



Post Implementation Audit of the District's Computerized Maintenance Management System

Audit #01-10

**Prepared by
Office of Inspector General**

**Allen Vann, Inspector General
John Lynch, Lead Information Systems Auditor**



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

3301 Gun Club Road, West Palm Beach, Florida 33406 • (561) 686-8800 • FL WATS 1-800-432-2045 • TDD (561) 697-2574
Mailing Address: P.O. Box 24680, West Palm Beach, FL 33416-4680 • www.sfwmd.gov

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Re: Final Report - Post
Implementation Audit of the District's
Computerized Maintenance
Management System, Audit #01-10

This audit was performed pursuant to the Inspector General's authority set forth in Chapter 20.055, F.S. The audit focused on assessing the extent to which the District's computerized maintenance management system (CMMS) is providing the anticipated and desired benefits in meeting management and maintenance needs of the Water Resource Operations Group. This report was prepared by Mr. John T. Lynch, Lead Information Systems Auditor.

Sincerely,

Allen Vann
Inspector General

AV/jl
Enclosure

c: Frank Finch
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INTRODUCTION

This report details the result of our audit of the Computerized Maintenance Management System (CMMS) used by the Water Resource Operation Group for tracking their operation and maintenance of the District's structures and canals including nearly 1,800 miles of canal and levees, 293 major control structures, 27 major pump stations, and close to 2,000 small structures.

Funding for operations and maintenance are included in the District's "Program C: O&M Regional Flood Control Systems." The fiscal year 2001 budget for Program C is \$79 million.



Structure S-79 on the Caloosahatchee River

CMMS has been in place since late 1996 and was designed "to assist in the planning, management, and administrative procedures required for effective maintenance".¹ CMMS currently tracks over 5,000 District assets including buildings, structures, canals, levees, gates, weirs, culverts, vehicles and equipment.

¹ CMMS, ODM Business Case Cost-Benefit Analysis (1995, April 18), Executive Summary.

BACKGROUND

In 1985 the State Auditor General recommended that the District use a maintenance management type system for its infrastructure. In addition, in two separate technology assessments conducted in 1989 and 1992, respectively, Andersen Consulting recommended that the District use a Computerized Maintenance Management System (CMMS) in support of the field station and pump station activities.

In early 1995, the then Operation and Maintenance Department developed a business case to support the purchase and implementation of CMMS. The software was procured through a Request for Proposal (RFP) that resulted in a contract awarded in late 1995 to Synergen Associates, Inc. (Synergen) for their Computerized Maintenance Management System software product. The system was implemented in October 1996 (FY 1997). (See Appendix A.) Costs since inception are summarized below:



	Fiscal Year	Amount
Contract Amount	1995	\$275,432
Amendment	1996	23,900
Consulting P.O.	1997	5,355
Staff Support and Software Maintenance *	1998	110,163
	1999	114,200
	2000	118,449
	2001	122,921
Total		\$770,420

* source: WRO, Engineering & Business Process Department

These costs do not include the costs in time and effort required by District employees to continually feed new information into the system.

OBJECTIVES, SCOPE, AND METHODOLOGY

The objectives of this audit were to:

- Determine the extent to which the District's Computerized Maintenance Management System (CMMS) is providing the anticipated and desired benefits in meeting the management and maintenance needs of the Water Resource Operations Business Group.
- Ascertain that the system is providing accurate and complete information.
- Ensure that adequate controls have been implemented in the operations and maintenance of the system.

Our scope included a review of the system from implementation to the current period.

Our methodology included:

1. Gaining an understanding of the system through a review of:
 - The business case document,
 - Request for Proposal, and
 - Contract C-6593 with Synergen.
2. Reviewing current operational performance reported with CMMS as measured against the "baseline performance" referenced in the business case document.
3. Evaluate the Information Systems controls over:
 - Access & Security,
 - Data Entry & Verification,
 - Backup & Recovery, and
 - Program/Data "Change Control" Process.

4. Interview the CMMS users and technical support staff to determine:

- Sources of input data,
- Operation Information requirements,
- Use of System Reports, and
- Unmet needs.

This audit was conducted in accordance with "generally accepted government auditing standards" as promulgated by the Comptroller General of the United States. In addition, we were guided by the "Standards for Information Systems Auditing" as developed by The Information Systems Audit and Control Foundation Standards Board. Fieldwork done for this audit was concluded in April 2001.

EXECUTIVE SUMMARY

The use, reports generated, access & security, and future plans for the CMMS were reviewed. This review resulted in the following findings.

The CMMS lacks user confidence in the accuracy of cost information for both labor and materials per work order. The number of interfaces to other District systems and lack of reconciliation of shared information from these other systems has resulted in inaccuracies in CMMS reports.



The system has provided the ability to better plan work activities, review the backlog of work orders, and develop preventative maintenance schedules. However, the system has not met the stated objectives of the “business case” used to justify its implementation.

Controls over access authorization, program changes and database backup storage need to be strengthened.

