Appendix F –

Drainage Impact Assessment

Section 16 Planning Application for Proposed Mixed-Use Development with Minor Relaxation of Building Height Restriction at Lot 4354 in D.D. 124, Kiu Tau Wai, Yuen Long

Drainage Impact Assessment

June 2026

Delivering a better world

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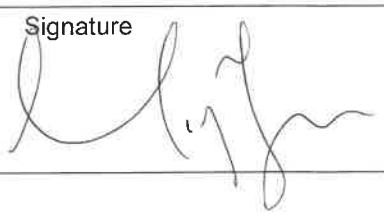
The Drainage Impact Assessment has been reviewed by registered professional engineer in the Civil Engineering discipline.

RPE Number	0377480	Signature 
Name	YUEN Ming Chung	
Discipline	CVL	

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1. Introduction

1.1 Background

1.1.1 AECOM Asia Company Limited (AECOM) was commissioned by the Applicant to conduct a Drainage Impact Assessment (DIA) in support of a Section 16 Application under the Town Planning Ordinance (Cap. 131), for a mixed-use development.

1.1.2 The Application Site is bounded by Ping Ha Road to the north, Kiu Cheong Road to the east and Hung Tin Road to the west. The location of the Application Site is indicated in **DIA/Figure 1**.

1.2 Objectives of this Submission

1.2.1 This report outlines the assessment results of the potential drainage impact caused by the Proposed Development at the Application Site. The main objectives of this assessment include the followings:

(i) Review the existing stormwater drainage condition.

(ii) Outline the methodology adopted in this assessment.

(iii) Outline changes to the drainage characteristics and potential drainage impacts which may arise from the Application Site.

(iv) Propose drainage mitigation measures where appropriate to mitigate the potential drainage impact.

(v) Discuss the responsibility of the construction and maintenance aspects of the proposed drainage system.

1.3 Nomenclature

1.3.1 The following abbreviations and shortened expressions in **Table 1** are adopted in this report.

AECOM	AECOM Asia Company Limited
DSD	Drainage Services Department
GFA	Gross Floor Area
HKO	Hong Kong Observatory
mPD	Metres above Principal Datum
PlanD	Planning Department
SDM	Stormwater Drainage Manual (5th edition, DSD)
DIA	Drainage Impact Assessment

Table 1 – Nomenclature

2. Development Proposal

2.1 The Indicative Development Proposal

2.1.1 The Application Site has an area of approximately 9,946 m^2 with a total Gross Floor Area (GFA) at about 79,568 m^2.

2.1.2 The Master Layout Plan (MLP) of the Proposed Development is shown in **DIA/Figure 2**. The development schedule is summarized in **Table 2, Table 3** and **Table 4** below.

The Overall Development

Application Site Area (m^2) (about)	9,946 m^2
Total Plot Ratio (about)	8.0
• Domestic Plot Ratio (about)	5.2
• Non-Domestic Plot Ratio (about)	2.8
Total GFA (about)	79,568 m^2
• Domestic GFA (about)	51,697 m^2
• Non-Domestic GFA (1) (about)	27,871 m^2
○ Commercial/Office Tower	18,581 m^2
○ Commercial/Retail Podium	9,290 m^2
Maximum Site Coverage (above ground) (not more than)	Not more than 68mPD
• Podium Below 15m Over 15m but not exceeding 20m	 Not more than 100% Not more than 60%
• Tower (Above 20m)	Not more than 38.5% Non-domestic: 11.5% Domestic: 27%

Table 2 – Development Parameters of the Overall Development

Residential Portion

Building Height (at main roof)	Not more than 160mPD
Number of Storeys (2)	38 storeys (above 5 levels of commercial/retail podium)
Number of Blocks	2
Number of Flats	1,140
Average Flat Size	45.3 m^2
Anticipated Population (3)	3,192
Private Open Space (m^2) (not less than) (4)	3,192 m^2
Residents' Clubhouse Facilities	
Clubhouse GFA (m^2) (about) (5)	2,250 m^2
No. of Storeys	1

Table 3 – Development Parameters of the Residential Portion

Commercial Portion

Building Height (at main roof)	Not more than 106mPD
Number of Storeys	
• Commercial/Office Tower (6)	17 storeys (above 5 levels of commercial/retail podium)
• Commercial/Retail Podium	5 storeys
• Anticipated Nos. of Workers	1,115
Number of Blocks	1

Table 4 – Development Parameters of the Commercial Portion

Remarks:
(1) Including 'Eating Place', 'Office', 'Place of Entertainment', 'Place of Recreation, Sports or Culture', 'School' (kindergarten, nursery, language, computer, commercial and tutorial schools, art school, ballet and other types of schools providing interest / hobby related courses) and 'Shop and Services'.
(2) Excluding transfer plates and 1 level of refuge floor.
(3) Assuming a person-per-flat ratio of 2.8 for Hung Shui Kiu/Ha Tsuen NDA as per the 2021 Population Census.
(4) Not less than $1m^2$ per person according to HKPSG.
(5) The residents' clubhouse GFA is about 4.352% of the domestic GFA and is exempted from plot ratio calculation.
(6) Excluding transfer plates.

3. Assessment Methodology

3.1 Overview of Methodology

3.1.1 This assessment is carried out to assess the drainage impact arising from the Proposed Development on the drainage system.

