PROPOSED TEMPORARY WAREHOUSE (EXCLUDING DANGEROUS GOODS GODOWN) WITH ANCILLARY FACILITIES FOR A PERIOFD OF 3 YEARS AND ASSOCIATED FILLING OF LAND IN "AGRICULTURE" ZONE, VARIOUS LOTS IN D.D. 89 AND ADJOINING GOVERNMENT LAND, MAN KAM TO, NEW TERRITORIES

Drainage Impact Assessment

September 24

MARVELLOUS
CONSTRUCTION & DESIGN COMPANY LIMITED

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PROPOSED TEMPORARY WAREHOUSE (EXCLUDING DANGEROUS GOODS GODOWN) WITH ANCILLARY FACILITIES
FOR A PERIOFD OF 3 YEARS AND ASSOCIATED FILLING OF LAND IN "AGRICULTURE" ZONE, VARIOUS LOTS IN D.D. 89
AND ADJOINING GOVERNMENT LAND, MAN KAM TO, NEW TERRITORIES
_____ Drainage Impact Assessment

1 Introduction

1.1 Background

1.1.1   The applicant seeks planning permission from the Town Planning Board (the Board) under Section (S.) 16 of the Town Planning Ordinance (Cap. 131) (the Ordinance) to use Various Lots in D.D. 89 and Adjoining Government Land (GL), Man Kam To, New Territories (the Site) for 'Proposed Temporary Warehouse (Excluding Dangerous Goods Godown) with Ancillary Facilities for a Period of 3 Years and Associated Filling of Land'.

1.1.2   This report aims to support the development in drainage aspect.

1.2 Application Site

1.2.1   The application site is situated beside Man Kam To Road and Law Wo Station Road. It has an area of approx. 16,256 m^2. The site location is shown in **Figure 1**.

1.2.2   The existing site is mainly cover with vegetation with level various from approx. +5.0 to + 6.5mPD. The proposed site intent to fill to +7.5mPD to match with entrance level and for formation of structures, parking, L/UL spaces and circulation.

1.2.3   The surrounding site levels are mainly higher along the Man Kam To Road at approx. + 5.5 to + 8.1 mPD at the east. The site levels are generally lower at the north and west at approx. +2.9 to + 4.0 mPD.

1.2.4   There are existing watercrouse surrounding the proposed site, collecting runoff near Man Kam To Road which has generally higher ground level. The proposed site is minimum 3m away from the existing watercourse. **Figure 2** indicate the existing drainage system of the area.

1.2.5   According to the topo information, there is an area with ground level of approximate +4mPD which may provide flood storage during rainfall event. The existing levels, proposed levels and area which is suspected with flood storage is shown in **Figure 4-1**.

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_____ Drainage Impact Assessment

2 Development Proposal

2.1 The Proposed Development

2.1.1 The total site area is approximately 16,256 m^2. The existing site area is mainly coved by vegetation.

2.1.2 After the development the site would be fully paved. The catchment plan is shown in **Figure 4-2**.

Proposed Development	
Total Site Area (m^2)	16,256
Paved Area after Development (m^2)	16,256

Table 1 – Site Development Area

3 Assessment Criteria

3.1.1 The Recommended Design Return Period based on Flood Level from SDM (Table 10) is adopted for this report. The recommendation is summarized in **Table 2** below.

Description	Design Return Periods
Intensively Used Agricultural Land	2 – 5 Years
Village Drainage Including Internal Drainage System under a polder Scheme	10 Years
Main Rural Catchment Drainage Channels	50 Years
Urban Drainage Trunk System	200 Years
Urban Drainage Branch System	50 Years

Table 2– Design Return Periods under SDM

3.1.2 The proposed drainage system intended to collect runoff from internal site and external catchment. 1 in 10 years return period is adopted for the drainage design.

3.1.3 Stormwater drainage design will be carried out in accordance with the criteria set out in the Stormwater Drainage Manual published by DSD. The proposed design criteria to be adopted for design of this stormwater drainage system and factors which have been considered are summarised below.

1. Intensity-Duration-Frequency Relationship – The Recommended Intensity-Duration-Frequency relationship is used to estimate the intensity of rainfall. It can be expressed by the following algebraic equation.

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

The site is located within the North District Zone. Therefore, for 10 years return period, the following values are adopted.

a	=	454.9
b	=	3.44
c	=	0.412

2. The peak runoff is calculated by the Rational Method
i.e. $Q_p = 0.278CiA$

where			
	Q_p	=	peak runoff in m³/s
	C	=	runoff coefficient (dimensionless)
	i	=	rainfall intensity in mm/hr
	A	=	catchment area in km²

3. The run-off coefficient (C) of surface runoff are taken as follows:

1. Paved Area: C = 0.95
2. Unpaved Area: C = 0.35

4. Manning's Equation is used for calculation of velocity of flow inside the channels:

   Manning's Equation: $v = \dfrac{R^{\frac{1}{6}}}{n}\, R^{\frac{1}{2}} S_f^{\frac{1}{2}}$

   Where,

   V = velocity of the pipe flow (m/s)
   S_f = hydraulic gradient
   n = manning's coefficient
   R = hydraulic radius (m)

5. Colebrook-White Equation is used for calculation of velocity of flow inside the pipes:

   Colebrook-White Equation: $\underline{v} = -\sqrt{32gRS}\, \log\log\left(\dfrac{k_s}{14.8R} + \dfrac{1.255v}{R\sqrt{32gRS_f}}\right)$

   where,

V	=	velocity of the pipe flow (m/s)
S_f	=	hydraulic gradient
k_f	=	roughness value (m)
v	=	kinematics viscosity of fluid
D	=	pipe diameter (m)
R	=	hydraulic radius (m)

6. Volume of Drainage Detention Tank:

   Extreme Rainfall intensity (1 in 10 yr) at North District Area for rainfall duration of 120 mins, I = 63.2 mm/hr

   2 hours rainfall duration is adopted

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FOR A PERIOFD OF 3 YEARS AND ASSOCIATED FILLING OF LAND IN "AGRICULTURE" ZONE, VARIOUS LOTS IN D.D. 89
AND ADJOINING GOVERNMENT LAND, MAN KAM TO, NEW TERRITORIES

_____ Drainage Impact Assessment

4 Proposed Drainage System

4.1. Proposed Storage Tank

4.1.1   Additional runoff is generated due to the change of hard pavement ratio. Storage tank is proposed to collect the additional runoff from the site, such that there is no drainage impact to the nearby area.

4.1.2   The storage tank is proposed to collect the additional runoff for a 1 in 10 year rainfall event for 2 hours. The volume of existing suspected flood storage is also considered in the storage tank design (suspected flood storage area refer to **Figure 4-1**). As per the design for volume of storage tank shown in **Appendix A2**, the total storage volume of the storage tank is proposed to be not less than 1,920 m^3.

4.1.3   During rainstorm event, runoff would be first discharged to storage tank. When the tank is full, it would overflow to manhole A and eventually discharge to existing watercourse downstream.

4.1.4   An interconnection pipe, at invert level of storage tank, is proposed between the storage tank and manhole A and the flow is controlled by a penstock. After the rainfall event, the stored water would be discharge to manhole A by opening the penstock and eventually discharge to existing watercourse downstream.

4.1.5   The detail design of storage tank and discharge arrangement would be designed in later stage of the project.

4.2. Proposed Channels

4.1.6   Proposed channels are designed for collection of runoff for internal and external catchment. They are proposed to connect to proposed storage tank.

4.1.7   The design calculations of proposed UChannel are shown in **Appendix A1**.

4.1.8   The alignment, size, gradient and details of the proposed drains are shown in **Figure 3**. The catchment plan is shown in **Figure 4-2**.

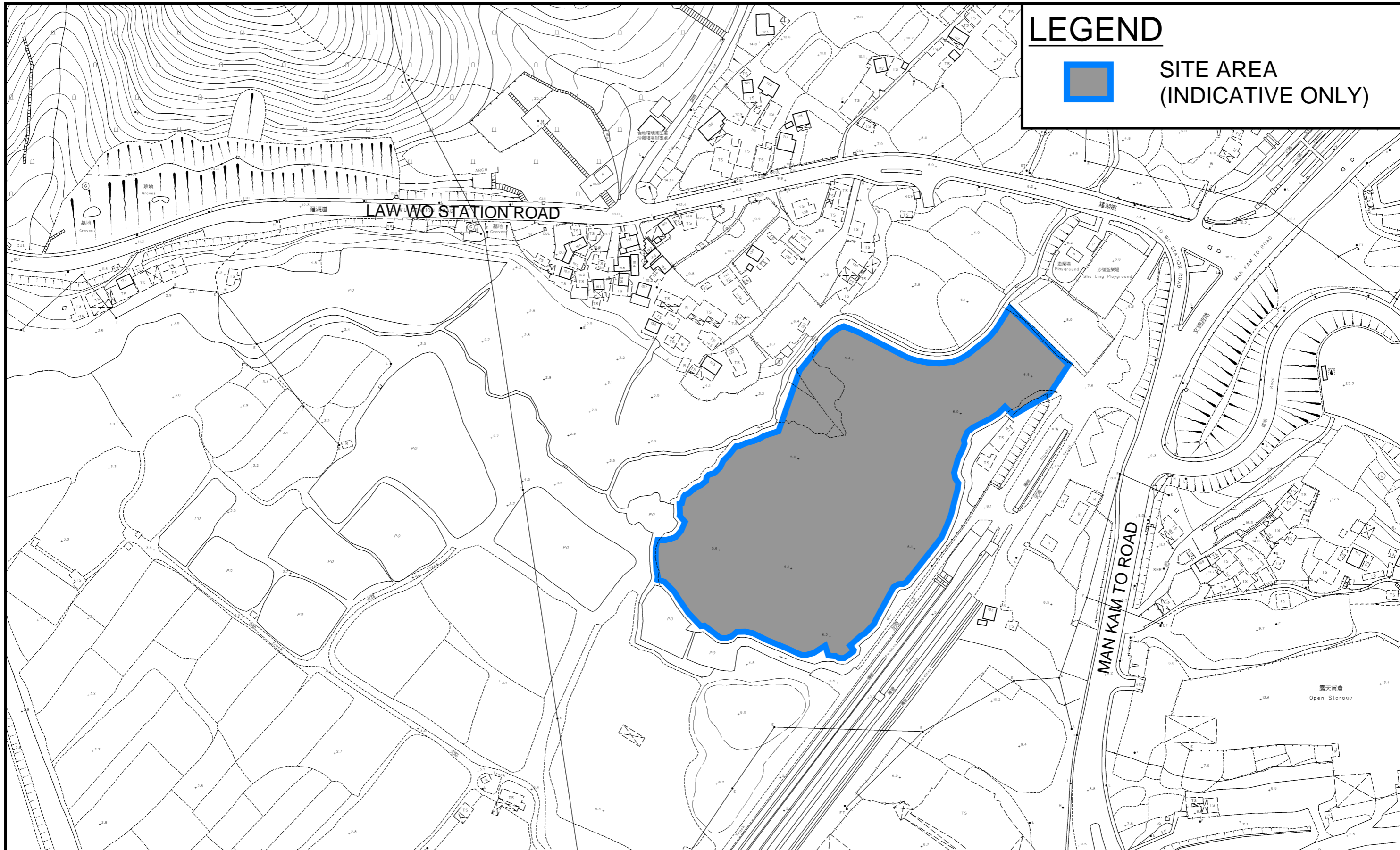4.1.5   Reference Drawings are shown in **Appendix C** for reference.