CHAPTER 1: The System

Overview

The system consists of the following component systems, database files and interfaces to other District systems:

- Component Systems
 - Resources - employees, assets, and accounts
 - Maintenance - Work Orders
 - Regular
 - Preventive
 - Emergency
 - Purchasing - Purchase Orders & Invoices
 - Inventory - Inventory reference
- File System utilizes an Oracle relational database management system
- Interfaces (to other Payroll, Financial, and Fuel systems)
 - Employees, Leave, and Labor time keeping
 - Purchase Orders and Invoices
 - Receiving and Inventory
 - Fuel
 - Job Charge Numbers

The system uses inputs from individuals for time keeping, supervisors for the creation of work orders, stores keepers for inventory, and administrators for preventive maintenance schedules. Preventive maintenance scheduling is established in CMMS by input from the System Administrator(s).

CMMS Interfaces to Other District Systems

The CMMS interfaces to the Ross Payroll system, the AMS Local Government Financial System and the Traks Fuel System. There are a total of eleven interfaces for the exchange of information between these systems. (See Appendix B.)

They consist of the following:

- Load Leave Summary (Ross)
- Post DTA (Ross Distributed Time and Attendance)
- Cost Labor (LGFS)

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- Load Invoices (LGFS)
 - Load Inventory (LGFS)
 - Load Inventory Log (LGFS)
 - Load PO (LGFS)
 - Load Receiving (LGFS)
 - Load Employees (Ross)
 - Fuel Interface (TRAKS)
 - Work Order Number (LGFS)

We found that the information transferred between these systems is not reconciled and in some cases (CMMS inventory) is only used as a reference. As a result, the accuracy of the data provided in CMMS for cost of time and materials per work order is questionable. There is currently an initiative underway to reconcile the Pay Period information between the Ross payroll information and the CMMS timekeeping information.

CMMS Survey and Interviews

In order to evaluate the benefits and identify concerns with use of CMMS, a survey was developed. (See Appendix C.) The survey questions were based on the benefits described in the “OMD Business Case Cost-Benefit Analysis” report dated April 1995.

This included:

- Cost Accountability,
- Improved Budgeting and Cost Control,
- Improved Work Documentation and Audit Trail,
- Availability of Maintenance Reports,
- Availability of Equipment and Work History,
- Cost Distribution for Maintenance,
- Better Planning & Scheduling,
- Work Measurement, and
- Improved Quality.

We surveyed over 20% of the authorized District users ([see page 12](#)). Those surveyed included Crew Chiefs, Planners/Schedulers, Supervisors, Administrators, and Directors. Of the 91 surveyed, 80%, or 73 of the survey group, responded. Of the 73 respondents, 66 indicated they currently use the System.

The summarized results of the 66 system users' responses is as follows:

Success in Achieving Business Case Proposed "Target" Benefits with CMMS	Yes	No	Do Not Know
Cost Accountability: Ability to trace specific job cost, accuracy of timesheet information, and improved tracking of material cost.	38%	24%	39%
Improved Budgeting and Cost Control: Improved budget process, controlling (decreasing) cost, and reducing unplanned expenditures.	14%	37%	49%
Improved Work Documentation and Audit Trail: Improved documentation of work and ability to tracing history of work & cost.	63%	18%	19%
Availability of Maintenance Reports: Increase in availability of maintenance reports and regular review of maintenance reports.	40%	42%	18%
Availability of Equipment and Work History: Availability of work history and regular review.	19%	44%	37%
Cost Distribution for Maintenance: Better labor and material cost distribution.	26%	24%	50%
Better Planning & Scheduling: Improved planning and scheduling of work.	41%	36%	23%
Work Measurement: Improved ability to measure performance.	23%	35%	42%
Improved Quality: Improved quality of maintenance and better planning/scheduling of preventive maintenance.	29%	30%	42%

The survey indicates that CMMS has only made a significant improvement in "Improved Work Documentation and Audit Trail". All other surveyed areas have shown no significant improvement with the implementation of the Synergen Computerized Maintenance Management System. The system does not appear to have met the objectives of the business case.

Written comments included in the survey indicate that CMMS had improved the planning and scheduling of work. This includes better use of resources, tracking of scheduled work activities, and the development of a backlog list of work orders for scheduling. However, problems noted with CMMS included: inaccuracy in cost information for time and materials, the system's inability to meet the needs of fleet management, a need for additional training, and the lack of consensus on what data needs to be collected and reported.

In addition, selected staff members were interviewed at the Field Operations Center, West Palm Beach, Clewiston, Miami, Homestead, and Okeechobee Field Stations on their use of the system. These interviews were used as follow-up to the survey.

