

Your Ref.: TPB/A/NE-KTS/525  
Our Ref.: 2105PA - L009  
Date: 26<sup>th</sup> June 2023

(By hand)

**The Secretary**  
**Town Planning Board**  
C/o Town Planning Board Section  
Planning Department  
15/F, North Point Government Offices  
333 Java Road  
North Point, Hong Kong

Dear Sir/Madam,

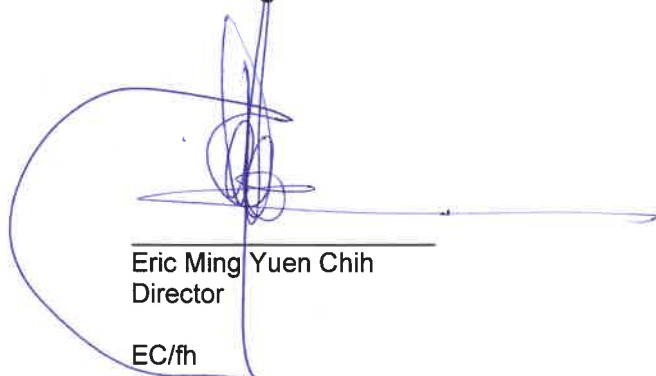
**Re : Response to Departments' Comments**  
**Proposed Residential Development (House) and Minor Relaxation of**  
**Plot Ratio Restriction in "Residential (Group D)" Zone at**  
**Various Lots in D.D.94, Hang Tau Tai Po, Kwu Tung South, Sheung Shui**

We refer to your e-mail dated 16th May 2023.

Please refer to attached "Responses to Comments" and 4 sets of revised Drainage Impact Assessment report prepared by Ramboll Hong Kong Limited for your departmental circulation to address Environmental Protection Department and Drainage Services Department's comments.

Should you have any queries, please do not hesitate to contact the undersigned at 2581 3081.

Sincerely Yours,  
For and on behalf of  
**CHIH Design Ltd.**



Eric Ming Yuen Chih  
Director  
EC/fh

c.c. Great Huge Limited

– Mr. Wan  
(by E-mail) (w/ encl)

**Proposed Residential Development (Houses) and Minor Relaxation of Plot Ratio Restriction at Various Lots in D.D. 94, Hang Tau Tai Po, Kwu Tong South, Sheung Shui, New Territories (Application No. A/NE-KTS/525)**  
**Submission of Sewerage Impact Assessment (SIA) Report**

<b><u>Comments from Environmental Protection Department and Drainage Services Department attached in Planning Department's Email</u></b>	
<b>Date: 16 June 2023</b> <b>Report Ref.: R8752_V1.0</b>	
<b>Comment</b>	<b>Response</b>
<b>Comments from Director of Environmental Protection (Contact Person: Ms. Felix TAI; Tel.: 2835 1845)</b>	
SIA	
(1) DSD's advice should be sought on whether there are any available sewerage system for connection when the proposed development is in operation. If so, the wastewater should be conveyed to the public sewerage system. If no foreseeable public sewerage connection system will be covered, an on-site tertiary STW is suggested, the project proponent should also state the technique being adapted (e.g. MBR technology with ultra-filtration). Please be reminded that the discharge point should be sited away from the natural watercourse(s), if there is any alternation of the current stage of watercourses and/or ponds, advice from AFCD should be sought.	<p>As per DSD's reply, there is no available public sewerage system for connection at the vicinity. Therefore, STP is proposed and MBR with ultra-filtration is recommended.</p> <p>The treated wastewater will be collected, with new drainage pipe constructed and discharged to open channel nearby. There is no alternation of any watercourse and ponds.</p>
(2) Please clarify if there is any swimming pool from the proposed development and include the sewage from the backwashing of the swimming pool if applicable.	It is clarified that there is no swimming pool proposed.
<b>Comments from CE/MS, DSD (Contact Person: Mr Keith LIU; Tel.: 2300 1595)</b>	
(1) In addition to respond EPD's enquiry, please be advised that there is NO available public sewerage system for connection at the vicinity	Noted.
SIA	
(1) Section 2.5.3 – Please provide the layout (showing the footprint) of the proposed STP for reference.	Figure 2 shows the location and layout of proposed STP which is nearby the main entrance on northern side.

**Proposed Residential Development (Houses) and Minor Relaxation of Plot Ratio Restriction at Various Lots in D.D. 94, Hang Tau Tai Po, Kwu Tong South, Sheung Shui, New Territories (Application No. A/NE-KTS/525)**  
**Submission of Sewerage Impact Assessment (SIA) Report**

<b><u>Comments from Environmental Protection Department and Drainage Services Department attached in Planning Department's Email</u></b>	
<b>Date: 16 June 2023</b>	
<b>Report Ref.: R8752_V1.0</b>	
<b>Comment</b>	<b>Response</b>
(2) Please indicate in the report that the project proponent will be responsible for the implementation and maintenance of the proposed private STP.	Noted and Section 2.5.3 was added.
(3) Please advise the discharge location and standard of the treated effluent for reference.	The discharge location was shown in Figure 2 and the proposed STP will be designed in accordance with the requirement in the "Guideline for the Design of Small Treatment Plants" issued by EPD. The standard is described under Section 2.5.7.
(4) The SIA report needs to meet the satisfaction of EPD, the planning authority of sewerage infrastructure.	Noted.
<b>DIA</b>	
(1) Please be advised that the Stormwater Drainage Manual has been updated vide Corrigendum No. 1/2022. Please kindly adopt the latest design parameters in the drainage analysis.	Noted and updated. The column of Runoff[2] represents the situation in Mid 21 <sup>st</sup> Century (11.1%) and the column of Runoff [3] represents the situation in Late 21 <sup>st</sup> Century (16%).
(2) It appears that climate change consideration was not incorporated in the drainage assessment. Please kindly review your calculation with view of Section 6.8 of the Stormwater Drainage Manual.	It is clarified that the climate change consideration was adopted in the drainage assessment. Pls also refer to response above.
(3) The site is located within the North District Rainfall Zone. However, the storm factor of the HKO rainfall zone was adopted. Please review your calculation with reference to Figure 3 and Table 3d of the Stormwater Drainage Manual.	Noted and revised.
(4) Please elaborate the drainage impact due to the proposed development and confirm if the downstream river section is adequate for the respective drainage	It is clarified that the surface runoff from the proposed development contributes only approximately 0.04% of the capacity of the downstream river and is considered insignificant so that no adverse drainage impact due to the proposed development is anticipated.

**Proposed Residential Development (Houses) and Minor Relaxation of Plot Ratio Restriction at Various Lots in D.D. 94, Hang Tau Tai Po, Kwu Tong South, Sheung Shui, New Territories (Application No. A/NE-KTS/525)**  
**Submission of Sewerage Impact Assessment (SIA) Report**

<b><u>Comments from Environmental Protection Department and Drainage Services Department attached in Planning Department's Email</u></b>	
<b>Date: 16 June 2023</b> <b>Report Ref.: R8752_V1.0</b>	
<b>Comment</b>	<b>Response</b>
impact. Please also evaluate the surface runoff before and after the proposed development for comparison.	As the Application Site will be provided at least 20% green coverage, the surface runoff will in fact decrease after development. The comparison calculation was shown in Table 1 of Appendix 2.

Prepared for

**Great Huge Limited**

Prepared by

**Ramboll Hong Kong Limited**

**PROPOSED PRIVATE RESIDENTIAL DEVELOPMENT AT LOT 409 RP, 409S.AA, 409S.AB, 409S.AC, 409S.AD, 409S.AE, 409S.AF, 409S.AG, 409S.AH, 409S.AI, 409S.AJ, 409S.AK, 409S.AL, 409S.AM, 409S.AN, 409S.AO, 409S.AP, 409S.AQ, 409S.AR, 409S.AS, 409S.AT, 409S.AU, 409S.AV, 409S.AW, 409S.AX, 409S.AY, 409S.AZ, 409S.BA, 409S.BB, 409S.BC, 409S.BD, 409S.BE, 409S.BF, 409S.BG, 409S.BH, 409S.BI, 409S.BJ, 409S.BK, 409S.BL, 409S.BM, 409S.BN, 409S.BO, 409S.BP, 409S.BQ, 409S.BR, 409S.BS, 409S.BT, 409 S.F. RP, 409 S.F.SS.1, 409 S.F.SS.2, 409 S.F.SS.3, 409 S.F.SS.4, 409 S.F.SS.5, 409 S.F.SS.6, 409 S.F.SS.7, 409 S.F.SS.8, 409 S.F.SS.9, 409 S.F.SS.10, 409 S.F.SS.11, 409 S.F.SS.12, 409 S.F.SS.13, 409 S.F.SS.14, 409 S.F.SS.15, 409 S.F.SS.16, 409 S.F.SS.17, 409 S.F.SS.18, 409 S.F.SS.19, 409 S.F.SS.20, 409 S.F.SS.21, 409S.G, 409S.H, 409S.I, 409S.J, 409S.K, 409S.L, 409S.M, 409S.N, 409S.O, 409S.P, 409S.Q, 409S.R, 409S.S, 409S.T, 409S.U, 409S.V, 409S.W, 409S.X, 409S.Y, 409S.Z IN D.D 94, KWU TUNG SOUTH, N.T.**

## **SEWERAGE AND DRAINAGE IMPACT ASSESSMENT**

Date **June 2023**

Prepared by **Miko Wan**  
**Assistant Environmental Consultant**



Signed \_\_\_\_\_

Approved by **Calvin Chiu**  
**Senior Manager**



Signed \_\_\_\_\_

Project Reference **CHIKTS94EI00**

Document No. **R8752\_v1.1**

No part of this document may be reproduced or transmitted, in any form or by any means electronic, mechanical, photographic, recording or otherwise, or stored in a retrieval system of any nature without the written permission of Ramboll Hong Kong Ltd, application for which shall be made to Ramboll Hong Kong Ltd, 21/F, BEA Harbour View Centre, 56 Gloucester Road, Wan Chai, Hong Kong.

Disclaimer: This report is made on behalf of Ramboll Hong Kong Ltd. No individual is personally liable in connection with the preparation of this report. By receiving this report and acting on it, the client or any third party relying on it accepts that no individual is personally liable in contract, tort or breach of statutory duty (including negligence).