5 Conclusion

5.1.1   Drainage review has been conducted for the Proposed Development. Storage tank and channels are proposed to mitigate the drainage impact to the nearby area.

5.1.2   With implementation of the above drainage system, the no unacceptable drainage impact is anticipated.

-    End of Text   -

FIGURES

LEGEND

SITE AREA
(INDICATIVE ONLY)

LAW WO STATION ROAD

MAN KAM TO ROAD

LO WU STATION ROAD

Open Storage

PROJECT:
PROPOSED TEMPORARY WAREHOUSE (EXCLUDING DANGEROUS GOODS GODOWN) WITH ANCILLARY FACILITIES FOR A PERIOFD OF 3 YEARS AND ASSOCIATED FILLING OF LAND IN "AGRICULTURE" ZONE
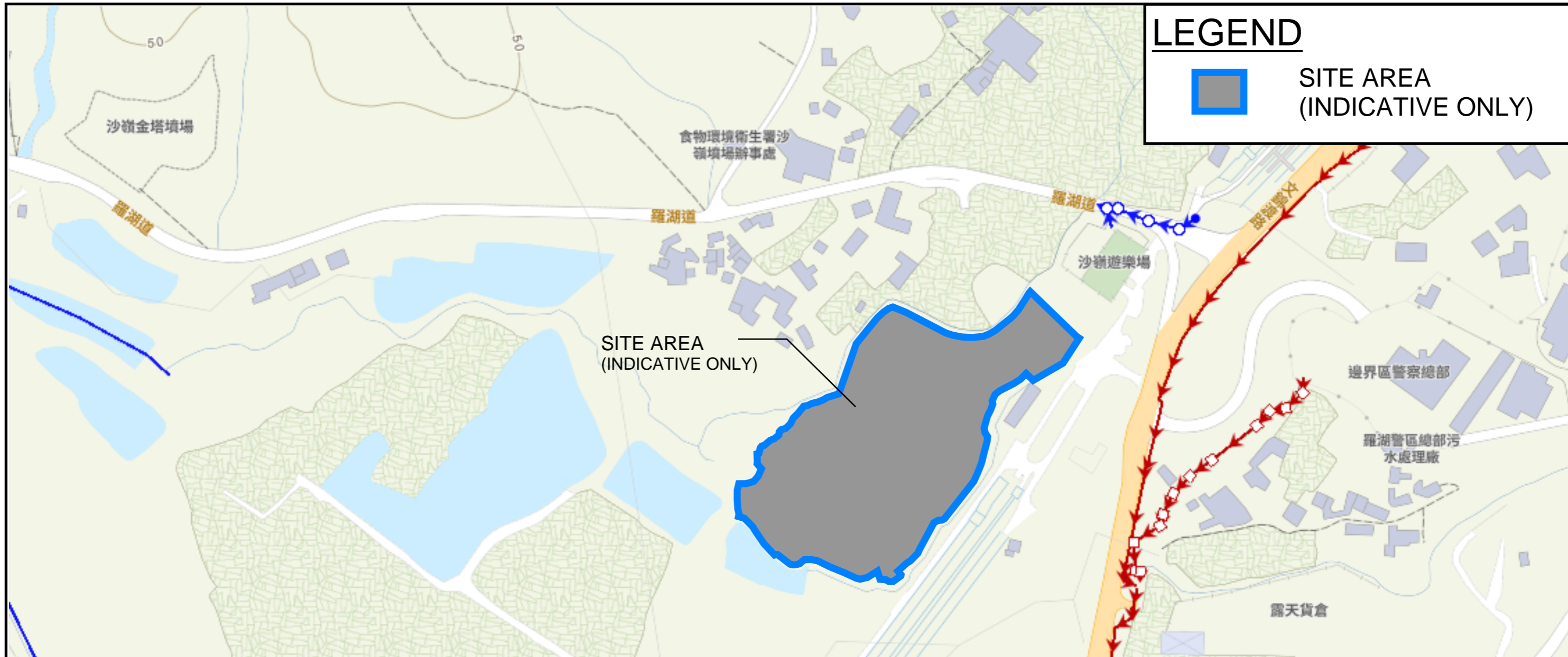
TITLE
SITE LOCATION PLAN

FIGURE NUMBER
FIGURE 1

LOCATION:
VARIOUS LOTS IN D.D. 89 AND ADJOINING GOVERNMENT LAND, MAN KAM TO, NEW TERRITORIES

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| VER | DESCRIPTION | DATE |

SITE AREA
(INDICATIVE ONLY)

沙嶺金塔墳場

食物環境衛生署沙
嶺墳場辦事處

羅湖道

羅湖道

沙嶺遊樂場

邊界區警察總部

羅湖警區總部污
水處理廠

露天貨倉

缸瓦甫路

文錦

LEGEND:

◪	Combined Manhole	н	Tapping Point (Sewer)	н	Tapping Point (Storm)		
☾	Overflow (Combined)	▣	Sewer Terminal Manhole	◉	Storm Water Terminal Manhole		
—	Pipe (Combined)	●	Catchpit	▨	Tunnel Protection Zone (100m / 200m)		
⊠	Interface Valve Chamber	⊁	Inlet	▨	Tunnel Protection Zone (General Range)		
▢	Sewer Manhole	○	Storm Water Manhole	▦	Tunnel / Box Culvert (Sewer)		
▭	Oil / Petrol Interceptor	⊢	Outlet	▦	Tunnel / Box Culvert (Storm)		
☾	Overflow (Sewer)	—	Pipe (Storm)				
—	Pipe (Sewer)	⊞	Sand Trap				

PROJECT: PROPOSED TEMPORARY WAREHOUSE (EXCLUDING DANGEROUS GOODS GODOWN) WITH ANCILLARY FACILITIES FOR A PERIOFD OF 3 YEARS AND ASSOCIATED FILLING OF LAND IN "AGRICULTURE" ZONE	TITLE EXISTING DRAINAGE PLAN	FIGURE NUMBER FIGURE 2
LOCATION: VARIOUS LOTS IN D.D. 89 AND ADJOINING GOVERNMENT LAND, MAN KAM TO, NEW TERRITORIES	MARVELLOUS CONSTRUCTION & DESIGN COMPANY LIMITED	VER DESCRIPTION DATE

LEGEND

- ▢ SITE AREA (INDICATIVE ONLY)
- → EXISTING WATERCOURSE
- ⊢→ PROPOSED CHANNEL
- ⊢▸ PROPOSED PIPE
- ▢ PROPOSED CATCHPIT
- ▣ MANHOLE A (TYPE F1)

NOTES:

1. ALL LEVELS ARE IN METRES TO HONG KONG PRINCIPAL DATUM (m.P.D.) UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
3. LOCATION OF CATCHPITS ARE APPROX. ONLY.
4. CONNECTION LEVELS ARE APPROX. ONLY AND SHALL BE VERFIED ON SITE.

PIPE1 - DISCHARGE TO EXISTING WATERCOURSE REFER TO DETAIL "1"

STORAGE TANK NOT LESS THAN 1920 m³

INTERCONNECTION PIPE SEE DETAIL 1

CONNECT TO EXISTING STREAM at IL +5.78

MANHOLE/PIT SCHEDULE

PIT#	GROUND LEVEL (mPD)	INVERT LEVEL (mPD)
SP01	7.50	6.98
CP1.01	7.50	6.90
CP1.02	7.50	6.88
CP1.03	7.50	6.71
CP1.04	7.50	6.69
CP1.05	7.50	6.60
CP1.06	7.50	6.53
CP1.07	7.50	6.51
CP1.08	7.50	6.40
CP1.09	7.50	6.27
CP1.10	7.50	5.95 *
SP02	7.50	7.05
CP2.01	7.50	7.00
CP2.02	7.50	6.99
CP2.03	7.50	6.94
CP2.04	7.50	6.93
CP2.05	7.50	6.77
CP2.06	7.50	6.61
CP2.07	7.50	6.56
CP2.08	7.50	6.49
CP2.09	7.50	6.47
CP2.10	7.50	6.34
CP2.11	7.50	6.26
SP03	7.50	7.28
MANHOLE A	7.50	4.36
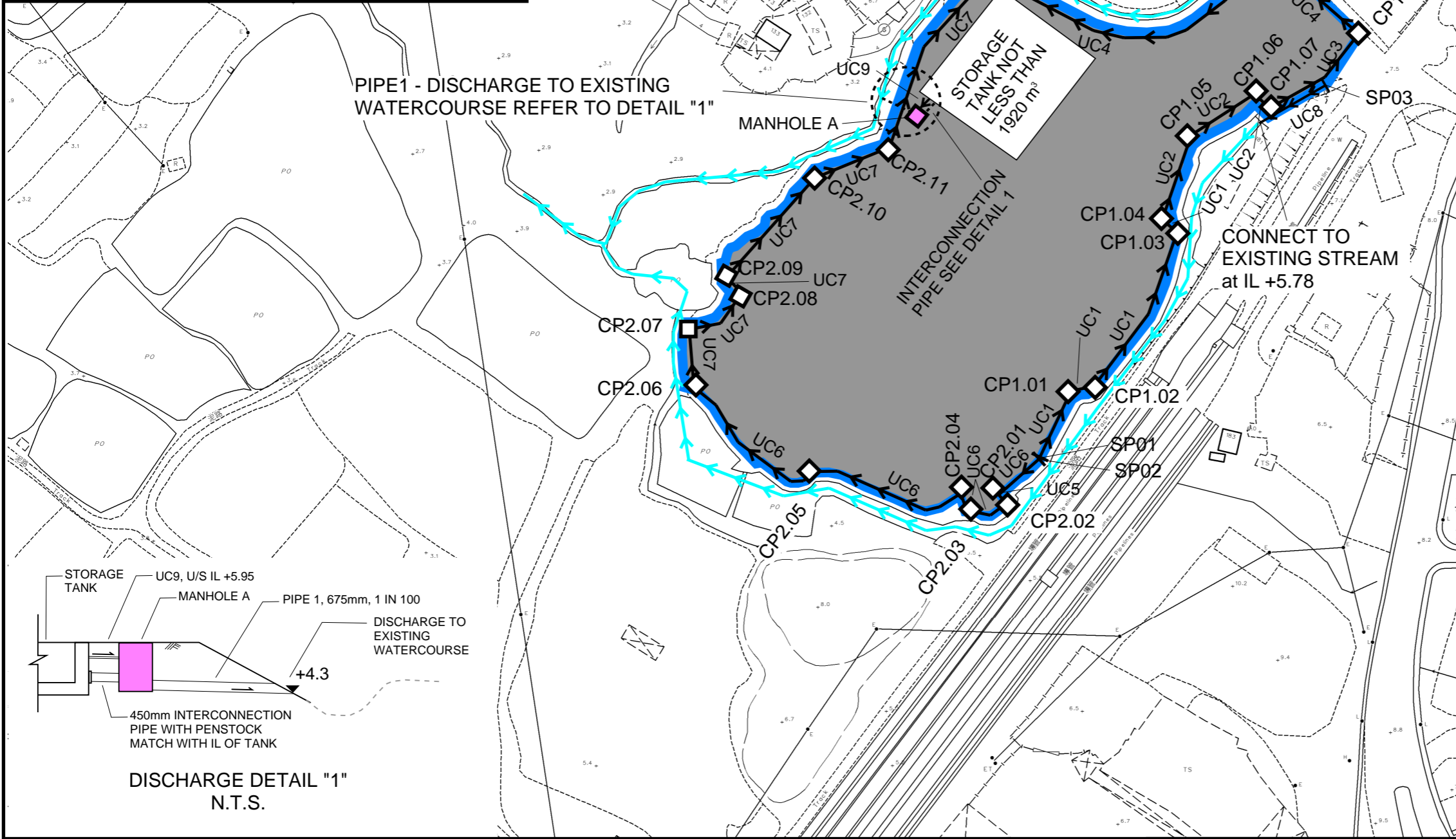
SP: START POINT
* DISCHARGE TO STRAGE TANK BY UC5

