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Solid Waste Information and Tracking System Client-Server Conversion Project Management Plan

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Abstract: Project Management Plan governing the conversion of SWITS to a client-server architecture. This PMP describes the background, planning and management of the SWITS conversion. It does not constitute a statement of product requirements. Requirements and specification documentation needed for the SWITS conversion will be released as supporting documents.

[1] Oracle, Developer/2000, Designer/2000, Forms 3.0, and ReportWriter 1.1 are trademarks of Oracle Corporation.
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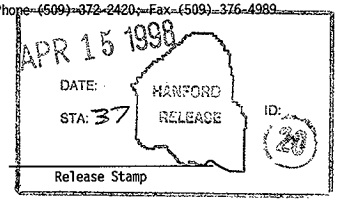

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Document Title: **SOLID WASTE INFORMATION AND TRACKING SYSTEM CLIENT-SERVER CONVERSION PROJECT MANAGEMENT PLAN**

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TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Purpose

This Project Management Plan is the lead planning document governing the proposed conversion of the Solid Waste Information and Tracking System (SWITS) to a client-server architecture. This plan presents the content specified by American National Standards Institute (ANSI)/ Institute of Electrical and Electronics Engineers (IEEE) standards for software development, with additional information categories deemed to be necessary to describe the conversion of SWITS fully. This plan is a living document that will be reviewed on a periodic basis and revised when necessary to reflect changes in baseline design concepts and schedules.

1.2 Scope

This Project Management Plan describes the background, planning and management of the SWITS conversion to a client-server architecture. It does not constitute a statement of product requirements. Requirements and specification documentation needed for the SWITS conversion will be defined in subsequent sections.

The planned conversion of SWITS represents a redevelopment of application software from host-based to client-server. Included in the redevelopment will be a change to the user interface of SWITS. A graphical user interface (GUI) will replace the current character mode front end. The target development tool, Oracle Developer/2000 [1], will also require an upgrade to the SWITS database management system (DBMS).

Conversion to a GUI client-server architecture will influence all aspects of the SWITS application and project. The change in user interface will significantly alter the SWITS menu structure, system navigation, screen formats and operation. Hardware requirements for a SWITS user will increase. Project procedures and practices will be affected: operations and maintenance, testing, configuration management and control, software quality assurance, documentation and user training.

1.3 Overview

The mission of the Solid Waste Management (SWM) program is to characterize, treat, minimize, segregate, package, store, and dispose of radioactive, hazardous, and mixed solid waste in a safe, cost-effective, and environmentally acceptable manner, in accordance with applicable regulations. The Solid Waste Information and Tracking System (SWITS) was developed to support the Solid Waste Management program at the Hanford site. SWITS was implemented in October 1991, replacing three solid waste tracking systems existing then. By combining the separate systems and fulfilling increased tracking requirements and new tracking methods, SWITS satisfied the requirements of "cradle to grave" real-time tracking of regulated solid waste. SWITS currently supports Hanford site-wide, multi-contractor waste generators and other Department of Energy sites. It provides on-line access and reporting capabilities for on-site generators, Solid Waste Services, Solid Waste Operations, and Warehouse, Transportation and Packaging groups.

Since the implementation of SWITS, the Solid Waste Management program and the Hanford Site have undergone significant changes, while improvements in computing technology have displaced the technology with which SWITS was developed. The SWITS Client-Server Conversion project will address the challenges facing the SWITS application today:

- discontinued support of current development tools by Oracle[1]
- incompatibility between new releases of Oracle database management systems and current development tools
- Year 2000 modification requirements
- an outdated, character mode front end
- modifications and enhancements to key processing modules (i.e., U101 screen) have outgrown the SWITS software design
- the management and maintenance of SWITS, and the cost of both, in its current architecture will continue to be challenged by new waste tracking methods and requirements

The SWITS Client-Server Conversion will incorporate current, established technologies and transform the SWITS application into a viable, cost-effective information management system for the future:

- client-server architecture
- a common desktop user interface
- application partitioning
- data integrity, business rules and application logic enforced with database triggers and stored procedures
- Internet/Intranet capable development environment

1.4 Deliverables

1.4.1 Documentation

All custom software documentation will adhere to Fluor Daniel Hanford (FDH) policies and applicable ANSI/IEEE software engineering standards. All documents will be reviewed, approved and distributed in accordance with HNF-PRO-439, *Supporting Document Requirements*.

