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LegCo Panel on Planning, Lands and Works

Implementation of Information Systems Strategy (Stage 2) in Water Supplies Department

Maintenance Works Management System and Laboratory Information Management System

PURPOSE

This paper is to brief Members of the implementation of Information Systems Strategy (Stage 2) in Water Supplies Department (WSD) which comprises two information management systems, namely Maintenance Works Management System (MWMS) and Laboratory Information Management System (LIMS), and the supporting data and network infrastructure. The capital cost of the project is estimated to be $40,253,000.

BACKGROUND

2. In order to meet WSD's longer-term operational requirements, the Director of Water Supplies (DWS), with the assistance of the Director of Information Technology Services (DITS) and the consultants, had completed a departmental Information Systems Strategy Study in March 1999. The study concluded that the current IT structure in WSD is far from adequate in supporting its business needs and therefore recommended an ISS with three major programs, viz. "Customer Service", "Water Supply and Distribution Operations" and "Management Information for Finance and Administration", for development under a 5-year plan.

3. On 5 February 2001, the Administration briefed the Legislative Council Panel on Planning, Lands and Works on the recommendations of the ISS Study and the implementation of a new Customer Care and Billing System (CCBS) as Stage 1 of the ISS Plan for WSD (i.e. the Customer Service programme). Members raised no in-principle objection to the ISS and the CCBS. The Finance Committee (FC) approved a new commitment of $253.1 million for implementing the CCBS on 9 March 2001.

4. To implement the Stage 2 of the ISS plan, WSD has employed consultants to conduct a feasibility study for the proposed MWMS, LIMS and the supporting data and network infrastructure which form parts of the Water Supply and Distribution Operations programme. The study, completed in June 2001, confirmed the viability of the systems. Subject to funding approval, we will start development work on the proposed systems in April 2002 for full commissioning by April 2005.

CURRENT SITUATION AND PROBLEMS

5. WSD's main business objective is to provide a full supply of potable water and flushing water to meet the demands of the territory. WSD, therefore, has to carry out regular maintenance of waterworks facilities, and a full range of systematic testing of water samples to ensure reliability and quality of water supplies. However, the department's efforts to better manage maintenance works and to further improve the quality and efficiency of laboratory work have been constrained by a lack of advanced information management tools.

Management of Maintenance Works

6. WSD issues about 20 000 works orders (at a total value of about $880 million) each year to external contractors for the maintenance of waterworks facilities including plants, equipment and water mains. With the completion and commissioning of new facilities, the number of works orders has been growing at an annual rate of 5%. At present, WSD relies on the Works Order System (WOS), developed in 1996 and maintained by the Treasury, for verification and payment of works carried out by maintenance contractors. As WOS is essentially an accounting system, the department has to rely on paper records in planning and scheduling maintenance activities as well as keeping performance data of contractors manually. As the maintenance records are located in different regions and offices, there are limitations and deficiency in developing a comprehensive management information system with which to prioritize the preventive maintenance program thereby optimizing the allocation of maintenance funds, and to enhance monitoring of contractors' performance and quality of maintenance works.

Water Quality Control

7. There are 16 laboratories in WSD providing water quality testing and analysis services to 20 treatment works across the territory and five regional offices as well as to other government departments such as the Food and Environmental Hygiene Department. Each year, the department collects about 150 000 water samples from various sampling points (e.g. catchments, impounding reservoirs, treatment works, service reservoirs, water mains and consumers' taps) and performs over one million tests for chemical, bacteriological

and radiological analyses to ensure that the quality of treated water conforms to the World Health Organisation (WHO)'s standards. While the department has been upgrading the instruments used to perform water quality tests, stand alone PCs continue to be used in individual laboratories for storing sample testing results. With the limitations of the existing PC-based laboratory information system which was developed in-house in 1990, staff in the laboratories have to rely heavily on manual processes for compliance checking against water quality guidelines, collating individual testing results and compiling management reports on water quality. This has led to considerable problems such as duplicated data entries, data inconsistency, fragmentation of information, lengthy response time in processing enquiries and inefficient reporting of management information.

8. WHO has announced that a new version of the "Guidelines for Drinking Water Quality" will be published in 2003. It is expected that the number of health-related parameters requiring testing would increase from 94 at present to about 120. This will certainly increase the volume of water quality tests and hence the demand for the processing capabilities of the laboratory computer system. To improve efficiency in managing information on water quality and to comply with the new requirements, there is a need for WSD to develop and implement an information management system for the laboratories using the latest IT available in the market.