3.1.2 The assessment is carried out in accordance with the requirements stated in *"Advice Note No.1 – Application of the Drainage Impact Assessment Process to Private Sector Projects"* issued by the Drainage Services Department (DSD). The design parameters adopted are referenced from the design guidelines published by the DSD as follows:

- Stormwater Drainage Manual (SDM).
- Stormwater Drainage Manual - Corrigendum No. 1/2022.
- Stormwater Drainage Manual - Corrigendum No. 1/2024.

3.2 Methodology and Assumptions

3.2.1 Rational Method is used for estimation of surface runoff from the Application Site. The design parameters are summarized in **Table 5**.

Design Storm Return Period	50 years / 200 years
Rainfall Intensity	$i = \frac{a}{(t_d + b)^c}$
Rainfall Zone	HKO Headquarters
Design Storm Constants	For 50 years return period: a = 505.5; b = 3.29; c = 0.355 For 200 years return period: a = 508.8; b = 3.46; c = 0.322
Runoff Coefficients, C	0.95 (Paved Area) 0.35 (Unpaved Area)
Rainfall Increases due to Climate Change	16%
Design Allowance	12.1%
Sediment Allowance	5% reduction in flow area if the gradient is greater than 1 in 25 10% reduction in flow area in other cases

Table 5 – Design Parameters for Runoff Estimation

3.2.2 Colebrook-White Equation and Manning's Equation is used for estimation of hydraulic checking of existing and proposed drainage system. The design parameters are summarized in **Table 6**.

Colebrook-White Roughness Value, ks	0.15 (Precast concrete pipes)
Manning's Coefficient, n	0.014 (Concrete-lined channels)
Pipe Sediment	10% reduction in flow capacity
Viscosity of Water, $\mathcal{V}$	1 x 10^{-6} m^2/s

Table 6 – Design Parameters for Hydraulic Analysis

3.3 Climate Change and Design Allowance

3.3.1 Design consideration on rainfall due to climate change has been incorporated into the design in accordance with the latest design guidelines and Corrigendums published by the DSD, as listed in **Section 3.1.2**.

SDM Corrigendum No. 1/2022

3.3.2 According to item (e), drainage provision in new development areas should consider the climate change effects up to the end of 21st century plus design allowance. With reference to items (k) and (n), a 16% increase in rainfall intensity and a 12.1% design allowance have been considered for this assessment.

SDM Corrigendums No. 1/2024

3.3.3 The latest storm constants have been considered for this assessment to reflect the latest rainfall data and climate projections.

4. Runoff Estimations

4.1 Site Condition

4.1.1 The Site is a triangular strip of land on the south side of Ping Ha Road and adjoins Kiu Cheong Road. The Site slopes downward from west to east in general and dipped gently towards the existing open channel along the northern boundary. The carriageway at Ping Ha Road is at about 7.3 mPD at the western end of the Site, and about 8.0 mPD at near the eastern end of the Site. The carriageway at Kiu Cheong Road then falls to about 6.35 mPD at the proposed entrance to the Site.

4.1.2 The existing ground level within the Site falls gently from 4.0 mPD to 3.2 mPD (west to east). The ground levels along the western and southern boundaries generally match with the adjacent open storage area at about 4.0 mPD in general.

4.1.3 The drainage of the existing site relies on overland flow. The open storage areas south of the Site were intercepted by local channels flowing to the west connecting to existing open channel adjoining Hung Tin Road. Site runoff flows towards north and discharges to the downstream section of the same existing open channel.

4.2 Runoff Estimation

4.2.1 Rational Method is adopted for estimation of the runoff from the pre-development and post-development scenarios.

4.2.2 The pre-development and post-development surface runoff have been estimated. The proposed development is mostly hard paved; there will be greenery and landscape provisions on podium. The percentage of paved area comprising building blocks, concrete structures, roads and other paved facilities generally unchanged, hence, the surface runoff remains unchanged at the Application Site. A summary of the surface runoff calculations is shown in Table 7 below. For detailed runoff estimation, please refer to **Annex 1**.

	Area (m^2)		50 years return period		200 years return period	
	Paved	Unpaved	Design Rainfall Intensity (with Climate Change) (mm/hr)	Total Surface Runoff (m^3/s)	Design Rainfall Intensity (with Climate Change) (mm/hr)	Total Surface Runoff **(m^3/s)**
Pre-Development	9,946	0	306	0.80	338	0.86
Post-Development	9,946	0	306	0.80	338	0.86
			Net Increase	**0**		**0**

Table 7 – Summary of Surface Runoff

5. Potential Drainage Impacts and Mitigation Measures

5.1 Review on Existing Drainage System

5.1.1 The Application Site is bounded by Ping Ha Road to the north, Kiu Cheong Road to the east and Hung Tin Road to the west. A main drainage channel is situated at the north of the Application Site.

5.1.2 According to record plans obtained from the DSD, there is existing public drainage system serving the Application Site. An existing 5m wide rectangular channel is located along the northern boundary of the Application Site. The channel collects runoffs from areas east of Hung Tin Road and discharges via the twin pipe (SWD1018460 and SWD1030423) located to the northeast of the Application Site. The pipes ultimately discharge stormwater to Tin Shui Wai River via existing 2550mm diameter pipes to existing box culvert. The existing drainage record is shown in **DIA/Figure 3**.

