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6 SEWERAGE AND SEWAGE TREATMENT IMPLICATIONS

6.1 Introduction

6.1.1 This section presents the assessment of sewerage and sewage treatment implication arising from the operation of the Project.

6.1.2 The proposed preliminary arrangement of the trunk sewers, including any necessary pumping provisions, for the collection, transportation, treatment and the disposal of the sewage discharged from the Developments and Infrastructure will be discussed. The sewerage and sewage treatment implications associated with the Project were assessed in accordance with the criteria and guidelines on Annex 6 – Criteria for Evaluating Water Pollution of the EIAO-TM and the requirements of WPCO.

6.2 Population and Employment Data

Sewage Catchments in North-East New Territories

6.2.1 There is no existing sewerage system within the vicinity of the Project . Also, both nearby Shek Wu Hui STW (SWHSTW) or Yuen Long STW (YLSTW) do not have enough capacity to treat the additional sewage discharge arising from the Project. Besides, under the present condition, Ngau Tam Mei/San Tin Trunk Sewage which is currently in planning stage would be laid along the San Tin Highway. However, the Ngau Tam Mei/San Tin Trunk Sewage is not planned to cater for additional flows from the proposed development.

6.2.2 A new sewage discharge system shall be provided for the sewage impact arising from the proposed development. Tertiary effluent polishing plant (EPP) is proposed to treat the sewage generated from the development site. The tertiary EPP could ensure the treated sewage effluent achieve a decent water quality standard and thus reuse the treated effluent for non-potable use. Sewage pumping stations are required to collect the sewage from the lower regions and pump to regions with higher mPD. If there is a power failure in the tertiary EPP, an emergency bypass is proposed to prevent the unsewered sewage contaminate the environment by discharging raw sewage to the Ngau Tam Mei Channel, then Deep Bay control zone directly via San Tam Road.

Population and Employment for Estimation of Sewage Flow

6.2.3 The population of the Project as stipulated in the Revised RODP is summarised in **Table 6-1**.

Table 6-1 Population Summary of the Project in Revised RODP

Residential population	159,000
Employment population	165,000

6.3 Methodology of Sewerage Impact Assessment

Unit Flow Factors

6.3.1 The sewage flows are estimated using UFF in Table T-1 and T-2 of EPD's Guidelines for Estimating Sewage Flows for Sewerage Infrastructure Planning Version 1.0 (GESF). With reference to the GESF, commercial flows comprise flows due to commercial activities and due to employees. The total UFF is sum of UF for employee plus various commercial activities, i.e. J2 to J12 as defined in Table T-2 of GESF. The unit flows factors that were used to estimate the sewage flows from the Project are listed in **Table 6-2** below.

Table 6-2 Unit Flow Factors for Residential, Commercial and Industrial Population from GESF

Description	Type	Unit	UFF per Employee (m3/head/d)	UFF for commercial Activities (m3/head/d)	Total Unit Flow Factors (UFF) (m3/head/d)
Residential	Public Housing (R1)	Person			0.19
Residential[1]	Private Housing (R2)	Person			0.27
Private Development in Non-residential Land use[2]	Private Housing (R2)	Person			0.27
Residential	Modern Village	Person			0.27
Hotel	Dining (J10)	Employee	0.08	1.50	1.58
Advanced Manufacturing- Lab Staff	General	Employee	0.08	0.2	0.28
Advanced Manufacturing- Administration Staff	J6	Employee	0.08		0.08
R&D Wet Lab Staff	J2	Employee	0.08	0.25	0.33
R&D Wet Lab Administration Staff	J6	Employee	0.08		0.08
R&D Dry Lab Staff	General	Employee	0.08	0.2	0.28
R&D Dry Lab Administration Staff	J6	Employee	0.08		0.08
Retail	J4	Employee	0.08	0.20	0.28
Dining	J10	Employee	0.08	1.50	1.58
Entertainment	J11	Employee	0.08	0.20	0.28
Data Centre	J6	Employee	0.08		0.08
Office	J6	Employee	0.08		0.08
Convention	J11	Employee	0.08	0.20	0.28
Ancillary commercial	J3	Employee	0.08	0.10	0.18
Logistic	J3	Employee	0.08	0.10	0.18
GIC Facilities	J11	Employee	0.08	0.20	0.28
Residential/ Talent Accommodation	J11	Employee	0.08	0.20	0.28

Note:

1. *The residential (private housing) means that the whole land parcel is solely for housing development, with minimal retail GFA to serve the residents.*

2. *Private development in non-residential land use means that the land parcels includes residential and other land uses*

Catchment Inflow Factors

6.3.2 The Catchment Inflow Factors (Pcif) cater for the net overall ingress of water or wastewater to the sewage system. They are catchment-dependent and applicable to major sewage facilities of a catchment. They are not applicable to new catchments which are deemed to be free from misconnections and pipe defects. Therefore, the Pcif are not applicable in estimating the total flows from the new developments area.