PROPOSED CHANNEL

Proposed Channel UC1, 525 mm, 1 in 300
Proposed Channel UC2, 600 mm, 1 in 300
Proposed Channel UC3, 600 mm, 1 in 300
Proposed Channel UC4, 675 mm, 1 in 300
Proposed Channel UC5, 750 mm, 1 in 100
Proposed Channel UC6, 450 mm, 1 in 300
Proposed Channel UC7, 675 mm, 1 in 300
Proposed Channel UC8, 225 mm, 1 in 40
Proposed Channel UC9, 675 mm, 1 in 100
Proposed PIPE1, 675 mm, 1 in 100
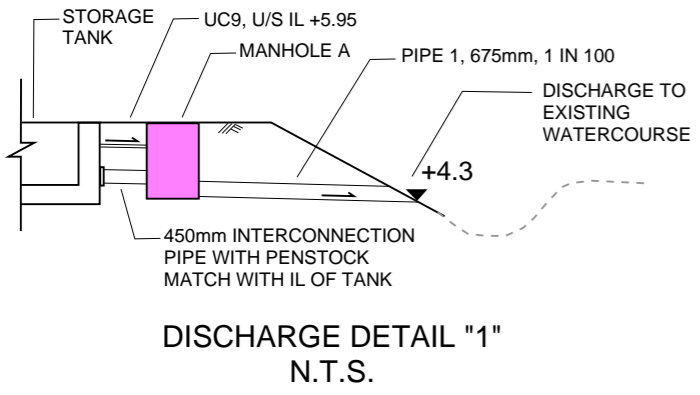
DISCHARGE DETAIL "1" N.T.S.

- STORAGE TANK
- UC9, U/S IL +5.95
- MANHOLE A
- PIPE 1, 675mm, 1 IN 100
- DISCHARGE TO EXISTING WATERCOURSE
- +4.3
- 450mm INTERCONNECTION PIPE WITH PENSTOCK MATCH WITH IL OF TANK

PROJECT:
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TITLE
PROPOSED DRAINAGE SYSTEM

FIGURE NUMBER
FIGURE 3

LOCATION:
VARIOUS LOTS IN D.D. 89 AND ADJOINING GOVERNMENT LAND, MAN KAM TO, NEW TERRITORIES

VER	DESCRIPTION	DATE

LEGEND:

+5.7   EXISTING LEVEL

+5.6   PROPOSED LEVEL
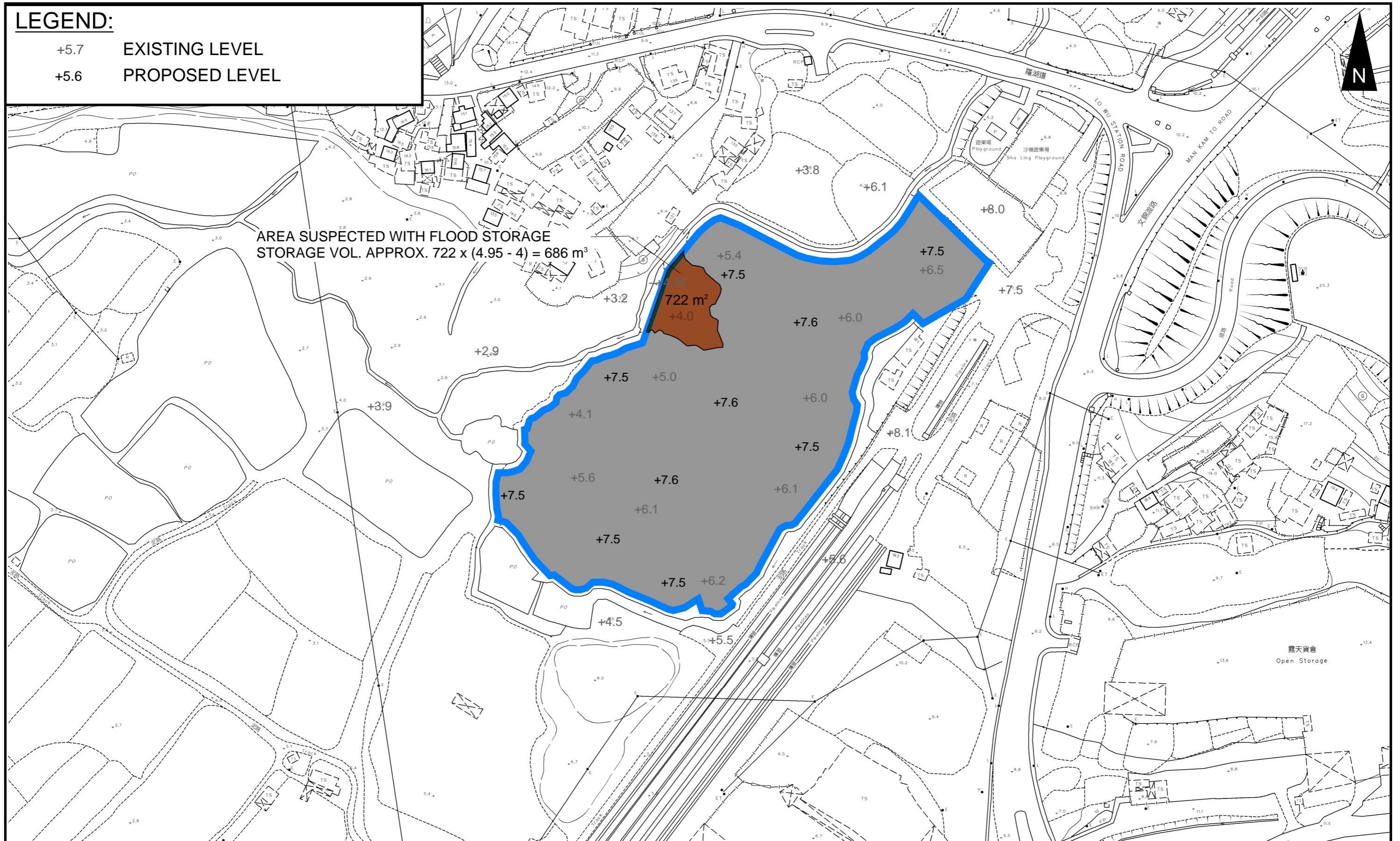
AREA SUSPECTED WITH FLOOD STORAGE
STORAGE VOL. APPROX. 722 x (4.95 - 4) = 686 m³

722 m²

PROJECT:
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FACILITIES FOR A PERIOFD OF 3 YEARS AND ASSOCIATED FILLING OF LAND IN "AGRICULTURE" ZONE

LOCATION:
VARIOUS LOTS IN D.D. 89 AND ADJOINING GOVERNMENT LAND, MAN KAM TO, NEW TERRITORIES

TITLE
AREA OF SUSPECTED
FLOOD STORAGE

FIGURE NUMBER
FIGURE 4-1

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CONSTRUCTION & DESIGN COMPANY LIMITED

VER | DESCRIPTION | DATE

LEGEND:

→ FALL

N

B1: 622 m² 100% UNPAVED

A1: 1,968 m²

A3: 1,222 m²

B2: 1,290 m² 50% PAVED

A2: 5,838 m²

A4: 4,285 m²

B3: 1,100 m² 50%PAVED

A5:2,943 m²

PROJECT:
PROPOSED TEMPORARY WAREHOUSE (EXCLUDING DANGEROUS GOODS GODOWN) WITH ANCILLARY FACILITIES FOR A PERIOFD OF 3 YEARS AND ASSOCIATED FILLING OF LAND IN "AGRICULTURE" ZONE

LOCATION:
VARIOUS LOTS IN D.D. 89 AND ADJOINING GOVERNMENT LAND, MAN KAM TO, NEW TERRITORIES

TITLE
CATCHMENT PLAN

FIGURE NUMBER
FIGURE 4-2

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VER | DESCRIPTION | DATE

APPENDIX

Appendix A1: Design Calculation

Zone

North District

Return Period	1 in	10	years

n	0.014
Ks	0.15
Viscosity	0.000001

Storm Constant	North District a	454.9
	North District b	3.44
	North District c	0.412

Catchment Area Table (Area in m^2)

Catchment	A1	A2	A3	A4	A5	B1	B2	B3	Total Site Area				
Total Area	1968	5838	1222	4285	2943	622	1290	1100	16256				
Hard Paved Area	1968	5838	1222	4285	2943	0	645	550	16256				
Unpaved Area	0	0	0	0	0	622	645	550	0				
Equival. Area	1869.6	5546.1	1160.9	4070.75	2795.85	217.7	838.5	715	15443.2				

