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Fruit Design and Build Limited

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Ramboll Hong Kong Limited

PLANNING APPLICATION FOR PROPOSED COMPREHENSIVE DEVELOPMENT SCHEME TO INCLUDE WETLAND RESTORATION PROPOSAL AND PROPOSED FILLING OF PONDS/LAND AND EXCAVATION OF LAND IN "OU(CDWRA)" ZONE AT VARIOUS LOTS IN D.D. 104, NORTH OF KAM POK ROAD EAST, POK WAI, YUEN LONG, NEW TERRITORIES

DRAINAGE IMPACT ASSESSMENT

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CHAPTERS

Page

1. INTRODUCTION 1-1

1.2 Application Site and its Environs 1-1
1.3 Proposed Development 1-1

2. DRAINAGE IMPACT ASSESSMENT ("DIA") 2-1

2.1 Scope of Work 2-1
2.2 Assessment Criteria and Methodology 2-1
2.3 Existing Drainage and Condition of the Application Site 2-2
2.4 Proposed Development and Drainage System 2-2
2.5 Maintenance Responsibility 2-3

3. OVERALL CONCLUSION 3-1

FIGURES

Figure 1.1 Location of the Application Site and its Environs
Figure 2.1 Existing Drainage System in the vicinity of the Application Site
Figure 3.1 Proposed Drainage System for the Application Site
Figure 3.2 Proposed Drainage System for the Application Site (Existing Road Drain Overlaying)
Figure 3.3 Indicative Cross Section Diagrams (Sheet 1 of 3)
Figure 3.4 Indicative Cross Section Diagrams (Sheet 2 of 3)
Figure 3.5 Indicative Cross Section Diagrams (Sheet 3 of 3)
Figure 3.6 Maintenance Responsibility

APPENDICES

Appendix 1.1 Indicative Master Layout Plan of the Proposed Development
Appendix 2.1 Summary of Catchment Characteristic
Appendix 2.2 Drainage Impact Assessment Calculations under Existing Condition
Appendix 2.3 Drainage Impact Assessment Calculations under Proposed Condition
Appendix 2.4 Hydraulic Checking for Peripheral Drain (Most Critical Section)
Appendix 3.1 Calculation of Backwater Effect
Appendix 4.1 Boundary Condition provided by DSD
Appendix 5.1 Site Surveying of Existing Drainage Ditch

1. INTRODUCTION

1.1.1 The applicant proposes to develop the Application Site at various lots in DD104, north of Kam Pok Road East, Yuen Long, into a residential development cum wetland restoration area. The zoning of the Application Site is "Other Specified Uses – Comprehensive Development to include Wetland Restoration Area" (OU(CDWRA)) on the approved Nam Sang Wai Outline Zoning Plan S/YL-NSW/8. A S16 application is required for the proposed development.

1.1.2 Ramboll Hong Kong Limited has been commissioned by the Project Proponent to conduct the said Drainage Impact Assessment (DIA) for the proposed development under this application. Architectural drawings and technical information of the Development Site were largely provided respectively by the project architect and other project team members.

1.1.3 The Application Site is also the subject of a previous planning application under the application no. A/YL-NSW/290 and a DIA report (R7192) was previously submitted in support of that planning application (Previous DIA). Since then, the layout plan of proposed development has been further reviewed taking into account the concerns of AFCD with respect to the layout of proposed wetland restoration area. Compared to the previous scheme in Previous DIA, the application boundary in current application remains the same. Thus, this DIA serves as an update to the above-mentioned previous submitted DIA report based on the current revised development scheme as requested by AFCD.

1.2 Application Site and its Environs

1.2.1 The Application Site is about 51,073 m^2, and it is immediate southeast of an existing low-rise residential development, Man Yuen Chuen and north of the Kam Pok Road East. The Application Site is partly occupied by abandoned ponds and partly by soil ground.

1.2.2 **Figure 1.1** shows the location of the Application Site and the environs.

1.3 Proposed Development

1.3.1 The original development scheme comprises a total of 114 units in 108 housing blocks of 3 to 5-storey high (i.e. 89 in the form of 2- to 4-storey on top of 1-level of communal basement carpark and 25 in 2-storey on top of 1-level of carport), two 2-storeys clubhouses, an underground sewage pumping station (SPS) and a proposed wetland restoration area (WRA). To respond to AFCD's comments, amendments to the original MLP are hence required. As a result, the proposed Wetland Restoration Area (WRA) has been increased and there is a net reduction in total no. of units have been reduced to 90 units in 84 housing blocks varying from 2-storeys to 4-storeys on top of 1-level of carport.

1.3.2 The indicative revised Master Layout Plan (MLP) and sections of the Proposed Development are included in planning statement.

2. DRAINAGE IMPACT ASSESSMENT ("DIA")

2.1 Scope of Work

2.1.1 The aim of this study is to assess the changes to runoff from the Application Site as a result of the proposed development and the potential impacts on the existing drainage system and surrounding areas. Drainage Record Plans from the Drainage Services Department (DSD) were obtained for the information of drainage impact assessment.

2.2 Assessment Criteria and Methodology

2.2.1 The assessment standard complies with the Stormwater Drainage Manual (2022 Edition) published by DSD (DSD SDM). The Site is located within an urban drainage branch system and a 1 in 50 years return storm has therefore been adopted for the DIA.

2.2.2 The catchment runoff has been calculated using the "Rational Method", as outlined in the DSD SDM:

$$Q = 0.278\ C\ i\ A$$

Where Q = peak runoff in m^3/s
C = runoff coefficient (dimensionless)
i = rainfall intensity in mm/hr
A = catchment area in km

2.2.3 The existing Site consists of a group of abandoned ponds of around 4.9 ha in total. According to the latest development layout, the proposed development comprises houses. In the site inspection, it has been noted that parts of the Application Site have been paved concrete and pantry, unpaved soft landscape around intermixed among fishponds. Runoff coefficient of 0.95 has been adopted for the paved areas and 0.35 has been adopted for unpaved areas (i.e. soft landscape). A runoff coefficient of 0.35 has been adopted for fishponds in the existing scenario and a coefficient of 1.0 has been adopted for fishponds and the proposed WRA in the proposed scenario. A summary of catchment characteristics is provided in **Appendix 2.1**.

2.2.4 The design criteria for flood level depends on a combination of rainstorm event and tidal level, as well as the catchment characteristics. With reference to the Table 11 of DSD SDM, the determination of flood level is provided in **Table 2.1**.

Table 2.1 Determination of Flood Level

Flood Level Return Period Scenarios	Rainfall Return Period (year)	Sea Level Return Period (year)
50-years A (Case I)	50	10
50-years B (Case II)	10	50

2.2.5 With the reference to Table 28 of DSD SDM, as extracted in **Table 2.2** below, rainfall increase and sea level rise due to climate change has been considered in the calculations. As 1 in 50 years return storm is adopted for the assessment, the mid-21st century value has been considered.

Table 2.2 Rainfall Increase and Sea Level Rise due to Climate Change

	Rainfall Increase	Sea Level Rise (m)
Mid-21st Century (2041 – 2060)	11.1%	0.20

2.3 Existing Drainage and Condition of the Application Site

2.3.1 According to the Drainage Record Plans obtained from DSD, there is no public drainage in the immediate vicinity of the Site. There is a drainage ditch to the west of the side, which runs northwards along the eastern perimeter of Ma Yuen Chuen. The drainage ditch turns westward before discharging into Ngau Tam Mei Drainage Channel.

2.3.2 Based on the ground levels shown on the basemaps, surface runoff within the Site runs westwards, entering the abovementioned drainage ditch. For the ponds outside Site to the north and northeast of the Site, and the construction site and open storage area to the east of the site, the existing ground level indicates that surface runoff would run westwards as well then enter the above-mentioned drainage ditch. For the Hong Kong and China Gas Company Limited Yuen Long Open Yard to the south of the Site, runoff runs towards the east and south into another drainage ditch, which discharges to Ngau Tam Mei Drainage Channel. For Ma Yuen Chuen and the open storage area to the west of the Site, based on site observation, there are gullies along Kam Pok Road collecting runoff from these areas. The runoff then discharges to Ngau Tam Mei Drainage Channel as well.

2.3.3 The existing drainage system in the vicinity of the Application Site and the direction of runoff flow are shown in **Figure 2.1**. Sections of the existing drainage ditch to the west of the Site are shown in **Appendix 5.1**. For the purpose of this study, this DIA has been prepared based on a proposed new drainage system for the proposed development as described in below paragraphs. During later detailed design stage, availability of the existing drainage system as shown in **Figure 2.1** and its maintenance responsibility to cater for discharge from the proposed development, will be further reviewed where appropriate.

2.4 Proposed Development and Drainage System

2.4.1 A set of 800mm peripheral drain is proposed along the east of the application site boundary to divert the surface runoff from Catchments C2 and C3 and to maintain the flow as its original flow direction.

2.4.2 A set of peripheral drains are proposed across the Site to collect stormwater runoff from the Proposed Development, Catchment C2 and Catchment C3. It runs to the proposed standard sized drains (at **Appendix 2.3**).

2.4.3 New drainage pipes are proposed along Kam Pok Road East towards west and then to Kam Pok Road. The storm water will be directly discharge to the Ngau Tam Mei Channel.

2.4.4 The designated location of the outlet has avoided the existing retaining walls and the cycle track underpass.

2.4.5 Locations of existing drainage system for the proposed development (S1 to S27) are shown in **Appendix 5.1** and in **Figure 2.1**. Calculation of drainage discharge under existing condition is shown in **Appendix 2.2**. The boundary conditions of the application site provided by DSD is shown in **Appendix 4.1**.

2.4.6 Upon the completion of the Proposed Development, the Site would consist of residential blocks, clubhouse, driveways/EVAs, and a WRA. Except the WRA, the other areas will be paved. With the adoption of Rational Method, the WRA is considered as paved area under a conservative perspective in the hydraulic analysis/calculation. Consideration has been given to the rainfall intensity and sea level rise due to climate change effect when calculating the drainage discharge under backwater effect, which are demonstrated in **Appendix 2.3** and **Appendix 3.1**. The drainage discharge still works under backwater effect. Hydraulic checking of peripheral drain is provided in **Appendix 2.4**.

2.4.7 The indicative location of peripheral drains within the Application Site, and the proposed drains are indicated in **Figure 3.1**.

2.5 Maintenance Responsibility

2.5.1 Proposed drainage pipe from S1 to the site boundary will be maintained by the Project Proponent.

2.5.2 Proposed drainage pipes from site boundary to S8 is proposed to be maintained by DSD. Details of maintenance responsibility will be further liaised/ confirmed with relevant department in later detailed design stage.

2.5.3 Details of the maintenance responsibility of the pipes are indicated in **Figure 3.6**.

3. OVERALL CONCLUSION

3.1.1 A residential development cum wetland restoration area is proposed for the Application Site at various lots in DD104, north of Kam Pok Road East, Yuen Long. The potential drainage impact has been quantitatively addressed.

3.1.2 The Proposed Development will increase the runoff generated from the Application Site. Runoff from the Proposed Development and nearby Catchments to the east of the Site will be conveyed to the proposed drainage system, and then discharging into Ngau Tam Mei Drainage Channel. The project proponent will be responsible for implementation of the required drainage works while the maintenance responsibility has been proposed in this DIA, which will be further liaised with relevant department during detailed design stage.

3.1.3 Temporary drainage measures shall be implemented to ensure that the flooding conditions will not be worsened during construction. Periodic inspection by the Authorized Person or his representative will be carried out during construction.

3.1.4 With the implementation of the above proposed drainage measures and temporary drainage works during construction, if any, the Proposed Development at the Application Site is technically feasible, having no insurmountable impact from drainage point of view.