Peaking Factors

6.3.3 Peaking Factors cater for seasonal/diurnal fluctuation and normal amount of infiltration and inflow. The peaking factors shall be in accordance to Table T-5 of EPD's GESF.

6.3.4 Under normal condition, peaking factors (excluding stormwater allowance) are applicable to planning sewage facilities receiving flow from new upstream sewage systems which essentially have no misconnections and defects for infiltration. If the service conditions of the upstream sewage systems for the planning horizons under considerations are unclear, peaking factors (including stormwater allowance) shall be used.

6.3.5 **Table 6-3** below shows the peaking factors for various population range including and excluding stormwater allowance for design of sewer and STWs.

Table 6-3 Peaking Factors for Various Population Ranges

Population Range	Peaking Factor (including stormwater allowance) for facility with existing upstream sewage	Peaking Factor (excluding stormwater allowance) for facility with new upstream sewage
Sewers		
< 1,000	8	6
1,000 – 5,000	6	5
5,000 – 10,000	5	4
10,000 – 50,000	4	3
> 50,000	Max ($7.3/N^{0.15}$,2.4)	Max ($6/N^{0.175}$,1.6)
Sewage Treatment Works, Preliminary Treatment Works and Pumping Station		
< 10,000	4	3
10,000 – 25,000	3.5	2.5
25,000 – 50,000	3	2
> 50,000	Max ($3.9/N^{0.065}$,2.4)	Max ($2.6/N^{0.065}$,1.6)

Note
N = Contributing population in thousands

$$contributing\ population = \frac{calculated\ total\ average\ flow\ (m^3/day)}{0.27\ (m^3/person/day)}$$

Unit Load Factor

6.3.6 The global unit load factors used to estimate the sewage loading from the proposed developments are referred in Table 4 of the sewage Manual Part 1 (SM1) and are listed in **Table 6-4** below.

Table 6-4 Global Unit Load Factors

Trades	Unit	Percentage (%)	SS (kg/d)	BOD (kg/d)	COD (kg/d)	TKN (kg/d)	NH_3N (kg/d)	E.coli (no./d)
Domestic (Residential)	Person	100	0.04	0.042	0.09	$8.5x10^{-3}$	$5x10^{-3}$	$4.3x10^{10}$
Commercial G/IC(1)	Employee	100	0.059	0.087	0.173	$9.2 x10^{-3}$	$4.8 x10^{-3}$	$3.5 x10^{10}$
Industrial (R&D and Adv. Manu)	Employee	10(2)	0.059	0.087	0.173	$9.2 x10^{-3}$	$4.8 x10^{-3}$	$3.5 x10^{10}$
	Flow	40(3)	559 (mg/L)	452 (mg/L)	1130 (mg/L)	62 (mg/L)	29 (mg/L)	$3.5 x10^{10}$
	flow	50(4)	800 (mg/L)	800 (mg/L)	2000 (mg/L)	100 (mg/L)	52 (mg/L)	$3.5 x10^{10}$
Schools (5)	Student	100	0.034	0.034	0.07	$6.7 x 10^{-3}$	$3 x10^{-3}$	$3.5 x10^{10}$

Note: References from Sewage Manual Part 1 Table 4

(1) Unit Load Factors (Commercial, G/IC & Industrial) is the sum of Unit Load Factors for commercial activities and employed population.

(2) It is assumed 10% load from Industrial follow Commercial (Employed Population + Commercial Activities)

(3) It is assumed 40% load with similar characteristics to measured sewage at Tai Po Industrial Estate

(4) It is assumed 50% load could reach upper limits in WPCO TM Table 1

(5) Unit Load Factors of Schools is based on the number of school students

Effluent Polishing Plant

6.3.7 It is understood that there is currently no spare capacity from YLSTW or SWHSTW to handle the sewage generated from the Project, thus an on-site EPP is required, namely STLMC EPP for on-site treatment. The on-site EPP will be designed up to tertiary level treatment standard to enable for reuse of reclaimed water while the rest of sewage effluent is suggested to discharge to the Deep Bay.