Pavement Type	Hard Paved	Unpaved
Runoff Coefficient	0.95	0.35

DRAINAGE DESIGN

Item	Total Equivalent Area m2 (1)	ToC min	Intensity mm/hr (2)	Total Discharge m3/s (3)	Size mm	Gradient 1 in	V m/s (4)	Capacity m3/s (5)	Utilitization (6)	Remark
Design of Channel UC1 for Catchment, A4	4071	3.00	211.18	0.24	525	300	1.33	0.33	73%	
Design of Channel UC2 for Catchment, A3,A4	5232	3.00	211.18	0.31	600	300	1.45	0.47	66%	
Design of Channel UC3 for Catchment, A3,A4,B2	6070	3.00	211.18	0.36	600	300	1.45	0.47	77%	
Design of Channel UC4 for Catchment, A1,A3,A4,B1,B2	8157	3.00	211.18	0.48	675	300	1.57	0.64	75%	
Design of Channel UC5 for Catchment, Total Site Area,B1,B2	16499	3.00	211.18	0.97	750	100	2.91	1.46	66%	
Design of Channel UC6 for Catchment, A5	2796	3.00	211.18	0.16	450	300	1.20	0.22	76%	
Design of Channel UC7 for Catchment, A2,A5	8342	3.00	211.18	0.49	675	300	1.57	0.64	77%	
Design of Channel UC8 for Catchment, B3	715	3.00	211.18	0.04	225	40	2.06	0.09	45%	For External Catchment B3
Design of Channel UC9 for Catchment, Total Site Area,B1,B2	16499	60.00	82.29	0.38	675	100	2.72	1.10	34%	From Storage Tank to Manhole A, ToC assumed as 60 min for conservative purpose
Design of PIPE1 for Catchment, Total Site Area,B1,B2	16499	60.02	82.28	0.38	675	100	3.02	1.08	35%	From Manhole A to Existing Stream

1) Sum of Area in Catchment Table

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

3) 0.278 x Intensity x Equivalent Area

4) Channel: Manning Equation, Pipe Colebrook-White Equation

Manning Equation $v = \dfrac{R^{\frac{1}{6}}}{n} R^{\frac{1}{2}} S_f^{\frac{1}{2}}$

Colebrook-White Equation $v = -\sqrt{32gRS} \, log \, log \left(\dfrac{k_s}{14.8R} + \dfrac{1.255v}{R\sqrt{32gRS_f}} \right)$

5) Q = A x V

6) Less than 90%, for 10% allowance for siltation

Appendix A2: Sizing of Storage Tank

| North District | | Return Period | 1 in | 10 | years | | Duration | 120 | min | | Rainfall Intensity, I | 63.2 | mm/hr |

Site Area

| 16256 | m^2 |

	Pre-Development			Post-Development			Runoff Coefficient
Hard Paved		0 m^2			16256 m^2		0.95
Green		16256 m^2			0 m^2		0.35
Total Equivalent Area	= 0 x 0.95 + 16256 x 0.35	5689.6 m^2		=16256 x 0.95 + 0 x 0.35	15443.2 m^2		
Design Flow Rate, Q	= 0.278 x 5689.6 x 63.2 / 1000000	0.100 m^3/s		= 0.278 x 15443.2 x 63.2 / 1000000	0.271 m^3/s		
Volume of Runoff in 120 min	= 0.1 x 120 x 60	720 m^3			1954 m^3		

Storage Vol. Required	= 1954 - 720 =	1234 m^3	
Suspected Existing Flood Stroage Vol.	=	686 m^3	See Figure 4-1
Total Sorage Vol. Required.	= 686 + 1234 =	1920 m^3	

DEVELOPMENT PARAMETERS

APPLICATION SITE AREA	: 16,256 m²	(ABOUT)
COVERED AREA	: 7,369 m²	(ABOUT)
UNCOVERED AREA	: 8,887 m²	(ABOUT)
PLOT RATIO	: 0.91	(ABOUT)
SITE COVERAGE	: 45 %	(ABOUT)
NO. OF STRUCTURE	: 2	
DOMESTIC GFA	: NOT APPLICABLE	
NON-DOMESTIC GFA	: 14,738 m²	(ABOUT)
TOTAL GFA	: 14,738 m²	(ABOUT)
BUILDING HEIGHT	: 16.5 m	(ABOUT)
NO. OF STOREY	: 2	

B1	WAREHOUSE (EXCL. D.G.G), OFFICE AND WASHROOM	5,950 m² (ABOUT)	11,900 m² (ABOUT)	16.5 m (ABOUT)(2-STOREY)
B2	WAREHOUSE (EXCL. D.G.G), OFFICE AND WASHROOM	1,419 m² (ABOUT)	2,838 m² (ABOUT)	16.5 m (ABOUT)(2-STOREY)
TOTAL		**7,369 m² (ABOUT)**	**14,738 m² (ABOUT)**	

W — N — E
S

CIRCULATION SPACE

INGRESS / EGRESS
10 m (ABOUT)

AT LEAST 3m FROM THE EXISTING NATURAL STREAM

APPLICATION SITE

AT LEAST 3m FROM THE EXISTING NATURAL STREAM

B2

B1

CIRCULATION SPACE

AT LEAST 3m FROM THE EXISTING NATURAL STREAM

~10,000
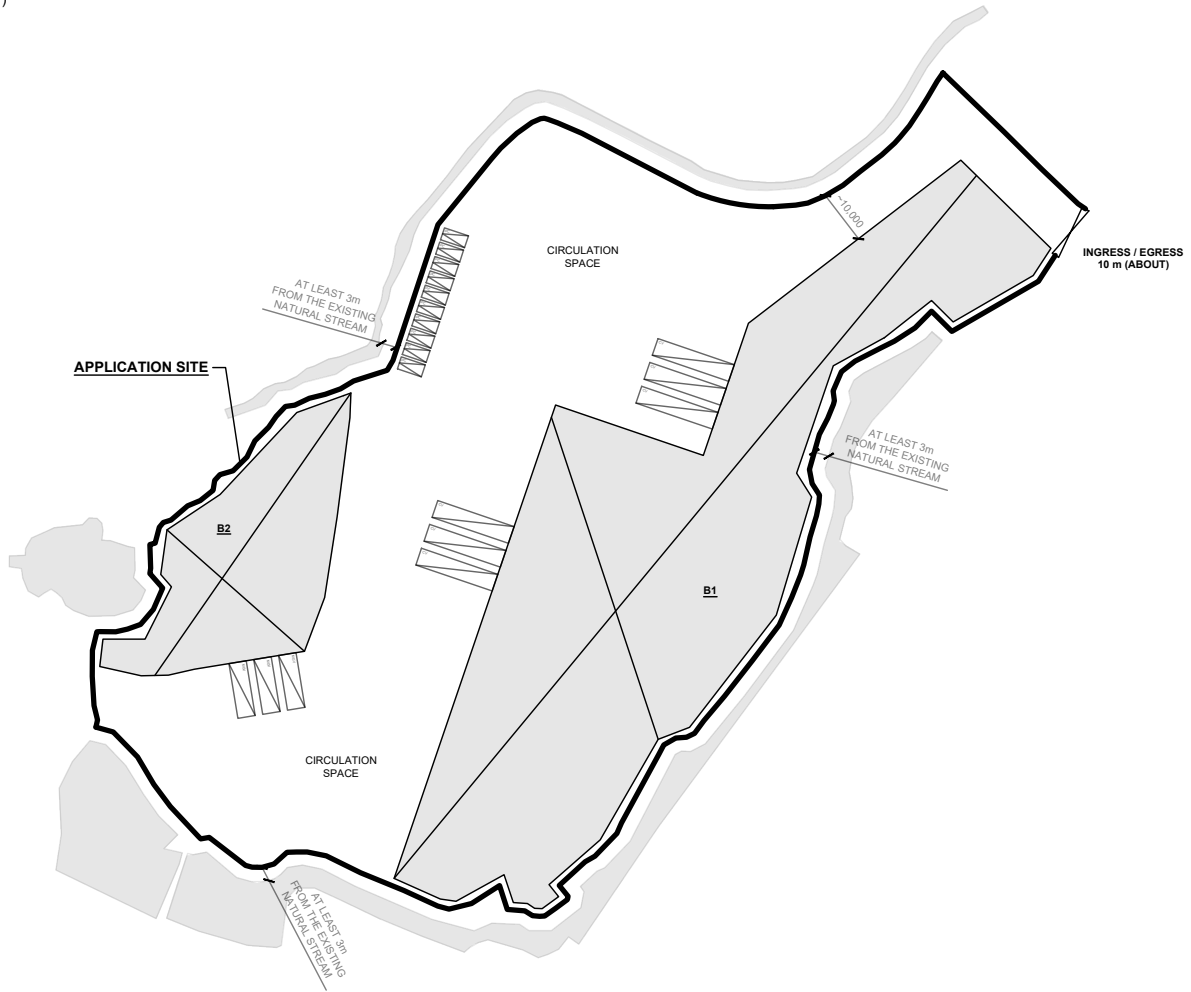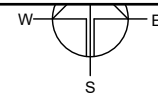
PARKING AND LOADING / UNLOADING (L/UL) PROVISIONS

NO. OF PRIVATE CAR PARKING SPACE	: 10
DIMENSION OF PARKING SPACE	: 5 m (L) x 2.5 m (W)
NO. OF L/UL SPACE FOR MEDIUM GOODS VEHICLE	: 3
DIMENSION OF L/UL SPACE	: 11 m (L) x 3.5 m (W)
NO. OF L/UL SPACE FOR CONTAINER VEHICLE	: 6
DIMENSION OF L/UL SPACE	: 16 m (L) x 3.5 m (W)

LEGEND

▢	APPLICATION SITE
⊠	STRUCTURE
▨	PARKING SPACE (PC)
MGV	L/UL SPACE (MGV)
CV	L/UL SPACE (CV)
▷◁	INGRESS / EGRESS

PLANNING CONSULTANT

R-Riches
Property Consultants Ltd.