5.1.3 According to drainage record plans from DSD, there is an existing manhole (SMH1011507) located at the northeast of the Application Site. Stormwater received will be conveyed by an existing 2550mm diameter pipe (SWD1018503) and its downstream system towards the river outfall.

5.2 Proposed Drainage Arrangement

External Catchment Area

5.2.1 The sub-catchment used as input to the hydraulic calculation and the respective flow direction of the hydraulic calculation is given in **Annex 3**. The proposed drainage layout plan for the Proposed Development is shown in **DIA/Figure 4**. To intercept existing runoff from the south and the west, surface channels will be provided along the southern and western boundaries of the Site.

Catchment Areas within the Application Site

5.2.2 The Development proposed to raise the site formation level to +8.00mPD.

5.2.3 It is proposed that the runoff from areas within the Site be drained to the east and collected for discharge into the existing 2550 diameter pipe via a proposed DN750 underground drainpipe with connections at an existing manhole at Ping Ha Road. As such, terminal manhole STMH1 will ultimately discharge site runoff to the existing box culvert to Tin Shui Wai River. The cover level of terminal manhole should be higher than that of the downstream public manhole(s).

5.2.4 The proposed drainage pipes and peripheral drains will be designed with adequate capacity to cater for effects of climate change. The proposed drainage layout is shown in **DIA/Figure 4**. Hydraulic calculation refers to **Annex 2 and Annex 3**.

5.2.5 With the implementation of the proposed drainage arrangement, no insurmountable drainage impacts are anticipated.

6. Maintenance Responsibility

6.1.1 The general operation and maintenance requirements will be referenced to Practice Note No. 1/2024 “Design Checklists on Operation & Maintenance Requirements”.

6.1.2 The Development will be responsible for constructing all necessary drainage systems within the Application Site, carrying out connection works to the public drainage system, and undertaking modification works to the existing public drainage networks.

6.1.3 The Applicant is responsible for the maintenance of terminal manhole and all upstream and downstream drainage system within the site boundary.

6.1.4 The drainage systems outside the site boundary are proposed to be handed over to relevant government department for future maintenance.

7. Conclusion

7.1.1 This DIA report serves as a supporting document for proposing domestic flat units to the original pure commercial development. The DIA has been carried out to assess the potential drainage impact due to the Proposed Development.

7.1.2 The pre-development and post-development surface runoff have been estimated. No changes in surface runoff is expected at the Application Site.

7.1.3 Proper internal and peripheral drainage system will be provided within the Application Site to collect and convey runoff from the external catchments and the Application Site.

7.1.4 The proposed drainage layout is shown in **DIA/Figure 4.** With the implementation of the proposed drainage arrangement, the proposed development would be acceptable in drainage terms.

End of Report

Figures

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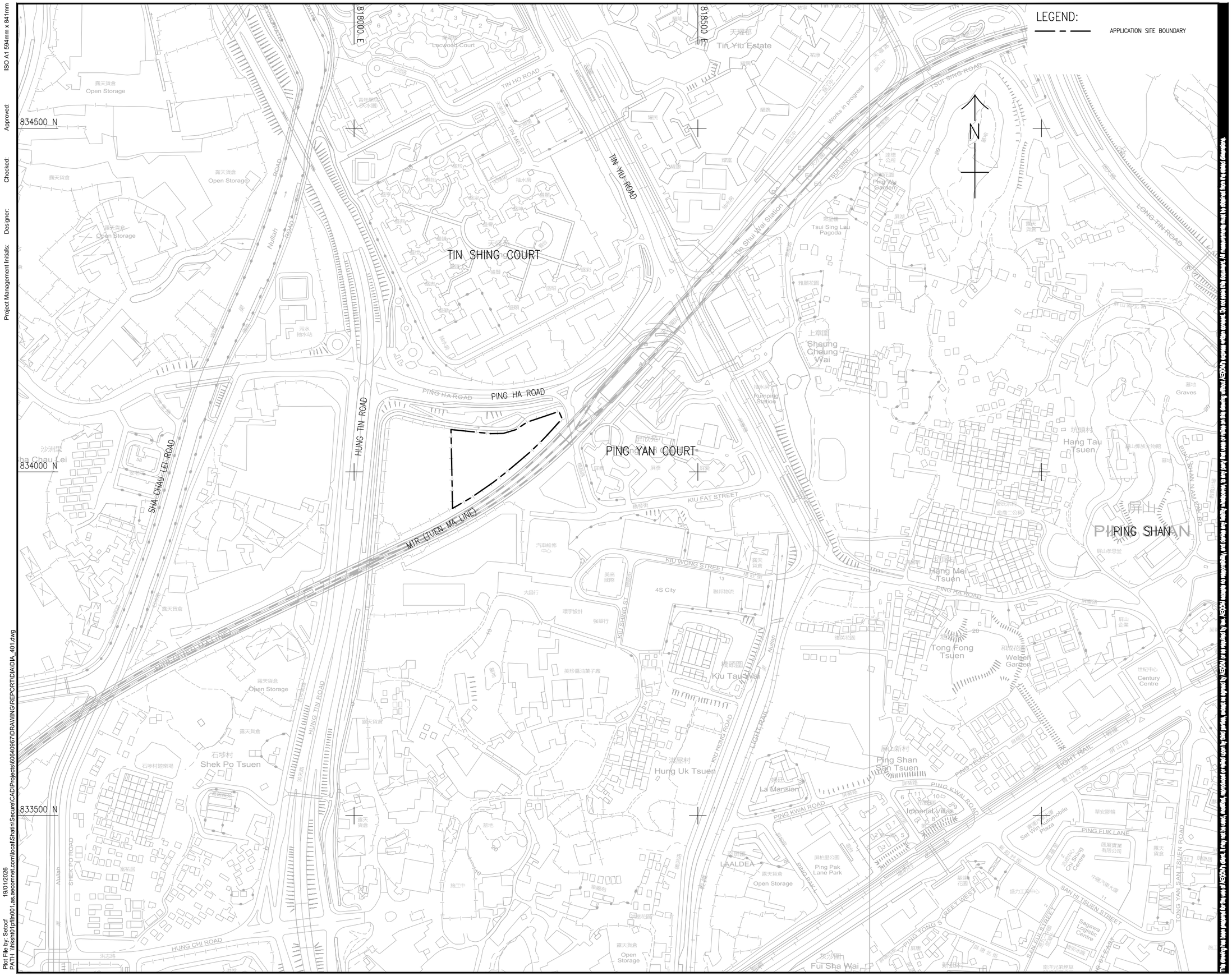