6.3.8 As discussed with DSD, Moving Bed Biofilm Reactors (MBBR), Aerobic Granular Sludge (AGS) and Membrane Bioreactor (MBR) sewage treatment process would be considered under the current stage to achieve the discharge requirement.

6.3.9 It is expected that EPP undergoes tertiary treatment level which is the highest level of treatment for polishing the treated effluent from secondary treatment process. This process typically comprises a combination of physical and biological processes with the objective of further removing nutrients and suspended solids in the sewage.

6.3.10 **Table 6-5** below shows the STLMC EPP Effluent Discharge Standard which is reference to YLEPP standard and approved by the EPD.

Table 6-5 Treatment Standard of STLMC EPP

Parameter	Unit	Design Standard
5-day Biochemical Oxygen Demand (BOD_5)	mg/L	10 (95 percentile)
Total Suspended Solid (TSS)	mg/L	10 (95 percentile)
Ammonia Nitrogen (NH_3-N)	mg/L	2 (annual average)
Total Nitrogen (TN)	mg/L	10 (annual average)
Total Phosphorus (TP)	mg/L	1 (annual average)
Escherichia coli (E. coli)	cfu/100ml	100[1] (Upper limit)

Note: Monthly geometric mean is adopted

6.3.11 Emergency by-pass is proposed for the proposed on-site EPP and will convey the raw sewage to the proposed drainage in case of emergency such as power failure at the proposed on-site EPP.

6.3.12 The new EPP will provide tertiary level sewage treatment to produce treated sewage effluent (TSE) of high quality to the proposed water reclamation plant. The details are in section 6.4.

6.4 Proposed Water Reclamation Plant

6.4.1 The new EPP will provide tertiary level sewage treatment to produce treated sewage effluent (TSE) of high quality for conversion into reclaimed water that is suitable for reuse within the Project for non-potable uses such as toilet flushing and controlled irrigation. Based on the TSE water quality, the TSE has potential to be utilized in district cooling system (DCS) make-up water.

6.4.2 Using TSE can relieve the stress on freshwater supplies used for flushing and irrigation purposes. Since recycled TSE provides a cost-efficient supply that decrease the demands and stress on fresh water. Besides, since there are strict water quality guidelines to control the effluent standard. It can prevent any potential negative impacts or influence towards the public health and environment sustainability.

6.4.3 The proposed water quality standards for the TSE reuse is summarized below in **Table 6-6**.

Table 6-6 Proposed Water Quality Standards of TSE Reuse

Water Quality Parameter	Unit	Water Quality
E. Coli	cfu/100mL	Not detectable
Total residual chlorine (TRC)	mg/L	*≥ 1 (out of treatment system)* *≥ 0.2 (at point-of-use)*
Dissolved oxygen (DO)	mg/L	≥ 2
TSS	mg/L	≤ 5
Colour	HU	≤ 20
Turbidity	NTU	≤ 5
pH	-	6 - 9
Threshold odour number (TON)	TON	≤ 100
BOD_5	mg/L	≤ 10
Ammonia nitrogen	mg/L	≤ 1
Synthetic detergents	mg/L	≤ 5

Note:
1. *Apart from TRC which has been specified, the water quality standards for all parameters shown above shall be applied at the point-of0use of the system. HU = Hazen Unit. NTU = Nephelometric Turbidity Unit,*
2. *The parameters are referenced to Technical Specifications on Grey Water Reuse and Rainwater Harvesting issued by WSD in May 2015, which is also referred to the target water quality standard adopted in North East New Territories Area project.*

6.4.4 In general, the following precautionary measures should be adopted for TSE reuse:

- To avoid cross connection and hence contamination, all pipes and fittings used for the TSE water supply and distribution system should be purple in colour for distinguishing them from the pipes and fittings used for the fresh water supply and distribution systems.
- Regular checking/inspections of the TSE supply and distribution systems for possible cross connection to the fresh water supply and distribution system should be carried out. The use of non-toxic dye may be adopted in the checking/inspections
- Warning signs should be permanently displayed where public access to TSE is possible (except for toilets) notifying the employees, visitors and the public at large that treated effluent is being used and is not suitable for drinking.

- Storage of sodium hypochlorite solution will be required and this is not a hazardous material. Thus, the storage is not considered as Potentially Hazardous Installation (PHI)

6.4.5 The usual practice to distinguish reclaimed water pipe work from potable pipework is by colour code. Under Demonstration Scheme on Reclaimed Water Uses in the Northern District, for example, purple/lavender-coloured pipes were used between SWHSTW to respective user's premises for easy differentiation from existing pipework.