PROJECT

PROPOSED TEMPORARY WAREHOUSE (EXCLUDING DANGEROUS GOODS GODOWN) WITH ANCILLARY FACILITIES FOR A PERIOD OF 3 YEARS AND ASSOCIATED FILLING OF LAND

SITE LOCATION

VARIOUS LOTS IN D.D.89 AND ADJOINING GOVERNMENT LAND, MAN KAM TO, NEW TERRITORIES

SCALE	
1 : 1500 @ A4	
DRAWN BY	DATE
MN	17.5.2024
REVISED BY	DATE
APPROVED BY	DATE

DWG. TITLE

LAYOUT PLAN

DWG NO.	VER.
PLAN 9	001

4 NOS. STAINLESS STEEL GRATING FIXED TO BOTTOM SLAB BY STAINLESS STEEL SCREWS

20 x 20 CHAMFER

STEPPED CHANNEL

H3

FALL

U-CHANNEL

20 THICK APPROVED CELLULAR JOINT FILLER SEALED WITH 20 x 20 Tk POLYSULPHIDE JOINT SEALANT

500 + GREATER OF H1 OR H2

A

FALL

FALL

A

20 THICK APPROVED CELLULAR JOINT FILLER SEALED WITH 20 x 20 Tk POLYSULPHIDE JOINT SEALANT

FALL

H4

STEPPED OR U-CHANNEL OR PIPE

U-CHANNEL

500 + GREATER OF H3 OR H4

PLAN
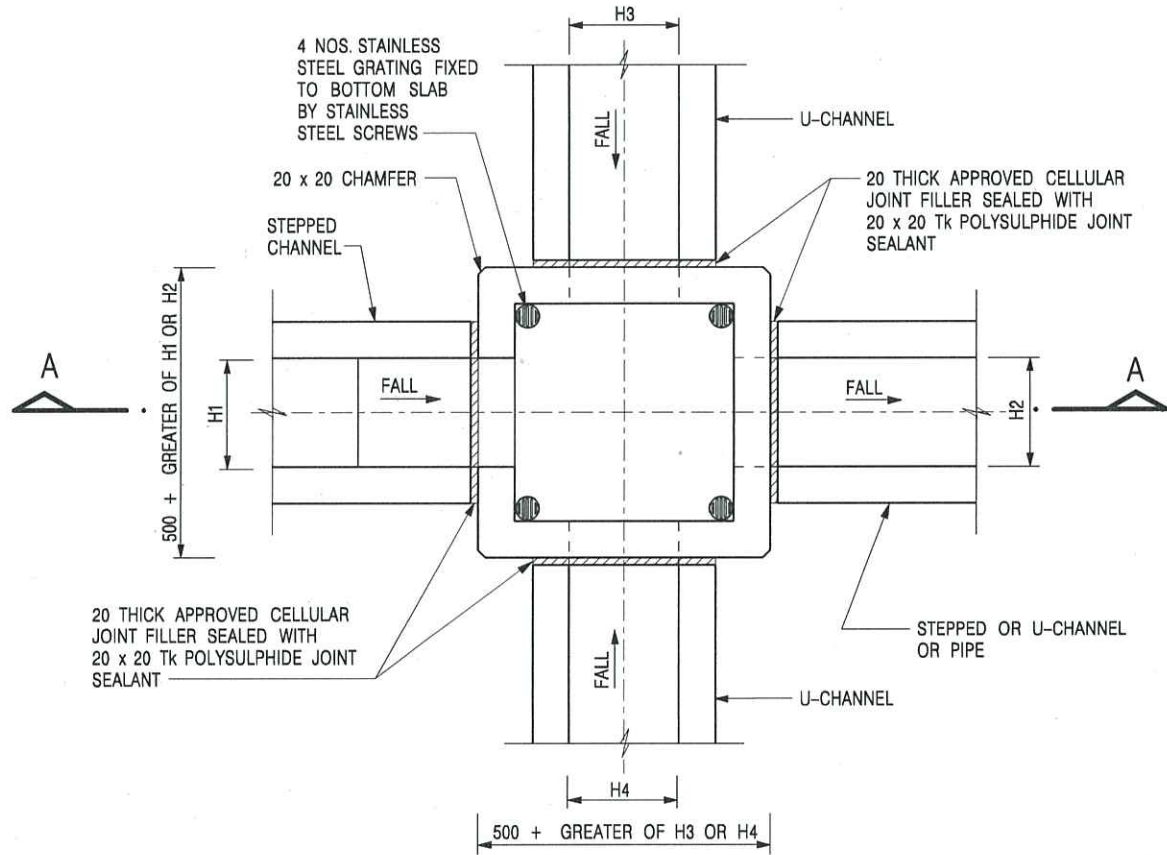
NOMINAL SIZE (LARGEST OF H1, H2, H3 & H4)	B
300 – 600	150
675 – 900	175

20 THICK APPROVED CELLULAR JOINT FILLER SEALED WITH 20 x 20 Tk POLYSULPHIDE JOINT SEALANT

100

100

20 x 20 CHAMFERS ON ALL SIDES

100 MIN.

350 (OR 650 FOR CATCHPIT CONSTRUCTED ON OR ADJACENT TO A FOOTPATH)

A252 MESH OR EQUIVALENT

FALL

FALL

300 BELOW LOWEST INVERT

B

25 DIA. DRAIN PIPES

SECTION A – A
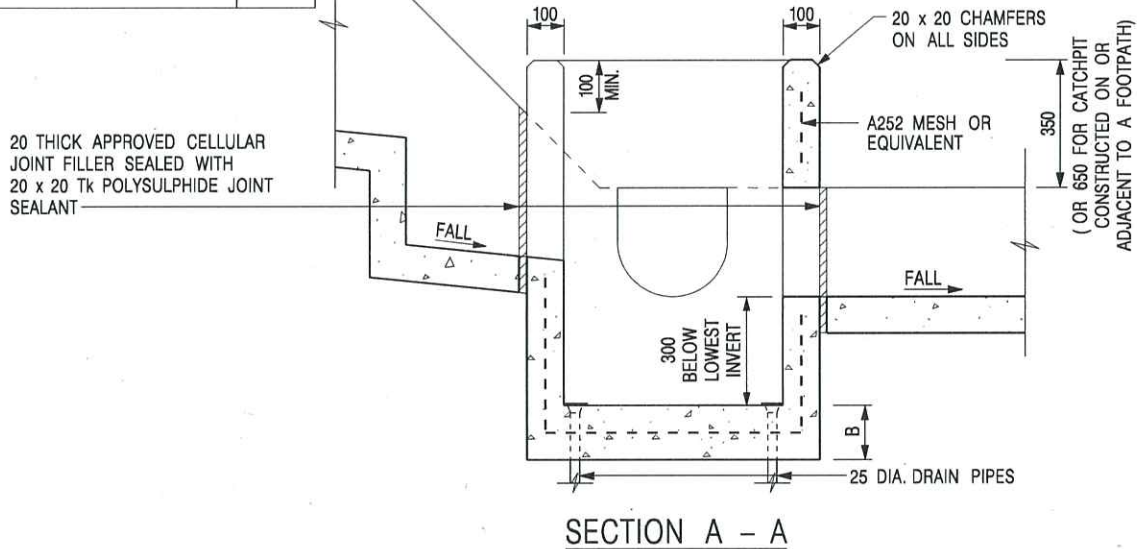
NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.

2. REFER TO SHEET 2 FOR OTHER NOTES.

–	FORMER DRG. NO. C2406J.		Original Signed	03.2015
REF.	REVISION		SIGNATURE	DATE

CATCHPIT WITH TRAP

(SHEET 1 OF 2)

CEDD CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

SCALE 1 : 20

DATE JAN 1991

DRAWING NO. C2406 /1

卓越工程 建設香港

We Engineer Hong Kong's Development

DEPTH OF RECESS AND DETAILS OF
PRECAST CONCRETE COVERS
(SEE STD. DRG. NO. C2407)

50   50   60 FOR
                              STEEL GRATINGS
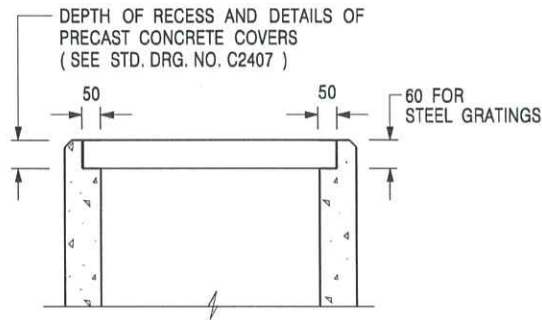
ALTERNATIVE TOP SECTION
FOR PRECAST CONCRETE COVERS / GRATINGS

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.

2. ALL CONCRETE SHALL BE GRADE 20 /20.

3. CONCRETE SURFACE FINISH SHALL BE CLASS U2 OR F2 AS APPROPRIATE.

4. FOR DETAILS OF JOINT, REFER TO STD. DRG. NO. C2413.

5. CONCRETE TO BE COLOURED AS SPECIFIED.

6. UNLESS REQUESTED BY THE MAINTENANCE PARTY AND AS DIRECTED BY
   THE ENGINEER, CATCHPIT WITH TRAP IS NORMALLY NOT PREFERRED
   DUE TO PONDING PROBLEM.

7. UPON THE REQUEST FROM MAINTENANCE PARTY, DRAIN PIPES AT CATCHPIT
   BASE CAN BE USED BUT THIS IS FOR CATCHPITS LOCATED AT SLOPE TOE
   ONLY AND AS DIRECTED BY THE ENGINEER.

8. FOR CATCHPITS CONSTRUCTED ON OR ADJACENT TO A FOOTPATH,
   STEEL GRATINGS (SEE DETAIL 'A' ON STD. DRG. NO. C2405 /2) OR
   CONCRETE COVERS (SEE STD. DRG. NO. C2407) SHALL BE PROVIDED
   AS DIRECTED BY THE ENGINEER.

9. IF INSTRUCTED BY THE ENGINEER, HANDRAILING (SEE DETAIL 'J'
   ON STD. DRG. NO. C2405 /5; EXCEPT ON THE UPSLOPE SIDE) IN LIEU OF
   STEEL GRATINGS OR CONCRETE COVERS CAN BE ACCEPTED AS AN ALTERNATIVE
   SAFETY MEASURE FOR CATCHPITS NOT ON A FOOTPATH NOR ADJACENT TO IT.
   TOP OF THE HANDRAILING SHALL BE 1 000 mm MIN. MEASURED FROM THE
   ADJACENT GROUND LEVEL.

10. MINIMUM INTERNAL CATCHPIT WIDTH SHALL BE 1 000 mm FOR CATCHPITS
    WITH A HEIGHT EXCEEDING 1 000 mm MEASURED FROM THE INVERT LEVEL
    TO THE ADJACENT GROUND LEVEL. AND, STEP IRONS (SEE DSD STD. DRG.
    NO. DS1043) AT 300 c/c STAGGERED SHALL BE PROVIDED.
    THICKNESS OF CATCHPIT WALL FOR INSTALLATION OF STEP IRONS SHALL
    BE INCREASED TO 150 mm.

11. FOR RETROFITTING AN EXISTING CATCHPIT WITH STEEL GRATING,
    SEE DETAIL 'G' ON STD. DRG. NO. C2405 /4.

12. SUBJECT TO THE APPROVAL OF THE ENGINEER, OTHER MATERIALS
    CAN ALSO BE USED AS COVERS / GRATINGS.

REF.	REVISION	SIGNATURE	DATE
A	MINOR AMENDMENT.	Original Signed	04.2016
–	FORMER DRG. NO. C2406J.	Original Signed	03.2015

CATCHPIT WITH TRAP

(SHEET 2 OF 2)

**CIVIL ENGINEERING AND
DEVELOPMENT DEPARTMENT**

CEDD

SCALE 1 : 20	DRAWING NO.
DATE JAN 1991	C2406 /2A

卓越工程 建設香港   We Engineer Hong Kong's Development

BERM WIDTH VARIES (1000 MIN.)