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SECTION 16 PLANNING APPLICATION FOR PROPOSED MIXED-USE DEVELOPMENT WITH MINOR RELAXATION OF BUILDING HEIGHT RESTRICTION AT LOT 4354 IN D.D. 124, KIU TAU WAI, YUEN LONG

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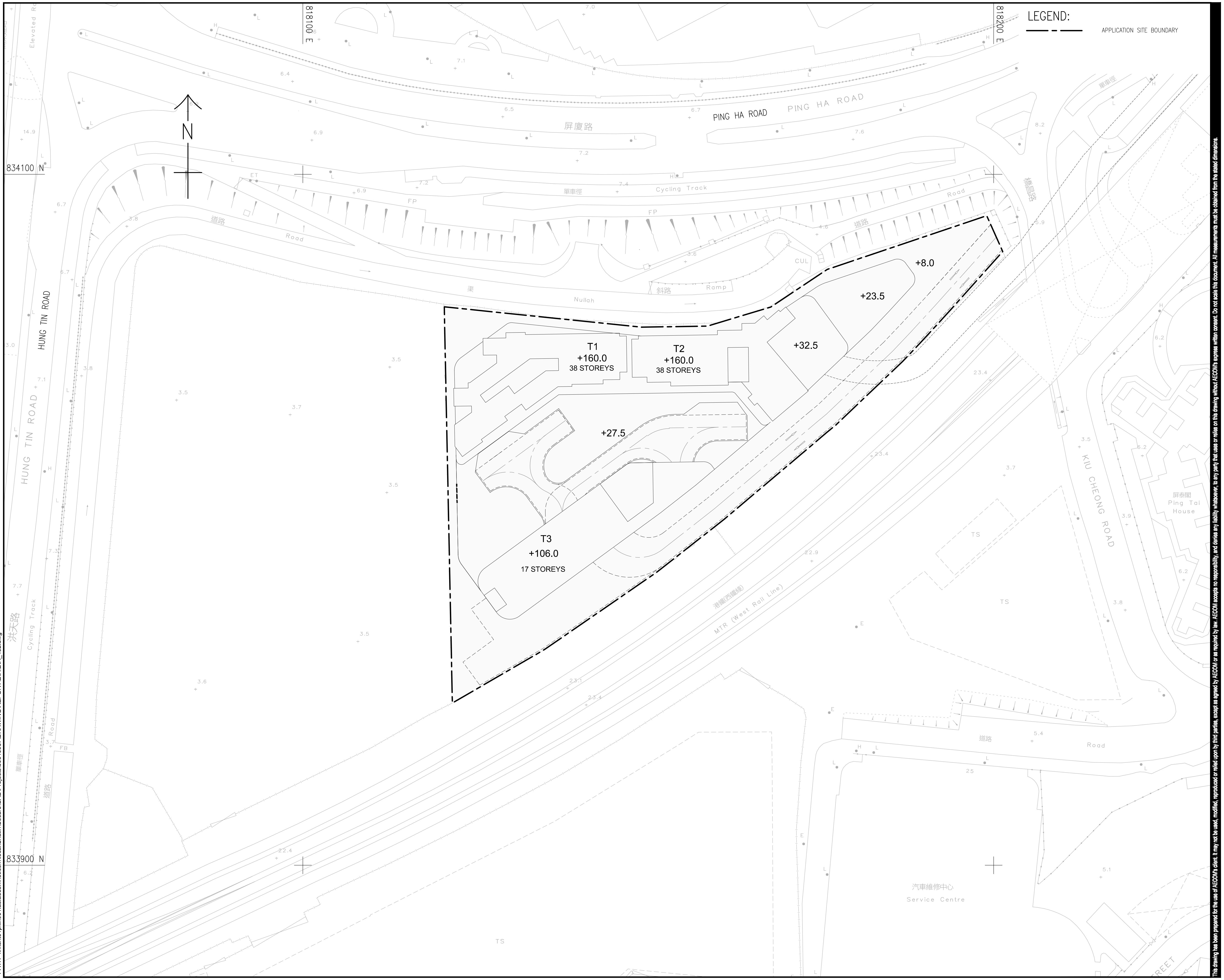

