SUBMISSION REPORT
FOR
DRAINAGE PROPOSAL DESIGN
FOR TEMPORARY OFFICE AND ANCILLARY TOILET
ON
LOT 1060RP (Part) IN D.D.100
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Date : January 2023

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REFERENCES

1. Stormwater Drainage Manual, Planning Design and Management by DSD
2. Geotechnical Manual for Slopes by GEO
3. Standard Drawings by DSD

1. Introduction

This proposal is prepared to be supplementary information for S.16 application for temporary office and ancillary toilet for a period of 3 years on lot 1060 RP (Part) in D.D.100, Tong Kung Leng, Kwu Tung South, Sheung Shui.

2. Existing Drainage Condition

The site covers about 390 square metres. A plan showing the existing catchments are enclosed in Appendix C. Currently, the surface runoff collected from the site is discharging to existing 225mm and 700mm wide surface channel connected to existing 300mm dia. underground pipe as shown in Appendix B. As per the existing site condition, peripheral U-channels are already existed in the development.

3. Design Parameters & Assumptions

The design criteria to be used for the modeling assessment are based on the standards set out in the Stormwater Drainage Manual, Third Edition (SDM). According to Section 6.6.1 of the SDM, the existing village drainage system in the vicinity of the development is classified as main rural catchment drainage system. Table 10 of the SDM recommends to be adopted a 50 year design return period storm event for the urban drainage branch system.

Stormwater Runoff (Q)

The rate of stormwater runoff used in this assessment report is estimated by the "Rational method" in which the peak runoff is calculated from the formula:

$$Q = K \times i \times A / 3600$$

where

Q	=	maximum runoff (L/s)
i	=	design mean intensity of rainfall (mm/hr)
A	=	area of catchment (m^2)
K	=	runoff coefficient

Time of Concentration (tc)

The time of concentration is defined as the time required for stormwater runoff to flow from the most remote part of the catchment area to the point in the drainage system under consideration. Based on the assumptions adopted in the Rational Method, this is the time taken for the peak runoff to become established at the considered section.

The time of concentration comprises the time for water flowing within natural catchments and along the man-made drainage pipes/channels. For natural catchments, the time of concentration is estimated by the modified form of the Brandsby William's equation.

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

Where t_o = time of concentration of a natural catchment (min.)

A = catchment area (m^2)

H = average slope (m per 100m), measured along the line of natural flow, from the summit of the catchment to the point under consideration

L = distance (on plan) measured on the line of natural flow between the summit and the point under consideration (m)

Mean Rainfall Intensity (i)

Mean rainfall intensity-duration curves attached in this report are based on the Statistical analysis of long term rainfall records from the Hong Kong Observatory. A return period of 50 years is adopted.

Runoff Coefficient (K)

The value of K is taken as 1 for developed area. For vegetated ground, the value of K is taken as 0.3. Therefore, future discharge to the existing stormwater drainage route will be increased after the site development.

4. Existing Stormwater Drainage Works

Existing stormwater drainage works include surface U-channels at the peripheral of the site collecting the runoff from catchments within the site. The U-channels will connect and discharge the surface runoff to the existing 300mm dia. underground pipe. Catchpits with 300mm sump are at the discharged points of U-Channel to desilt the surface water before discharging to the drainage outside. The stormwater drainage proposal plan is shown in **Appendix B.**

5. Effect on Drainage Characteristics and Potential Drainage Impact

The drainage design of the existing U-channel and the capacity checking of the existing drainage system are presented in **Appendix C.**

6. Conclusion

Existing Peripheral channels have been provided along the site boundary where necessary to intercept runoff from crossing the site. The drainage conditions of adjacent areas will not be adversely affected.

