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D02/01 Sewerage Impact Assessment

S12A Rezoning Application for Sai Lam Temple, at Lot Nos. 63 and 296 (Part) in D.D. 185, Sheung Wo Che No. 198, Sha Tin

Prepared for Sai Lam (Salvation) Foundation Limited
11 April 2025

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1 INTRODUCTION

1.1 Background

1.1.1 Part of the area in "Sai Lam Temple" (the Site) is located at Lots Nos. 63 and 296 (Part) in D.D. 185, Sheung Wo Che No. 198, Sha Tin. It is operated by "Sai Lam (Salvation) Foundation Limited" (the Applicant). As advised by the Applicant, the Site in Sai Lam Temple ("SLT") have a long history of community and religious uses since Sai Lam Temple was built in the 1920s. The Site is currently occupied by worship hall as well as columbarium use that can accommodate up to 10,960 niches.

1.1.2 The Site is zoned "Village Type Development" ("V") under the Approved Sha Tin Outline Zoning Plan (OZP) No. S/ST/38. In order to continue the current operation of the Site and reflect the existing religious use of Sai Lam Temple, it is proposed to rezone the Site from "V" to "Government, Institution or Community (1)" ("(G/IC(1)") under Section 12A of the *Town Planning Ordinance* (TPO). This rezoning application is compatible with the existing land use in Sheung Wo Che, which is a traditional religious district in Sha Tin. The continued operation of the columbarium can also help resolve the currently significant shortage of columbarium supply confirmed by the government[1].

1.1.3 In order to support the aforementioned planning application, SMEC Asia Limited (SMEC) has been appointed by the Applicant to conduct a Sewerage Impact Assessment (SIA).

1.2 Site Description

1.2.1 The Site area is about 1,482m^2. As shown on ***Figure 1.1***, the Site is surrounded by hillsides, mature trees and burial grounds. Sam Yuen Kung Temple (religious use of Sai Lam Temple) is to the east of the Site. Sin Tin Toa Home for the Aged is located to the immediate east of the Site. To the immediate north of the Site is a footpath towards To Fuk Shan Tsz (道福山祠).

1.2.2 The Site is located close to public transport services including Sha Tin MTR Station and its adjoining bus terminus. It spends approximately 10-15 minutes between the Site and the aforesaid public transportation means on foot. Visitors can access the site either via a footpath from Shatin Rural Committee Road or the track from the unnamed access road connecting Sheung Wo Che Garden and Pai Tau Street.

1.2.3 As stated in ***paragraph 1.1.1***, the Site has been occupied since 1920s. As such, generation of wastewater from the Site is not new to the environment.

1.3 Project Description

1.3.1 The existing ancillary columbarium provides 10,960 niches for placing 13,015 urns. The Site area is about 1,482m^2. The niche number to be applied for will be 10,960 sold niches (8,905 single niches and 2,055 double-urn niches).

1.3.2 The Site is already developed. The Master Layout Plan is attached as ***Appendix A***. It comprises of the following buildings:

- G/F Worshipping Hall in Building A (H1)
- G/F Storage Room, Ancestral Tablet Room and 1/F Columbarium in Building B (H2)

[1] The Press Releases dated 28 July 2016 provided by the Secretary for Food and Health (SFH) on Medical Council and columbarium supply, http://www.info.gov.hk/gia/general/201606/28/P201606280882.htm.

- G/F and 1/F Columbarium in Building C (H3)
- G/F Columbarium and Worshipping Hall, 1/F Columbarium and 2/F Worshipping Hall in Building D (H4)
- G/F Management Office, Shop and Storage Room and Columbarium, and 1/F Columbarium and Praying Room, Storage Room in Building E (H5)
- 2 smokeless Joss Paper Furnaces

1.3.3 The operating hours of the Project are:

- Regular periods (non-festival periods including weekends and public holidays): 9:00 am – 6:00 pm
- Ching Ming and Chung Yeung Festival periods (i.e. 2 consecutive weekends/public holidays before and after the actual festival day): 8:00 am – 6:00 pm
- Ching Ming and Chung Yeung Festival: Closed

1.3.4 As mentioned in ***paragraph 1.3.2***, most of the buildings and facilities are already in place. Therefore, no major construction works will be carried out. Construction works will involve renovations when necessary.

1.4 Objectives of this Report

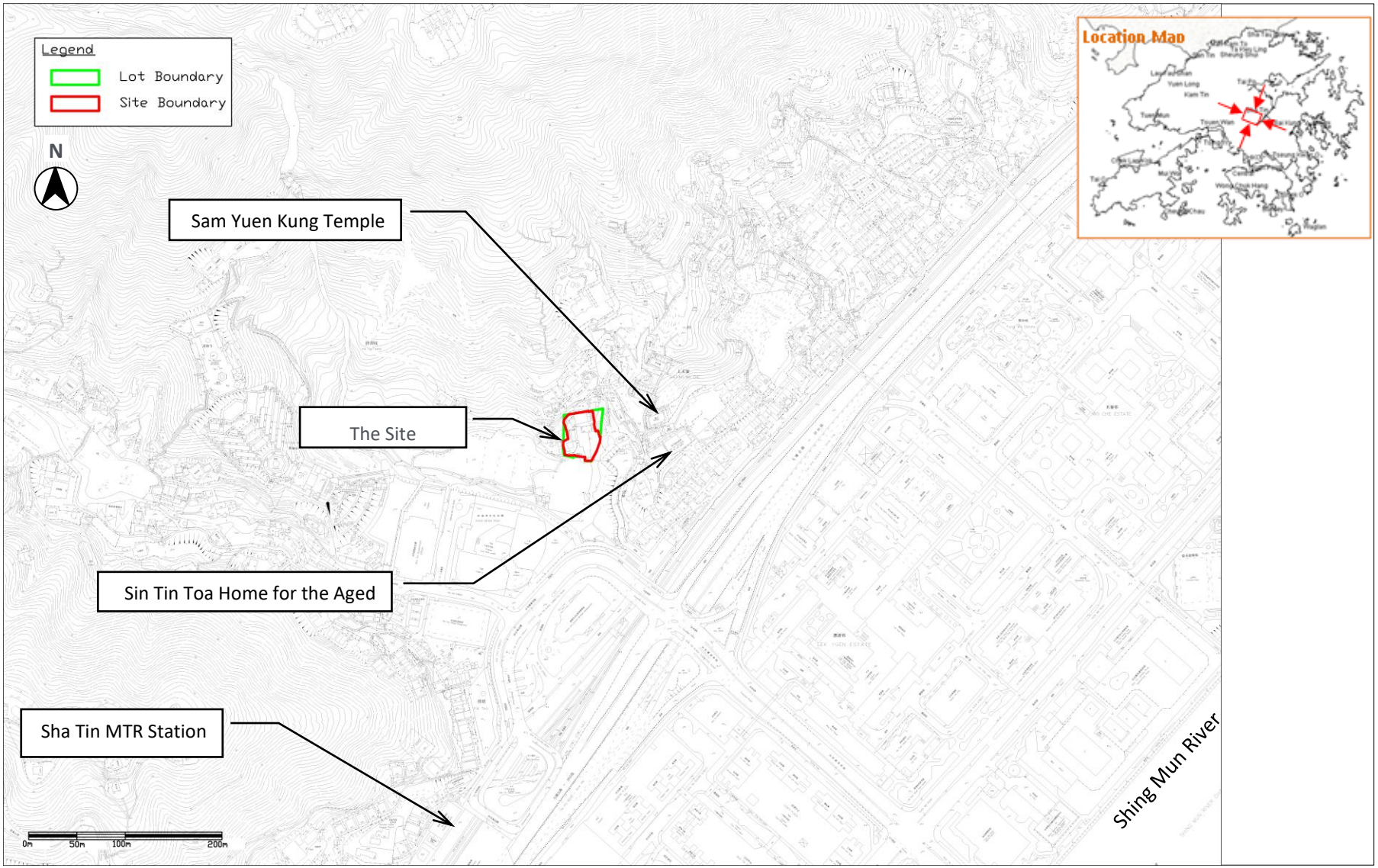
1.4.1 This SIA study is undertaken to assess the potential sewerage issues arising from the Project and recommend necessary mitigation measures to alleviate the sewerage impacts.

1.5 Reference Materials

1.5.1 In evaluating the sewerage impact arising from the Project, the following sources have been specifically referred to:

- Magill's Medical Guide, 6th edition, published by Salem Press, 2011
- BEAM Plus New Building Version 2.0, published by BEAM Society, September 2019
- Environmental Protection Department (EPD) publication Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning Version 1.0, March 2005
- Drainage Services Department (DSD) publication Sewerage Manual – Key Planning Issues and Gravity Collection System

Figure 1.1: Site Location and its Environs



2 DESCRIPTION OF EXISTING ENVIRONMENT AND BASELINE CONDITIONS

2.1 Site Location

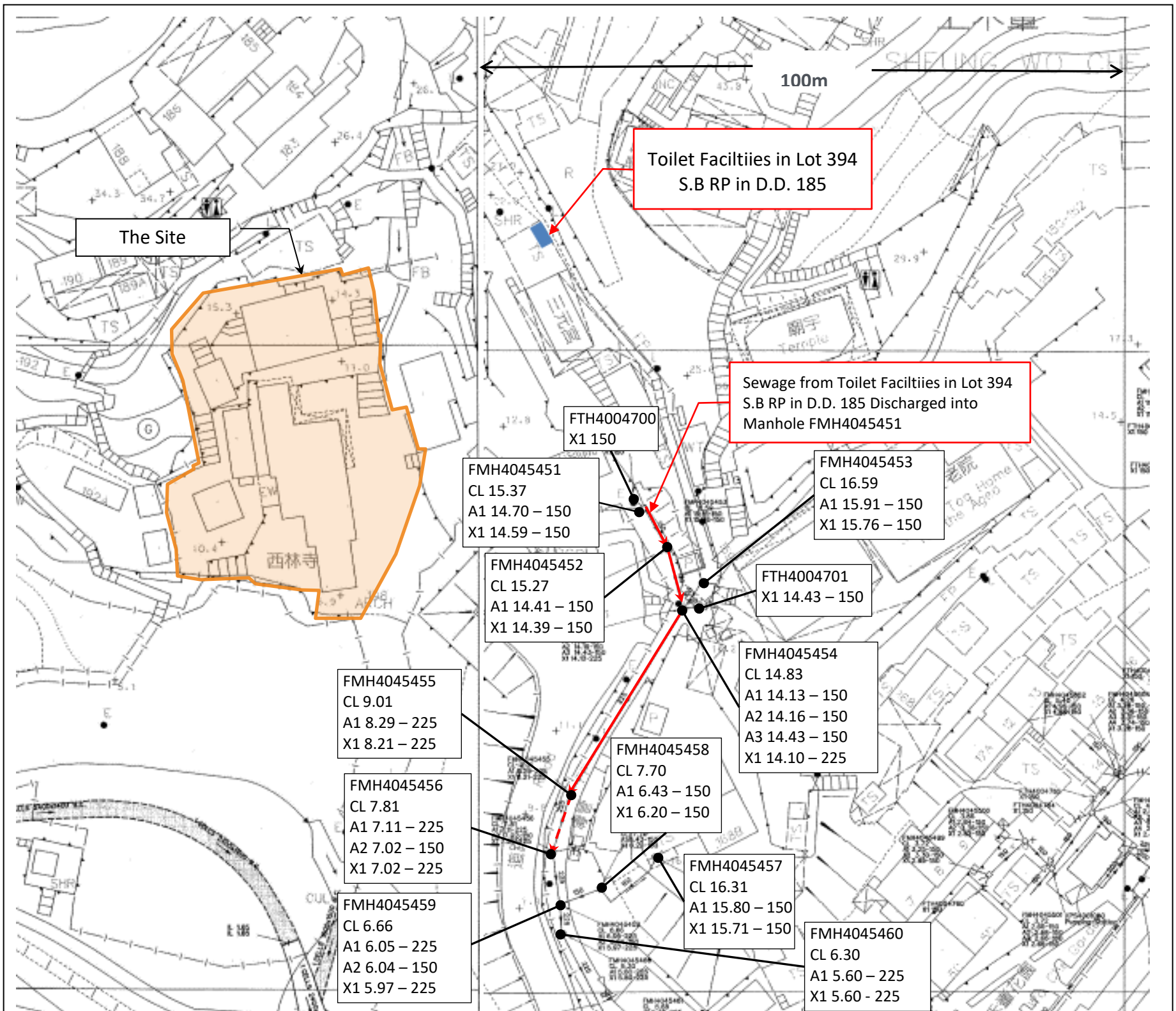
2.1.1 The Site is located at Lot Nos. 63 and 296 (Part) in D.D. 185, Sheung Wo Che No. 198, Shatin. The Site is currently zoned "Village Type Development" ("V") under the Approved Sha Tin OZP No. S/ST/38 and is surrounded with hill slopes, mature trees and burial ground.

