Description	Magnitude	Unit	Remark
A1	**Ho Sin Hang Building, Leung Kau Kui Building, B.Y. Lam Building, Dorothy Y.L. Wong Building, Lau Lee Yuen Haan Amenities Building, Lau Chung Him Building, Patrick Lee Wan Keung Academic Building, Lingnan University Main Building**			
	Total number of Staff (Including Honorary, visiting, temporary & adjunct staff)	972	persons	Referred to University Statistics Booklet 2023 by Lingnan University https://www.ln.edu.hk/about-lu/facts-and-figures/university-statistics-booklet
	Unit flow	0.28	m^3/person/day	Referred to the planning unit flow for Commercial Employee + Community, Social & Personal Services J11 in Table T-2 of GESF.
	Total Number of Student	5265	persons	Referred to University Statistics Booklet 2023 by Lingnan University https://www.ln.edu.hk/about-lu/facts-and-figures/university-statistics-booklet
	Unit Flow Factor [2]	0.04	m^3/person/day	School Student in Table T-2 of GESF
	Average Sewage Discharge	482.76	m3/day	
A2	**Canteen (G/F Lau Lee Yuen Haan Amenities Building)**			
	Total Floor Area	1770.0	m2	Refer to Geoinfo map, located at GF
	Worker Density per GFA (in 100m2)	5.1	person/100 m2	Referred to the worker density of Community, Social & Personal Services (All Types) in Table 8 of CIFSUS
	Total number of person	91	persons	
	Unit flow Factor	1.58	m^3/person/day	Referred to the planning unit flow for Commercial Employee + Restaurants & Hotels J10 in Table T-2 of GESF.
	Average Sewage Discharge	143.78	m3/day	
A3	**Generation from swimming pool**			
	Volumn of Swimming Pool	213	m^3	Area:142m2 , assume average height of 1.5m
	Turnover Rate	6	hr	General Specification for Swimming Pool Water Treatment Installation in Government Buildings of The Hong Kong Special Administrative Region (6 hr for outdoor swimming pool)
	Surface Loading Rate of Filter	30	$m^3/m^2/hr$	Swimming Pools: Design and Construction, Fourth Edition By Philip H. Perkins (30 m3/m2/hr adopted)
	Required Filter Area	1.183	m^2	
	Backwash Duration	7	mins/day	With reference to Section B8.5.5 of General Specification for Swimming Pool Water Treatment Installation in Government Buildings of the HKSAR published by the ArchSD, "the water velocity chosen shall be effective in cleaning the filter in duration of 7 minutes for sand filter"
	Backwash Flow Rate	30	$m^3/m^2/hr$	Technical Paper - Domestic Swimming Pool Filtration by European Union of Swimmingpool and Spa Associations
	Maximum backwash volume	10.35	m^3/day	
	Peak Flow	0.0247	m^3/s	
	Total ADWF of Catchment A	**626.54**	m^3/day	
B	**Indoor Sports Complex**			
	Total Floor Area	2005.0	m2	
	Worker Density per GFA (in 100m2)	3.3	person/100 m2	Referred to the worker density of Community, Social & Personal Services (All Types) in Table 8 of CIFSUS
	Total number of person	67	persons	
	Unit flow	0.28	m^3/person/day	Referred to the planning unit flow for Commercial Employee + Community, Social & Personal Services J11 in Table T-2 of GESF.
	Total ADWF of Catchment B	**18.76**	m^3/day	
D	**Parkland Villas Block 1-3**			
	Residential Building			
	Total number of units	576	units	Refer to https://hk.centanet.com/estate/en/Parkland-Villas/2-KEPPWPPHPB
	Average Household Size	2.6	persons	Refer to Average Domestic Household Size of Tuen Mun District Council in 2021 Population Census: Summary Result, published by Census and Statistics Department
	Total number of residents	1498	persons	
	Unit flow	0.19	m3/person/day	Referred to the planning unit flow for Domestic (housing type specific) - R1 in Table T-1 of GESF.
	Total ADWF of Catchment D	**284.6**	m^3/day	

Population Estimation for Catchment Areas

Catchment	Description	Magnitude	Unit	Remark
E1	**Parkland Villas Block 4-6**			
	Residential Building			
	Total number of units	576	units	Refer to https://hk.centanet.com/estate/en/Parkland-Villas/2-KEPPWPPHPB
	Average Household Size	2.6	persons	Refer to Average Domestic Household Size of Tuen Mun District Council in 2021 Population Census: Summary Result, published by Census and Statistics Department
	Total number of residents	1498	persons	
	Unit flow	0.19	m3/person/day	Referred to the planning unit flow for Domestic (housing type specific) - R1 in Table T-1 of GESF.
	Total ADWF of Catchment E	**284.6**	m^3/day	
E2	**Generation from swimming pool**			
	Volumn of Swimming Pool	621	m^3	Area:414m2 , assume average height of 1.5m
	Turnover Rate	6	hr	General Specification for Swimming Pool Water Treatment Installation in Government Buildings of The Hong Kong Special Administrative Region (6 hr for outdoor swimming pool)
	Surface Loading Rate of Filter	30	$m^3/m^2/hr$	Swimming Pools: Design and Construction, Fourth Edition By Philip H. Perkins (30 m3/m2/hr adopted)
	Required Filter Area	3.450	m^2	
	Backwash Duration	7	mins/day	With reference to Section B8.5.5 of General Specification for Swimming Pool Water Treatment Installation in Government Buildings of the HKSAR published by the ArchSD, "the water velocity chosen shall be effective in cleaning the filter in duration of 7 minutes for sand filter"
	Backwash Flow Rate	30	$m^3/m^2/hr$	Technical Paper - Domestic Swimming Pool Filtration by European Union of Swimmingpool and Spa Associations
	Maximum backwash volume	30.19	m^3/day	
	Peak Flow	0.0719	m^3/s	