A summary of these interviews indicated that:

- Although the CMMS Fleet Module was capturing the asset information and the time/materials for work orders, it was not providing the staff with the tools necessary to analyze the effectiveness of the fleet program. The system lacked some of the functionality found in the District's previous PC based FMIS system. Also, there are some concerns about the ability of the system in scheduling preventative maintenance beyond date triggered events. This includes maintenance based on "miles traveled" or "hours of use".
- In order to provide accurate reports, the staff at one field station uses a monthly report using a combination of data for work order labor hours from CMMS and material cost information directly from LGFS by accounting "object code".
- CMMS has improved work order timekeeping. However, inventory information, standard preventative maintenance requirements and equipment history detail information are still kept in hard form.
- The staff has confidence in the Labor hours by Work Order number that are entered by the work crew, supervisors, or the administrative staff. However, because the staff is not confident in the material cost information in CMMS it is reported using LGFS.
- Preventative Maintenance (PM) use varies from location to location based upon the unique functions and preferred methods used at that location. It can vary from creation of a monthly work order list to open annual work orders that are only closed at the end of the year. In some cases where CMMS PM scheduling does not fit the nature of the work, such as vegetation management, is not used at all.

CHAPTER 2: System Report Utilization

Report utilization is an indicator of how the information collected in CMMS is used by staff. The current reports used by staff consist of eight standard reports and to a lesser extent some custom reports.

Of the surveyed CMMS users, the reported utilization is as follows:

Report Name	% of surveyed users utilizing the report
Time Keeping Report	73%
Total Payroll Hours by Charge No. and Task within date	50%
Employee Pay Period Time Report	47%
Work Order Backlog Report	47%
Work Order Detail Report (Labor & Materials)	38%
Work Order Labor Report (Labor only)	36%
Fleet Report	21%
Employee Listing Report	18%
Other Custom Reports as requested	15%

Many of the 66 respondents utilized more than one report. However, 7 (11%) did not respond to which reports they used or indicated they used “none” of the reports. This group that indicated “none” were primarily Crafts or Technical personnel. Three Supervisors did not indicate which reports (if any) they used.

The most frequently used report, at 73%, is the CMMS the Time Keeping report. The next most frequently used report, excluding the other payroll/timekeeping reports, is the Work Order Backlog Report. The Work Order Backlog Report provides a good source of information for planning, scheduling and tracking of outstanding work order requests.

Two other reports, Work Order Detail and Work Order Labor are use by 38% and 36% of the users, respectively. However, since there is no reconciliation of the labor and materials cost to the supporting systems (Ross and AMS), the accuracy of these reports is questionable.

Recommendation:

(1) In order to provide accurate reporting of materials and labor costs by work order in CMMS, the information should be reconciled to Ross HR/PR and AMS LGFS on a regular basis.

Management Response: A CMMS material transactions report has been developed for Field Station personnel to be able to reconcile material transactions entered in LGFS to what is posted to CMMS. SOP's have also been developed which state how often these should be run and what to do in the event a transaction does not show or is in error. Currently the Clewiston Field Station is utilizing and testing this report and it will be rolled out to the remaining field stations within the next several months.

SOP's have also been developed to prevent changes being made in Ross after timesheets have been uploaded from CMMS. All labor cost discrepancies identified have been due to changes being made in the Ross system after upload from CMMS, therefore causing inconsistencies between the two systems. Field Station timekeepers must be trained that any post payroll changes must be made in CMMS as well as Ross. The labor cost interface is now run manually by the CMMS Administrator when accounting gives notification that the JV entries have been completed for each pay period. This ensures that the interface runs and all errors are corrected. Since CMMS does not include employee wage rates, there is no way to verify that the labor costs are accurate coming from LGFS.

Responsible Division/Office: WRO Field Stations and CMMS Administrator.

Estimated Completion Date: All field stations by 10/01/01

CHAPTER 3: Access & Security

System Security Administration - Authority

There are 1.5 full time employees assigned as CMMS Administrators. Access to the system is the responsibility of the CMMS system administrator(s). The CMMS administrator works in the Water Resources Operations Business Group and reports directly to Technical Services Division Director.

The CMMS system administrator, using an approved “CMMS New Employee/User Form”, assigns user accounts. In addition, the database administrator in the Information Technology Division must also grant users access to the District’s Oracle relational database management system. This provides for good separation of duties in establishment of new accounts.

User Access Authorization

These “employee/user” approval forms are filed in the Technical Services Division. A review of this file revealed that a few of these forms are not initialed and/or dated by the administrator. Also, there appears to be no specific order to how these forms are filed.

During our fieldwork we found that there were 409 authorized CMMS users. We verified the 409 users against the current employee roster. There were four accounts (1%) in error. These errors consisted of two duplicate accounts and two accounts where there was no employee identification number match to the roster. The CMMS system administrator corrected these errors.

Recommendation

(2) The CMMS New Employee/User Form should always be initialed and dated to reflect any action(s) taken.

Management Response: This procedure has already been implemented.

Responsible Division/Office: WRO CMMS Administrator

Estimated Completion Date: Completed.

Backup & Recovery

The CMMS Oracle production database files reside on the District's Digital Equipment Corporation Alpha server computer system. These files (tables) are backed up to disk (mirror image) each weekday night. Another backup to disk is also done with the system down on Saturday night.

