SILTATION MODELING FOR SELANGOR DAM IN HULU SELANGOR

INSTITUTE OF RESEARCH, DEVELOPMENT AND COMMERCIALISATION

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Tarikh : 21 Disember 2004

Prof. Madya Ir. Dr. Junaidah Ariffin
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Tuan/Puan

CADANGAN PROJEK PENYELIDIKAN FKA : SILTATION MODELLING FOR SELANGOR DAM IN HULU SELANGOR

Dengan hormatnya perkara di atas adalah dirujuk.

Sukacita dimaklumkan bahawa Jawatankuasa Penyelidikan, Pembangunan dan Pengkomersilan (URDC) diperingkat Fakulti telah membuat keputusan:

i. Bersetuju meluluskan cadangan penyelidikan yang dikemukakan oleh tuan/puan.

ii. Tempoh projek penyelidikan ini ialah 12 bulan, iaitu mulai 1 Januari 2005 hingga 31 Disember 2005.

iii. Kos yang diluluskan ialah sebanyak RM20,000.00 sahaja.

iv. Penggunaan geran yang diluluskan hanya akan diproses setelah perjanjian ditandatangani.

v. Semua pembelian peralatan yang kosnya melebihi RM500.00 satu item perlu menggunakan Pesanan Jabatan Universiti Teknologi MARA (LO). Pihak tuan/puan juga dikehendaki mematuhi peraturan penerimaan peralatan. Panduan penerimaan peralatan baru dan pengurusannya dilampirkan bersama.

vi. Semua peralatan/kelengkapan penyelidikan yang dibeli adalah menjadi hak milik fakulti. Semua perlatan/kelengkapan hendaklah diserahkan kepada pihak fakulti setelah tamat penyelidikan untuk kegunaan bersama.

vii. Seperti yang tuan/puan sedia maklum tuan/puan perlu membentangkan kertas kerja di Seminar Hasil Penyelidikan IRDC setelah projek tamat dijalankan nanti.

viii. Kertaskerja boleh dibentangkan di seminar selain yang dianjurkan oleh IRDC setelah 75% deraf awal laporan akhir projek dihantar ke IRDC untuk semakan. Walau bagaimana pun, tuan/puan perlu membuat permohonan kepada Institut Penyelidikan, Pembangunan dan pengkomersilan.

ix. Tuan/Puan perlu membelanjakan 50% daripada geran penyelidikan yang telah diluluskan bagi projek tuan/puan dalam tempoh 6 bulan pertama projek berjalan.

x. Pihak tuan/puan dikehendaki mengemukakan Laporan Kemajuan kepada IRDC 3 kali setiap tahun iaitu pada bulan April, Ogos dan Disember sepanjang penyelidikan tuan/puan berjalan. Laporan Akhir perlu dihantar sebaik sahaja projek penyelidikan disiapkan. Format menulis laporan akhir boleh diperolehi di IRDC.

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Tarikh : 31 Mei 2006
No Fail Projek : 600-IRDC/ST 5/3/917

YBhg Prof Azni Zain Ahmed
Penolong Naib Canselor
Institut Penyelidikan, Pembangunan dan Pengkomersilan (IRDC),
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YBhg Prof,

LAPORAN AKHIR PENYELIDIKAN '*SILTATION MODELING FOR SELANGOR DAM IN HULU SELANGOR*'

Merujuk kepada perkara di atas bersama-sama ini disertakan 2 (dua) naskah Laporan Akhir Penyelidikan bertajuk "Siltation Modeling For Selangor Dam in Hulu Selangor" untuk makluman pihak Prof.

Sekian, terima kasih.

Yang benar,

Prof Madya Ir Dr Junaidah Ariffin
Ketua
Projek Penyelidikan

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SILTATION MODELING FOR SELANGOR DAM IN HULU SELANGOR.

ABSTRACT

Reservoir sedimentation is a serious problem that warrants intensive investigation. Once operational, the inflow sediments will gradually accumulate within the dam area due to reduction in the velocity of flow. Subsequently, this reduces the storage capacity of the reservoir and increases maintenance operation. Thus, sediment monitoring and sampling is highly required to estimate the rate of deposition of sediment in a dam so that necessary measures can be taken to prevent loss of benefits.

In this study, field hydraulics and sediment data were used in the development of a sediment model. Data were extracted from three river systems namely Sungai Selangor, Sungai Gerachi and Sungai Luit. Sungai Selangor and Sungai Luit are the two major rivers that flow into the Sungai Selangor Dam which was developed and constructed for source of water supply.

The simulation of sediment deposition in a reservoir using any mathematical modeling can be further enhanced using the derived multi-layer perceptron (MLP) sediment model. In this study, the developed 3-layer MLP network structure model is proposed for Sungai Selangor to facilitate in the estimation of sediment deposition in the reservoir area of Sungai Selangor Dam. Four independent variables namely relative roughness on the bed (R/d_{50}), ratio of shear velocity and fall velocity (U^*/W_s), ratio of shear velocity and average velocity (U^*/V) and the Froude Number (V^2/gy) were used as input variables in the input layer and the total sediment load Q_T as the output variable.

Range of discrepancy ratios of 0.5-2.0, 0.5-1.75, 0.25-1.5 and 0.75-1.75 were used as measures of accuracy of the derived model. Discrepancy ratio is the ratio of the predicted or calculated sediment load to the measured sediment load. In the training phase, 86.8% of the data lies within the discrepancy ratio of 0.5 – 2.0 and a perfect 100% of the data lies within the same discrepancy ratio for the observed flow range. Values of R^2 in both the training and testing phases are 0.584 and 0.800 respectively. The root mean square errors show favourable results in comparison to the average sediment load for both testing and training phases.

Under normal weather flow pattern the graphs of inflow and outflow sediments exhibit a polynomial behaviour. The annual sediment volume was approximated to be 23,000 m^3. With sediment size range between 0.063 mm to 2.5 mm, the amount of sediment trapped in the reservoir is 100%. The time for the sediments to fill up half of its dead storage capacity was found to be 108.9 years. The above estimated time is valid under normal flow conditions and does not take into consideration any abnormality in the behaviour of rainfall and discharge (high intensity rainfall with high sediment transport rate) and for as long as there is no significant change in the geography and land-use development within the catchment in close proximity to the flood plain.

Keywords: Dam, multi-layer perceptron, sediment deposition, sediment transport.