6.4.6 Apart from that, proper signage, promotion and education to the general public especially potential local users of reclaimed water for landscape irrigation shall be considered and implemented.

6.4.7 The main health concern with TSE reuse is the small but definite risk of diarrhoeal diseases associated with accidental ingestion of insufficiently treated TSE. With the implementation of precautionary measures set out in above, and the adoption of stringent health-based water quality standards for the TSE, significant increase in health risk is not expected.

6.4.8 Reuse of TSE offers following major benefits:

- Savings in fresh water supply, thus reduces the water to be diverted from the Dongjing River, and helps to relief the fresh water stress in downstream Dongjiang River that is often in needs of fresh water.
- Savings in energy consumption to convey the fresh water from the Dongjiang River, thus reduces the carbon footprint and contributes to the substainabilities of the communities.
- Savings in fresh water supply system expansion requirement
- Reduces the pollution to be discharged to the environment.

6.4.9 TSE reuse has the advantage of reducing wastewater discharge in the receiving water bodies thereby reducing the pollution load to the environment. It also reduces demand on raw water, which is scarce natural resource deserved for preservation to the maximum extent practicable

6.5 Existing and Planned Sewerage Infrastructure

<u>Planned Sewerage Infrastructure</u>

6.5.1 There is no existing sewerage system within the vicinity of the Project. Further, the Project fall within the sewage catchment area (SCA) of Yuen Long (YL STW). However, both nearby Shek Wu Hui STW (SWH STW) or Yuen Long STW (YL STW) would not have sufficient capacity to cater the additional sewage generated from the Project.

6.6 Estimation of Sewage Discharge

<u>Estimated Sewage Discharge from the Development</u>

Residential Discharge

6.6.1 Based on the design parameters and assumptions discussed in section 6.3, the estimated sewage discharge of Residential sites in the Project is summarized in **Table 6-7**.

Table 6-7 Summary of Estimated Sewage Discharge in Residential Site

Land Use Type	Population	Total ADWF (m^3/day)
Village	70	20
Public Housing (R1)	104,000	19,719
Private Housing (R2)	24,000	6,495
Private Development in Non-residential Land use (R2)	31,000	8,497
Sub-total	159,000	34,731

Note:

1. *The Residential accommodation includes OU(I&T)1.1.1, OU(I&T)1.1.2, OU(I&T)1.1.3, OU(MU)2.1.11, OU(MU)1.2.1 and G.5.11*
2. *Total may not add up due to rounding*

Commercial Discharge

6.6.2 Based on the design parameters and assumptions discussed in section 6.3, the estimated sewage discharge of Residential sites in the Project is summarized in **Table 6-8** below.

Table 6-8 Summary of Estimated Sewage Discharge in Commercial Site

Land Use Type	Employment	Total ADWF (m^3/day)
Hotel (J10)	1,500	2,371
Advanced Manufacturing- Lab Staff(General)	22,800[1]	6,391
Advanced Manufacturing- Administration Staff (J6)	11,400[1]	913
R&D Wet Lab Staff (J2) [3]	21,500[2]	7,088
R&D Wet Lab Administration Staff (J6) [3]	5,400[2]	430
R&D Dry Lab Staff (General) [3]	43,000[2]	12,028
R&D Dry Lab Administration Staff (J6) [3]	10,700[2]	859
Retail (J4)	9,000	2,416
Dining (J10)	2,200	3,592
Entertainment (J11)	2,200	637
Data Centre (J6)	600	47
Office (J6)	7,700	618
Convention (J11)	700	187
Ancillary commercial (J3)	5,000	903
Logistic(J3)	6,200	1,107
GIC Facilities (J11)	12,500	3,501
Residential/ Talent Accommodation (J11)	1,700	479
Sub-total	165,000	43,567

Note:

1. *Advanced Manufacturing is divided into 2 categories, Admin Staff : Manufacturing Staff = 1 :2*
2. *R&D is divided into 4 categories, Dry Lab : Wet Lab = 2:1; Admin Staff : Lab Staff = 1:4.The Unit Demand of R&D are reference to LMCL*
3. *The Unit Demand of R&D are reference to LMCL*
4. *Total may not add up due to rounding*

Total Sewage Discharge

6.6.3 Based on the design parameters and assumptions discussed in section 6.3, the estimated sewage discharge of Residential sites in the Project is summarized in **Table 6-9**.

