LCH Planning and Development
Consultants Limited

Our Ref.: PD2410002/11
Your Ref.: TPB/A/YL-NSW/357

31 March 2026

By Email

Town Planning Board Secretariat
15/F, North Point Government Offices,
333 Java Road,
North Point,
Hong Kong

Dear Sir/Madam,

SECTION 16 PLANNING APPLICATION NO. A/ YL-NSW/357

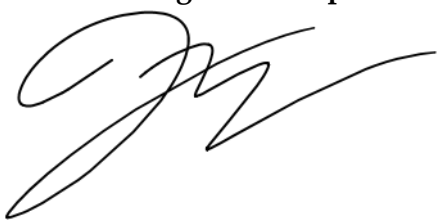
Further Information Submission

We refer to the departmental comments received from Drainage Services Department on 26 March 2026 of the captioned Application.

Please find attached our responses to the departmental comments with the Drainage Impact Assessment Report. This further information contains the technical clarification and response the relevant departmental comments without major changes in the assumptions and methodologies, findings and proposed mitigation measures. Thus, according to TPB PG-No. 32B, this further information does not constitute as a material change the application and should be accepted and exempted by the TPB for inclusion into the application.

Should you require further information or have any query, please feel free to contact the undersigned or Haze Tsang at [redacted].

Yours faithfully,
For and on behalf of
LCH Planning & Development Consultants Limited



Junior Ho
Director

c.c. the Applicant

Encl.
- Appendix 1 – Responses to Departmental Comments
- Appendix 2 – Drainage Impact Assessment Report

[redacted]

Filling of Pond for Permitted Agricultural Use for a Period of 3 Years in "Other Specified Uses" annotated "Comprehensive Development to include Wetland Restoration Area" ("OU(CDWRA)") and "Village Type Development" ("V") zones, Lots 1212 S.E ss.1 and 1212 S.E RP (Part) in D.D. 115 and adjoining Discrepant Areas (Part), Nam Sang Wai, Yuen Long, New Territories

Section 16 Planning Application No. A/YL-NSW/357

Response to Departmental Comments Table

No.	Comments Received	Our Responses
A. *Comments from the Drainage Services Department (Contact person: Ms. Jessica KWAN, Tel: 3965 8924)*		
Date: 26 March 2026		
1.	The applicant should employ a qualified engineer (Registered Professional Engineer in the Civil Engineering discipline) to prepare for drainage submission. The drainage submission should be signed and certified by a qualified engineer;	The DIA is signed and certified by a qualified engineer, Ir. Leung Wing Kit. Please refer to the **DIA**.
2.	Para. 3.1 & Appendices B & C: The applicant should review roughness coefficient of the proposed stormwater pipe;	The roughness coefficient of the proposed stormwater pipe is changed to 0.006mm. Please refer to **Para. 3.1** and **Appendix B and C** of the **DIA**.
3.	Para. 3.2 & Figures 3.2 & 3.3: A sand trap/desilting type catchpit should be provided prior to connection to the proposed stormwater terminal manhole or to the downstream public stormwater drainage system;	Catchpit with sand traps is provided prior to connection to the proposed stormwater terminal manhole. Please refer to **Figure 3.2** and **Figure 3.3** of **DIA**.
4.	R-t-C No. 8 & Appendix D: In addition to calculating the utilization of the existing watercourse (Kam Tin River) from the subject site, the Consultant should also provide an assessment of the overall utilization of the existing drainage system;	There is no existing drainage system within the Site and to Kam Tin River. Please refer to **Appendix E** of **DIA**. The overall utilization of the existing watercourse (Kam Tin River) has been calculated. Please refer to **Appendix D** of **DIA**.
5.	Table 3.1: Please use "paved"/"unpaved" ratio instead of using "water bodies" & "heavy soil";	Paved and unpaved ratio was used. Please refer to **Table 3.1** of the **DIA**.
6.	Para. 3.4: Please be reminded that the extreme sea level due to climate change by the end of the 21st century under a 50-year	Portable flood barriers will be used on Site when there is heavy rain. Please refer to **Para. 3.4** of the **DIA**.

No.	Comments Received	Our Responses
	return period is 5.01mPD. The design of any structures/drainage facilities should consider this to minimize flood risk. If part of the Site is anticipated to be subject to adverse flooding impact under a 50-year return period, the applicant should propose appropriate mitigate measures. In addition, it is crucial to ensure that the flooded water does not overflow into the adjacent area;	
7.	The applicant should demonstrate with hydraulic calculation that the proposed drainage facilities are adequate to collect, convey and discharge the surface runoff accrued on the application site and the overland flow intercepted from the adjacent lands; and	Calculations are provided. Please refer to **Appendix B and C** of the **DIA**.
8.	The applicant should demonstrate the existing facilities to be discharged to have sufficient capacity to cater for any additional flow generated due to the subject application.	The existing watercourse has sufficient capacity to cater for the flow generated from the Site. Please refer to **Appendix D** of the **DIA**.

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Section 16 Application for Filling of Pond for Permitted Agricultural Use in Sub-section 1 and the Remaining Portion (Portion) of Section E of Lot No. 1212 in D.D. 115 and the Discrepant Areas (Portion) adjacent to Section E of Lot No. 1212 in D.D. 115, Nam Sang Wai, Yuen Long, New Territories

Drainage Impact Assessment Report

Reference: P159-DIA-I4
Date: 30 March 2026
Confidential

[redacted]

Section 16 Application for Filling of Pond for Permitted Agricultural Use in Sub-section 1 and the Remaining Portion (Portion) of Section E of Lot No. 1212 in D.D. 115 and the Discrepant Areas (Portion) adjacent to Section E of Lot No. 1212 in D.D. 115, Nam Sang Wai, Yuen Long, New Territories

Drainage Impact Assessment Report

Reference: P159-DIA-I4

Date: 30 March 2026

Issue	Status	Prepared By	Date	Checked by	Date	Approved By	Date
1	-	Elvis Liu	Sep 25	Cheryl Chan	Sep 25	Joan Choi	Sep 25
2	-	Cheryl Chan	Dec 25	Cheryl Chan	Dec 25	Joan Choi	Dec 25
3	-	Elvis Liu	Mar 26	Cheryl Chan	Mar 26	Joan Choi	Mar 26
4	-	Elvis Liu	Mar 26	Cheryl Chan	Mar 26	Joan Choi	Mar 26

[redacted]

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1 Introduction

1.1 Background

The planning application is for filling a pond for permitted agricultural use in Sub-section 1 and the Remaining Portion (Portion) of Section E of Lot No. 1212 in D.D. 115 and the Discrepant Areas (Portion) adjacent to Section E of Lot No. 1212 in D.D. 115 in Nam Sang Wai, Yuen Long, New Territories (hereafter as "the Site").

The Site mainly falls within an area designated as "Other Specified Uses" annotated as "Comprehensive Development to include Wetland Restoration Area" ("OU(CDWRA)") zone with a small portion in an area designed as "Village Type Development" ("V") zone on the Approved Nam Sang Wai Outline Zoning Plan No. S/YL-NSW/11 ("NSW OZP"). According to the Notes of the NSW OZP for "OU(CDWRA)" and "V" zones, 'Agricultural Use' falls into Column 1 that is always permitted by the Board.

The Site falls within the Wetland Buffer Area ("WBA") as designated under the TPB PG-No. 12C for "Application for Developments within Deep Bay Area under Section 16 of the Town Planning Ordinance". Complying with its "No-Net-Loss in Wetland" principle, this proposed use aligns with the guideline's intention to protect the ecological integrity of the fishponds and wetlands within the sensitive Wetland Conservation Area ("WCA") through the rehabilitation of agricultural area and fishponds.

The proposed area for cultivation was previously ponds and had been formed for more than two decades. It is currently covered with vegetation. In order to reflect the current situation of the Site and to regularize the pond filling, a planning application for filling of pond is proposed.

This proposal demonstrates that the proposed agricultural use is always permitted under the NSW OZP and the filling of pond is to reflect the current condition of the Site.

Due to concerns about possible drainage impact arising from the proposed development, Urban Green Consultants Ltd. (UGC) has been commissioned to

conduct a Drainage Impact Assessment (DIA) to demonstrate the acceptability of drainage impact upon the surrounding environment.

1.2 Study Objectives

The objectives of this DIA are to assess the possible drainage impacts that may be caused by the proposed development and to recommend mitigation measures to alleviate such impacts if necessary.

1.3 Report Structure

The remaining chapters of this report are shown below:

Chapter 2 – Site Context

Chapter 3 – Drainage Analysis

Chapter 4 – Conclusion

2 Site Context

2.1 Current Site Conditions and its Environs

The Site covers a total area of about 21,929m^2, including portion of Lot 1212 s.E R.P. of about 13,068 m^2., Lot 1212 s.E ss.1 of about 10m^2., and a portion of Discrepant Areas (Portion) adjacent to Lot 1212 s.E of about 8,851 m^2. The Site is currently fenced off, largely paved with vegetations covering a major portion of the site and a pond situated in the northwest.

The Site is located at the far fringe of Nam Sang Wai. The surrounding environment of the Site is in rural village context intermixed with temporary uses. The Site is surrounded by Shan Pui Tsuen and Shan Pui Chung Hau Tsuen, with other low-rise residential developments. The immediate northwest of the Site is the Hong Kong School of Motoring, while to the southwest is the transitional housing project of United Court providing about 1800 units. Figure 2.1 shows the Site location and its environs.

2.2 Existing Drainage Condition

A site survey was conducted on 7 May 2025. The Site is not served by any drainage system to direct surface runoff. Part of the runoff overflows directly into the Kam Tin River.

3 Drainage Analysis

3.1 Assessment Methodology and Assumptions

This DIA has adopted the Rational Method for runoff estimation:

$$Q_p = 0.278\ i \sum C_j\ A_j$$

where
Q_p is peak runoff (m^3/s);
i is rainfall intensity (mm/hr);
A_j is the j^{th} catchment (km^2);
C_j is the runoff coefficient of the j^{th} catchment (dimensionless).

The details of the Rational Method can be referred to the *Stormwater Drainage Manual* (SDM) (DSD, 2018) with Corrigendum No. 1/2022, 1/2024, 2/2024.

Based on a 1:50 year flood protection standard in the SDM and the estimated time of concentration, the appropriate rainfall intensities (i) were calculated based on linear interpolation of the intermediate table values.