Appendix A

Current Site General View

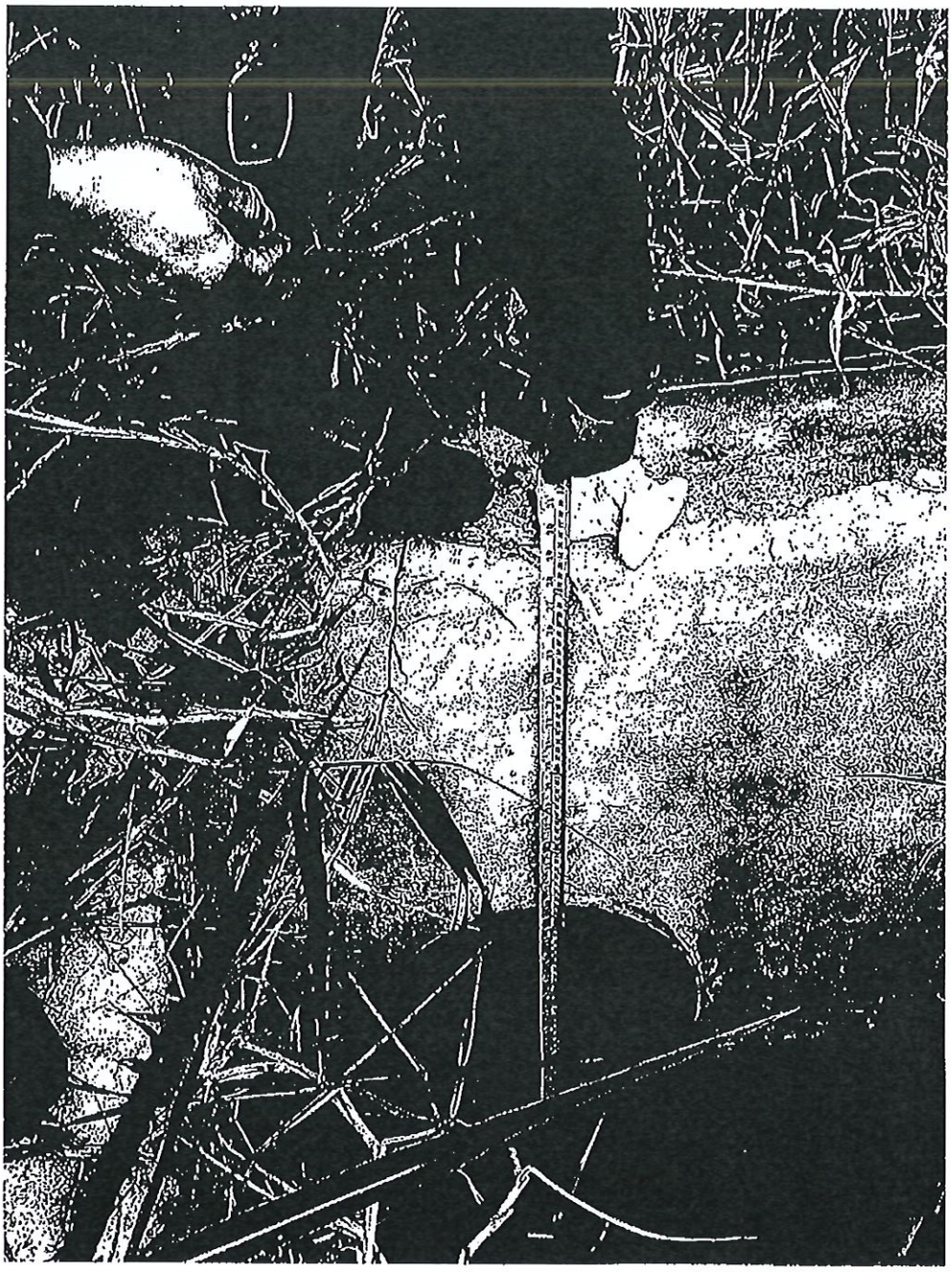