The backup disk files are copied to magnetic tape cartridges each Thursday in the early morning and on Saturday's. These backups include the entire Oracle database system as well as the backup disk files. There are five sets of backup tape cartridges rotated through this process. One set is kept in the computer room and the other four sets are kept in the District's vault located in the B-50 building.

Recommendation:

(3) For the purposes of disaster recovery, the rotation of backup tapes for the District's Oracle databases should include one set of backups being located off-site in the West Palm Beach Field Station's walk-in storage vault.

Management Response: This is the responsibility of Information Technology and will be forwarded to them for a response.

Responsible Division/Office: Information Technology

Estimated Completion Date: Pending

Program/Data Change Control

The CMMS database administrators maintain two environments for the System. One environment called "production" contains the current application software and live data files. The other environment is called "test" and is used to test changes to the programs or data. The use of multiple environments is a recommended practice to protect the production system from errors during development and testing.

Changes to computer programs such as patches, new releases, and custom modifications are part of application program support. Change control normally involves the following steps:

- Change Request,

-
- Change Authorization,
 - Development and Testing,
 - Change Approval, and
 - Implementation.

These steps can be supported by a change request form that would require; change authorization, testing review, and production implementation signature approvals.

In supporting CMMS, the staff does not follow a standard procedure that uses an application program change request form with authorization approvals. With a large support staff “separation of duties” control for implementation of changes can be achieved by having a different support staff member (other than the programmer) implement the change. However, with a small support staff separation of duties is not always practical. Change control in these situations can be mitigated with a formal “implementation” approval process.

Recommendation:

(4) A “CMMS Program Change Authorization” form with signature approval for change authorization, testing review, and production implementation should be developed and utilized by the support staff.

Management Response: A form will be developed to allow user signoff and will be kept in a central location.

Responsible Division/Office: WRO CMMS Administrator.

Estimated Completion Date: 05/30/01.

CHAPTER 4: Future Plans

The District is currently considering the replacement of the nearly ten year old Ross Human Resource/Payroll System and the AMS Local Government Financial System with an Enterprise Resource Planning (ERP) system. ERP's are software systems that integrate the gamut of any business enterprise including manufacturing, distribution, personal, project management, payroll and financials. These system take full advantage of new technologies such as Web enablement, e-business, relation database management systems, computer aided software development tools, object oriented programming languages, client/server architecture, and open systems portability.

The District has established within the Corporate Resource Business Group a MIS implementation project team to "select and implement new computer hardware and software for all financial and human resource applications." In addition, the Government Financial Officers Association (GFOA) research center developed a report for the District titled "Enterprise Financial System Needs Assessment: Findings Opinions and Recommendations."

In the report the GFOA includes work order integration as part of an ERP system. Work order costing and tracking in an ERP system would duplicate what the CMMS does. With work order management as part of any new ERP system there would be no need to interface or reconciliation between various other systems. There is an aspect of CMMS that is not addressed in the GFOA report, preventative maintenance work order scheduling.

Recommendation:

(5) Work Order costing and tracking should be part of the specifications for any new ERP software system under consideration as a replacement for the District's current Human Resource and Financial systems.

Management Response: This has already been included in the MIS/ERP needs assessment. This was sent via e-mail to Steve Parris on 4/27/01. The implementation date of the new MIS/ERP system is unknown at this time.

Responsible Division/Office: WRO Technical Services/MIS Project Team.

Estimated Completion Date: Pending

Recommendation:

(6) If Preventative/Fleet Maintenance scheduling of work orders cannot be included in the District's future ERP system specifications, a separate preventive maintenance scheduling software system should be implemented.

Management Response: This has already been included in the MIS/ERP needs assessment. This was sent via e-mail to Steve Parris on 4/27/01. The implementation date of the new MIS/ERP system is unknown at this time.

Responsible Division/Office: WRO Technical Services/MIS Project Team

Estimated Completion Date: Pending

CONCLUSION

The CMMS has not provided the benefits projected in the business case used to support its procurement and installation. The “stand alone” nature of the Synergen system and the number of interfaces to other District systems have made the implementation, use and reconciliation of the information difficult. After over four years of operation, the system has not been able to fully meet the maintenance management needs of District staff.



With the planned replacement of the current Human Resource and Financial systems that are the main interfaces to CMMS, it may be time to consider a replacement of the Synergen Computerized Maintenance Management System as part of the District's overall Information Technology strategic planning.

GLOSSARY of TERMS

These definitions were developed by District staff or were drawn from the "Free On-line Dictionary of Computing," by Dennis Howe @ Web Site www.foldoc.org.

