Table 3. Design criterion calculation.

Site Locations	Data Set	Peak flow, Q_{peak} (m^3/d)	Average daily flow, Q_{ave} (m^3/d)	Design Criterion, k
Taman Pandan Damai (PE: 2244)	MHk-01	1571.10	405.75	4.23
	MHk-02	1315.96	749.00	1.92
	MHk-03	2203.29	603.97	3.99
Bandar Putra (PE: 1694)	MH92b-01	1242.09	547.99	2.40
	MH92b-02	1142.29	487.96	2.48
	MH92b-03	1036.20	501.11	2.19
	MH92b-04	1410.74	501.10	2.98
	MH92b-05	1333.50	439.84	3.21

3.3 Flow pattern

Flow pattern of the three different site locations were investigated. Figure 1 shows the average flow, maximum flow and minimum flow analyzed in a day at Taman Pandan Damai. Based on Figure 1, it can be seen clearly the amount of daily flowrate at early of the day from period of 4am to 9am morning is higher compared to the end of the day from period of 9am to 12am midnight at Taman Panda Damai. However, there is another peak flow that occurred at 11.50am. This may happen and it does not rule out the high amount of rainfall that occurred and inflow to sewer pipeline at the time during the investigated period.

Figure 2 shows the daily flow pattern in Bandar Putra from 11 March 2016 to 8 April 2016. It can be seen clearly the peak flow happened at 5.20am morning. The peak flow in between the period from 5am to 9am was high compared to over the entire period. The high volume of sewage flow was detected in monitored manhole. This may happened due to residents preparing to go to work or school at the period, thus higher amount of wastewater was detected. It does not rule out the high amount of rainfall involved, because the peak flow was too high over the period. Another peak occurred during the period from 6pm to 8pm evening. This may happened due to residents coming back from work or school where sanitary activities were done.

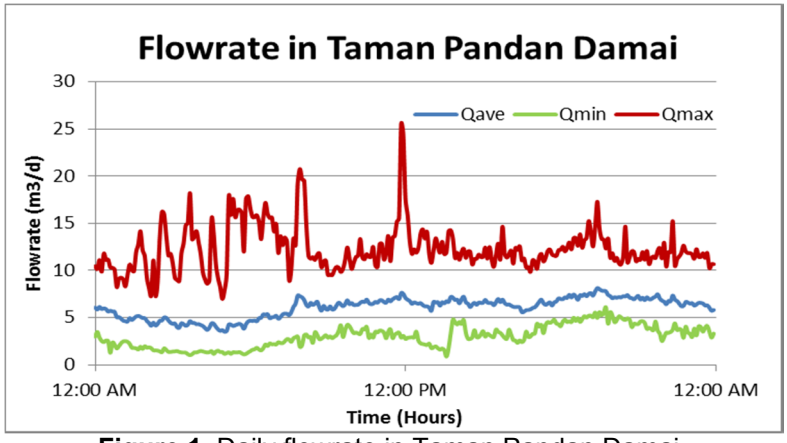

Figure 1. Daily flowrate in Taman Pandan Damai.

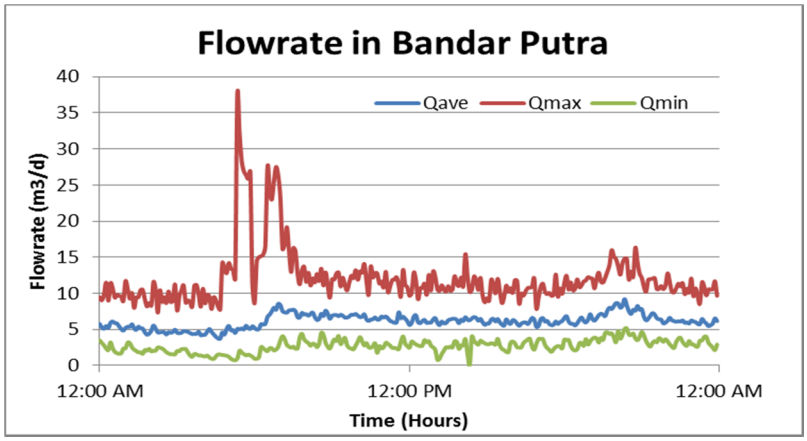

Figure 2. Daily flowrate in Bandar Putra.

4 CONCLUSIONS

The present study was designed to determine and compare the per capita flow as well as design criterion in the sewerage systems of Kuantan, Pahang to their counterpart in the MSIG. The objective was achieved. The overall average per capital flow, Q_{pcf} in this study is measured at 0.277 m^3/day/person, which is 23% higher than the 0.225 m^3/d/person stated in MSIG. Meanwhile, the resultant design criterion, k obtained from this study was 3.02, 36% lower than 4.7. This study has found that generally the sewer lines in the areas studied are sufficient to cater to the PE of those sites. Sanitary flow in sewer line is unpredictable, hence long term period investigations are necessary, with added input such as real time rainfall intensity data.

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