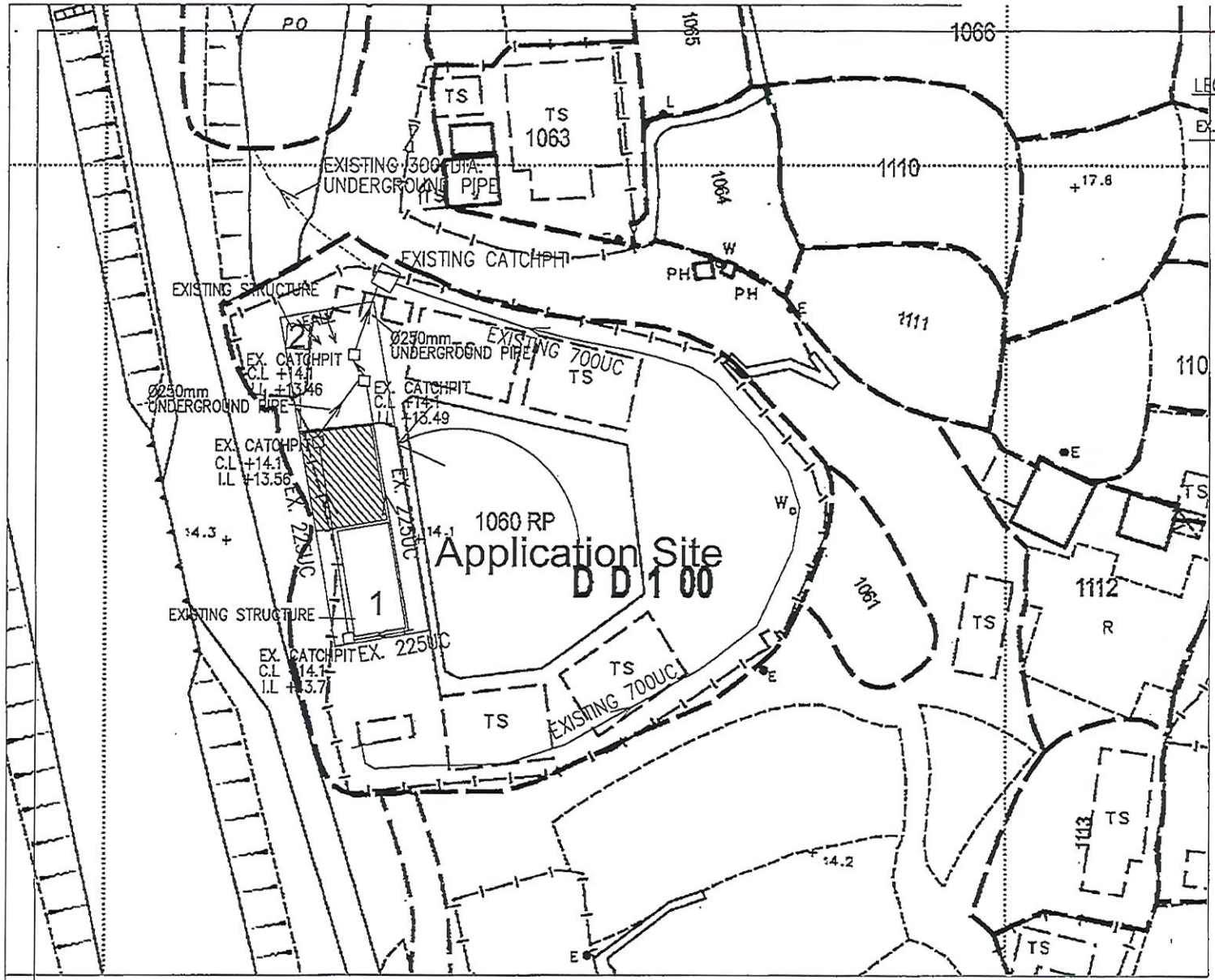


