利安設計工程有限公司
LEON Design Engineering Limited

Stormwater Drainage Design

For

Temporary Shop and Services with Ancillary Office

at Lot No. 1038A in D.D. 130

Fuk Hang Tsuen, Tuen Mun, N.T.

Report No.: **LD/L1038A/DS01**
Date: **16/7/2024**

Project :	Temporary Shop and Services with Ancillary Office at Lot no.1038A	Date	File No: DS01
	in DD130 in Fuk Hang Tsuen in Tuen Mun, N.T.	15/7/2024	Sheet No.
Title:	**Stormwater Drainage Proposal**		1 of 3

Background

Due to the proposed development in Lot 1038A DD 130, surface runoff will be connected to the drainage system at the site by U-channels and catchpits. The runoff will be finally discharged to an existing drainage system.
This report is to briefly assess the impact to the existing drainage system arising from the development.

Scope of Work

Determine the existing drainage condition & impact arising from the development and verify the adequacy of the downstream drainage to cater for the additional runoff in the proposed condition.

Assessment Cristeria and Methodology

1. Determine the catchment area of the existing drainage channel adjacent to Lot 1038A DD 130 to be affected.
2. Determine the runoff directions and land uses to assign suitable runoff coefficients to the catchments.
3. Determine the rainfall intensity for the catchments.
4. Determine the runoff by Rational Method as advised in the Stormwater Drainage Manual (SDM).
5. Determine the capacity of the affected channel.

1. Determine the Catchment for the Downstream Drainage

Refer to Appendix-A for the proposed catchment plan.
As shown, the catchment area of the development to be affected is 500 meter square.

2. Determine the Rainfall Intensity for the Catchment

2.1. Determine the Rainfall lntensity for the Catchment of the affected channel.
SDM
Catchment Area and Run-off (1 in 50-year)

Site Area, m^2 : **500**

Proposed Application Site is concrete paved, C = **0.95**
No Upstream Catchment
Prposed Development will be paved Area, C = **0.95**
Catchment is small, so Rational Method is appropriate.

Catchment	Area, A	t_c [1]	Intensity, i [2]	Runoff	Peak Runoff, Q_p [4]	
				Coefficient, C [3]	Base Case	Mid 21st Century [5]
	(m^2)	(min)	(mm/h)		(m^3/s)	
Paved 100%	500	5	229	0.95	0.03	0.03

Remarks:

[1] The Application Site is flat. Time of concentration (t_d) is assumed to be 5 min.

[2] $$i = \frac{a}{(t_d + b)^c}$$ where i = extreme mean intensity in mm/hr
t_d = duration in minutes ($t_d \leq 240$)
a, b and c = storm constants

According to Table 3a - Storm Constants for Different Return Periods of **HKO Headquarters** of SDM:

Return Period	50 Years
a	451.3
b	2.46
c	0.337

[3] Value of C is made reference to Section 7.5.2 of DSD's SDM.

[4] $Q_p = 0.278C\ i\ A$ where Q_p = peak runoff in m^3/s
C = runoff coeficient (dimensionless)
i = rainfall intensity in mm/hr
A = catchment area in km^2

[5] The rainfall increse due to climate change for mid 21st century of 11.1% is adopted based on (k) of SDM - Corrigendum No. 1/2022

time of concentration (t_d) = natural flow time (t_0) + channel flow time (t_f)

SDM
Cl.7.5.2

$$t_0 = 0.14465 \frac{L}{H^{0.2} A^{0.1}}$$

For the affected channel section:
distance (L) = 25 m
average slope (H) = (change in height)/L
H = (7.4 - 7.2) / 25
H = 0.80%
area of catchment(A)= 500 m^2
t_0 = 5.1 min
t_f=time of flow (which is assumed to be zero for conservative checking
t_f = 0 min
t_d = 5.1 min

SDM
Cl. 4.3.2

$$i = \frac{a}{(t_d + b)^c}$$

where i is the rainfall intensity

Return period T (years)	2	5	10	20	50	100	200	500	1000	
i =	166	192	205	217	228	235	240	247	250	mm/hr