2.2 Existing Baseline Conditions

2.2.1 With reference to the Common Spatial Data Infrastructure, there is a foul manhole FMH4045451 closest to Sam Yuen Kung and connecting to 150mm/225mm sewers along the footpath from Sin Tin Toa Home for the Aged to the Sin Tin Rural Committee Road, from north to south.

2.2.2 Manhole FMH4045451 and the sewers in the downstream area of the site are shown on ***Figure 2.1***.

Figure 2.1: Sewerage Layout Plan



3 SEWERAGE ANALYSIS

3.1 Review of Handling of Sewage

3.1.1 The Applicant has advised that catering services are not or will not be provided at the Site, and there are approx. 5 staff and 10 visitors each day during non-festival seasons. The Applicant has obtained consent from the owner of Lot 394 S.B RP in D.D. 185 (SLT Foundation Ltd.). This consent permits the staff and visitors of the site to utilize the existing five permanent toilets, which are connected to the downstream municipal sewerage system Manhole FMH4045451 located adjacent to the Site within the Sam Yuen Kung Temple. The sewage from staff and visitors during non-peak periods is therefore proposed to be discharged to the foul Manhole FMH4045451, as mentioned in ***Section 2.2***, which is connected to the public sewerage system. For the location and arrangement of the permanent toilets, please refer to the letter of toilet consent from the use of toilet facilities is attached in ***Appendix B***.

3.1.2 A large volume of visitor is expected during the Peak Grave Sweeping Days (Ching Ming or Chung Yeung Festival Periods). Because of the constraints of the Site, provision of portable chemical toilets is the most appropriate solution for handling the sewage generated by the larger number of visitors during Peak Grave Sweeping Days (sewage generated by staff during Peak Grave Sweeping Days will still be discharged to the public sewer as normal).

3.2 Assumptions

3.2.1 Sewage arising from Peak Grave Sweeping Days (Scenario 1) and non-peaking periods (Scenario 2) has been assessed in this SIA Report. A comparison of sewage generated under these two scenarios is presented in the following sections.

3.2.2 As discussed in the Traffic Impact Assessment in the planning application, a Visit-by-Appointment System would be implemented for crowd control during the Peak Grave Sweeping Days. The daily total visitor amount would be limited to 3,000. As advised by the Project Traffic Consultant and the Applicant, the number of visitors and staff are summarised in ***Table 3-1***. This conservative assumption of the number of visitors and staff is for a worst case scenario only.

Table 3-1: Estimated Populations During Peak Grave Sweeping Days and Non-peaking Periods

PERIOD	NO OF PEOPLE PER DAY	
	VISITORS	STAFF*
Peak Grave Sweeping Days **(Scenario 1)**	3,000	10
Non-festival Period **(Scenario 2)**	10	5

Notes: * Full time and part-time staff.

3.2.3 As no catering services will be provided, visitors to the Site will generally stay on-site for less than an hour, based on the Applicant's observations. Generally, most people urinate every 4 to 6 hours and ~50% of visitors will use toilets, based on the Applicant's observations. Such assumptions form the basis of a realistic situation. With reference to page 3,081 of the sixth edition of Magill's Medical Guide, published by Salem Press in 2011, human micturition (urination) is around 200mℓ on average.

3.2.4 During non-peaking periods, approx. 10 people will visit the Site, based on the Applicant's observations. Visitors during non-peak periods will use the permanent toilet facilities to be connected to the public sewer.

3.2.5 In order to alleviate the sewerage impacts during festival periods, one to two portable chemical toilets are proposed to be provided for the visitors. Examples of portable chemical toilets as shown in ***Appendix B*** or other equivalent types with typical flush volume of 1ℓ or less per flush, and each sewage storage tank with volume of ~ 400ℓ are proposed.

3.2.6 With reference to BEAM Plus New Building (current version 2.0), published by BEAM Society, the default assumptions estimate water consumption for non-residential use at 7ℓ/min for 10s per hand washing and a toilet flush of 6.5ℓ/flush. Therefore, the sewage generation from a visitor during both peak and non-peak periods using the permanent toilet is:

Unit flow of toilet flushing = 6.5ℓ + 200mℓ = 6.7ℓ/flush

Unit flow of hand washing = 7ℓ/min / 60s x 10s = 1.2ℓ/wash

Unit flow of total sewage = 7.9ℓ/visitor (0.0079m^3)

3.2.7 The unit flow rate of sewage generated from the on-site staff is assumed to be 0.28m^3/person/day, which is the unit flow factor for J11 Community, Social & Personal Services as recommended in the Guidelines for Estimating Sewerage Flows for Sewerage Infrastructure Planning Version 1.0 published by EPD in 2005.

3.2.8 Average Dry Weather Flow generated during Peak Grave Sweeping Days and non-peaking periods are shown in ***Table 3-2***.

Table 3-2: Estimated Average Dry Weather Flow During Peak Grave Sweeping Days and Non-peaking Periods

PERIOD	WASTEWATER GENERATION (m^3/DAY)	
	Visitors	Staff*
Peak Grave Sweeping Days (Scenario 1)	13.628	3.220
	16.848 m^3/day to Public Sewer	
Non-peaking Period (Scenario 2)	0.045	1.610
	1.655 m^3/day to Public Sewer	

Notes:

1. During Peak Grave Sweeping Days, all sewage generated by the visitors and staff will be discharged to public sewer for the worst-case scenario. Sewage from about 1 - 2 chemical toilets and wastewater from the Smokeless Joss Paper Burner will be tankered away off-site by licenced collector at least once per day.
2. During non-peaking periods, sewage from staff and visitors will be discharged to public sewer. And wastewater from the Smokeless Joss Paper Burner will be tankered away off-site by licenced collector regularly.

3.3 Methodology

3.3.1 The capacities of sewers have been calculated using Colebrook-White's Equation as below:

$$V = -\sqrt{32gRs} * \log\left(\frac{ks}{14.8R} + \frac{1.25v}{R\sqrt{32gRs}}\right)$$

where
- V = Mean velocity (m/s)
- g = gravitational acceleration (m/s^2)
- R = hydraulic radius (m)
- k_s = hydraulic pipeline roughness (m)
- υ = kinematic viscosity of fluid (m^2/s)
- s = hydraulic gradient (energy loss per unit length due to friction)

3.3.2 According to ***Table 3-2***, the peak sewage flow from the Project during both the Peak Grave Sweeping Days and non-peaking periods will be discharged into public sewers for the worst-case scenario. During Peak Grave Sweeping Days, one to two portable chemical toilets will be provided to alleviate the sewerage impact. During non-peaking periods, sewage from staff and visitors will be discharged into foul Manhole FMH4045451. If the peak sewage flow from the Project into foul Manhole FMH4045451 does not exceed the capacity of the downstream sewerage system, then there will be no unacceptable impact from the Project.

3.4 Results and Discussion

3.4.1 As indicated in ***Table 3-2***, the Average Dry Weather Flows ("ADWFs") from the Site during Peak Grave Sweeping Days (Scenario 1) and non-peaking periods (Scenario 2) were calculated to be 16.848m^3/day and 1.655 m^3/day, respectively, which will be discharged into Manhole FMH4045451.

3.4.2 To determine the sewerage impact of this flow has on the existing public sewerage system during Peak Grave Sweeping Days and non-peaking periods, the capacity of the sewerage system has been evaluated as detailed in ***Appendix D*** and ***Appendix E***, respectively.

3.4.3 During Peak Grave Sweeping Days, the sewage arising from the site staff and visitors of the Site, together with the sewage from the village houses at the upstream of the Site, with a peak flow of 0.00711m^3/s in total will be discharged into foul Manhole FMH4045451. In addition to the wastewater from the downstream catchments including the adjacent village houses and Sin Tin Toa Home for the Aged, approximately 7.1% to 30.6% of the sewer capacities between Manholes FMH4045451 and FMH4045455 (i.e. 150mm to 225mm sewers) will be contributed as summarised on ***Figure 3.1***. This indicates no unacceptable impact on the public sewerage system from the Project during Peak Grave Sweeping Days. Additional one to two portable chemical toilets will also be provided during Peak Grave Sweeping Days and the collected sewage will be tankered away by a licensed contractor at least once per day.

3.4.4 During non-peaking periods, the sewage arising from the site staff and visitors of the Site, together with the sewage from the village houses at the upstream of the Site, with a peak flow of 0.00377m^3/s in total will be discharged into foul Manhole FMH4045451. In addition to the wastewater from the downstream catchments including the adjacent village houses and Sin Tin Toa Home for the Aged, approximately 5.2% to 16.3% of the sewer capacities between Manholes FMH4045451 and FMH4045455 (i.e. 150mm to 225mm sewers) will be contributed as summarised on ***Figure 3.2***. This indicates no unacceptable impact from the Project during non-peaking periods.

3.4.5 Overall, therefore, no unacceptable impact on the public sewerage system from the Project during Peak Grave Sweeping Days and non-peaking periods is anticipated. No upgrading works for the public sewerage system are required.

