

**Proposed Temporary Public Vehicle Park
(Excluding Container Vehicle)
For a Period of 3 Years at Part of
Lot Nos. 1111, 1112 RP, 1113 RP, 1116 RP and 1117S.A.
In D.D.125, Yuen Long**

**Drainage Impact Assessment on
Proposed Surface Drainage Outflow
(Rev. A)**

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- A Proposed Drainage Details for the Application Site
- B Checking of Existing U-channel Capacity with Enlarged Runoff

1. INTRODUCTION

Application for the proposed temporary public vehicle park (excluding container vehicle) has been submitted to DLO, for a period of 3 years at part of Lots 1111, 1112 RP, 1113 RP, 1116RP and 1117 S.A. in DD125. The extent for the application is given in Figure 1 in **Appendix A**.

In response to DSD's comment, this report is prepared to

- (a) Identify the existing channel/gully and provide site record photos.
- (b) Demonstrate with hydraulic calculation that the proposed and existing drainage facilities are adequate to collect, convey and discharge the surface runoff.

2. REVIEW OF THE CATCHMENT AREA AND EXISTING RUNOFF

2.1 Existing Surface Drainage

According to the latest proposal, the surface runoff of the proposed site will be intercepted and discharge to the nearby DSD 600UC to the southeast of the area, and the 600UC discharge to a nullah via a 600 mm diameter concrete pipe. Based on the field survey, the 600UC has a gradient greater than **1 in 150**.

The existing record plates are given as the following plates, and the location of photo taken is presented in Figure A.

Figure A – Location of Photos

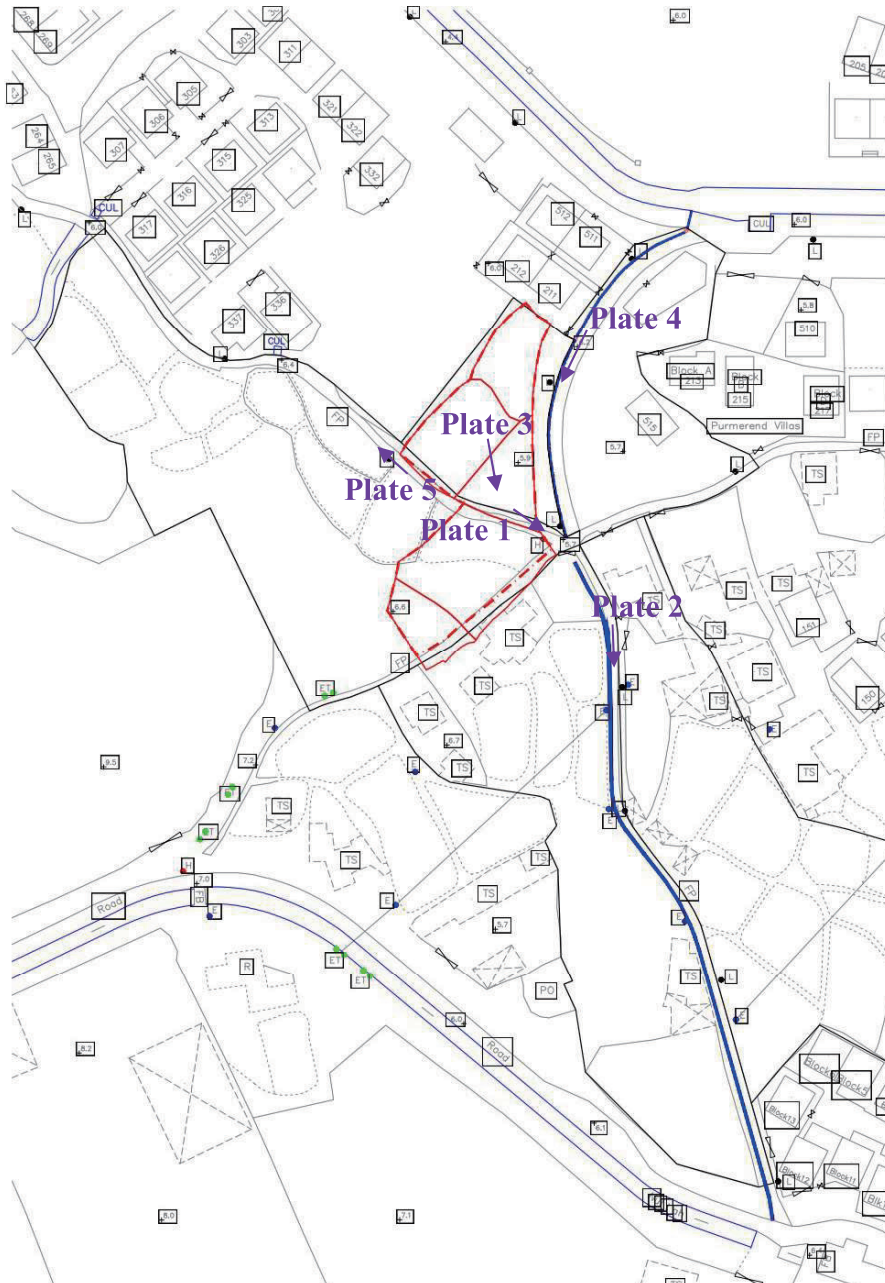


Plate 1 – The inlets of the existing 600UC



Plate 2 – General view of the 600UC



Plate 3 – General view of the catchment to the west of application site



Plate 4 – General view of the catchment to the east of application site



Plate 5 – Irregular channel across the site and catchment looking north



2.2 Existing Catchment Collected by the Drainage Provision

The catchment collected by the terminal 600 UC maintained by DSD is as shown in the plan (scale 1 in 1000) in **Appendix B**.

According to the proposal, the existing 600 UC will collect more runoff from the northern side of the application site and increased runoff from paved surface for the whole application site.

