Paper P21

Estimation of baseflow index for the upper Langat river catchment, Selangor, Malaysia

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Baseflow, or groundwater runoff, is the flow component contributed to the river by groundwater. The purpose of this study is to estimate the Base Flow Index (BFI) for the upper Langat river catchment. The estimation of the index used the Ineson and Downing base flow separation method that estimated the groundwater discharge below the lower limit of the total hydrograph. The river discharge data recorded at Dengkil from 1960-2008 was used for this study. The estimated value of BFI for the upper Langat river catchment is between 0.50-0.51. The less extensive and thinner quaternary sediment cover in the upper catchment area is believed to limit the surface water and groundwater interaction.

Estimating the Baseflow Index is an important issue in hydrogeologic studies. In most cases, Baseflow Index is estimated by hydrograph separation. In hydrologic terms, hydrograph separation is the process where the storm hydrograph is separated into baseflow components and surface runoff components. Both these compenents are crucial for efficient development and management of groundwater resources.

Although several methods have been used to estimate ground-water discharge from stream flow records, the most commonly used is the estimation by the continues and long term of discharge into the stream. In other words, it requires an extended period of recording to estimate the long-term groundwater discharge. For Malaysian river, less study has been published in Base Flow Index.

The area of Langat river catchment is 1240 km2 and the length of the river is about 200 km. It is underlain by six lithologies which are comprised Hawthornden Schist, Kajang Formation, Kenny Hill Formation, granite, Tekali Quartz Ridge and alluvium (Anis Suhaila, 2007)(Figure 1). The Completed and and consecutive daily mean streamflow records from 1960 – 2008 of a streamflow gauging station in upper Langat river
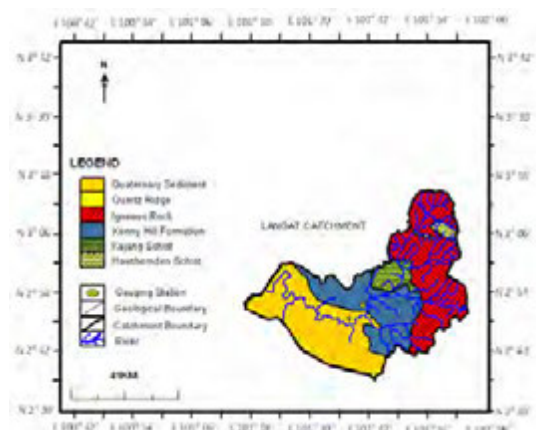

Figure 1: The map of study area and location of the gauging station.

catchment was choosen and the location of the station is also shown in Figure 1.

Ineson & Downing (1964) base flow separation method is approaches to separate base flow component and surface runoff (Figure 2). This method is used because it is more reliable and representing the real situation. The Base Flow Index (BFI) or reliability index, which is long-term ratio of base flow to total stream flow, can be related to the base flow response of a catchment (Nathan & McMahon, 1990).

Table 1 shows that the BFI value is between 0.50 - 0.51 because the location of stream flow gauging station is at the upper part of Langat river catchment. Furthermore, the less extensive and thinner alluvium cover along the river is believed to limit the surface water and groundwater interaction. Both these reason are generally controlled the value of BFI. By using this method, the value of BFI can be determined and this method is reliable to get the value of Base Flow Index. So, more research about this component should be extended to lower catchment of Langat River.

References

Anis Suhaila Mokhtar, 2007. Kajian Perhubungan Geologi dengan Kimia Air di Lembangan Langat, BSc. thesis (Unpubl.), University of Malaya.

Ineson, J., Downing, R.A., 1964. The ground-water component of river discharge and its relationship to hydrogeology. J Inst Water Eng 18:519–541

Nathan, R.J. & McMahon, T.A., 1990. Evaluation of automated techniques for base flow and recession analysis. Water Resources Research. 26(7):1465–1473
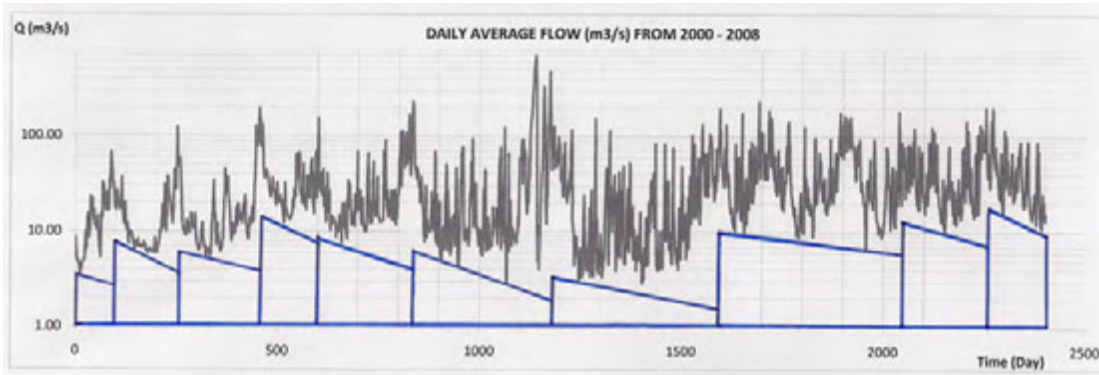
Figure 2: The Base flow separation method.

Table 1: The Base Flow Index

CATCHMENT	STATION NO	LATITUDE	LONGITUDE	AREA (KM^2)	LENGTH (KM)	TIME PERIOD ANALYZED	ANNUAL RAINFALL (mm)	TOTAL STREAMFLOW (m3/year)	BASEFLOW (m3/year)	BASEFLOW INDEX (BFI)	DISCHARGE (m3/s)
Langat	2816441	E101.68343°	N02.85643°	1240	200	1960 - 2008	2375.58	4.00E+11	2.05E+11	0.51	34.7