Figures

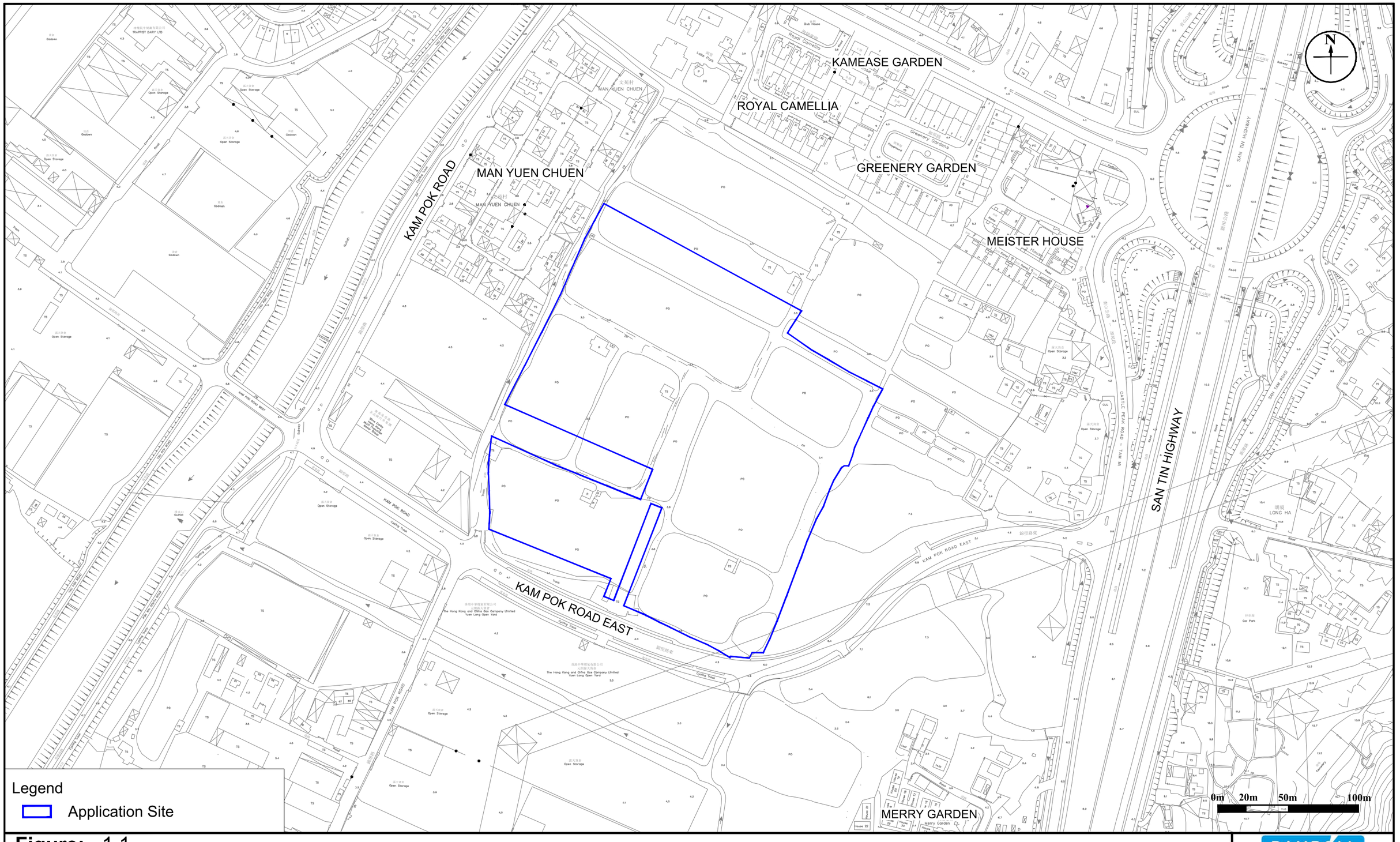

Figure: 1.1

Title: Application Site and Its Environs

Project: Planning Application for Proposed Comprehensive Development Scheme to include Wetland Restoration Proposal in "OU(CDWRA)" Zone at North of Kam Pok Road East, Pok Wai, Yuen Long, New Territories

RAMBOLL

Drawn by:	SN
Checked by:	HN
Rev.:	4.0
Date:	Sep 2021

\\APHKFPS3\DRIVE Q\PROJECTS\FDBNPWWREA00\04 DELIVERABLES\02 DIA\01 FIGURE\R7192_V4.0\SOURCE\FIGURE 1.DWG

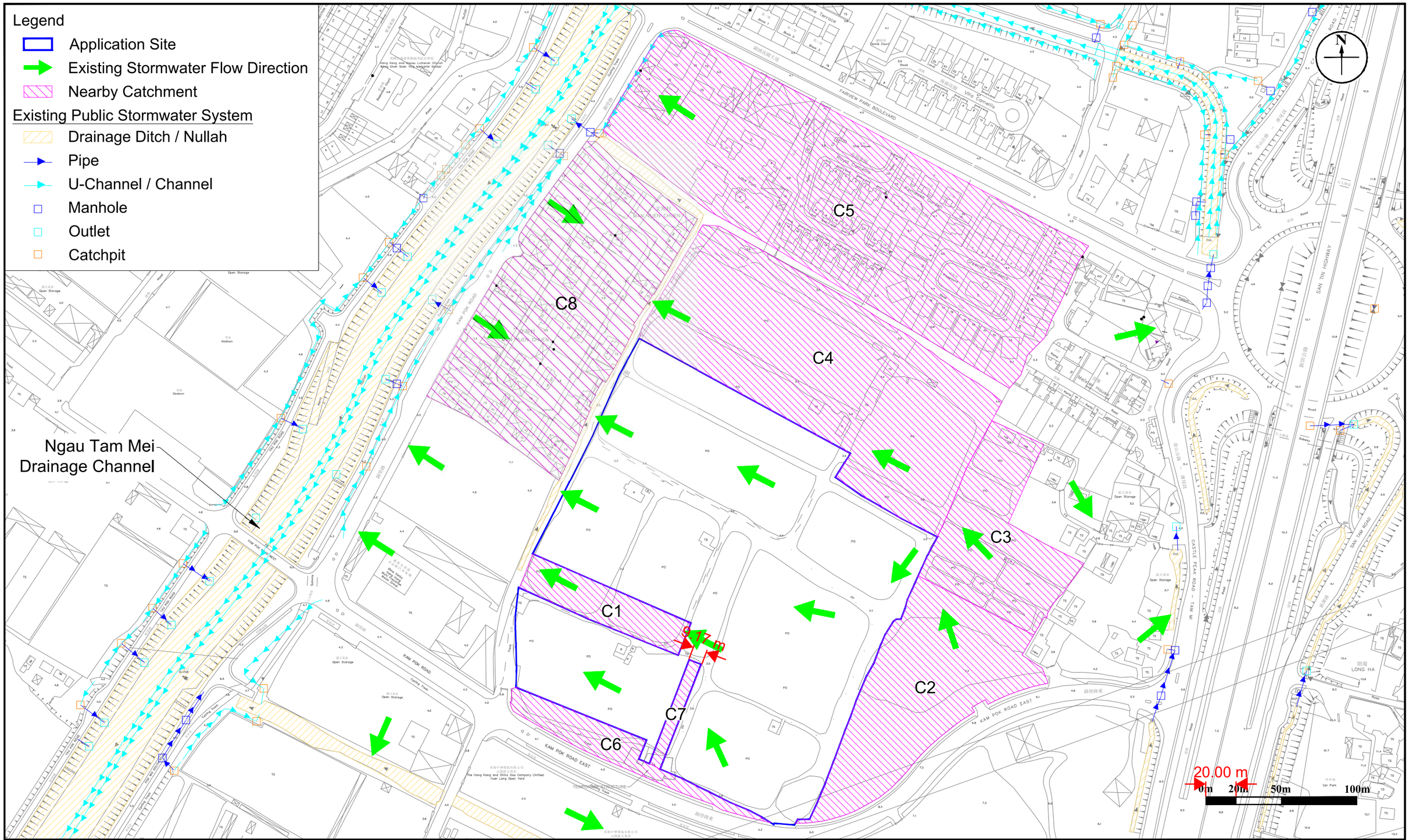

Figure: 2.1	RAMBOLL
Title: Existing Drainage System in the vicinity of the Application Site	Drawn by: SN Checked by: HN
Project: Planning Application for Proposed Comprehensive Development Scheme to include Wetland Restoration Proposal in "OU(CDWRA)" Zone at North of Kam Pok Road East, Pok Wai, Yuen Long, New Territories	Rev.: 1.0 Date: Jan 2022

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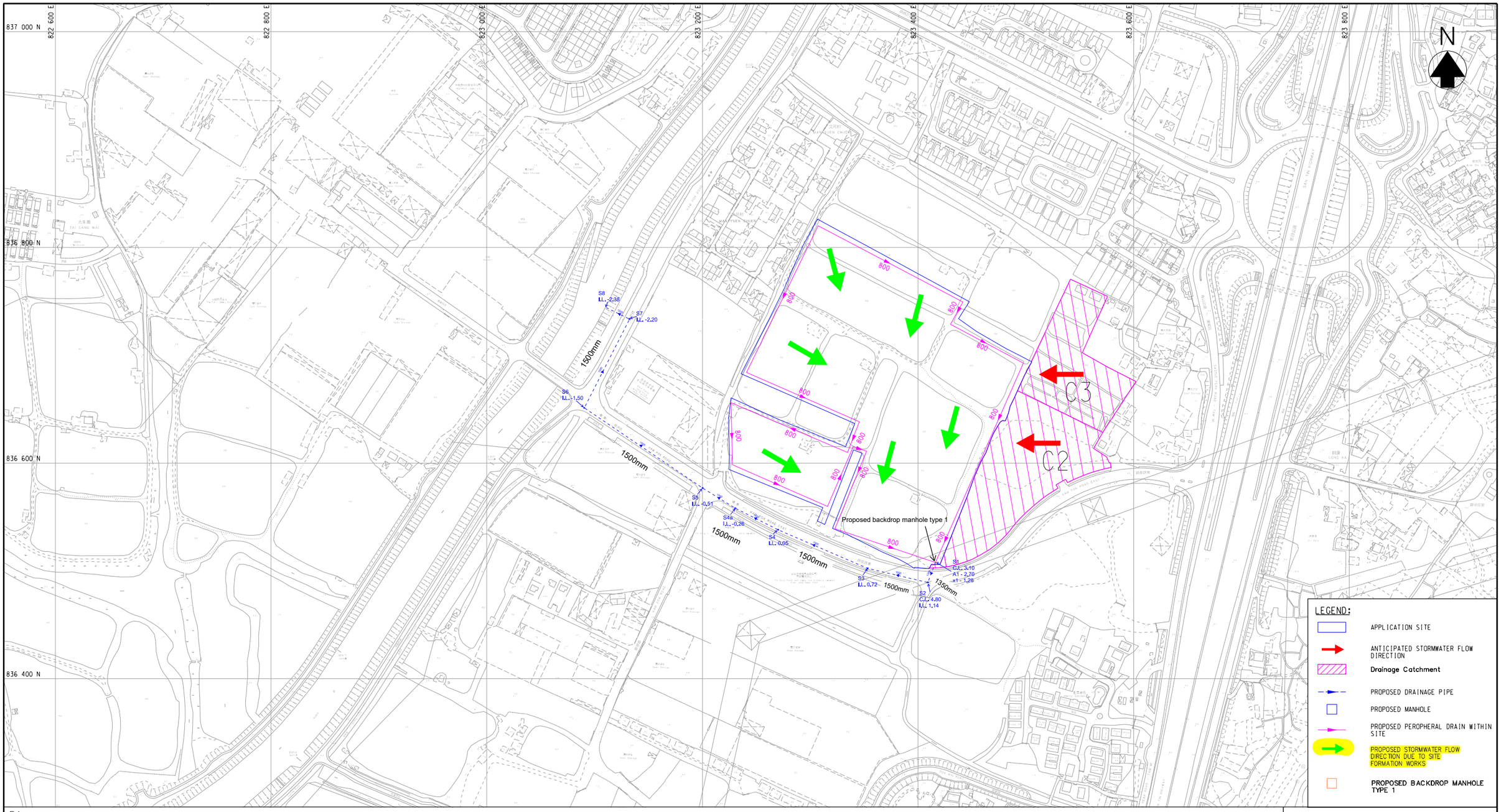

Figure: 3.1

Title: PROPOSED DRAINAGE SYSTEM FOR THE APPLICATION SITE

Project: PLANNING APPLICATION FOR PROPOSED COMPREHENSIVE DEVELOPMENT SCHEME TO INCLUDE WETLAND RESTORATION PROPOSAL IN "OU(CDWRA)" ZONE AT NORTH OF KAM POK ROAD EAST, POK WAI, YUEN LONG, NEW TERRITORIES