As required by the system development cycle the following documents, specific to the client-server conversion of SWITS, will be produced and issued as supporting documents:

- SWITS C/S Conversion System Requirements Specification (SRS)
- SWITS C/S Conversion Preliminary Design Document
- SWITS C/S Conversion Database Conversion Plan
- SWITS C/S Conversion Test Plan
- SWITS C/S Conversion Installation Plan
- SWITS C/S Conversion Training Plan

The following are existing SWITS documents that will be revised and issued as supporting Project Management documents (document number and current revision number listed):

- SWITS Configuration Management Plan - WHC-SD-WM-SWD-007 Rev. 0
- SWITS Maintenance Plan - WHC-SD-WM-PLN-040 Rev. 2
- SWITS Software Design Description - WHC-SD-WM-SWD-009 Rev. 8
- SWITS Training Handbook - Rev. 0

1.4.2 Client and Server Application Software

The SWITS C/S Conversion Preliminary Design Document will define the system architecture necessary to satisfy the requirements set forth in the SWITS C/S Conversion SRS. The architecture design will separate the application software into components that run on the clients and server. Application partitioning is a critical strategy and design step in migrating a host-based application to client-server. Client application software primarily controls the user interface and formulates requests for data from the server. The server application software along with the DBMS is responsible for administering data integrity and business rules. Application logic and algorithms are also coded in the server application software. Splitting the workload between the desktop client and application server in this manner provides several benefits:

- streamlines the user interface
- business and application rules are administered centrally:
  - eliminates replication of proprietary business logic
  - strengthens data quality and integrity processes
  - improves data planning
- reduces network traffic between the client and the server

An estimated 150 reports and 100 screens and menus will need to be converted to client application software. Most, but not all, of the reports and screens represent a one-to-one conversion from the current Forms 3.0[1] and ReportWriter 1.1[1] tools. The preliminary design phase will explore and define opportunities to reengineer portions of the SWITS front end.

The server application software will use Oracle database triggers and stored procedures. Database triggers are procedures stored in the database. They are executed automatically by the database engine under predefined conditions. Data integrity and business and application rules are enforced by the triggers when a specific event occurs, such as inserting or modifying data values. SWITS Transaction Logging is an example of database triggers supporting an audit trail for sensitive data.

Stored procedures are programs also stored in the database that can be executed by database triggers, other stored procedures, or directly from client software. Common processing logic and edits can be implemented in stored procedures rather than replicating in multiple client modules or database triggers.

Desktop hardware requirements for the current release of Developer/2000 calls for a 486 machine with at least 16mb of memory for runtime usage. Recommended hardware for software development is a Pentium[2] with 32mb of memory.

1.4.3 Server Hardware and Operating System Software

The redevelopment of SWITS from host-based to client-server will be accompanied by the acquisition of a new hardware platform capable of supporting the required software environment. Hardware procurement is not within the scope of this plan, but hardware needs are mentioned here as a dependency for developing the new version of SWITS. The present SWITS machine is not compatible with software needed for SWITS development, and its performance at current workload levels is marginal.

The planned acquisition includes a Sun Enterprise 4000 Server[3] to be leased for about $5870 per month and supported by LMSI at monthly rates then in effect. This project will require the new hardware system to be available by the time the implementation phase begins.

The actual hardware cost to SWITS will be mitigated when one or more other applications are moved onto the new server and can then be assessed a portion of lease and system management costs. Every effort will be made to identify suitable applications and move them to the SWITS server as soon as practical.