3. Determine Existing Flow to the affected channel

SDM
Cl. 7.5.2

$$Q = 0.278 i \sum_{j=1}^{m} CjAj$$

where m is the number of subcatchments
refer to LD/L1038A/D01 for the existing catchment plan

Assumptions

SDM
Cl. 7.5.2

The whole catchment can be described by three types of catchment characteristics:
1. Grassland & paved.
2. Grassland catchment shall take a runoff coefficient of 0.35 as taken from the higher end of 0.35 "Steep Grassland"· C=0.25.
3. Paved catchement shall take a runoff coefficient of 0.95 as taken from the higher end of "Concrete".

3.1. Summary of existing flow in the affected section of the channel in different return period

For the section of the channel to be affected

Return Period	Existing Flow (m^3/s)
2	0.02
10	0.03
50	0.03
200	0.03

4. Proposed Diversion for the affected section of channel

$$Q = A\frac{R^{1/6}}{n}\sqrt{RSf}$$

Use the Manning Equation to Determine the Drainage Capacity

Refer to Drawing No. LD/L1038A/D01, the alignment of proposed channel is indicated to suit for the proposed development. The proposed diversion comprise of 225mm concrete U-channel. The channel size and the capacity check are as follows.

Assumptions:

4.1 Roughless coefficient of proposed channel, n is 0.014 (Concrete-lined channels)
4.2 End of the proposed channel will connect with existing channel gradient would be a little bit flatter, say 1 in 150

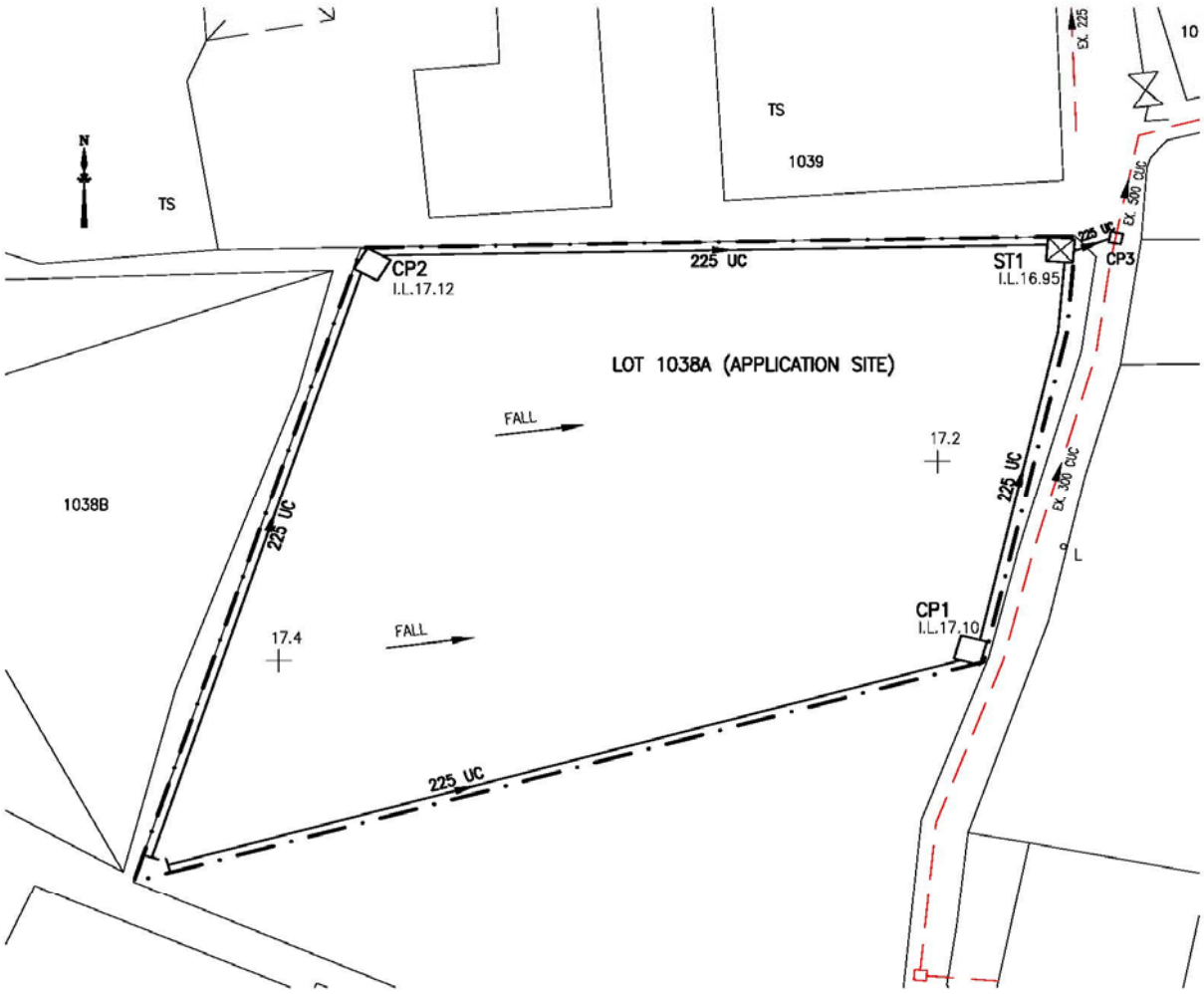
Full-bore capacity of the proposed channel section