80 x 60 x 2.2 DIA. GALVANIZED AND PVC COATED DOUBLE TWISTED WIRE MESH

50 THICK MASONRY FACING ON 50 MIN. THICK CEMENT MORTAR (SET IN 1 : 3 CEMENT / SAND), OR 75 THICK CONCRETE APRON, AS SPECIFIED; ALL TO BE OMITTED IF THIS AREA IS SPRAYED CONCRETE

75 THICK CONCRETE SLAB

BRUSHED FINISH OR AS OTHERWISE DIRECTED

150

25 x 25 CHAMFER

100

FINISHED SLOPE PROFILE

FIXING PIN

NON-BIODEGRADABLE EROSION CONTROL MAT

50 MIN. THICK CEMENT MORTAR

500

200

H/2

H/2 MIN.

E

B

10

1

POLYTHENE SHEET

T   H   T

U-CHANNELS CONSTRUCTED ON BERM

HANDRAILING (SEE STD. DRG. NO. C2103)

200

EXTENT OF WIRE MESH SHALL BE 1 500 OR BERM WIDTH WHICHEVER IS THE LESSER

A252 MESH

25 x 25 CHAMFER

200

300

1000

300

50

POLYTHENE SHEET

DETAILS OF BERM WITH HANDRAILING

80 x 60 x 2.2 DIA. GALVANIZED AND PVC COATED DOUBLE TWISTED WIRE MESH

NON-BIODEGRADABLE EROSION CONTROL MAT

FINISHED SLOPE PROFILE

FIXING PIN

50 MIN. THICK CEMENT MORTAR

500

200

50 THICK MASONRY FACING ON 50 MIN. THICK CEMENT MORTAR (SET IN 1 : 3 CEMENT / SAND), OR 75 THICK CONCRETE APRON, AS SPECIFIED; ALL TO BE OMITTED IF THIS AREA IS SPRAYED CONCRETE

D

E

15

H/2

H/2 MIN.

500

200

50 DIA. PVC PIPES AT 1500 c / c WITH FALL OF 1 ON 3 WHERE D > 600

80 x 60 x 2.2 DIA. GALVANIZED AND PVC COATED DOUBLE TWISTED WIRE MESH

NON-BIODEGRADABLE EROSION CONTROL MAT

FIXING PIN

50 MIN. THICK CEMENT MORTAR

T   H   T

U-CHANNELS NOT CONSTRUCTED ON BERM

15

H/2

B

T   H   T

HALF-ROUND CHANNEL

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.

2. ALL CONCRETE TO BE GRADE 20 / 20.

3. CONCRETE SURFACE FINISH SHALL BE CLASS U2, F2 OR BRUSHED FINISH AS DIRECTED.

4. SPACING OF EXPANSION JOINT IN CHANNELS, BERM SLABS AND APRONS TO BE 10 METRES MAXIMUM, SEE STD. DRG. NO. C2413 FOR DETAILS.

5. JOINTS FOR CHANNELS, BERM SLABS, APRONS AND WALLS, ETC. TO BE ON THE SAME ALIGNMENT.

6. FOR DIMENSIONS T, H, & B, SEE TABLE BELOW.

7. BIODEGRADABLE EROSION CONTROL MAT IF REQUIRED, SEE STD. DRG. NO. C2511/1E.

8. CONCRETE TO BE COLOURED AS SPECIFIED.

9. CONCRETE U-CHANNEL CAN BE CAST IN-SITU OR PRECAST CONCRETE SUBJECT TO THE ENGINEER'S AGREEMENT ON THE DETAILS.

10. DETAILS OF EROSION CONTROL MAT AND WESH MESH ON BERM. (SEE STD DRG. NO. C2511/1E)

NOMINAL SIZE H	T	B	REINFORCEMENT
300	80	100	A252 MESH PLACED CENTRALLY AND T=100 WHEN E > 650
375 – 600	100	150	
675 – 900	125	175	A252 MESH PLACED CENTRALLY

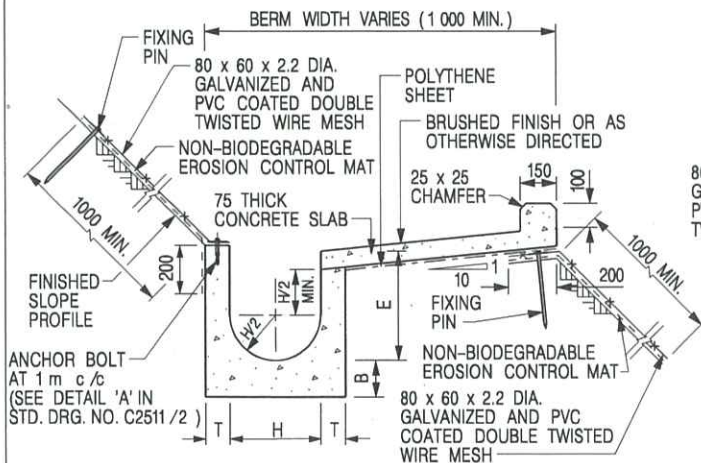## DETAILS OF HALF-ROUND AND U-CHANNELS (TYPE A – WITH MASONRY APRON)

CEDD

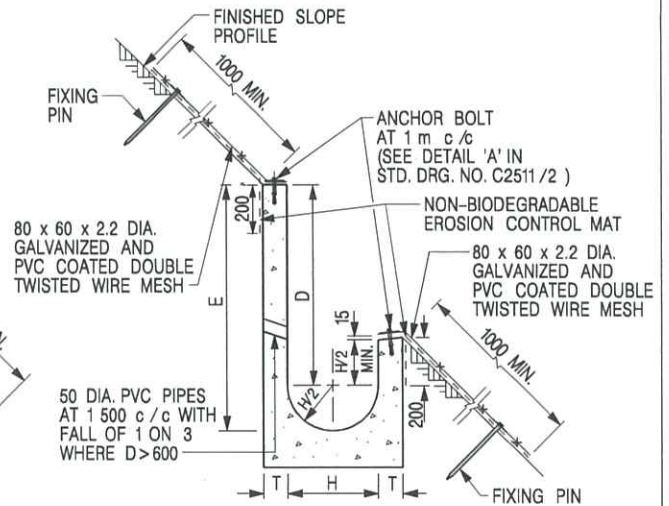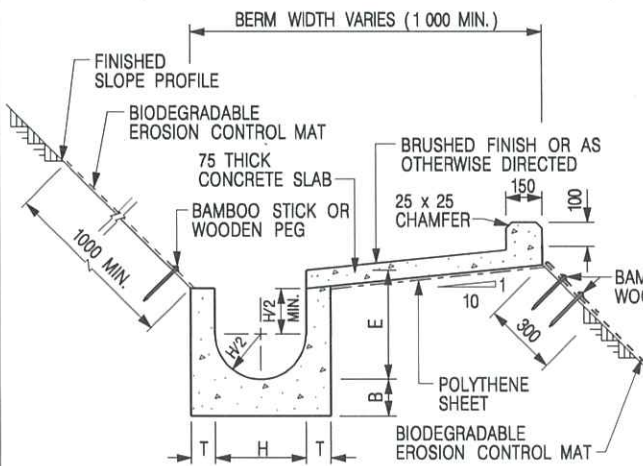**CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT**

SCALE 1 : 25

DATE JAN 1991

DRAWING NO. C2409I

卓越工程 建設香港

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U-CHANNELS CONSTRUCTED ON BERM WITH NON-BIODEGRADABLE EROSION CONTROL MAT

Labels: FIXING PIN; 80 x 60 x 2.2 DIA. GALVANIZED AND PVC COATED DOUBLE TWISTED WIRE MESH; NON-BIODEGRADABLE EROSION CONTROL MAT; POLYTHENE SHEET; BRUSHED FINISH OR AS OTHERWISE DIRECTED; 25 x 25 CHAMFER; 150; 100; 75 THICK CONCRETE SLAB; BERM WIDTH VARIES (1 000 MIN.); 1000 MIN.; FINISHED SLOPE PROFILE; 200; H/2 MIN.; H/2; E; B; 10; 1; FIXING PIN; 200; 1000 MIN.; NON-BIODEGRADABLE EROSION CONTROL MAT; ANCHOR BOLT AT 1 m c/c (SEE DETAIL 'A' IN STD. DRG. NO. C2511/2); 80 x 60 x 2.2 DIA. GALVANIZED AND PVC COATED DOUBLE TWISTED WIRE MESH; T; H; T

U-CHANNELS NOT CONSTRUCTED ON BERM WITH NON-BIODEGRADABLE EROSION CONTROL MAT

Labels: FINISHED SLOPE PROFILE; 1000 MIN.; FIXING PIN; ANCHOR BOLT AT 1 m c/c (SEE DETAIL 'A' IN STD. DRG. NO. C2511/2); NON-BIODEGRADABLE EROSION CONTROL MAT; 80 x 60 x 2.2 DIA. GALVANIZED AND PVC COATED DOUBLE TWISTED WIRE MESH; 200; E; D; H/2 MIN.; 15; H/2; 1000 MIN.; 200; 80 x 60 x 2.2 DIA. GALVANIZED AND PVC COATED DOUBLE TWISTED WIRE MESH; 50 DIA. PVC PIPES AT 1 500 c/c WITH FALL OF 1 ON 3 WHERE D > 600; FIXING PIN; T; H; T

U-CHANNELS CONSTRUCTED ON BERM WITH BIODEGRADABLE EROSION CONTROL MAT

Labels: BERM WIDTH VARIES (1 000 MIN.); FINISHED SLOPE PROFILE; BIODEGRADABLE EROSION CONTROL MAT; 75 THICK CONCRETE SLAB; BAMBOO STICK OR WOODEN PEG; 1000 MIN.; BRUSHED FINISH OR AS OTHERWISE DIRECTED; 25 x 25 CHAMFER; 150; 100; 10; 1; 300; BAMBOO STICK OR WOODEN PEG; POLYTHENE SHEET; BIODEGRADABLE EROSION CONTROL MAT; H/2 MIN.; H/2; E; B; T; H; T

U-CHANNELS NOT CONSTRUCTED ON BERM WITH BIODEGRADABLE EROSION CONTROL MAT

Labels: FINISHED SLOPE PROFILE; 1000 MIN.; BAMBOO STICK OR WOODEN PEG; BIODEGRADABLE EROSION CONTROL MAT; E; D; 15; H/2 MIN.; H/2; 300; 1000 MIN.; 50 DIA. PVC PIPES AT 1 500 c/c WITH FALL OF 1 ON 3 WHERE D > 600; BAMBOO STICK OR WOODEN PEG; T; H; T

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.