Table 6-9 Summary of Total Sewage Discharge

Category	ADWF (m^3/day)
Residential Discharge	34,731
Commercial Discharge	43,567
Other Contribution[1]	11,359
Sub-total of Proposed Development (with 10% allowance)	98,623
Flexibility for receiving additional sewage flow from developments, existing villages, reject water from WRP and centrate from FWPF	26,377
Total Sewage Discharge	125,000

Notes:

1. *Other contribution includes the discharge from NOL, Sport Centre and Swimming Pool, EPP, Schools, DCS, Private Hospital and Food waste pre-treatment plant.*

6.7 Pollutant Load Estimation

6.7.1 Based on the Global Unit Load Factors discussed in Section 4.6, the pollutant loads are estimated from the proposed development and listed in **Table 6-10** below.

Table 6-10 Projected Pollutant Concentration

Trades	Development Parameter	SS (kg/d)	BOD (kg/d)	COD (kg/d)	TKN (kg/d)	NH_3N (kg/d)	E.coli (no./d)
Domestic (Residential)	159,977	6,340	6,720	14,400	1,360	800	6.68×10^{15}
Commercial G/IC	45,813	2,700	3,990	7,930	420	220	1.60×10^{15}
Industrial (R&D and Adv. Manu)	107,801	16,650	14,960	45,080	2.920	732	3.77×10^{15}
Schools	12,600	428	428	882	84	50	4.41×10^{14}
Total	326,191	15,891	20,512	41,855	2,857	1,588	1.27×10^{16}

Table 6-11 Global Unit Load Factors

Trades	Unit	Percentage (%)	SS (kg/d)	BOD (kg/d)	COD (kg/d)	TKN (kg/d)	NH_3N (kg/d)	E.coli (no./d)
Domestic (Residential)	Person	100	0.04	0.042	0.09	8.5×10^{-3}	5×10^{-3}	4.3×10^{10}
Commercial G/IC(1)	Employee	100	0.059	0.087	0.173	9.2×10^{-3}	4.8×10^{-3}	3.5×10^{10}
Industrial (R&D and Adv. Manu)	Employee	10(2)	0.059	0.087	0.173	9.2×10^{-3}	4.8×10^{-3}	3.5×10^{10}
	Flow	40(3)	559 (mg/L)	452 (mg/L)	1130 (mg/L)	62 (mg/L)	29 (mg/L)	3.5×10^{10}
	flow	50(4)	800 (mg/L)	800 (mg/L)	2000 (mg/L)	100 (mg/L)	52 (mg/L)	3.5×10^{10}
Schools (5)	Student	100	0.034	0.034	0.07	6.7×10^{-3}	3×10^{-3}	3.5×10^{10}

Note:

References from Sewage Manual Part 1 Table 4

(6) *Unit Load Factors (Commercial, G/IC & Industrial) is the sum of Unit Load Factors for commercial activities and employed population.*
(7) *It is assumed 10% load from Industrial follow Commercial (Employed Population + Commercial Activities)*
(8) *It is assumed 40% load with similar characteristics to measured sewage at Tai Po Industrial Estate*
(9) *It is assumed 50% load could reach upper limits in WPCO TM Table 1*
(10) *Unit Load Factors of Schools is based on the number of school students*

6.8 Proposed Effluent Polishing Plant

6.8.1 The design EPP would take 125,000 m^3/day. In order to enhance the system efficiency and have wise land use planning, 2 phases implementation of EPP is recommended and subjected to further liaison with DSD and EPD. The first phase capacity is 65,000 m^3/day in 2031 while the second phase capacity is 125,000 m^3/day in 2035. All the civil works will be carried out in one go meanwhile the E&M works will be separated in two phases. Besides, the co-location of EPP, Food-Waste Pre-treatment Facilities (FWPF) and Water Reclamation Plant (WRP) is suggested. Since the actual layout of the EPP is not finalised, EPP and FWPF are indicated in one color in the land layout. The land layout is shown in **Figure 6-1**.

6.8.2 During operation phase, the FWPF adopts mechanical treatment to food waste for impurities removal and size reduction. The treated food waste will be delivered to the EPP and then mixed with sludge. It is assumed that there are 47 tonne dry solids per day combined. The sludge treatment involves sludge thickening, anaerobic digestion, combined heat and power (CHP) generation and sludge dewatering. The final disposal would be disposed to landfill or T-park. The disposal scheme would be determined at detailed design stage.