RAMBOLL

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Date:	Aug 2023

Plot date : 9/12/2023

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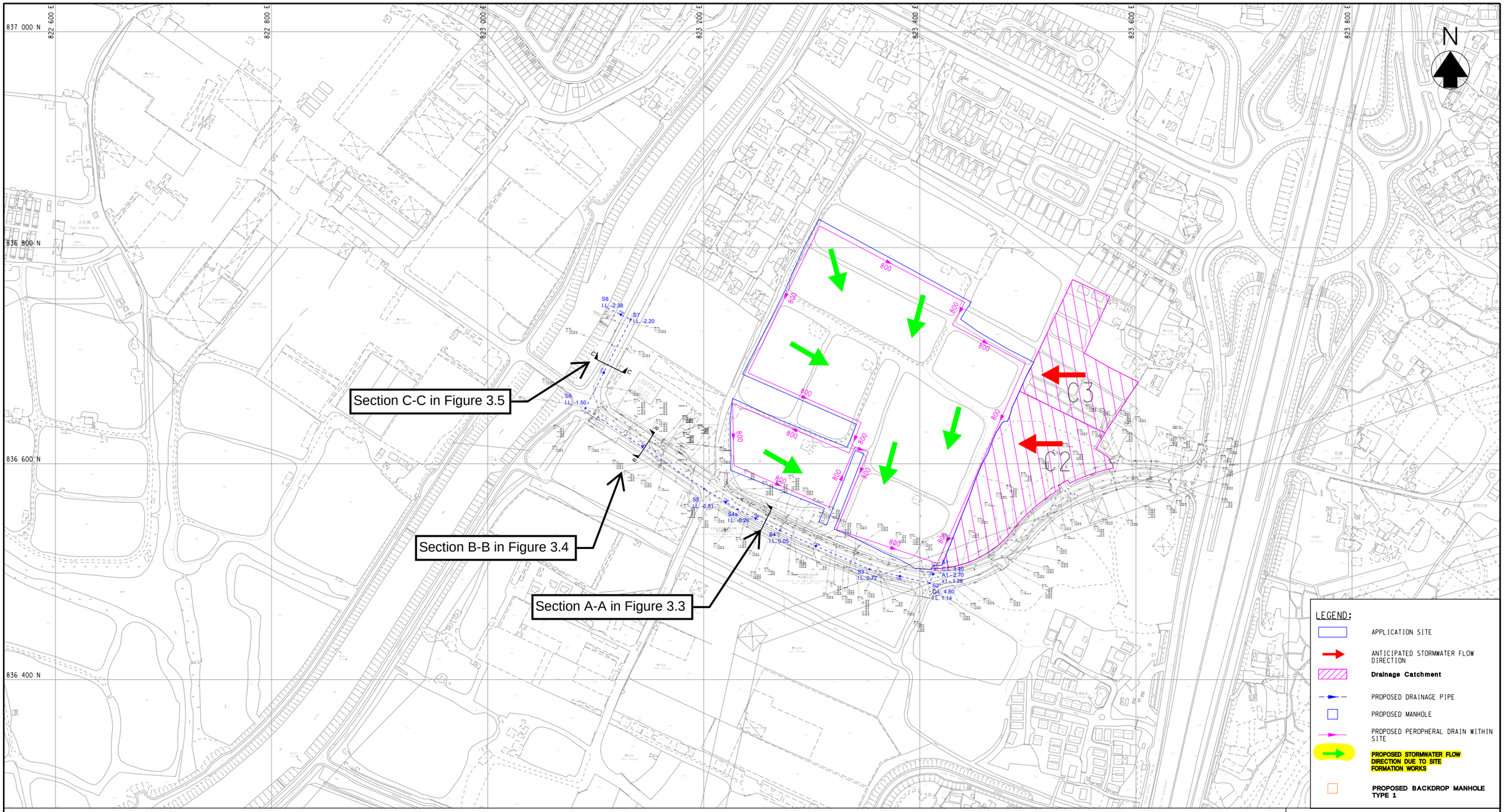

Figure: 3.2

Title: **PROPOSED DRAINAGE SYSTEM FOR THE APPLICATION SITE (ROAD DRAIN OVERLAYING)**

Project: PLANNING APPLICATION FOR PROPOSED COMPREHENSIVE DEVELOPMENT SCHEME TO INCLUDE WETLAND RESTORATION PROPOSAL IN "OU(CDWRA)" ZONE AT NORTH OF KAM POK ROAD EAST, POK WAI, YUEN LONG, NEW TERRITORIES

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Plot date : **9/12/2023**

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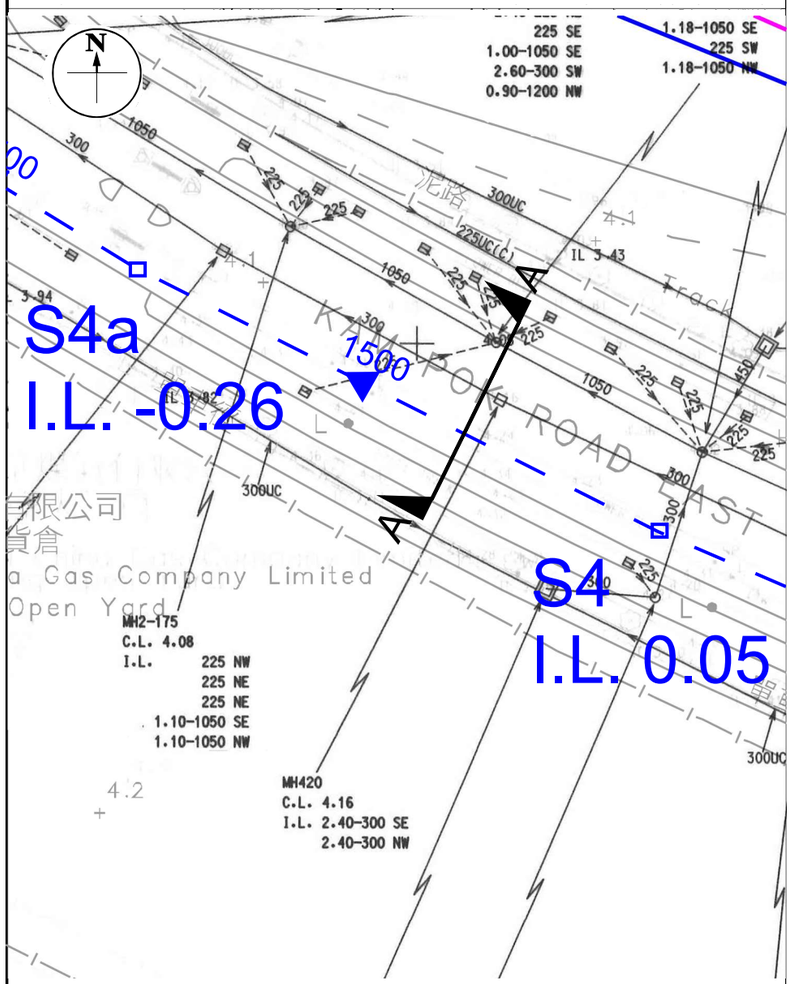
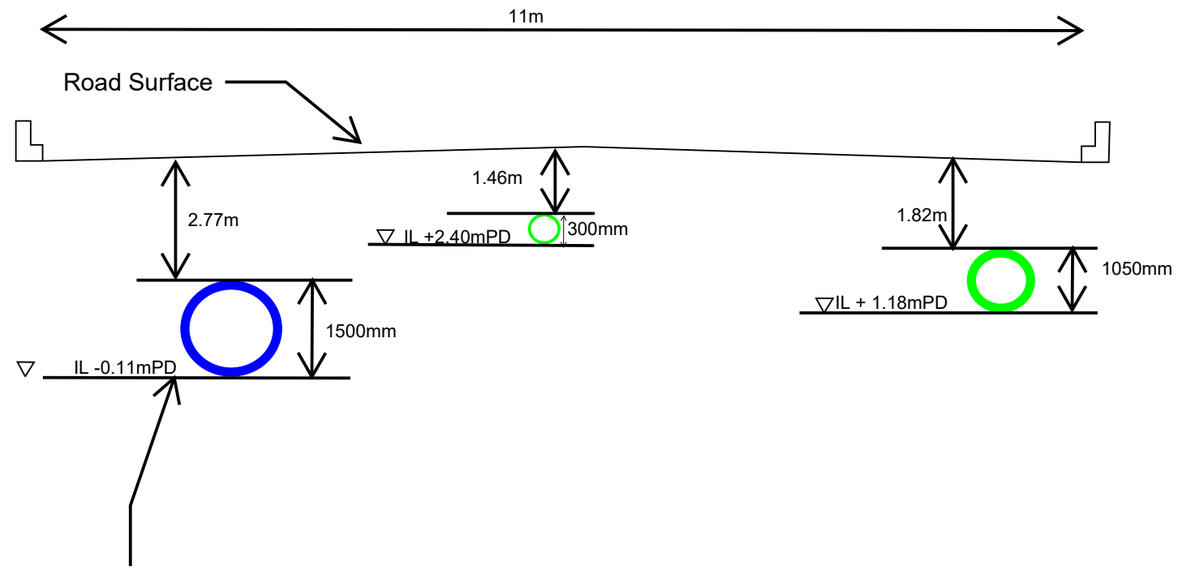
Legend

- Application Site
- Proposed Drainage Pipe
- Propose Drainage Manhole
- Existing Road Drain
- Proposed Drainage Pipe



Key Plan



Proposed Drainage Pipe mid-way between S4 and S4a

Section A-A

Figure: 3.3

Title: Indicative Cross Section Diagrams (sheet 1 of 3)

Project: PLANNING APPLICATION FOR PROPOSED COMPREHENSIVE DEVELOPMENT SCHEME TO INCLUDE WETLAND RESTORATION PROPOSAL IN "OU(CDWRA)" ZONE AT NORTH OF KAM POK ROAD EAST, POK WAI, YUEN LONG, NEW TERRITORIES

RAMBOLL

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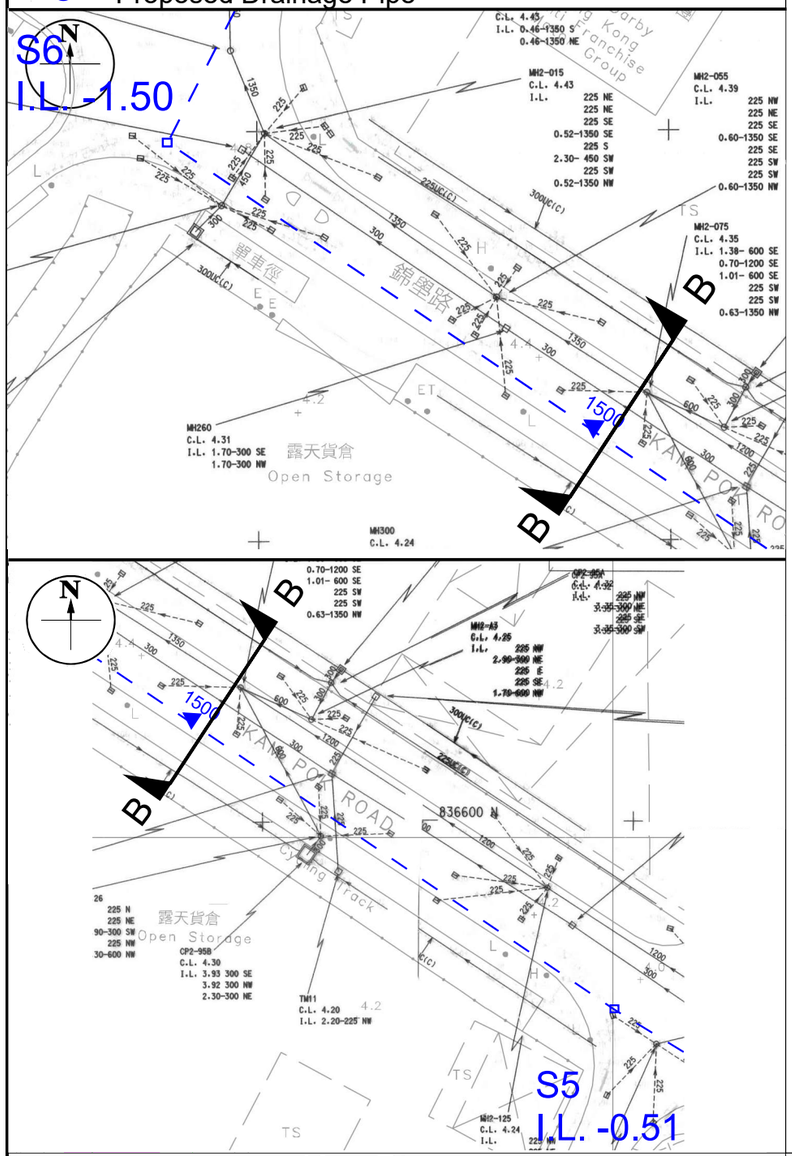
Checked by: HN
Rev.: 1
Date: Nov 2023

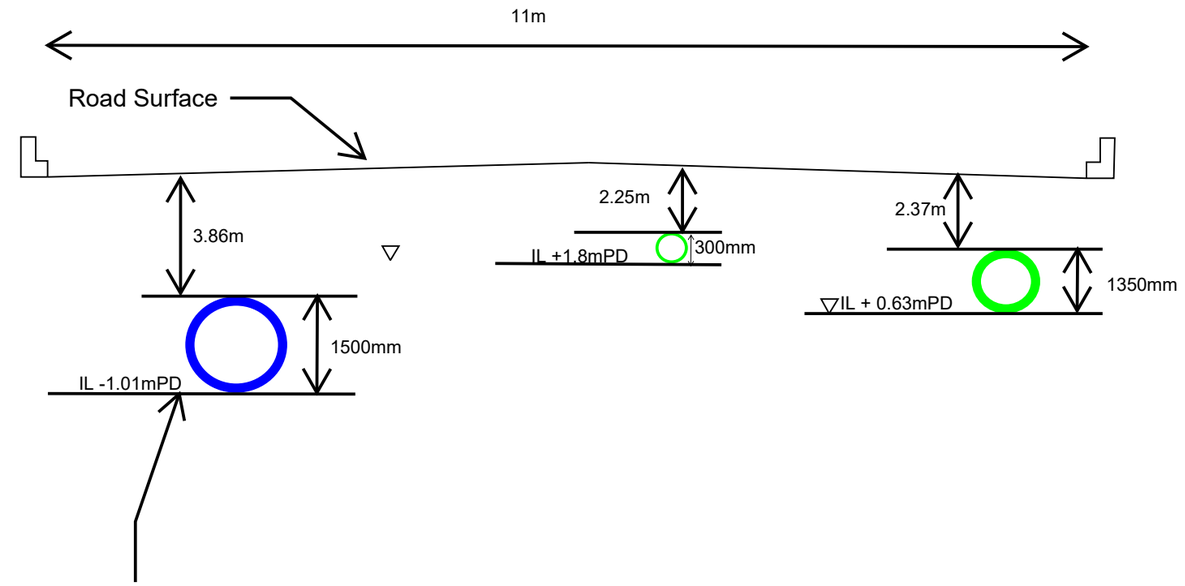
\\APHKFPS3\DRIVE Q\PROJECTS\FDBNPWWREA00\04 DELIVERABLES\03 SIA\01 FIGURE\R7191_V6.1\SOURCE\FIGURE 2.1 PROPOSED SEWER_SCENARIO 2_220812.DWG