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MASTER LAYOUT PLAN

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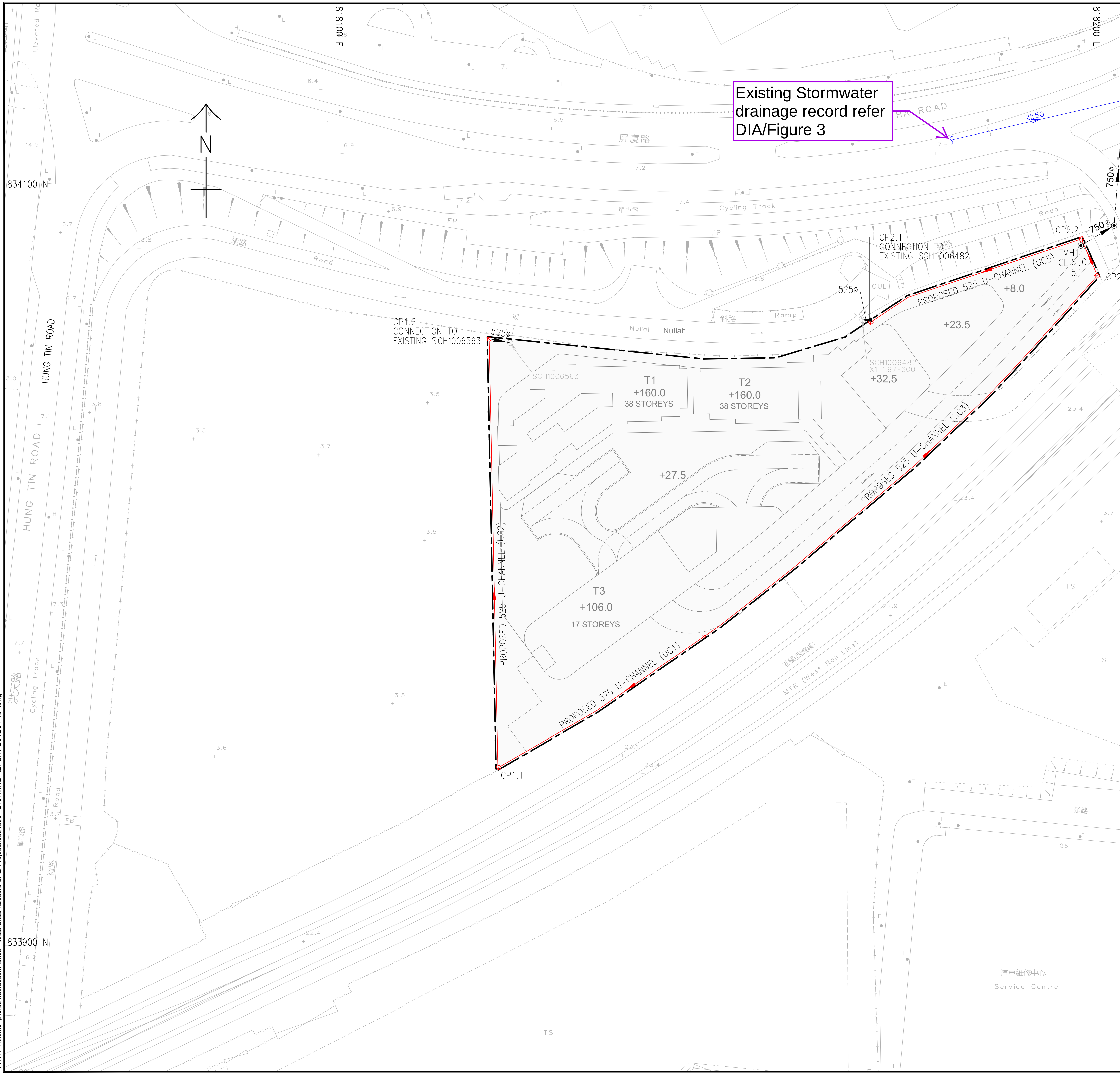

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- EXISTING STORM WATER DRAIN
- EXISTING STORM WATER MANHOLE
- PROPOSED STORM WATER MANHOLE
- PROPOSED CATCHPIT
- DEMOLISH OF EXISTING CATCHPIT
- PROPOSED STORM DRAIN
- PROPOSED U CHANNEL