Data and Network Infrastructure

9. To meet individual operational requirements, WSD has developed a number of stand alone computer-based applications on a piece-meal basis over the years, such as the Pipe Leakage Inspection System, Slope Management System and Water Quality Complaint System. As a result, operational data is kept at different offices/units scattered throughout the department and not in a standard format that can be shared readily. This hinders a speedy response by these systems thereby affecting the services to the public. In addition, the existing office network in WSD is unable to support the required increase in the number of work stations from the existing 1 200 to 1 600 along with the implementation of MWMS and LIMS. Also, the existing office network has limited capacity for transmitting spatial data such as engineering drawings and geographical information from the Drawing Office to users in WSD's headquarters and five regional offices.

The Proposed Systems

10. The new systems will be developed on an open-platform to enable interface with Treasury's computer systems for payment purpose, with CCBS (i.e. Stage I of ISS) and other existing and future WSD computer systems. The MWMS will interface with the LIMS through the supporting data and network infrastructure to form an integrated system with 350 existing and 400 new work stations.

11. The proposed systems will maintain a corporate data centre to provide system functions on works orders management, maintenance works progress management, contractors' performance management, water sample analysis management and laboratory administration to support the day-to-day operation of some 1 500 staff in five regional offices, 16 laboratories and the headquarters of WSD. It will improve the capacity of the existing office network to cater for increased communications and allow efficient transmission of spatial data. In addition, it will also offer on-line service for the submission of job records by contractors through the Internet. A summary of the major functions of the proposed system is at **Enclosure 1**.

ANTICIPATED BENEFITS

Savings

12. It is estimated that implementation of the proposed systems will give rise to annual savings of $19.5m, of which $11m can be achieved by better planning and scheduling of preventive maintenance works and deletion of five posts of Works Supervisor and Artisan by 2006-07 as a result of streamlining of work. Through natural wastage, retraining and redeployment, no staff redundancy would arise. The remaining annual savings are achieved by improved efficiency in operation, reduced WOS' share of the operating costs of computer systems at the Treasury, and avoidance of the need to enhance existing computer networks and provision of additional staff to cope with the additional water quality test requirements in compliance with the forthcoming revision in WHO's guidelines. A summary of the savings is at **Enclosure 2**.

Other Benefits

13. In addition, the proposed systems will also bring about the following improvements -

(a) Better information retrieval and data management

The new systems will maintain records of maintenance works and water testing results to enable efficient retrieval by works and laboratory staff. Such information will also be shared among various WSD officers reducing the need for duplication of records. The availability of timely and good quality data will enhance WSD's operational efficiency by facilitating better management decision-making at corporate and regional levels.

(b) Reduced inconvenience caused by maintenance works to the public

The new MWMS with comprehensive information on each

maintenance job will facilitate close monitoring of contractors' performance to ensure that works are delivered in accordance with the prescribed requirements including the time taken to complete the job. As a result, inconvenience to the public such as that caused by road opening or interruption of water supply will be reduced to the minimum.

(c) Better services to customers and business partners

With the support of electronic service delivery provided by the integrated system, WSD will be able to receive job records submitted by contractors and exchange underground utility plans with utility undertakers electronically through the Internet. The availability of centralized corporate data will also enable frontline staff to handle a majority of enquiries and service requests, such as water suspension schedule and progress of maintenance works, direct.

(d) Enhanced quality assurance of water quality data

The new LIMS will enable WSD laboratories to achieve a higher level of quality assurance of water quality data through capturing results directly from most water test instruments for further analysis, computation and collation, reducing the need for manual data transcription and data entry. It will also support more frequent dissemination of updated water quality test reports and statistics through the WSD's web site.

COSTS

14. The total non-recurrent cost for implementing the proposed system is estimated to be around $40 million. Of this amount, $36 million is for the purchase of computer hardware and software and outsourcing for site preparation and system development. The remaining $4.25 million is to meet the cost of a project team of three contract staff to support the implementation of these three programmes. Upon full commissioning in 2005-06, the estimated annually recurrent cost of the proposed systems will be $5.055 million and then $5.44 million from 2006-07 onwards. A detailed breakdown of the non-recurrent and annual recurrent costs is at **Enclosure 3**.

COST-BENEFIT ANALYSIS

15. A cost-benefit analysis indicates that this project will break even in the year 2008-09 (i.e. three years after implementation) and achieve savings of $19.5 million a year thereafter. A detailed cost-benefit analysis is at **Enclosure 4**.

IMPLEMENTATION PLAN

16. We estimate that implementation of the proposed systems will be completed in phases from November 2003 to April 2005. A proposed implementation plan is as follows -

	Activity	Target Commencement Date	Target Completion Date
(a)	Preparation of tender document	April 2002	October 2002
(b)	Tendering for implementation service including provision of hardware and software	November 2002	April 2003
(c)	Site preparation, installation of hardware, software and data conversion	May 2003	December 2004
(d)	System development and testing	April 2003	January 2005
(e)	System live run for		
	(i) data infrastructure		November 2003
	(ii) LIMS		March 2004
	(iii) MWMS		April 2005

Way Forward

17. Subject to the views of Members, we will submit the proposal on implementation of MWMS, LIMS and the supporting data and network infrastructure to FC on 26 April 2002 for funding approval.