The assumptions of this DIA are summarised below:

- Rainstorm return period – 1 in 50 years
- Runoff coefficient for flatted grassland (heavy soil) – 0.25
- Manning's roughness coefficient for the proposed U-channels – 0.016
- Colebrook-White's roughness coefficient (ks) for the proposed circular pipes – 0.000006 m
- Kinematic viscosity of water at 15°C (v) – 1.140x10-6 m^2/s
- Gravity (g) – 9.806 m^2/s

3.2 Design Parameters

Based on the geographical characteristics of the Site and its surroundings, there are a total of 11 catchments (Catchment A, D – M) were identified as shown in Figure 3.1A before the proposed development. There is a change in the catchment area after the proposed development. Figure 3.1B shows that there is a total of 12 catchments (Catchment A – M). Before the proposed development, the flow of catchments F and G will naturally flow into Kam Tin River through the Site. But with an increase of about 2 m in the Site level, the flow of catchment G will no longer flow through the Project Site. The flow in catchment G directly flows into the United Court (Catchment H), then the flow of catchment G and H discharges into the surface channels of United Court. Catchment K in Figure 3.1A originally flows through the Site as well. But due to the change in ground level, the flow of catchment K now

combines with the flow of catchment J, forming one single catchment as shown in Figure 3.1B. Therefore, the drainage characteristics of nearby catchment areas have changed after the proposed development.

Among all nearby catchment areas, only catchment F will flow through the Site. For conservative assessment purposes, the runoff from Catchment F has been fully incorporated into the hydraulic calculations. Since the existing overland flow will be changed, wall openings will be provided for the fence wall between catchment G and the Site. The wall openings are proposed to have dimensions of 300 mm (W) x 200 mm (H) and they will be distributed at a regular spacing of 2 m to ensure the surface runoff from catchment F can be conveyed to the proposed drainage system within the Site.

No existing drainage facilities are found on Site based on the site survey conducted on 7 May 2025. Surface runoff from Catchment A, B, C and F will be collected by a series of the proposed U-channels and circular pipes, then discharged to the Kam Tin River via proposed U-channels M1 – M12 and proposed circular pipe M9 to Kam Tin River. Sand trap will be provided together with the terminal manhole to collect sediment before the collected runoff is discharged to the existing watercourse. Figure 3.3A to 3.3D shows the cross sections of proposed drainage facilities with the existing and proposed ground levels. Figure 3.4 shows the details of the connection between the proposed drainage system and the existing Kam Tin River. Figure 3.5 and Figure 3.6 shows the typical design of catchpit, u-channel and sand trap. The drainage proposal is shown in Figure 3.2.

For the surface runoff from Catchment D - M (as indicated in Figure 3.1B), the runoff will not flow towards the Site. Therefore, the Site will not collect the runoff from surrounding catchments.

The surface runoff from the Site has been estimated and presented in Appendix B.

3.3 Assessment Results

The surface characteristics of the on-site catchment area (i.e. Catchment A, B and C) has changed after the proposed development. The changes in surface characteristics of the on-site catchment area are summarized in Table 3.1.

Table 3.1 Changes in Surface Characteristics of On-Site Catchment Area

On-Site Catchment Area	Existing Development		Proposed Development
	Unpaved	Paved	Paved
A	90%	10%	100%
B	80%	20%	100%
C	60%	40%	100%

Detailed calculations of the estimated on-site catchment runoffs to the proposed drainage system are provided in Appendix B. The assessment results are summarized in Table 3.2.

Table 3.2 Estimated Runoffs to Proposed U-Channels

Channel Segment	Diameter / Width, m	Depth, m	Gradient	Catchment Runoff, m^3/s	Capacity, m^3/s	% of capacity flow	Sufficient Capacity?
M1-M2	0.450	0.450	0.003	0.066	0.159	42%	Y
M2-M3	0.450	0.450	0.003	0.101	0.159	64%	Y
M3-M4	0.450	0.450	0.003	0.101	0.159	64%	Y
M4-M5	0.450	0.450	0.003	0.101	0.159	64%	Y
M5-M6	0.600	0.600	0.003	0.181	0.342	53%	Y
M6-M7	0.600	0.600	0.003	0.181	0.342	53%	Y
M7-M8	0.600	0.600	0.005	0.181	0.342	53%	Y
M8-M9	0.600	0.600	0.005	0.181	0.342	53%	Y
M1-M12	0.450	0.450	0.010	0.066	0.275	24%	Y
M12-M11	0.450	0.450	0.010	0.146	0.275	53%	Y

Channel Segment	Diameter / Width, m	Depth, m	Gradient	Catchment Runoff, m^3/s	Capacity, m^3/s	% of capacity flow	Sufficient Capacity?
M11-M10	0.600	0.600	0.005	0.146	0.419	35%	Y
M10-M9	0.600	0.600	0.003	0.146	0.342	43%	Y

Table 3.3 Estimated Runoffs to Proposed Circular Pipes

Pipe Segment	Diameter / Width, m	Depth, m	Gradient	Catchment Runoff, m^3/s	Capacity, m^3/s	% of capacity flow	Sufficient Capacity?
M9 to Kam Tin River	0.750	0.750	0.003	0.326	0.764	43%	Y

Based on the results in Appendix B, the proposed drainage system has adequate capacity to cater the surface runoff from the proposed development. Table 3.4 has also shown that the existing watercourse Kam Tin River has sufficient capacity to cater the discharge from the Site as the Site only contributes 0.02% of the total runoff (refer to Table 3.5). Detailed calculations are tabulated in Appendix D.

Table 3.4 Estimated Capacities of the Existing Watercourse

Existing Watercourse	Diameter / Width, m	Depth, m	Gradient	Discharge, m^3/s	% of capacity flow	Sufficient Capacity?
Kam Tin River	Top width: 34.0m	4 (River Depth)	0.069	1737	60.98%	Y
	Bottom Width: 25.0m	3 (Assumed Water Depth)		1059		

Table 3.5 Contribution from the Identified Catchments to the Existing Watercourse

Existing Watercourse	Diameter / Width, m	Depth, m	Gradient	Catchment Runoff, m^3/s	Capacity, m^3/s	% of capacity flow used in Kam Tin River	Sufficient Capacity?
Kam Tin River	Top width: 34.0m Bottom Width: 25.0m	4	0.069	0.326	1683	61%	Y

3.4 Climate Change

To consider the effect of climate change in the drainage system, the project of rainfall increase of 11.1% for Mid-21st Century (2041-2060) and 16.0% for the and End of 21st Century (2081-2100) as well as design allowance in End of 21st Century of 12.1% as per requirements in Stormwater Drainage Manual (SDM) Corrigendum No. 1/2022 are adopted. Detailed calculations are provided in Appendix C.

The analysis indicated that the proposed drainage system would have sufficient capacity for the additional runoff from the proposed development with a 11.1% and 16% increase in rainfall intensity as well as 12.1% of design allowance. Hence, the proposed development would not cause adverse drainage impacts nor increase the flooding susceptibility of the surrounding areas.

In view of projected extreme sea levels due to climate change, the design water level by the end of the century is estimated to reach 5.01 mPD. The original Site formation level was approximately 3.0 mPD. Following the completion of the pond filling works, the existing Site levels have been raised and now range from approximately 4.0 mPD to 7.2 mPD.

With the increased formation levels, the majority of the Site will remain above the projected extreme sea level of 5.01 mPD. Therefore, only part of the Site is anticipated to be subject to adverse flooding impact arising from sea level rise under the projected climate change scenario. Therefore, portable flood barriers will be installed on the Site to mitigate possible flooding impacts. The portable flooding barriers will be placed on the Site whenever there an amber rainstorm signal, red rainstorm signal or black rainstorm signal is issued.

3.5 Recommendation

Upon detailed design stage, the Project Proponent will appoint engineer and contractor to design and to construct the proposed drainage system. The detailed arrangement of the proposed drainage system and drainage connections will be further investigated at the detailed design. Iron grating will be provided for the surface channels. Detailed information of the proposed drainage system will be prepared and submitted to DSD and relevant parties during the detailed design stage.

4 Conclusion

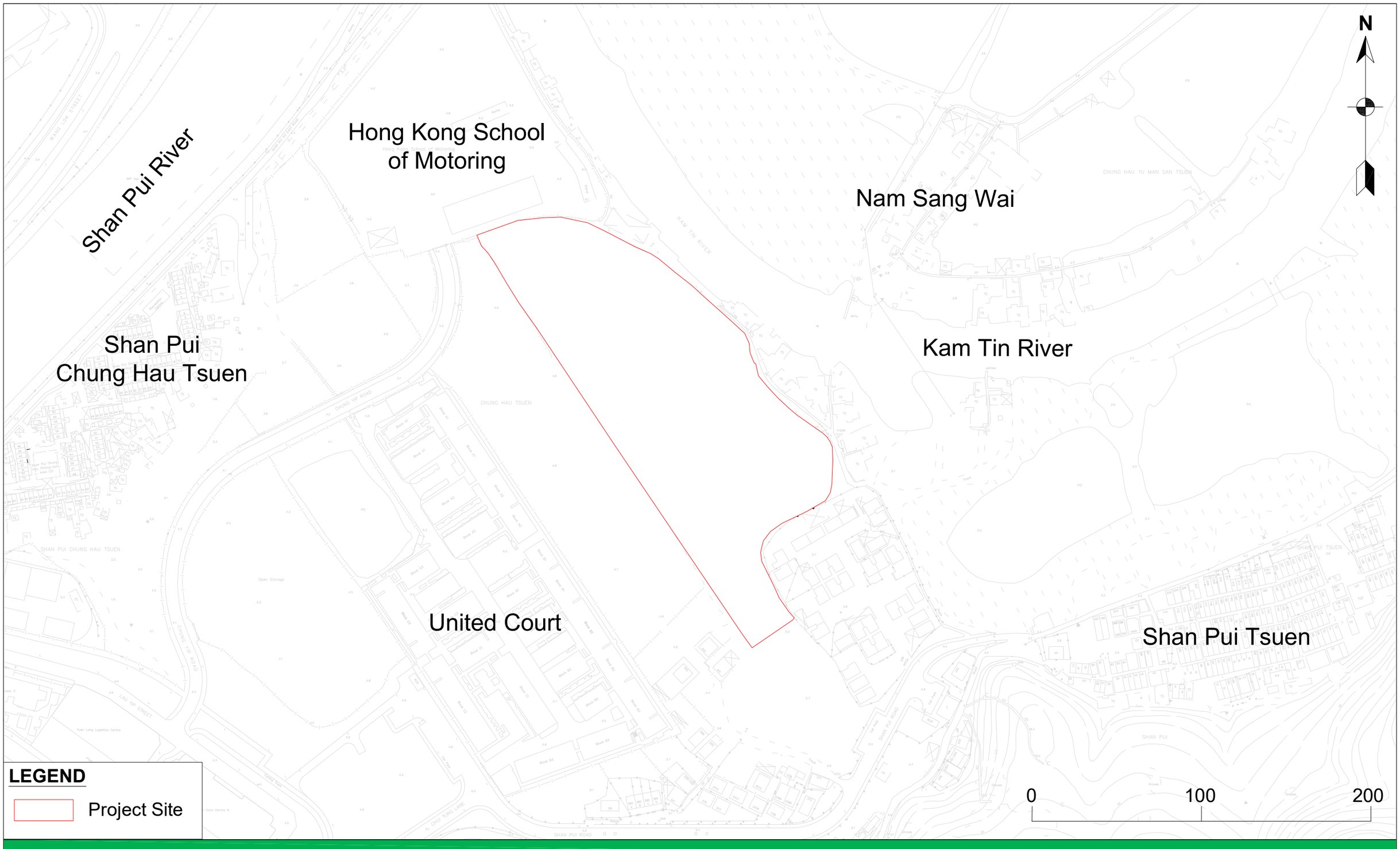
A Drainage Impact Assessment (DIA) has been conducted for the proposed development in Yuen Long, New Territories.