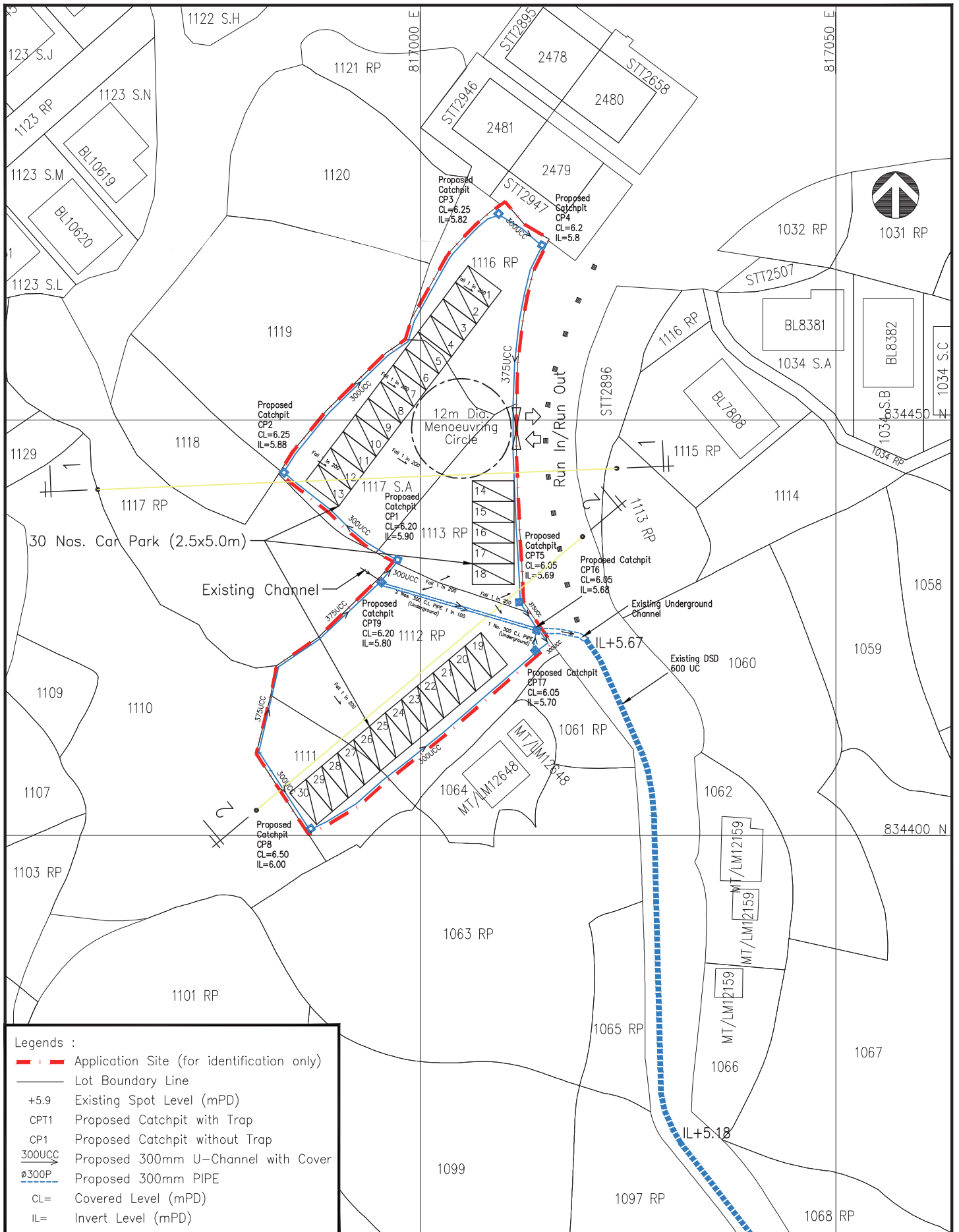
3. ASSESSMENT OF DRAINAGE CAPACITY

The runoff of 1 in 200 year return period rainstorm is calculated using rational method according to the TGN30 and latest Stormwater Drainage Manual, 2018

The design checking of the open-channel flow capacity of the existing 600UC, and the proposed drainage works are checked against the design runoff in **Appendix B**.

In summary, the flow collected by the 600UC and the pipe is less than the design capacity. The capacity of the new constructed 375 UC and 300UC within the application is adequate.

Appendix A -



Legends :

- Application Site (for identification only)
- Lot Boundary Line
- +5.9 Existing Spot Level (mPD)
- CPT1 Proposed Catchpit with Trap
- CP1 Proposed Catchpit without Trap
- Proposed 300mm U-Channel with Cover
- Proposed 300mm PIPE
- CL= Covered Level (mPD)
- IL= Invert Level (mPD)

Project :
 Temporary Public Vehicle Park (excluding Container Vehicle) for a Period of 3 Years will Filling of Land IN "Village Type Development" Zone, Lot Nos. 1111 (Part), 1112 (Part), 1113 RP (Part), 1116 RP (Part) and 1117 S.A in D.D.125, Ha Tseun, Yuen Long.