1.4.4 Database Management System (DBMS)

An upgrade of the DBMS is required for the client-server development tools. SWITS is currently using Oracle version 7.0 while new system development will require a version no earlier than 7.3. Since Oracle Corporation periodically withdraws support for older versions of its software, long-term support will be best assured by the implementation of the latest version of the Oracle DBMS approved for use at Hanford.

This DBMS upgrade will require the current version of the Sun Solaris[3] operating system which in turn runs only on recent models of Sun hardware. All components of the hardware and software platform will be certified as Year 2000 compliant by the vendors.

1.5 Definitions & Acronyms

- Application Partitioning -- Separating an application into components that run on clients and server(s) in a client/server environment.

- CCB -- Change Control Board.

- Centralized Processing -- Processing performed in one or more computers in a single location. All terminals in the organization are connected to the central computers. Contrast with distributed computing and decentralized processing.

- Character mode -- A method of display in which information is displayed in plain text, although sometimes with enhancements such as simple line drawing to simulate windows. SWITS is currently a character mode software application.

- Client -- Clients are devices and software that request information. Clients are objects that use the resources of another object. A client is another name for a PC on a local area network. It used to be called a workstation. Now it is the "client" of the server.

- Client/server architecture -- A network and application design that divides processing between clients and servers. In the database world, the client formulates a request for data. The server determines how to retrieve the data most efficiently, performs the retrieval, and the passes it back to the client.

- DBMS -- see Database Management System.

- Database engine -- The part of a database management system that actually performs the storage and retrieval of data. In a client/server system, the database engine runs on the database server and responds to a client-based front end. Database engines also support host-based systems.

- Database Management System -- Software that controls the organization, storage, retrieval, security and integrity of data in a database. It accepts requests from the application and instructs the operating system to transfer the appropriate data. Currently SWITS uses Oracle Version 7.0 for its DBMS.

- Database Server -- A computer in a LAN dedicated to database storage and retrieval. The database server is a key component in a client/server environment. It holds the database management system (DBMS) and the databases. Upon requests from the client machines, it searches the database for selected records and passes them back over the network.

- Database Trigger -- An SQL procedure executed when a record is added, deleted or modified. It is used to maintain referential integrity and business rules in the database. A trigger may also execute a stored procedure. Triggers and stored procedures are built into DBMSs used in client/server environments.

- Distributed Computing -- The use of multiple computers in an organization or application rather than one centralized system. Distributed computing implies that they are networked together, not just decentralized systems without any communications between them. In addition, client/server applications continue to disburse more computers throughout the enterprise. See client/server.

- Distributed Processing -- see Distributed Computing.

- FDH -- Fluor Daniel Hanford, Inc.

- Front end -- Software that provides a user interface to a "back end" such as a database management system. Front ends usually support data entry forms, menus, reporting, and ad hoc query usage.

- Graphical User Interface (GUI) -- Software that uses the graphical capabilities of computers to display information. Besides text, GUIs use graphical objects such as pointing devices together with on-screen pointers, scrolling resizable windows, graphics images, and many other items to provide information to the user. Microsoft Windows[4] and Apple Mac[5] O/S are examples of software that are GUIs themselves and also allow GUI applications to run.

- GUI -- see Graphical User Interface.

- Host-based -- A software application that runs entirely on one machine, usually a remote computer that is being accessed with a dumb terminal or a workstation acting as such. SWITS is currently a host-based application accessed by users who run terminal emulation software on their PCS.

- IEEE -- Institute of Electrical and Electronic Engineers. A standards setting body for software engineering.

- IRM -- Information Resource Management

- LMSI -- Lockheed Martin Services, Inc. PHMC IRM preferred provider with right of first refusal.