AMS (AMS system, LGFS or Advantage)

American Management Systems, Inc. is a software development and marketing company located in Fairfax, Virginia. The District utilizes the AMS Local Government and Financial System for financial/administrative management (now referred to as the Advantage System.)

application program (Or "application")

A complete, self-contained program that performs a specific function directly for the user. This is in contrast to systems software such as an operating system (OS), which exists to support application programs.

audit trail (computer)

A record showing who has accessed a computer system and what operations he or she has performed during a given period of time. Audit trails are useful both for maintaining security and for recovering lost transactions.

backup

A spare copy of a file or system of files, usually kept on magnetic tape or other removable medium, for use in the event of failure or loss of the original files or system.

change control

In a computer production program or database application, the process of administering modifications to the programs or data. This includes administrative authorization approval and providing an audit trail for modification activities.

client-server

A common form of distributed system in which software is split between server tasks and client tasks. A client sends requests to a server, according to some protocol, asking for information or action, and the server responds.

computer aided software development

A technique for using computers to help with one or more phases of the software life cycle, including the systematic analysis, design, implementation and maintenance of software.

crash

A sudden, usually drastic failure of a computer system as a result of a hardware or software problem.

e-business (electronic commerce)

Business conducted using electronic media such as the Internet, other computer networks, wireless transmissions, etc

ERP (enterprise resource planning)

Any software system designed to support and automate the business processes of a medium and large business. This may include manufacturing, distribution, personnel, project management, payroll, and financials.

hardware

The physical, touchable, material parts of a computer or other system. The term is used to distinguish these fixed parts of a system from the more changeable software or data components.

information systems security

Control techniques and measures applied to an Information Technology Process that satisfies the business requirement to safeguard information against unauthorized use, disclosure or modification, damage or loss and is enabled by physical, logical and administrative controls which ensure access to systems, data and programs is restricted to authorized users. (Brian A. Coleman, CISA)

interface

A boundary across which two systems communicate. An interface might be a hardware connector used to link to other devices, or it might be a convention used to allow communication between two software systems. Often used to share data.

LGFS

See AMS.

local area network (LAN)

Networks that cover a smaller area such as a complex of buildings are called a Local Area Network, LAN. Multiple Local Area Networks can be interconnected through a Wide Area Network. (i.e. B-50 to B-1 computer communications link.)

object-oriented programming

The use of a class of programming languages and techniques based on the concept of an "object" which is a data structure (abstract data type) encapsulated with a set of routines, called "methods", which operate on the data.

open system portability (portability)

The ease with which a piece of software (or file format) can be "ported", i.e. made to run on a new platform and/or compile with a new compiler.

operating system (OS)

The low-level software, which scheduled tasks, allocates storage, handles the interface to peripheral hardware and presents a default interface to the user when no application program is running.

Oracle (or Oracle database(s))

Oracle Corporation is primarily a database software development and marketing company located in Redwood Shores, California. The District utilizes the Oracle relational database management system, RDBMS, software. (See relational database management system.)

password

An arbitrary string of characters chosen by a user or system administrator and used to authenticate the user when he attempts to log on in order to prevent unauthorized access to his account.

patch

A temporary addition to a piece of code, usually as a quick-and-dirty remedy to an existing bug or misfeature.

platform

Specific computer hardware. It may also refer to a specific combination of hardware and operating system.

recovery

The process of restoring computer data file with a backup copy usually after a crash or accidental deletion of a file.

relational database management system (RDMS)

A relational database allows the definition of data structures, storage and retrieval operations and integrity constraints. In such a database the data and relations between them are organized in tables. A table is a collection of records and each record in a table contains the same fields. Certain fields may be designated as keys, which means that searches for specific values of that field will use indexing to speed them up.

release (major release)

A piece of software which is not merely a revision or bug-fix (patch) but contains substantial changes.

Ross

Ross Systems, Inc. is a software development and marketing company located in Redwood, California. The District utilizes the Ross Human Resource and Payroll System. Also referred to as the Ross system or HR/PR.

software

Computer programs, as opposed to the computers on which they run (the "hardware").

Synergen

Synergen Associates, Inc. is the developer and distributor of the Synergen Series of software products and is located in Walnut Creek, California. The District utilizes the Synergen Computerized Maintenance Management System, CMMS.

user(s)

The people who either use computers directly, or use the information they provide; also called computer users or end users.