Figure 3.1: Sewage Flow Schematic (Peak Grave Sweeping Days)

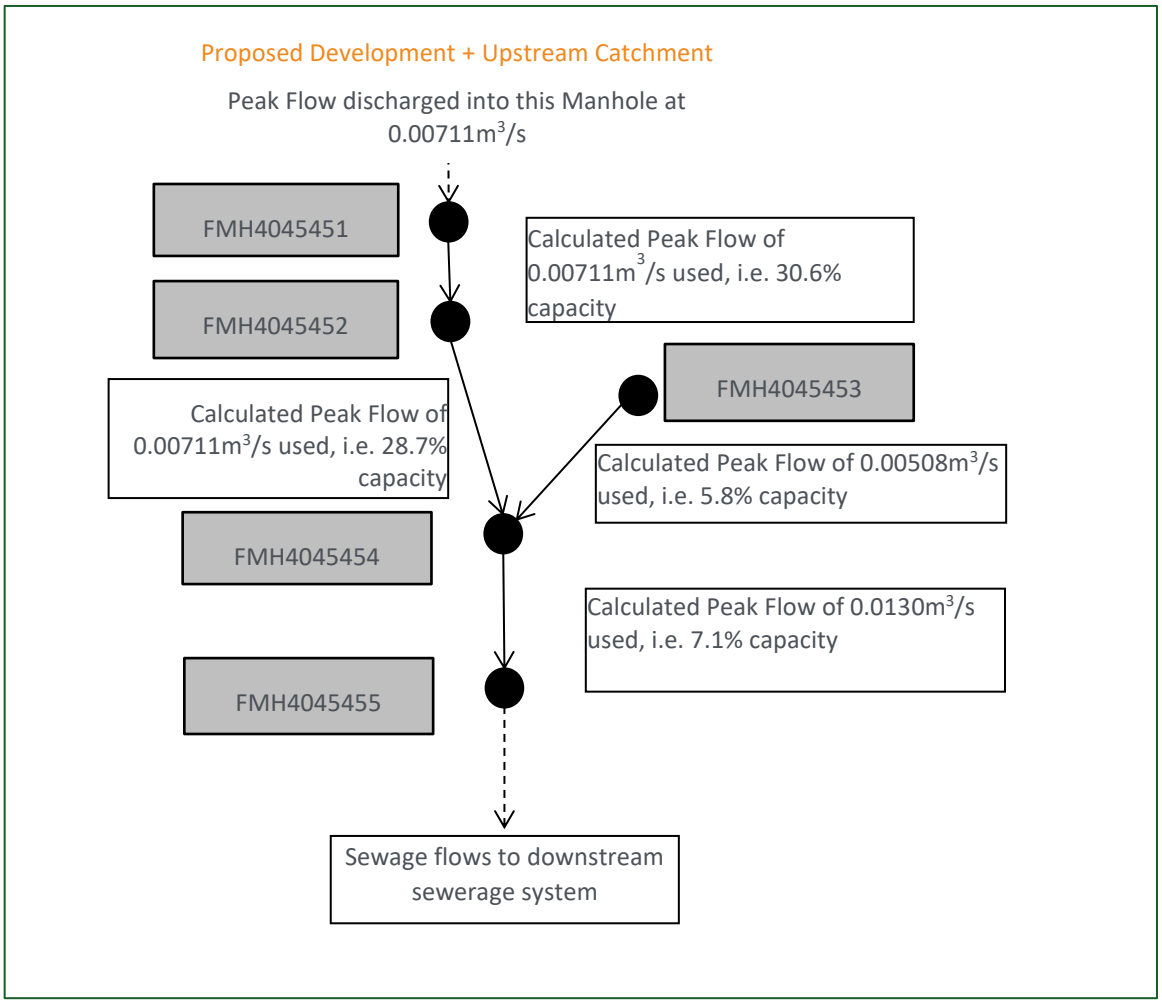
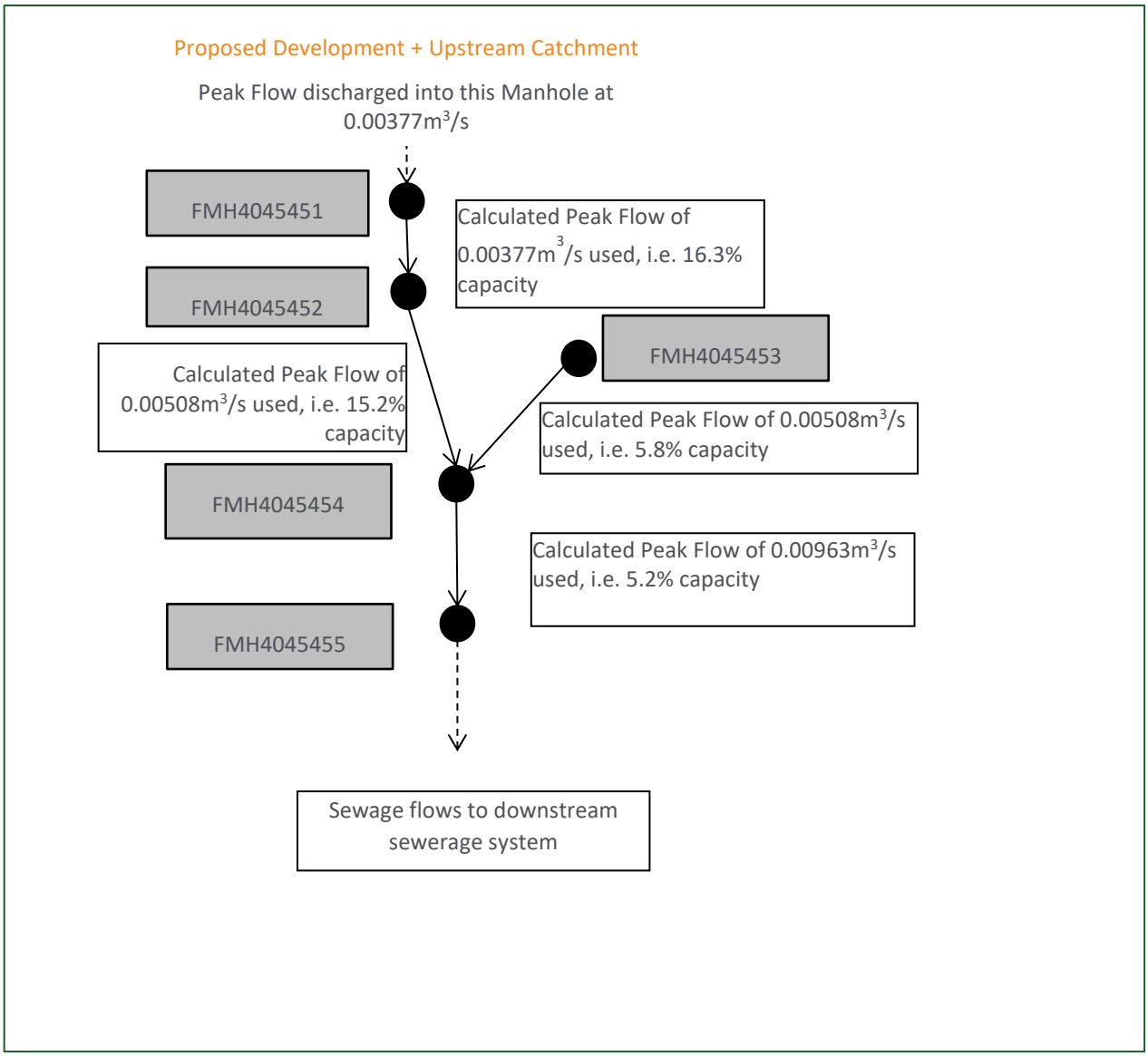


Figure 3.2: Sewage Flow Schematic (Non-festival Period)



4 CONCLUSIONS AND RECOMMENDATIONS

4.1.1 A Sewerage Impact Assessment (SIA) has been conducted to evaluate the possible sewerage impacts and to recommend the most suitable handling of sewage for the rezoning application for Regularisation of a Pre-cut off Columbarium ancillary to Sai Lam Temple, Lot Nos. 63 and 296 (Part) in D.D. 185, Sheung Wo Che No. 198, Shatin, from "V" (V) to "G/IC".

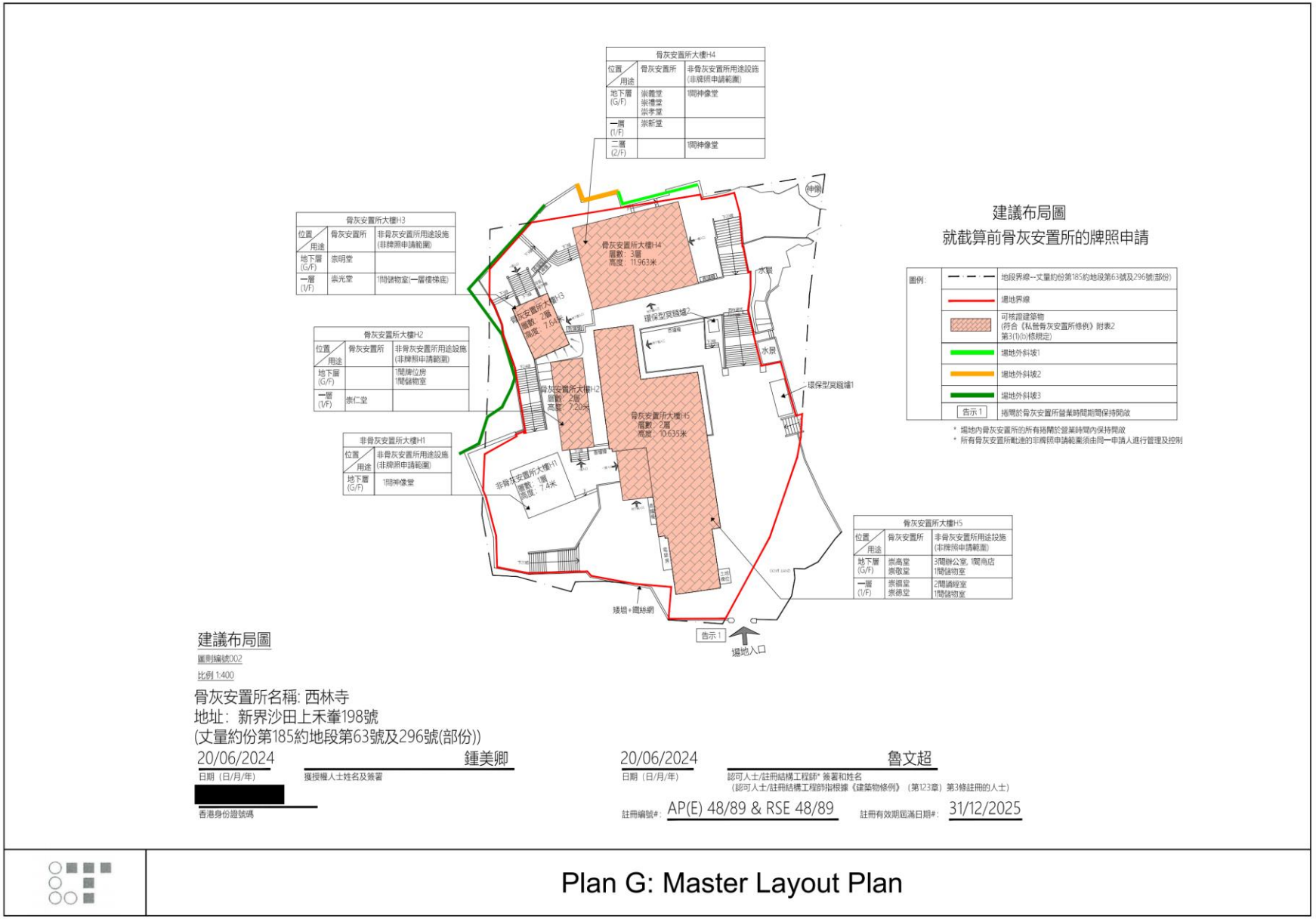
4.1.2 Two scenarios have been identified for the purpose of assessment: Scenario 1, during Peak Grave Sweeping Days (Ching Ming or Chung Yeung Festival Periods) when there will be a large number of visitors; and Scenario 2, during non-peaking periods, when there will be fewer visitors.