Legend

- Application Site
- Proposed Drainage Pipe
- Propose Drainage Manhole
- Existing Drainage Pipe
- Proposed Drainage Pipe



Key Plan



Section B-B

Figure: 3.4

Title: Indicative Cross Section Diagrams (sheet 2 of 3)

RAMBOLL

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Project: PLANNING APPLICATION FOR PROPOSED COMPREHENSIVE DEVELOPMENT SCHEME TO INCLUDE WETLAND RESTORATION PROPOSAL IN "OU(CDWRA)" ZONE AT NORTH OF KAM POK ROAD EAST, POK WAI, YUEN LONG, NEW TERRITORIES

Rev.: 1

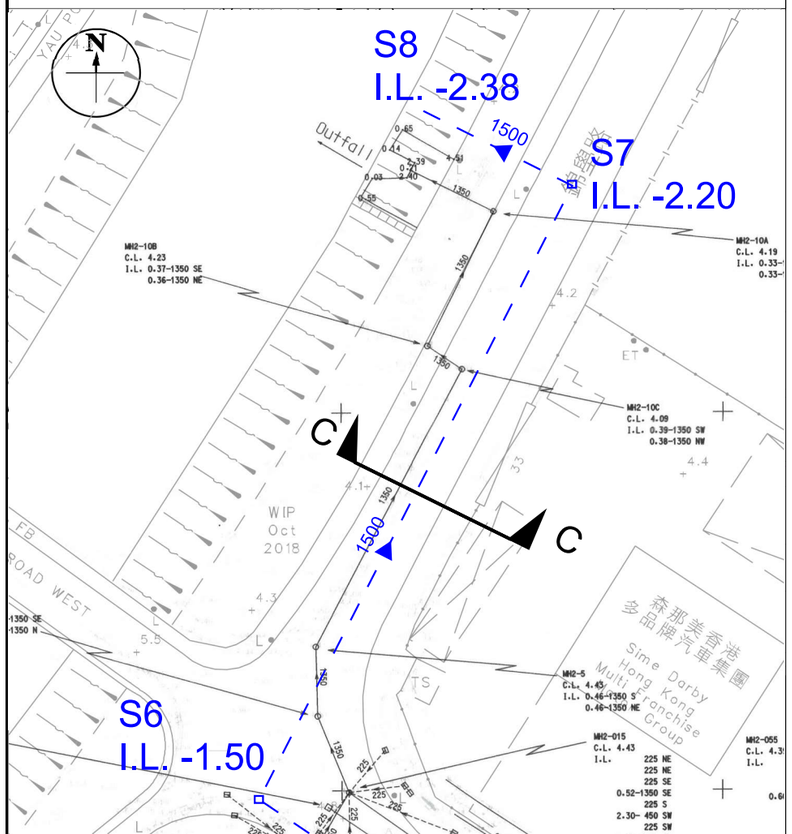
Date: Nov 2023

\\APHKFPS3\DRIVE Q\PROJECTS\FDBNPWWREA00\04 DELIVERABLES\03 SIA\01 FIGURE\R7191_V6.1\SOURCE\FIGURE 2.1 PROPOSED SEWER_SCENARIO 2_220812.DWG

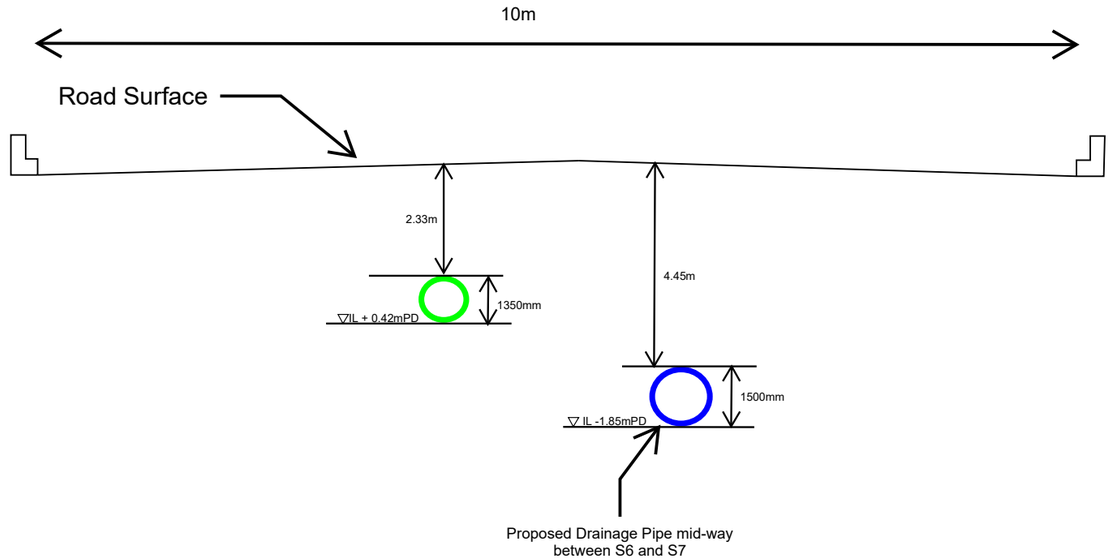
Legend

- Application Site
- Proposed Drainage Pipe
- Propose Drainage Manhole
- Existing Drainage Pipe
- Proposed Drainage Pipe

Remark: The design details of the proposed sewerage system illustrated in this figure are for reference only, and are subject to the detailed design of the Project.



Key Plan



Section C-C

Figure: 3.5	RAMBOLL
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Project: PLANNING APPLICATION FOR PROPOSED COMPREHENSIVE DEVELOPMENT SCHEME TO INCLUDE WETLAND RESTORATION PROPOSAL IN "OU(CDWRA)" ZONE AT NORTH OF KAM POK ROAD EAST, POK WAI, YUEN LONG, NEW TERRITORIES	Rev.: 1 Date: Nov 2023

\\APHKFPS3\DRIVE Q\PROJECTS\FDBNPWWREA00\04 DELIVERABLES\03 SIA\01 FIGURE\R7191_V6.1\SOURCE\FIGURE 2.1 PROPOSED SEWER_SCENARIO 2_220812.DWG

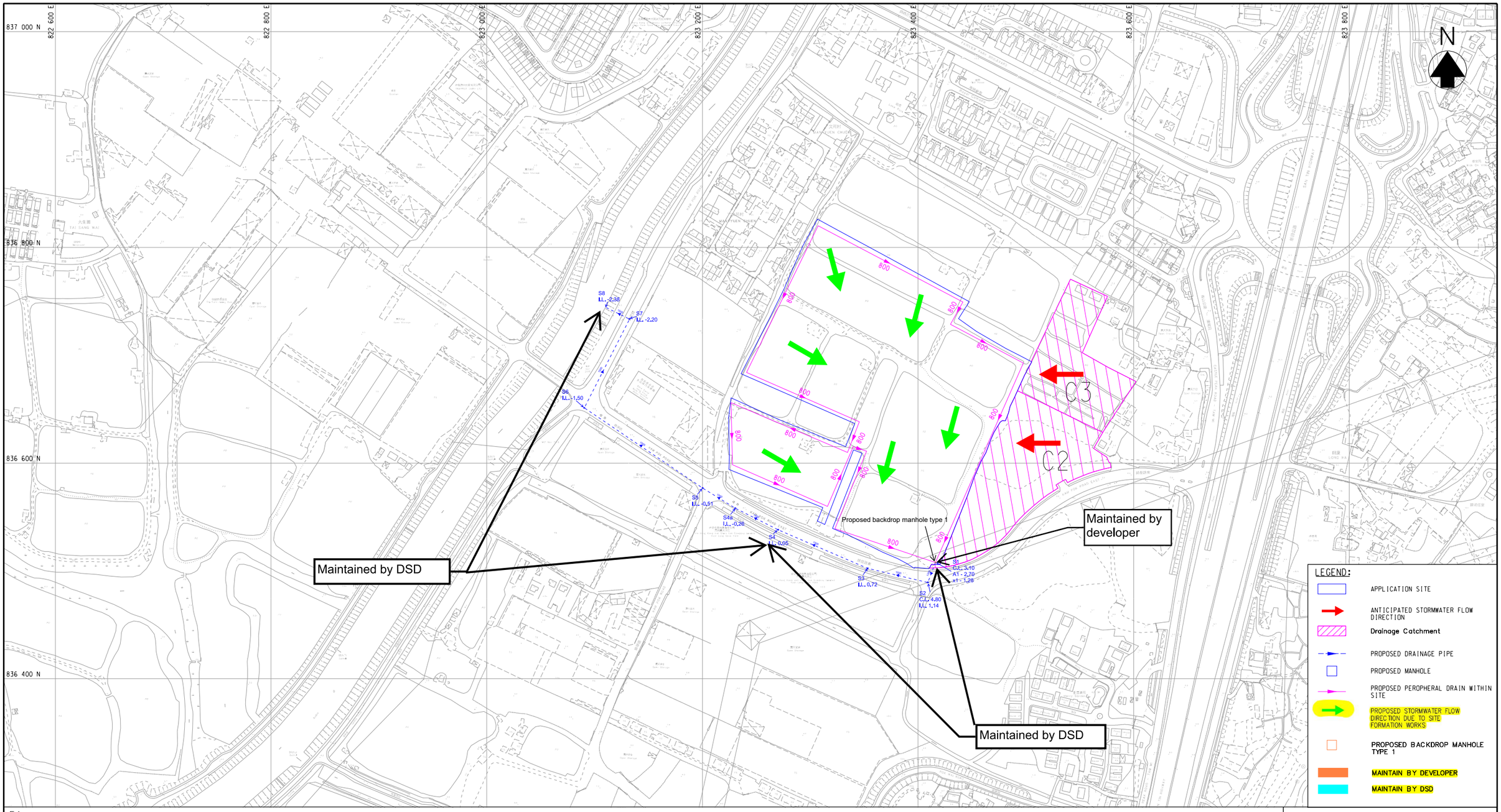

Figure: 3.6

Title: MAINTENANCE RESPONSIBILITY

Project: PLANNING APPLICATION FOR PROPOSED COMPREHENSIVE DEVELOPMENT SCHEME TO INCLUDE WETLAND RESTORATION PROPOSAL IN "OU(CDWRA)" ZONE AT NORTH OF KAM POK ROAD EAST, POK WAI, YUEN LONG, NEW TERRITORIES

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Date:	Aug 2023

User : liu45022

Plot date : 9/12/2023

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Appendix 1.1 Indicative Master Layout Plan of the Proposed Development

Please refer to the Planning Statement

Appendix 2.1 Summary of Catchment Characteristic

Summary of Catchment Characteristic

Catchment		Area (m^2)	Coverage	Runoff Coefficient
Existing (Site)	Pond	49,000.0	96%	0.35
	Unpaved pond bund / footpath	2,073.3	4%	0.35
	Total	51,073.3		
Future (Site)	Paved area	20,582.0	40.3%	0.95
	Wetland Restoration Area (WRA)	24,702.0	48.4%	1.00
	Uncovered horizontal planting area, grass paver	5,789.0	11.3%	0.35
	Total	51,073.3		
C1	Pond	2191.3	79%	1.00
	Unpaved pond bund / footpath	593.5	21%	0.35
	Total	2,784.8		
C2	Construction site for village houses	4365.1	40%	0.95
	Open storage area	6,547.6	60%	0.35
	Total	10,912.7		
C3	Pond	5,954.1	81%	1.00
	Unpaved pond bund / footpath	942.4	13%	0.35
	Village houses	497.7	7%	0.95
	Total	7,394.2		
C4	Pond	15,359.8	70%	1.00
	Unpaved pond bund / footpath	6,657.0	30%	0.35
	Total	22,016.8		
C5	Pond	626.5	2%	1.00
	Village houses / paved area	30,333.1	96%	0.95
	Landscaping area	660.0	2%	0.35
	Total	31,619.6		
C6	Pond	734.0	29%	1.00
	Temporary structure / paved area	1,824.5	71%	0.95
	Total	2,558.5		
C7	Pond	537.2	86%	1.00
	Temporary structure / paved area	86.2	14%	0.95
	Total	623.4		
C8	Unpaved area	340.3	20%	0.35
	Paved area	1,355.0	80%	0.95
	Total	1,695.3		

Appendix 2.2 Drainage Impact Assessment Calculations under Existing Condition

Appendix 2.2 Drainage Impact Assessment Calculations under Existing Condition

Note:

1) Colebrook-White's equation is adopted for full-bore pipe velocity calculation; Manning's equation is adopted for non-circular features.