Consultant :

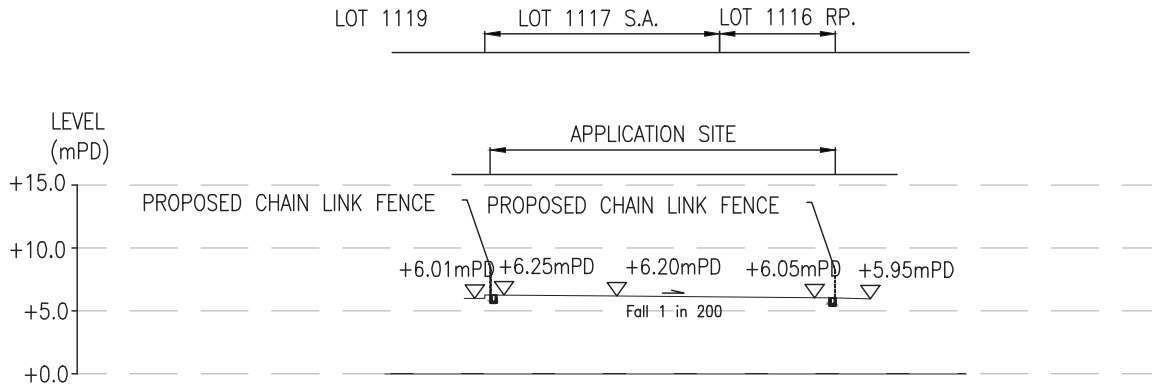


Drawing Title : Drainage Layout Plan

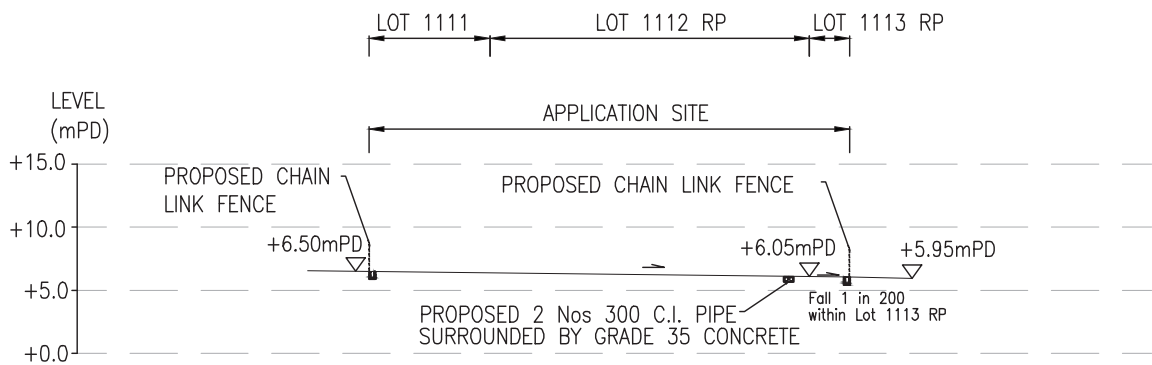
Drawing No. Figure 1

Date : Nov. 2023

Scale : 1:600



SECTION 1-1



SECTION 2-2

Project :
 Proposed Temporary Hardware Processing Workshop with Ancillary Office for a Period of 3 Years in "Other Specified Uses" annotated "Enterprise and Technology Park" Zone and area shown as 'Road', Lot Nos. 1373 (Part), 1375 (Part), 1376 (Part), 1377 (Part) and 1378 (Part) in D.D.124, Ha Tseun, Yuen Long.

Consultant :



Drawing Title : Sections

Drawing No. Figure 2

Date : NOV. 2023

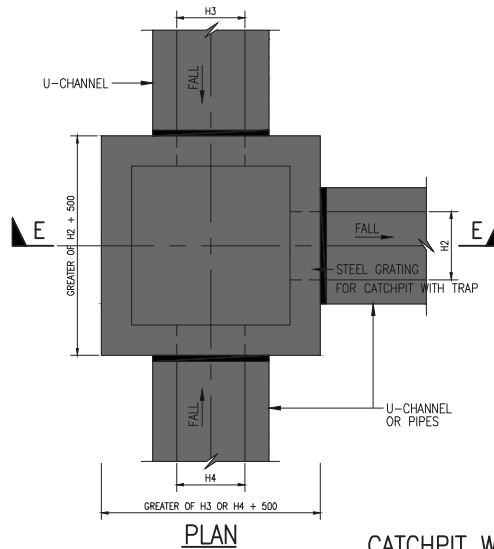
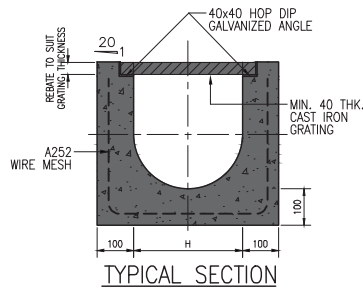
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NOTES FOR CATCHPIT

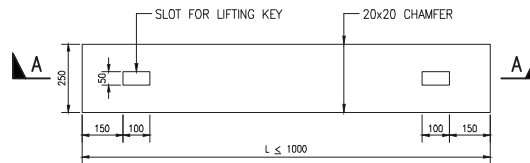
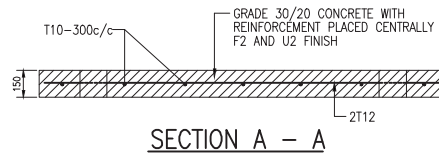
1. ALL CONCRETE SHALL BE GRADE C35 AND COMPLY WITH CS1:2010.
2. MINIMUM CONCRETE COVER SHALL BE 40mm.
3. ALL REINFORCEMENT (GRADE 500B) TO BE HIGH TENSILE DEFORMED BAR.
ALL REINFORCEMENT SHALL COMPLY WITH CS2:2012.
ALL WIRE MESH SHALL BE GRADE 500B STEEL COMPLY WITH CS2:2012.
4. RUN OFF FROM THIS SITE SHALL BE PROPERLY TREATED AND CONVEYED TO THE PUBLIC DRAIN VIA CATCHPIT DURING THE SITE FORMATION WORKS.