Photo 1. Existing 300mm dia. underground pipe

Appendix B

Stormwater Drainage Proposal Plan



REV	DESCRIPTION	CHECKED	APPROVED	DRN	DATE
	OLD SUBMIT	RC	AF	RF	MARCH 19

PROJECT TITLE:

STORMWATER DRAINAGE PROPOSAL
LOT No.1060 RP IN D.D. 100

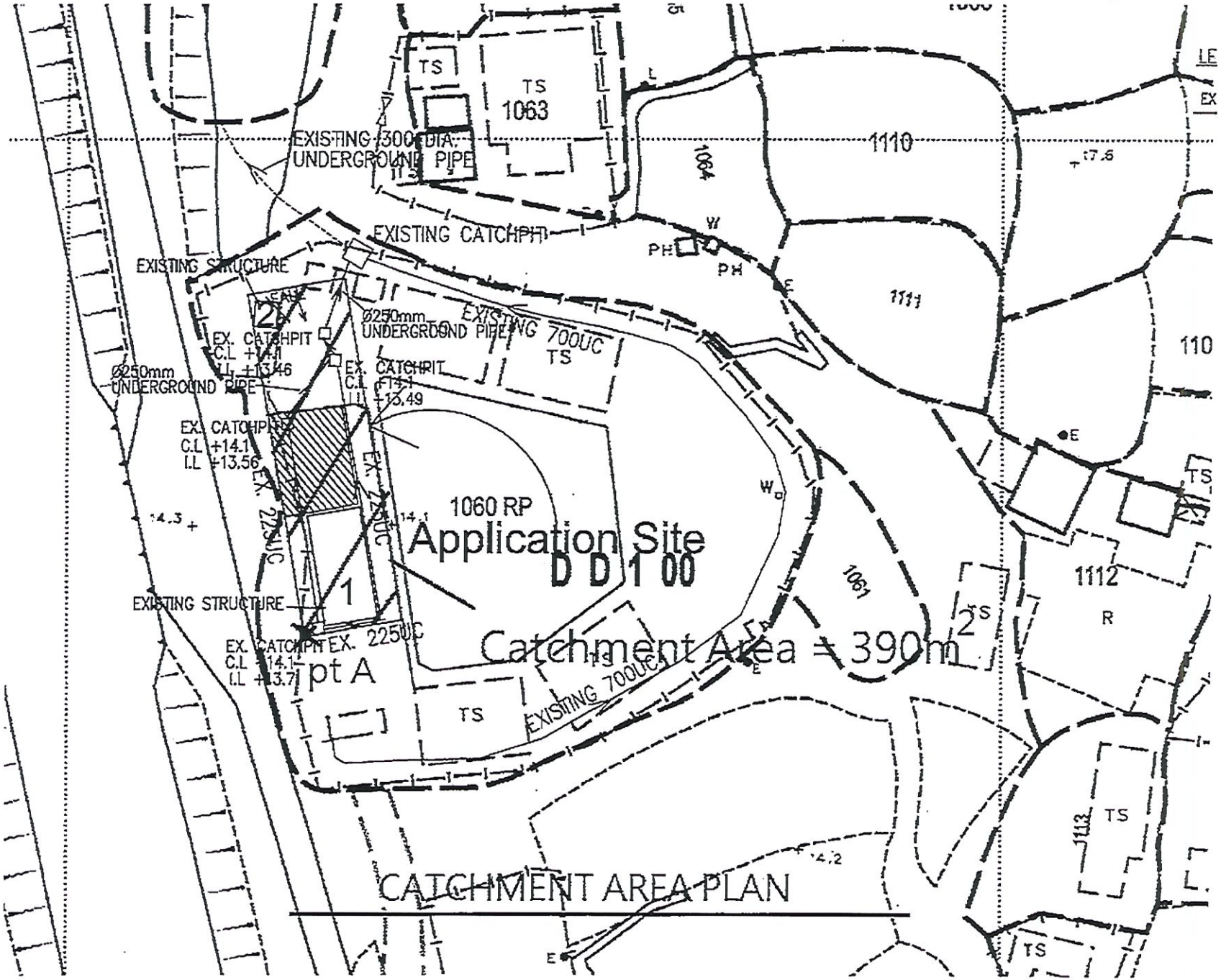
DRAWING TITLE:

STORMWATER DRAINAGE PROPOSAL PLAN

SCALE: 1	M.S.	CAD FILE: CAD_REF	
DRAWN	RF	DRAWING NO.	SDP001
S.D.	RF		
DESIGNED	RC		
CHECKED	AF	AUS. REF. NO.:	

Appendix C

Surface Drainage Design


EXISTING 300 DIA. UNDERGROUND PIPE
EXISTING CATCHPIT
EXISTING STRUCTURE
Ø250mm UNDERGROUND PIPE
EX. CATCHPIT C.L +14.1 I.L +13.46
EX. CATCHPIT C.L +14.1 I.L +13.49
EX. CATCHPIT C.L +14.1 I.L +13.56
EX. CATCHPIT C.L +14.1 I.L +13.71
EX. 225UC
EXISTING 700UC
1060 RP
Application Site
D D 1 00
Catchment Area = 390m²
pt A
1
2
TS
1063
1110
1111
1112
1113
1061
1064
110
CATCHMENT AREA PLAN

Drainage Design for Proposed 225UC

Page no.

Proposed stormwater proposal at lot 1060RP in DD100 Tong Kung Leng

Date: 7-Jan-23

Prepared by: Ray Cheng

Check for the drainage capactiy

Total catchment area, A1 = 390 m^2 Assume k = 1 for paved surface

Use Rational Method from Geo-Manual

$Q = kiA/3600$ where,

Q = Maximum runoff (lit/sec)
k = Runoff coefficient
i = Design mean intensity of rainfall (mm/hr)
A = Total catchment area (m^2)

Longest distance from summit point to outlet, Pt A (Ld) = 45.00 m
Shortest distance from summit point to outlet, Pt A (Ls) = 41.00 m

Elevation of remote point (CP2) = 14.10 mPD
Elevation of outlet point (CP2) = 13.36 mPD