The peak surface runoff was calculated based on a 50-year return period, as well as projected increases in rainfall intensity attributed to both the Mid-21st Century and End of 21st Century (with design allowance) due to climate change.

Surface runoff from the Site will be collected by a series of U-channels and circular pipes, then discharged to the Kam Tin River. The drainage analysis has demonstrated that the proposed drainage systems have adequate capacity to cater the surface runoff from the Site.

Based on the above, it is concluded that the proposed development will not result in any adverse drainage impacts.

Figures



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Section 16 Application for Filling of Pond for Permitted Agricultural Use in Sub-section 1 and the Remaining Portion (Portion) of Section E of Lot No. 1212 in D.D. 115 and the Discrepant Areas (Portion) adjacent to Section E of Lot No. 1212 in D.D. 115, Nam Sang Wai, Yuen Long, New Territories

Site Location and Its Environs

Figure 2.1

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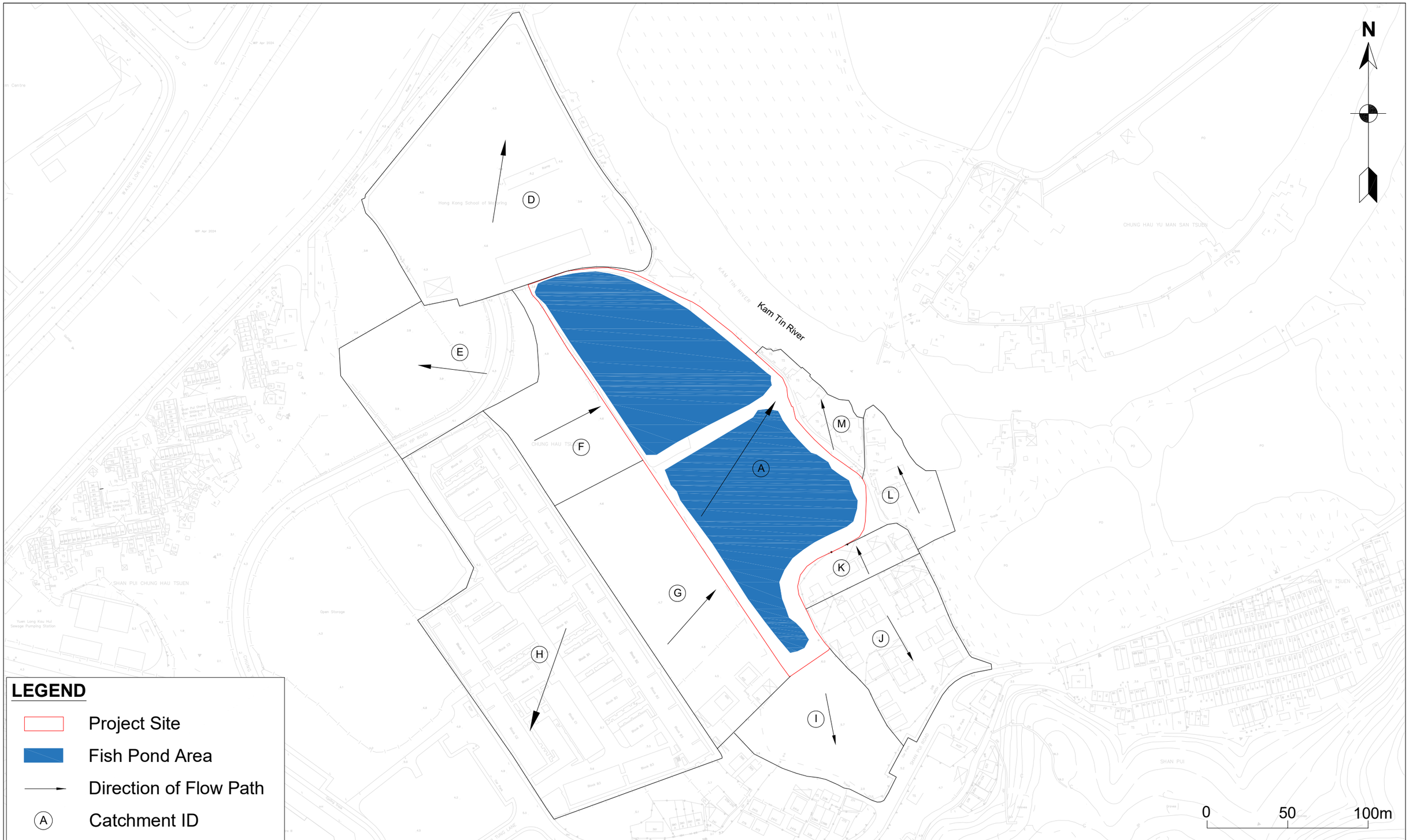

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Identified Catchment Areas before the Proposed Development

Figure 3.1A

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Section 16 Application for Filling of Pond for Permitted Agricultural Use in Sub-section 1 and the Remaining Portion (Portion) of Section E of Lot No. 1212 in D.D. 115 and the Discrepant Areas (Portion) adjacent to Section E of Lot No. 1212 in D.D. 115, Nam Sang Wai, Yuen Long, New Territories

Identified Catchment Areas after the Proposed Development

Figure 3.1B

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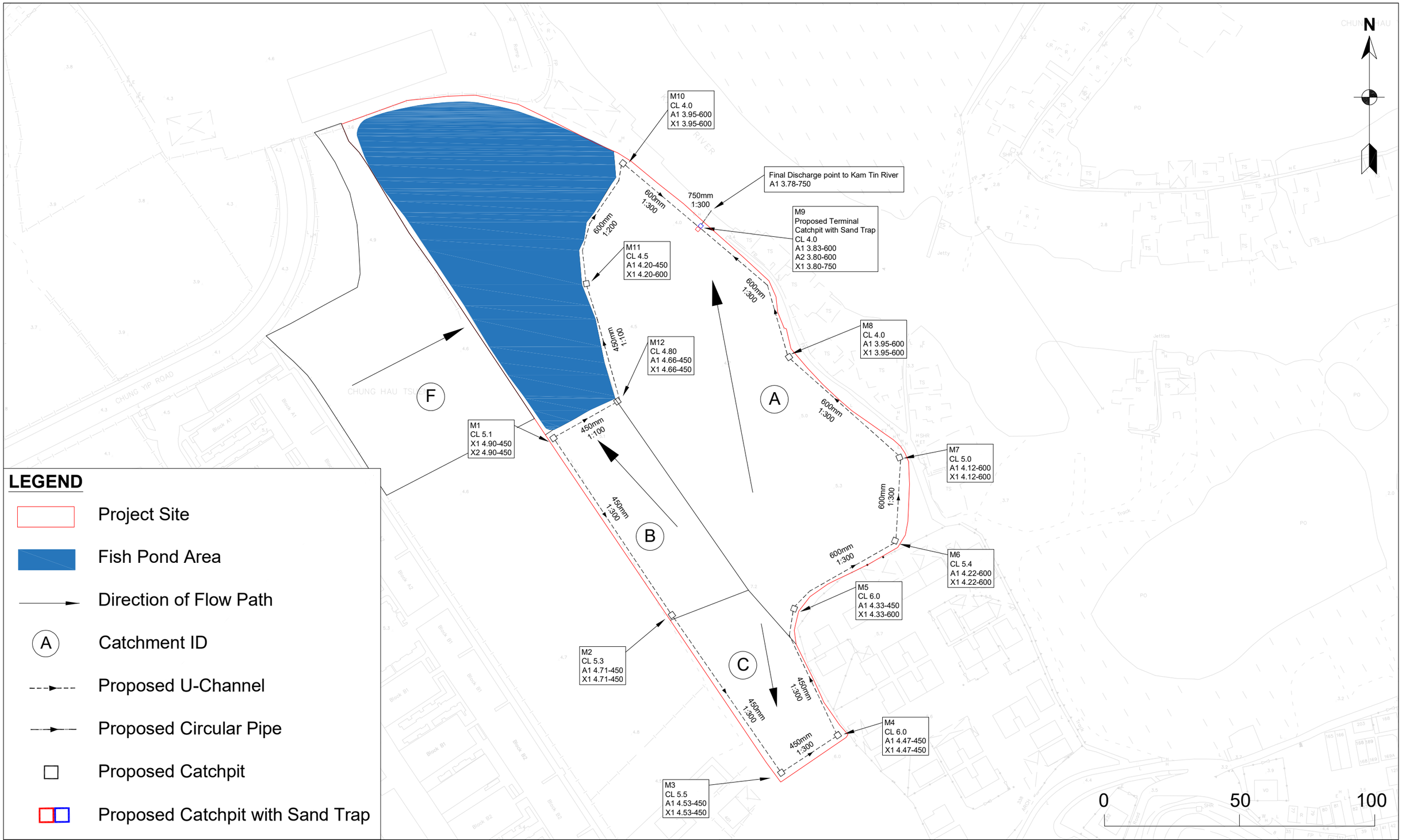