4.1.3 Under Scenario 1, sewage from staff and visitors during peak periods will be discharged into the public sewerage system. All sewage from staff and visitors of the Site during peak periods together with the sewage from the village houses at the upstream of the Site, with a peak flow of 0.00711m^3/s in total will be discharged into the public sewerage system via foul Manhole FMH4045451. In order to alleviate the sewerage impact during peak periods, it is recommended to provide additional one to two portable chemical toilets for collecting the sewage generated from the visitors.

4.1.4 All sewage from staff and visitors under Scenario 2 of the Site during non-peaking periods, together with the sewage from the village houses at the upstream of the Site, with a peak flow of 0.00377m^3/s in total will be discharged into the public sewerage system via foul Manhole FMH4045451.

4.1.5 As mentioned in ***paragraph 3.4.3***, approximately 7.1% to 30.6% of the sewer capacities between Manholes FMH4045451 and FMH4045455 (i.e. 150mm to 225mm sewers) will be contributed under Scenario 1. As mentioned in ***paragraph 3.4.4***, approximately 5.2% to 16.3% of the sewer capacities between Manholes FMH4045451 and FMH4045455 will be contributed. As such, there will be no unacceptable sewerage impact arising from the Site. No upgrading works for the public sewerage system are therefore required.

Appendix A MASTER LAYOUT PLAN OF THE SITE


骨灰安置所大樓H4
位置/用途 | 骨灰安置所 | 非骨灰安置所用途設施(非牌照申請範圍)
地下層(G/F) | 崇義堂 崇德堂 崇孝堂 | 1間神像堂
一層(1/F) | 崇新堂 |
二層(2/F) | | 1間神像堂
骨灰安置所大樓H3
位置/用途 | 骨灰安置所 | 非骨灰安置所用途設施(非牌照申請範圍)
地下層(G/F) | 崇明堂 |
一層(1/F) | 崇光堂 | 1間儲物室(一層樓梯底)
骨灰安置所大樓H2
位置/用途 | 骨灰安置所 | 非骨灰安置所用途設施(非牌照申請範圍)
地下層(G/F) | | 1間牌位房 1間儲物室
一層(1/F) | 崇仁堂 |
非骨灰安置所大樓H1
位置/用途 | 非骨灰安置所用途設施(非牌照申請範圍)
地下層(G/F) | 1間神像堂
骨灰安置所大樓H4 層數：3層 高度：11.963米
骨灰安置所大樓H3 層數：2層 高度：7.5米
骨灰安置所大樓H2 層數：2層 高度：7.205米
骨灰安置所大樓H5 層數：2層 高度：10.635米
非骨灰安置所大樓H1 層數：1層 高度：7.4米
環保型冥鏹爐1
環保型冥鏹爐2
水景
水景
神像
矮牆+鐵絲網
告示1
場地入口
骨灰安置所大樓H5
位置/用途 | 骨灰安置所 | 非骨灰安置所用途設施(非牌照申請範圍)
地下層(G/F) | 崇高堂 崇敬堂 | 3間辦公室, 1間商店 1間儲物室
一層(1/F) | 崇福堂 崇德堂 | 2間講經室 1間儲物室
建議布局圖
就截算前骨灰安置所的牌照申請
圖例：
地段界線--丈量約份第185約地段第63號及296號(部份)
場地界線
可核證建築物 (符合《私營骨灰安置所條例》附表2 第3(1)(b)條規定)
場地外斜坡1
場地外斜坡2
場地外斜坡3
告示1 揭關於骨灰安置所營業時間期間保持開放
* 場地內骨灰安置所的所有揭關於營業時間內保持開放
* 所有骨灰安置所範圍的非牌照申請範圍須由同一申請人進行管理及控制
建議布局圖
圖則編號002
比例 1:400
骨灰安置所名稱: 西林寺
地址： 新界沙田上禾輋198號
(丈量約份第185約地段第63號及296號(部份))
20/06/2024
日期（日/月/年）
鍾美卿
獲授權人士姓名及簽署
[redacted]
香港身份證號碼
20/06/2024
日期（日/月/年）
魯文超
認可人士/註冊結構工程師* 簽署和姓名
(認可人士/註冊結構工程師指根據《建築物條例》（第123章）第3條註冊的人士)
註冊編號#: AP(E) 48/89 & RSE 48/89
註冊有效期屆滿日期#: 31/12/2025
Plan G: Master Layout Plan

Appendix B TOILET CONSENT FROM THE USE OF TOILET FACILITIES

TOCO PLANNING CONSULTANTS LTD.
TOWN PLANNING, ENVIRONMENT & DEVELOPMENT CONSULTANCY
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No. 651 King's Road,
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E-mail: tocoplanning@hotmail.com
Website: http://www.tocoplanning.com

達材都市規劃顧問有限公司

Secretariat of Private Columbaria Licensing Board
Private Columbaria Affairs Office
Room 501-502,
5/F, Trade Square,
681 Cheung Sha Wan Road,
Kowloon, Hong Kong

Attn. Mr. CHU Chun Hei, Andy

Your ref: ( ) in FEHD PC 72-40/62/2018/057

Dear Mr. Chu,

11 May, 2020

Applications for "Pre-cut-off Columbarium Licence" and "Temporary Suspension of Liability" for Sai Lam Temple
Lot Nos. 63, 296 (Part) in D.D. 185
No.198 Sheung Wo Che, Sha Tin

We refer to the phone conversation between our staff Miss Jacqueline Ho and PCLB Officer Miss Yiu recently.

Please find attached a letter from the Landowner giving consent to the Applicant about the usage of toilets within Sai Lam Temple and a certified copy of the sales contract for niche no. 02A0726D and 10B0305S as requested by Miss Yiu for your attention.

Also, please be advised that our office has been relocated. For future correspondence, please send it to the following address:-

Unit No. 5, 13/F, Technology Plaza,
No. 651 King's Road, North Point
Hong Kong

RECEIVED
11 MAY 2020
Private Columbaria Affairs Office
FEHD

Yours faithfully,
Toco Planning Consultants Ltd.

Ted Chan
Managing Director

TOCO PLANNING CONSULTANTS LTD.

c.c. Pte Columbaria Licensing Team (Attn. Miss YIU Sze Yi)

TED T. C. CHAN
MPIA, MHKIP, RPP

私營骨灰安置所事務辦事處
九龍長沙灣道 681 號貿易廣場 5 樓 501-502 室

敬啟者，

有關沙田上禾輋村西林寺
第 185 約 63 及 296 號(部分)地段
就私營骨灰安置所條例申請暫免法律責任書及牌照事宜

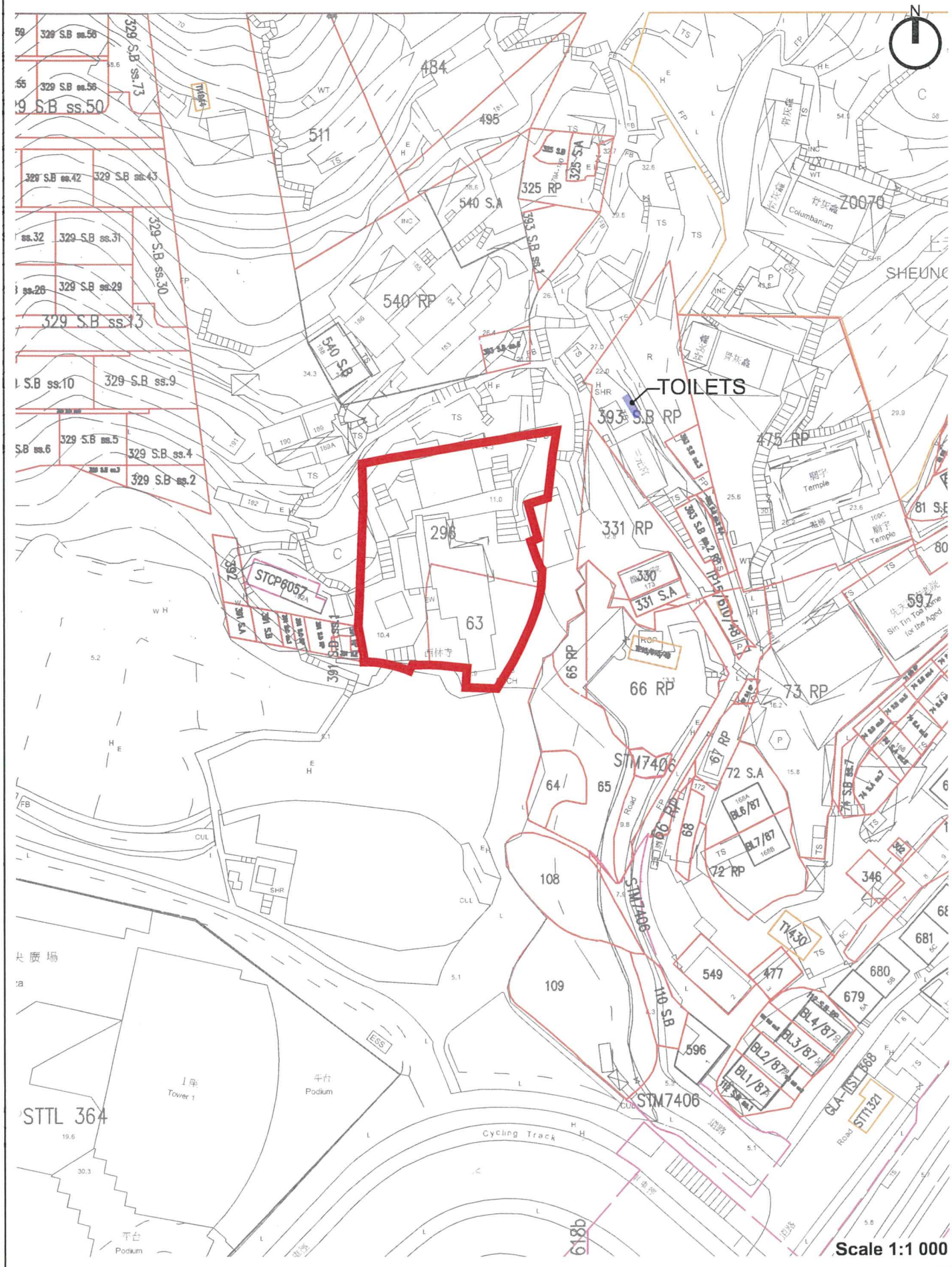
本公司(西林寺基金有限公司)是上述地段及丈量約份第 185 約地段第 393 號 B 分段餘段的土地擁有人，同意讓西林(普眾)基金會有限公司的相關人士，包括西林寺的職員、信眾、拜祭人士及遊客在開放時間內使用西林寺內位於地段第 393 號 B 分段餘段土地上的五間男女共用洗手間及五個洗手盆。所提及的廁所和洗手盆的維修工程及清潔事項由西林(普眾)基金會有限公司負責。