NOTES FOR U-CHANNEL

1. ALL DIMENSIONS ARE IN MILLIMETRES.
 2. FOR DIMENSIONS OF CHANNEL SEE TABLE.
- | NOMINAL SIZE H | T | B | REINFORCEMENT |
|----------------|----|-----|----------------------------|
| 225-375 | 80 | 100 | A252 MESH PLACED CENTRALLY |
3. CONCRETE SURFACE FINISH SHALL BE CLASS U2 OR F2 AS APPROPRIATE.
 4. EXPANSION JOINTS SHALL BE PROVIDED AT A MAXIMUM SPACING OF 10 METRES.
 5. X=20 UNLESS OTHERWISE SPECIFIED.
 6. ALL CONCRETE SHALL BE GRADE C35.
 7. ALL 300UC SHALL BE AT LEAST 1 IN 200
ALL 375UC SHALL BE AT LEAST 1 IN 100

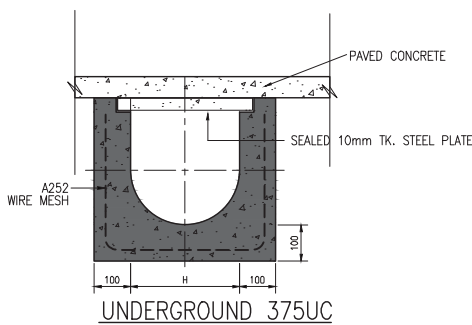
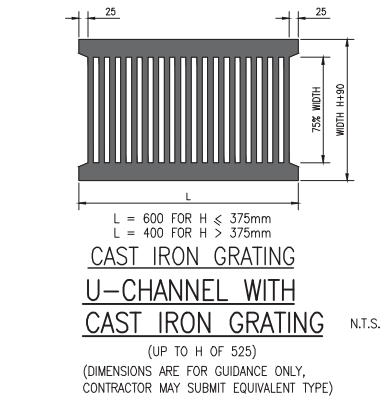
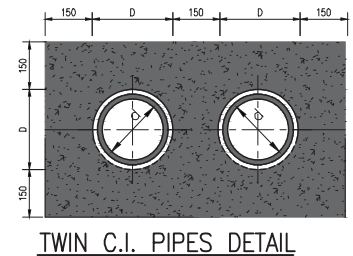
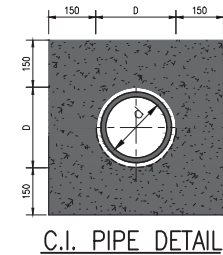


CATCHPIT WITH TRAP N.T.S.



NOTES FOR UNDERGROUND C.I. PIPE

1. CONCRETE SURROUND OF GRADE 35 CONCRETE SHALL BE PROVIDED FOR UNDERGROUND C.I. PIPE.
2. C.I. PIPE SHOULD FOLLOW BS 437:2008



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Consultant :
MC Consultants And Construction Limited