- OSSP -- Organization Standard Software Practices.
- PHMC -- Project Hanford Management Contract.
- SDD -- Software design description. A document containing the detailed design of an information system.
- SPMP -- System Project Management Plan. The controlling document for managing a software project.
- Stored Procedure -- In a database management system (DBMS), it is an SQL program that is stored in the database which is executed by calling it directly from the client or from a database trigger. When the SQL procedure is stored in the database, it does not have to be replicated in each client. This saves programming effort especially when different client user interfaces and development systems are used. Triggers and stored procedures are built into DBMSs used in client/server environments.
- SWITS -- Solid Waste Information and Tracking System. The primary information system for tracking solid waste on the Hanford site.
- SWM -- Solid Waste Management
- WMH -- Waste Management Federal Services of Hanford, Inc. PHMC solid waste management contractor.
- WMS -- Waste Management Services
- WRAP -- Waste Receiving and Packaging. A facility in the Hanford 200 West Area that will receive, analyze, process, and repackage solid waste.
- WRAP DMS -- WRAP Data Management System. An information system used to track solid waste within the WRAP facility. Like SWITS, it is Oracle-based, and an on-line interface exists between them.

2.0 PROJECT ORGANIZATION

2.1 Process Model

A tailored version of the software life cycle model presented in the IEEE Software Engineering Standards will be followed on this project. Since this is an upgrade to an existing system, certain steps in the life cycle will be omitted. Those steps that are applicable, and will be followed in the SWITS Client-Server Conversion, are described below:

- Requirements Phase - The *redevelopment* is planned and the requirements for a system product, such as the functional and performance capabilities, are defined and documented.

- Design Phase - The designs for architecture, components, interfaces, and data structures are created, documented, and verified to satisfy requirements.

- Implementation Phase - The product is created from design documents, debugged and prepared for formal testing.

- Certification Phase - The product is evaluated to determine if requirements have been satisfied.

- Installation Phase - The product is integrated into an operational environment and tested to ensure that it performs as required.

2.2 Organizational Structure, Boundaries and Interfaces

The existing organizational structure of the SWITS project will be maintained. Waste Management Federal Services of Hanford, Inc. (WMH) has responsibility for the overall SWITS operations and maintenance. SWITS software maintenance and development are provided by the Systems Development & Integration (SD&I) organization of Lockheed Martin Services, Inc. (LMSI).

The SWITS Change Control Board (CCB) is responsible for all planning, oversight and implementation activities for SWITS. The SWITS CCB membership, defined in *SWITS Change Control Board Charter*, HNF-IP-1259, represents all parties with an interest in SWITS. This project will also view the SWITS CCB as the focal point for all SWITS change activities. The weekly CCB meetings will be the primary forums for reporting project status. Additionally, the CCB will balance the urgency and importance of change requests for the current application with the conversion project activities, taking into account available resources.

The SWITS Client-Server Conversion will coordinate with the Waste Receiving and Packaging (WRAP) project. Changes to the SWITS database architecture may require modifications to the WRAP Data Management System (DMS) tables and SWITS/WRAP DMS interface modules. Tasks will be included in the detailed project schedule for coordination of schema changes, testing and acceptance by WRAP DMS. WRAP DMS is also represented on the SWITS CCB.

2.3 Responsibilities

Figure 2.1 shows the SWITS conversion activities and the responsible organization(s).

Figure 2.1. SWITS Client-Server Conversion Activity Responsibility Matrix.

Activity	WMS	SD&I
PLANNING		
Project Management Plan		X
Configuration Management Plan - Revision*		X
Database Conversion Plan		X
Test Plan	X	X
Installation Plan	X	X
Maintenance Plan - Revision*		X
Training Plan	X	
REQUIREMENTS and SPECIFICATIONS		
System Requirements Specification		X
Preliminary Design Document		X
Software Design Description - Revision*		X
OPERATIONS AND SUPPORT		
Training Handbook - Revision*	X	
CONSTRUCTION and IMPLEMENTATION		
Software Development		X
Prepare Test Procedures	X	X
Unit Test		X
System Testing	X	X
Customer Acceptance	X	X
Installation and Checkout	X	X