Ramboll Hong Kong Limited  
  
21/F, BEA Harbour View Centre  
56 Gloucester Road, Wan Chai, Hong Kong

Tel: (852) 3465 2888  
Fax: (852) 3465 2899  
Email: hkinfo@ramboll.com

Q:\Projects\CHIKTS94EI00\04 Deliverables\02 DSIA Report\R8752\_v1.1.docx

## CHAPTERS

	Page
<b>1. INTRODUCTION .....</b>	<b>3</b>
1.1 Background and Objectives.....	3
1.2 Application Site and its Environs .....	3
1.3 Proposed Development Scheme.....	3
<b>2. SEWERAGE IMPACT ASSESSMENT .....</b>	<b>4</b>
2.1 Scope of Work.....	4
2.2 Assessment Criteria and Methodology .....	4
2.3 Existing Sewerage System .....	4
2.4 Wastewater Generated by the Proposed Development.....	4
2.5 Sewerage Impact .....	5
2.6 Conclusion .....	6
<b>3. DRAINAGE IMPACT ASSESSMENT .....</b>	<b>7</b>
3.1 Scope of Work.....	7
3.2 Assessment Criteria and Methodology .....	7
3.3 Site Condition .....	7
3.4 Proposed Development.....	7
3.5 Discussion .....	8
<b>4. OVERALL CONCLUSION .....</b>	<b>9</b>
4.1 Conclusion .....	9

## TABLES

Table 1	Estimated Peak Flow for Application Site (onsite STP) .....	4
<b>Table 2</b>	<b>Summary of Discharge Standard of Treated Effluent (flow rate between 10 and 200 m<sup>3</sup>/day).....</b>	<b>6</b>
Table 3	Summary of Surface Runoff under Existing and Proposed Conditions.....	8

## FIGURES

Figure 1	Location of the Application Site and its Environs
Figure 2	Proposed Sewage Treatment Plant and Effluent Discharge Location
Figure 3	Proposed Drainage System

## APPENDICES

Appendix 1	Master Layout Plan
Appendix 2	Detailed Sewerage Analysis
Appendix 3	Detailed Drainage Analysis
Appendix 4	Drainage Record Obtained from DSD

## 1. INTRODUCTION

### 1.1 Background and Objectives

- 1.1.1 A residential development (the Proposed Development) has been proposed at Kwu Tung South, New Territories (the Application Site).
- 1.1.2 The Application Site falls within the "Residential (Group D)" ("R(D)") zone under the Approved Kwu Tung South Outline Zoning Plan (OZP) No. S/NE-KTS/18.
- 1.1.3 Ramboll Hong Kong Limited is commissioned by the Applicant to provide consultancy services to prepare this drainage and sewerage impact assessment (DSIA) report with respect to the Application Site.
- 1.1.4 The design of the master layout plan (MLP) and other technical information on the Proposed Development are provided by the Project Architect (CHIH Design Ltd).

### 1.2 Application Site and its Environs

- 1.2.1 The Application Site is approximately 12,100 m<sup>2</sup>. It is bounded by a village access road on the west in Hang Tau Village.
- 1.2.2 To the immediate east and southeast of the Application Site is existing village houses development (Serenity Garden and Richmond Villa). To the immediate south and north are scattered village houses. To the further west of the site is Sheung Yue River.
- 1.2.3 The Application Site is currently used as warehouse, open storage and machinery storage & repair.
- 1.2.4 **Figure 1** shows the location of the Application Site and its environ.

### 1.3 Proposed Development Scheme

- 1.3.1 The Proposed Development consists of 42 houses (i.e. House 1 to House 42). E&M rooms, clubhouse, onsite sewage treatment plant are proposed underneath House 36 to House 42, which are located at the northwest corner of the Application Site.
- 1.3.2 The tentative occupation year is 2028.
- 1.3.3 The MLP, floor plans and sections of the Proposed Development are shown in **Appendix 1**.



## 2. SEWERAGE IMPACT ASSESSMENT

### 2.1 Scope of Work

2.1.1 The aim of this sewerage impact assessment (SIA) is to assess whether sewage generation from the Proposed Development would impose any significant impact and whether the capacity of the existing sewerage network serving the Application Site, if any, is sufficient to cope with the sewage flow from the Proposed Development.

### 2.2 Assessment Criteria and Methodology

2.2.1 Environmental Protection Department's (EPD's) Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning, Version 1 (GESF) has been referred to for the purposes of estimating the quantity of the sewage generated from the Proposed Development and the existing catchment area. Sewage flow parameters and global peaking factors in this document have been adopted for this SIA.

2.2.2 Based on the building type in the area, the following unit flow factor is used in the SIA calculation:

- Private Domestic R4: 0.37 m<sup>3</sup>/day

### 2.3 Existing Sewerage System

2.3.1 There is no existing sewerage system serving the Application Site. The nearest manhole is around 415m away from the Application Site and various private lots are situated in between. Therefore, it is considered not practicable to connect with the existing sewerage system.

### 2.4 Wastewater Generated by the Proposed Development

2.4.1 Wastewater arising from the Proposed Development will be primarily contributed by the residents.

2.4.2 Based on the constraints as mentioned in **Section 2.3**, onsite sewage treatment plant (STP) is proposed. The treated effluent will be discharged to the stormwater system.

2.4.3 Detailed calculation for the Proposed Development is given in **Table 1** below and **Appendix 2**.

**Table 1 Estimated Peak Flow for Application Site (onsite STP)**

Development Parameters	Proposed Development	
	Residential	Clubhouse
Area (m <sup>2</sup> )	-	232
Units	42	-
Assumed Population	118 <sup>(1)</sup>	8 <sup>(2)</sup>
Design Flow (m <sup>3</sup> /person/day)	0.37 <sup>(3)</sup>	0.28 <sup>(4)</sup>
<b>Flow Rate (m<sup>3</sup>/day)</b>	<b>43.7</b>	<b>2.1</b>
<b>Total Flow Rate (m<sup>3</sup>/day)</b>	<b>45.8</b>	
<b>Peak Flow (L/s)</b>	<b>3.2</b>	

(1) Refer to 2021 Population Census: Average Household Size of 2.8 in Sheung Shui Rural District

(2) Based on Table 8 of CIFSUS – Community, Social & Personal Services - 30m<sup>2</sup> per worker

(3) Refer to Table T-1 of GESF – Private R4

(4) Refer to Table T-2 of GESF – J11

## 2.5 Sewerage Impact

- 2.5.1 It is currently technically infeasible to discharge wastewater generated from the Proposed Development to public sewerage system. Therefore, onsite STP is proposed to cater for sewage discharge based on design capacity of 3.2 L/s.
- 2.5.2 The exact treatment process would be subject to later detailed design and submissions. It will be necessary for the treatment facilities to achieve the necessary discharge standards, as set out in EPD's Technical Memorandum – Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters.
- 2.5.3 Membrane bioreactor **with ultra-filtration** (MBR) is recommended to achieve required effluent discharge standard and sludge dewatering system will be provided and designed in accordance with the requirement in the "Guidelines for the Design of Small Sewage Treatments Plants" issued by EPD. **Figure 2 shows the location of the proposed STP and the proposed discharge location. The project proponent will be responsible for the implementation and maintenance of the proposed private STP.**
- 2.5.4 Sludge storage tank with deodorisation facilities will be provided. The sludge after having been dewatered and thickened will be tanked away to the landfill for disposal subject to confirmation with future licensed collector/contractor. As good practice for sewage treatment facilities, measures will be incorporated into the design to minimize the risk of emergency overflow from the treatment plant. These measures will include standby pumps, secure power supplies and appropriate alarms, as well as comprehensive Operation and Maintenance procedures, to keep the facilities in good working order. Holding tank for emergency storage/retention will be included with adequate capacity (e.g. to store 6-hours of ADWF discharge) to minimise need of emergency discharge. In the event of any emergency overflow, on-call crews will follow the overflow emergency response plan and proceed with the best response to correct the problem immediately. For example, the alarm system will be activated once overflow occurs. The on-call crews will provide instant response by acknowledging the alarm, to investigate the cause of overflow and correct the problem. The alarm system will repeat until it is acknowledged. In addition, the on-call crews will ensure the standby pump is switched on and contain the overflowed sewage using temporary weirs or vacuum trucks, where applicable.
- 2.5.5 The STP will also be subject to regular maintenance to ensure that it functions in designed condition and optimal performance, and can minimise any emergency situation. In addition, regular self-monitoring will be conducted to ensure the quality of the treated effluent shall meet the applicable standard before discharge. Monitoring programme will be devised for T&C of the system. A discharge licence will be applied prior the development commencement and monitoring requirement under the licence would be strictly followed as per Water Pollution Control Ordinance (WPCO). Necessary discharge standards, as set out in EPD's Technical Memorandum – Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters will be adopted.
- 2.5.6 The treated effluent will be discharged to the terminal stormwater manhole onsite and discharged to Sheung Yue River eventually (see next Chapter). Discharge from STP is also accounted in the Drainage Impact Assessment. No unacceptable impacts are expected from the proposed discharge of the treated effluent. With the proposed onsite STP in place, there is no sewerage connection to the public sewerage system.

**2.5.7** The Water Pollution Control Ordinance (WPCO) provides the major statutory framework for the protection and control of water quality in Hong Kong. According to the Ordinance and its subsidiary legislation, Hong Kong waters are divided into ten Water Control Zones (WCZs). Corresponding statements of Water Quality Objectives (WQOs) are stipulated for different water regimes (marine waters, inland waters, bathing beaches subzones, secondary contact recreation subzones and fish culture subzones) in each WCZ based on their beneficial uses. WQOs for the Deep Bay WCZ relevant to this assessment are listed below, which is the targeted discharge standard of treated effluent to be met.

**Table 2 Summary of Discharge Standard of Treated Effluent (flow rate between 10 and 200 m<sup>3</sup>/day)**

Determinand	Limit
pH	6-8
Temp (°C)	45
Colour (lovibond units (25mm cell length))	1
Suspended solids	50
BOD	20
COD	80
Oil & grease	20
Iron	10
Boron	4
Barium	4
Mercury	0.001
Cadmium	0.001
Other toxic metals individually	0.5
Total toxic metals	1
Cyanide	0.1
Phenols	0.5
Sulphide	5
Total residual chlorine	1
Total nitrogen	100
Total phosphorus	10
Surfactants (total)	15
E. coli (count/100ml)	1000

All units in mg/L unless otherwise stated; all figures are upper limits unless otherwise indicated

## 2.6 Conclusion

- 2.6.1 A Sewerage Impact Assessment (SIA) has been conducted to evaluate the potential impacts due to the sewage generation from the Proposed Development.
- 2.6.2 The estimated sewage generations from the Proposed Development will be approximately 3.2L/s.
- 2.6.3 The nearest public foulwater manhole is located 415m from the Application Site, while various private lots are situated in between. Therefore, onsite STP is proposed to treat effluent before discharge to public drain. Details of the proposed STP including emergency discharge, emergency storage/retention arrangement and the sludge disposal arrangement will be provided after specialist contractor and licensed collector are engaged. The proposal will be submitted to relevant departments for approval.

### 3. DRAINAGE IMPACT ASSESSMENT

#### 3.1 Scope of Work

- 3.1.1 The aim of this Drainage Impact Assessment (DIA) is to assess whether there is any unacceptable impact on existing drainage network serving the Application Site after development.