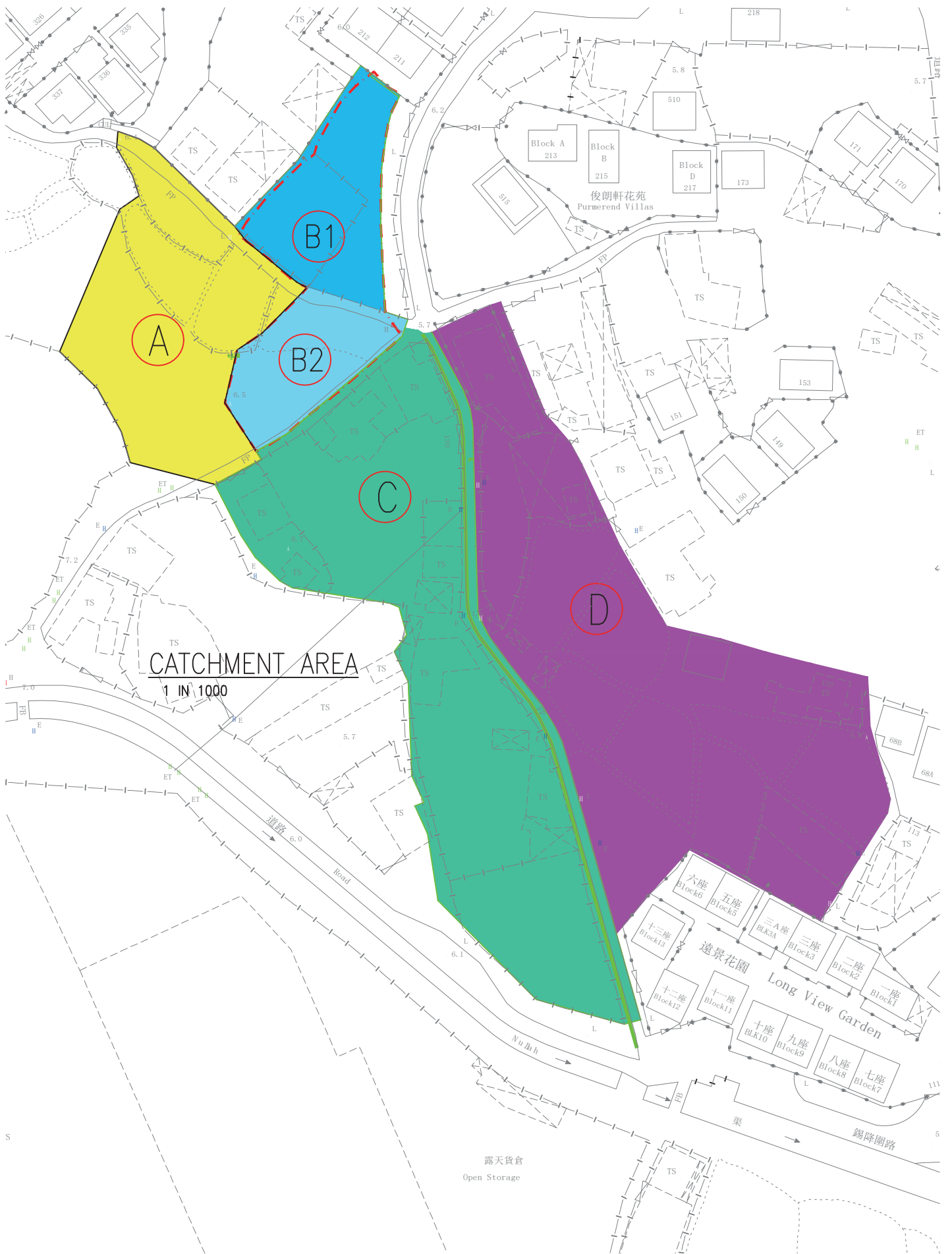
Drawing Title : Typical Details

Drawing No. Figure 3

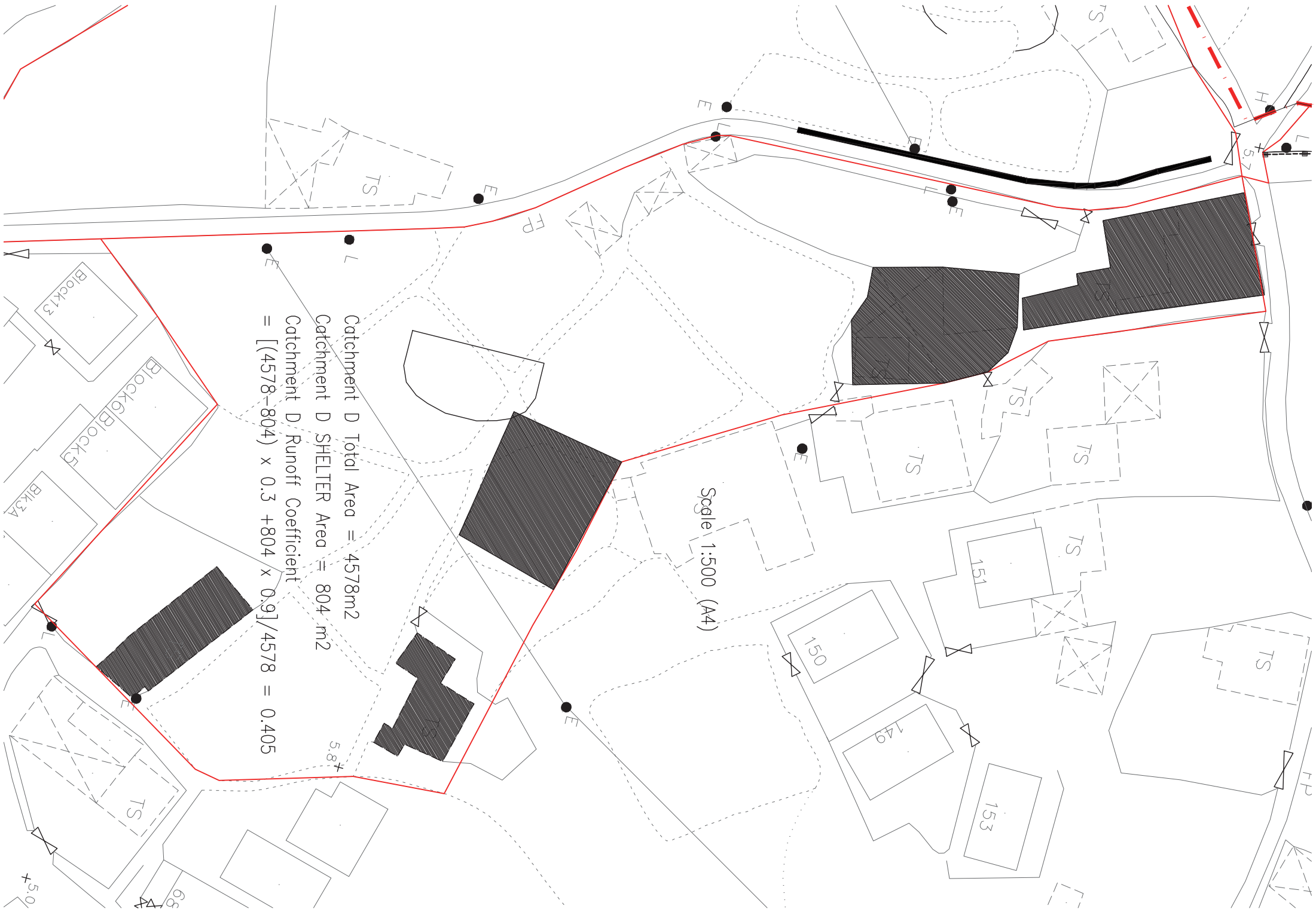
Date : Nov. 2023

Scale : N.T.S.