西林寺基金有限公司

SAI LAM TEMPLE FOUNDATION LIMITED 西林寺基金有限公司

姓名：CHAN CHI KEUNG
職位：DIRECTOR
身份證號碼：[redacted]

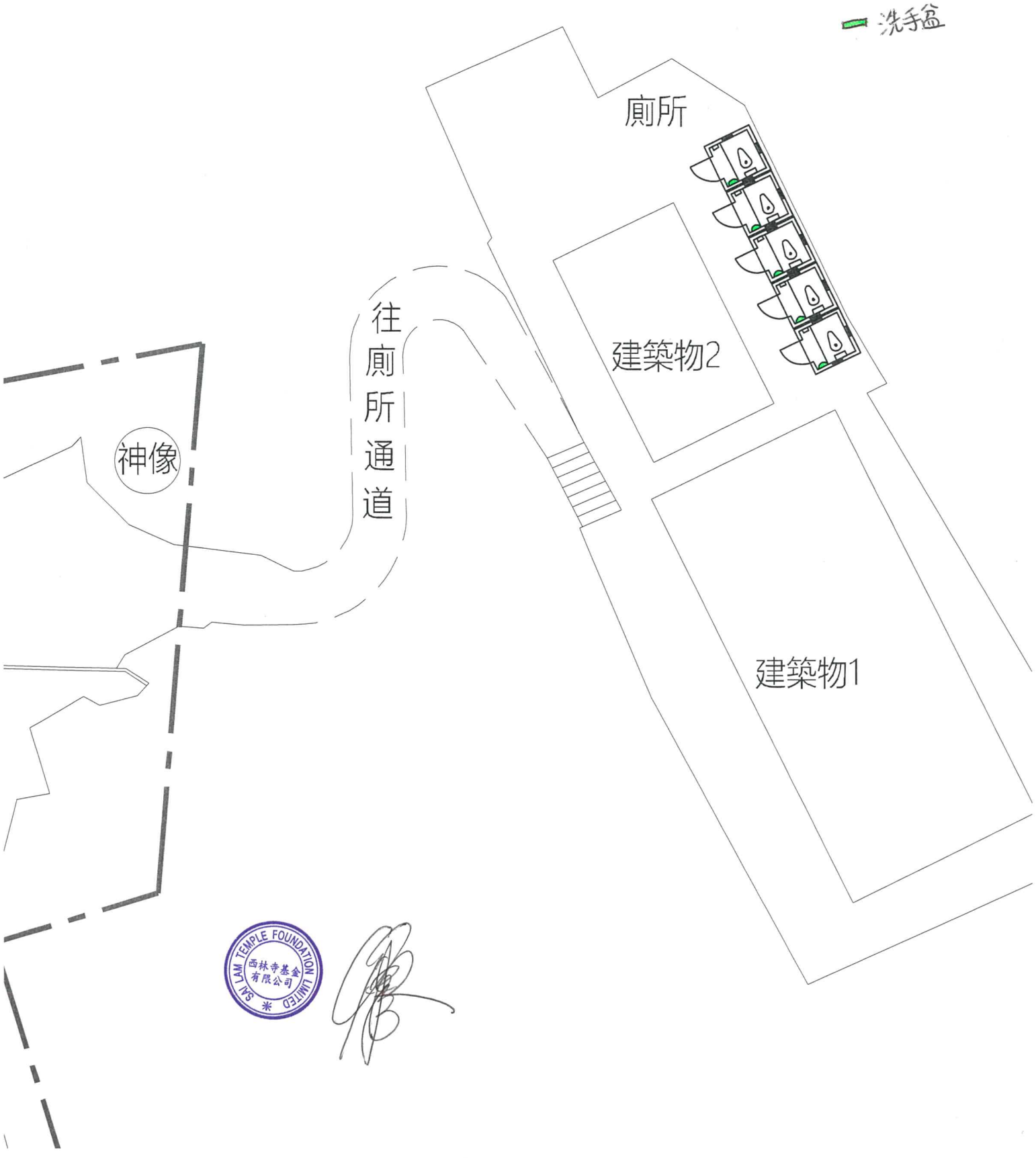
二零二零年四月二十二日



SAI LAM TEMPLE FOUNDATION LIMITED 西林寺基金有限公司

Toilet Location Plan

沙田西林寺廁所位置圖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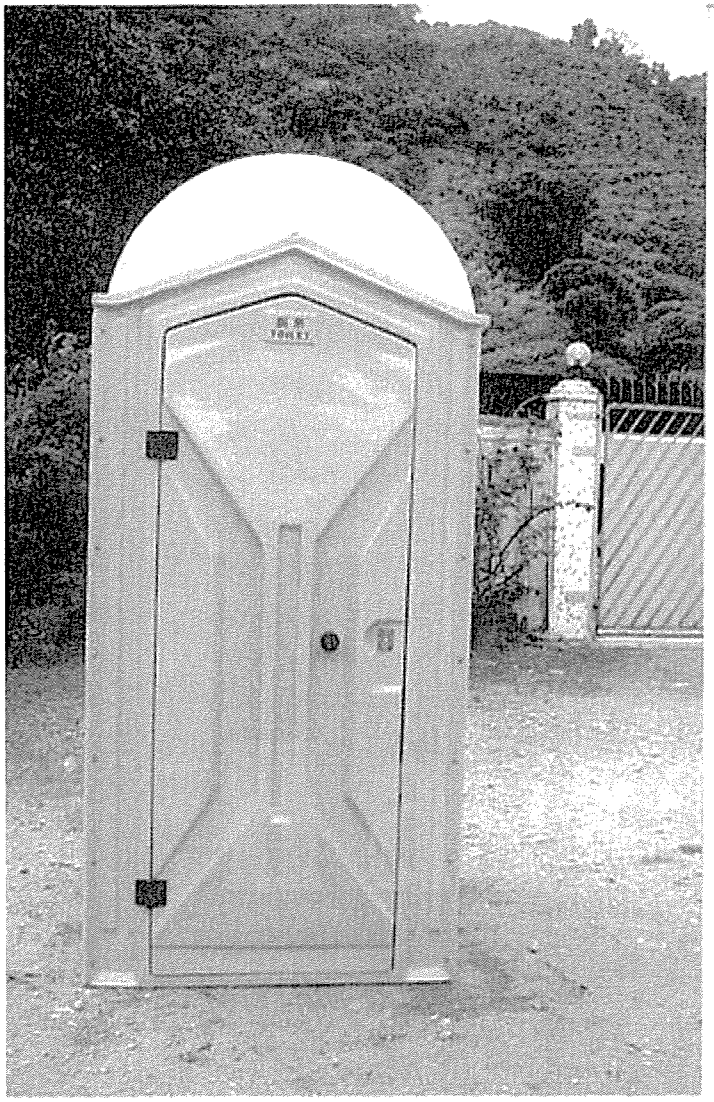
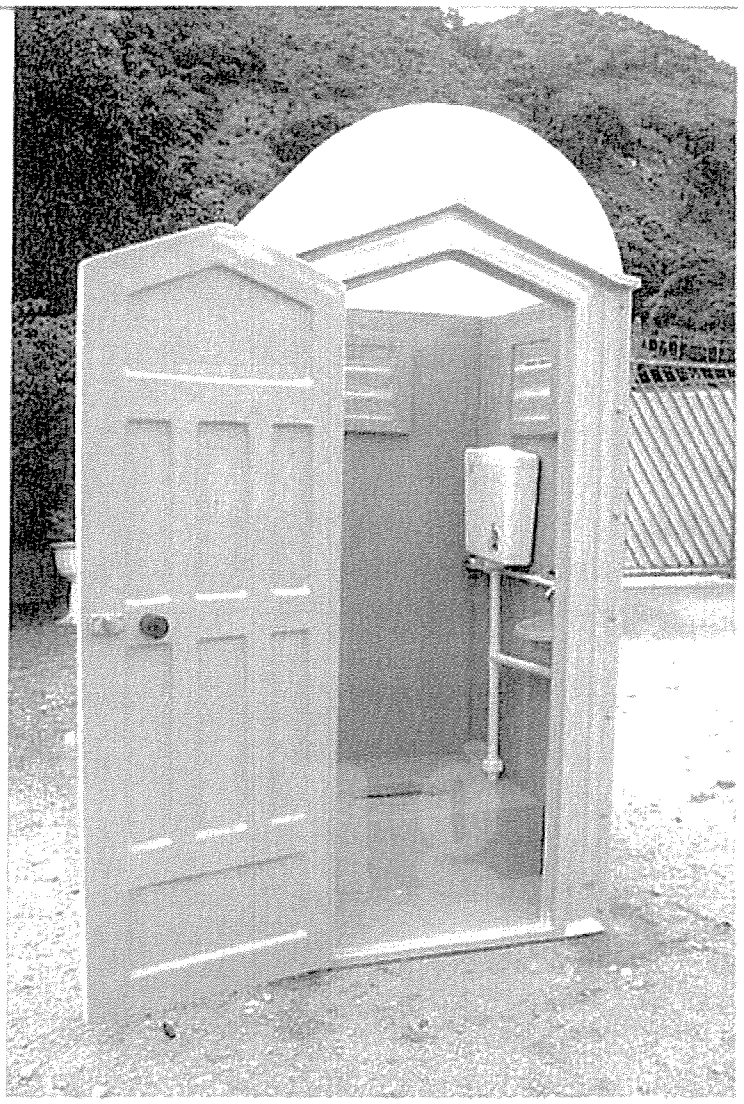
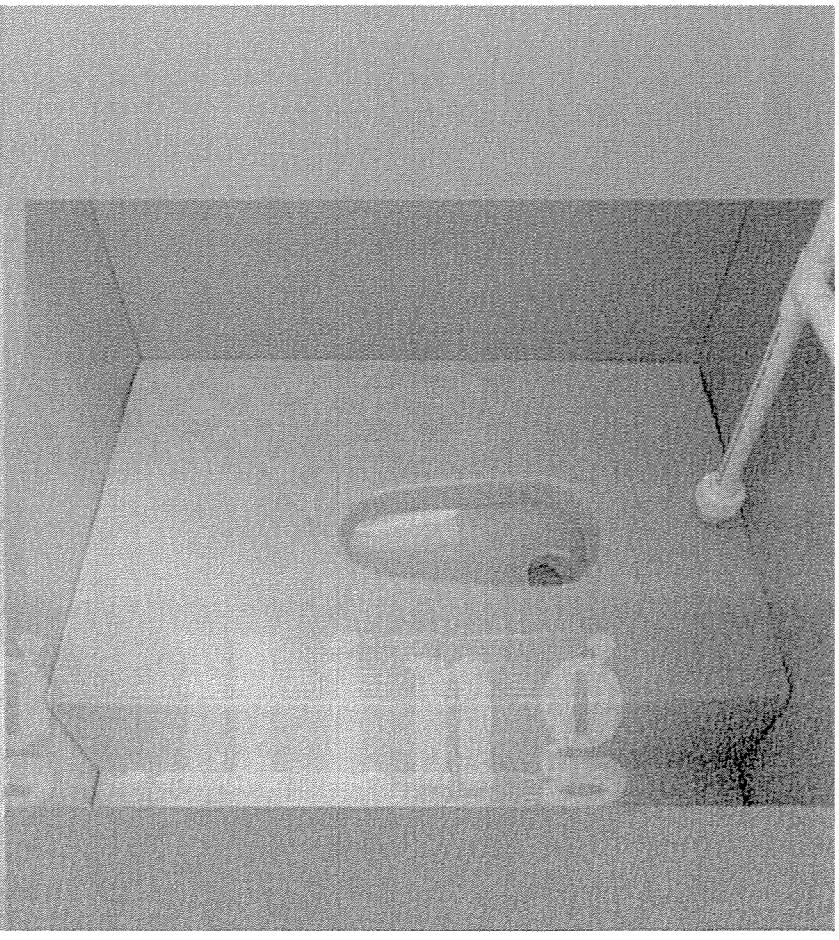
廁所
建築物2
往廁所通道
神像
建築物1
SAI LAM TEMPLE FOUNDATION LIMITED
西林寺基金有限公司