#### 3.2 Assessment Criteria and Methodology

- 3.2.1 The assessment standard complies with Drainage Services Department (DSD) Stormwater Drainage Manual (SDM) (2018 Edition) and **Corrigendum No. 1/2022**. The Application Site is situated in rural area, therefore, a 1 in 50 year return storm has been adopted for the DIA.
- 3.2.2 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 <sup>3</sup> /s
	$C$	=	runoff coefficient (dimensionless)
	$i$	=	rainfall intensity in mm/hr
	$A$	=	catchment area in km

- 3.2.3 The Proposed Development will be for residential use. An overall runoff coefficient of 0.95 is adopted for the future paved areas, and 0.20 for the greenery areas.
- 3.2.4 The rainfall intensity parameter "i" is dependent on the return period, rainfall duration and the time of concentration of the catchment under consideration. For the future upstream catchment containing the Site, there is no significant change to the flow path and the same time of concentration has been adopted as for the existing scenario. Runoff calculations are included in **Appendix 3**.

#### 3.3 Site Condition

- 3.3.1 Based on site observations, the Application Site consists of warehouse, open storage and machinery storage & repair. The area is generally paved.
- 3.3.2 There are no existing flooding blackspots or known drainage problems in the vicinity of the Application Site.

#### 3.4 Proposed Development

- 3.4.1 It is recommended that the drainage system of the Proposed Development to be discharged through the proposed drainage system (T1 to Outfall) as shown in **Figure 3**. The new underground pipes (525mm in diameter) connecting to the site's terminal manhole and the proposed outfall are proposed to discharge the surface runoff from the Application Site. The surface runoff from the Application Site have been estimated and presented in **Appendix 3**.
- 3.4.2 The total catchment area for the drainage system will remain unchanged after development at the Application Site. The proposed green coverage of the Proposed Development will be no less than 20%. In other words, the surface runoff will decrease comparing the existing Application Site.
- 3.4.3 The surface runoff before and after development is summarized below in **Table 3**.

**Table 3 Summary of Surface Runoff under Existing and Proposed Conditions**

Catchment	Area (m <sup>2</sup> )	Runoff (m <sup>3</sup> /s) under 1 in 50 years scenario
Site (Before)	12,100	0.663
Site (After) + STP	12,100	0.551

3.4.4 The treated effluent from the STP of 3.2 L/s (i.e. 0.00032m<sup>3</sup>/s) has been considered in this DIA. The total discharge volume (i.e. future surface runoff + effluent from STP) is considered to be 0.554m<sup>3</sup>/s.

**3.5 Discussion**

3.5.1 A DIA has been conducted to evaluate the potential impacts due to the surface runoff from the Proposed Development.

3.5.2 It is noted that the Proposed Development will be equipped with onsite sewage treatment plant (STP) to treat the effluent before discharging to the proposed drainage system. The estimated flow from the STP would have a peak discharge rate of 3.2 L/s (i.e. 0.0032m<sup>3</sup>/s).

3.5.3 Hence, the total discharge volume (i.e. future surface runoff + effluent from STP) after development is 0.554m<sup>3</sup>/s.

3.5.4 The surface runoff and treated effluent will discharge to the proposed connection via the site terminal manhole and new 525mm diameter drainage pipes to the proposed outfall of Sheung Yue River. Detailed capacity calculations of the proposed pipes are included in **Appendix 3**.

3.5.5 The surface runoff from the Proposed Development will be discharge to the downstream river (16mW x 2.3mH open channel) (**Appendix 4**). As the capacity of the open channel at least 1664.61m<sup>3</sup>/s, the Proposed Development only approximately 0.04% of the capacity of the open channel and is considered insignificant.

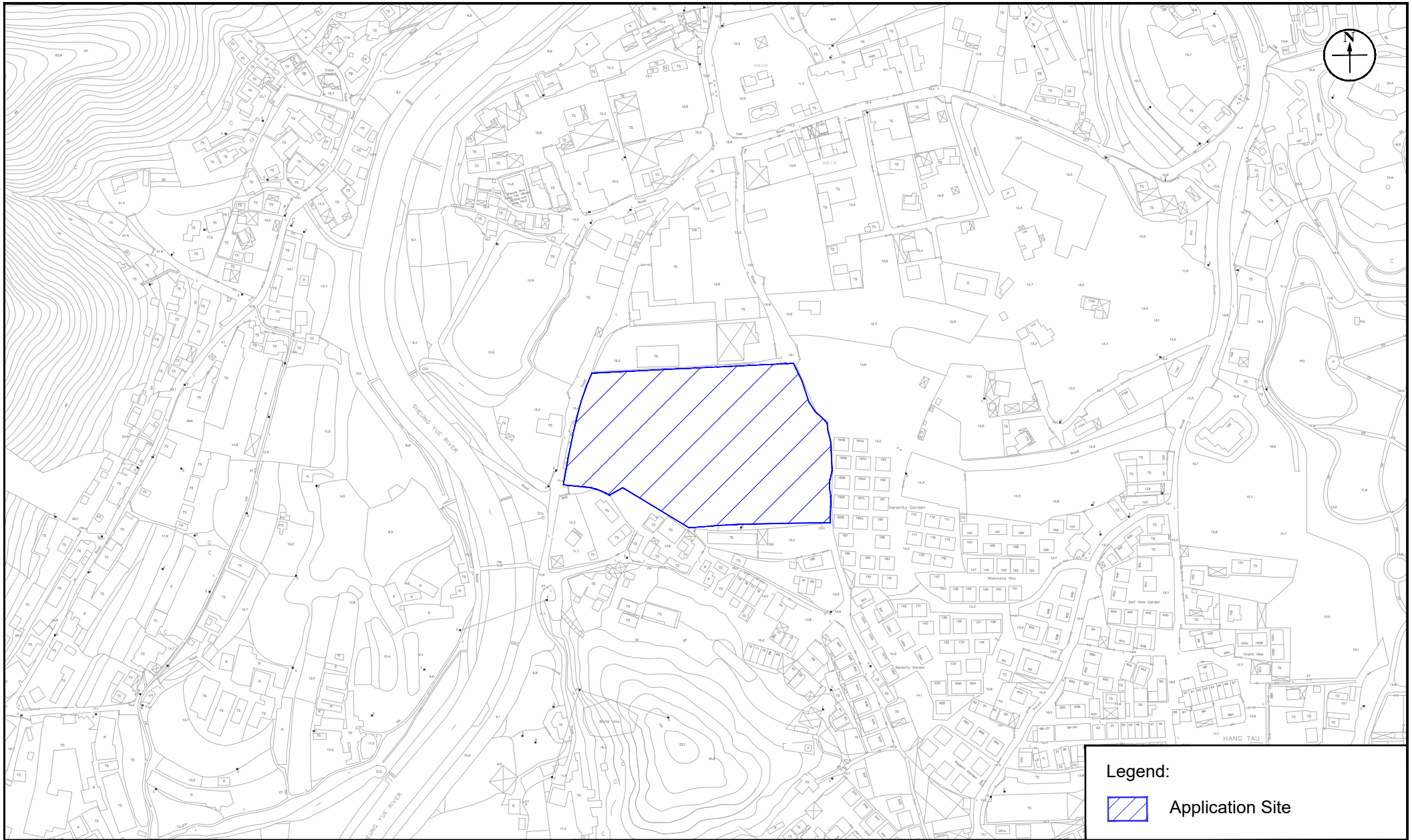
## 4. OVERALL CONCLUSION

### 4.1 Conclusion

- 4.1.1 A residential development is proposed at the Application Site at Kwu Tung South, N.T. The potential sewerage and drainage impact have been assessed.
- 4.1.2 Given that the long separation distance and inaccessible private lots between the Application Site and public foulwater manholes, it is considered not practicable to connect the Application Site with existing sewerage network. Therefore, onsite sewage treatment plant (STP) is proposed and the treated effluent (i.e. 3.2L/s) will be discharged through the proposed drainage system.
- 4.1.3 The STP will be subject to later detailed design and the proposal will be submitted to relevant departments for approval. The project proponent will be responsible to apply for the discharge license and **the implementation and maintenance of the proposed private STP.**
- 4.1.4 According to the findings in DIA, the total discharge volume will be 0.55m<sup>3</sup>/s (with the treated effluent from the STP included). With the proposed 525mm diameter drainage pipes in place, no adverse sewerage and drainage impact due to the Proposed Development is anticipated.


