6.2.3.3 The commercial employment factor includes for the discharges from hotels on a catchment-wide basis. However, it should be noted that the overall factor masks large potential local flow-per-employee variations. Individual hotels actually discharge considerably higher volumes than would be predicted using this overall factor, whereas an office block would discharge considerably less. Therefore, specific factors for hotels (such as the factor derived in the N&S Kowloon SMP study, where a figure of 690 L/employee/day was used) will be used in this study if it is necessary to assess the capacity of local, upstream sewers.

6.2.4 *Peaking Factors*

6.2.4.1 Flow peaking factors allow for diurnal flow variations, seasonal variations in dry weather and variations due to wet weather inflows. For populations > 50,000, design peaking factors will be calculated in accordance with the DSD Sewerage Manual as follows:

$P_{(sewers)} = 7.3 / N^{0.165}$ where N is the population equivalent [p.e.] in thousands;
p.e. = Average Dry Weather Flow (m^3/day) / 0.25.

In general, all flows collected by sewers should receive preliminary treatment and be conveyed to the preliminary treatment works without excessive surcharging/overflow. Hence the peaking factors for sewers [$P_{(sewers)} = 7.3 / N^{0.165}$] are applied for establishing peak flows to pumping stations and preliminary treatment.

This approach has also been used for sewerage master plans carried out for and accepted by EPD in the past, for example the Outlying Islands SMP Review. However, it is acknowledged that EPD have opined that the peaking factors for Sewage Treatment Plants and Pumping Stations as stated in Table 3 of the Sewerage Manual may be more appropriate this Study. This will be investigated and considered in the detailed design stage.

6.2.4.2 The above formula, which includes a significant component for storm runoff allowance, has been used for the assessment of sewer pipelines, pumping stations and preliminary treatment works. It should be noted that these factors do not include for excessive storm runoff into foul sewers. It is assumed that an inflow and infiltration control strategy will be implemented to eliminate excessive inflows where these occur.

6.3 Sewage Flow Assessment

6.3.1 *SEKD Population Estimates*

6.3.1.1 Sewage from SEKD will be directed to either the To Kwa Wan Preliminary Treatment Works (TKWPTW) or the Kwun Tong Preliminary Treatment Works (KTPTW). Residential population and employment projections for the SEKD are shown on **Tables 6.2** and **6.3**. Assessments of the projected sewage flows generated from the SEKD, based on the residential population and employment projections are shown on **Table 6.4**.

Table 6.2 Residential Population by Housing Type

Use	Flats			Flat Mix (%)	Population			Pop Mix (%)
	TKW PTW	KT PTW	Total		TKW PTW	KT PTW	Total	
South East Kowloon[1]								
Public Housing 2006					67,955		67,955	86.8
Private Housing 2006					10,339		10,339	13.2
Sub Total 2006					78,294		78,294	100.0
Public Housing 2011					67,955		67,955	75.6
Private Housing 2011					21,881		21,881	24.4
Sub Total 2011					89,836		89,836	100.0
Public Housing 2016	22,218	18,298	40,516	46.1	67,955	56,271	124,226	48.0
Private Housing 2016	32,604	14,810	47,414	53.9	98,013	40,956	138,969	52.0
Sub-total	**54,822**	**33,108**	**87,930**	**100.0**	**165,968**	**97,227**	**263,195**	**100.0**
Adjoining Sites[2]								
Private Housing	3,500	0	3,500		10,115	0	10,115	
Total	**58,322**	**33,108**	**91,430**		**176,083,**	**97,227**	**273,310**	

1. Private residential areas on top of rail depot (2A), trolley depot (1K) and in the office block (3T) are included.
2. Includes planning areas 3T, 3V and 3X.
3 Projected residential population figures and their breakdown information including development years are provided in the Development schedule in the Appendix.

Table 6.3 Employment in SEK by 2016 (includes allowance for ultimate development)

Use	Employment		
	To Kwa Wan PTW	Kwun Tong PTW	Total
Community, Social & Personal Services	12,781	8,076	20,857
Retail	17,248	7,261	24,509
HITEC	0	4,500	4,500
Office	4,530	0	4,530
EMSD	0	2,500	2,500
Hospital	0	3,500	3,500
Education	1,904	687	2,59191
Police	850	0	850
School Village	468	0	468
Metropolitan Park	100	0	100
Stadium	346	0	346
Kai Tak Node (Tourist Node)			
Retail	0	3,650	3,650
Hotel	0	825	825
Museum	0	100	100
Cruise Terminal	0	80	80
Total	**42707**	**33692**	**76399**

6.3.2 *SEKD Projected Flows*

6.3.2.1 The distribution of flows to TKWPTW and KTPTW, is based on the catchment area division of the SEKD. The sewerage catchment boundaries have, predominantly, been determined by the alignments of existing major stormwater conveyance systems and their extensions.