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Drainage Proposal

Figure 3.2

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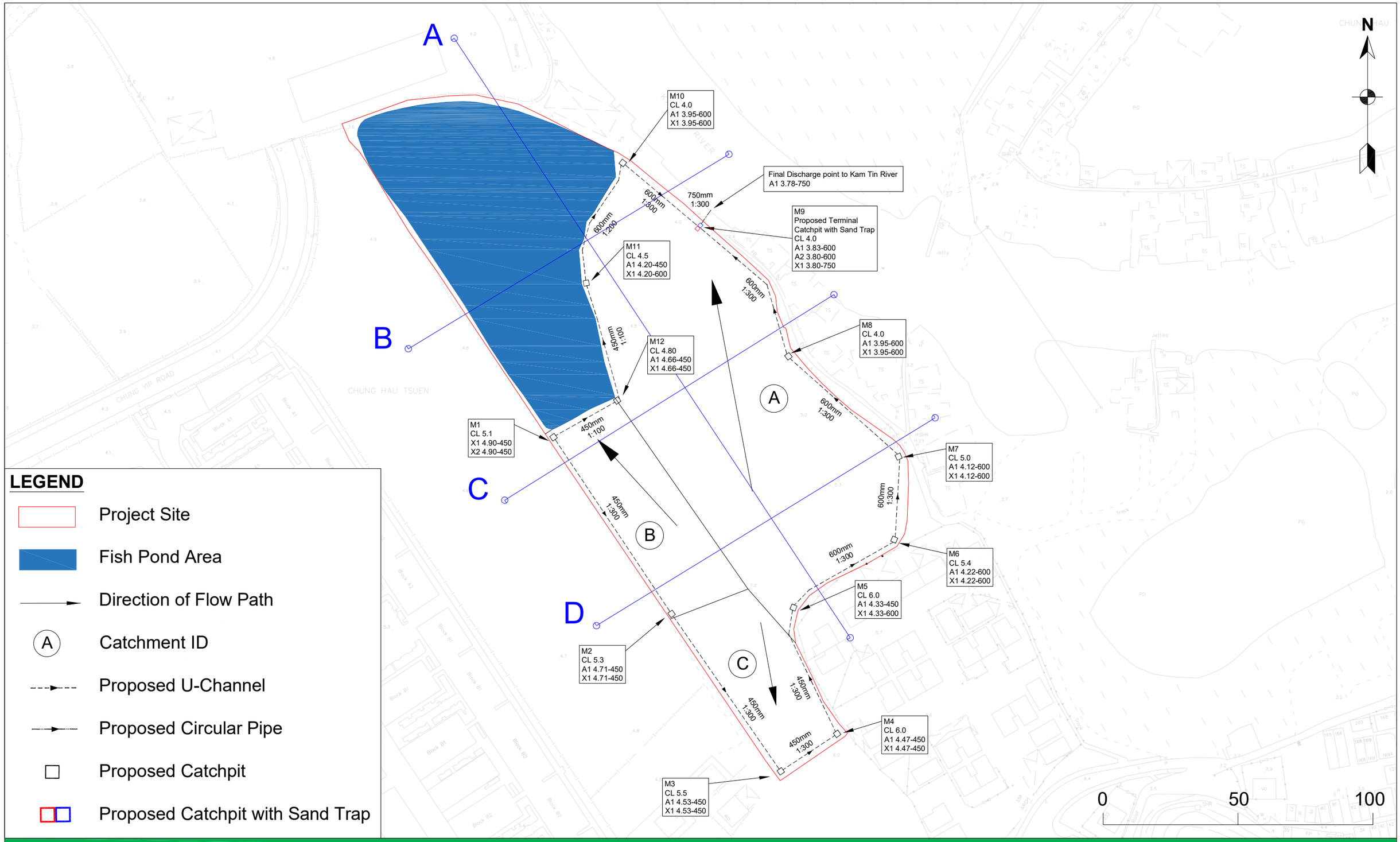

LEGEND

- Project Site
- Fish Pond Area
- Direction of Flow Path
- (A) Catchment ID
- Proposed U-Channel
- Proposed Circular Pipe
- Proposed Catchpit
- Proposed Catchpit with Sand Trap

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Section 16 Application for Filling of Pond for Permitted Agricultural Use in Sub-section 1 and the Remaining Portion (Portion) of Section E of Lot No. 1212 in D.D. 115 and the Discrepant Areas (Portion) adjacent to Section E of Lot No. 1212 in D.D. 115, Nam Sang Wai, Yuen Long, New Territories

Cross Section of Existing and Proposed Ground Level

Figure 3.3

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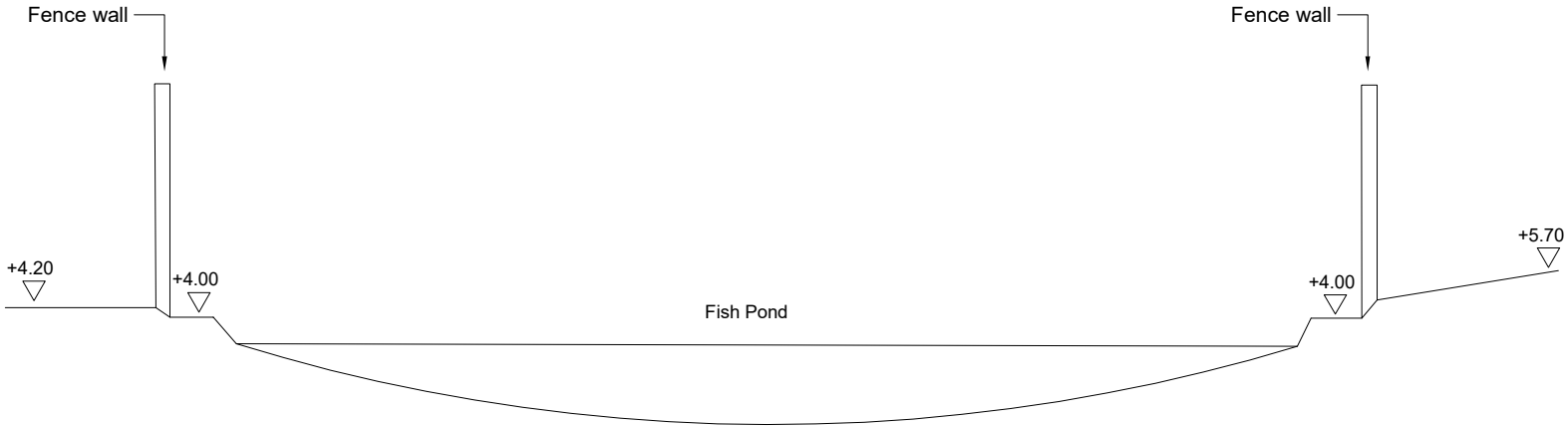
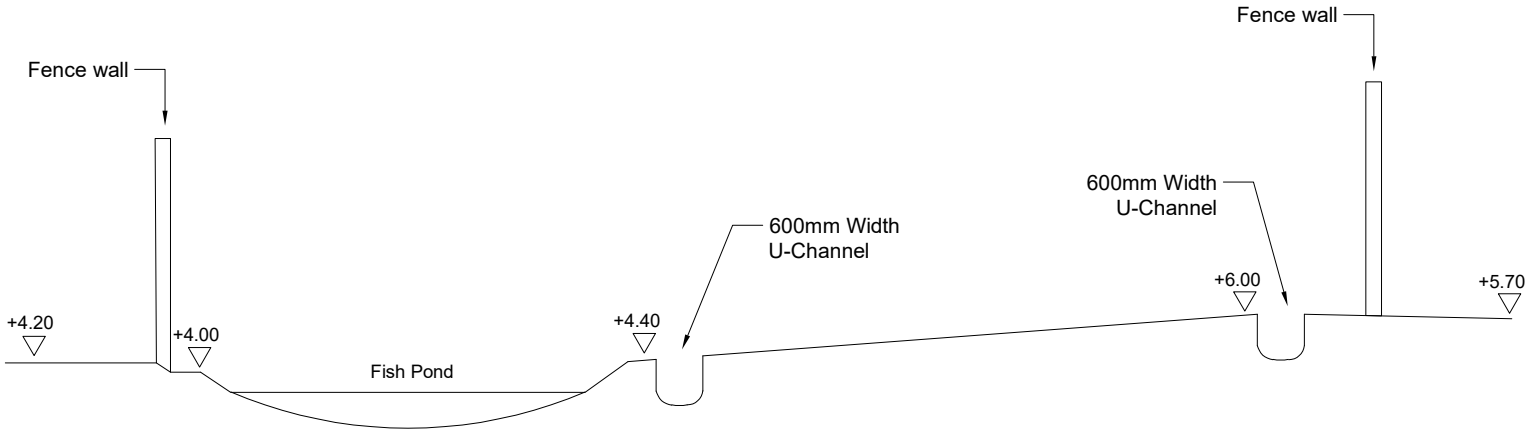


Existing Ground Level



Proposed Ground Level

Section A

NOT IN SCALE

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Section 16 Application for Filling of Pond for Permitted Agricultural Use in Sub-section 1 and the Remaining Portion (Portion) of Section E of Lot No. 1212 in D.D. 115 and the Discrepant Areas (Portion) adjacent to Section E of Lot No. 1212 in D.D. 115, Nam Sang Wai, Yuen Long, New Territories

Cross Section - Section A

Figure 3.3A

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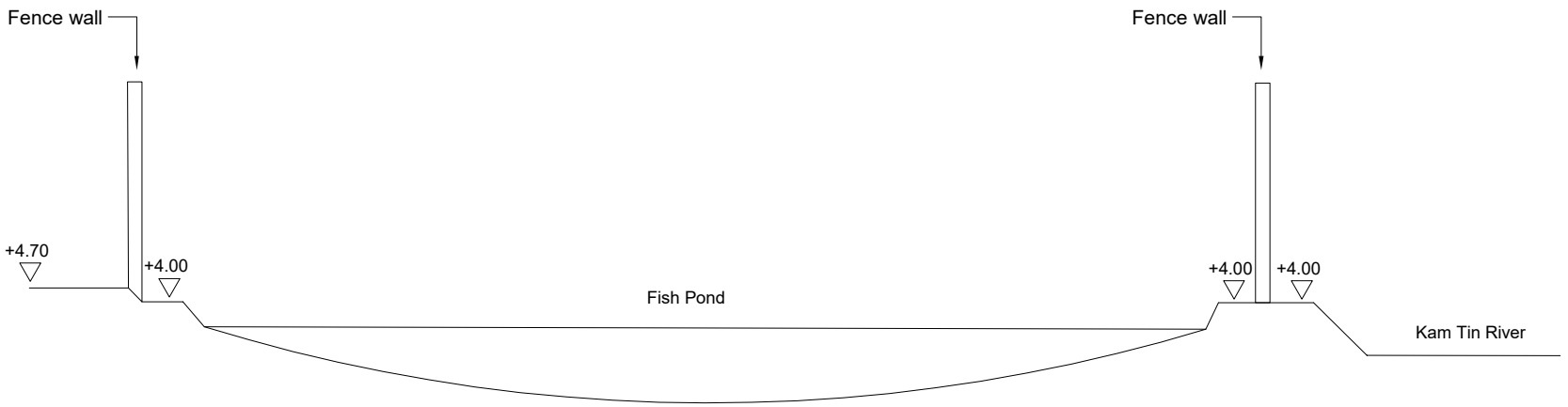
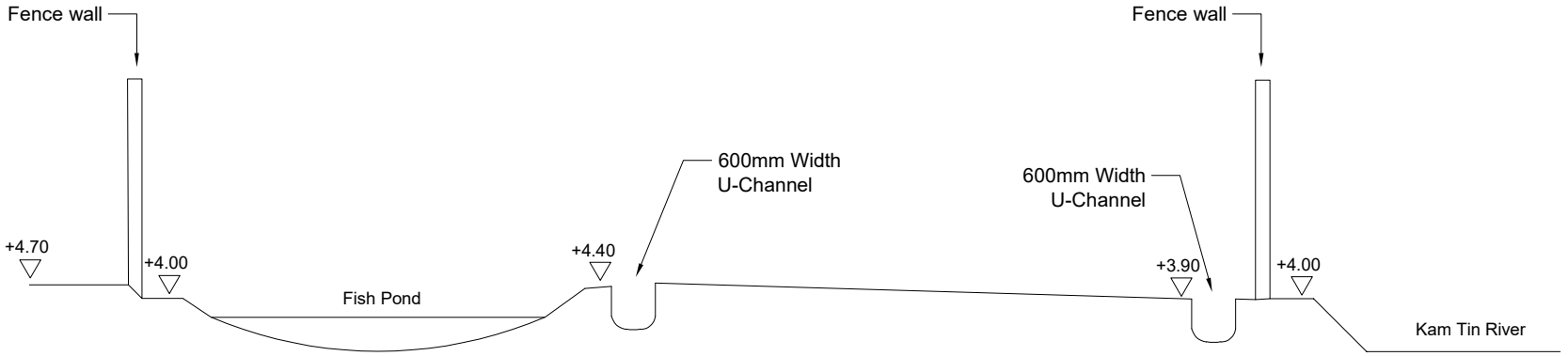