## Figures



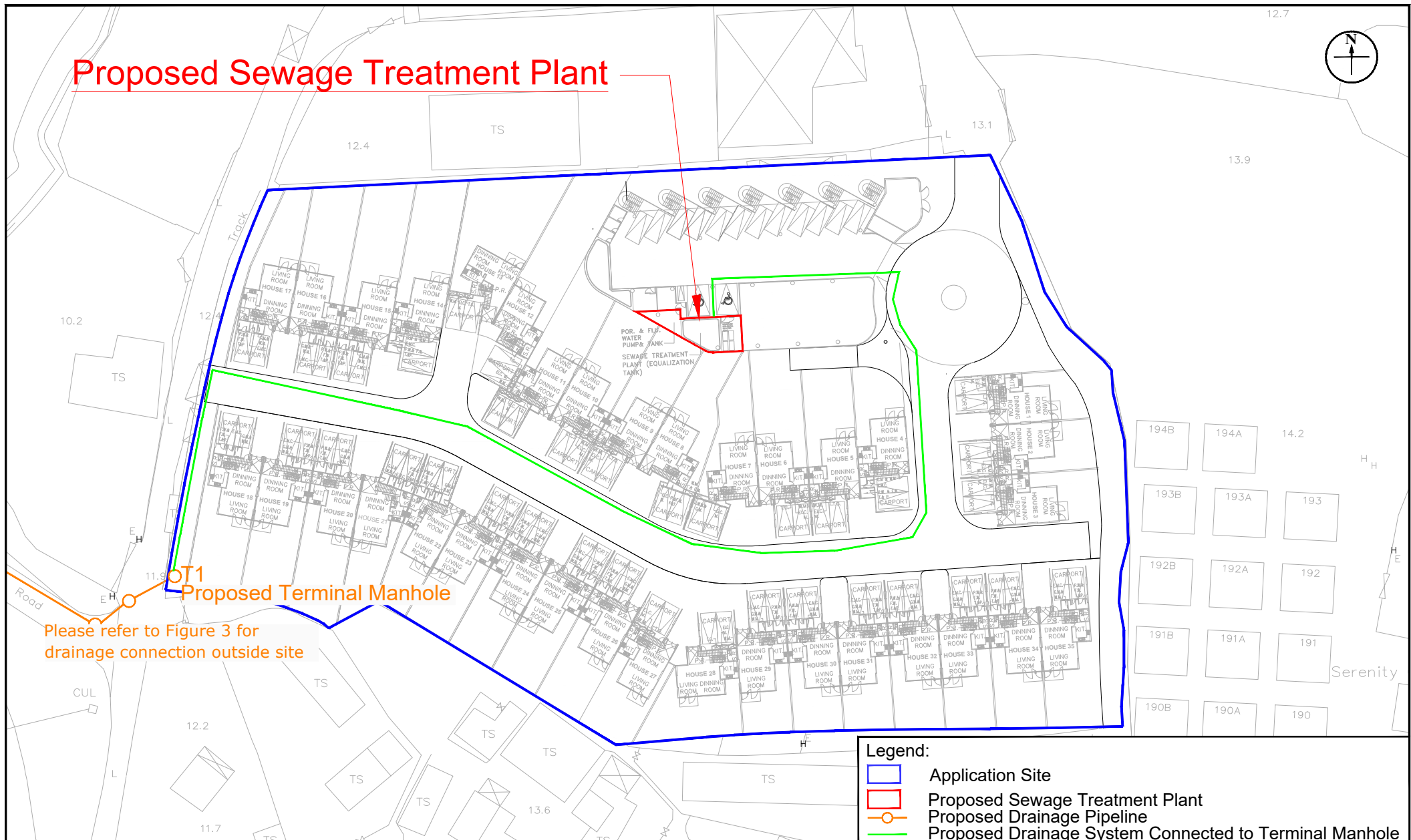


**Legend:**

 Application Site

<b>Figure:</b> 1		
<b>Title:</b> Location of the Application Site and its Environs		Drawn by: MW
<b>Project:</b> Proposed Residential Development at Lot 409 RP, 409S.AA, 409S.AB, 409S.AC, 409S.AD, 409S.AE, 409S.AF, 409S.AG, 409S.AH, 409S.AI, 409S.AJ, 409S.AK, 409S.AL, 409S.AM, 409S.AN, 409S.AO, 409S.AP, 409S.AQ, 409S.AR, 409S.AS, 409S.AT, 409S.AU, 409S.AV, 409S.AW, 409S.AX, 409S.AY, 409S.AZ, 409S.BA, 409S.BB, 409S.BC, 409S.BD, 409S.BE, 409S.BF, 409S.BG, 409S.BH, 409S.BI, 409S.BJ, 409S.BK, 409S.BL, 409S.BM, 409S.BN, 409S.BO, 409S.BP, 409S.BQ, 409S.BR, 409S.BS, 409S.BT, 409 S.F. RP, 409 S.F.ss.1, 409 S.F.ss.2, 409 S.F.ss.3, 409 S.F.ss.4, 409 S.F.ss.5, 409 S.F.ss.6, 409 S.F.ss.7, 409 S.F.ss.8, 409 S.F.ss.9, 409 S.F.ss.10, 409 S.F.ss.11, 409 S.F.ss.12, 409 S.F.ss.13, 409 S.F.ss.14, 409 S.F.ss.15, 409 S.F.ss.16, 409 S.F.ss.17, 409 S.F.ss.18, 409 S.F.ss.19, 409 S.F.ss.20, 409 S.F.ss.21, 409S.G, 409S.H, 409S.I, 409S.J, 409S.K, 409S.L, 409S.M, 409S.N, 409S.O, 409S.P, 409S.Q, 409S.R, 409S.S, 409S.T, 409S.U, 409S.V, 409S.W, 409S.X, 409S.Y, 409S.Z in D.D 94, Kwu Tung South, N.T.		Checked by: CC
		Rev.: 1.0
		Date: Jan 2023









**Proposed Sewage Treatment Plant**

**OT1 Proposed Terminal Manhole**

Please refer to Figure 3 for drainage connection outside site

Legend:	
	Application Site
	Proposed Sewage Treatment Plant
	Proposed Drainage Pipeline
	Proposed Drainage System Connected to Terminal Manhole

**Figure: 2**

**Title:** Proposed Sewage Treatment Plant and Effluent Discharge Location

**Project:** Proposed Residential Development at Lot 409 RP, 409S.AA, 409S.AB, 409S.AC, 409S.AD, 409S.AE, 409S.AF, 409S.AG, 409S.AH, 409S.AI, 409S.AJ, 409S.AK, 409S.AL, 409S.AM, 409S.AN, 409S.AO, 409S.AP, 409S.AQ, 409S.AR, 409S.AS, 409S.AT, 409S.AU, 409S.AV, 409S.AW, 409S.AX, 409S.AY, 409S.AZ, 409S.BA, 409S.BB, 409S.BC, 409S.BD, 409S.BE, 409S.BF, 409S.BG, 409S.BH, 409S.BI, 409S.BJ, 409S.BK, 409S.BL, 409S.BM, 409S.BN, 409S.BO, 409S.BP, 409S.BQ, 409S.BR, 409S.BS, 409S.BT, 409 S.F. RP, 409 S.F.ss.1, 409 S.F.ss.2, 409 S.F.ss.3, 409 S.F.ss.4, 409 S.F.ss.5, 409 S.F.ss.6, 409 S.F.ss.7, 409 S.F.ss.8, 409 S.F.ss.9, 409 S.F.ss.10, 409 S.F.ss.11, 409 S.F.ss.12, 409 S.F.ss.13, 409 S.F.ss.14, 409 S.F.ss.15, 409 S.F.ss.16, 409 S.F.ss.17, 409 S.F.ss.18, 409 S.F.ss.19, 409 S.F.ss.20, 409 S.F.ss.21, 409S.G, 409S.H, 409S.I, 409S.J, 409S.K, 409S.L, 409S.M, 409S.N, 409S.O, 409S.P, 409S.Q, 409S.R, 409S.S, 409S.T, 409S.U, 409S.V, 409S.W, 409S.X, 409S.Y, 409S.Z in D.D 94, Kwu Tung South, N.T.

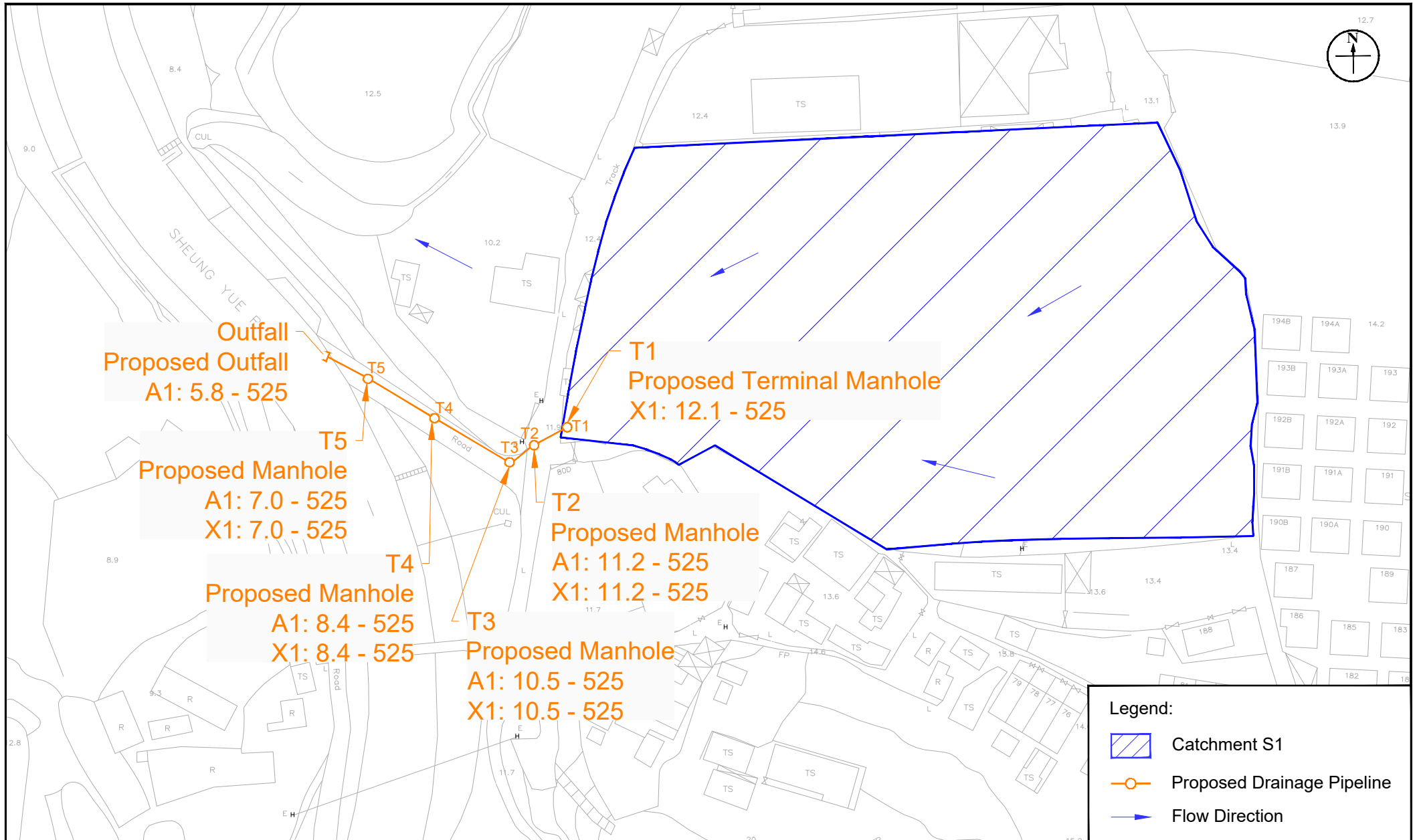
**RAMBOLL**

Drawn by: MW

Checked by: CC

Rev.: 1.1

Date: Jun 2023



**Figure: 2**

**Title:** Proposed Drainage System

**Project:** Proposed Residential Development at Lot 409 RP, 409S.AA, 409S.AB, 409S.AC, 409S.AD, 409S.AE, 409S.AF, 409S.AG, 409S.AH, 409S.AI, 409S.AJ, 409S.AK, 409S.AL, 409S.AM, 409S.AN, 409S.AO, 409S.AP, 409S.AQ, 409S.AR, 409S.AS, 409S.AT, 409S.AU, 409S.AV, 409S.AW, 409S.AX, 409S.AY, 409S.AZ, 409S.BA, 409S.BB, 409S.BC, 409S.BD, 409S.BE, 409S.BF, 409S.BG, 409S.BH, 409S.BI, 409S.BJ, 409S.BK, 409S.BL, 409S.BM, 409S.BN, 409S.BO, 409S.BP, 409S.BQ, 409S.BR, 409S.BS, 409S.BT, 409 S.F. RP, 409 S.F. ss.1, 409 S.F. ss.2, 409 S.F. ss.3, 409 S.F. ss.4, 409 S.F. ss.5, 409 S.F. ss.6, 409 S.F. ss.7, 409 S.F. ss.8, 409 S.F. ss.9, 409 S.F. ss.10, 409 S.F. ss.11, 409 S.F. ss.12, 409 S.F. ss.13, 409 S.F. ss.14, 409 S.F. ss.15, 409 S.F. ss.16, 409 S.F. ss.17, 409 S.F. ss.18, 409 S.F. ss.19, 409 S.F. ss.20, 409 S.F. ss.21, 409S.G, 409S.H, 409S.I, 409S.J, 409S.K, 409S.L, 409S.M, 409S.N, 409S.O, 409S.P, 409S.Q, 409S.R, 409S.S, 409S.T, 409S.U, 409S.V, 409S.W, 409S.X, 409S.Y, 409S.Z in D.D 94, Kwu Tung South, N.T.