*Upgrade to current SWITS Project Documentation

3.0 MANAGERIAL PROCESS

3.1 Management Objectives and Priorities

The primary project management goal is to deliver a high quality enhancement to SWITS within budget and schedule constraints. The project will adhere to IEEE standards and requirements defined in ANSI/IEEE Software Engineering Standards. Priorities for converting SWITS, listed in order, include:

- Meet all customer requirements as defined in the SWITS C/S SRS
- Follow established software development standards that ensure quality software that adheres to the LMSI SD&I Software Quality Assurance policy (draft)
- Complete the project on schedule
- Complete the project within budget
- Minimize costs

3.2 Assumptions, Dependencies, and Constraints

Ongoing support from Waste Management Services personnel is assumed for all phases of SWITS redevelopment. The requirements, design and certification phases will rely heavily on user participation from several functional areas including Solid Waste Services, Solid Waste Operations and generators.

A GUI application will involve considerable customer involvement in a design effort, since GUI interfaces are significantly different from those provided by character mode system. Training in GUI structures, design and standards will be necessary to design an effective front end for the SWITS client-server application.

Application partitioning and the design and implementation of server code objects (database triggers and stored procedures) are critical to the success of this project. Expertise must be brought to the project to address these needs.

Operations and maintenance support on the production system during the implementation, certification and installation phases will be reduced to a level of .6 FTE (full-time equivalent) SD&I staffing.

3.3 Risk Management

- Availability of software and database development staff

Every effort will made to maintain planned staffing levels with appropriate technical skills.

- Funding

Funding levels are critical to maintaining the resources needed to complete tasks on schedule. Changes to customer funding should be communicated as soon as known to allow for necessary plan and schedule modifications.

- Schedule risk

Discussions of project status will be held at least weekly. The SWITS Change Control Board will be used as a forum for project status communication.

- User availability

User participation in most tasks will be critical, leading to the possibility of schedule modifications should user availability change. Project impacts due to this factor will be communicated during regular status meetings.

- System development environment

SWITS production operation and efficient system development may conflict if conducted on the same hardware platform. The acquisition of a separate database server for development will be explored.

3.4 Monitoring and Controlling Mechanisms

- The weekly SWITS Change Control Board meeting will be used to communicate cost and schedule status.

- Informal communication among project staff and between developers and project management will be strongly encouraged. Informal channels between LMSI staff and users will also be used to address technical and other issues.

3.5 Staffing Plan

Appendix C specifies the planned SD&I staffing levels at different phases of the SWITS Client-Server Conversion project. The SD&I development team will consist of the following:

- Program Manager, .1 FTE
  Responsible for overall resource management, budget, schedule, staffing and training related to the SD&I project scope.

- Project Manager, .2 - .5 FTE
  Responsible for all aspects of the SWITS Client-Server Conversion design, implementation, testing and quality; directs all SWITS staff and works with Program manager to ensure that personnel are adequately trained to perform assigned functions; serves as the focal point of contact between SD&I project organization and WMS personnel; and provides the reporting interface to LMSI management through the Program manager.

- Software Engineers, .2 - 4.0 FTE
  Responsible for the design, coding, documentation, configuration control, testing and quality of software and deliverables; works with the user organization and SWITS project manager to design and implement project deliverables.

4.0 TECHNICAL PROCESS

4.1 Methods, Tools, and Techniques

Applicable requirements set forth in HNF-PRO-241, *Engineering Specification Requirements*, and the LMSI SD&I Software Quality Assurance policy (draft) will govern the plans, documents and work activities on this project.

The planned development tools for the SWITS conversion are Oracle Designer/2000 [1] and Developer/2000. Designer/2000 supports the modeling of systems with business process reengineering, analysis, and design diagrammers. Developer/2000 incorporates the necessary forms, reports and graphics tools for building the application. Both tool suites are client-server applications themselves and share a common repository of information and development methodology. Currently, Forms Version 4.5 and Reports Version 2.5 development tools are included in the Developer/2000 suite. New versions of both Forms and Reports are expected to be available in a new release of Developer/2000 for this project.