Channel Width	=	225	mm	=	0.225 m
Channel Depth	=	225	mm	=	0.225 m
Hydraulic Gradient, S_f	=	0.0067			
Gradient 1 in	=	150			
A	=	0.0506	m^2		
P	=	0.675	m		
R	=	0.075	m		
Full bore capacity	=	0.0525	m^3/s		

The capacity of the proposed channel is larger than the highest capacity of Return Period 1 in 200 (0.03 m^3/s). Therefore, used 225mm UC is adequate for catchment Area of A.

5. CONCLUSION

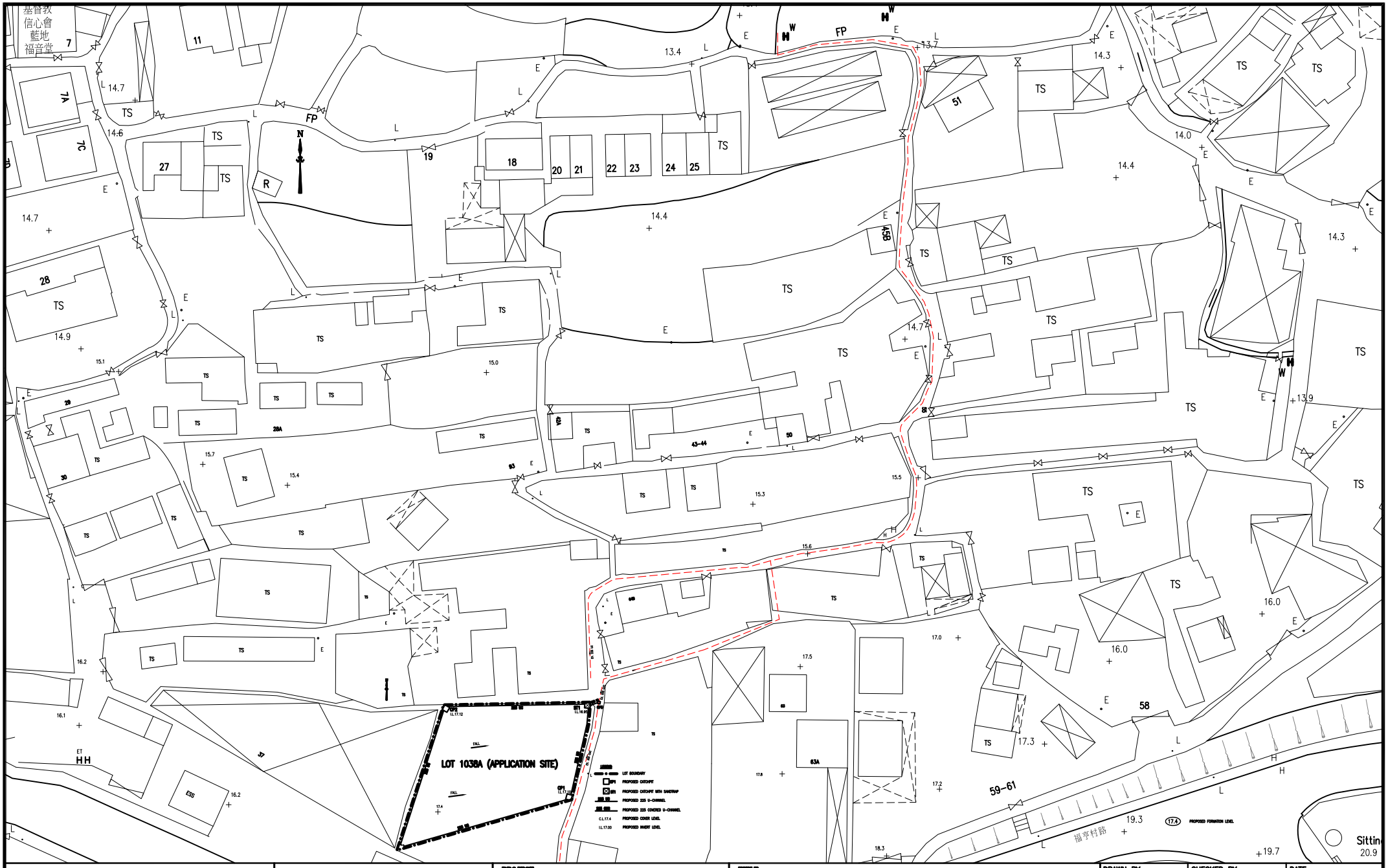
5.1 A Drainage Impact Assessment has been conducted to evaluate the potential drainage impact due to the proposed drainage system.
5.2 The Drainage Impact Assessment has demonstrated that subject to the implementation of the proposed drainage system would not cause adverse drainage impact or an increase in the flooding susceptibility of the adjacent areas.
5.3 It is concluded that the Proposed Development will not result in any adverse drainage impact to the existing drainage system.



Plan of Catchment Areas
NTS

PLANS

LD/L1038A/FIG1	Location of Application Site
LD/L1038A/D01(A)	Proposed Drainage Layout Plan