Appendix B

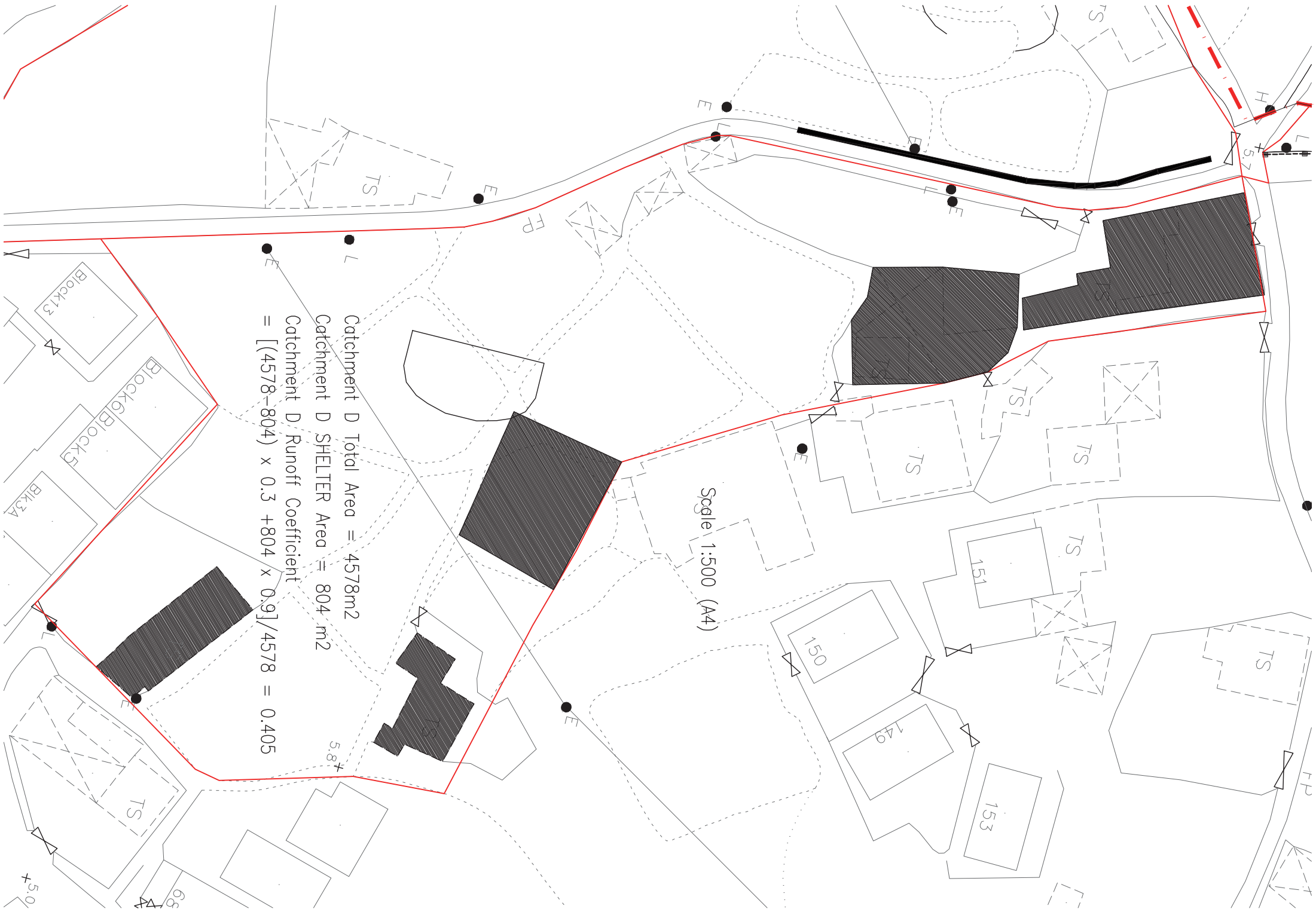






Scale 1:500 (A4)

Catchment D Total Area \approx 4578m²
 Catchment D SHELTER Area \approx 804 m²
 Catchment D Runoff Coefficient
 $= [(4578 - 804) \times 0.3 + 804 \times 0.9] / 4578 = 0.405$



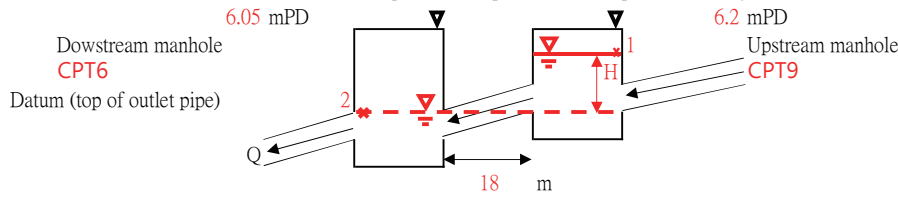
Calculation of U-channel capacity with Catchment Area

| Catchment ID | Area (m ²) | Run-off Coefficient | Longest Flow Path L (m) | Highest Catchment Level (mPD) | Outlet Level (mPD) | δh (m) | Drop in 100m H (m per 100m) | Time of Entry t _e (min) | U-channel Length w (m) | Assumed Velocity v (m/sec) | Time of Flow t _f (min) | Time of Concentration T _c (min) | x113.8% | | Highest U-channel End (mPD) | Gradient (1 in) |
|--------------|------------------------|---------------------|-------------------------|-------------------------------|--------------------|--------|-----------------------------|------------------------------------|------------------------|----------------------------|-----------------------------------|--|-------------------------------------|---------------------------|-----------------------------|------------------|
| | | | | | | | | | | | | | Rainfall Intensity (TGN 30) (mm/hr) | Peak Runoff Q (litre/min) | | |
| A | 1817 | 0.3 | 48 | 9.7 | 5.7 | 4 | 8.33 | 2.145 | 30 | 2 | 0.250 | 2.395 | 457 | 4152 | - | - |
| B (B1+B2) | 1475 | 0.9 | 49 | 6.5 | 6.1 | 0.4 | 0.82 | 3.558 | 50 | 2 | 0.417 | 3.975 | 433 | 9580 | - | - |
| C | 4195 | 0.6 | 51 | 6.7 | 6 | 0.7 | 1.37 | 3.007 | 151 | 2 | 1.258 | 4.265 | 427 | 17913 | - | - |
| D | 4578 | 0.405 | 76 | 6.1 | 6 | 0.1 | 0.13 | 7.099 | 151 | 2 | 1.258 | 8.358 | 362 | 11186 | - | - |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

| Collect Area | Total Peak Run-off (litre/min) | Provided Channel/pipe | Channel Capacity in Chart (litre/min) | Velocity | | Remarks |
|--------------------------|--------------------------------|-----------------------------|---------------------------------------|-----------|----|---|
| Catchment 1 A+B+C+D | 42831 | 600UC (1 in 150) | 46000 | 2.35m/sec | OK | |
| Catchment 2 A+B | 13732 | 300 Dia. Pipe (1 in 100) | N/a | 1.613 | OK | Separated calculating pipe capacity refers. |
| Catchment 3 0.5xB | 4790 | 300UC (1 in 200) | 4900 | 1.3m/sec | OK | |
| Catchment 4 B(=B1+B2) | 9580 | 375UC (1 in 200) | 10000 | 1.3m/sec | OK | |