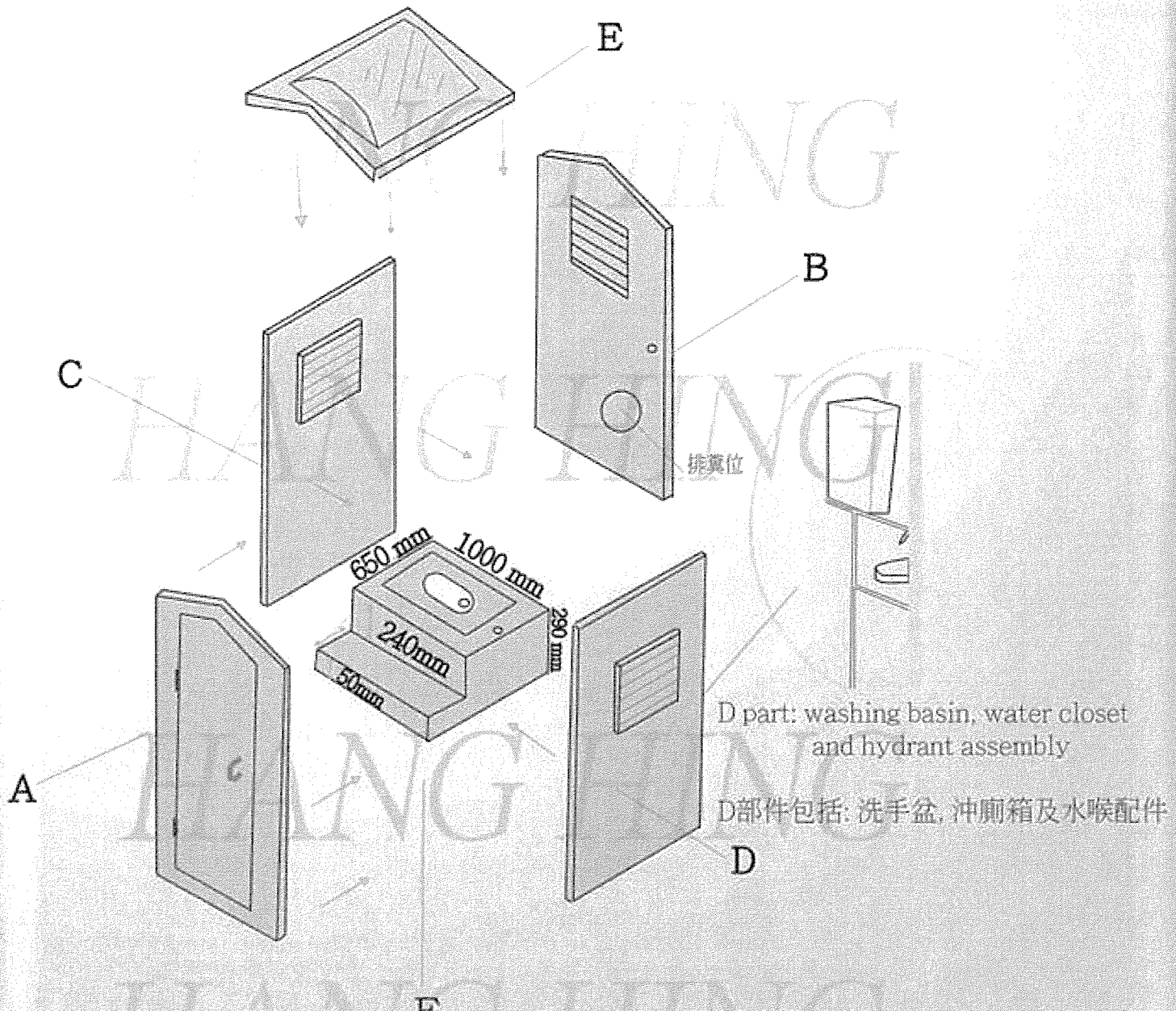






恒興玻璃纖維製品廠有限公司
Hang Hing Fibre Glass Products Manufacturer Co., LTD
香港荃灣沙咀道26-38號滙力工業中心18字樓8室 傳真: 2412 0810
E-mail: info@hang-hing.com.hk www.hang-hing.com.hk
Flat 8, 18/F., Thriving Industrial Centre, 26-38 Sha Tsui Road, Tsuen Wan, N.T., Hong Kong.

Tel: 2490 8822



D part: washing basin, water closet and hydrant assembly

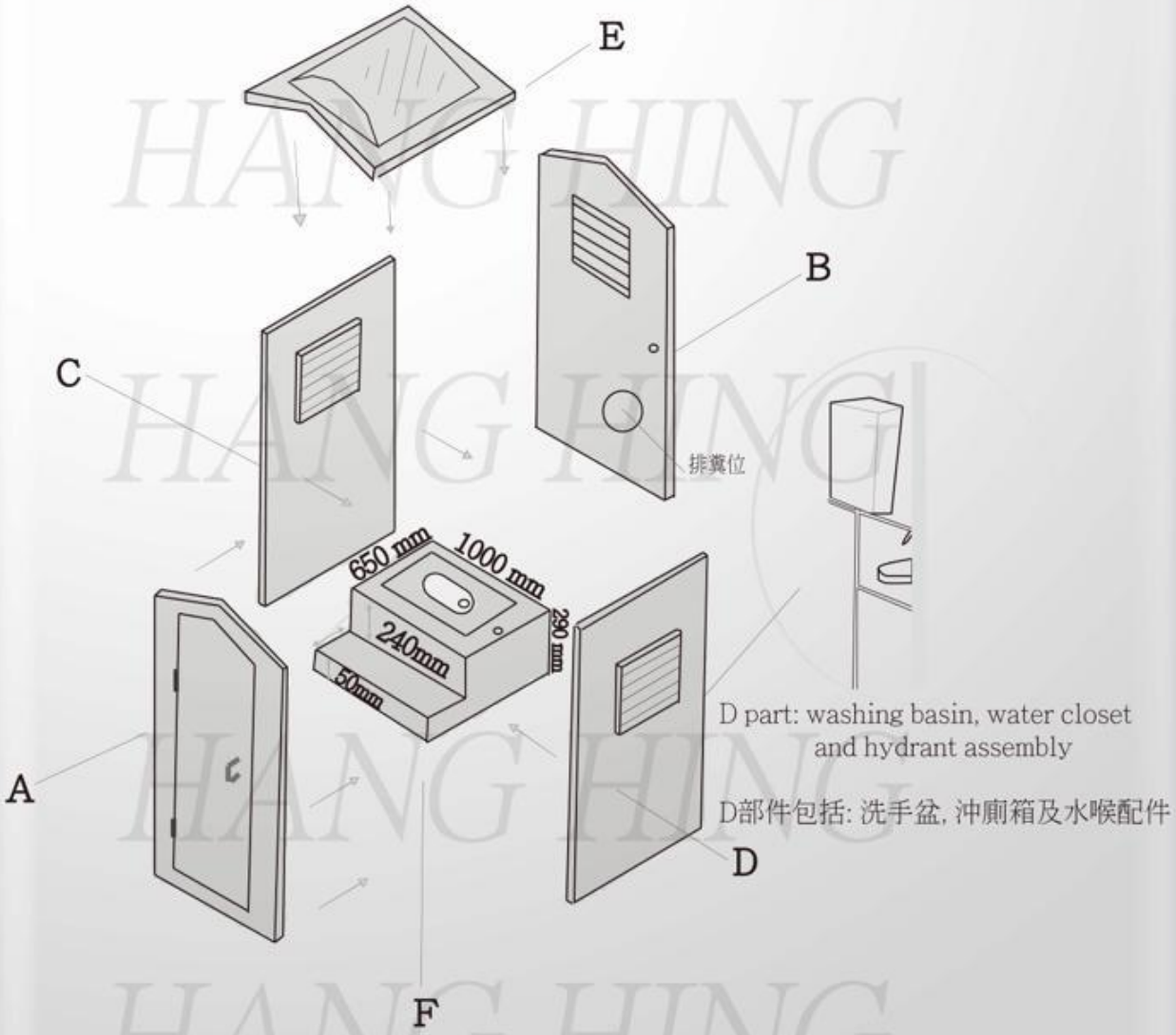
D部件包括: 洗手盆, 沖廁箱及水喉配件

Can be changed to toilet seat
可改用坐廁

From	Hang Hing Fibre Glass Products Manufacturer Co., Ltd
item / products	流動廁所
Date	6 June 2012
Sales	Tony Ling

Appendix C CATALOGUES OF PORTABLE TOILET

恒興玻璃纖維製品廠有限公司
Hang Hing Fibre Glass Products Manufacturer Co., LTD
香港荃灣沙咀道26-38號滙力工業中心18字樓8室 傳真: 2412 0810
E-mail: info@hang-hing.com.hk www.hang-hing.com.hk
Flat 8, 18/F., Thriving Industrial Centre, 26-38 Sha Tsui Road, Tsuen Wan, N.T., Hong Kong.
TeL: 2490 8822