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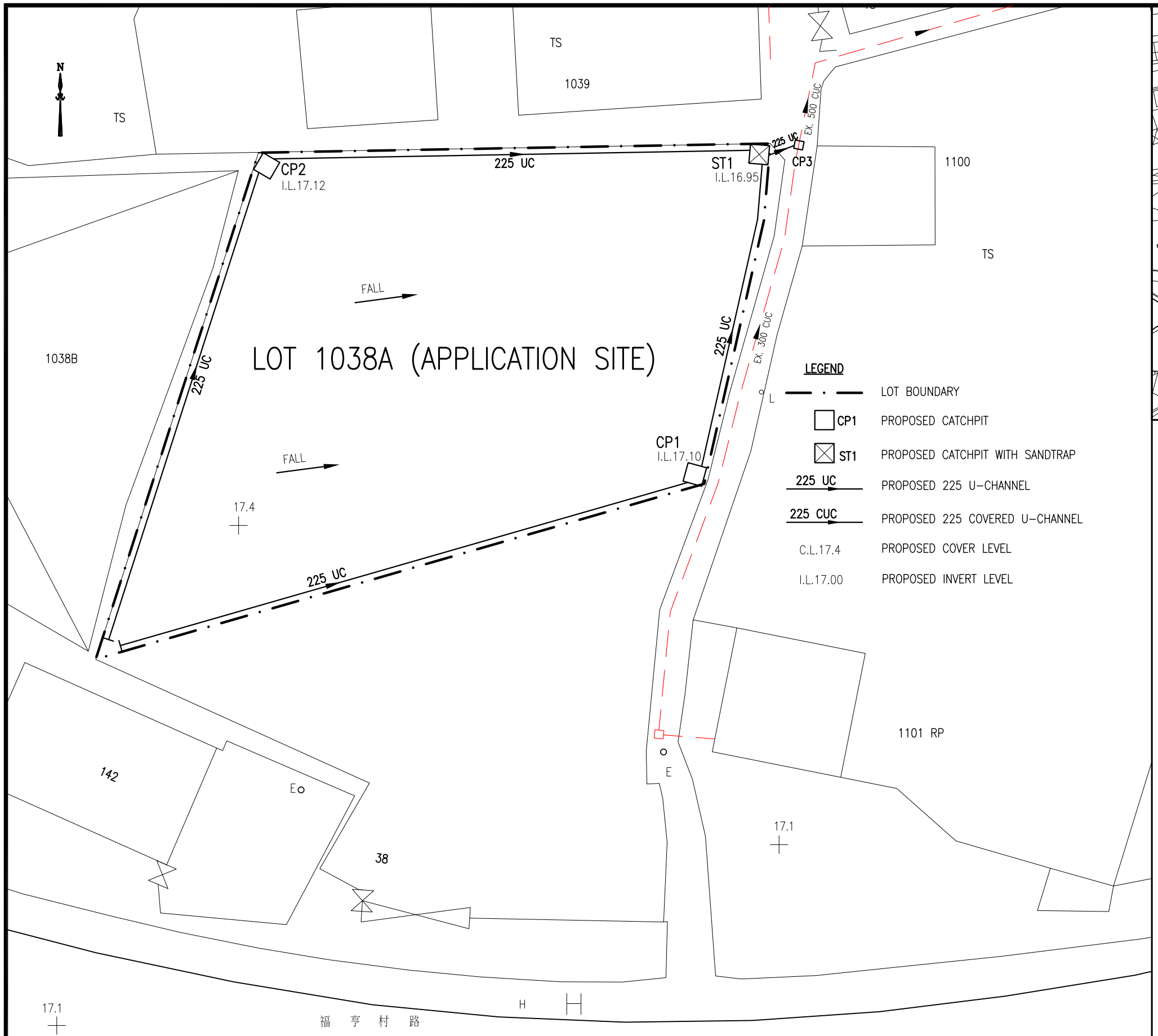
PROJECT

LOT 1038A IN D.D. 130
FUK HANG TSUEN,TUEN MUN, N.T.