From	To	US I.L. (mPD)	DS I.L. (mPD)	No. of pipe	Shape	Bottom Width (m)	Height (m)	Top Width (m)	Side Slope (m/m)	Inflow Catchment	Runoff from Catchment (m^3/s)	Full Flow Velocity (m/s)	Full Flow Capacity (m^3/s)	Cumulative Runoff (m^3/s)	Utilization
S1	S2	2.96	2.55	1	Trapezoidal	1.47	0.70	2.54	1.53	C1, C6, C7	0.293	7.221	8.771	8.771	3.3%
S2	S3	2.55	2.48	1	Trapezoidal	2.38	1.27	4.64	1.78	-	0.000	4.207	14.878	14.878	2.0%
S3	S4	2.48	2.54	1	Trapezoidal	2.40	1.17	3.89	1.27	-	0.000	4.106	14.349	14.349	2.0%
S4	S5	2.54	2.41	1	Trapezoidal	0.61	0.91	5.15	2.49	C8	0.104	3.405	2.718	2.718	14.6%
S5	S6	2.41	2.49	1	Trapezoidal	1.44	1.16	5.08	1.57	-	0.000	3.971	9.035	9.035	4.4%
S6	S7	2.49	2.44	1	Trapezoidal	1.06	1.13	4.51	1.53	-	0.000	2.974	5.445	5.445	7.3%
S7	S8	2.44	2.41	1	Trapezoidal	1.02	1.01	3.87	1.41	-	0.000	2.022	3.191	3.191	12.4%
S8	S9	2.41	2.40	1	Trapezoidal	1.03	0.53	2.92	1.78	-	0.000	0.929	0.588	0.588	67.4%
S9	S10	2.40	2.39	1	Trapezoidal	1.44	0.68	4.63	2.35	-	0.000	1.055	1.117	1.117	35.5%
S10	S11	2.39	2.37	1	Trapezoidal	1.49	0.72	4.63	2.18	C2, C3, Site	1.800	1.599	1.886	1.886	116.5%
S11	S12	2.37	2.27	1	Trapezoidal	1.60	0.76	3.90	1.51	-	0.000	3.715	5.343	5.343	41.1%
S12	S13	2.27	2.28	1	Trapezoidal	0.98	1.10	5.26	1.95	-	0.000	1.227	1.878	1.878	117.0%
S13	S14	2.28	2.26	1	Trapezoidal	1.44	1.67	7.06	1.68	-	0.000	2.332	8.527	8.527	25.8%
S14	S15	2.26	2.25	1	Trapezoidal	0.44	0.32	0.76	0.50	C4	0.178	0.646	0.201	0.201	1183.0%
S15	S16	2.25	2.20	1	Trapezoidal	0.40	0.36	0.70	0.42	-	0.000	1.502	0.615	0.615	386.3%
S16	S17	2.20	2.00	1	Trapezoidal	0.50	0.48	2.44	2.02	-	0.000	3.188	1.016	1.016	233.9%
S17	S18	2.00	1.73	1	Trapezoidal	0.61	0.54	3.03	2.24	-	0.000	4.075	1.686	1.686	140.9%
S18	S19	1.73	1.61	1	Trapezoidal	0.62	0.94	5.32	2.50	-	0.000	2.855	2.406	2.406	98.7%
S19	S20	1.61	1.59	1	Trapezoidal	2.24	1.09	6.94	2.16	-	0.000	1.972	5.313	5.313	44.7%
S20	S21	1.59	1.60	1	Trapezoidal	1.84	0.99	6.08	2.14	-	0.000	1.328	2.725	2.725	87.2%
S21	S22	1.60	1.54	1	Trapezoidal	1.13	0.63	6.55	4.30	-	0.000	2.345	1.697	1.697	140.0%
S22	S23	1.54	1.46	1	Trapezoidal	2.05	0.98	7.16	2.61	-	0.000	3.781	8.091	8.091	29.4%
S23	S24	1.46	1.23	1	Trapezoidal	0.60	1.11	6.23	2.54	-	0.000	5.153	5.342	5.342	44.5%
S24	S25	1.23	1.87	1	Trapezoidal	1.64	1.22	6.82	2.12	-	0.000	11.207	27.253	27.253	8.7%
S25	S26	1.87	1.98	1	Trapezoidal	2.61	1.17	5.01	1.03	-	0.000	5.357	21.158	21.158	11.2%
S26	S27	1.98	1.32	1	Trapezoidal	1.89	1.57	9.32	2.37	-	0.000	14.301	51.600	51.600	4.6%
S27	Outlet	1.32	1.58	1	Trapezoidal	3.23	2.96	8.49	0.89	C5	2.087	19.690	344.174	344.174	1.3%

Remark: Please refer to Figure 2.1 for the location of existing drainage system, and Appendix 5.1 for the locations of S1 to S27.

Appendix 2.3 Drainage Impact Assessment Calculations under Proposed Condition

Appendix 2.3 Drainage Impact Assessment Calculations under Proposed Condition

Note:

1) Colebrook-White's equation is adopted for full-bore pipe velocity calculation; Manning's equation is adopted for non-circular features.

From	To	US I.L. (mPD)	DS I.L. (mPD)	No. of pipe	Shape	Bottom Width (m)	Height (m)	Top Width (m)	Side Slope (m/m)	Pipe Size (m)	Inflow Catchment	Runoff from Catchment (m^3/s)	Full Flow Velocity (m/s)	Full Flow Capacity (m^3/s)	Cumulative Runoff (m^3/s)	Utilization
S1	S2	1.28	1.14	1	Circular	-	-	-	-	1.35	C2, C3, Site	3.262	2.827	3.642	3.262	89.6%
S2	S3	1.14	0.72	1	Circular	-	-	-	-	1.50	-	0.000	2.967	4.718	3.262	69.1%
S3	S4	0.72	0.05	1	Circular	-	-	-	-	1.50	-	0.000	2.963	4.713	3.262	69.2%
S4	S4a	0.05	-0.26	1	Circular	-	-	-	-	1.50		0.000	2.923	4.648	3.262	70.2%
S4a	S5	-0.26	-0.51	1	Circular	-	-	-	-	1.50	-	0.000	2.892	4.600	3.262	70.9%
S5	S6	-0.51	-1.50	1	Circular	-	-	-	-	1.50	-	0.000	2.964	4.715	3.262	69.2%
S6	S7	-1.50	-2.20	1	Circular	-	-	-	-	1.50	-	0.000	2.991	4.757	3.262	68.6%
S7	Outlet	-2.20	-2.38	1	Circular	-	-	-	-	1.50	-	0.000	2.955	4.700	3.262	69.4%

Remark: Please refer to Figure 3.1 for the location of proposed drainage system.

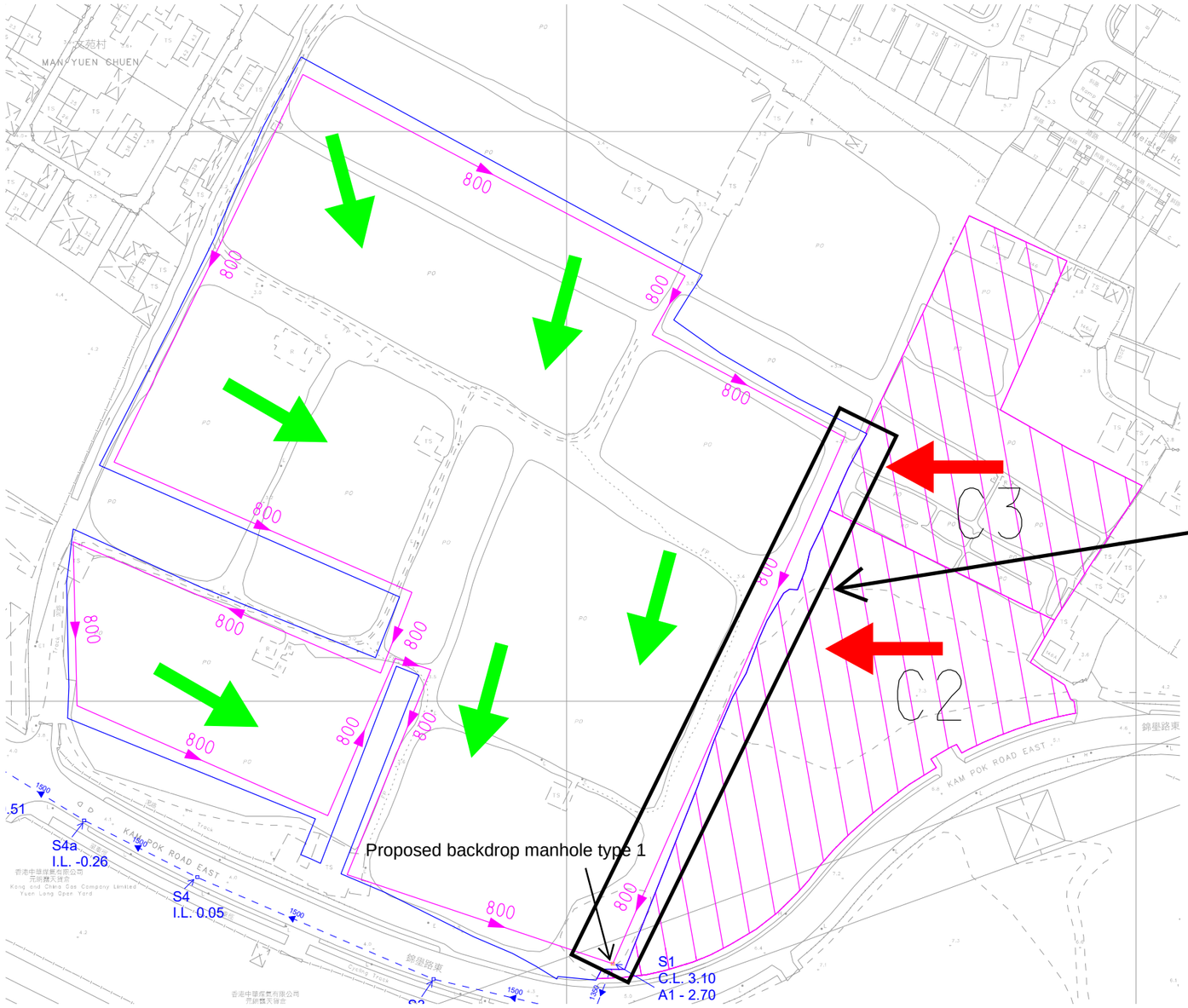
Appendix 2.4 Hydraulic Checking of Peripheral Drain (Most Critical Section)

Appendix 2.4 Hydraulic Checking of Pheripherial Drain for most cirtical section

Note:

1) Colebrook-White's equation is adopted for full-bore pipe velocity calculation; Manning's equation is adopted for non-circular features.

	US I.L. (mPD)	DS I.L. (mPD)	No. of pipe	Shape	Bottom Width (m)	Height (m)	Top Width (m)	Side Slope (m/m)	Pipe Size (m)	Inflow Catchment	Runoff from Catchment (m^3/s)	Full Flow Velocity (m/s)	Full Flow Capacity (m^3/s)	Cumulative Runoff (m^3/s)	Utilization
Pheripherial Drain	5.10	2.70	1	U-shape	-	-	-	-	0.80	C2, C3	0.575	2.341	1.204	0.575	47.8%



Appendix 3.1 Calculation of Backwater Effect

Appendix 3.1 Backwater Analysis for the Proposed Application Site (Alternative Method) **Appendix 3.1**