Average fall, H = $(z_1-z_2)/L_s \times 100$
= 1.80 m per 100m

From TGN30

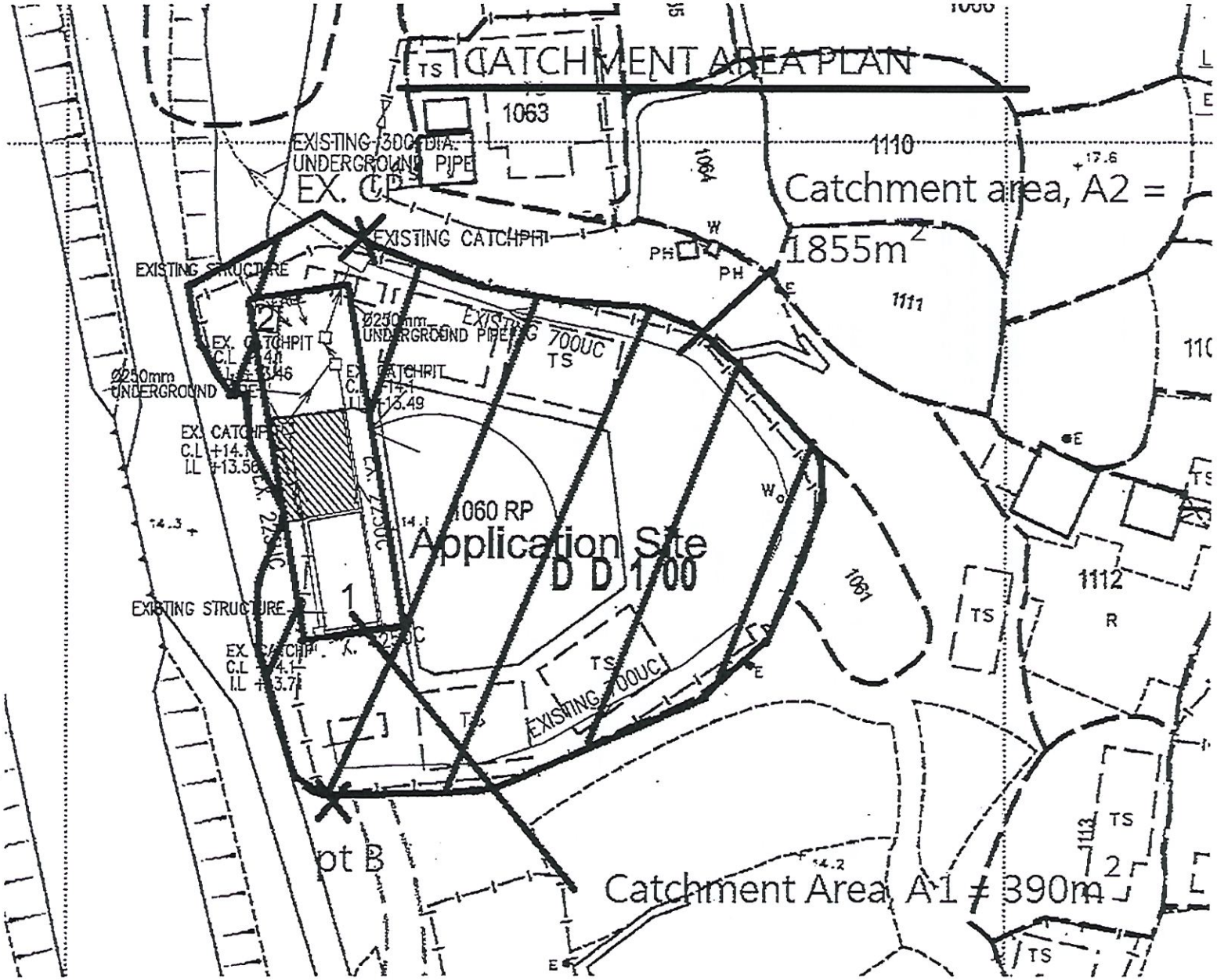
$T_c = 0.14465 \times L_d / (H^{0.2} \times A^{0.1})$
= 3.19 min

Assume a 1 in 50 year design rainfall return period for rural area
From Geo-Manual (Fig 8.2)

i = 350 mm/hr
Q = kiA/60
2275 lit/min

From TGN 43A1
For proposed 225 UC with 1 in 100 gradient

Maximum capacity	=	3900	lit/min	>	2275	o.k.
The corresponding velocity	=	1.45	m/s	<	4	o.k.


CATCHMENT AREA PLAN
1063
1110
EXISTING 300 DIA. UNDERGROUND PIPE
EX. CP
EXISTING CATCHPIT
Catchment area, A2 =
1855m²
EXISTING STRUCTURE
Ø250mm UNDERGROUND PIPE
EXISTING 700UC
TS
1060 RP
Application Site
D D 100
EXISTING STRUCTURE
1111
1112
R
1081
EXISTING 700UC
pt B
Catchment Area, A1 = 390m²

Drainage Checking for Existing 300mm dia. underground pipe Page no.

Proposed stormwater proposal at lot 1060RP in
DD100 Tong Kung Leng Date: 7-Jan-23
Prepared by: Ray Cheng

Check for the drainage capactiy

Total catchment area,	A1	=	390	m^2	Assume k = 1 for paved surface	
	A2	=	1855	m^2	Assume k = 0.3 for UNpaved surface	
	Total Area	=	390 + 1855 x 0.3	=	946.5	m^2

Use Rational Method from Geo-Manual

$Q = kiA/3600$ where,

Q = Maximum runoff (lit/sec)
k = Runoff coefficient
i = Design mean intensity of rainfall (mm/hr)
A = Total catchment area (m^2)

Longest distance from summit point to outlet, Pt B (Ld) = 130.00 m
Shortest distance from summit point to outlet, Pt B (Ls) = 60.00 m

Elevation of remote point (Ex. CP) = 14.10 mPD
Elevation of outlet point (Ex. CP) = 13.36 mPD

Average fall, H = $(z_1-z_2)/L_s \times 100$
= 1.23 m per 100m

From TGN30

$T_c = 0.14465 \times L_d / (H^{0.2} \times A^{0.1})$
= 9.09 min

Assume a 1 in 50 year design rainfall return period for rural area
From Geo-Manual (Fig 8.2)

i = 295 mm/hr
Q = kiA/60
4654 lit/min

The existing 300mm dia. underground pipe
The capcaity = 111.013 x 60 = 6,660 lit/min > 4,654 lit/min O.K.