Existing Ground Level



Proposed Ground Level

Section B

NOT IN SCALE

URBAN GREEN

Section 16 Application for Filling of Pond for Permitted Agricultural Use in Sub-section 1 and the Remaining Portion (Portion) of Section E of Lot No. 1212 in D.D. 115 and the Discrepant Areas (Portion) adjacent to Section E of Lot No. 1212 in D.D. 115, Nam Sang Wai, Yuen Long, New Territories

Cross Section - Section B

Figure 3.3B

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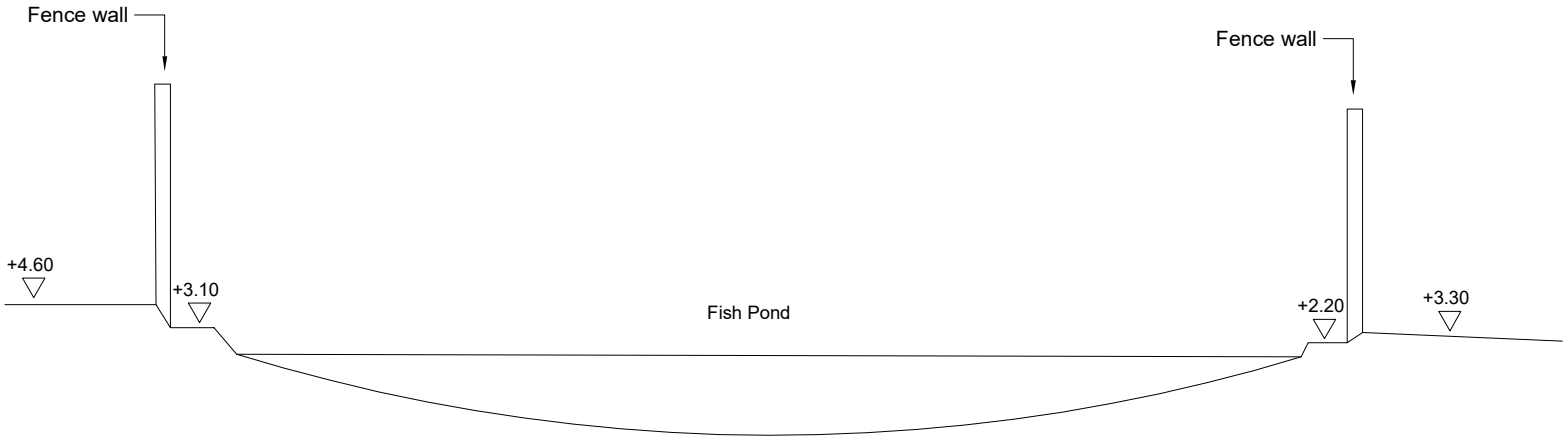

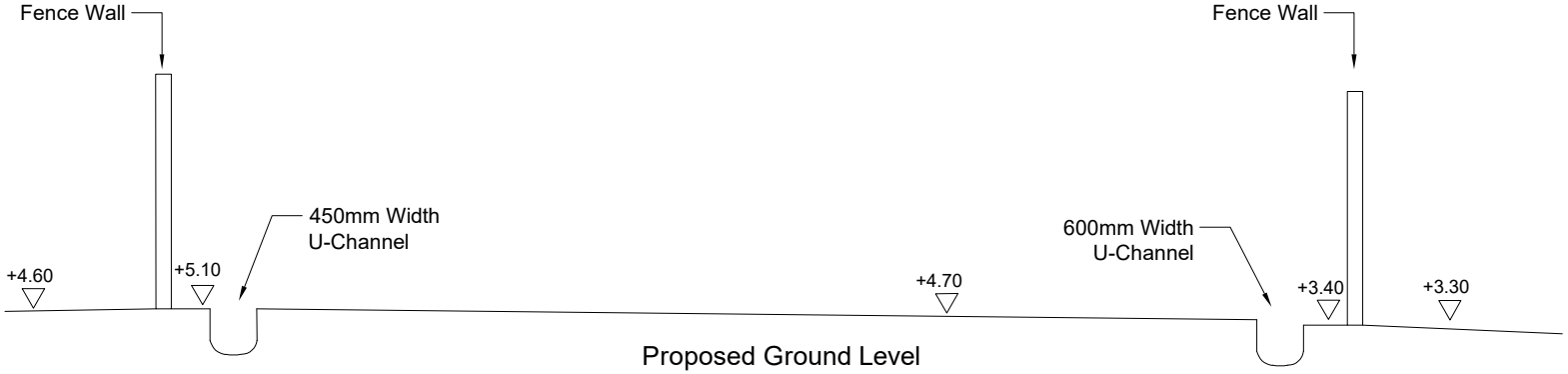

Section C

NOT IN SCALE

URBAN GREEN

Section 16 Application for Filling of Pond for Permitted Agricultural Use in Sub-section 1 and the Remaining Portion (Portion) of Section E of Lot No. 1212 in D.D. 115 and the Discrepant Areas (Portion) adjacent to Section E of Lot No. 1212 in D.D. 115, Nam Sang Wai, Yuen Long, New Territories

Cross Section - Section C

Figure 3.3C

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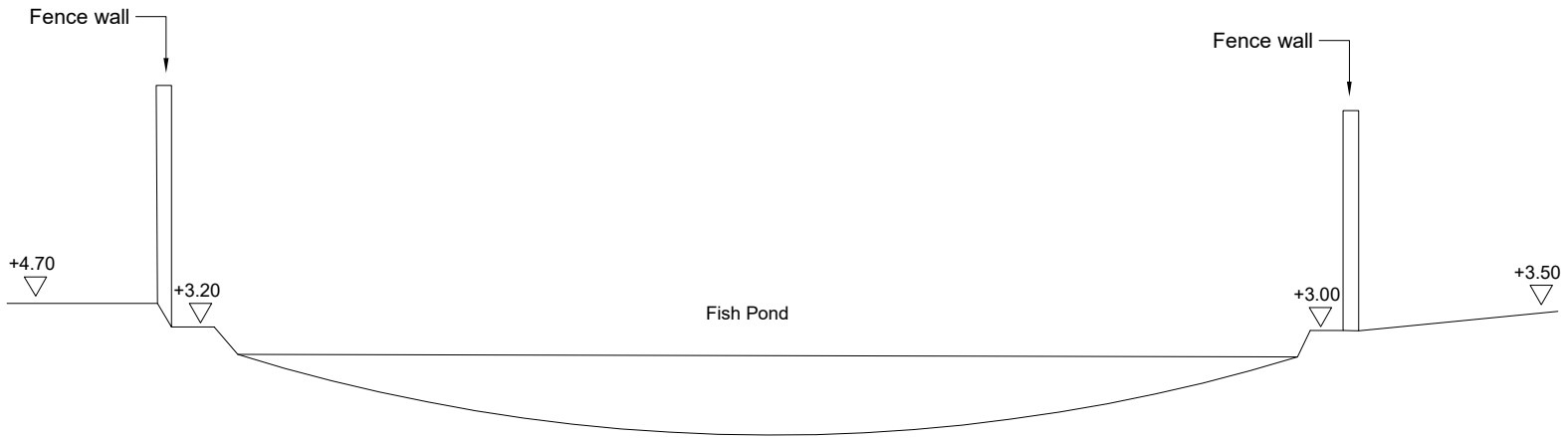

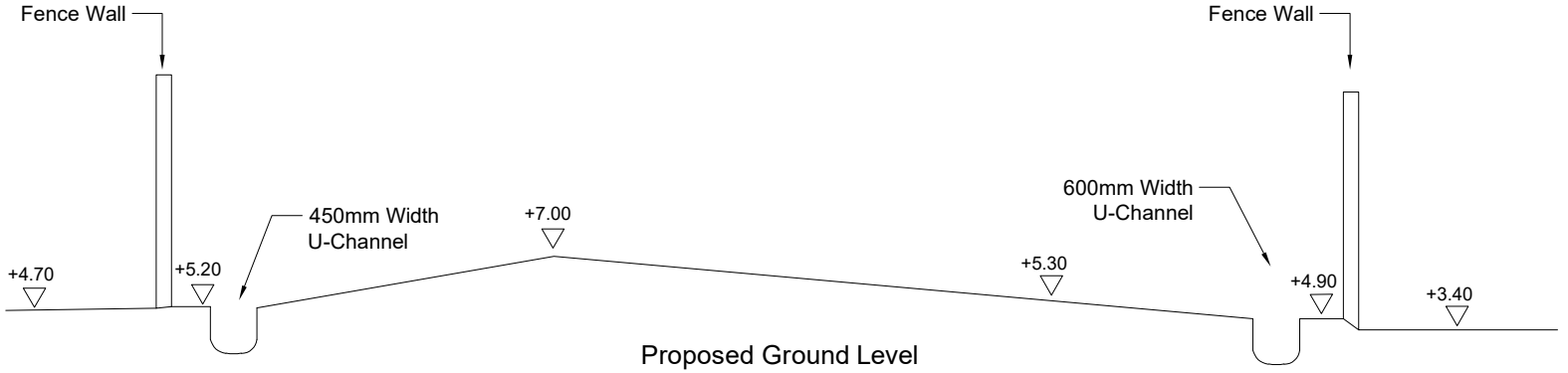

Section D

NOT IN SCALE

URBAN GREEN

Section 16 Application for Filling of Pond for Permitted Agricultural Use in Sub-section 1 and the Remaining Portion (Portion) of Section E of Lot No. 1212 in D.D. 115 and the Discrepant Areas (Portion) adjacent to Section E of Lot No. 1212 in D.D. 115, Nam Sang Wai, Yuen Long, New Territories