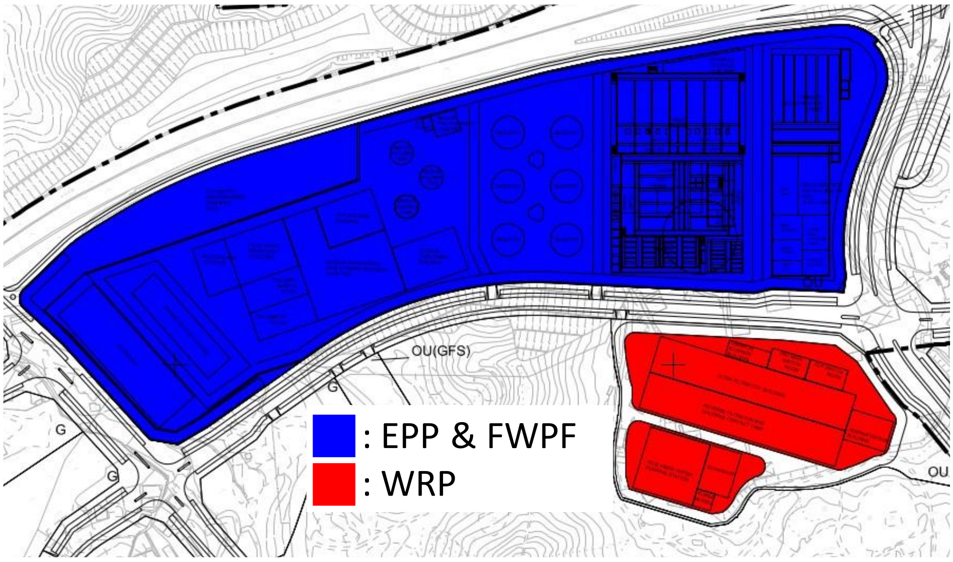

Figure 6-1 Location Plan of EPP and Co-located Facilities

6.9 Proposed Food Waste Pre-treatment Facilities

6.9.1 For food waste/sewage sludge co-digestion at the proposed EPP, it is recommended to set up a FWPF. Based on the population intake in the Project, a FWPF with minimum 100 wet t/d capacity is suggested by EPD. Therefore, 1 ha footprint should be reserved for FWPF to cater development activities of the Project. In view of facilitating the treatment process, FWPF will be set up in Site OU(EPP).5.3.

6.10 Proposed Sewerage Scheme

6.10.1 After considering the relief in the Project, there is a need to establish 3 sewage pumping stations because of the flat terrain on the east of the Project. Site OU.1.2, OU.3.2 and OU.5.7 are utilized as the sewage pumping station. Most sewage collected within the internal sewerage system will be conveyed to the proposed pumping station and discharged via twin rising mains to public sewerage system. A schematic layout showing the locations of proposed sewage pumping stations is shown in **Figure 6-2**.

6.10.2 The preliminary list of responsible parties of the proposed sewerage and sewage treatment facilities is shown in **Table 6-12**.

Table 6-12 Preliminary list of responsible parties of the proposed sewerage and sewage treatment facilities

Sewerage/sewage treatment facilities	Parties responsible for construction	Parties responsible for maintenance
Twin rising mains	Sewerage Project Division of Drainage Services Department	Mainland North Division of Drainage Services Department
Sewage pumping stations	Sewerage Project Division of Drainage Services Department	Sewage Treatment Division 1 of Drainage Services Department
Sewage treatment facilities	Sewerage Project Division of Drainage Services Department	Sewage Treatment Division 1 of Drainage Services Department