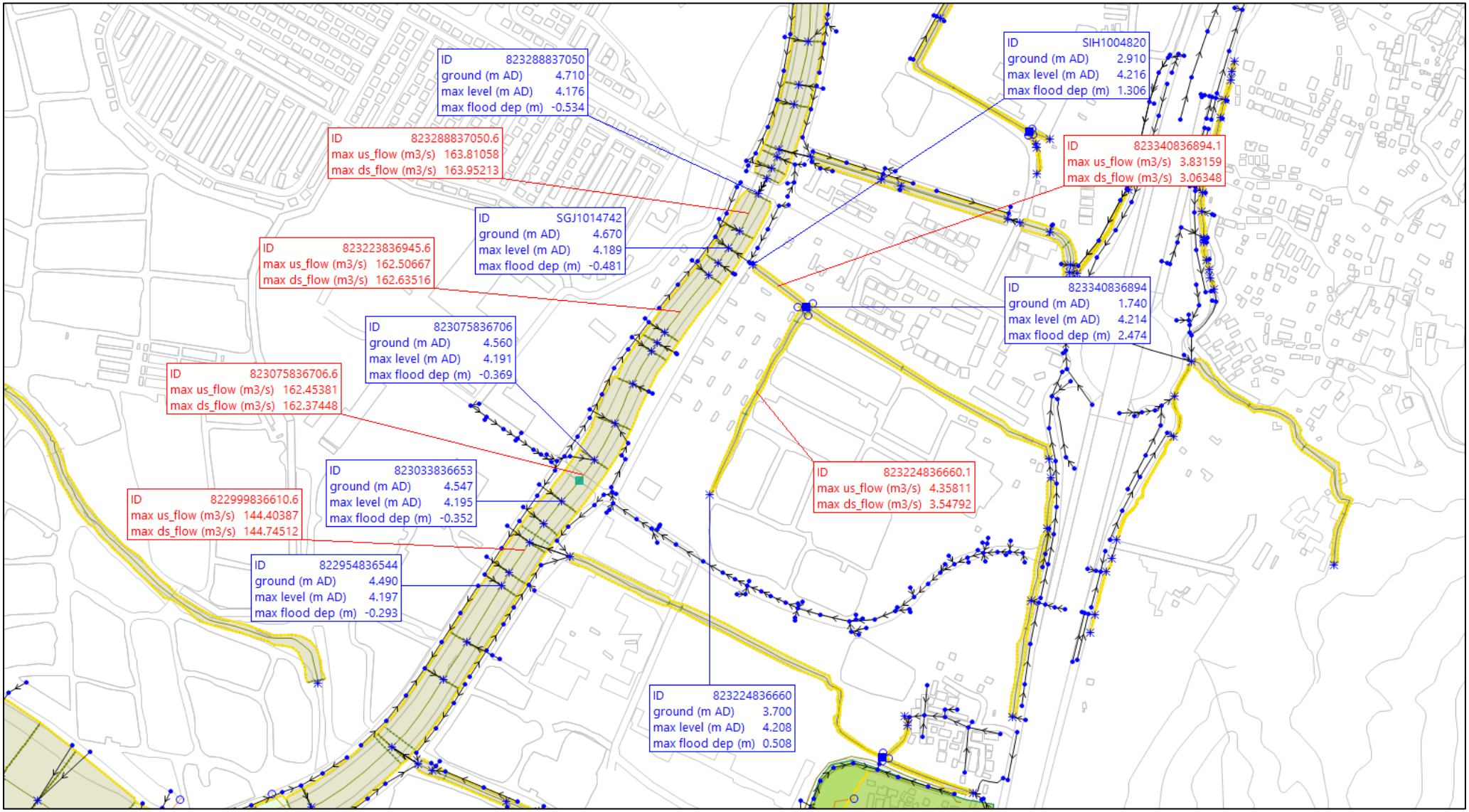
Type	Size			Hydraulics				Friction Loss	Inlet/Outlet		Water Level [1] (mPD)	Ground Level (mPD)	Check [2]
	Width (m)	Height (m)	Length (m)	Radius (m)	Flow (m^3/s)	Velocity (m/s)	Friction slope (S_f)		K	Loss			
											4.563		
									1	0.0014	4.56		
Proposed Circular Drain	1.50	1.50	25.85	0.38	0.296666667	0.167878992	0.000023449	0.001			4.57	4.0	
Proposed Circular Drain	1.50	1.50	98.16	0.38	0.296666667	0.167878992	0.000023449	0.002			4.57	4.0	
Proposed Circular Drain	1.50	1.50	141.31	0.38	0.296666667	0.167878992	0.000023449	0.003			4.57	4.0	
Proposed Circular Drain	1.50	1.50	84.08	0.38	0.296666667	0.167878992	0.000023449	0.002			4.57		
Proposed Circular Drain	1.50	1.50	95.71	0.38	0.890000000	0.503636975	0.000211045	0.020			4.59	3.1	
Proposed Circular Drain	1.50	1.50	59.86	0.38	0.840000000	0.475342763	0.000187999	0.011			4.63		
Proposed Circular Drain	1.35	1.35	18.54	0.34	0.840000000	0.586842918	0.000329757	0.006			4.58	3.1	
									0.5	0.0007	4.58	5.1	**OK**

Remark:

(1) With reference to the Appendix 4, flood level of 50B (PP with climate change) provided by DSD, the maximum water level of the Ngau Tam Mei Drainage Channel at the oulet is +4.563 mPD.

(2) According to Appendix 4, the boundary water level of Ngau Tam Mei River is already higher than the ground level, hence, the unfavourable condition is not a result of the Proposed Development. Thus, no mitigation works is proposed under this project.

Appendix 4.1 Boundary Condition provided by DSD


ID 823288837050
ground (m AD) 4.710
max level (m AD) 4.176
max flood dep (m) -0.534
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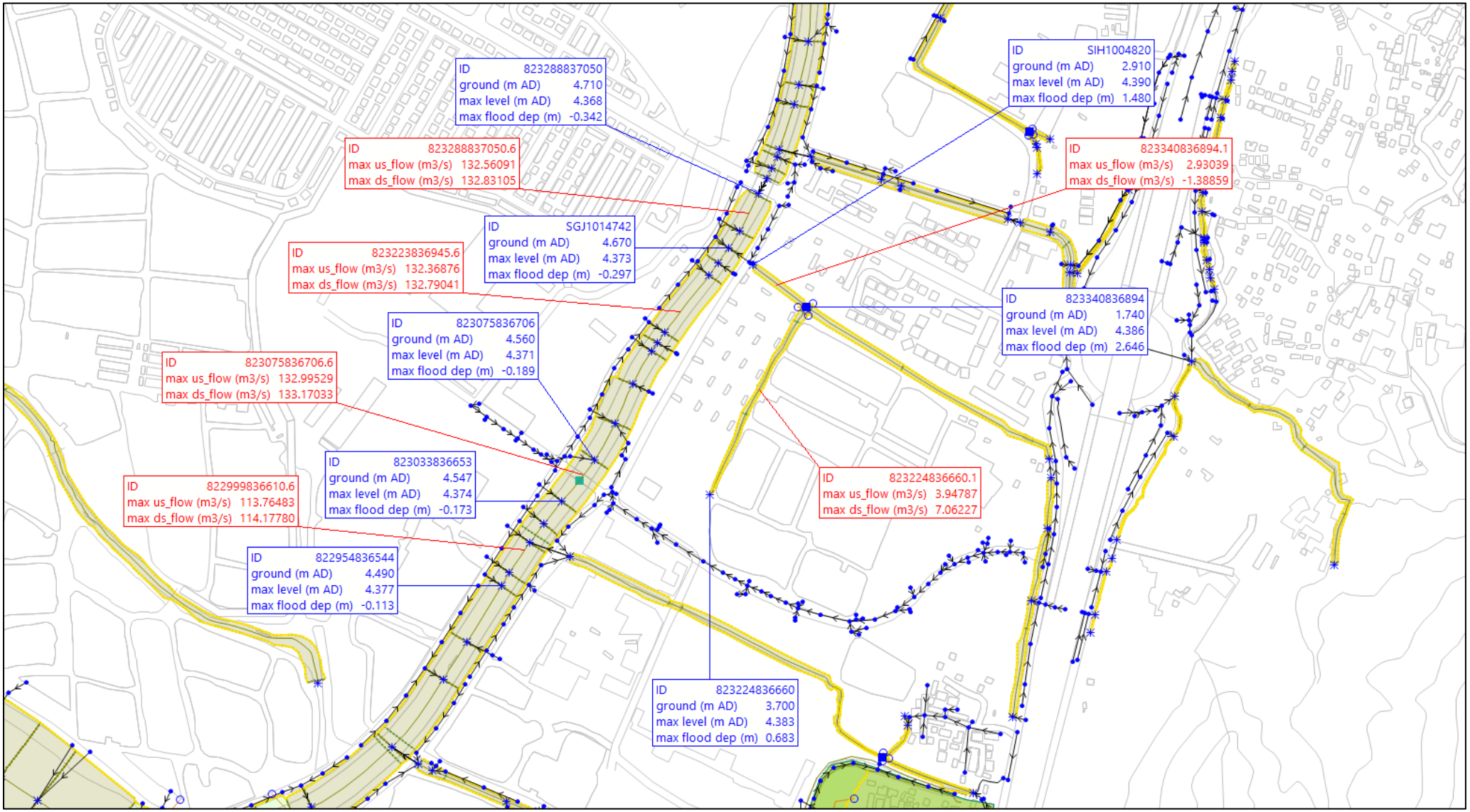
max us_flow (m3/s) 163.81058
max ds_flow (m3/s) 163.95213
ID SGJ1014742
ground (m AD) 4.670
max level (m AD) 4.189
max flood dep (m) -0.481
ID 823223836945.6
max us_flow (m3/s) 162.50667
max ds_flow (m3/s) 162.63516
ID 823075836706
ground (m AD) 4.560
max level (m AD) 4.191
max flood dep (m) -0.369
ID 823075836706.6
max us_flow (m3/s) 162.45381
max ds_flow (m3/s) 162.37448
ID 823033836653
ground (m AD) 4.547
max level (m AD) 4.195
max flood dep (m) -0.352
ID 822999836610.6
max us_flow (m3/s) 144.40387
max ds_flow (m3/s) 144.74512
ID 822954836544
ground (m AD) 4.490
max level (m AD) 4.197
max flood dep (m) -0.293
ID 823224836660
ground (m AD) 3.700
max level (m AD) 4.208
max flood dep (m) 0.508
ID 823224836660.1
max us_flow (m3/s) 4.35811
max ds_flow (m3/s) 3.54792
ID SIH1004820
ground (m AD) 2.910
max level (m AD) 4.216
max flood dep (m) 1.306
ID 823340836894.1
max us_flow (m3/s) 3.83159
max ds_flow (m3/s) 3.06348
ID 823340836894
ground (m AD) 1.740
max level (m AD) 4.214
max flood dep (m) 2.474