Checking 300 mm Pipe Capacity

Assume the water level of downstream manhole is equal to the top of the sewer upstream. The system is illustrated as below:-



| | | | | |
|--------------------------|--------------------------|------------------------|-------------------------|--------------------------------|
| Ground level (upstream): | 6.2 mPD | Downstream invert lev: | 5.7 mPD | |
| Pipe Dia.: | 300 mm | Datum lev.: | 6 mPD | |
| Cross-section area: | 0.0706858 m ² | Design flow rate: | 0.114 m ³ /s | = (13732 litres/min)/60/1000/2 |
| Length of pipe: | 18 m | FOS against overflow: | 1 | |
| | | Factored flow rate: | 0.114 m ³ /s | |
| | | Mean velocity of flow: | 1.613 m/s | |

Water Level in Downstream Manhole = 5.70 mPD

Head loss Calculation

| | | | |
|-----------------------------------|----------------------------|-----------------------------|-----------|
| Hydraulic dia of pipe (Dh): | 0.3 m | Reynold's Number, Re: VD/v: | 483900 |
| Kinematic viscosity of sewage(v): | 1.00E-06 m ² /s | Roughness (ε): | 0.00015 m |
| Mean velocity of flow(V): | 1.613 m/s | | |

By Colebrook White Equation

$$\frac{1}{\sqrt{f}} = -2 \log \left(\frac{\epsilon}{3.7 D_h} + \frac{2.51}{Re \sqrt{f}} \right)$$

by try and error method:

Let

| | | | | | | | | |
|--|---|----------|----------|----------|----------|----------|----------|----------|
| $\frac{1}{\sqrt{f}}$ | = | 1 | 7.705747 | 7.513403 | 7.51837 | 7.518238 | 7.518241 | 7.518241 |
| $-2 \log \left(\frac{\epsilon}{3.7 D_h} + \frac{2.51}{Re \sqrt{f}} \right)$ | = | 7.705747 | 7.513403 | 7.518366 | 7.518238 | 7.518241 | 7.518241 | 7.518241 |

Therefore: $\frac{1}{\sqrt{f}} = 7.518241$

and Darcy friction coefficient, f = 0.017692

Assume entrance loss coefficient

| | | | |
|--|--|---|------|
| Entrance loss (kent): | 0.02652 | m | |
| Exit Loss (kexit): | 0.05304 | m | |
| By Darcy-werebach equation, total head loss (hfo)= | (fL/Dh)*v ² /2g++kent+kexit | = | |
| | | | 0.22 |

Total head at each point:

| | | | | | |
|---------------------------------|---|---|---------------------------------|-------|---|
| Pressure head at point 1 (P1): | 0 | m | Pressure head at point 1 (P2): | 0 | m |
| Velocity head at point 1 (V1): | 0 | m | Velocity head at point 1 (V2): | 0 | m |
| Elevation head at point 1 (Z1): | H | m | Elevation head at point 1 (Z2): | -0.30 | m |

By Bernoulli equation includes head loss:

$$(P_1/\rho g + V_1/2g + Z_1) - (P_2/\rho g + V_2/2g + Z_2) = h_{fo}$$

$$(0+0+H)-(0+0+0.3) = 0.22 \text{ m}$$

$$H = -0.08 \text{ m} \quad (5.92) \text{ mPD}$$

Water Top Level at Upstream Manhole = 5.92 mPD

Freeboard = 0.28 m

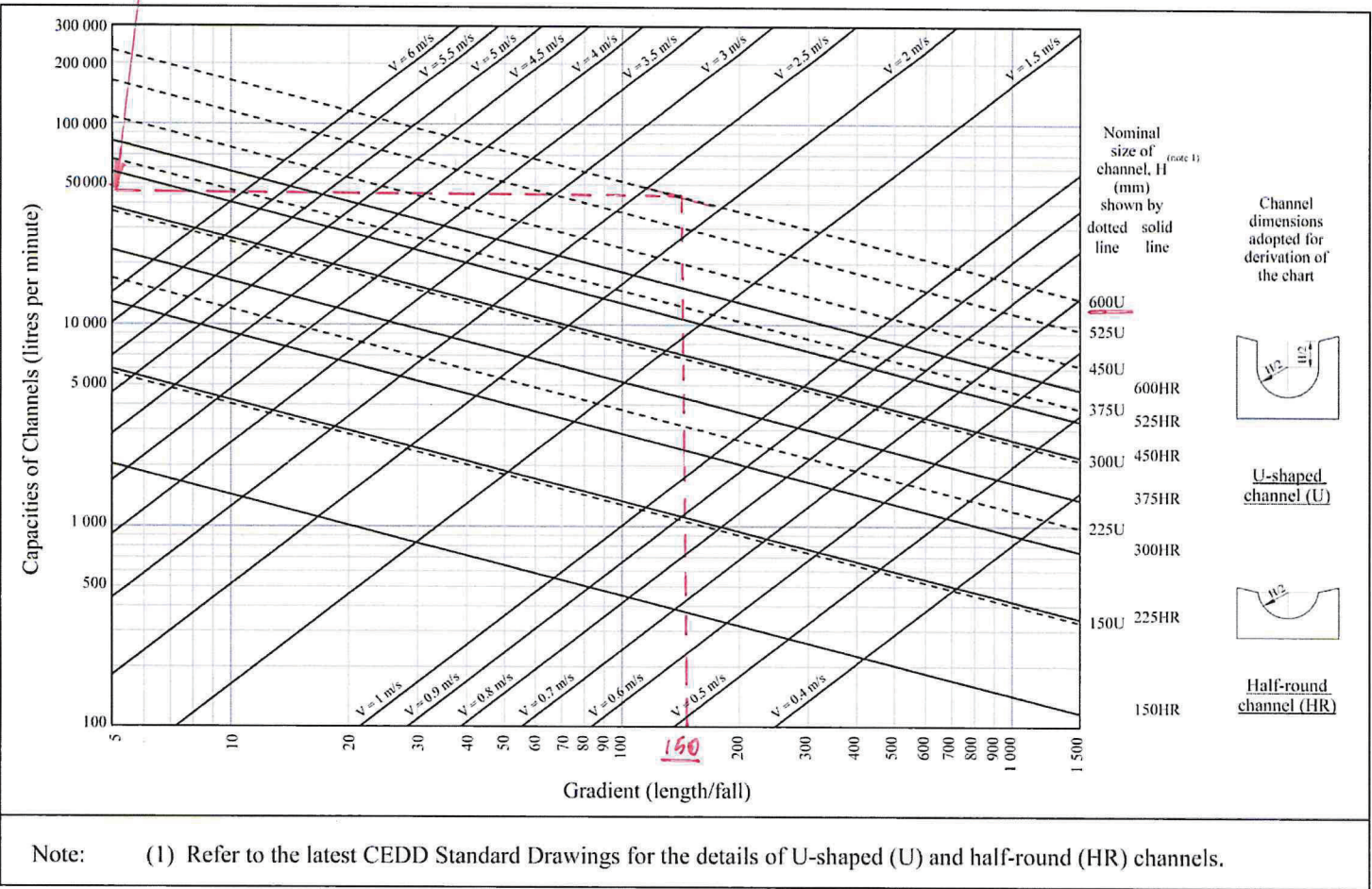
Pipe Capacity > 0.114m³/sec

**GEO Technical Guidance Note No. 43 (TGN 43)
 Guidelines on Hydraulic Design of U-shaped and Half-round Channels on
 Slopes**

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CAPACITY OF EXISTING 600 UC = 46,000 litres/min.

Figure 1 - Chart for the rapid design of U-shaped and half-round channels up to 600 mm

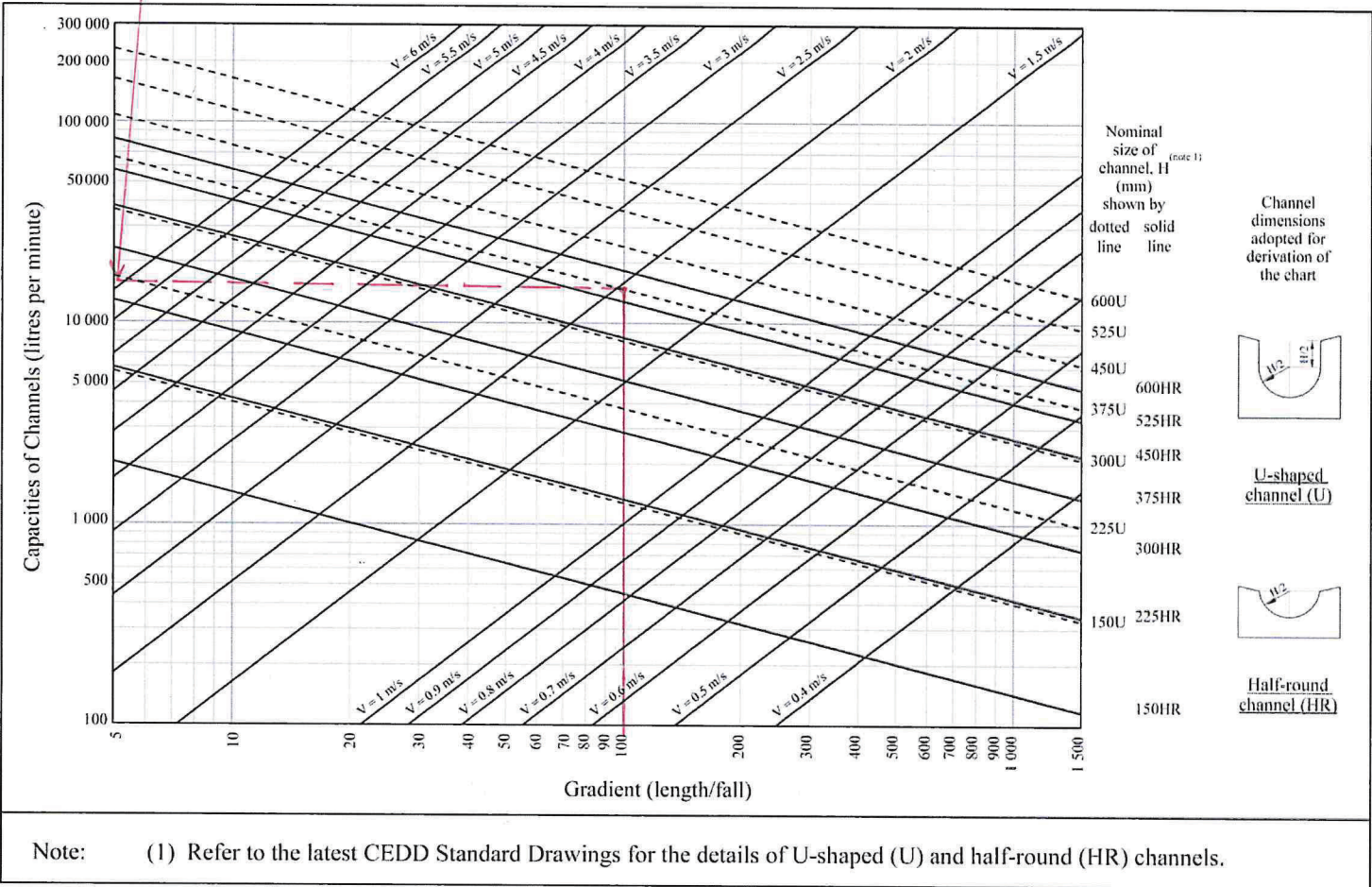


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3750C (i.m. 100)
 Capacity = 15000 litres/minute.

Figure 1 - Chart for the rapid design of U-shaped and half-round channels up to 600 mm



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