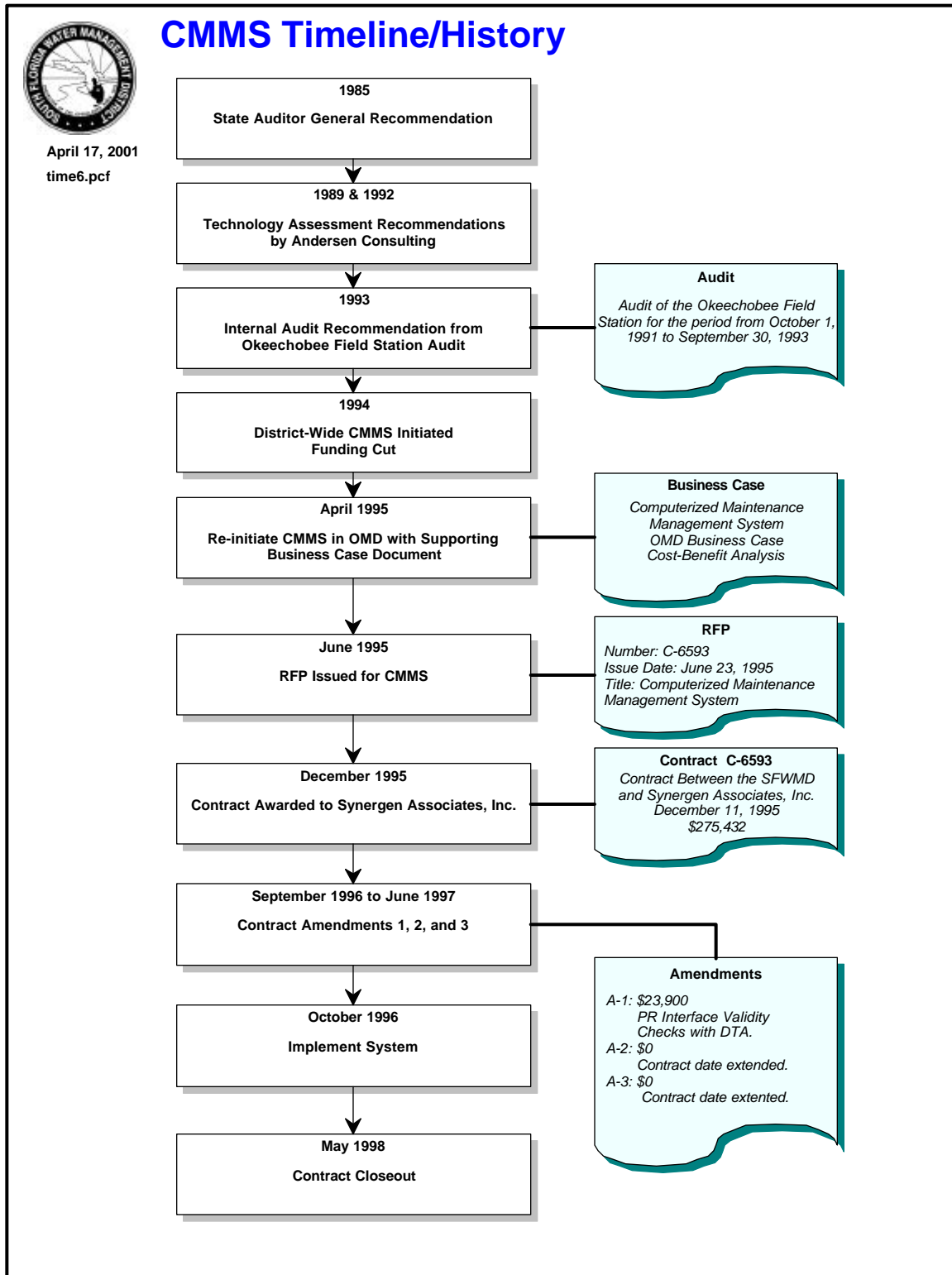
web (world-wide-web, www)

An Internet client-server hypertext distributed information retrieval system, which originated from the CERN High-Energy Physics laboratories in Geneva, Switzerland.

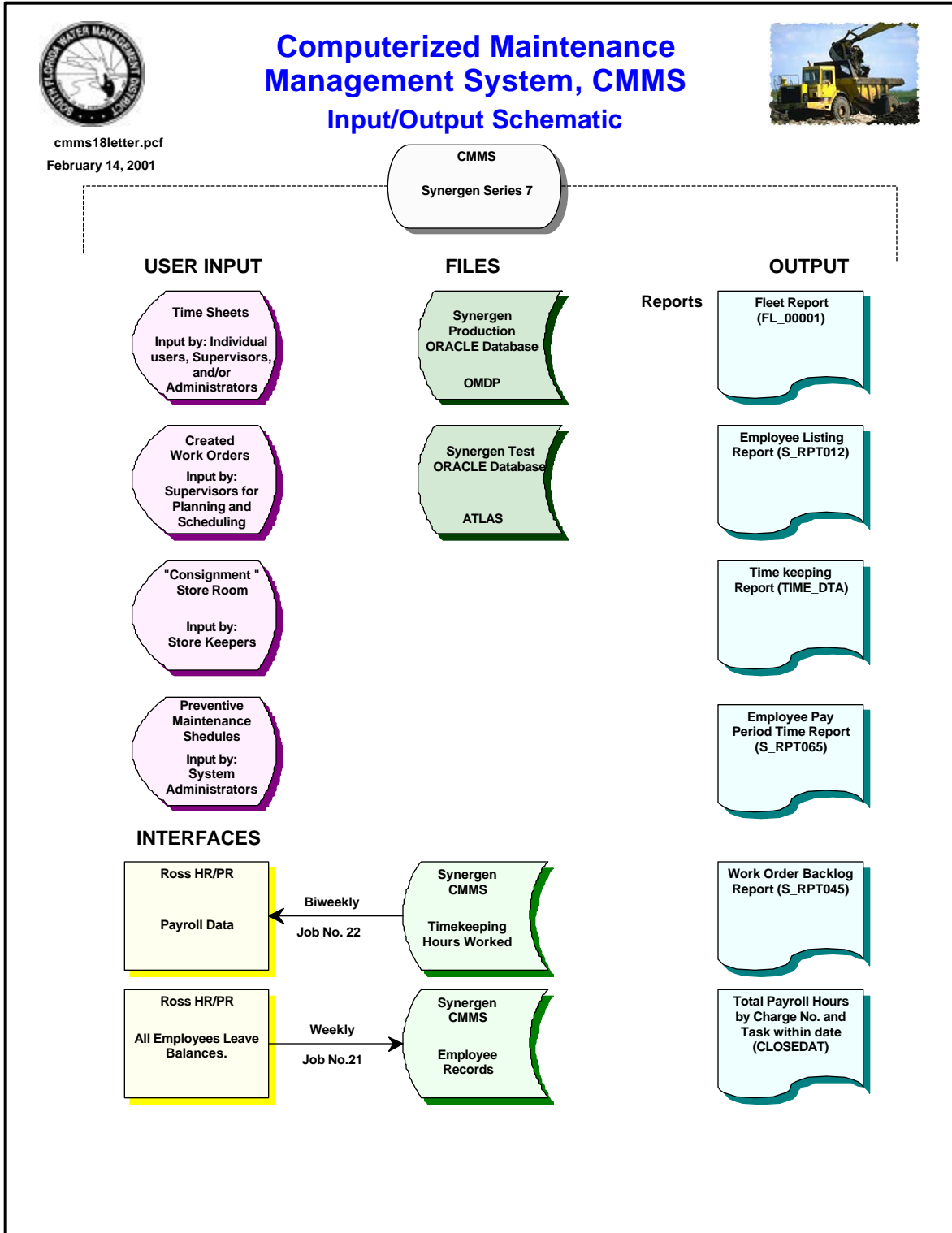
wide area network (WAN)