Cross Section - Section D

Figure 3.3D

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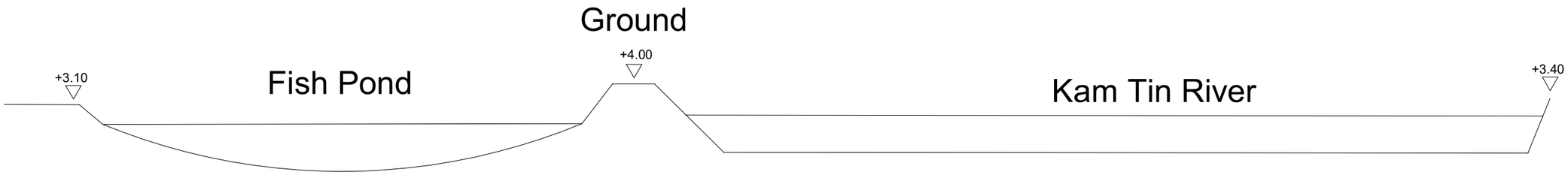
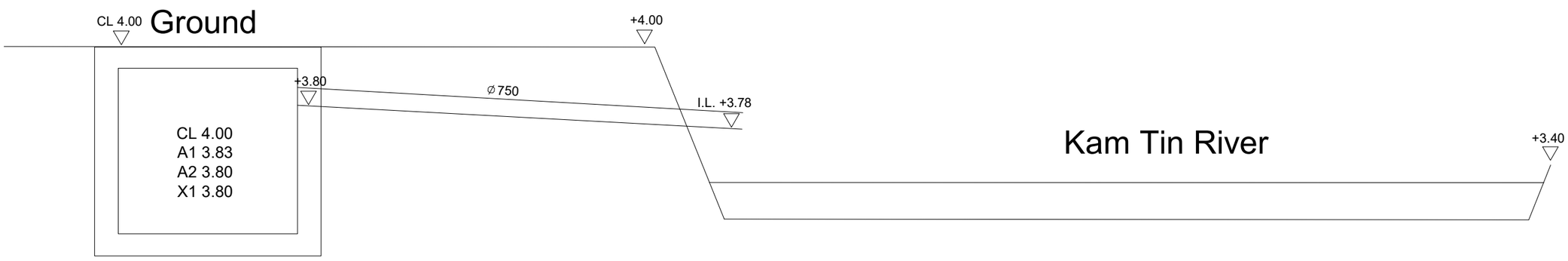


Stream Level Before the Proposed Development



Stream Level After the Proposed Development

Not in Scale

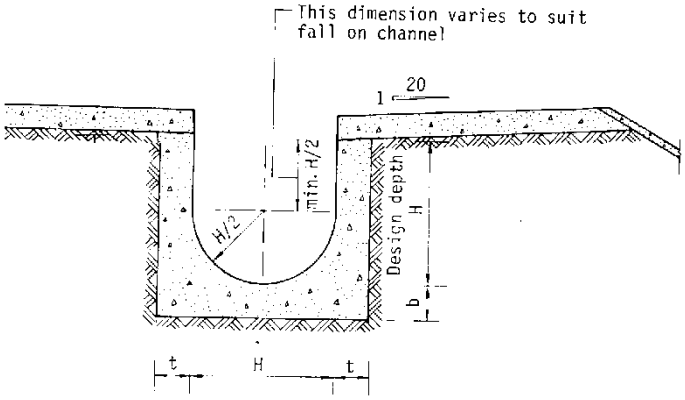
URBAN GREEN

Section 16 Application for Filling of Pond for Permitted Agricultural Use in Sub-section 1 and the Remaining Portion (Portion) of Section E of Lot No. 1212 in D.D. 115 and the Discrepant Areas (Portion) adjacent to Section E of Lot No. 1212 in D.D. 115, Nam Sang Wai, Yuen Long, New Territories

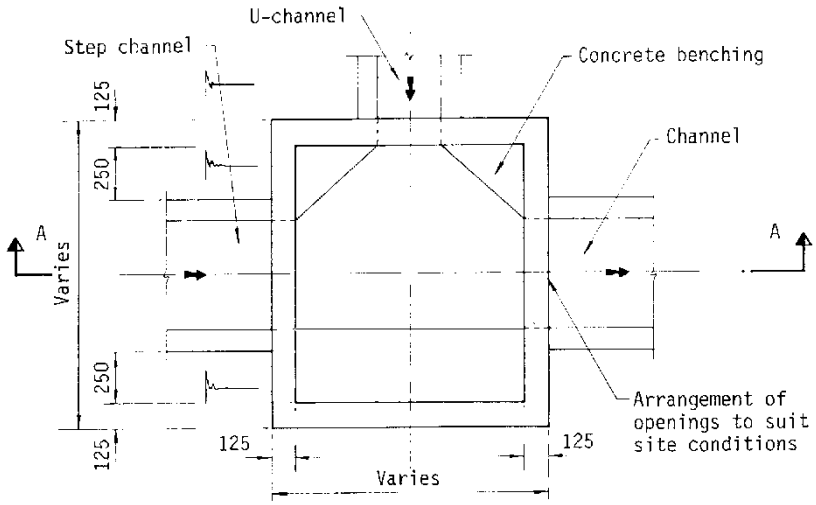
Details of Proposed Connections to Kam Tin River