Appendix E1

Calculation of Flow Capacity of Existing Condition before Proposed Development

Calculation of Flow Capacity of Proposed Development

Sewer No.				Material	Internal Diameter (m) [a]	Cross-section Area (m^2)	Length (m)	Inlet mPD (m) [a]	Outlet mPD (m) [a]	Hydraulic pipeline roughness (m) [b]	Hydraulic Gradient	Mean Velocity (m/s) [c]	Max Capacity of Sewer (m^3/s)	Total Average Dry Weather Flow	Catchment Inflow Factor	Revised Total Average Dry Weather Flow [g]	Contributing Population	Peaking Factor	Peak Discharge from Project Site m^3/day	Peak Discharge through Manhole m^3/s	Swimming Pool Discharge through Manhole m3/s	Total Discharge through Manhol m3/s	Utility	Remark
S1	E-33	S2	E-32	Clayware	0.300	0.071	4.0	19.35	19.30	0.003	0.01250	1.39	0.098	626.5	1.1	689.2	2553	6.0	4135.2	0.048	/	0.048	48.7%	Catchment A (A1)
S2	E-32	S3	E-28	Clayware	0.300	0.071	8.2	19.30	19.20	0.003	0.01220	1.37	0.097	626.5	1.1	689.2	2553	6.0	4135.2	0.048	/	0.048	49.3%	Catchment A (A1&A2)
S3	E-18	S4	E-16	Clayware	0.300	0.071	16.2	18.85	17.60	0.003	0.07716	3.46	0.244	626.5	1.1	689.2	2553	6.0	4135.2	0.048	/	0.048	19.6%	Catchment A (A1&A2&A3)
S4	E-13	S5	E-12	Clayware	0.300	0.071	16.1	17.00	16.87	0.003	0.00807	1.12	0.079	626.5	1.1	689.2	2553	6.0	4135.2	0.048	/	0.048	60.7%	Catchment A (A1-A4)
S5	E-9	S6	E-8	Clayware	0.300	0.071	9.4	12.35	11.80	0.003	0.05851	3.01	0.213	626.5	1.1	689.2	2553	6.0	4135.2	0.048	/	0.048	22.5%	Catchment A (A1-A7)
S6	E-2	S7	E-1A	Clayware	0.300	0.071	21.5	10.11	9.90	0.003	0.00977	1.23	0.087	626.5	1.1	689.2	2553	6.0	4135.2	0.048	0.0247	0.073	83.5%	Catchment A (A1-A8)
S7	E-1A	S8	E-1	Clayware	0.300	0.071	22.6	9.90	8.88	0.003	0.04513	2.64	0.187	626.5	1.1	689.2	2553	6.0	4135.2	0.048	0.0247	0.073	38.8%	Catchment A (A1-A8)
S8	FMH1015210	S9	FMH1015211	Clayware	0.450	0.159	19.2	7.64	7.48	0.003	0.00836	1.49	0.236	1214.5	1.1	1336.0	4948	6.0	8016.0	0.093	0.0965	0.189	80.0%	Catchment A-E
S9	FMH1015211	S10	FMH1015265	Clayware	0.450	0.159	52.0	6.04	5.69	0.003	0.00673	1.33	0.212	1214.5	1.1	1336.0	4948	6.0	8016.0	0.093	0.0965	0.189	89.2%	Catchment A-E

[a] Reference from GeoInfo Map
[b] For all the public sewers, assumed clayware slimed sewers in "poor" condition, ks value of 3.0mm is adopted.
[c] The velocity is calculated using the Colebrook-White Formula:

$$V = -2(2gDS)^{0.5}\log\left(\frac{k}{3.7D} + \frac{2.5\nu}{D(2gDS)^{0.5}}\right)$$

where
k = Colebrook-White roughness coefficient, in meter
V = mean velocity (m/s)
D = circular cross-section pipe, inside diameter (m)
S = slope, in meters per meter
v = kinematic viscosity of water, in meter per second (0.000001306 m/s)
g = gravitational acceleration (m/s2) (9.807m/s2)

[d] The Contributing Population is defined as:

$$\text{Contributing Population} = \frac{\text{Calculated total average flow } (m^3/\text{day})}{0.27\ (m^3/\text{person/day})}$$