2. ALL CONCRETE TO BE GRADE 20/20.

3. CONCRETE SURFACE FINISH SHALL BE CLASS U2, F2 OR BRUSHED FINISH AS DIRECTED.

4. SPACING OF EXPANSION JOINT IN CHANNELS, BERM SLABS AND APRONS TO BE 10 METRES MAXIMUM, SEE STD. DRG. NO. C2413 FOR DETAILS.

5. JOINTS FOR CHANNELS, BERM SLABS, APRONS AND WALLS, ETC. TO BE ON THE SAME ALIGNMENT.

6. FOR DIMENSIONS T, H, & B, SEE TABLE BELOW.

7. FOR TYPICAL FIXING PIN DETAILS, SEE STD. DRG. NO. C2511/2.

8. MINIMUM SIZE OF 25 x 50 x 300mm SHALL BE PROVIDED FOR WOODEN PEG.

9. MINIMUM SIZE OF 10mm DIAMETER WITH 200mm LONG SHALL BE PROVIDED FOR BAMBOO STICK.

10. THE FIXING DETAILS OF NON-BIODEGRADABLE AND BIODEGRADABLE EROSION CONTROL MATS ON EXISTING BERM SHALL REFER TO STD. DRG. NO. C2511/1.

NOMINAL SIZE H	T	B	REINFORCEMENT
300	80	100	A252 MESH PLACED CENTRALLY AND T=100 WHEN E > 650
375 – 600	100	150	
675 – 900	125	175	A252 MESH PLACED CENTRALLY

DETAILS OF HALF-ROUND AND U-CHANNELS (TYPE B – WITH EROSION CONTROL MAT APRON)

CEDD

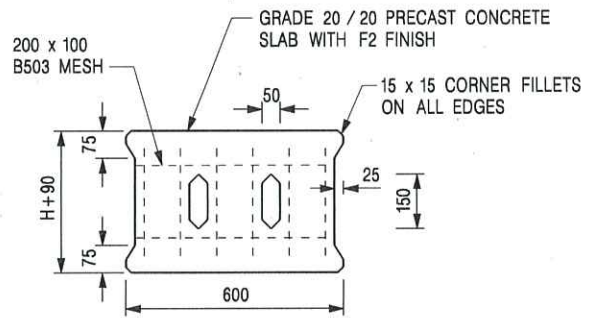**CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT**

SCALE	DIAGRAMMATIC	DRAWING NO.
DATE	JAN 1991	C2410I

卓越工程 建設香港

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TYPICAL SECTION

SLAB REINFORCED WITH ONE LAYER OF B503 MESH PLACED CENTRALLY

PLAN OF SLAB

200 x 100 B503 MESH

GRADE 20 / 20 PRECAST CONCRETE SLAB WITH F2 FINISH

15 x 15 CORNER FILLETS ON ALL EDGES
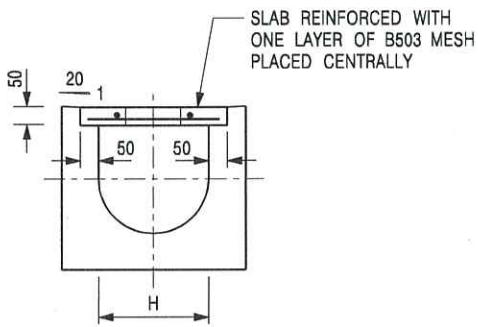
U–CHANNELS WITH PRECAST CONCRETE SLABS
(UP TO H OF 525)

REBATE TO SUIT GRATING THICKNESS

40 X 40 HOT DIP GALVANISED ANGLE

MIN. 40 THICK CAST IRON GRATING

TYPICAL SECTION

CAST IRON GRATING

WIDTH $H+90$

75 % WIDTH
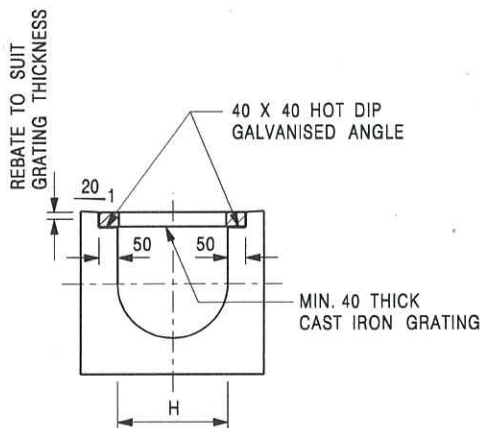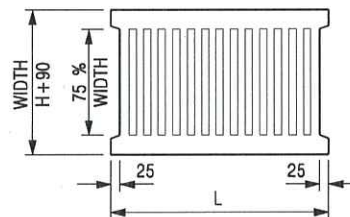
L = 600mm FOR H ≤ 375mm
L = 400mm FOR H > 375mm

U–CHANNEL WITH CAST IRON GRATING

(DIMENSIONS ARE FOR GUIDANCE ONLY, CONTRACTOR MAY SUBMIT EQUIVALENT TYPE)

(UP TO H OF 525)

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.

2. H = NOMINAL CHANNEL SIZE.

3. ALL CAST IRON FOR GRATINGS SHALL BE GRADE EN-GJL-150 COMPLYING WITH BS EN 1561.

4. FOR COVERED CHANNELS TO BE HANDED OVER TO HIGHWAYS DEPARTMENT FOR MAINTENANCE, THE GRATING DETAILS SHALL FOLLOW THOSE AS SHOWN ON HyD STD. DRG. NO. H3156.

REF.	REVISION	SIGNATURE	DATE
E	NOTES 3 & 4 AMENDED.	Original Signed	12.2014
D	NOTE 4 ADDED.	Original Signed	06.2008
C	MINOR AMENDMENT. NOTE 3 ADDED.	Original Signed	12.2005
B	NAME OF DEPARTMENT AMENDED.	Original Signed	01.2005
A	CAST IRON GRATING AMENDED.	Original Signed	12.2002

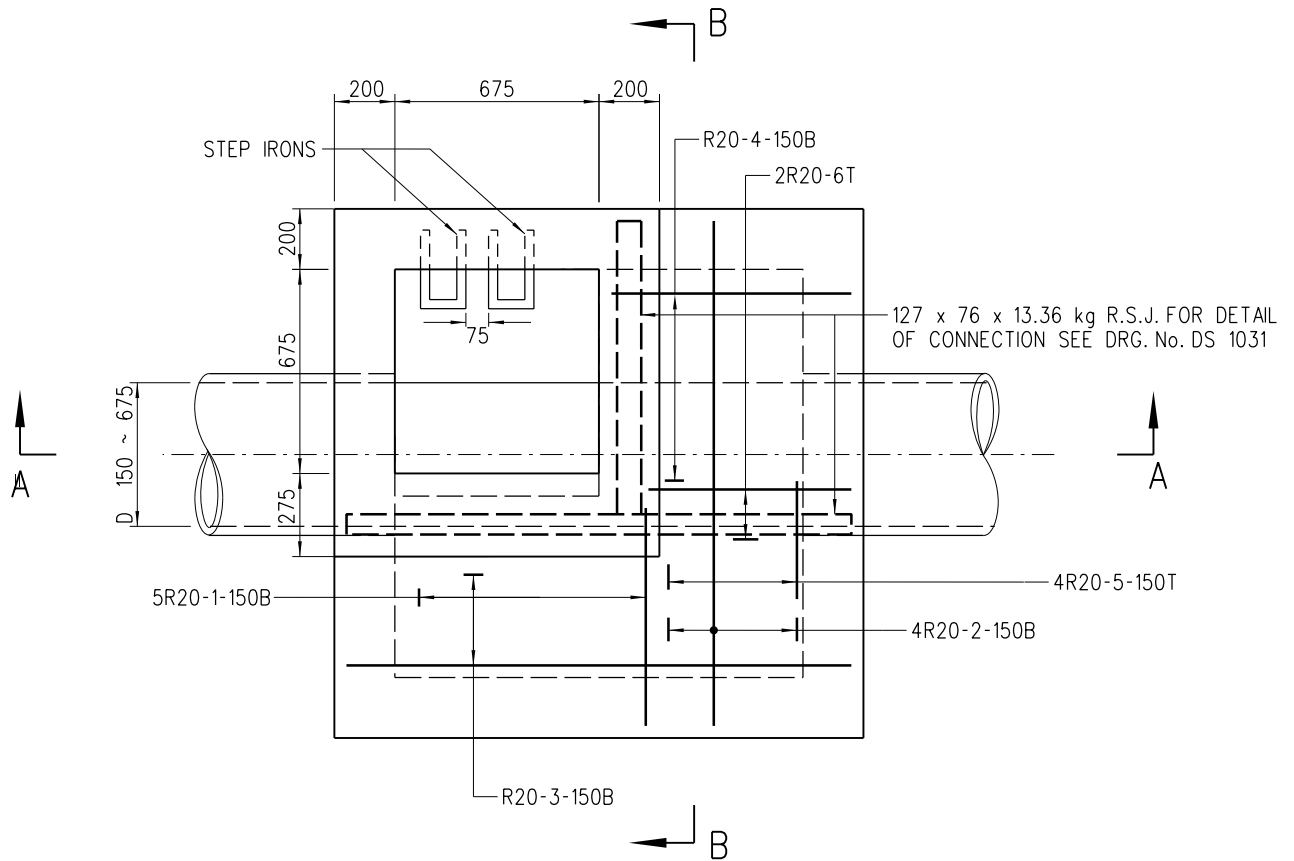# COVER SLAB AND CAST IRON GRATING FOR CHANNELS

CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

CEDD

SCALE	1 : 20	DRAWING NO.
DATE	JAN 1991	C2412E

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PLAN

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.

2. NOTATION OF REINFORCEMENT : THE SEQUENCE OF DESCRIPTION OF IDENTIFICATION MARKS ON DRAWINGS FOR STEEL REINFORCING BARS FOR CONCRETE WORK IS AS FOLLOWS (NUMBER, TYPE, SIZE, MARK, SPACING, LOCATION OR COMMENT)

3. B DENOTES GRADE 500B RIBBED REINFORCEMENT.

4. R DENOTES GRADE 250 PLAIN REINFORCEMENT.

5. PIPE DIAMETER : 150 TO 675 mm

6. NORMAL RANGE OF DEPTH : 2 500 TO 3700 mm (MEASURED FROM ROAD LEVEL TO LOWEST INVERT)

7. USED IN : STORMWATER DRAIN AND SEWER

8. JUNCTION : POSITION OF JUNCTION TO BE DETERMINED IN EACH INDIVIDUAL CASE. CHANNELS IMMEDIATELY UNDER ACCESS TO MANHOLE SHOULD BE AVOIDED.

9. TOP TREATMENT : SEE DRG. No. DS 1032

10. FOUNDATION : FOUNDATION OF MANHOLE VARIES WITH SITE CONDITION. THEREFORE, IT SHOULD BE DETERMINED ON SITE BY THE ENGINEER.