Figure 3.4

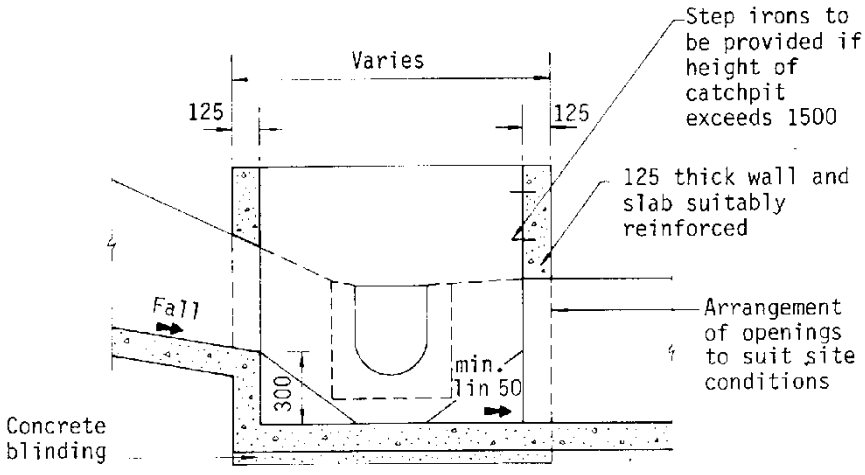
Rev. 0



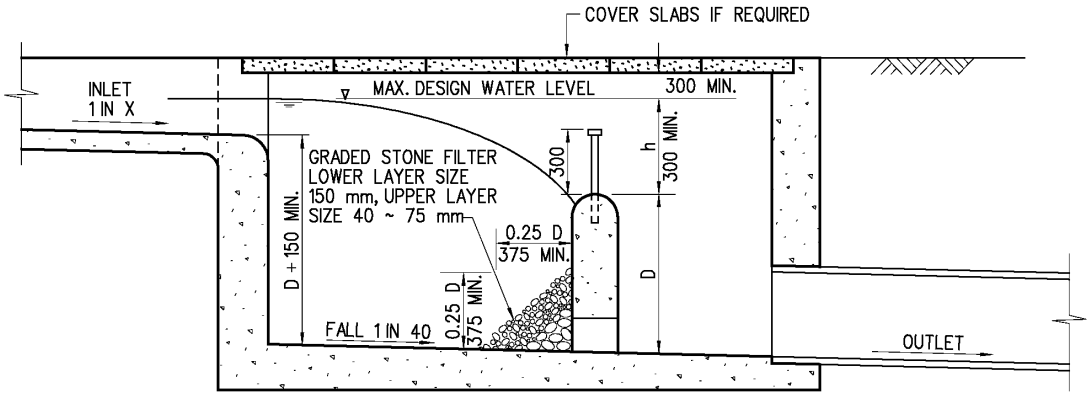
Typical Details of U-Channel



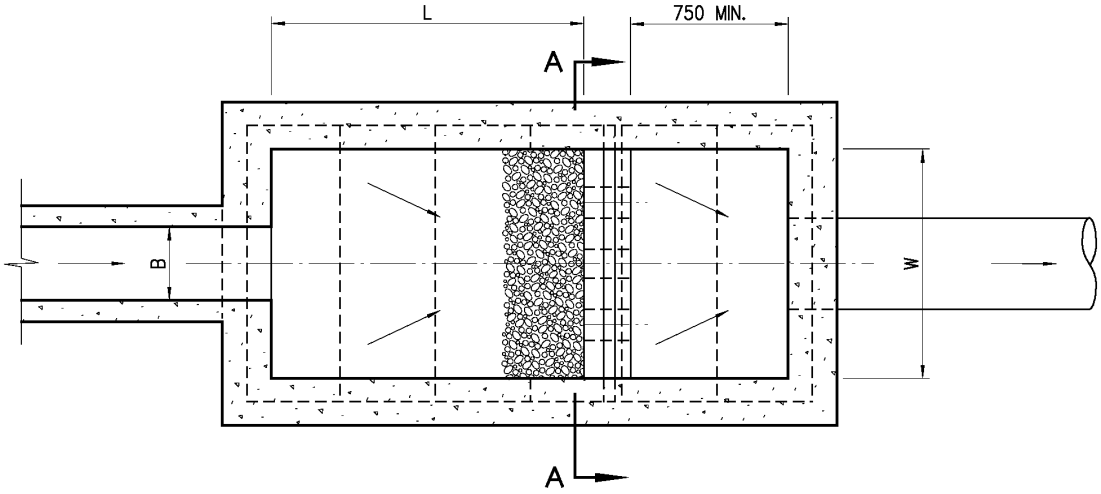
Typical Details of Catchpit



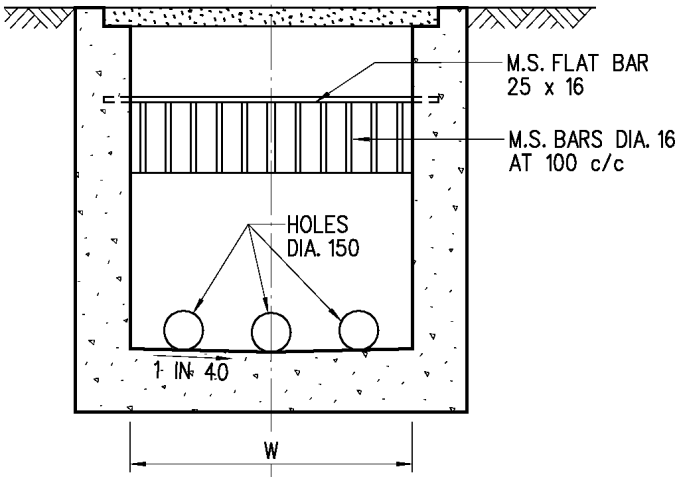
Section A-A



Typical Longitudinal Section of Sand Trap



Typical Plan of Sand Trap



Section A-A

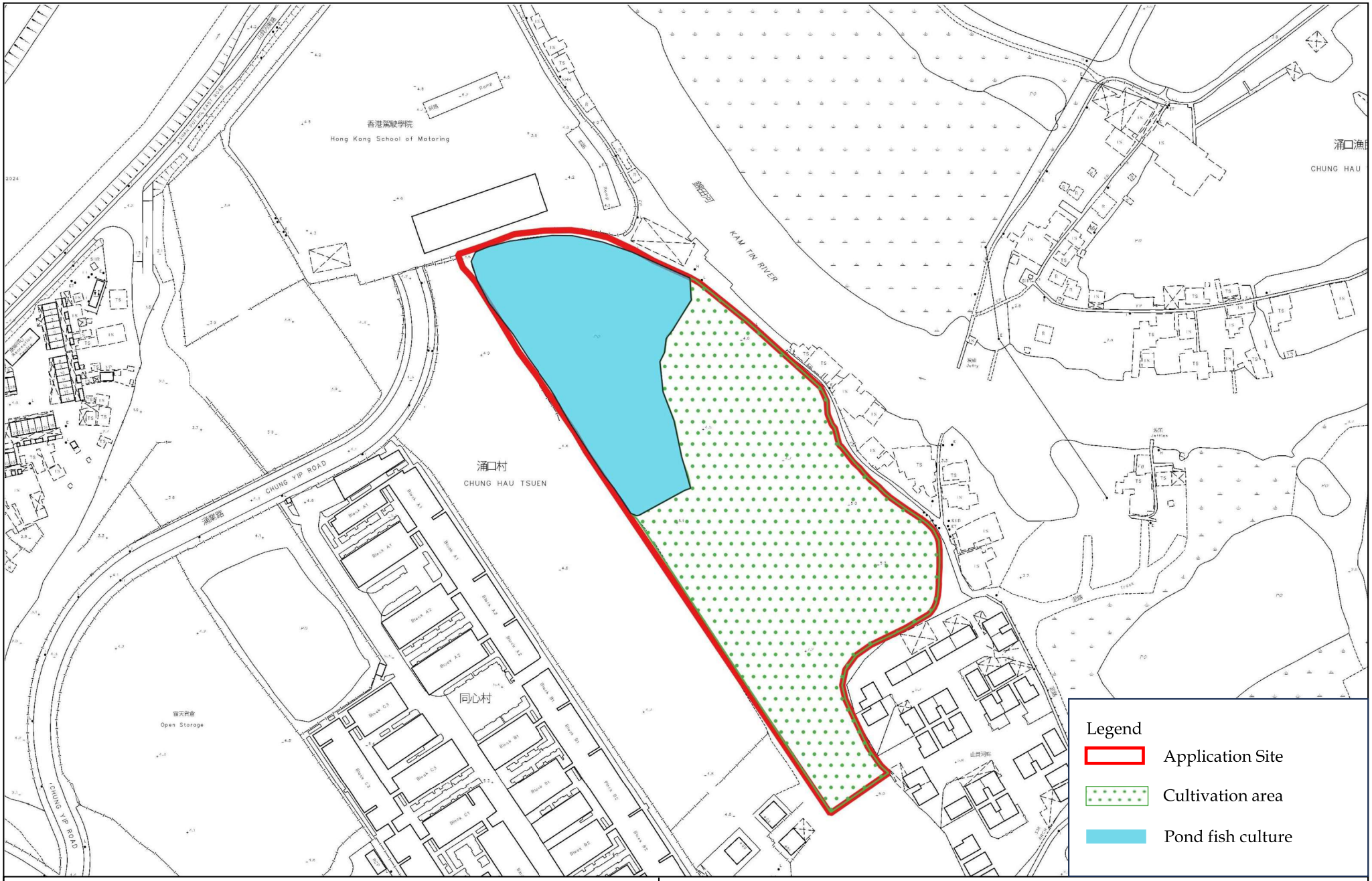
Notes:

1. All dimensions are in millimeters.
2. Size

   Depth: D not less than 750
   Width: W ≥ 3B
   Length: $4.8D^{0.67} h^{0.5} X^{-0.5} \geq 4B$
3. Graded Stone Filter shall be crusher run granite aggregate.
4. Capacity D W L to be according to size and nature of catchment, providing detention time not less than 5 minutes for max. design flow of inlet.
5. Source: From DSD drawing No. DS 1025B.

Appendix A

Proposed Layout Plan



LCH Planning and Development Consultants Limited

Figure 7 : Indicative Layout Plan

(Extracted based on Aerial Photo no. A22836 taken on 5.10.1990 by Lands Department)

Filling of Pond for Permitted Agricultural Use in Sub-section 1 and the Remaining Portion (Portion) of Section E of Lot No. 1212 in D.D. 115 and the Discrepant Areas (Portion) adjacent to Section E of Lot No. 1212 in D.D. 115, Nam Sang Wai, Yuen Long, New Territories

(Source: HK GEODATA STORE, HKSAR Government)

Appendix B

Detailed Drainage Analysis

Capacity Flow Estimation for Proposed Catchments and Drainage System with 50 Year Return Period

A.Calculation of All Catchment Runoff with Proposed Development

Catchment ID	Surface Type	Catchment Area (A), m^2	Catchment Area (A), km^2	Average Slope (H), m/100m	Flow Path Length (L), m	Inlet Time (t_0), min	Time of Concentration (t_c), min	Duration (t_d), min	a (50 year return period) [2]	b (50 year return period) [2]	c (50 year return period) [2]	Runoff Intensity, mm/hr	Runoff Coefficient (C)	C x A	Peak Runoff (Q_p), m^3/s
A	100% Grassland (heavysoil), flat	10,514	0.0105	2.11	151.30	7.46	7.46	7.46	505.5	3.29	0.355	218	0.25	0.0026	0.1590
B	100% Grassland (heavysoil), flat	2,504	0.0025	2.21	94.86	5.35	5.35	5.35	505.5	3.29	0.355	235	0.25	0.0006	0.0409
C	100% Grassland (heavysoil), flat	2,053	0.0021	1.66	72.15	4.40	4.40	4.40	505.5	3.29	0.355	245	0.25	0.0005	0.0350
F	100% Grassland (heavysoil), flat	5,350	0.0054	0.49	61.20	4.33	4.33	4.33	505.5	3.29	0.355	246	0.25	0.0013	0.0914
														Total	**0.3263**

B. Capacity Flow Estimation and Adequacy Check for Proposed U-Channels

Channel Segment	Shape	Diameter, m	Depth, m	Slope	Length, m	Manning's Roughness Coefficient [3]	Cross Section Area, m^2 [5]	Wetted Perimeter, m	Hydraulic Radius, m	Mean Velocity, m/s	Capacity Flow, m^3/s	Catchments Served	Runoff, m^3/s [1]	% of Capacity Flow	Sufficient Capacity? (Y/N)
M1-M2	U-Channel	0.450	0.450	0.003	76	0.016	0.163	1.157	0.14	0.98	0.159	B, F	0.066	42%	Y
M2-M3	U-Channel	0.450	0.450	0.003	69	0.016	0.163	1.157	0.14	0.98	0.159	B, C, F	0.101	64%	Y
M3-M4	U-Channel	0.450	0.450	0.003	23	0.016	0.163	1.157	0.14	0.98	0.159	B, C, F	0.101	64%	Y
M4-M5	U-Channel	0.450	0.450	0.003	49	0.016	0.163	1.157	0.14	0.98	0.159	B, C, F	0.101	64%	Y
M5-M6	U-Channel	0.600	0.600	0.003	44	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.181	53%	Y
M6-M7	U-Channel	0.600	0.600	0.003	29	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.181	53%	Y
M7-M8	U-Channel	0.600	0.600	0.003	53	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.181	53%	Y
M8-M9	U-Channel	0.600	0.600	0.003	59	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.181	53%	Y
M1-M12	U-Channel	0.450	0.450	0.010	25	0.016	0.163	1.157	0.14	1.69	0.275	B, F	0.066	24%	Y
M12-M11	U-Channel	0.450	0.450	0.010	44	0.016	0.163	1.157	0.14	1.69	0.275	A, B, F	0.146	53%	Y
M11-M10	U-Channel	0.600	0.600	0.005	47	0.016	0.289	1.542	0.19	1.45	0.419	A, B, F	0.146	35%	Y
M10-M9	U-Channel	0.600	0.600	0.003	35	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.146	43%	Y

C. Capacity Flow Estimation and Adequacy Check for Proposed Circular Pipes

Pipe Segment	Length	Level (out)	Level (in)	Diameter	Depth	A_w [5]	k_s [4]	v	s	g	V	Capacity Flow	Catchment Served	Q_p	Is $Q_c > Q_p$?	% of capacity
	m	mPD	mPD	m	m	m^2	m	m^2/s	-	m/s^2	m/s	m^3/s		m^3/s	Y/N	%
M9 to Kam Tin River	6	3.80	3.78	0.750	0.750	0.398	0.000006	1E-06	0.003	9.810	1.9929	0.792	A, B, C, F	0.326	Y	41%

Note:
[1] Runoff is calculated in accordance with DSD's "Stormwater Drainage Manual - Planning, Design and Management" (SDM), fifth edition, January 2018.
[2] 50 years return period of HKO Headquarters is adopted in the calculation according to Stormwater Drainage Manual - Corrigendum No. 1/2024.
[3] For the proposed U-channel, value of n for concrete-lined channels under fair condition (i.e. n = 0.016) is adopted in the calculation.
[4] For the proposed circular pipe, value of ks for uPVC (Pipes) under normal condition (i.e. 0.006 mm) is adopted in the calculation.
[5] 10% reduction in flow area has been considered as per the requirement in SDM (Section 9.3).

Appendix C

Detailed Drainage Analysis with Climate Change Considerations

Capacity Flow Estimation for Proposed Catchments and Drainage System with 50 Year Return Period (with rainfall increase of 11.1%)

A.Calculation of All Catchment Runoff with Proposed Development

Catchment ID	Surface Type	Catchment Area (A), m^2	Catchment Area (A), km^2	Average Slope (H), m/100m	Flow Path Length (L), m	Inlet Time (t_0), min	Time of Concentration (t_c), min	Duration (t_d), min	a (50 year return period) [2]	b (50 year return period) [2]	c (50 year return period) [2]	Runoff Intensity, mm/hr	Runoff Coefficient (C)	C x A	Peak Runoff (with rainfall increase of 11.1%) (Q_p), m^3/s
A	100% Grassland (heavysoil), flat	10,514	0.0105	2.11	151.30	7.46	7.46	7.46	505.5	3.29	0.355	218	0.25	0.0026	0.1766
B	100% Grassland (heavysoil), flat	2,504	0.0025	2.21	94.86	5.35	5.35	5.35	505.5	3.29	0.355	235	0.25	0.0006	0.0455
C	100% Grassland (heavysoil), flat	2,053	0.0021	1.66	72.15	4.40	4.40	4.40	505.5	3.29	0.355	245	0.25	0.0005	0.0388
F	100% Grassland (heavysoil), flat	5,350	0.0054	0.49	61.20	4.33	4.33	4.33	505.5	3.29	0.355	246	0.25	0.0013	0.1016
														Total	**0.3625**