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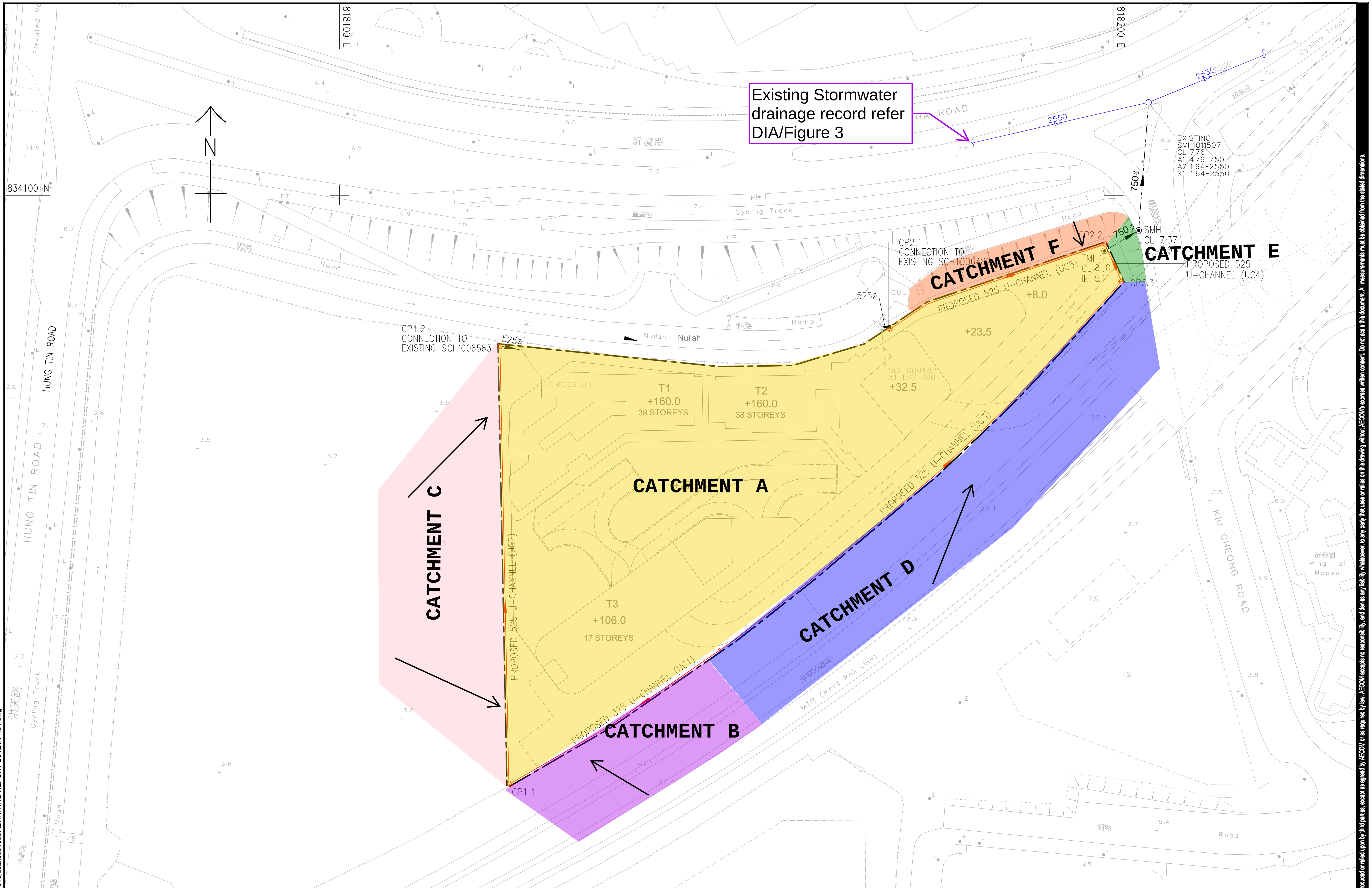

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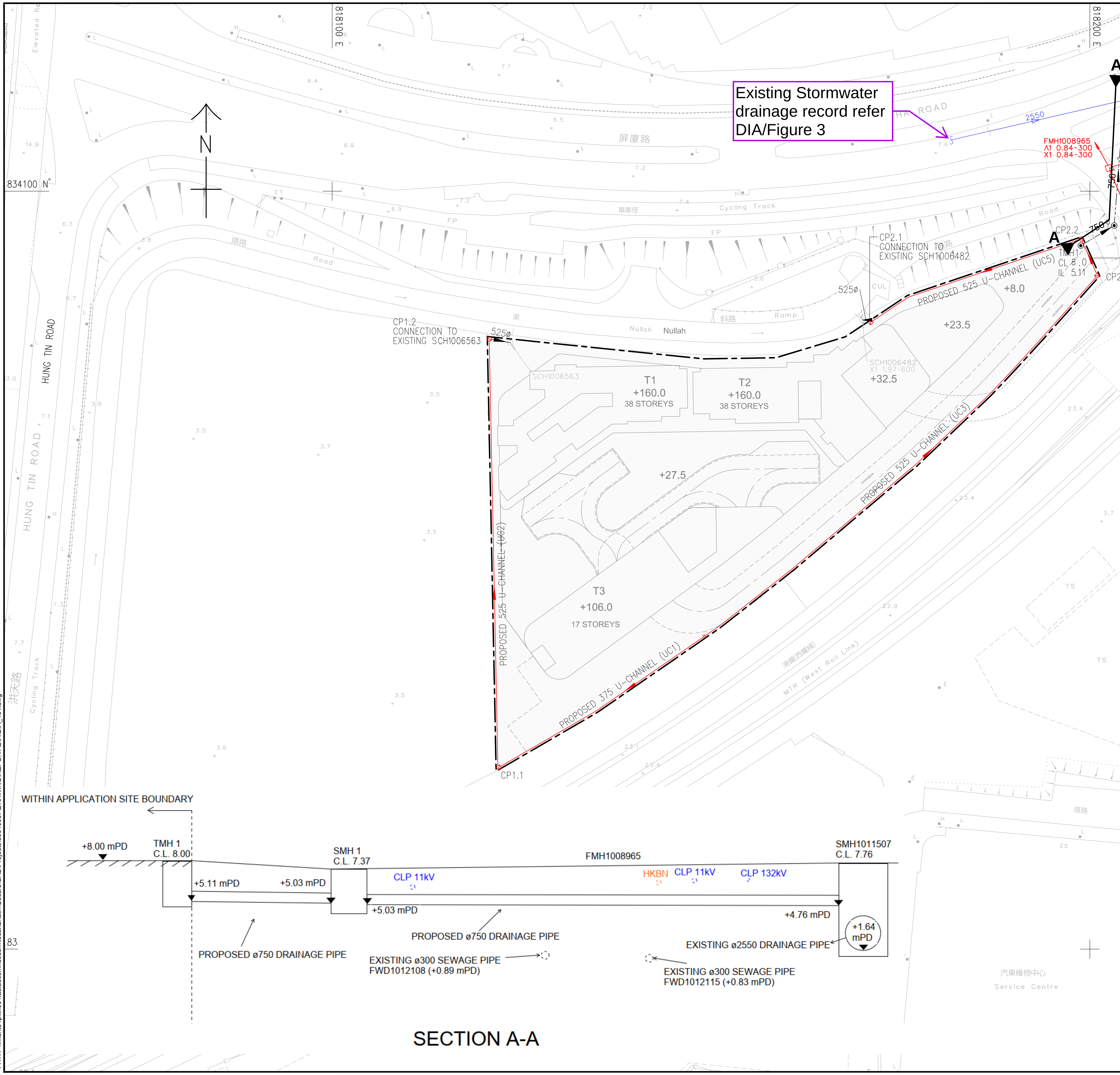