[e] Reference from Table T-5 of Guidelines for Estimating Sewage Flows for Sewerage Infrastructure Planning
[f] Reference from Table T-4 of Guidelines for Estimating Sewage Flows for Sewerage Infrastructure Planning
[g] Revised Total Average Dry Weather Flow = Total Average Dry Weather Flow x Catchment Inflow Factor
[h] Pipe segment that exceeded 100% used capacity are bolded and underlined

Appendix E2

Calculation of Flow Capacity of Proposed Development

Calculation of Flow Capacity of Proposed Development

Sewer No.				Material	Internal Diameter (m) [a]	Cross-section Area (m^2)	Length (m)	Inlet mPD (m) [a]	Outlet mPD (m) [a]	Hydraulic pipeline roughness (m) [b]	Hydraulic Gradient	Mean Velocity (m/s) [c]	Max Capacity of Sewer (m^3/s)	Total Average Dry Weather Flow	Catchment Inflow Factor	Revised Total Average Dry Weather Flow [g]	Contributing Population	Peaking Factor	Peak Discharge from Project Site m^3/day	Peak Discharge through Manhole m^3/s	Swimming Pool Discharge through Manhole m3/s	Total Discharge through Manhol m3/s	Utility	Remark
P1	Site TM	S1	E-33	Clayware	0.300	0.071	7.0	19.45	19.35	0.003	0.01429	1.49	0.105	100.3	1.1	110.4	409	8.0	883.0	0.010	/	0.010	9.7%	The Site
S1	E-33	S2	E-32	Clayware	0.300	0.071	4.0	19.35	19.30	0.003	0.01250	1.39	0.098	753.7	1.1	829.0	3070	6.0	4974.2	0.058	/	0.058	58.6%	Catchment A (A1)+ The Site
S2	E-32	S3	E-28	Clayware	0.300	0.071	8.2	19.30	19.20	0.003	0.01220	1.37	0.097	753.7	1.1	829.0	3070	6.0	4974.2	0.058	/	0.058	59.3%	Catchment A (A1&A2)+ The Site
S3	E-18	S4	E-16	Clayware	0.300	0.071	16.2	18.85	17.60	0.003	0.07716	3.46	0.244	753.7	1.1	829.0	3070	6.0	4974.2	0.058	/	0.058	23.6%	Catchment A (A1&A2&A3)+ The Site
S4	E-13	S5	E-12	Clayware	0.300	0.071	16.1	17.00	16.87	0.003	0.00807	1.12	0.079	753.7	1.1	829.0	3070	6.0	4974.2	0.058	/	0.058	73.0%	Catchment A (A1-A4)+ The Site
S5	E-9	S6	E-8	Clayware	0.300	0.071	9.4	12.35	11.80	0.003	0.05851	3.01	0.213	753.7	1.1	829.0	3070	6.0	4974.2	0.058	/	0.058	27.1%	Catchment A (A1-A7)+ The Site
S6	E-2	S7	E-1A	Clayware	0.300	0.071	21.5	10.11	9.90	0.003	0.00977	1.23	0.087	753.7	1.1	829.0	3070	6.0	4974.2	0.058	0.0247	0.082	94.7%	Catchment A (A1-A8)+ The Site
S7	E-1A	S8	E-1	Clayware	0.300	0.071	22.6	9.90	8.88	0.003	0.04513	2.64	0.187	753.7	1.1	829.0	3070	6.0	4974.2	0.058	0.0247	0.082	44.0%	Catchment A (A1-A8)+ The Site
S8	FMH1015210	S9	FMH1015211	Clayware	0.450	0.159	19.2	7.64	7.48	0.003	0.00836	1.49	0.236	1341.7	1.1	1475.8	5466	5.0	7379.1	0.085	0.0965	0.182	76.9%	Catchment A-E+ The Site
S9	FMH1015211	S10	FMH1015265	Clayware	0.450	0.159	52.0	6.04	5.69	0.003	0.00673	1.33	0.212	1341.7	1.1	1475.8	5466	5.0	7379.1	0.085	0.0965	0.182	85.7%	Catchment A-E+ The Site

[a] Reference from GeoInfo Map
[b] For all the public sewers, assumed clayware slimed sewers in "poor" condition, ks value of 3.0mm is adopted.
[c] The velocity is calculated using the Colebrook-White Formula:

$$V = -2(2gDS)^{0.5}\log\left(\frac{k}{3.7D} + \frac{2.5\nu}{D(2gDS)^{0.5}}\right)$$

where
k = Colebrook-White roughness coefficient, in meter
V = mean velocity (m/s)
D = circular cross-section pipe, inside diameter (m)
S = slope, in meters per meter
v = kinematic viscosity of water, in meter per second (0.000001306 m/s)
g = gravitational acceleration (m/s2) (9.807m/s2)

[d] The Contributing Population is defined as:

$$\text{Contributing Population} = \frac{\text{Calculated total average flow } (m^3/\text{day})}{0.27\ (m^3/\text{person/day})}$$

[e] Reference from Table T-5 of Guidelines for Estimating Sewage Flows for Sewerage Infrastructure Planning
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[g] Revised Total Average Dry Weather Flow = Total Average Dry Weather Flow x Catchment Inflow Factor
[h] Pipe segment that exceeded 100% used capacity are bolded and underlined