D part: washing basin, water closet and hydrant assembly

D部件包括: 洗手盆, 沖廁箱及水喉配件

Can be changed to toilet seat
可改用坐廁

From	Hang Hing Fibre Glass Products Manufacturer Co., Ltd
item / products	流動廁所
Date	6 June 2012
Sales	Tony Ling


TOILET
2012/5/3
永旺(香港)百貨
25周年植樹日
參加者專用


TOILET

Appendix D CALCULATIONS OF SEWAGE GENERATION DURING PEAK GRAVE SWEEPING DAYS

S12A Rezoning Application for Sai Lam Temple, at Lot Nos. 63 and 296 (part) in D.D. 185, Sheung Wo Che No. 198, Sha Tin

Estimation of Sewage Generation during Peak Grave Sweeping Days (Scenario 1)

1 - 13,015 urns in place during peak periods **Sewage Generation from Visitors to be collected in Permanent Toilets and Discharged to Public Sewer**				
Total No. of Visitors	=	3,000	visitors/day	Maximum number of visitor in Peak Grave Sweeping Days, with implementation of Visit-by-Appointment System
Unit Flow Rate (Visitors)	=	0.0079	m^3/person/visit	200ml micturtion[Note 1]+6.5L flushing[Note 3]+1.2L Hand-washing[Note 3]
Percentage of Visitors will Use the Toilet	=	50	%	~50% of the visitors do use toilets, based on the Applicant's observations
Operation Hours	=	10	Hours	Operation Hour shall be from 08:00 to 18:00
Estimated Average Dry Weather Flow	=	11.8500	m^3/day	Total No. of Visitors x Unit Flow Rate (Visitors) x Percentage of Visitors that will use the Toilet
Catchment Inflow Factor	=	1.15		For Sha Tin
Average Dry Weather Flow (with Catchment Inflow Factor)	=	13.6275 0.00037854	m^3/day m^3/s	
2 - Sewage from Staff of the Site				
No. of Staff	=	10	staff	According to the TIA Report
Unit Flow Rate (Site Staff)	=	0.28	m^3/person/day	Refer to EPD GESF[Note 2]
Estimated Average Dry Weather Flow	=	2.80	m^3/day	No. of Staff x Unit Flow Rate (Site Staff)
Operation hour per day	=	10	hours	Operation Hour shall be from 08:00 to 18:00
Catchment Inflow Factor	=	1.15		For Sha Tin
Average Dry Weather Flow (with Catchment Inflow Factor)	=	3.2200 0.000089	m^3/day m^3/s	
3 - Sewage from Village Houses in the Upstream Area (North of Sai Lam Temple)				
Total No. of Village Houses (North of Sai Lam Temple)	=	13	houses	Including No. 179A - 192, Sheung Wo Che Road
Estimated No. of Residents in Each House	=	9	people	By Assumption
Estimated Total No. of Residents (Southwest of Sai Lam Temple)	=	117	people	Total No. of Village Houses (North of Sai Lam Temple) x Estimated No. of Residents in Each House
Unit Flow Rate (Residents)	=	0.27	m^3/day	The Unit Flow Rate of Private village (Type R2) is stated in Table T-1 of Ref. 2[Note 2].
Estimated Average Dry Weather Flow	=	31.59	m^3/day	Estimated Total No. of Residents (Southwest of Sai Lam Temple) x Unit Flow Rate (Residents)
Catchment Inflow Factor	=	1.15		For Sha Tin
Average Dry Weather Flow (with Catchment Inflow Factor)	=	36.3285 0.000420	m^3/day m^3/s	

Note:

1. Human's micturition is assumed to be 200mL in accordance with p. 3081 of "Magill's Medical Guide", 6th ed., various medical editors, Salem Press, USA, 2011.
2. Environmental Protection Department (EPD) publication Guidelines for Estimating Sewage Flows (GESF) for Sewage Infrastructure Planning Version 1.0, March 2005.
3. BEAM Plus New Buildings Version 2.0 in September 2019
4. Schedule 1 of CAP 459A Residential Care Homes (Elderly Persons) Regulation.

4 - Sewage from Village Houses No. 168A, 168B and 172 (Southwest of Sai Lam Temple)			
Total No. of Village Houses (Southwest of Sai Lam Temple)	=	3 houses	Including No. 168A, 168B and 172, Sheung Wo Che Road
Estimated No. of Residents in Each House	=	9 people	By Assumption
Estimated Total No. of Residents (Southwest of Sai Lam Temple)	=	27 people	Total No. of Village Houses (Southwest of Sai Lam Temple) x Estimated No. of Residents in Each House
Unit Flow Rate (Residents)	=	0.27 m^3/person/day	The Unit Flow Rate of Private village (Type R2) is stated in Table T-1 of Ref. 2 [Note 2].
Estimated Average Dry Weather Flow	=	7.29 m^3/day	Estimated Total No. of Residents (Southwest of Sai Lam Temple) x Unit Flow Rate (Residents)
Catchment Inflow Factor	=	1.15	For Sha Tin
Average Dry Weather Flow (with Catchment Inflow Factor)	=	8.3835 m^3/day 0.000097 m^3/s	
5 - Sewage from Sin Tin Toa Home for the Aged			
Maximum Number of Residents	=	198 people	Stated in Licence of Residential Care Home for the Elderly (Licence No.: 11563 valid until 31 October 2017), classified as "care and attention home".
Unit flow rate of Residents	=	0.19 m^3/person/day	The unit flow rate of institutional and special class in Table T-1 of Ref. 2 [Note 2].
Estimated Average Dry Weather Flow	=	37.62 m^3/day	
Employee			
Home Manager	=	1 person	Required for care and attention home of Ref. 4 [Note 4]
Ancillary worker	=	5 person	1 ancillary worker for every 40 residents or part thereof, between 7 a.m. and 6 p.m. for care and attention home of Ref. 4 [Note 4]
Care worker (07:00 - 15:00)	=	10 person	1 care worker for every 20 residents or part thereof, between 7 a.m. and 3 p.m. for care and attention home of Ref. 4 [Note 4]
Care worker (15:00 - 20:00)	=	5 person	1 care worker for every 40 residents or part thereof, between 3 p.m. and 10 p.m. for care and attention home of Ref. 4[Note 4]
Care worker (20:00 - 07:00)	=	3 person	1 care worker for every 60 residents or part thereof, between 10 p.m. and 7 a.m. for care and attention home of Ref. 4 [Note 4]
Health worker	=	7 person	Unless a nurse is present, 1 health worker for every 30 residents or part thereof, between 7 a.m. and 6 p.m. for care and attention home of Ref. 4 [Note 4]
Nurse	=	3 person	Unless a health worker is present, 1 nurse for every 60 residents or part thereof, between 7 a.m. and 6 p.m. for care and attention home of Ref. 4 [Note 4]
Additional Employees	=	2 person	As an additional requirement for a care and attention home or an aged home, any 2 persons being a home manager, an ancillary worker, a care worker, a health worker or a nurse shall be on duty between 6 p.m. and 7 a.m. of Ref. 4 [Note 4]
Total No. of Employees	=	36 employees	
Unit flow rate	=	0.28 m^3/employee/day	Assume the characteristics of the unit flow rate is the same as that of "Commercial Employee" and "Community, Social & Personal Services" in Table T-2 of 2 [Note 2].
Estimated Average Dry Weather Flow	=	10.08 m^3/day	
Estimated Average Dry Weather Flow (total)	=	47.7 m^3/day	
Catchment Inflow Factor	=	1.15	
Average Dry Weather Flow (with Catchment Inflow Factor, total)	=	54.8550 m^3/day 0.000635 m^3/s	

Note:

1. Human's micturition is assumed to be 200mL in accordance with p. 3081 of "Magill's Medical Guide", 6th ed., various medical editors, Salem Press, USA, 2011.
2. Environmental Protection Department (EPD) publication Guidelines for Estimating Sewage Flows (GESF) for Sewage Infrastructure Planning Version 1.0, March 2005.
3. BEAM Plus New Buildings Version 2.0 in September 2019
4. Schedule 1 of CAP 459A Residential Care Homes (Elderly Persons) Regulation.

Calculation of Flow Capacity

Manhole		Length	Level (Out)	Level (In)	d	d'	r	d'-r	θ	β	A_w	P_w	R	s	k_s	V	Q_C	ADWF	P_c	P	Q_p	Catchment	Is $Q_C > Q_p$?	% of capacity
		m	mPD	mPD	m	m	m	m	radian	radian	m^2	m	m	-	mm	m/s	m^3/s	m^3/day			m^3/s		Y/N	%
FMH4045451	FMH4045452	6.78	14.59	14.41	0.15	0.143	0.075	0.068	0.871	5.412	0.017	0.406	0.04187	0.02655	3	1.3649	0.0232	53.176	196.948	8	0.00711	Sewage from upstream village houses (36.3285m^3/day) + The Site (During Peak: staff + visitors) (13.6275m^3/day + 3.22m^3/day)	Y	30.6%
FMH4045452	FMH4045454	8.58	14.39	14.13	0.15	0.143	0.075	0.068	0.871	5.412	0.017	0.406	0.04187	0.0303	3	1.4583	0.025	53.176	196.95	8	0.00711	Sewage from upstream village houses (36.3285m^3/day) + The Site (During Peak: staff + visitors) (13.6275m^3/day + 3.22m^3/day)	Y	28.7%
FMH4045453	FMH4045454	4.24	15.76	14.16	0.15	0.143	0.075	0.068	0.871	5.412	0.017	0.406	0.04187	0.37721	3	5.1523	0.088	54.855	203.17	8	0.00508	Sin Tin Tao Home for the Aged (54.855 m^3/day)	Y	5.8%
FMH4045454	FMH4045455	33.12	14.10	8.29	0.225	0.214	0.1125	0.1015	0.892	5.391	0.039	0.606	0.06436	0.17542	3	4.707	0.184	116.415	431.16	8	0.0130	Sewage from upstream village houses (36.3285m^3/day) + The Site (During Peak: staff + visitors) (13.6275m^3/day + 3.22m^3/day) + Sin Tin Tao Home for the Aged (54.855 m^3/day) + village houses to the southwest of Sai Lam Temple (No. 168A, 168B and 172) (8.3835 m^3/day)	Y	7.1%

Legend

d = pipe diameter, m

d' = flow depth (m) of the maximum flow rate without surcharge (i.e., full bore flow) = 0.95d

r = pipe radius (m) = 0.5d

θ = angle (radian) of air space in a circular pipe = $2\cos^{-1}[(d'-r)/r]$

β = angle (radian) of wetted perimeter in a circular pipe = $2\pi - \theta$

A_w = wetted area (m^2) = (r^2/2) (β + sinθ)

