

<b>Mott MacDonald HK</b> <b>Consulting Engineers</b> 20th Floor, Two Landmark East 100 How Ming Street Kwun Tong, Kowloon, Hong Kong	Contract: Agreement No. CE 45/2004 (CE) Liantang/Heung Yuen Wai Boundary Control Point and Associated Works - Investigation			Job Ref: 255228
	Subject: Estimation of Pollutant Loadings from Proposed Development			Calc. Sheet No. Page
	Drawing Ref. -	Calculations by WT	Checked by JC	Date: 10.09.2010

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### Appendix 6.3 Estimation of Pollutant Loadings from Proposed Development

#### 1. Proposed Redevelopment

The existing Chuk Yuen North and Chuk Yuen South will be resumed for LT/HYW BCP and the connecting road construction.

#### 2. Design Population and Sewage Flow from LT/HYW BCP & Resite

References:

- Sewerage Manual Part 1
- Guidelines for the Design of Small Sewerage Treatment Plants
- EPD's Guidelines for Estimating Sewage Flows for Sewerage Infrastructure Planning Version 1.0 (GESF)

- Preliminary Planning Study on Developing LT/HYW Control Point

Assumptions:

- Global unit flow factor (GUFF) for staff is based on Table T-2 of GESF (0.08 m<sup>3</sup>/person/day)
- For passengers, the GUFF of 0.02 m<sup>3</sup>/person/day from the Preliminary Planning Study Report is used.
- Sewage flow from Canteen is 0.5 m<sup>3</sup>/day/m<sup>2</sup>
- Sewage flow from villagers of resite is 0.27 m<sup>3</sup>/person/day

#### Design Population and Average Daily Flow (ADF) with 10% Passengers Toilet Using

Type	No. of Vehicles (no./day)	Population/ Daily Passengers	Percentage of toilet use (%)	GUFF (m <sup>3</sup> /p/d)	ADF (m <sup>3</sup> /d)
<b>Resite</b>	-	528	100%	0.27	142.56
<b>BCP</b>					
• Car	2000	-	10%	0.02	-
• Bus/Coach	850	-	10%	0.02	-
• Good vehicles	15000	30000	10%	0.02	60.0
• Passengers	-	30000	10%	0.02	60.0
• Staff	-	500	100%	0.08	40.0
• Canteen	2 nr	25 m <sup>2</sup>	-	0.5 m <sup>3</sup> /d/m <sup>2</sup>	25.0

Estimated total Average Dry Weather Flow (ADWF) = 327.56 m<sup>3</sup>/d

= 3.8 l/s

#### Design Population and Average Daily Flow (ADF) with 15% Passengers Toilet Using

Type	No. of Vehicles	Population/	toilet use (%)	GUFF (m <sup>3</sup> /p/d)	ADF (m <sup>3</sup> /d)
<b>Resite</b>	-	528	100%	0.27	142.56
<b>BCP</b>					
• Car	2000	-	15%	0.02	-
• Bus/Coach	850	-	15%	0.02	-
• Good vehicles	15000	30000	15%	0.02	90.0
• Passengers	-	30000	15%	0.02	90.0
• Staff	-	500	100%	0.08	40.0
• Canteen	2 nr	25 m <sup>2</sup>	-	0.5 m <sup>3</sup> /d/m <sup>2</sup>	25.0

Estimated total Average Dry Weather Flow (ADWF) = 387.56 m<sup>3</sup>/d

= 4.5 l/s

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### 3. Calculation of Sewage Load from Raw Sewage

Assumptions:

- Global unit load factors are taken from Table 4 of the Sewerage Manual
- Unit load factors for staff is similar to the employed population
- Unit load factors for passengers are taken as 1/3 of those for employed population.
- Unit load factors for canteen is based on "Guidelines for the design of small sewage treatment plants"

Global Unit Load factors

Load Type	Unit Load Factor				
	Villagers	Staff	Passengers	Canteen	
SS (kg/d/person)	0.04	0.034	0.0113	0.3	kg/m <sup>2</sup> /d
BOD (kg/d/person)	0.042	0.034	0.0113	0.3	kg/m <sup>2</sup> /d
TN (kg/d/person)*	0.0085	0.0067	0.0022	0	kg/m <sup>2</sup> /d
TKN (kg/d/person)	0.0085	0.0067	0.0022	0	kg/m <sup>2</sup> /d
NH <sub>3</sub> N (kg/d/person)	0.005	0.004	0.0013	0	kg/m <sup>2</sup> /d
E. Coli. (no./d/person)	4.30E+10	3.50E+10	1.17E+10	0E+00	no./m <sup>2</sup> /d

Total pollution load from the raw sewage of the proposed LT/HYW BCP & Chuk Yuen Resite (with 10% of passengers using toilet)

Load Type	Chuk Yuen Resite	Pollutant Loadings				Total
		LT/HYW BCP				
		Staff	Passengers	Canteen	Sub-total	
SS (kg/d)	21.12	17.00	68.00	15.00	100.00	121.12
BOD (kg/d)	22.18	17.00	68.00	15.00	100.00	122.18
TN (kg/d)*	4.49	3.35	13.40	0.00	16.75	21.24
TKN (kg/d)	4.49	3.35	13.40	0.00	16.75	21.24
NH <sub>3</sub> N (kg/d)	2.64	2.00	8.00	0.00	10.00	12.64
E. Coli. (no./d)	2.27E+13	1.75E+13	7.00E+13	0E+00	8.75E+13	1.10E+14

Total pollution load from the raw sewage of the proposed LT/HYW BCP & Chuk Yuen Resite (with 15% of passengers using toilet)

Load Type	Chuk Yuen Resite	Unit Load Factor				Total
		LT/HYW BCP				
		Staff	Passengers	Canteen	Sub-total	
SS (kg/d)	21.12	17.00	102.00	15.00	134.00	155.12
BOD (kg/d)	22.18	17.00	102.00	15.00	134.00	156.18
TN (kg/d)*	4.49	3.35	20.10	0.00	23.45	27.94
TKN (kg/d)	4.49	3.35	20.10	0.00	23.45	27.94
NH <sub>3</sub> N (kg/d)	2.64	2.00	12.00	0.00	14.00	16.64
E. Coli. (no./d)	2.27E+13	1.75E+13	1.05E+14	0.00	1.23E+14	1.45E+14

\*TN is equal to TKN + nitrite N + nitrate N. As nitrite N and nitrate N are assumed to be in very small amount or zero in raw domestic wastewater at the beginning, TN is taken as equal to TKN in the raw sewage.