**RAMBOLL**

Drawn by: MW

Checked by: CC

Rev.: 1.0

Date: Jan 2023

**Appendix 1      Master Layout Plan**



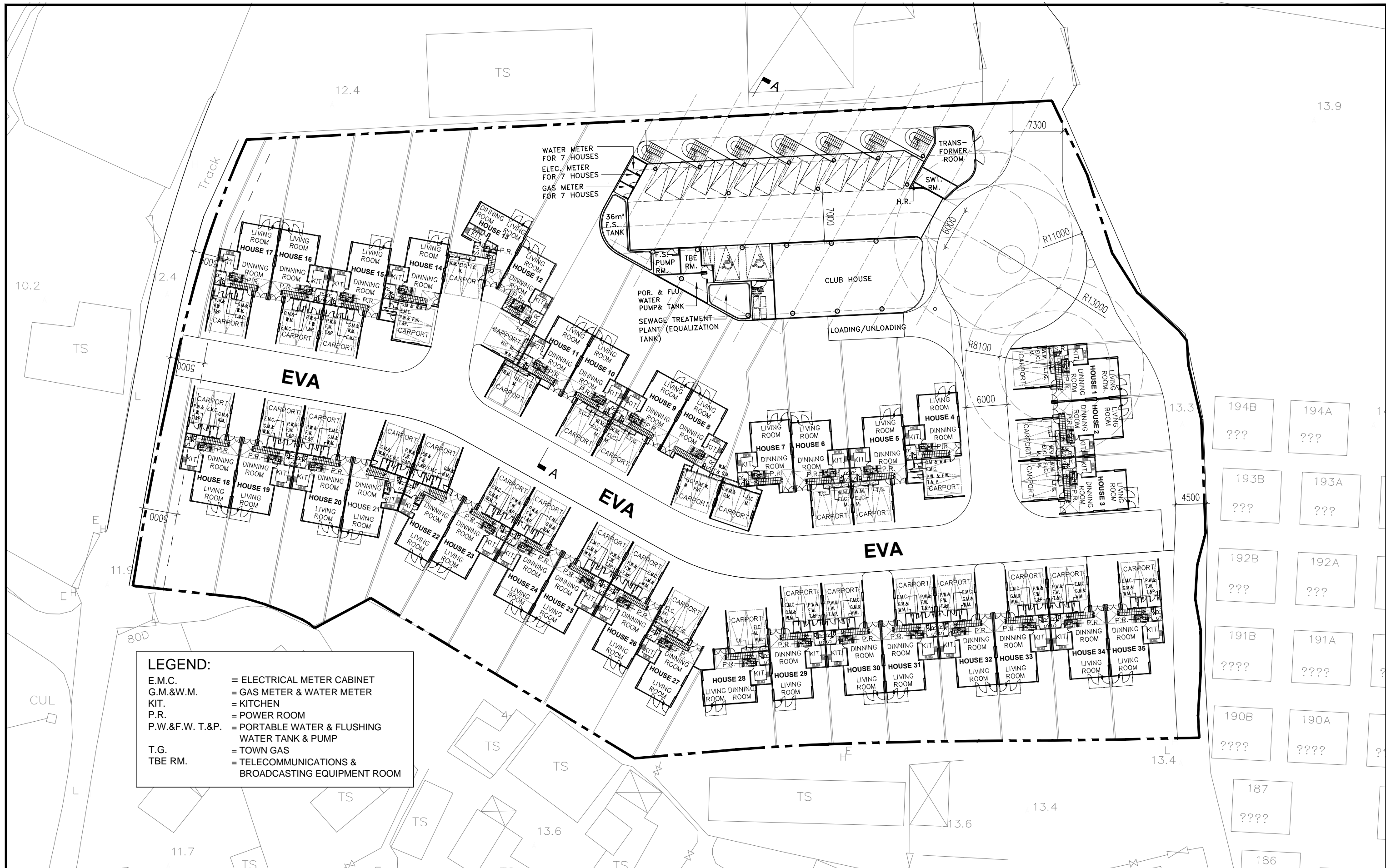
**LEGEND:**  
 - - - APPLICATION SITE BOUNDARY

**PLAN 5 MASTER LAYOUT PLAN**

PROPOSED PRIVATE RESIDENTIAL DEVELOPMENT at  
 Lot 409 RP, 409S.AA, 409S.AB, 409S.AC, 409S.AD, 409S.AE, 409S.AF, 409S.AG, 409S.AH, 409S.AI, 409S.AJ, 409S.AK, 409S.AL, 409S.AM, 409S.AN, 409S.AO, 409S.AP, 409S.AQ, 409S.AR, 409S.AS, 409S.AT, 409S.AU, 409S.AV, 409S.AW, 409S.AX, 409S.AY, 409S.AZ, 409S.BA, 409S.BB, 409S.BC, 409S.BD, 409S.BE, 409S.BF, 409S.BG, 409S.BH, 409S.BI, 409S.BJ, 409S.BK, 409S.BL, 409S.BM, 409S.BN, 409S.BO, 409S.BP, 409S.BQ, 409S.BR, 409S.BS, 409S.BT, 409 S.F. RP, 409 S.F.ss.1, 409 S.F.ss.2, 409 S.F.ss.3, 409 S.F.ss.4, 409 S.F.ss.5, 409 S.F.ss.6, 409 S.F.ss.7, 409 S.F.ss.8, 409 S.F.ss.9, 409 S.F.ss.10, 409 S.F.ss.11, 409 S.F.ss.12, 409 S.F.ss.13, 409 S.F.ss.14, 409 S.F.ss.15, 409 S.F.ss.16, 409 S.F.ss.17, 409 S.F.ss.18, 409 S.F.ss.19, 409 S.F.ss.20, 409 S.F.ss.21, 409S.G, 409S.H, 409S.I, 409S.J, 409S.K, 409S.L, 409S.M, 409S.N, 409S.O, 409S.P, 409S.Q, 409S.R, 409S.S, 409S.T, 409S.U, 409S.V, 409S.W, 409S.X, 409S.Y, 409S.Z in D.D 94, Kwu Tung South, N.T.

**CHIH** Design Ltd  
 JOB NO.: 2105PA  
 DATE : 19 - 01 - 2023  
 SCALE : 1:500 @A3





**LEGEND:**

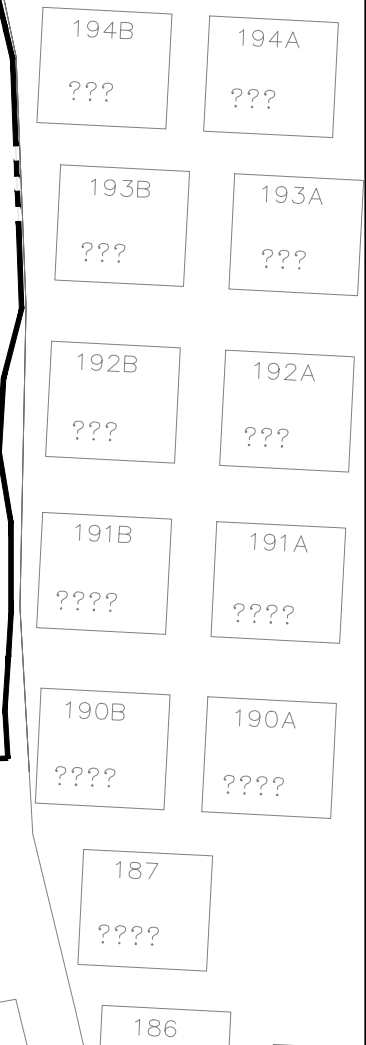
- E.M.C. = ELECTRICAL METER CABINET
- G.M.&W.M. = GAS METER & WATER METER
- KIT. = KITCHEN
- P.R. = POWER ROOM
- P.W.&F.W. T.&P. = PORTABLE WATER & FLUSHING WATER TANK & PUMP
- T.G. = TOWN GAS
- TBE RM. = TELECOMMUNICATIONS & BROADCASTING EQUIPMENT ROOM

**PLAN 6** GROUND FLOOR PLAN  
 PROPOSED PRIVATE RESIDENTIAL DEVELOPMENT at  
 Lot 409 RP, 409S.AA, 409S.AB, 409S.AC, 409S.AD, 409S.AE, 409S.AF, 409S.AG, 409S.AH, 409S.AI, 409S.AJ, 409S.AK, 409S.AL, 409S.AM, 409S.AN, 409S.AO, 409S.AP, 409S.AQ, 409S.AR, 409S.AS, 409S.AT, 409S.AU, 409S.AV, 409S.AW, 409S.AX, 409S.AY, 409S.AZ, 409S.BA, 409S.BB, 409S.BC, 409S.BD, 409S.BE, 409S.BF, 409S.BG, 409S.BH, 409S.BI, 409S.BJ, 409S.BK, 409S.BL, 409S.BM, 409S.BN, 409S.BO, 409S.BP, 409S.BQ, 409S.BR, 409S.BS, 409S.BT, 409 S.F. RP, 409 S.F. ss.1, 409 S.F. ss.2, 409 S.F. ss.3, 409 S.F. ss.4, 409 S.F. ss.5, 409 S.F. ss.6, 409 S.F. ss.7, 409 S.F. ss.8, 409 S.F. ss.9, 409 S.F. ss.10, 409 S.F. ss.11, 409 S.F. ss.12, 409 S.F. ss.13, 409 S.F. ss.14, 409 S.F. ss.15, 409 S.F. ss.16, 409 S.F. ss.17, 409 S.F. ss.18, 409 S.F. ss.19, 409 S.F. ss.20, 409 S.F. ss.21, 409S.G, 409S.H, 409S.I, 409S.J, 409S.K, 409S.L, 409S.M, 409S.N, 409S.O, 409S.P, 409S.Q, 409S.R, 409S.S, 409S.T, 409S.U, 409S.V, 409S.W, 409S.X, 409S.Y, 409S.Z in D.D 94, Kwu Tung South, N.T.