6.3.2.2 The SEKD catchment has been divided into ten sub-catchments (A, A1, B, C, D, E, F, G, H and I) as shown in **Drawing No. 22936/SW/003**.

6.3.2.3 Based on the catchment area division, it is proposed that sewage generated from subcatchments A, A1, B, C, D and E be conveyed to the To Kwa Wan PTW, whilst sewage generated from subcatchments F, G, H and I is proposed to be conveyed to the Kwun Tong PTW. Based on the above current population estimates, projected flows from the SEKD Planning Area are estimated as follows in **Table 6.4**. Full details including residential and commercial flows for intermediate periods are provided in the **Appendix 6A**.

Table 6.4 Estimated Sewage Flows from SEKD

	To Kwun Tong PTW	To To Kwa Wan PTW		
Year	2016	2006	2011	2016
Residential Flow (m^3/day)	25,243	18791	21561	39718

	To Kwun Tong PTW	To To Kwa Wan PTW		
Educational Flow (m^3/day)	354	391	518	944
Employment Flow (m^3/day)	11,692	4026	5436	14947
Total Average Flow (m^3/day)	38,825	23207	27514	57,735
Total Average Flow (m^3/s)	0.45	0.27	0.32	0.67

6.4 Assessment of Sewerage and Sewage Treatment Capacities

6.4.1 *Introduction*

6.4.1.1 The proposed SEKD will discharge sewage flows directly to both the Kwun Tong PTW and the To Kwa Wan PTW. These flows will then enter the existing SSDS Stage I tunnel system conveying flows to the Stonecutters Island Sewage Treatment Works (SCISTW). Therefore, the following assessments will focus on the impacts of the proposed SEKD on:

- SSDS Stage I;
- Existing trunk sewerage system; and
- The internal SEKD sewerage system.

6.4.2 *Assessment of Major SSDS Facilities*

Stonecutters Island STW and SCIMPS

6.4.2.1 As part of the assessment carried out to evaluate the impacts of the SEKD on the major existing and planned SSDS facilities, a comparison has been made on the projected flows to the Kwun Tong PTW and To Kwa Wan PTW, based on projections for these catchments as developed under the following Studies:

(1) Agreement No. CE 104/98, Strategic Sewage Disposal Scheme Stage II, Preliminary Project Feasibility Study (flow projections based on TPEDM Scenario II-August 1999 data);

(2) Agreement No. CE 85/98, Stage II Study On Review of Metroplan and The Related Kowloon Density Study Review (flow projections based on DEVIN model); and

(3) Agreement No. CE 25/98, Review of Central and East Kowloon Sewerage Master Plans (RC&EKSMP).

6.4.2.2 For all methods, the projected flows from the SEKD for years 2006, 2011 and 2016 have been based on the latest Preliminary Layout Plan as developed under this Study and the corresponding distribution of flows to the two PTWs. **Table 6.5** shows the projected flows to Kwun Tong PTW and To Kwa Wan PTW, for years 2006, 2011 and 2016, based on data from the TPEDM Scenario II – August 1999, DEVIN Model, and the data developed under the RC&EKSMP.

Table 6.5 Projected Flows to Kwun Tong PTW and To Kwa Wan PTW

	Year 2006 ADWF (m^3/s)			Year 2011 ADWF (m^3/s)			Year 2016 ADWF (m^3/s)		
PTW	TPEDM[1] Sc. II	DEVIN[2] Model	RC&EK[3]	TPEDM[1] Sc. II	DEVIN[2] Model	RC&EK[3]	TPEDM[1] Sc. II	DEVIN[2] Model	RC&EK[3]
Kwun Tong	3.79 (0)	3.77 (0)	4.30 (0)	4.26 (0.21)	4.18 (0.21)	4.93 (0.21)	4.58 (0.45)	4.53 (0.45)	5.24 (0.45)
To Kwa Wan	3.29 (0.37)	3.17 (0.37)	3.78 (0.37)	3.36 (0.45)	3.15 (0.45)	3.70 (0.45)	3.62 (0.67)	3.62 (0.67)	3.99 (0.67)

Notes:
1. The SSDS Stage II PPFS flow projections are based on development projections under PlanD's TPEDM Scenario II (August 1999) data.
2. The Metroplan Review projections are based on development projections under the DEVIN Model.
3. Central and East Kowloon projections are based on data obtained from the report titled "Technical Note No. 2 – Population and Land Use (Revised) dated July 2000" under the same study.
4. The flow figures shown in brackets refer to the contribution of flow from the SEKD, as developed under this Study (Table 6.4 refers).
5. Related flow calculations are provided separately in the Appendix to this report
6. Flow figures for 2016 allow for the ultimate development.