[10:37:42][NSTD_NAS03A4Plus_01Sept2015_2pdf][16/10/2018][HL] ANNEX TGN 30 A1

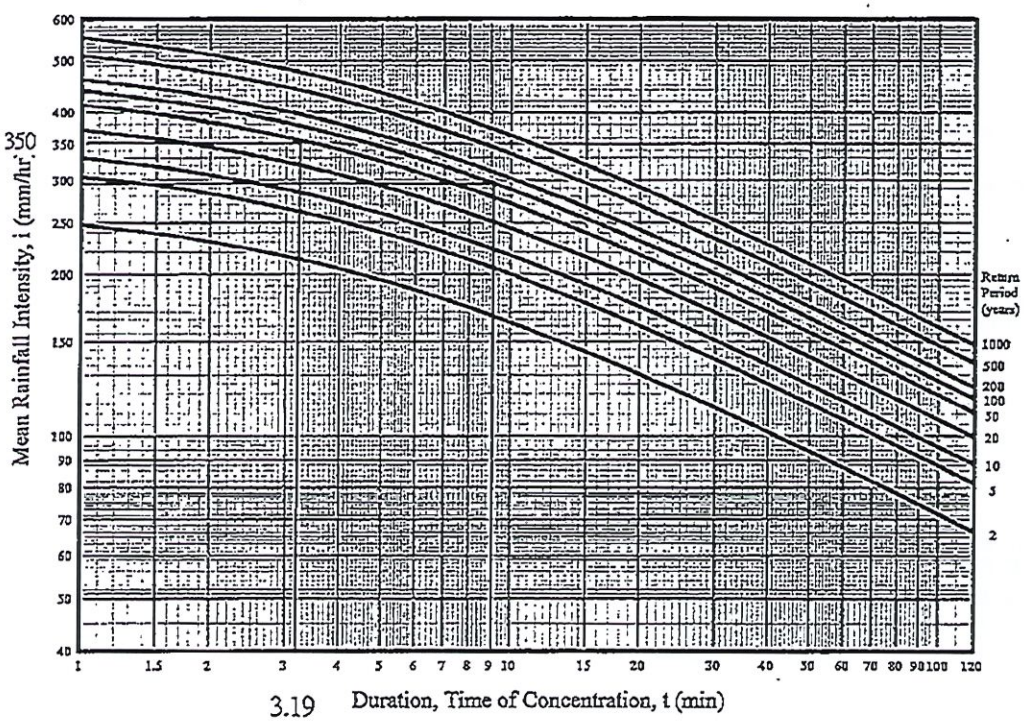
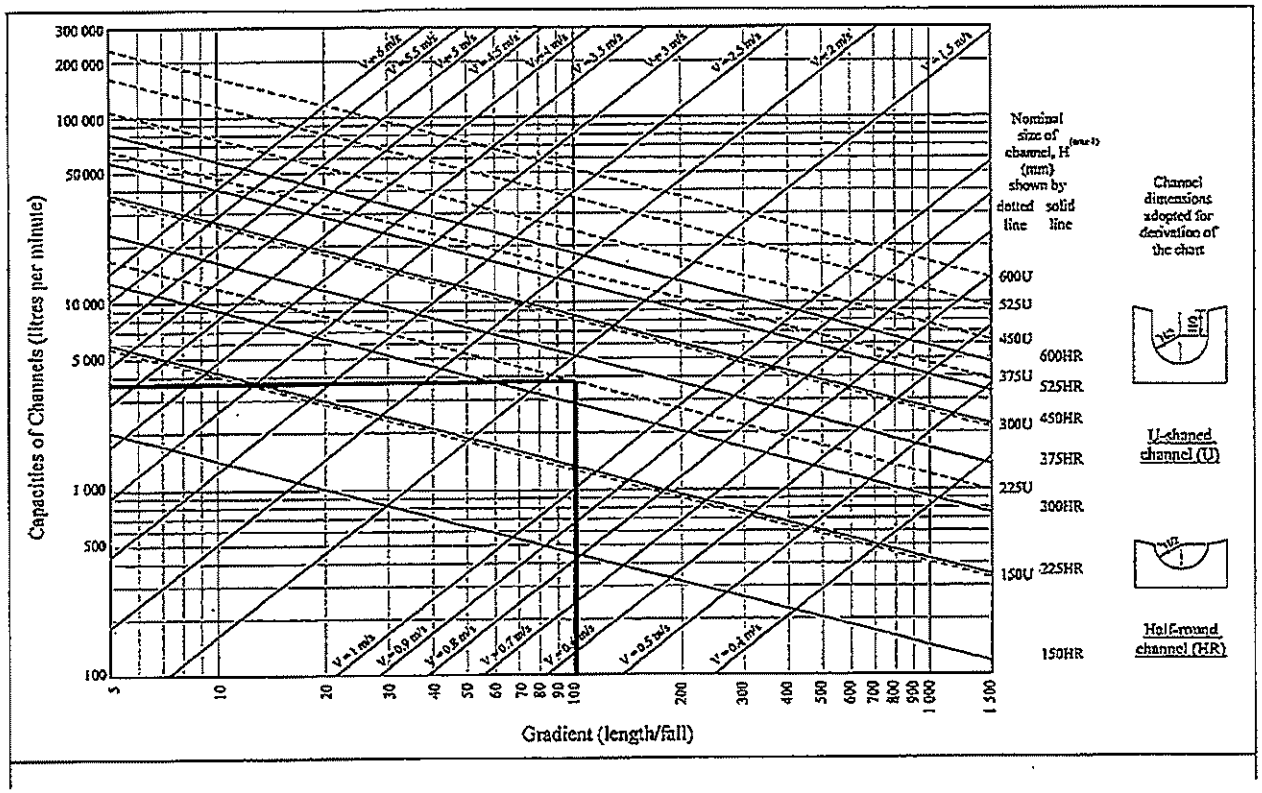