**CHH** Design Ltd  
 JOB NO.: 2105PA  
 DATE : 19 - 01 - 2023  
 SCALE : 1:500 @A3



**PLAN 7** FIRST FLOOR PLAN  
 PROPOSED PRIVATE RESIDENTIAL DEVELOPMENT at  
 Lot 409 RP, 409S.AA, 409S.AB, 409S.AC, 409S.AD, 409S.AE, 409S.AF, 409S.AG, 409S.AH, 409S.AI, 409S.AJ, 409S.AK, 409S.AL, 409S.AM, 409S.AN, 409S.AO, 409S.AP, 409S.AQ, 409S.AR, 409S.AS, 409S.AT, 409S.AU, 409S.AV,  
 409S.AW, 409S.AX, 409S.AY, 409S.AZ, 409S.BA, 409S.BB, 409S.BC, 409S.BD, 409S.BE, 409S.BF, 409S.BG, 409S.BH, 409S.BI, 409S.BJ, 409S.BK, 409S.BL, 409S.BM, 409S.BN, 409S.BO, 409S.BP, 409S.BQ, 409S.BR, 409S.BS,  
 409S.BT, 409 S.F. RP, 409 S.F. ss.1, 409 S.F. ss.2, 409 S.F. ss.3, 409 S.F. ss.4, 409 S.F. ss.5, 409 S.F. ss.6, 409 S.F. ss.7, 409 S.F. ss.8, 409 S.F. ss.9, 409 S.F. ss.10, 409 S.F. ss.11, 409 S.F. ss.12, 409 S.F. ss.13, 409 S.F. ss.14, 409 S.F. ss.15,  
 409 S.F. ss.16, 409 S.F. ss.17, 409 S.F. ss.18, 409 S.F. ss.19, 409 S.F. ss.20, 409 S.F. ss.21, 409S.G, 409S.H, 409S.I, 409S.J, 409S.K, 409S.L, 409S.M, 409S.N, 409S.O, 409S.P, 409S.Q, 409S.R, 409S.S, 409S.T, 409S.U, 409S.V, 409S.W,  
 409S.X, 409S.Y, 409S.Z in D.D 94, Kwu Tung South, N.T.



**CHIH** Design Ltd  
 JOB NO.: 2105PA  
 DATE : 19 - 01 - 2023  
 SCALE : 1:500 @A3





**PLAN 8 SECOND FLOOR PLAN**

PROPOSED PRIVATE RESIDENTIAL DEVELOPMENT at

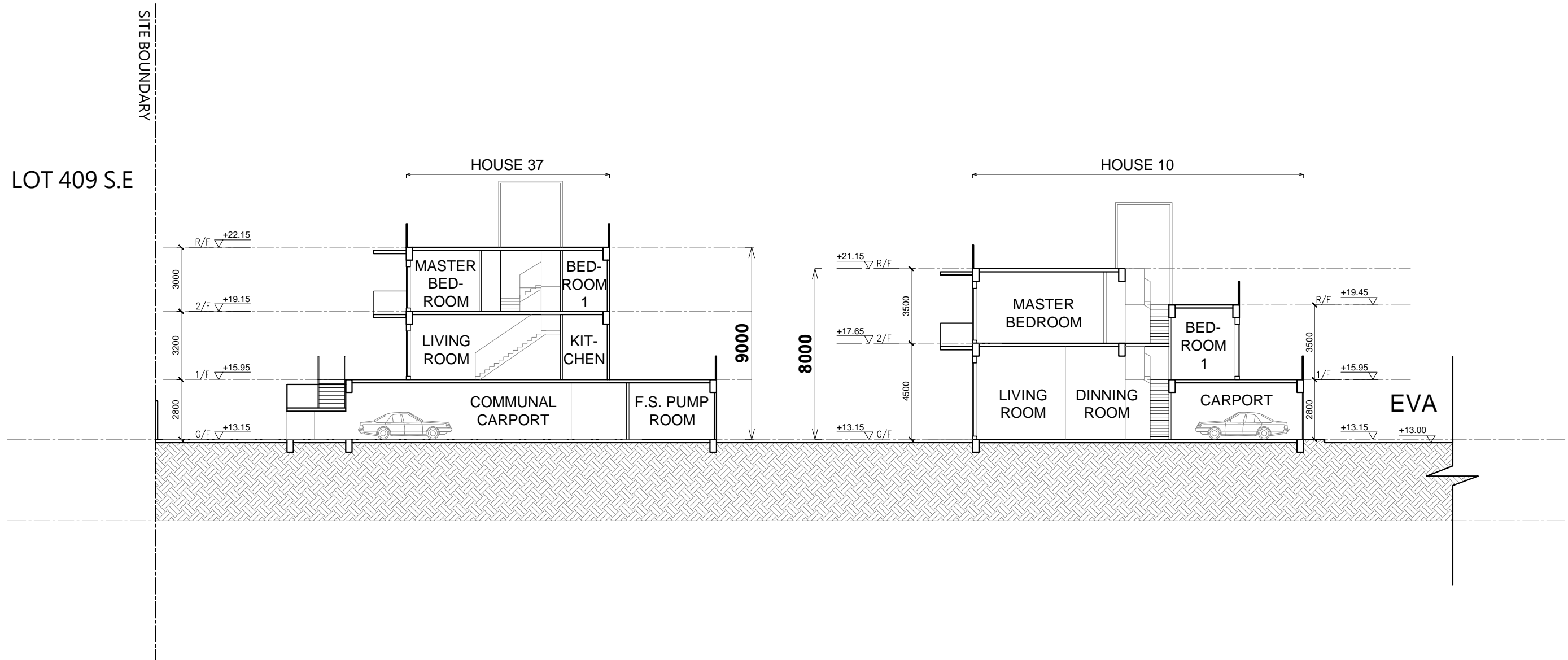
Lot 409 RP, 409S.AA, 409S.AB, 409S.AC, 409S.AD, 409S.AE, 409S.AF, 409S.AG, 409S.AH, 409S.AI, 409S.AJ, 409S.AK, 409S.AL, 409S.AM, 409S.AN, 409S.AO, 409S.AP, 409S.AQ, 409S.AR, 409S.AS, 409S.AT, 409S.AU, 409S.AV, 409S.AW, 409S.AX, 409S.AY, 409S.AZ, 409S.BA, 409S.BB, 409S.BC, 409S.BD, 409S.BE, 409S.BF, 409S.BG, 409S.BH, 409S.BI, 409S.BJ, 409S.BK, 409S.BL, 409S.BM, 409S.BN, 409S.BO, 409S.BP, 409S.BQ, 409S.BR, 409S.BS, 409S.BT, 409 S.F. RP, 409 S.F. ss.1, 409 S.F. ss.2, 409 S.F. ss.3, 409 S.F. ss.4, 409 S.F. ss.5, 409 S.F. ss.6, 409 S.F. ss.7, 409 S.F. ss.8, 409 S.F. ss.9, 409 S.F. ss.10, 409 S.F. ss.11, 409 S.F. ss.12, 409 S.F. ss.13, 409 S.F. ss.14, 409 S.F. ss.15, 409 S.F. ss.16, 409 S.F. ss.17, 409 S.F. ss.18, 409 S.F. ss.19, 409 S.F. ss.20, 409 S.F. ss.21, 409S.G, 409S.H, 409S.I, 409S.J, 409S.K, 409S.L, 409S.M, 409S.N, 409S.O, 409S.P, 409S.Q, 409S.R, 409S.S, 409S.T, 409S.U, 409S.V, 409S.W, 409S.X, 409S.Y, 409S.Z in D.D 94, Kwu Tung South, N.T.

**CHIH** Design Ltd

JOB NO.: 2105PA

DATE : 19 - 01 - 2023

SCALE : 1:500 @A3



PLAN 9

SECTION AA'

PROPOSED PRIVATE RESIDENTIAL DEVELOPMENT at

Lot 409 RP, 409S.AA, 409S.AB, 409S.AC, 409S.AD, 409S.AE, 409S.AF, 409S.AG, 409S.AH, 409S.AI, 409S.AJ, 409S.AK, 409S.AL, 409S.AM, 409S.AN, 409S.AO, 409S.AP, 409S.AQ, 409S.AR, 409S.AS, 409S.AT, 409S.AU, 409S.AV, 409S.AW, 409S.AX, 409S.AY, 409S.AZ, 409S.BA, 409S.BB, 409S.BC, 409S.BD, 409S.BE, 409S.BF, 409S.BG, 409S.BH, 409S.BI, 409S.BJ, 409S.BK, 409S.BL, 409S.BM, 409S.BN, 409S.BO, 409S.BP, 409S.BQ, 409S.BR, 409S.BS, 409S.BT, 409 S.F. RP, 409 S.F.ss.1, 409 S.F.ss.2, 409 S.F.ss.3, 409 S.F.ss.4, 409 S.F.ss.5, 409 S.F.ss.6, 409 S.F.ss.7, 409 S.F.ss.8, 409 S.F.ss.9, 409 S.F.ss.10, 409 S.F.ss.11, 409 S.F.ss.12, 409 S.F.ss.13, 409 S.F.ss.14, 409 S.F.ss.15, 409 S.F.ss.16, 409 S.F.ss.17, 409 S.F.ss.18, 409 S.F.ss.19, 409 S.F.ss.20, 409 S.F.ss.21, 409S.G, 409S.H, 409S.I, 409S.J, 409S.K, 409S.L, 409S.M, 409S.N, 409S.O, 409S.P, 409S.Q, 409S.R, 409S.S, 409S.T, 409S.U, 409S.V, 409S.W, 409S.X, 409S.Y, 409S.Z in D.D 94, Kwu Tung South, N.T.