P_w = wetted perimeter (m) = βr

R = Hydraulic radius (m) = A_w/P_w

s = Slope of the total energy line

k_s = equivalent sand roughness, mm

V = Velocity of flow calculated based on Colebrook White Equation, m/s

Q_c = Flow Capacity, m^3/s

Q_p = Estimated total peak flow from the Site during peak season, m^3/s

P_c = Contributing Population = ADWF/0.27

P = Peaking Factor (including stormwater allowance) for facility with existing upstream sewerage

ADWF (mulitiplied by Catchment Inflow Factor) = Total Average Dry Weather Flow, m^3/day

Appendix E CALCULATIONS OF SEWAGE GENERATION DURING NORMAL DAYS

S12A Rezoning Application for Sai Lam Temple, at Lot Nos. 63, and 296 (part) in D.D. 185, Sheung Wo Che No. 198, Sha Tin

Estimation of Sewage Generation during Non-peaking Period (Scenario 2)

1 - 13,016 urns in place and the absence of public sewer during normal days			
Sewage Generation from Visitors			
Total No. of Visitors	=	10 visitors/day	Maximum number of visitor during normal days, as advised by the Traffic Consultant
Unit Flow Rate (Visitors)	=	0.0079 m3/person/visit	200ml micturtion[Note 1]+6.5L flushing[Note 3]+1.2L Hand-washing[Note 3]
Percentage of Visitors will Use the Toilet	=	50 %	~50% of the visitors do use toilets, based on the Applicant's observations
Estimated Average Dry Weather Flow	=	0.0395 m^3/day	Total No. of Visitors x Unit Flow Rate (Visitors) x Percentage of Visitors that will use the Toilet
Operation hour per day	=	9 hours	Operation Hour shall be from 09:00 to 18:00
Catchment Inflow Factor	=	1.15	
Average Dry Weather Flow (with Catchment Inflow Factor)	=	0.045425 m^3/day 0.0000014020 m^3/s	
2. Sewage from Staff of the Site			
No. of Staff	=	5 staff	As advised by the Applicant
Unit Flow Rate (Site Staff)	=	0.28 m^3/person/day	Refer to EPD GESF[Note 2]
Estimated Average Dry Weather Flow	=	1.40 m^3/day	No. of Staff x Unit Flow Rate (Site Staff)
Operation hour per day	=	9 hours	
Catchment Inflow Factor	=	1.15	
Average Dry Weather Flow (with Catchment Inflow Factor)	=	1.6100 m^3/day 0.0000497 m^3/s	
3 - Sewage from Village Houses in the Upstream Area (North of Sai Lam Temple)			
Total No. of Village Houses (North of Sai Lam Temple)	=	13 houses	Including No. 179A - 192, Sheung Wo Che Road
Estimated No. of Residents in Each House	=	9 people	By Assumption
Estimated Total No. of Residents (Southwest of Sai Lam Temple)	=	117 people	Total No. of Village Houses (North of Sai Lam Temple) x Estimated No. of Residents in Each House
Unit Flow Rate (Residents)	=	0.27 m^3/day	The Unit Flow Rate of Private village (Type R2) is stated in Table T-1 of Ref. 2[Note 2].
Estimated Average Dry Weather Flow	=	31.59 m^3/day	Estimated Total No. of Residents (Southwest of Sai Lam Temple) x Unit Flow Rate (Residents)
Catchment Inflow Factor	=	1.15	For Sha Tin
Average Dry Weather Flow (with Catchment Inflow Factor)	=	36.3285 m^3/day 0.0004205 m^3/s	

Note:

1. Human's micturition is assumed to be 200mL in accordance with p. 3081 of "Magill's Medical Guide", 6th ed., various medical editors, Salem Press, USA, 2011.
2. Environmental Protection Department (EPD) publication Guidelines for Estimating Sewage Flows (GESF) for Sewage Infrastructure Planning Version 1.0, March 2005.
3. BEAM Plus New Buildings Version 2.0 in September 2019
4. Schedule 1 of CAP 459A Residential Care Homes (Elderly Persons) Regulation.

4 - Sewage from Village Houses No. 168A, 168B and 172 (Southwest of Sai Lam Temple)				
Total No. of Village Houses (Southwest of Sai Lam Temple)	=	3	houses	Including No. 168A, 168B and 172, Sheung Wo Che Road
Estimated No. of Residents in Each House	=	9	people	By Assumption
Estimated Total No. of Residents (Southwest of Sai Lam Temple)	=	27	people	Total No. of Village Houses (Southwest of Sai Lam Temple) x Estimated No. of Residents in Each House
Unit Flow Rate (Residents)	=	0.27	m^3/person/day	The Unit Flow Rate of Private village (Type R2) is stated in Table T-1 of Ref. 2 [Note 2].
Estimated Average Dry Weather Flow	=	7.29	m^3/day	Estimated Total No. of Residents (Southwest of Sai Lam Temple) x Unit Flow Rate (Residents)
Catchment Inflow Factor	=	1.15		For Sha Tin
Average Dry Weather Flow (with Catchment Inflow Factor)	=	8.3835	m^3/day	
	=	0.0000970	m^3/s	
5 - Sewage from Sin Tin Toa Home for the Aged				
Maximum Number of Residents	=	198	people	Stated in Licence of Residential Care Home for the Elderly (Licence No.: 11563 valid until 31 October 2017), classified as "care and attention home".
Unit flow rate of Residents	=	0.19	m^3/person/day	The unit flow rate of institutional and special class in Table T-1 of Ref. 2 [Note 2].
Estimated Average Dry Weather Flow	=	37.62	m^3/day	
Employee				
Home Manager	=	1	person	Required for care and attention home of Ref. 4 [Note 4]
Ancillary worker	=	5	person	1 ancillary worker for every 40 residents or part thereof, between 7 a.m. and 6 p.m. for care and attention home of Ref. 4 [Note 4]
Care worker (07:00 - 15:00)	=	10	person	1 care worker for every 20 residents or part thereof, between 7 a.m. and 3 p.m. for care and attention home of Ref. 4 [Note 4]
Care worker (15:00 - 20:00)	=	5	person	1 care worker for every 40 residents or part thereof, between 3 p.m. and 10 p.m. for care and attention home of Ref. 4[Note 4]
Care worker (20:00 - 07:00)	=	3	person	1 care worker for every 60 residents or part thereof, between 10 p.m. and 7 a.m. for care and attention home of Ref. 4 [Note 4]
Health worker	=	7	person	Unless a nurse is present, 1 health worker for every 30 residents or part thereof, between 7 a.m. and 6 p.m. for care and attention home of Ref. 4 [Note 4]
Nurse	=	3	person	Unless a health worker is present, 1 nurse for every 60 residents or part thereof, between 7 a.m. and 6 p.m. for care and attention home of Ref. 4 [Note 4]
Additional Employees	=	2	person	As an additional requirement for a care and attention home or an aged home, any 2 persons being a home manager, an ancillary worker, a care worker, a health worker or a nurse shall be on duty between 6 p.m. and 7 a.m. of Ref. 4 [Note 4]
Total No. of Employees	=	36	employees	
Unit flow rate	=	0.28	m^3/employee/day	Assume the characteristics of the unit flow rate is the same as that of "Commercial Employee" and "Community, Social & Personal Services" in Table T-2 of 2 [Note 2].
Estimated Average Dry Weather Flow	=	10.08	m^3/day	
Estimated Average Dry Weather Flow (total)	=	47.7	m^3/day	
Assume operation hour per day	=	24	hours	
Catchment Inflow Factor	=	1.15		For Sha Tin
Average Dry Weather Flow (with Catchment Inflow Factor)	=	54.8550	m^3/day	
	=	0.0006349	m^3/s	

Note:

1. Human's micturition is assumed to be 200mL in accordance with p. 3081 of "Magill's Medical Guide", 6th ed., various medical editors, Salem Press, USA, 2011.
2. Environmental Protection Department (EPD) publication Guidelines for Estimating Sewage Flows (GESF) for Sewage Infrastructure Planning Version 1.0, March 2005.
3. BEAM Plus New Buildings Version 2.0 in September 2019
4. Schedule 1 of CAP 459A Residential Care Homes (Elderly Persons) Regulation.

Calculation of Flow Capacity

Manhole		Length m	Level (Out) mPD	Level (In) mPD	d m	d' m	r m	d'-r m	θ radian	β radian	Aw m2	Pw m	R m	s -	ks mm	V m/s	QC m^3/s	ADWF m^3/day	P_c	P	Qp m3/s	Catchment	Is Qc > Qp? Y/N	% of capacity %
FMH4045451	FMH4045452	6.78	14.59	14.41	0.15	0.143	0.075	0.068	0.871	5.412	0.017	0.406	0.04187	0.02655	3	1.3649	0.0232	37.984	140.681	8	0.00377	Sewage from upstream village houses (36.3285m^3/day) + The Site (During Peak: staff + visitors) (1.61m^3/day + 0.04525m^3/day)	Y	16.3%
FMH4045452	FMH4045454	8.58	14.39	14.13	0.15	0.143	0.075	0.068	0.871	5.412	0.017	0.406	0.04187	0.0303	3	1.4583	0.0248	37.984	140.681	8	0.00377	Sewage from upstream village houses (36.3285m^3/day) + The Site (During Peak: staff + visitors) (1.61m^3/day + 0.04525m^3/day)	Y	15.2%
FMH4045453	FMH4045454	4.24	15.76	14.16	0.15	0.143	0.075	0.068	0.871	5.412	0.017	0.406	0.04187	0.37721	3	5.1523	0.0876	54.855	203.167	8	0.00508	Sin Tin Tao Home for the Aged (54.855 m^3/day)	Y	5.8%
FMH4045454	FMH4045455	33.12	14.10	8.29	0.225	0.214	0.1125	0.1015	0.892	5.391	0.039	0.606	0.06436	0.17542	3	4.707	0.184	101.222	374.898	8	0.00963	Sewage from upstream village houses (36.3285m^3/day) + The Site (During Peak: staff + visitors) (1.61m^3/day + 0.04525m^3/day) + Sin Tin Tao Home for the Aged (54.855 m^3/day) + village houses to the southwest of Sai Lam Temple (No. 168A, 168B and 172) (8.3835 m^3/day)	Y	5.2%

Legend

d = pipe diameter, m

d' = flow depth (m) of the maximum flow rate without surcharge (i.e., full bore flow) = 0.95d

r = pipe radius (m) = 0.5d

q = angle (radian) of air space in a circular pipe = $2\cos^{-1}[(d'-r)/r]$

b = angle (radian) of wetted perimeter in a circular pipe = 2p - q

Aw = wetted area (m2) = (r2/2) (b + sinq)

Pw = wetted perimeter (m) = br

R = Hydraulic radius (m) = Aw/Pw

s = Slope of the total energy line

ks = equivalent sand roughness, mm

V = Velocity of flow calculated based on Colebrook White Equation, m/s

Qc = Flow Capacity, m^3/s

Qc = Flow Capacity, m^3/s

P_c = Contributing Population = ADWF/0.27

P = Peaking Factor (including stormwater allowance) for facility with existing upstream sewerage

ADWF (mulitiplied by Catchment Inflow Factor) = Total Average Dry Weather Flow, m^3/day

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