Figure 1 – Updated Intensity-Duration-Frequency Curves

Notes: 1. These IDF curves are to supersede those given in Figure 8.2 of the Geotechnical Manual for Slopes (GCO, 1984).
2. These IDF curves have not incorporated any projected climate change effects. Except for temporary slope drainage design,

ANNEX

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



7 continued

ks = 0·600mm
i = 0·004 to 0·1
ie hydraulic gradient = 1 in 250 to 1 in 10

Water (or sewage) at 15° C
full bore conditions.
velocities in m/s
discharges in l/s

Gradient	Pipe diameters in mm: 50	75	80	100	125	150	175	200	225	250	275	300
0,00400	0.298	0.395	0.413	0.480	0.558	0.629	0.697	0.760	0.821	0.879	0.934	0.988
1/ 250	0.586	1.744	2.076	3.773	6.845	11.123	16.756	23.882	32.632	43.131	55.498	69.848
0,00420	0.304	0.405	0.423	0.493	0.572	0.645	0.714	0.779	0.841	0.901	0.958	1.013
1/ 238	0.601	1.790	2.129	3.868	7.018	11.404	17.178	24.482	33.451	44.213	56.888	71.595
0,00440	0.313	0.415	0.434	0.504	0.586	0.661	0.731	0.798	0.861	0.922	0.981	1.037
1/ 227	0.616	1.834	2.180	3.962	7.187	11.678	17.589	25.068	34.251	45.269	58.246	73.303
0,00460	0.321	0.425	0.444	0.516	0.599	0.676	0.748	0.816	0.881	0.943	1.003	1.061
1/ 217	0.630	1.876	2.231	4.053	7.352	11.945	17.992	25.641	35.033	46.301	59.574	74.973
0,00480	0.328	0.434	0.454	0.527	0.612	0.691	0.764	0.834	0.900	0.964	1.025	1.084
1/ 208	0.644	1.918	2.280	4.142	7.514	12.207	18.386	26.202	35.798	47.312	60.873	76.606
0,00500	0.335	0.443	0.463	0.539	0.625	0.705	0.780	0.852	0.919	0.984	1.046	1.106
1/ 200	0.658	1.958	2.328	4.230	7.672	12.464	18.772	26.751	36.548	48.301	62.145	78.206
0,00550	0.352	0.466	0.486	0.566	0.656	0.740	0.819	0.894	0.965	1.033	1.098	1.161
1/ 182	0.691	2.057	2.445	4.441	8.054	13.084	19.704	28.078	38.358	50.692	65.216	82.071
0,00600	0.368	0.487	0.509	0.591	0.686	0.774	0.856	0.934	1.008	1.079	1.147	1.213
1/ 167	0.723	2.151	2.557	4.644	8.420	13.676	20.595	29.345	40.088	52.976	68.155	85.765
0,00650	0.384	0.507	0.530	0.616	0.715	0.806	0.892	0.973	1.050	1.124	1.195	1.263
1/ 154	0.753	2.241	2.664	4.837	8.770	14.244	21.449	30.561	41.748	55.167	70.972	89.307
0,00700	0.399	0.527	0.550	0.640	0.742	0.837	0.926	1.010	1.090	1.167	1.241	1.312
1/ 143	0.783	2.328	2.767	5.024	9.108	14.791	22.271	31.731	43.344	57.276	73.682	92.718
0,00750	0.413	0.546	0.570	0.663	0.769	0.867	0.959	1.046	1.129	1.208	1.285	1.358
1/ 133	0.811	2.411	2.866	5.204	9.433	15.319	23.064	32.860	44.885	59.310	76.298	96.005
0,00800	0.427	0.564	0.589	0.685	0.794	0.896	0.991	1.081	1.166	1.248	1.327	1.403
1/ 125	0.838	2.492	2.962	5.378	9 748	15.829	23.832	33.952	46.375	61.278	78.828	99.187
0,00850	0.441	0.582	0.608	0.706	0.819	0.924	1.022	1.114	1.203	1.287	1.368	1.447
1/ 118	0.865	2.571	3.056	5.547	10.053	16.324	24.576	35.011	47.820	63.185	81.280	102.270
0,00900	0.454	0.599	0.626	0.727	0.843	0.951	1.052	1.147	1.238	1.325	1.409	1.489
1/ 111	0.891	2.647	3.146	5.711	10.349	16.804	25.298	36.038	49.223	65.037	83.660	105.264
0,00950	0.466	0.616	0.643	0.747	0.867	0.977	1.081	1.179	1.272	1.362	1.448	1.530
1/ 105	0.916	2.721	3.234	5.870	10.638	17.271	26.000	37.038	50.587	66.838	85.976	108.176
0,01000	0.479	0.632	0.660	0.767	0.890	1.003	1.109	1.210	1.306	1.397	1.485	1.573
1/ 100	0.940	2.793	3.320	6.025	10.918	17.726	26.684	38.012	51.915	68.593	88.231	111.013
0,01100	0.503	0.664	0.693	0.805	0.934	1.053	1.164	1.270	1.370	1.466	1.559	1.648
1/ 91	0.988	2.933	3.485	6.325	11.459	18.604	28.003	39.869	54.477	71.975	92.579	116.480
0,01200	0.526	0.694	0.725	0.842	0.976	1.100	1.217	1.327	1.432	1.532	1.629	1.722
1/ 83	1.033	3.066	3.643	6.611	11.977	19.442	29.263	41.682	56.924	75.206	96.734	121.705
0,01300	0.548	0.723	0.755	0.877	1.016	1.146	1.267	1.382	1.491	1.595	1.696	1.793
1/ 77	1.076	3.193	3.795	6.885	12.473	20.246	30.472	43.402	59.272	78.306	100.718	126.716
0,01400	0.569	0.751	0.784	0.910	1.055	1.189	1.315	1.434	1.548	1.656	1.760	1.861
1/ 71	1.117	3.316	3.943	7.149	12.950	21.019	31.635	45.057	61.531	81.288	104.553	131.538
0,01500	0.590	0.777	0.812	0.943	1.093	1.232	1.362	1.485	1.602	1.715	1.823	1.927
1/ 67	1.158	3.435	4.083	7.404	13.410	21.766	32.758	46.655	63.710	84.166	108.252	136.191
0,01600	0.609	0.803	0.839	0.974	1.129	1.273	1.407	1.534	1.655	1.771	1.883	1.990
1/ 62	1.196	3.549	4.218	7.650	13.856	22.488	33.843	48.199	65.819	86.950	111.831	140.691
0,01700	0.628	0.829	0.865	1.004	1.164	1.312	1.451	1.582	1.707	1.826	1.941	2.052
1/ 59	1.234	3.660	4.349	7.889	14.288	23.188	34.895	49.697	67.862	89.647	115.299	145.052
0,01800	0.647	0.853	0.891	1.034	1.198	1.351	1.493	1.628	1.757	1.880	1.998	2.112
1/ 56	1.271	3.768	4.478	8.121	14.707	23.867	35.917	51.151	69.844	92.267	118.647	149.287
0,01900	0.665	0.877	0.916	1.063	1.232	1.388	1.535	1.673	1.805	1.932	2.053	2.170
1/ 53	1.306	3.873	4.602	8.347	15.115	24.528	36.911	52.565	71.778	94.815	121.942	153.406

Coefficient for part-full pipes:

25	40	40	50	60	80	90	100	120	130	140	150

ks = 0·600mm i < 0·1