A computer communications network used to access information with a link over distances of more than one kilometer. Multiple Local Area Networks (LAN's) can be interconnected through a Wide Area Network. (District-wide computer communications network.)

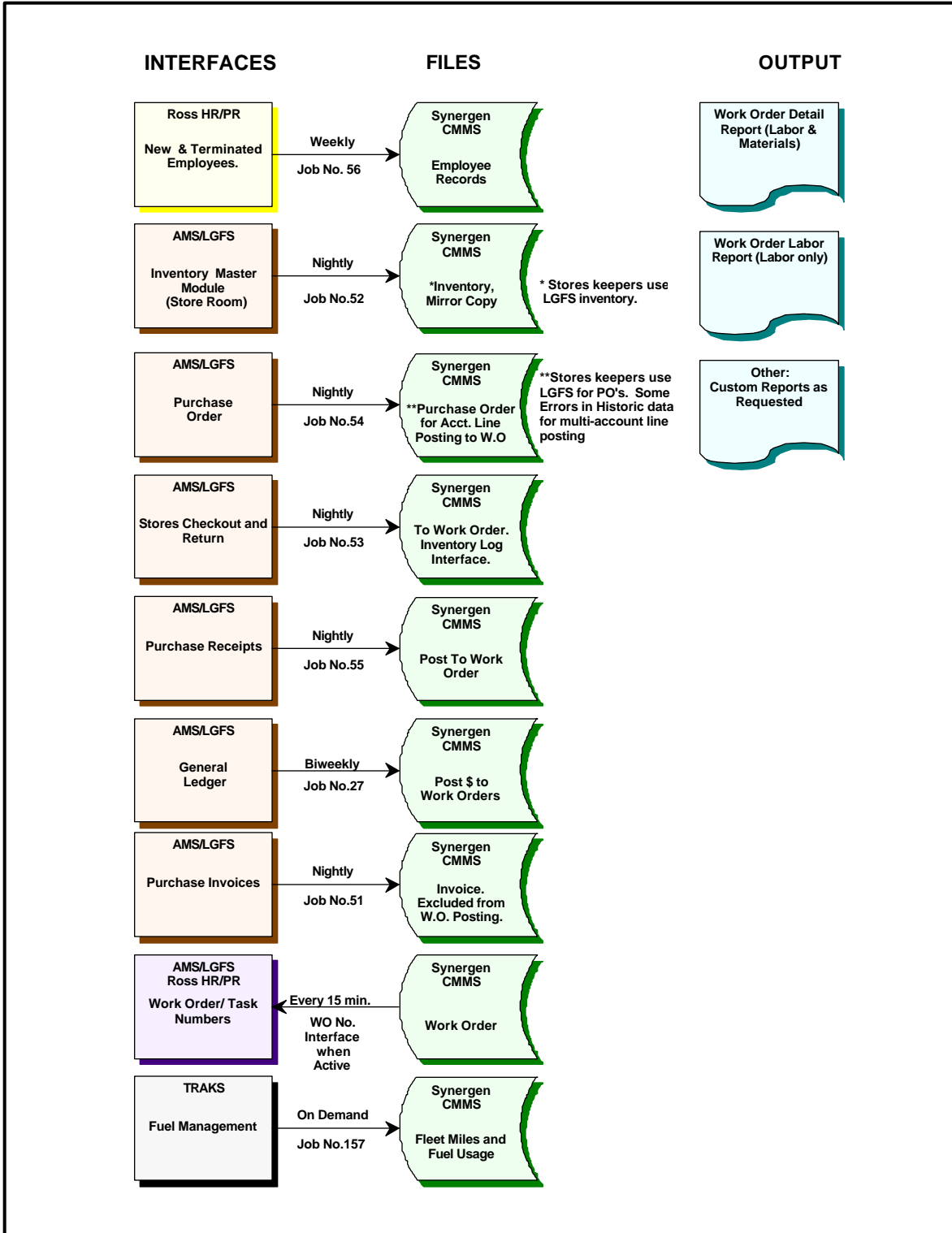
Appendix A CMMS Time Line/History



Appendix B
 System Schematic: Page 1 of 2



Appendix B (continued)
System Schematic: Page 2 of 2



Appendix C
CMMS QUESTIONNAIRE: Page 1 of 3

**Synergen
CMMS QUESTIONNAIRE**

Name:
Location:
Title ID Number:

INTRODUCTION

The District's Inspector General's Office is currently conducting an audit of the CMMS system. ***Please take the time to fill out this questionnaire.*** In **Section 1** please choose one answer only for each question. In **Section 2** please check all the reports you currently use from CMMS. In **Section 3** please list any problems or concerns that you may have about the CMMS and any suggested improvements or changes. Finally, please sign **Section 4** and return to John T. Lynch in the Inspector General's office (in B-1) via inter-office mail at Mail Stop Code 1310 by January 10, 2001.

SECTION 1 (Please check **only one box** for each question.)

Q.1 Are you currently a CMMS user?

Yes No*

* If answer **No**, please **go to SECTION 4**.

Cost accountability

Q.2 Can you now trace specific costs to specific jobs through CMMS?

Yes No Do Not Know

Q.3 Is payroll information in the ROSS system more accurately due to timesheet information being entered directly into CMMS?

Yes No Do Not Know

Q.4 Has CMMS improved the tracking of specific material (i.e. parts) related costs?

Yes No Do Not Know

Improved budgeting and cost control

Q.5 Has CMMS improved the budgeting process?

Yes No Do Not Know

Q.6 Have overall costs have become more controlled (decreased) with CMMS?

Yes No Do Not Know

Q.7 Have random (unplanned) expenditures been reduced by planned expenditures using CMMS?

Yes No Do Not Know

Appendix C (Continued)
CMMS QUESTIONNAIRE: Page 2 of 3

Improved work documentation and audit trail

Q.8 Has CMMS improved the overall work documentation?

Yes No Do Not Know