18. The remaining part of the ISS Plan covers those IT systems which aim to enhance control and monitoring of the operation of waterworks installations and to support internal management of financial and administrative matters of WSD. Subject to findings of feasibility studies, we will seek Members' views on the further implementation of the ISS Plan.

Works Bureau
February 2002
[L:\WSD\Panel-LIMS3]

Enclosure 1

Summary of Major Functions of the Proposed Maintenance Works Management System and Laboratory Information Management System

Maintenance Works Management System (MWMS)

The proposed MWMS will provide an integrated solution to meet the requirements on the management of maintenance works in the Water Supplies Department (WSD). The major functions of MWMS include -

(a) capture and process work requests for maintenance works;

(b) schedule and manage works orders and pre-determine the programme and standards for the maintenance works;

(c) schedule staff resource for site supervision and maintain site inspection records, progress reports and audit results of maintenance works;

(d) maintain history of maintenance works;

(e) process job records submitted by contractors for measurement and payment;

(f) interface with the Ledger Accounting and Financial Information System and the Payment of Creditors System of the Treasury to enable financial control and to arrange payment to contractors for each works order;

(g) provide on-line facilities for data entry and enquiry, and submission of job records by contractors; and

(h) generate management information and regular reports on contractors' performance.

Laboratory Information Management System (LIMS)

The proposed LIMS will provide facilities to support the day-to-day water testing and laboratory operations of WSD. The major functions of the new system include -

(a) schedule and manage sample collection, sample analysis and quality assurance activities;

(b) develop reference data to facilitate evaluation of test results;

(c) maintain history of the test results;

(d) maintain inventory information on equipment and consumables for the water treatment process;

(e) provide on-line facilities for data entry and enquiry; and

(f) generate management information and regular reports and statistics on water quality.

Enclosure 2

Summary of annual savings (from 2007-08 onwards) expected from the proposed Maintenance Works Management System and Laboratory Information Management System

		($ '000)
(i)	Staff savings	1,292
(ii)	Reduced requirements for scheduled maintenance	9,222
(iii)	Direct maintenance cost for WOS and existing computer networks	444
(iv)	Reduction in the use of paper	10
(v)	Improvement of staff efficiency	434
(vi)	WOS' share of operating costs of Treasury systems	4,368
(vii)	Savings resulting from avoidance of the need to enhance existing computer networks and provision of additional staff to cope with additional water quality test requirements.	3,746
	Total Savings	19,516

Enclosure 3

Breakdown of non-recurrent and recurrent costs of the proposed Maintenance Works Management System and Laboratory Information Management System

(A) Non-recurrent Costs

		($ '000)
(a)	Computer hardware, software and communication and network equipment	12,466
(b)	System development and implementation services (including training and site preparation)	17,543
(c)	Data conversion	2,725
(d)	Contingency	3,274
(e)	WSD contract staff	4,245
	Total	**40,253**

(B) Recurrent Costs

		2006-07 onwards ($ '000)
(a)	Computer hardware, software and communication and network equipment maintenance	2,118
(b)	System support services	2,582
(c)	Consumables	156
(d)	WSD contract staff	584
	Total	**5,440**

Enclosure 4

Cost-Benefit Analysis of the Maintenance Works and Laboratory Information Management Systems ($ '000) - at 2001 prices

	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Non-recurrent Expenditure (a)	**1,415**	**20,273**	**15,761**	**2,804**	**0**	**0**	**0**	**0**	**0**
Recurrent Expenditure (b)	**0**	**1,078**	**2,739**	**5,055**	**5,440**	**5,440**	**5,440**	**5,440**	**5,440**
Total Cost (c) = (a) + (b)	**1,415**	**21,351**	**18,500**	**7,859**	**5,440**	**5,440**	**5,440**	**5,440**	**5,440**
Total Savings (d)	**0**	**359**	**7,856**	**11,502**	**17,516**	**19,516**	**19,516**	**19,516**	**19,516**
Net Savings (d) - (c)	**(1,415)**	**(20,992)**	**(10,644)**	**3,643**	**12,076**	**14,076**	**14,076**	**14,076**	**14,076**
Net Present Value (4%)[1]	**(1,415)**	**(20,185)**	**(9,841)**	**3,239**	**10,323**	**11,569**	**11,124**	**10,697**	**10,285**
Net Cumulative Savings (4%)	**(1,415)**	**(21,600)**	**(31,441)**	**(28,202)**	**(17,879)**	**(6,310)**	**4,814**	**15,511**	**25,796**

[1] A discount rate of 4% is adopted for the financial appraisal of a computer project where the cashflow is expressed at constant prices.