50A (EE)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max level (m AD) 4.373
max flood dep (m) -0.297
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ID 823075836706
ground (m AD) 4.560
max level (m AD) 4.371
max flood dep (m) -0.189
ID 823075836706.6
max us_flow (m3/s) 132.99529
max ds_flow (m3/s) 133.17033
ID 823033836653
ground (m AD) 4.547
max level (m AD) 4.374
max flood dep (m) -0.173
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max us_flow (m3/s) 113.76483
max ds_flow (m3/s) 114.17780
ID 822954836544
ground (m AD) 4.490
max level (m AD) 4.377
max flood dep (m) -0.113
ID SIH1004820
ground (m AD) 2.910
max level (m AD) 4.390
max flood dep (m) 1.480
ID 823340836894.1
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max ds_flow (m3/s) -1.38859
ID 823340836894
ground (m AD) 1.740
max level (m AD) 4.386
max flood dep (m) 2.646
ID 823224836660.1
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max ds_flow (m3/s) 7.06227
ID 823224836660
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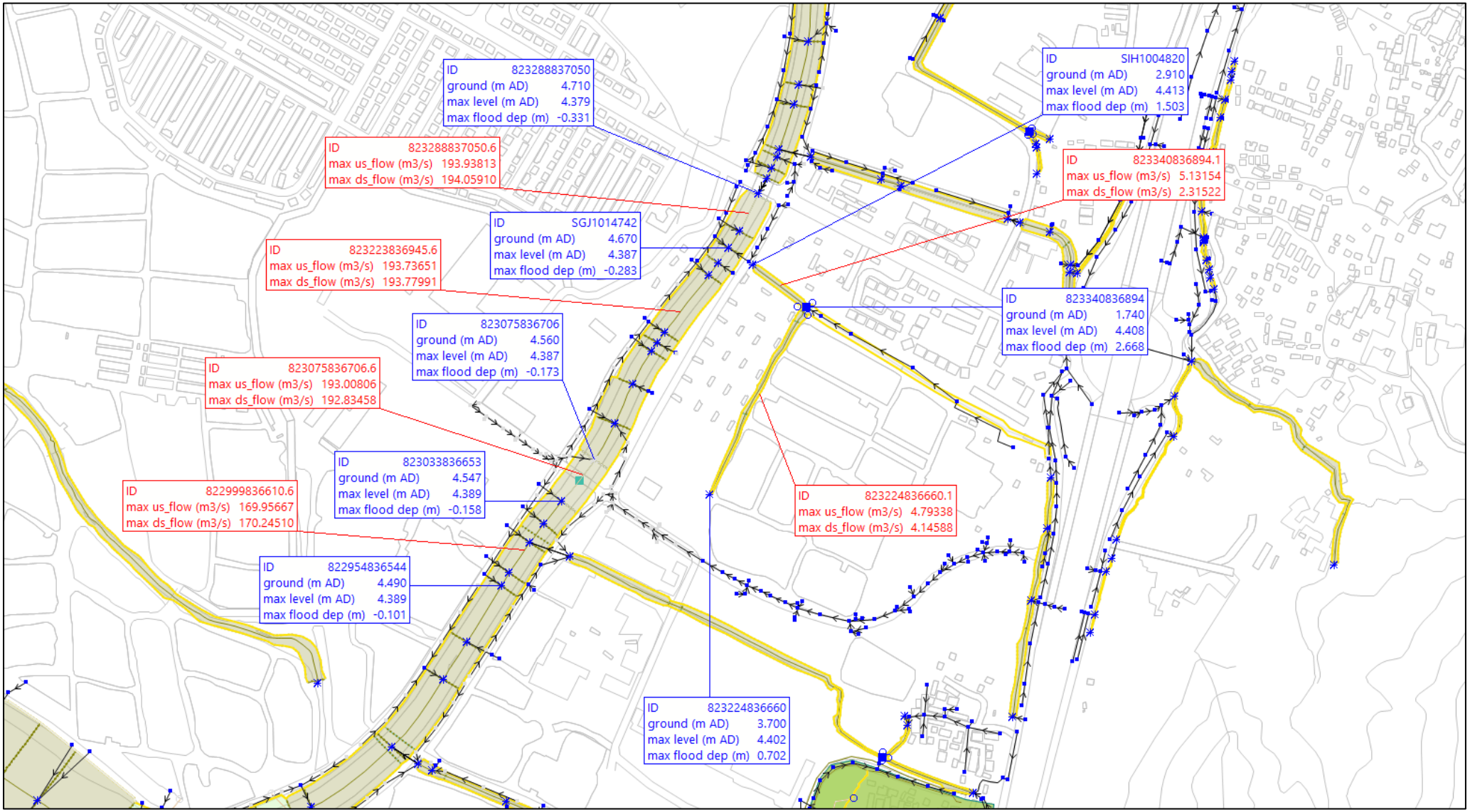
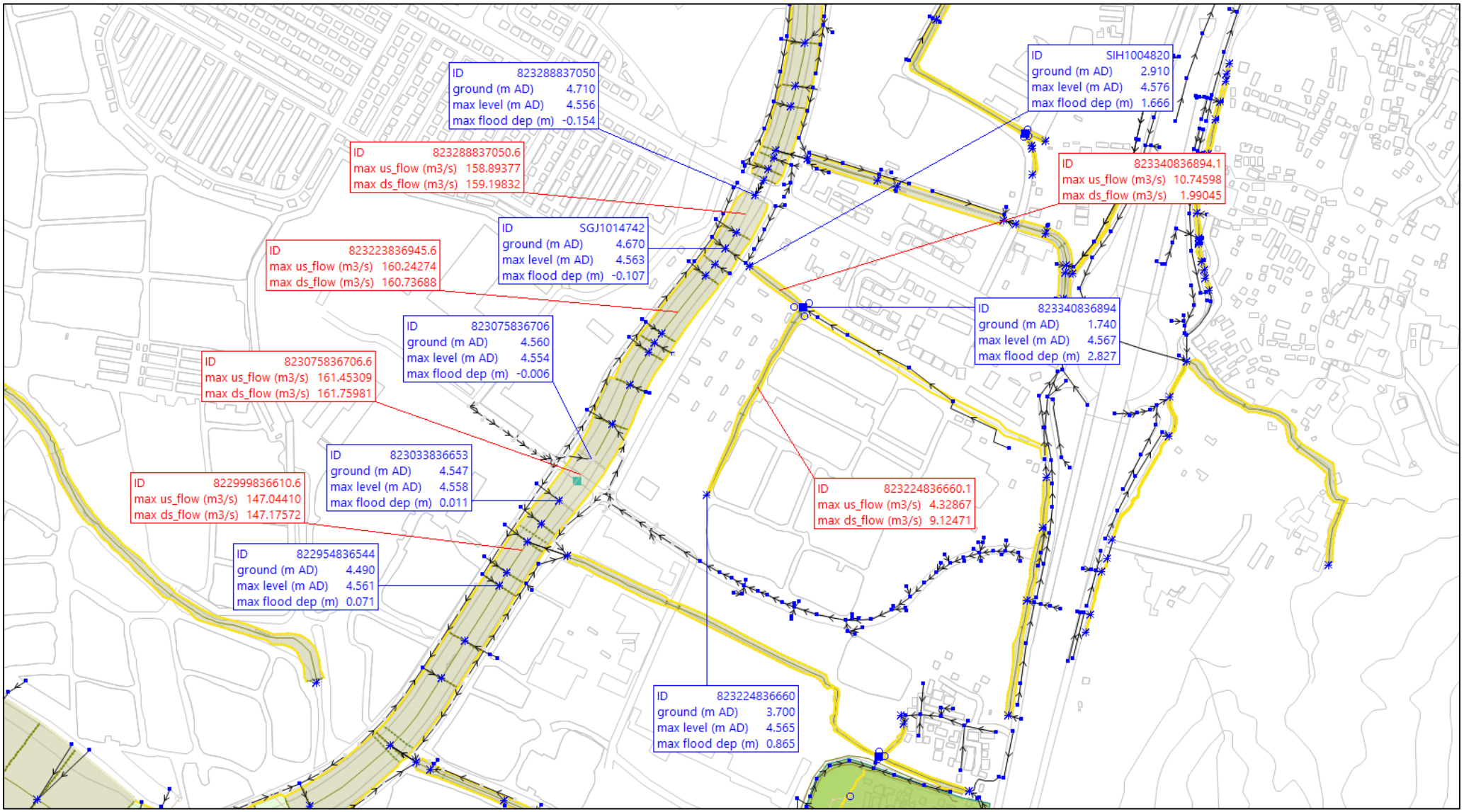
max level (m AD) 4.383
max flood dep (m) 0.683

50B (EE)

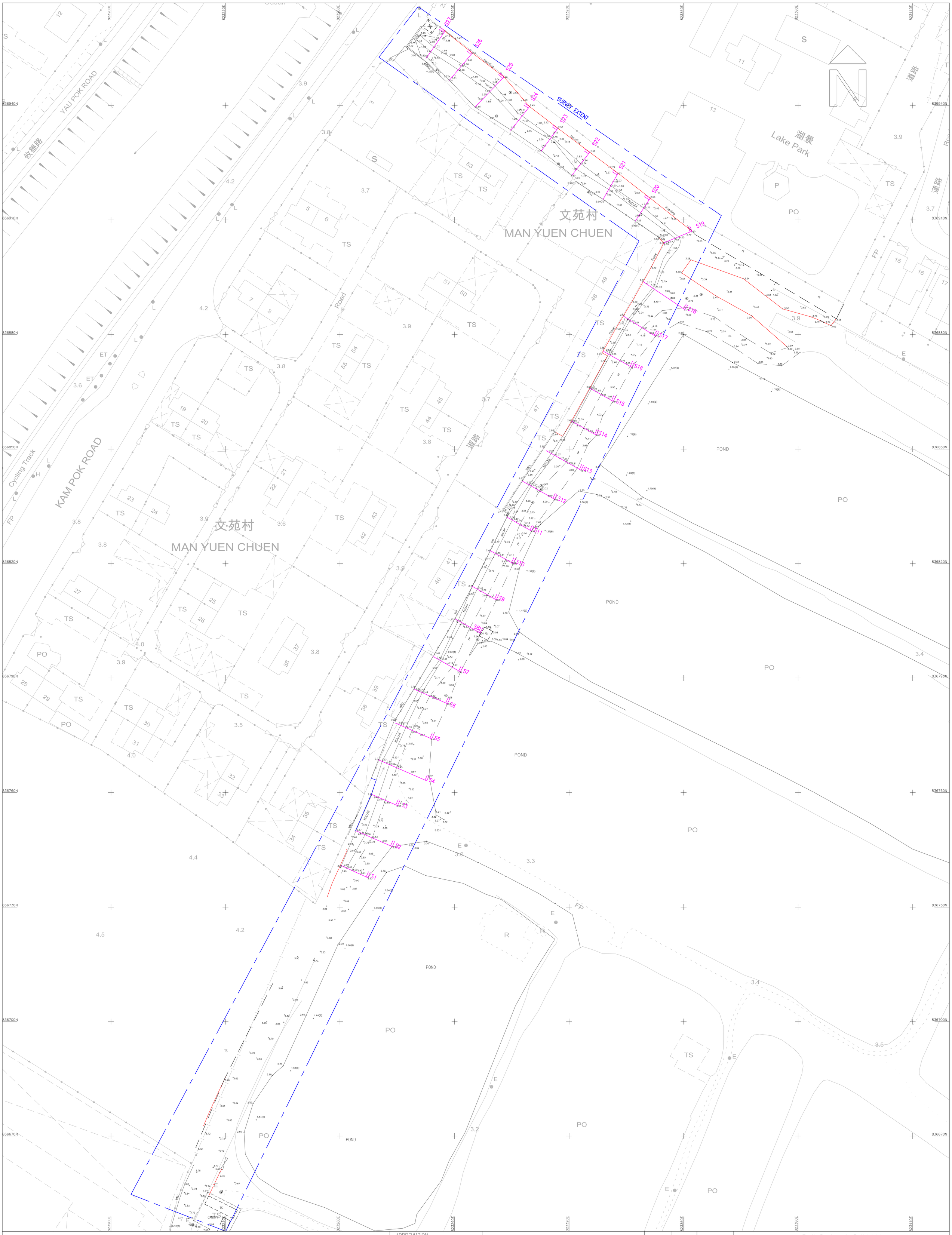


50A (PP with climate change)



50B (PP with climate change)

Appendix 5.1 Site Surveying of Existing Drainage Ditch



LEGEND:

- ARTIFICIAL SLOPE
- CHANNEL WITH FLOW DIRECTION (0.80 WIDE OF CHANNEL)
- STEP CHANNEL WITH FLOW DIRECTION (0.80 WIDE OF STEP CHANNEL)
- BOUNDARY LINE & BOUNDARY POINT
- GATE
- PERMANENT BUILDING AND CANOPY
- TREE WITH TREE NO.
- INCLINED WALL (TOP) (BOTTOM)
- GRAVE
- CONTOURS
- TS — TEMPORARY STRUCTURE
- PB — PILLAR BOX
- HR — HAND RAILING
- HD — HOARDING
- KL — KERB LINE (BOTTOM)
- ST — SLOPE TOP
- SB — SLOPE BOTTOM
- FX — FENCE
- BARRIERS
- BENCH
- ELECTIC POLE
- SB — SIGN BOARD
- SP — SIGN POLE
- L — LAMP POST
- TP — TELEPHONE POLE
- TL — TRAFFIC LIGHT
- H — FIRE HYDRANT
- PM — PARKING METER
- BOLLARD AT ROAD
- GULLY
- GRATING
- VALVE FIRE
- VALVE GAS
- VW — VALVE WATER WORKS
- MH — MANHOLE
- ATC — MANHOLE, ATC
- CATV — MANHOLE, CABLE TV
- E&M — MANHOLE, ELECTRIC & MECHANICAL SERVICES DEPARTMENT
- HKTC — MANHOLE, PCCW-HKT TELEPHONE LIMITED
- DSD — MANHOLE, DRAINAGE SERVICES DEPARTMENT
- PL — MANHOLE, PUBLIC LIGHTING
- HKL — MANHOLE, HUTCHISON COMMUNICATION LIMITED
- H3C — MANHOLE, HUTCHISON GLOBAL CROSSING LIMITED BROADBAND
- CATCH PIT
- MF — MANHOLE, FOUL WATER/SEWER
- MS — MANHOLE, STORM WATER
- PCCW — MANHOLE, PACIFIC CENTURY CABLE & WIRELESS
- NWT — MANHOLE, NEW WORLD TELEPHONE
- CLP — MANHOLE, CLP POWER
- WHT — MANHOLE, WHAFT T & T
- T&T — MANHOLE, TOWNGAS TELECOM

ABBREVIATION:

BD	BOULDER
BE	BERM
BS	BOUNDARY STONE
CA	CANOPY
CUL	CULVERT
CO	COLUMN
CONC	CONCRETE
EB	ELECTRIC BOX
END	END OF OBJECT
FB	FLOWER BED
FP	FOOTPATH
IL	INVERT LEVEL
NU	NULLAH
OH	OVERHANG
PL	PLATFORM
PO	POND
PZ	PIEZOMETER TUBE
RP	RAMP
RU	RUIN
SS	SHRINE
TS	TEMPORARY STRUCTURE
VB	VEHICLE BARRIERS
WE	WELL
WIP	WORK IN PROGRESS
WT	WATER TANK

SCALE 1 : 300 (SIZE A0)

metres 0 6 12 18 24 30 metres

HONG KONG METRIC GRID
PRINCIPAL DATUM HONG KONG
ALL UNITS IN METRES

NOTE
ALL SPOT LEVEL POSITIONS ARE THE DECIMAL POINT OR A CROSS

DATE OF SURVEY: DECEMBER 2022

REVISION	DATE	DESCRIPTION
INITIAL	10/01/2023	---

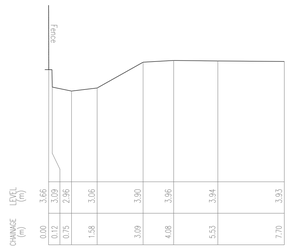
Fruit Design & Build Ltd.