CHIH Design Ltd

JOB NO.: 2105PA

DATE : 19 - 01 - 2023

SCALE : 1:200 @A3



## Appendix 2 Detailed Sewerage Analysis

**Table 1 Calculation for Sewage Generation Rate of the Proposed Development at the Subject Site**

**1. Residential Tower**

1a. Total number of residential units	=	42 units
1b. Total number of residents	=	118 people -- (2021 Population Census: Average Household Size of 2.8 in Sheung Shui Rural District)
1c. Design flow	=	0.37 m <sup>3</sup> /person/day -- (Private R4 in Table T-1 of GESF)
1d. Sewage Generation rate	=	<b>43.7 m<sup>3</sup>/day</b>

**2. Clubhouse**

2a. Assumed Area	=	232 m <sup>2</sup>
2b. Assumed floor area per employee	=	30.3 m <sup>2</sup> per worker -- (refer to Table 8 of CIFSUS - Community, Social & Personal Services)
2c. Total number of employees	=	8 employees
2d. Design flow for commercial activities	=	0.28 m <sup>3</sup> /employee/day -- (refer to Table T-2 of GESF - J11)
2e. Sewage Generation rate	=	<b>2.1 m<sup>3</sup>/day</b>

**Total Flow from Proposed Development**

Flow Rate (without Catchment Inflow Factor)	=	<b>45.8 m<sup>3</sup>/day</b>
Contributing Population	=	170 people
Peaking factor	=	6 Refer to Guidelines for the Design of Small Sewage Treatment Plants
Peak Flow	=	<b>3.2 litre/sec</b>

**Appendix 3      Detailed Drainage Analysis**

**Kwu Tung South, Various Lots D.D. 94**

**Table 1 - Proposed Catchment Areas and Run-off (1 in 50 year)**

$$Q_p = 0.278 C i A$$

Notes:

Site Area                      12,100                      m<sup>2</sup>

where Q<sub>p</sub> = peak runoff in m<sup>3</sup>/s  
 C = runoff coefficient (dimensionless)  
 i = rainfall intensity in mm/hr  
 A = catchment area in km<sup>2</sup>

Catchments are small, so Rational Method is appropriate

1 in 50-year (according to Table 3 of DSD Manual)

a= 1167.6

b= 16.76

c= 0.561

Surface Characteristics	Runoff coefficient, C*
Asphalt	0.70 - 0.95
Concrete	0.80 - 0.95
Brick	0.70 - 0.85
Grassland (heavy soil**)	
Flat	0.13 - 0.25
Steep	0.25 - 0.35
Grassland (sandy soil)	
Flat	0.05 - 0.15
Steep	0.15 - 0.20

	Catchment	Discharge Manhole	Paved	Unpaved	Run-off at	Area	Levels (mPD)		Fall	Overland, L	Fall, H	Overland t <sub>c</sub>	t <sub>0</sub>	Total t <sub>r</sub> <sup>1</sup>	Total t <sub>c</sub> <sup>2</sup>	Intensity	Weighted Runoff Coefficient	Run-off	
						(m <sup>2</sup> )	Upstream	Downstream	(m)	(m)	(m/100m)	(min)	(min)	(min)	(min)	(mm/h)		(m <sup>3</sup> /s)	
<b>Existing</b>	S1	T1	100%	0%		12,100							5.0	0.00	5.00	207	0.95	0.663	
<b>Future</b>	S1	T1	80%	20%	T1	12,100								5.0	0.00	5.00	207	0.79	0.551
					T2														0.550
					T3														0.550
					T4														0.547
					T5														0.544
					Outfall														0.543

Remarks:

1. Assumed Time of Concentration through stream flow
2. Assumed Time of Concentration

Kwu Tung South, Various Lots D.D. 94  
Hydraulic Calculations of Existing and Proposed Drainage System

Table 2a - 1 in 50 year Runoff of Future Catchments (m<sup>3</sup>/s)

Runoff at	Catchment	
	S1	Total
T1	0.551	0.55
T2	0.550	0.55
T3	0.550	0.55
T4	0.547	0.55
T5	0.544	0.54

Table 2b - Treated Effluent from the proposed on-site STP

Estimated Peak Sewage Generation Rate, m <sup>3</sup> /s	Estimated Peak Effluent from Proposed On-Site STP, m <sup>3</sup> /s
0.003	0.003

Table 3a - Hydraulic Capacities for Proposed Drainage System

Segment	Manhole Reference	Manhole Reference	Type of Channel	Pipe Dia.	Pipe Length	Invert Level 1	Invert Level 2	g	k <sub>s</sub>	s	Gradient	v	V	Area	Q	Q <sub>silt</sub> <sup>1</sup>
				mm	m	mPD	mPD	m/s <sup>2</sup>	m	1 in	m <sup>2</sup> /s	m/s	m <sup>2</sup>	m <sup>3</sup> /s	m <sup>3</sup> /s	
T1 - T2	-	-	Circular	525	8.4	12.10	11.20	9.81	0.0030	0.107	9	0.000001	5.89	0.22	1.28	1.21
T2 - T3	-	-	Circular	525	6.7	11.20	10.50	9.81	0.0030	0.105	10	0.000001	5.83	0.22	1.26	1.20
T3 - T4	-	-	Circular	525	19.5	10.50	8.40	9.81	0.0030	0.108	9	0.000001	5.92	0.22	1.28	1.22
T4 - T5	-	-	Circular	525	17.3	8.40	7.00	9.81	0.0030	0.081	12	0.000001	5.13	0.22	1.11	1.05
T5 - Outfall	-	Outfall	Circular	525	10.2	7.00	5.80	9.81	0.0030	0.117	9	0.000001	6.17	0.22	1.34	1.27

Table 3b - Hydraulic Capacities for Existing Drainage System

Segment	Type of Channel	Width (W)	Height (H)	Slope	Pipe Length (L)	Manning's roughness coefficient	Cross Section Area	Wetted Perimeter	Hydraulic Radius (R)	V	Q	Q <sub>silt</sub> <sup>1</sup>
		m	m		m		m	m	m/s	m <sup>2</sup> /s	m <sup>3</sup> /s	
River	Box Culvert	16.0	2.3	0.008	125.5	0.016	36.65	118.93	27.43	50.47	1849.563	1664.61

Table 4a - Comparison of Runoff from Proposed Catchments and Hydraulic Capacities of Proposed Drainage System

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Q <sub>silt</sub> <sup>1</sup>	Catchment Involved	Runoff	Occupancy	Sufficient Capacity?	Runoff [2]	Occupancy	Sufficient Capacity?	Runoff [3]	Occupancy	Sufficient Capacity?
			mm	m <sup>3</sup> /s		m <sup>3</sup> /s			m <sup>3</sup> /s			m <sup>3</sup> /s		
T1 - T2	-	-	525	1.21	S1	0.554	45.7%	YES	0.62	50.8%	YES	0.64	53.1%	YES
T2 - T3	-	-	525	1.20	S1	0.553	46.1%	YES	0.61	51.2%	YES	0.64	53.5%	YES
T3 - T4	-	-	525	1.22	S1	0.553	45.4%	YES	0.61	50.5%	YES	0.64	52.7%	YES
T4 - T5	-	-	525	1.05	S1	0.550	52.2%	YES	0.61	58.0%	YES	0.64	60.5%	YES
T5 - Outfall	-	Outfall	525	1.27	S1	0.548	43.1%	YES	0.61	47.9%	YES	0.64	50.0%	YES

Table 4b - Comparison of Runoff from Proposed Catchments and Hydraulic Capacities of Existing Drainage System

Segment	Manhole Reference	Manhole Reference	Pipe Dia.	Q <sub>silt</sub> <sup>1</sup>	Catchment Involved	Runoff	Occupancy	Sufficient Capacity?	Runoff [2]	Occupancy	Sufficient Capacity?	Runoff [3]	Occupancy	Sufficient Capacity?
			mm	m <sup>3</sup> /s		m <sup>3</sup> /s			m <sup>3</sup> /s			m <sup>3</sup> /s		
River	-	-	-	1664.61	S1	0.544	0.03%	YES	0.60	0.04%	YES	0.63	0.04%	YES

Remarks:

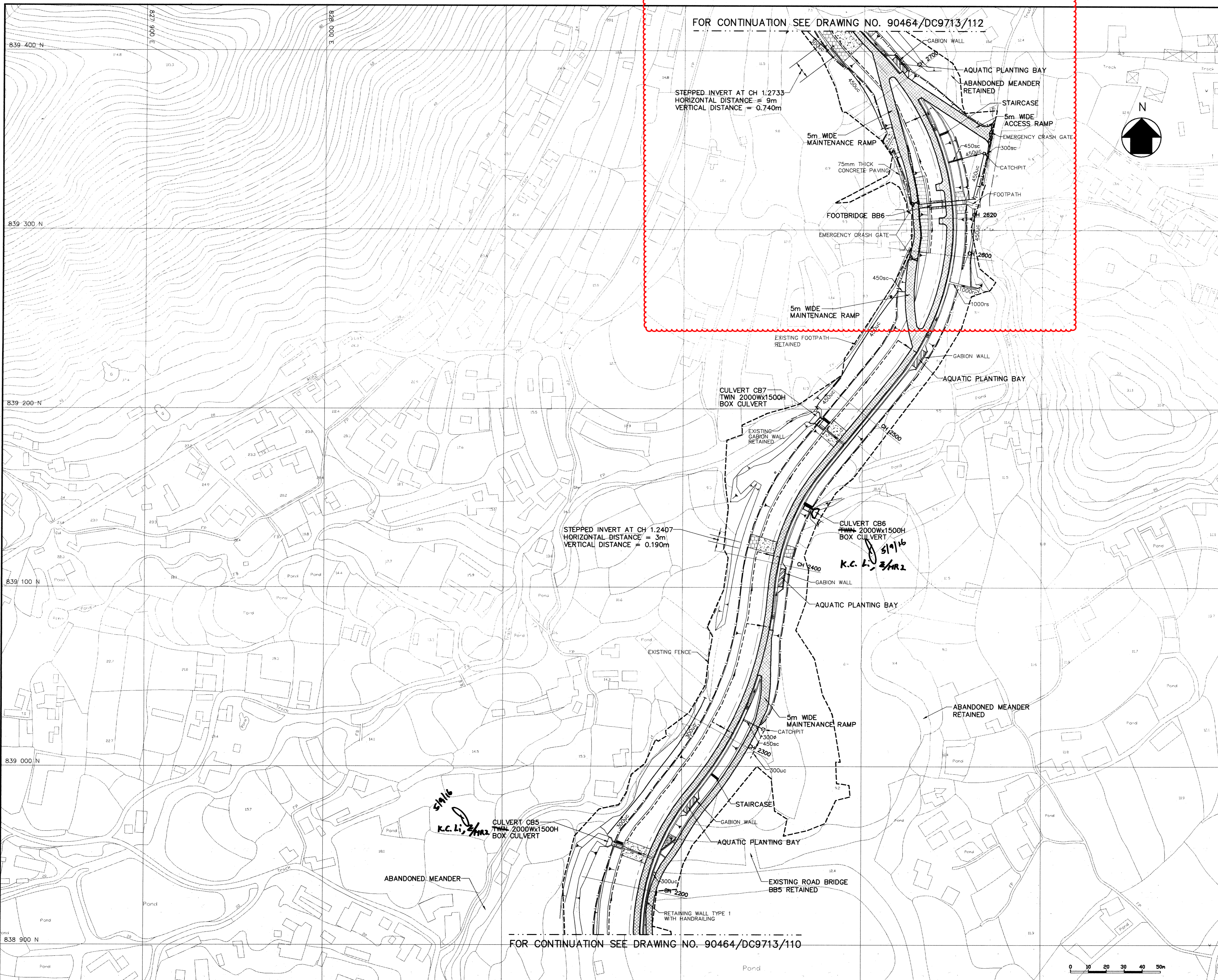
1. Q<sub>silt</sub>: 10% reduction in flow for gradient is not greater than 1 in 25, 5% reduction in flow for gradient greater than 1 in 25.
2. Cross Section Area of Circular Pipe:  $D^2 \times \pi / 4$
3. Perimeter of Circular Pipe:  $(D \times 2 \times \pi) / 2$