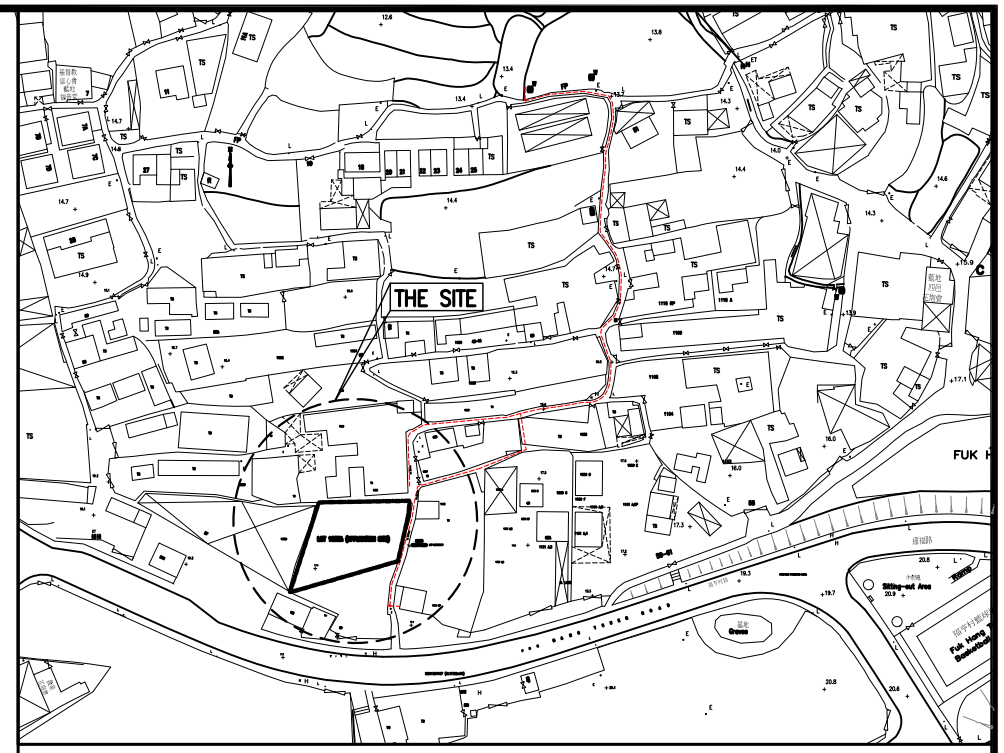
TITLE

LOCATION OF APPLICATION SITE

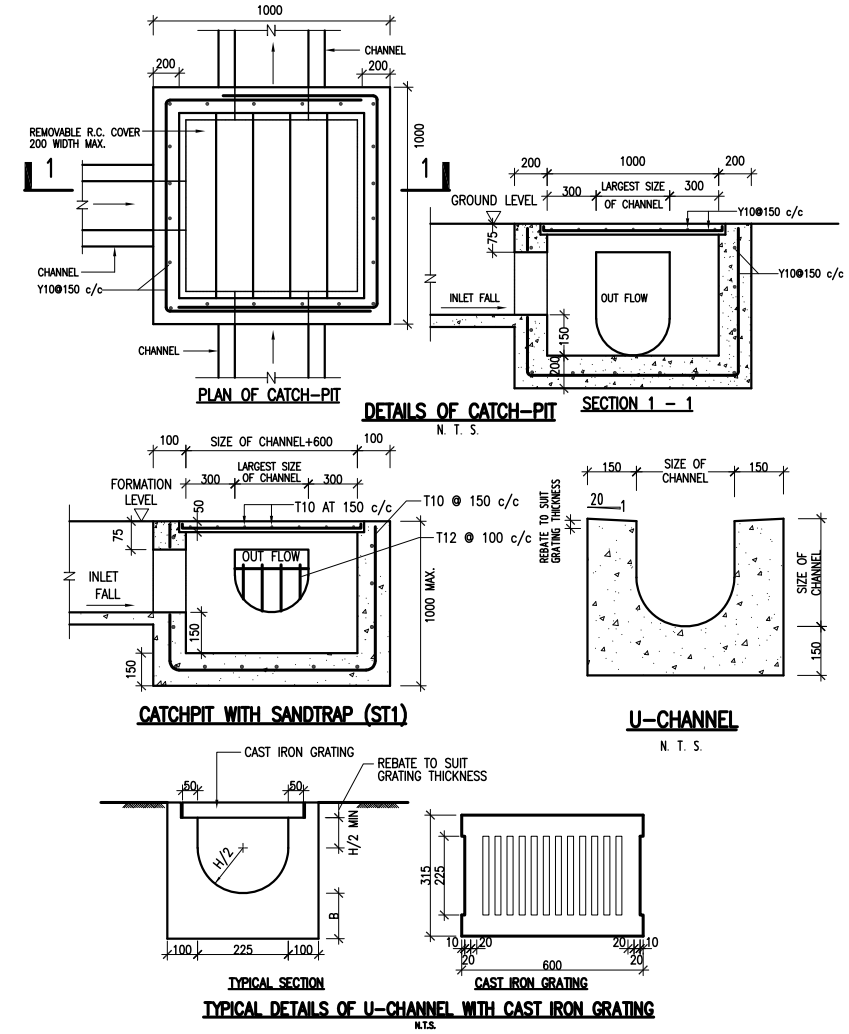
DRAWN BY	CHECKED BY	DATE
PT	PT	JULY 2024
SCALE: 1 : 800	JOB NO.: LD/ -	
CAD / FILE: LD-L1038A-D01	DWG NO.: LD/L1038A/FIG1	



PROPOSED DRAINAGE LAYOUT PLAN



KEY PLAN



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