11. CONCRETE : GRADE 30/20

12. ALL BAR MARKS APPEARED HEREON ARE USED FOR REFERENCE IN THIS DRAWING ONLY.

13. MINIMUM COVER AT END OF BARS 40 mm

14. COVER AND FRAME NOT SHOWN ON PLAN FOR CLARITY.

15. RECESS WITH SQUARE STEEL ROD SHALL BE PROVIDED AT TOP OF MANHOLE CHAMBER FOR INSTALLING MONITORING DEVICE(S). DETAILS REFER TO DSD STANDARD DRAWING NO. DS 1099.

REV.	DESCRIPTION	SIGNATURE	DATE
C	NOTE 15 ADDED	ORIGINAL SIGNED	2.8.2022
B	NOTE 11 DELETED NOTES 2, 3 & 4 ADDED	ORIGINAL SIGNED	29.4.2015
A	NOTE 11 REVISED	ORIGINAL SIGNED	24.11.2014
	NEW ISSUE	ORIGINAL SIGNED	15.8.2007

STANDARD MANHOLE
TYPE F1

DRAINAGE SERVICES DEPARTMENT

REFERENCE

SCALE 1 : 25

DRAWING No.

DS 1081C
(SHEET 1 OF 3)

200 | 675 | 200

MANHOLE COVER AND FRAME REF. DRG. No. DS 1077

ROAD LEVEL

600

150 APPROX.

300

VARIES

4

260

200 | 675 | 200

STEP IRONS AT
300 c/c STAGGERED

CHAMFER 25

2

COVER 50

2

127 x 76 x 13.36 kg R.S.J.

200 | 1 350 | 200

3 750 MAX.

1 500

D = 150 ~ 675

FALL

225

SECTION A-A

BAR MARKS	SHAPE CODE ○
5 & 6	⑳
2 & 3	㉟
1 & 4	㊵

C	NOTE 15 ADDED	ORIGINAL SIGNED	2.8.2022
B	NOTE 11 DELETED NOTES 2, 3 & 4 ADDED	ORIGINAL SIGNED	29.4.2015
A	NOTE 11 REVISED	ORIGINAL SIGNED	24.11.2014
	NEW ISSUE	ORIGINAL SIGNED	15.8.2007
REV.	DESCRIPTION	SIGNATURE	DATE

STANDARD MANHOLE
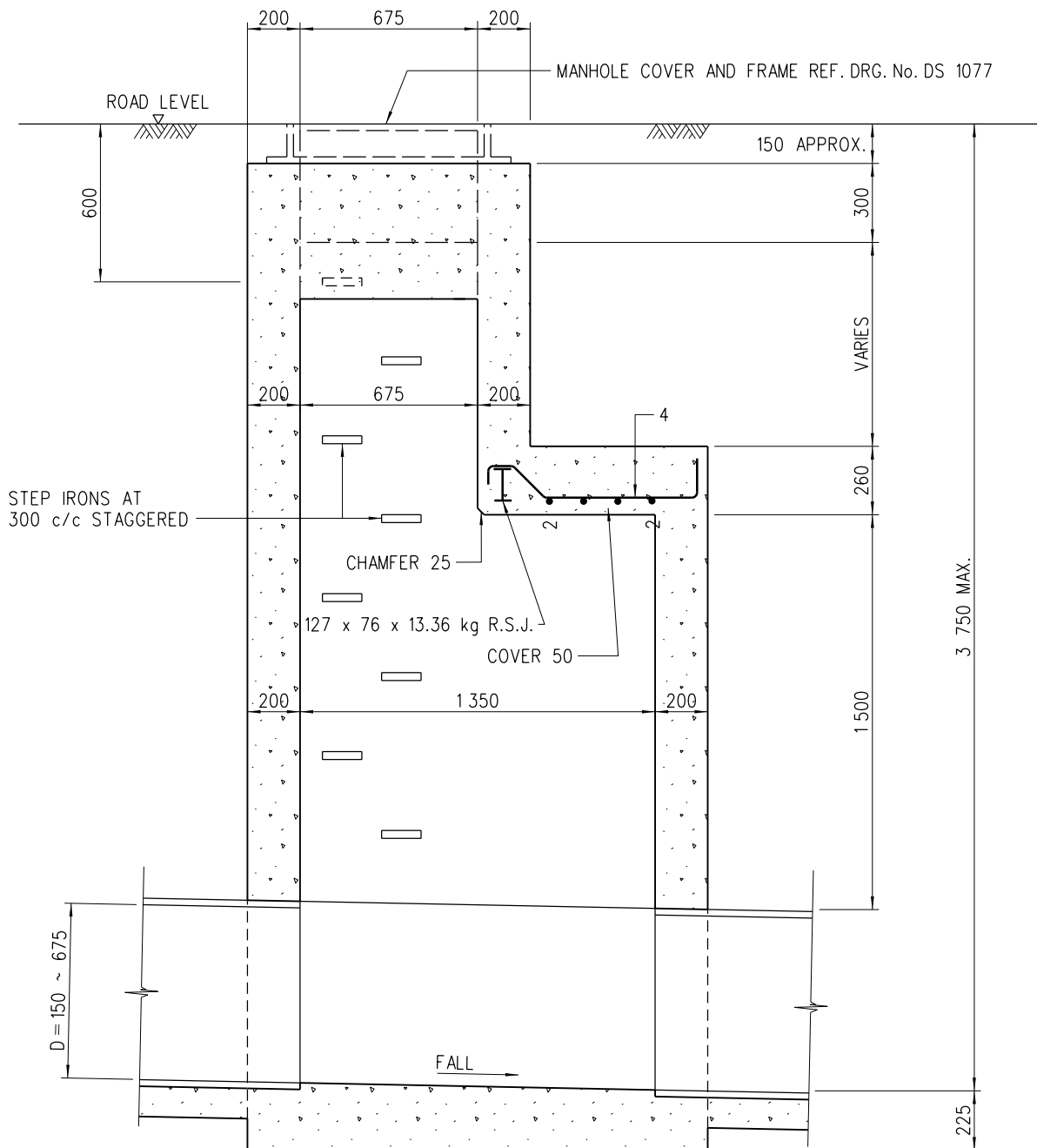TYPE F1

DRAINAGE SERVICES DEPARTMENT
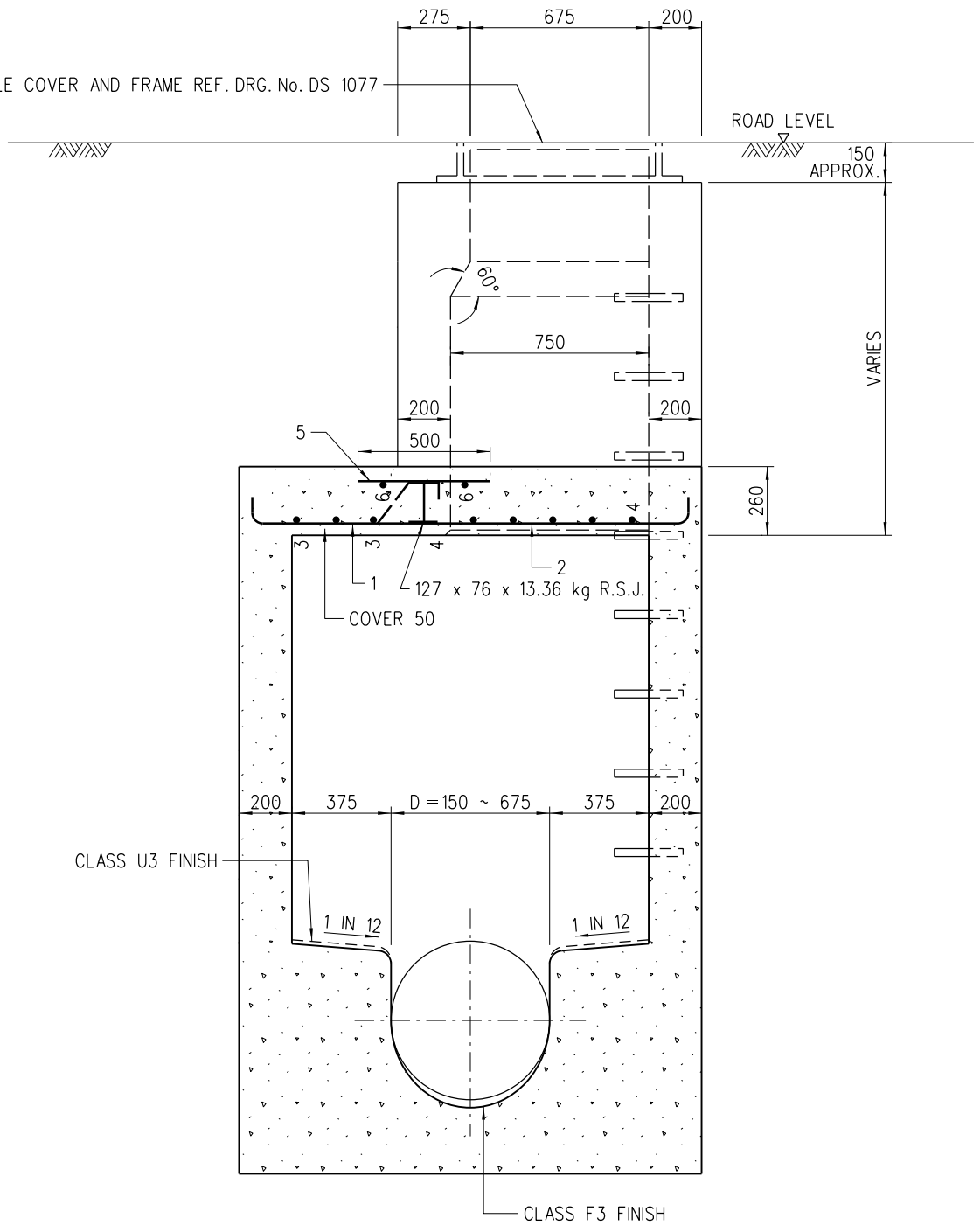
REFERENCE	DRAWING No.
SCALE 1 : 25	DS 1081C (SHEET 2 OF 3)

MANHOLE COVER AND FRAME REF. DRG. No. DS 1077

275   675   200

ROAD LEVEL

150
APPROX.

60°

750

VARIES

200   200

500

5

260

9   9   4

3   3   4   2

1   127 x 76 x 13.36 kg R.S.J.

COVER 50

200   375   D = 150 ~ 675   375   200

CLASS U3 FINISH

1 IN 12   1 IN 12

CLASS F3 FINISH

SECTION B-B

DRAINAGE SERVICES DEPARTMENT

STANDARD MANHOLE
TYPE F1

REFERENCE

DRAWING No.

DS 1081C

SCALE
1 : 25

(SHEET 3 OF 3)