Runoff [2] represents the situation in Mid 21st Century (11.1%)

Runoff [3] represents the situation in Late 21st Century (16%)

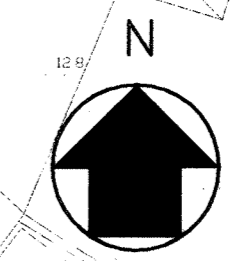
**Appendix 4      Drainage Record Obtained from DSD**





FOR CONTINUATION SEE DRAWING NO. 90464/DC9713/112

FOR CONTINUATION SEE DRAWING NO. 90464/DC9713/110



- Notes :**
- This drawing is to be read in conjunction with the general notes on drawing No. 90464/DC9713/102 unless otherwise stated.
  - For concrete staircase details see drawing No. 90464/DC9713/146.
- LEGEND:**
- Dry Weather Flow Channel
  - Maintenance Road
  - Footpath
  - Limit of Works
  - Gabion Wall (see Drg. No. 90464/DC9713/146)
  - Aquatic Planting Bay (see Drg. No. 90464/DC9713/146)
  - Retaining Wall (see Drg. No. 90464/DC9713/525 & 526)
  - U-channel (see CED's Standard Drg No. C2409C & C2412)
  - BB5 Footbridge Reference Number
  - Pedestrian Handrailing (see Drg. No. 90464/DC9713/500)
  - Emergency Crash Gate and "No-Entry" Signboard (see Drg No. 90464/DC9713/102 & 103)
  - Channel Slope
  - 150mm Dia. Sub-soil Drain
  - 300 uc U-Channel
  - uc U-Channel
  - sc Stepped Channel
  - rc Rectangular Open Channel
  - rs Rectangular Stepped Channel
  - jc J-Channel
  - Size of Channel in mm
  - 200x200x75 Granite Block Facing (see CED's Standard Drg No. C2002/1)
  - 175mm Concrete Paving (see Drg No. 90464/DC9713/146)
  - Catchpit (see CED's Standard Drg No. C2405)
  - Manhole (see DSD's Standard Drg No. DS1001 - DS1010)

B	ABR	As Built Record Drawing		22.4.03
A	IFT	Tender Drawings	SANGDM	18.12.98
Rev	Stat	Amendment	By	App. Date

Client **DRAINAGE SERVICES DEPARTMENT**

Contract No. DC/97/13

Project **Rural Drainage Rehabilitation Scheme**

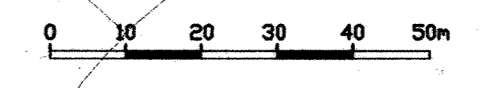
Title **River Beas General Layout of As Built Works**

(SHEET 4 OF 7)

**Mouchel**  
Mouchel Asia Limited  
Consulting Engineers

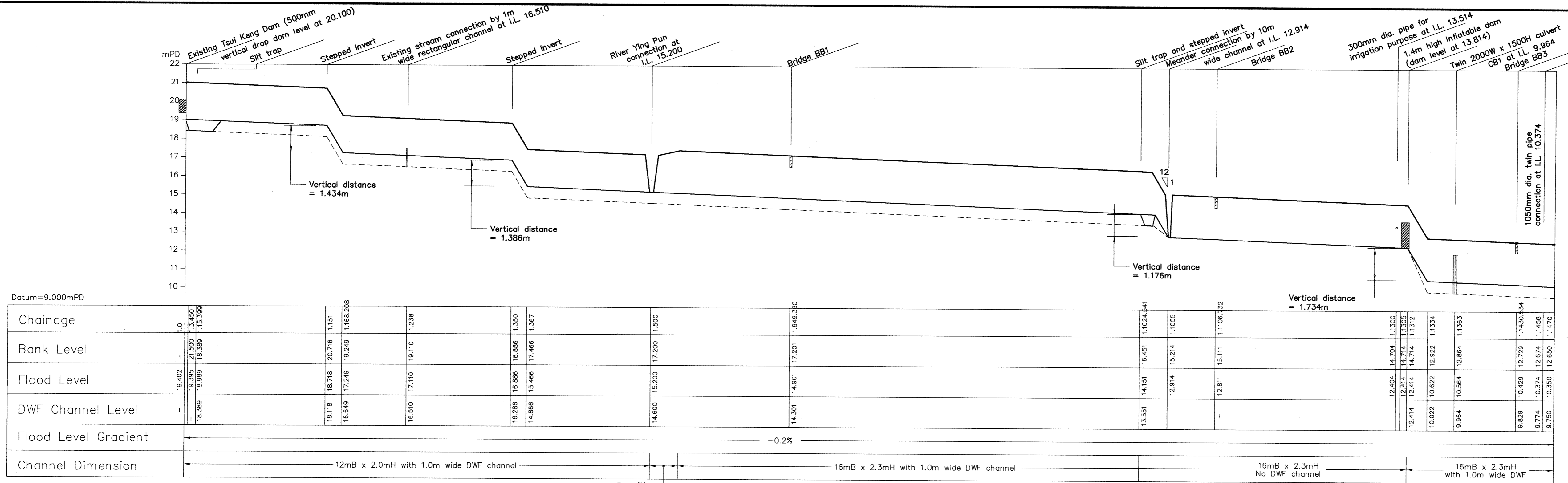
Drawn YJC	Date 22.4.03
Checked EL	Date 22.4.03
Approved KHS	Date 22.4.03
CAD File No. 713-111B	
Scale 1 : 1000	

First issued 18.12.98	Drg. No. 90464/DC9713/111	Rev. B
-----------------------	---------------------------	--------

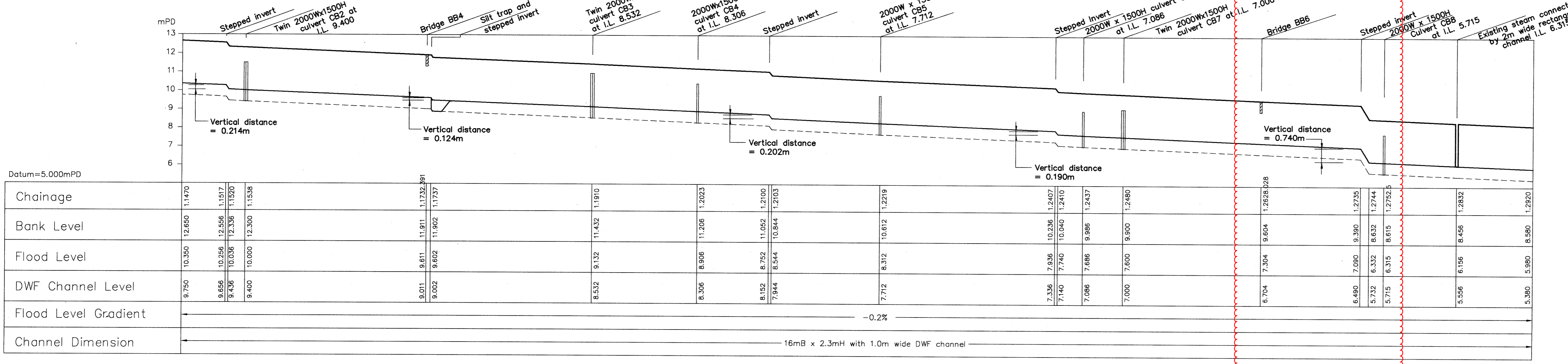


2-SE-146 end

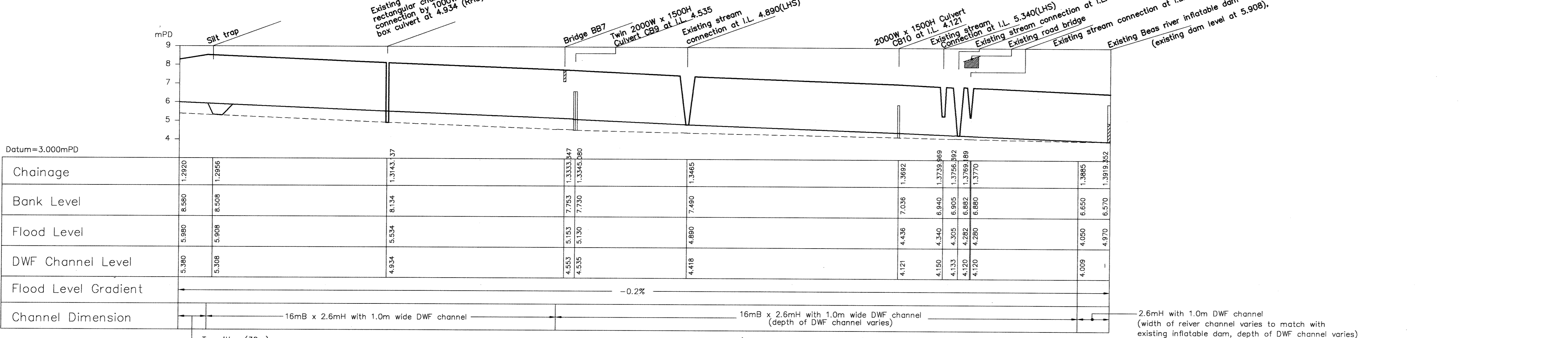




RIVER BEAS LONGITUDINAL PROFILE (CH1.0 - 1.1470)



RIVER BEAS LONGITUDINAL PROFILE (CH1.1470 - 1.2920)



RIVER BEAS LONGITUDINAL PROFILE (CH1.2920 - 1.3919)

Notes:  
1. This drawing is to be read in conjunction with the general notes on drawing No. 90464/DC9713/102 unless otherwise stated.

Rev	Issue	Amendment	By	App.	Date
B	ABR	As Built Record Drawing			22.4.03
A	IFT	Tender Drawing			SANGDWM/18.12.98

Client: **DRAINAGE SERVICES DEPARTMENT**

Contract No. DC/97/13  
Project: **Rural Drainage Rehabilitation Scheme**

Title: **River Beas Longitudinal Profile**

(SHEET 1 OF 2)

Drawn	YIC	Date	22.4.03
Checked	EL	Date	22.4.03
Approved	KHS	Date	22.4.03

Mouchel  
Mouchel Asia Limited  
Consulting Engineers

CAD File No. 713-118B  
Scale: HOR 1 : 2500  
VERT 1 : 125

First Issued	18.12.98	Dr. No.	90464/DC9713/118	Rev.	B
--------------	----------	---------	------------------	------	---