Q.9 Using CMMS (after a job is complete) can you go back to the documentation and trace the work performed and the costs directly related to that job?

Yes No Do Not Know

Availability of maintenance reports

Q.10 Has the availability of maintenance reports increased since implementation of CMMS?

Yes No Do Not Know

Q.11 Do you regularly review the CMMS maintenance reports?

Yes No Do Not Know

Availability of equipment and work history

Q.12 Is the documentation of equipment work history readily available in CMMS?

Yes No Do Not Know

Q.13 Do you on a regular basis review equipment's work history in CMMS before working on or scheduling work on equipment?

Yes No Do Not Know

Cost distribution for maintenance

Q.14 Are labor costs and costs for materials directly related to maintenance better distributed by CMMS?

Yes No Do Not Know

Better planning and scheduling

Q.15 Has planning and scheduling of work improved due to the implementation of CMMS?

Yes No* Do Not Know

*if answer **No** please **go to Q.17**

Q.16 In what way would you say CMMS has specifically improved planning and scheduling?

Work measurement and standards tools

Q.17 Has the ability to measure performance improved with the use of CMMS?

Yes No Do Not Know

Appendix C (Continued)
CMMS QUESTIONNAIRE: Page 3 of 3

Improved quality

Q.18 Has the quality of the maintenance improved as a result of CMMS planning, scheduling and reporting?

- Yes No Do Not Know

Q.19 Has the quality of preventive maintenance improved due to better planning and scheduling with CMMS?

- Yes No Do Not Know

SECTION 2 (all boxes that apply.)

Q.20 Please check all the CMMS reports that you use.

- Fleet Report (FL_00001)
 Employee Listing Report (S_RPT012)
 Timekeeping Report (TIME_DTA)
 Employee Pay Period Time Report (S_RPT065)
 Work Order Backlog Report (S_RPT045)
 Total Payroll Hours by Charge No. and Task within date (CLOSEDAT)
 Work Order Detail Report (Labor & Materials)
 Work Order Labor Report (Labor only)
 Other (please specify) _____

- None

SECTION 3

Q.21 Please describe any problems or concerns that you may have with CMMS.

Q.22 Please describe any improvements or changes that you recommend to CMMS.

SECTION 4

Q.23 Please sign your name and print the date.

_____/_____/_____
Date