

1986/004



# INSTITUTE of HYDROLOGY


**REAL-TIME DROUGHT MANAGEMENT  
SYSTEM FOR THE THAMES BASIN:**

**PROPOSALS FOR FURTHER WORK**

# **REAL-TIME DROUGHT MANAGEMENT SYSTEM FOR THE THAMES BASIN: PROPOSALS FOR FURTHER WORK**

## **1 INTRODUCTION**

A real-time drought management system has been implemented under contract to Thames Water by the Institute of Hydrology during 1986. The product is a decision support system designed to assist the water resource manager in assessing the reliability of the London and Farmoor systems of pumped-storage reservoirs to meet demands for water during drought periods. Changes in reliability as a consequence of changes in operating policy may be investigated and used to support a decision to modify the operating policy in a particular way. The system has been implemented on Thames Water's PDP11/73 microcomputer and forms a menu-driven suite of programs which makes extensive use of easily comprehended colour graphical displays and tables.

A feature of the contract was that much stress was put on producing an end-product which could be used operationally as early as possible. An operational system has now been achieved meeting the original contractual commitment. This proposal aims to set out a number of enhancements to the current system which are now considered desirable. It is recommended that a further contract be let as soon as possible in order that these enhancements can be completed in time to be used for drought management purposes during 1987.

The details of the proposals are presented in Section 2, a work schedule in Section 3, and the cost of the proposal in Section 4.

## **2 PROPOSAL**

### **A. System utilities**

1. A program to transfer historical rainfall and flow data from formatted data files to the data handling system random access files. This would be used primarily to replace recent data entered via the telemetry data acquisition task by quality controlled archive data as the latter becomes available. At present new historical data must be entered via forms provided by the "edit data archive" option. The formatted data files of archive data would be initially created from TW's data archive on the ICL and subsequently transferred to the PDP11/73. IH will supply the Kermit program to facilitate transfer of files between computers. TW will be responsible for work on the ICL required to implement this program and to prepare files prior to transfer.

2. A program to update the 30-day totals rainfall data set using the daily rainfall data set. This is used in the system principally in the calculation of weights based on the categorical probability rainfall forecast. At present this data set must be updated manually via the "edit data archive" option.
3. A program to re-initialise parameter sets of the data handling system using a formatted data file.

#### **B. Output options**

1. Graphical output is currently produced as lineprinter screen dumps. An option to provide high quality ink plots on a flat-bed plotter is required.
2. Improved lineprinter output from reservoir simulation programs. In particular all parameters defining a model simulation (operating rules, demands, etc.) would be included in the output.

#### **C. Reservoir simulation programs**

1. Extension to reproduce the operating strategy advocated in the Teddington proposal. This specifically requires modification of the Thames/Lee Apportionment Rule to allow the TWA50 rule to be implemented.
2. Consideration of the "Lee Bypassing" data set leading to a possible revision of the Low Hall daily flows specified for each month of the year.
3. Option to create "reservoir initialisation" data set during execution of the reservoir simulation task.

#### **D. Risk Analysis**

- i. Implement option to provide confidence limits for the risk estimates (see p 51-52 of technical report).
2. Implement option to compare two reservoir simulations on the same graph.
3. Introduce option to select a given year from the multiple scenarios and to plot the reservoir levels for that year.

4. Append additional scenarios to the multiple scenario option: zero rainfall simulation, n% standard rainfall profile (n = 50, 60, 75, 100), 1944 and 1976 rainfall profile. Plot these separately as part of risk analysis.

#### **E. Hydrological Analyses**

1. Explore effect of different categorical rainfall forecasts on risk assessment in the framework of a sensitivity analysis.
2. Explore effect of using historical flows in place of simulated flows in risk assessment, and in simulating reservoir levels for particular drought years.
3. Explore effect of using different numbers of scenarios on the risk assessment.
4. Make a comparison of new catchment average rainfall historical data sets with TW data set used for water resource planning in the context of its effect on risk assessment.
5. Consideration of the state updating procedure used in the rainfall-runoff model to gain operational experience as to when it is appropriate to use, and whether an improved scheme can be devised.

#### **F. Miscellaneous**

1. Improve program code and overlay structure to achieve faster execution.
2. Improvement of minor points of user interaction with programs, in the light of comments and discussion with TW staff.
3. Computer consultancy.

### 3. WORK SCHEDULE AND STAFFING

	Jan	Feb	Mar	Apr	May	Jun	
A.1			_____				KBB/RJM
A.2			_____				KBB/RJM
A.3			_____				
B.1		_____					KBB
B.2		_____					KBB/RJM
C.1				_____			RJM/DAJ/KBB
C.2				_____			RJM/DAJ
C.3					_____		RJM/KBB
D.1				_____			RJM/KBB
D.2		_____					KBB
D.3			_____				KBB
D.4					_____		RJM/KBB
E				_____	_____		RJM/DAJ
F		_____	_____	_____			KBB/RJM/DAJ /RFT

RJM Robert Moore (Project Manager)  
 DAJ David Jones  
 KBB Kevin Black  
 RFT Roger Templeman

#### 4. COSTING

Staff	19,200
Travel and Subsistence	100
Computing	2,000
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	£21,300
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The above costing is based on 1986/87 rates.