



UNIVERSITI PUTRA MALAYSIA

**STORMWATER QUALITY FROM THE SUNGAI LUI CATCHMENT,
MALAYSIA**

ABDUL HAMID.

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**STORMWATER QUALITY FROM THE SUNGAI LUI CATCHMENT,
MALAYSIA**

**By
ABDUL HAMID**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfillment of the Requirements for the Degree of Doctor of Philosophy**

2005



Dedicated

To

My father and mother, my father in law and mother in law, my brother and sisters, my late relatives and to my beloved wife Nigar Sultana Sehely and to my son Alvee Jawad Hamid



Abstract of the thesis presented to the Senate of the Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

**STORMWATER QUALITY FROM THE SUNGAI LUI CATCHMENT,
MALAYSIA**

By

ABDUL HAMID

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River water is continuously being impacted by pollutants generated from the catchment. In particular, substantial amounts of pollutants can be introduced to the rivers during storm events. This study was carried out to investigate the influence of storm events on the water quality parameters of the forested Sg. Lui catchment. Stormwater samples were collected from the Sg. Lui for 21 storm events between January 2003 to January 2004. Discharge, electrical conductivity (EC), pH, dissolved oxygen (DO), turbidity, total suspended solids (TSS), total phosphorus (TP), ammoniacal nitrogen (AN) and 5-day biochemical oxygen demand (BOD₅) were measured from the stormwater samples. Descriptive and inferential statistical analyses were carried out for the parameters studied.

The storm events sampled from the catchment were found to represent the 24th to 88th percentile of the average daily discharge for a typical year. Total suspended solids and turbidity appeared to be the major pollutants to the Sg. Lui catchment. The



results indicated a dilution-mobilization sequence in the concentration of TSS, TP, AN and the BOD₅ during the rising and falling limbs of the event hydrograph. A late flushing of materials was also observed, where much of the load was transported in the later half of an event. Event mean concentrations (EMC) were calculated for TSS, TP, AN and BOD₅ for the catchment. Hydrometeorological conditions of the catchment were used to explain the differences in the EMC values for the different events.

This study revealed that the water quality of the Sg. Lui catchment is influenced by the hydrometeorological conditions of the catchment. Statistical analyses confirmed the representativeness of the flow and the EMCs calculated for the Sg. Lui catchment. Discrete sampling enabled the detailed analysis of the hydrographs, pollutographs and loadographs. This assisted in understanding the processes influencing the temporal variability of the flow and water quality of the catchment during storm events.

**Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah**

**KUALITI AIR HUJAN DI KAWASAN TADAHAN SUNGAI LUI,
MALAYSIA**

Oleh

ABDUL HAMID

Disember 2005

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Air sungai dicemari secara berterusan oleh bahan pencemar dari kawasan tadahan. Sebahagian besar bahan pencemar masuk ke dalam sungai terutamanya semasa kejadian hujan berlaku. Kajian ini dijalankan untuk mengkaji pengaruh kejadian hujan ke atas parameter kualiti air di kawasan tadahan Sungai Lui yang berhutan. Sebanyak 21 kejadian hujan disampel antara Januari 2003 sehingga Januari 2004. Kadar alir air, kekonduksian elektrik (EC), pH, oksigen terlarut (DO), kekeruhan, jumlah pepejal terampai (TSS), jumlah fosforus (TP), ammoniakal nitrogen (AN) dan keperluan oksigen biokimia 5-hari (BOD₅) telah diukur daripada sampel kejadian hujan tersebut. Analisis statistik diskriptif dan inferens dijalankan keatas parameter yang dikaji.

Kejadian hujan yang disampel didapati mewakili persentil ke-24 hingga ke-88 daripada purata kadar alir harian untuk tahun 'biasa'. Jumlah Pepejal terampai dan kekeruhan merupakan bahan pencemar yang utama bagi kawasan tadahan urutan Sungai Lui. Keputusan analisis menunjuk perubahan pencairan-pergerakan pada



kepekatan TSS, TP, AN dan BOD₅ semasa tungkai menaik dan menurun hidrograf kejadian hujan. Kadar pelepasan bahan diperhatikan di mana kebanyakan daripada beban muatan telah dipindahkan pada peringkat separuh masa akhir kejadian hujan. Pengiraan kejadian purata kepekatan (EMC) terhadap TSS, TP, AN dan BOD₅ telah dilakukan. Keadaan hidrometeorologi kawasan tadahan digunakan untuk menerangkan perbezaan nilai EMC bagi kejadian hujan yang berbeza.

Kajian ini mendapati bahawa kualiti air Sungai Lui dipengaruhi oleh keadaan hidrometeorologi kawasan tadahan. Penyampelan diskrit membolehkan analisis hidrograf, graf pencemaran dan graf beban muatan yang terperinci. Ini membantu dalam memahami proses-proses yang mempengaruhi perubahan berdasarkan masa bagi kadar alir dan kualiti air kawasan tadahan semasa kejadian hujan. Penganalisaan ciri-ciri statistik mengesahkan keupayaan kadar alir dan EMC yang di kira dalam kajian ini untuk mewakili keadaan kawasan tadahan.

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