B. Capacity Flow Estimation and Adequacy Check for Proposed U-Channels

Channel Segment	Shape	Diameter, m	Depth, m	Slope	Length, m	Manning's Roughness Coefficient [3]	Cross Section Area, m^2 [5]	Wetted Perimeter, m	Hydraulic Radius, m	Mean Velocity, m/s	Capacity Flow, m^3/s	Catchments Served	Runoff, m^3/s [1]	% of Capacity Flow	Sufficient Capacity? (Y/N)
M1-M2	U-Channel	0.450	0.450	0.003	76	0.016	0.163	1.157	0.14	0.98	0.159	B, F	0.074	46%	Y
M2-M3	U-Channel	0.450	0.450	0.003	69	0.016	0.163	1.157	0.14	0.98	0.159	B, C, F	0.112	71%	Y
M3-M4	U-Channel	0.450	0.450	0.003	23	0.016	0.163	1.157	0.14	0.98	0.159	B, C, F	0.112	71%	Y
M4-M5	U-Channel	0.450	0.450	0.003	49	0.016	0.163	1.157	0.14	0.98	0.159	B, C, F	0.112	71%	Y
M5-M6	U-Channel	0.600	0.600	0.003	44	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.201	59%	Y
M6-M7	U-Channel	0.600	0.600	0.003	29	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.201	59%	Y
M7-M8	U-Channel	0.600	0.600	0.003	53	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.201	59%	Y
M8-M9	U-Channel	0.600	0.600	0.003	59	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.201	59%	Y
M1-M12	U-Channel	0.450	0.450	0.010	25	0.016	0.163	1.157	0.14	1.69	0.275	B, F	0.074	27%	Y
M12-M11	U-Channel	0.450	0.450	0.010	44	0.016	0.163	1.157	0.14	1.69	0.275	A, B, F	0.162	59%	Y
M11-M10	U-Channel	0.600	0.600	0.005	47	0.016	0.289	1.542	0.19	1.45	0.419	A, B, F	0.162	39%	Y
M10-M9	U-Channel	0.600	0.600	0.003	35	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.162	47%	Y

C. Capacity Flow Estimation and Adequacy Check for Proposed Circular Pipes

Pipe Segment	Length	Level (out)	Level (in)	Diameter	Depth	A_w [5]	k_s [4]	v	s	g	V	Capacity Flow	Catchment Served	Q_p	Is $Q_c > Q_p$?	% of capacity
	m	mPD	mPD	m	m	m^2	m	m^2/s	-	m/s^2	m/s	m^3/s		m^3/s	Y/N	%
M9 to Kam Tin River	6	3.80	3.78	0.750	0.750	0.398	0.000006	1E-06	0.003	9.810	1.9929	0.792	A, B, C, F	0.362	Y	46%

Note:
[1] Runoff is calculated in accordance with DSD's "Stormwater Drainage Manual - Planning, Design and Management" (SDM), fifth edition, January 2018.
[2] 50 years return period of HKO Headquarters is adopted in the calculation according to Stormwater Drainage Manual - Corrigendum No. 1/2024.
[3] For the proposed U-channel, value of n for concrete-lined channels under fair condition (i.e. n = 0.016) is adopted in the calculation.
[4] For the proposed circular pipe, value of ks for uPVC (Pipes) under normal condition (i.e. 0.006 mm) is adopted in the calculation.
[5] 10% reduction in flow area has been considered as per the requirement in SDM (Section 9.3).

Capacity Flow Estimation for Proposed Catchments and Drainage System with 50 Year Return Period (with rainfall increase of 16% and 12.1% of design allowance in End of 21th Century)

A.Calculation of All Catchment Runoff with Proposed Development

Catchment ID	Surface Type	Catchment Area (A), m^2	Catchment Area (A), km^2	Average Slope (H), m/100m	Flow Path Length (L), m	Inlet Time (t_0), min	Time of Concentration (t_c), min	Duration (t_d), min	a (50 year return period) [2]	b (50 year return period) [2]	c (50 year return period) [2]	Runoff Intensity, mm/hr	Runoff Coefficient (C)	C x A	Peak Runoff (with rainfall increase of 16% and 12.1% of design allowance in End of 21th Centry) (Q_p), m^3/s
A	100% Grassland (heavysoil), flat	10,514	0.0105	2.11	151.30	7.46	7.46	7.46	505.5	3.29	0.355	218	0.25	0.0026	0.2067
B	100% Grassland (heavysoil), flat	2,504	0.0025	2.21	94.86	5.35	5.35	5.35	505.5	3.29	0.355	235	0.25	0.0006	0.0532
C	100% Grassland (heavysoil), flat	2,053	0.0021	1.66	72.15	4.40	4.40	4.40	505.5	3.29	0.355	245	0.25	0.0005	0.0455
F	100% Grassland (heavysoil), flat	5,350	0.0054	0.49	61.20	4.33	4.33	4.33	505.5	3.29	0.355	246	0.25	0.0013	0.1189
														Total	**0.4243**

B. Capacity Flow Estimation and Adequacy Check for Proposed U-Channels

Channel Segment	Shape	Diameter, m	Depth, m	Slope	Length, m	Manning's Roughness Coefficient [3]	Cross Section Area, m^2 [5]	Wetted Perimeter, m	Hydraulic Radius, m	Mean Velocity, m/s	Capacity Flow, m^3/s	Catchments Served	Runoff, m^3/s [1]	% of Capacity Flow	Sufficient Capacity? (Y/N)
M1-M2	U-Channel	0.450	0.450	0.003	76	0.016	0.163	1.157	0.14	0.98	0.159	B, F	0.086	54%	Y
M2-M3	U-Channel	0.450	0.450	0.003	69	0.016	0.163	1.157	0.14	0.98	0.159	B, C, F	0.132	83%	Y
M3-M4	U-Channel	0.450	0.450	0.003	23	0.016	0.163	1.157	0.14	0.98	0.159	B, C, F	0.132	83%	Y
M4-M5	U-Channel	0.450	0.450	0.003	49	0.016	0.163	1.157	0.14	0.98	0.159	B, C, F	0.132	83%	Y
M5-M6	U-Channel	0.600	0.600	0.003	44	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.235	69%	Y
M6-M7	U-Channel	0.600	0.600	0.003	29	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.235	69%	Y
M7-M8	U-Channel	0.600	0.600	0.003	53	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.235	69%	Y
M8-M9	U-Channel	0.600	0.600	0.003	59	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.235	69%	Y
M1-M12	U-Channel	0.450	0.450	0.010	25	0.016	0.163	1.157	0.14	1.69	0.275	B, F	0.086	31%	Y
M12-M11	U-Channel	0.450	0.450	0.010	44	0.016	0.163	1.157	0.14	1.69	0.275	A, B, F	0.189	69%	Y
M11-M10	U-Channel	0.600	0.600	0.005	47	0.016	0.289	1.542	0.19	1.45	0.419	A, B, F	0.189	45%	Y
M10-M9	U-Channel	0.600	0.600	0.003	35	0.016	0.289	1.542	0.19	1.18	0.342	A, B, C, F	0.189	55%	Y

C. Capacity Flow Estimation and Adequacy Check for Proposed Circular Pipes

Pipe Segment	Length	Level (out)	Level (in)	Diameter	Depth	A_w [5]	k_s [4]	v	s	g	V	Capacity Flow	Catchment Served	Q_p	Is $Q_c > Q_p$?	% of capacity
	m	mPD	mPD	m	m	m^2	m	m^2/s	-	m/s^2	m/s	m^3/s		m^3/s	Y/N	%
M9 to Kam Tin River	6	3.80	3.78	0.750	0.750	0.398	0.000006	1E-06	0.003	9.810	1.9929	0.792	A, B, C, F	0.424	Y	54%

Note:
[1] Runoff is calculated in accordance with DSD's "Stormwater Drainage Manual - Planning, Design and Management" (SDM), fifth edition, January 2018.
[2] 50 years return period of HKO Headquarters is adopted in the calculation according to Stormwater Drainage Manual - Corrigendum No. 1/2024.
[3] For the proposed U-channel, value of n for concrete-lined channels under fair condition (i.e. n = 0.016) is adopted in the calculation.
[4] For the proposed circular pipe, value of ks for uPVC (Pipes) under normal condition (i.e. 0.006 mm) is adopted in the calculation.
[5] 10% reduction in flow area has been considered as per the requirement in SDM (Section 9.3).

Appendix D

Detailed Drainage Analysis of the Existing Watercourse

Capacity Flow Estimation and Adequacy Check for Existing Watercourse

Existing Watercourse	Scenario	Top Width, m	Bottom Width, m	Depth, m [1] [2]	Length, m [3]	Slope [3]	Side Slope, m	Manning's Roughness Coefficient [4]	Flow Area, m^2	Wetted perimeter, m	Hydraulic radius, m	Discharge, m^3/s	Capacity Used, %	Sufficient Capacity? (Y/N)
Kam Tin River	Assumed Water Depth	34	25	3	13000	0.069	1.125	0.040	86	34.031	2.54	1059.14	60.98%	Y
	Actual River Depth	34	25	4	13000	0.069	1.125	0.040	120	37.042	3.25	1736.90		

Contribution from the Identified Catchments to the Existing Watercourse

Existing Watercourse	Top Width, m	Bottom Width, m	River Depth, m [2]	Slope [3]	Manning's Roughness Coefficient [4]	Cross Section Area, m^2	Wetted perimeter, m	Hydraulic radius, m	Mean velocity, m/s	Capacity flow, m^3/s	Catchments Served	Runoff, m^3/s	Contribution from Identified Catchments, %	Total Capacity Used in Kam Tin River, %	Sufficient Capacity? (Y/N)
Kam Tin River	34	25	4	0.069	0.040	118	37.042	3.19	14.26	1683.071	A, B, C, F	0.326	0.0194%	61.00%	Y

Note:

[1] The water depth of Kam Tin River is adopted from government press release on 6 August, 1999. As mentioned in the press release, the river is not able to withstand a rainstorm of 1 in 50 years return period before increasing to 4 meters depth. Therefore, it is assumed that the water depth of Kam Tin River is 3 meters under worse case scenario. (https://www.info.gov.hk/gia/general/199908/06/0806162.htm#:~:text=Upon%20completion%2C%20the%20upstream%20of,270%20cubic%20metres%20per%20second.)

[2] The depth of Kam Tin River is adopted from government press release on 6 August, 1999. (https://www.info.gov.hk/gia/general/199908/06/0806162.htm#:~:text=Upon%20completion%2C%20the%20upstream%20of,270%20cubic%20metres%20per%20second.)

[3] The slope and length of Kam Tin River is adopted from Guided Field Trip to Kam Tin River, Handbook for Tour Guides under the JC-WISE Water Initiative on Sustainability and Engagement. (https://www.socsc.hku.hk/jcwise/mrmc/workbook/KTRHandbookforTourGuides_Eng.pdf)

[4] A Manning's roughness coefficient of 0.040 for "Natural-stream channels — Winding, with some pools and shoals, clean with some weeds and stone" in good condition will be adopted for streams based on site observation.

Appendix E

Site Photos

Location of the natural stream on Site (Future location of the Proposed Drainage Pipe M9 to Kam Tin River)

No existing drainage facilities on Site

No existing drainage facilities on Site