Topographical Survey
Nam Sang Wai
New Territories

SAM MAK & ASSOCIATES SURVEYORS (HK) LTD.
CONSULTANTS IN LAND, ENGINEERING, MARINE & AERIAL SURVEYS
ROOM 901, MARINA HOUSE, NO.68 HING MAN STREET, SHAUKEIWAN, HONG KONG.
TEL : 28951918 FAX : 28901759 E-mail: hkoffice@sammak.com

PLAN NO. 9215/01/01 (Sheet 1 of 3)

PRELIMINARY
(10/01/2023)
Cheung Chee Pak
Authorized Land Surveyor



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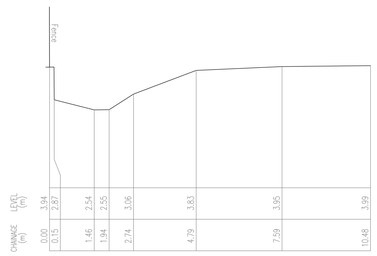

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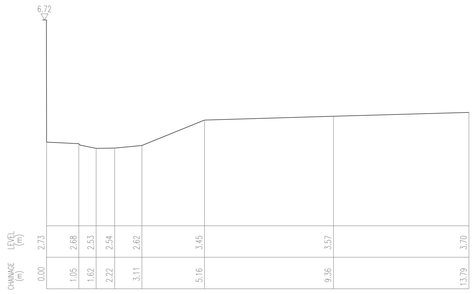
SECTION S3



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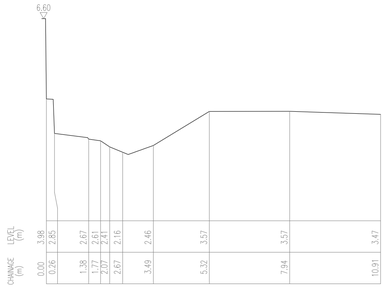

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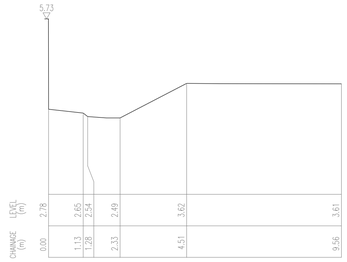

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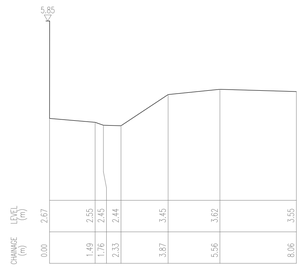

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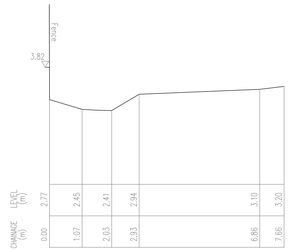

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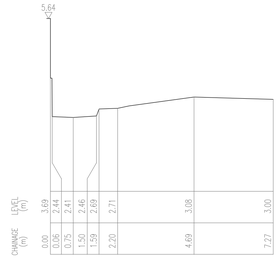

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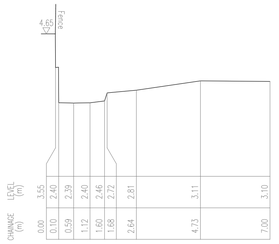

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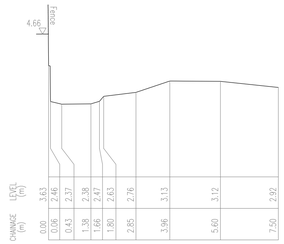

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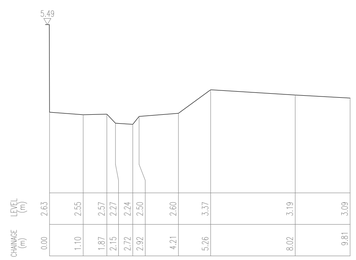

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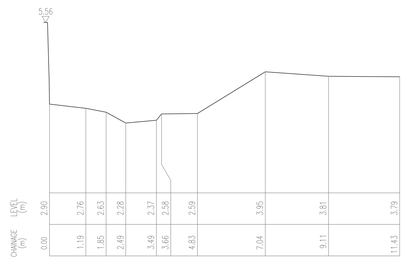

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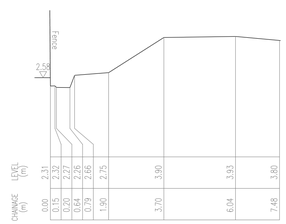

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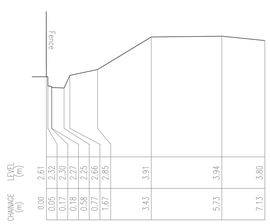

SECTION S15

LEGEND:

- ARTIFICIAL SLOPE
- CHANNEL WITH FLOW DIRECTION (0.80 U-C) — 0.80 WIDE OF CHANNEL
- STEP CHANNEL WITH FLOW DIRECTION (0.80 S-C) — 0.80 WIDE OF STEP CHANNEL
- BOUNDARY LINE & BOUNDARY POINT
- GATE
- PERMANENT BUILDING AND CANOPY (ESST.)
- TREE WITH TREE NO. (T1)
- INCLINED WALL (TOP) (BOTTOM)
- GRAVE (G)
- CONTOURS (130)
- TEMPORARY STRUCTURE (TS)
- PILLAR BOX (PB)
- HAND RAILING (HR)
- HOARDING (HD)
- KERB LINE (BOTTOM) (KL)
- SLOPE TOP (ST)
- SLOPE BOTTOM (SB)
- FENCE (FX)
- BARRIERS
- BENCH (BN)
- ELECTIC POLE (E)
- SIGN BOARD (SB)
- SIGN POLE (SP)
- LAMP POST (L)
- TELEPHONE POLE (TP)
- TRAFFIC LIGHT (TL)
- FIRE HYDRANT (H)
- PARKING METER (PM)
- BOLLARD AT ROAD
- GULLY
- GRATING
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- VALVE WATER WORKS
- MANHOLE (MH)
- MANHOLE, ATC (ATC)
- MANHOLE, CABLE TV (CATV)
- MANHOLE, ELECTRIC & MECHANICAL SERVICES DEPARTMENT (E&M)
- MANHOLE, PCCW-HKT TELEPHONE LIMITED (HKTC)
- MANHOLE, DRAINAGE SERVICES DEPARTMENT (DSD)
- MANHOLE, PUBLIC LIGHTING (PL)
- MANHOLE, HUTCHISON COMMUNICATION LIMITED (HCL)
- MANHOLE, HUTCHISON GLOBAL CROSSING LIMITED BROADBAND (HGC)
- CATCH PIT
- MANHOLE, FOUL WATER/SEWER (MF)
- MANHOLE, STORM WATER (MS)
- MANHOLE, PACIFIC CENTURY CABLE & WIRELESS (PCCW)
- MANHOLE, NEW WORLD TELEPHONE (NWT)
- MANHOLE, CLP POWER (CLP)
- MANHOLE, WHAFT T & T (WH&T)
- MANHOLE, TOWNGAS TELECOM (T&T)

ABBREVIATION:

BD	BOULDER
BE	BERM
BS	BOUNDARY STONE
CA	CANOPY
CUL	CULVERT
CO	COLUMN
CONC	CONCRETE
EB	ELECTRIC BOX
END	END OF OBJECT
FB	FLOWER BED
FP	FOOTPATH
IL	INVERT LEVEL
NU	NULLAH
OH	OVERHANG
PL	PLATFORM
PO	POND
PZ	PIEZOMETER TUBE
RP	RAMP
RU	RUIN
SS	SHRINE
TS	TEMPORARY STRUCTURE
VB	VEHICLE BARRIERS
WE	WELL
WIP	WORK IN PROGRESS
WT	WATER TANK

SCALE 1 : 100 (SIZE A1)

metres 0 2 4 6 8 10 metres

HONG KONG METRIC GRID
PRINCIPAL DATUM HONG KONG
ALL UNITS IN METRES

NOTE:
ALL SPOT LEVEL POSITIONS ARE
THE DECIMAL POINT OR A CROSS

DATE OF SURVEY: DECEMBER 2022

REVISION	DATE	DESCRIPTION
INITIAL	10/01/2023	---

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PLAN NO. 9215/01/01 (Sheet 2 of 3)

PRELIMINARY

(10/01/2023)

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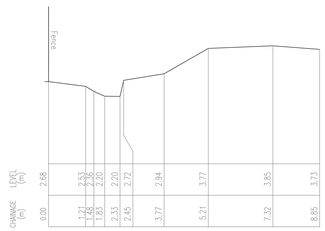
Authorized Land Surveyor



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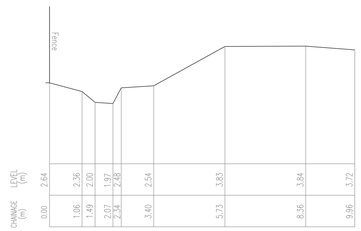

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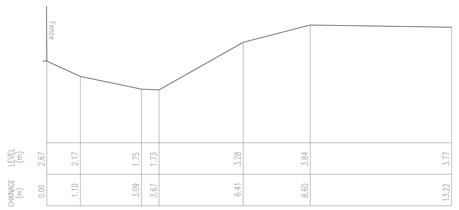

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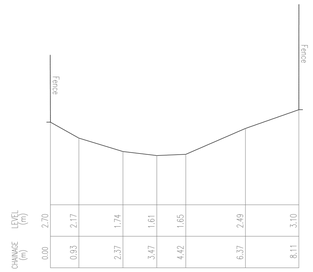

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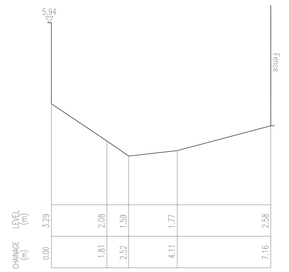

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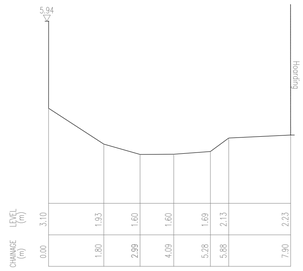

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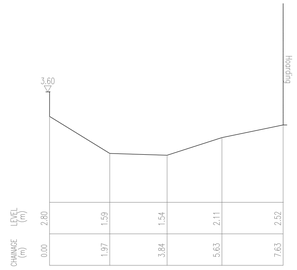

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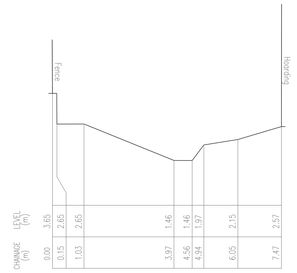

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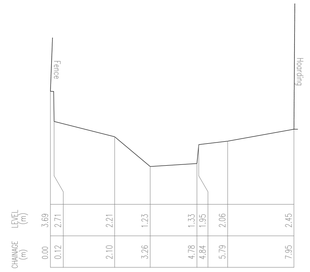

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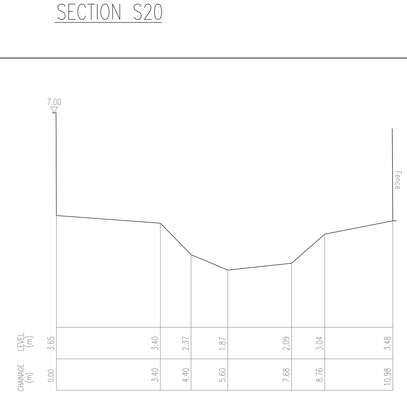

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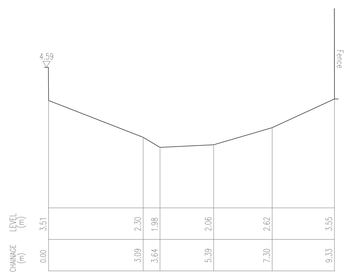

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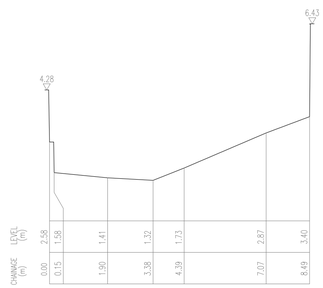

SECTION S27

LEGEND:

- ARTIFICIAL SLOPE
- CHANNEL WITH FLOW DIRECTION (0.60 U-C, 0.60 WIDE OF CHANNEL)
- STEP CHANNEL WITH FLOW DIRECTION (0.60 S-S, 0.60 WIDE OF STEP CHANNEL)
- BOUNDARY LINE & BOUNDARY POINT
- GATE
- PERMANENT BUILDING AND CANOPY
- TREE WITH TREE NO.
- INCLINED WALL (TOP) (BOTTOM)
- GRAVE
- CONTOURS
- TEMPORARY STRUCTURE (TS)
- PILLAR BOX (PB)
- HAND RAILING (HR)
- HOARDING (HD)
- KERB LINE (BOTTOM) (KL)
- SLOPE TOP (ST)
- SLOPE BOTTOM (SB)
- FENCE (FX)
- BARRIERS
- BENCH (BN)
- ELECTIC POLE (E)
- SIGN BOARD (SB)
- SIGN POLE (SP)
- LAMP POST (L)
- TELEPHONE POLE (TP)
- TRAFFIC LIGHT (TL)
- FIRE HYDRANT (H)
- PARKING METER (PM)
- BOLLARD AT ROAD
- GULLY
- GRATING
- VALVE FIRE
- VALVE GAS
- VALVE WATER WORKS (W)
- MANHOLE (MH)
- MANHOLE, ATC (ATC)
- MANHOLE, CABLE TV (CATV)
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