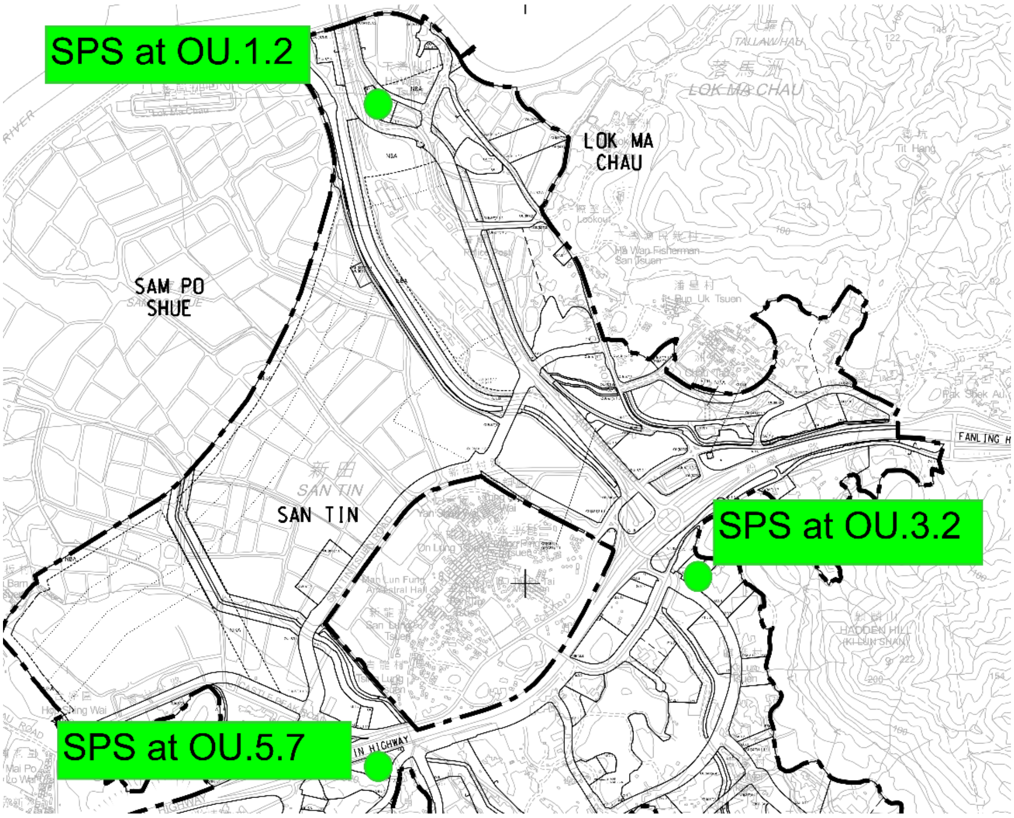

Figure 6-2 Proposed SPSs location

6.11 Treated Sewage Effluent Reuse

6.11.1 The estimated reclaimed water demand of the Project is 94,404 m^3/day. The design capacity of the WRP is 112,500 m^3/day. The surplus reclaimed water could be exported for other potential developments nearby.

6.12 Proposed Emergency Bypass and Normal Discharge Route

6.12.1 Under current design, in the emergency event when there is a power failure of STLMC EPP, the effluent will be discharged directly to Deep Bay control zone via Ngau Tam Mei Channel. A new pipework. will be constructed to connect the proposed EPP and Ngau Tam Mei Channel under San Tam Road. A schematic layout showing the emergency bypass is shown in **Figure 6-3.** For the normal discharge route, it will share the same route with the proposed emergency bypass to make good use of the pipework.

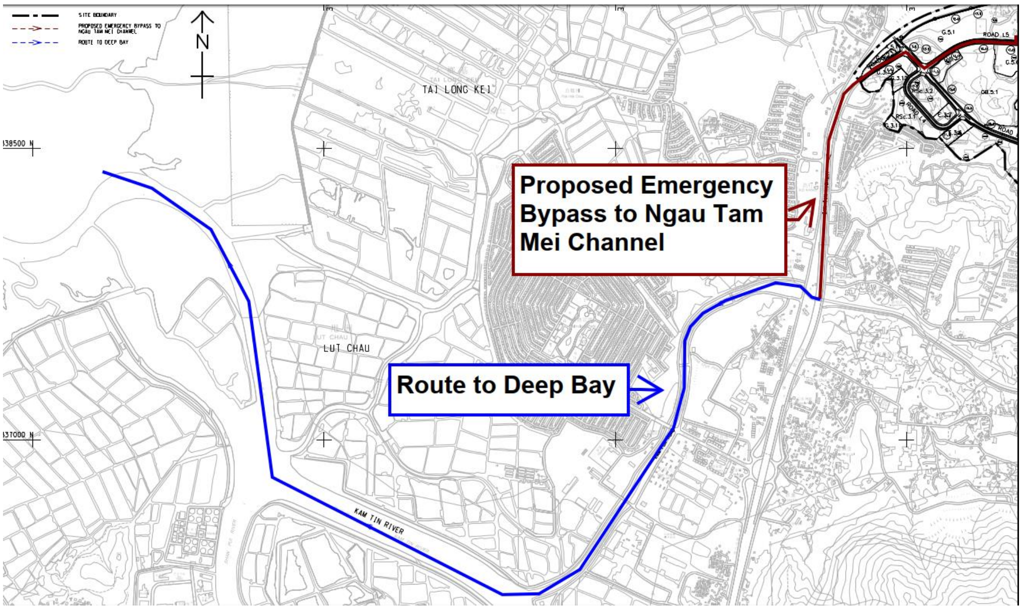

Figure 6-3 Proposed Emergency Bypass

6.13 Implementation Phasing

6.13.1 The sewage discharge build up are summarized in **Table 6-13** below. The implementation phasing will be further reviewed in detailed design stage and subjected to approval from relevant departments.