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- EXISTING STORM WATER MANHOLE
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Annex 1

Surface Runoff Estimation

Annex 1: Surface Runoff Estimation - Rational Method

Rainfall Return Period : 1 in 50

Return Period 50-year

Rainfall Intensity $i = \frac{a}{(t_d + b)^c}$ SDM Table 3a

a =	505.5		
b =	3.29		
c =	0.355		
t_d =	Duration in minutes	Assumed	
=	**5**	min	
i =	239		
Climate Change (End of 21 st Century) =	16.0%	Table 28 Corrigendum No.1/2022	
Design Allowance =	12.1%	Table 31 Corrigendum No.1/2022	

The design rainfall intensity with climate change allowance is 350mm/hr.

Using Rational Method to calculate the runoff for Pre / Post Development:

Q_p = 0.278CiA
C = runoff coefficient
i = rainfall intensity in mm/hr
A = catchment area in km^2

Pre-Development

	Application Site		Total Runoff (m^3/s)
	Paved	Unpaved	
Site Area (m^2)	9946.00	0.00	
Runoff coefficient (c)	0.95	0.35	
Rainfall intensity (i)	239	239	
Rainfall intensity including climate change	306	306	
Runoff (Q)	0.80	0.00	**0.80**

Post-Development

	Application Site		Total Runoff (m^3/s)	
	Paved	Unpaved		
Site Area (m^2)	9946.00	0		
Runoff coefficient (c)	0.95	0.35		
Rainfall intensity (i)	239	239		
Rainfall intensity including climate change	306	306		Net Increase
Runoff (Q)	0.80	0.00	**0.80**	0.00

Annex 1: Surface Runoff Estimation - Rational Method

Rainfall Return Period : 1 in 200

Return Period 200-year

Rainfall Intensity $i = \frac{a}{(t_d + b)^c}$ SDM Table 3a

a =	508.8		
b =	3.46		
c =	0.322		
t_d =	Duration in minutes	Assumed	
=	**5**	min	
i =	256		
Climate Change (End of 21 st Century) =	16.0%	Table 28 Corrigendum No.1/2022	
Design Allowance =	12.1%	Table 31 Corrigendum No.1/2022	

The design rainfall intensity with climate change allowance is 350mm/hr.

Using Rational Method to calculate the runoff for Pre / Post Development:

Q_p = 0.278CiA
C = runoff coefficient
i = rainfall intensity in mm/hr
A = catchment area in km^2

Pre-Development

	Application Site		Total Runoff (m^3/s)
	Paved	Unpaved	
Site Area (m^2)	9946.00	0.00	
Runoff coefficient (c)	0.95	0.35	
Rainfall intensity (i)	256	256	
Rainfall intensity including climate change	328	328	
Runoff (Q)	0.86	0.00	**0.86**

Post-Development

	Application Site		Total Runoff (m^3/s)	
	Paved	Unpaved		
Site Area (m^2)	9946.00	0		
Runoff coefficient (c)	0.95	0.35		
Rainfall intensity (i)	256	256		
Rainfall intensity including climate change	328	328		Net Increase
Runoff (Q)	0.86	0.00	**0.86**	0.00

Annex 2

Hydraulic checking of Proposed DN750 Stormwater Pipe

Annex 2: Hydraulic Check for Proposed DN750 Stormwater Pipe

Post-development

The full-bore capacity of the pipe is calculated using the Colebrook-White Equation:

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

where	V =	velocity of the pipe flow	m/s	
	s =	proposed pipe gradient	m/m	
	=	0.008333333		(1 in 120)
	k_s =	pipe roughness value		SDM Table 14
	=	0.15	x 10^{-3} m	Precast concrete pipe with 'O' joints in normal condition
	v =	kinematic viscosity of fluid		
	=	0.000001	m^2/s	
	D =	Proposed pipe diameter		
	=	**750**	mm	
	=	0.75	m	
	V =	2.94	m/s	
		Assume 10% reduction in pipe area for siltation effect		
	A =	0.40	m^2	
	Available Pipe capacity Q_a =	V x A		
	=	1.17	m^3/s	
	Number of Pipe Provided =	1		
	Total Available Pipe Capacity Q_T =	1.17	m^3/s	
		Peak runoff generated from the proposed development,		50-year
	Q_p =	0.80	m^3/s	
	>	Q_p		
		68.5%		
	=>	**OK**		

Annex 2: Hydraulic Check for Proposed DN750 Stormwater Pipe

Post-development

The full-bore capacity of the pipe is calculated using the Colebrook-White Equation:

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

where	V =	velocity of the pipe flow	m/s	
	s =	proposed pipe gradient	m/m	
	=	0.008333333		(1 in 120)
	k_s =	pipe roughness value		SDM Table 14
	=	0.15	x 10^{-3} m	Precast concrete pipe with 'O' joints in normal condition
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	D =	Proposed pipe diameter		
	=	**750**	mm	
	=	0.75	m	
	V =	2.94	m/s	
		Assume 10% reduction in pipe area for siltation effect		
	A =	0.40	m^2	
	Available Pipe capacity Q_a =	V x A		
	=	1.17	m^3/s	
	Number of Pipe Provided =	1		
	Total Available Pipe Capacity Q_T =	1.17	m^3/s	
		Peak runoff generated from the proposed development,		200-year
	Q_p =	0.86	m^3/s	
	>	Q_p		
		73.6%		
	=>	**OK**		

Annex 3

Hydraulic Calculation of Proposed Drainage Facilities

AECOM
Asia Co. Ltd.

Section 16 Planning Application for Proposed Mixed-Use Development with Minor Relaxation of Building Height Restriction at Lot 4354 in D.D. 124, Kiu Tau Wai, Yuen Long

Annex 3 - Hydraulic Calculation of Proposed Drainage Facilities

Project No. 60640967
Date Apr-26 Sheet
By

U-Channel | **For 50 Years Return Period** | **Utilization**

U/S	D/S	Length (m)	Ground Level U/S mPD	Ground Level D/S mPD	Invert Level U/S mPD	Invert Level D/S mPD	Depth Check U/S m	Depth Check D/S m	Grad. 1 in	Catchment Area (m^2) Paved	Ceoff.	Unpaved	Ceoff.	Equivalent Area	Total Area	Base Size (mm)	Starting Point Shape	Full Bore Velocity (U shape) m/s	Full Bore Capacity m^3/s	Time of Conc. min	Rainfall Intensity mm/hr	Discharge m^3/s	Discharge with Climate Change m^3/s	Utilization %
-	CP1.1	60.00	3.90	3.81	3.45	3.05	0.45	0.76	150	1256	0.95	0	0.35	1193	1193	375	U	1.40	0.158	5.00	238.58	0.079	0.101	64.2
CP1.1	CP1.2	121.00	3.81	3.33	3.21	2.40	0.60	0.93	150	3871	0.95	0	0.35	3677	3677	525	U	1.75	0.388	5.00	238.58	0.244	0.312	80.6
-	CP2.3	144.00	3.81	3.39	3.21	2.49	0.60	0.90	200	3146.9	0.95	0	0.35	2990	2990	525	U	1.52	0.336	5.00	238.58	0.198	0.254	75.7
CP2.3	CP2.2	10.40	3.39	3.32	2.49	2.44	0.90	0.88	200	3241.2	0.95	0	0.35	3079	3079	525	U	1.52	0.336	5.00	238.58	0.204	0.262	77.9
CP2.2	CP2.1	58.17	3.32	3.40	2.44	2.05	0.88	1.35	150	3660.8	0.95	0	0.35	3478	3478	525	U	1.75	0.388	5.00	238.58	0.231	0.295	76.2

AECOM Asia Co. Ltd.	Section 16 Planning Application for Proposed Mixed-Use Development with Minor Relaxation of Building Height Restriction at Lot 4354 in D.D. 124, Kiu Tau Wai, Yuen Long Annex 3 - Storm Drain Design	28/04/2026

Manhole		Ground												Design Flow		
Manhole No.		Cover Level		Nos.	Internal Size	Invert Level		Length	Grad	Material	k_s	Velocity	Capacity	Total flow from Uchannel	Percentage Capacity	Catchment
U/S	D/S	U/S mPD	D/S mPD		mm	U/S mPD	D/S mPD	m	1 in		mm	m/s	m^3/s	m^3/s	%	
CP1.2	SCH1006563	3.33	3.91	1	525	2.40	2.33	7.7	100	Concrete	0.60	2.24	0.4364	0.3124	71.59%	B+C
CP2.1	SCH1006482	3.40	3.75	1	525	2.05	1.98	10.4	150	Concrete	0.60	1.83	0.3559	0.2540	71.37%	D+E+F

Notes:
1. Allowance for sediment inside pipe account for 10% of full pipe capacity.

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