Table 6-13 Sewage Discharge Build-up

Population intake	Total Sewage Discharge with 10% allowance (cum/d)	Total Sewage Discharge without 10% allowance (cum/d)
2031	13,856	12,596
2034	65,315	59,377
Post 2034	125,000	113,636

6.13.2 Implementation phasing of major sewerage infrastructures and co-located facilities of EPP are listed in **Table 6-14**.

Table 6-14 Implementation Phasing for Major Sewage related Infrastructure

Year	EPP	WRP	FWPF	Pumping Station in Site OU(SPS)1.2	Pumping Station in Site OU(SPS)3.2	Pumping Station in Site OU(SPS)5.7
2031	**~65,000 m^3/d**	**112,500 m^3/d**	**100 tpd**	**0.67 m^3/s**	**1.17 m^3/s**	**2.12 m^3/s**
2035	**125,000 m^3/d**					

6.14 Potential Impacts by the Proposed Sewerage System

6.14.1 For SPSs and rising mains serving new development areas, those facilities have to be completed and commissioned early on the development but it can be years before they receive the design flows from full occupancy of the site. This results in low flows entering the wet well and long retention times in the rising main give the opportunity for bacteria to multiply in the anaerobic conditions in which formation of Hydrogen Sulphide would occur.

6.14.2 Odour impact are one of possible impacts generated from the construction and operation of the sewage system. The main odour nuisances can be attributed to the wet wells/ retention tanks of the SPSs and the sludge treatment process in EPP. Use of chemical dosing to oxygen injection for septicity control will be considered in the detailed design stage,

6.15 Recommend Mitigation Measures

6.15.1 Sewage septicity control measures shall be considered for the proposed SPSs and rising mains as follows. Non-dosing solutions should be considered in prior to dosing solutions

6.15.2 At this preliminary stage, direct injection of oxygen into the rising mains and pre-aeration in the wet well of the pumping stations are adopted as the sewage septicity control measures with details to be addressed in the detailed design stage.

6.15.3 Enclosed the pumping station inside building structure is considered as an odour mitigation measures. The structure is equipped with adequate odour control measures such as scrubber and activated charcoal filter at the exhaust of the ventilation system. The vent will be located away from air sensitive uses including the proposed development itself.

6.15.4 The effluent from STLMC EPP follows a stringent standard which won’t deteriorate the Deep Bay water quality. As discussed in Table 6-6, the water quality standards of TSE reuse can fulfil the discharge limits of pollutants in Standards for Effluents Discharged into Drainage and Sewage System, Inland and Coastal Waters, the Water Pollution Control Ordinance (CAP 358).

6.15.5 Given the sensitivity of inner Deep Bay in term of water quality and ecology, extensive effort will be expedited to avoid the occurrence for emergency discharge. In order to achieve this, the design of STLMC EPP will be cautiously reviewed to include additional provisions including as follows:

- Applied peaking factors for all major treatment units and electrical and mechanical equipment to a void equipment failure;
- Standby unit for all major equipment would be provided in case of unexpected breakdown of pumping and treatment facilities such that the standby pumps and treatment facilities could take over and function to replace the broken pumps; and
- Back-up power for dual power supply would be provided in case of power failure to sustain the function of pumping and treatment facilities

6.16 Summary

6.16.1 There is no existing sewerage system within the vicinity of the Project. The SWHSTW and YLSTW being upgraded would not have sufficient treatment capacity to cater for the additional sewage arising from the proposed development.

6.16.2 To cater the sewage discharge in the Project, it is proposed to construct a tertiary EPP with 125,000 cum/d capacity, WRP with 112,500 cum/d, FWPF with 100 wet t/d and three SPSs in 2031. Reuse of reclaimed water is recommended for non-potable uses such as toilet flushing and irrigation. The TSE for reclaimed water will be provided from the STLMC EPP with tertiary treatment to ensure a higher water quality standard. The rest of sewage effluent will be discharged to Deep Bay.

6.16.3 Based upon a preliminary sewerage impact assessment as described in this section, it can be concluded that the proposed development is sustainable from sewerage collection, treatment and disposal prospective. There is no identified insurmountable sewerage and sewage treatment implications arising from the Project.