Conversion tools exist to migrate Forms 3.0 and ReportWriter 1.1 applications, such as SWITS, into the newer versions. Because of the significant differences between host-based and client-server applications, an analysis of these tools will need to be done to determine how much they can assist this project, if at all.

4.2 Documentation

Documentation will be developed for the SWITS Client-Server Conversion project according to this project management plan and other governing documents. All documentation will be assembled in a consistent and controlled manner. The documents will be produced to maximize the benefits to the project design and implementation while reducing expenditure of staff resources. **Section 1.4.1** lists required documentation for the client-server conversion project and existing SWITS Project Management documents that will be revised and issued as supporting documents.

Each document produced or revised in support of the SWITS Client-Server Conversion will undergo a peer review before being submitted for approval to the SWITS project. Design reviews of project deliverables will be conducted, including preliminary and detailed design.

4.3 Configuration Control

SWITS change authority is defined in *SWITS Change Control Board Charter*, HNF-IP-1259. The SWITS CCB will continue as the responsible committee for all planning, oversight and implementation activities during and after the SWITS conversion.

Moving from a centralized host-based application to distributed client-server will necessitate a revision to the *SWITS Software Configuration Management Plan* (CMP), WHC-SD-WM-SWD-007. The revised CMP will be invoked in the development and testing environment(s) during this project and will replace the production procedures upon installation of the client-server software.

4.4 Acquisition

Under the Oracle maintenance contract, new releases of development and DBMS software can be ordered at any time for no charge. Pricing adjustments occur when the maintenance agreement is renewed. Typically, the maintenance contracts run from October to September.

The SWITS current maintenance contract includes 32 development/runtime copies of Forms and Reportwriter. The maintenance structure for new tools is by each development copy. There is no charge for runtime copies. The cost of the 32 Forms 3.0 and 32 Reportwriter 1.1 development/runtime copies is anticipated to cover the cost of Designer/2000 and Developer/2000 suites required for this project.

4.5 Data Management

The SWITS database structures are maintained in accordance with the data management requirements of the IEEE Software Engineering Standards. Modifications and enhancements resulting from the client-server conversion will continue to apply these standards during design and installation. Implementation will take place entirely within the latest version of the Oracle database management system.

5.0 WORK PACKAGES, SCHEDULE, AND BUDGET

5.1 Work Packages

Appendix A describes the major steps of the work breakdown structure (WBS) for the tasks to be completed on this work effort.

5.2 Dependencies

Appendix B describes the ordering of the project tasks. The major dependencies of the project are;

- training
- WMS support including preparation of planning, testing, and certification documents
- readiness of WRAP DMS to accommodate the new SWITS architecture
- limited modifications and enhancements to the production system during the implementation, certification and installation phases

5.3 Resource Requirements

Appendix C details the estimated resource requirements and proposed staffing plans for each major task in the WBS. All 1998 fiscal year cost estimates for the SD&I labor and training are included in the SWITS operations and maintenance task order. Figure 5.1 lists the estimated hours for operations & maintenance activities and the client-server project by fiscal year.

Figure 5.1. Estimated Hours by Fiscal Year.

	SD&I Labor Hours	
FY	Client-Server Conversion	Operations & Maintenance
1997	180	4600
1998	2,340	2200
1999	7,960	1000
Totals	10,480	7800

The cost estimate and staffing plans do not include;

- Fluor Daniel Hanford, Inc. general and administrative (G&A) overhead
- Waste Management Services (WMS) labor
- Hardware lease and maintenance costs (see section **1.4.3 Server Hardware and Operating System Software**)

5.4 Schedule

Appendix B contains the project schedule.

6.0 SOFTWARE QUALITY ASSURANCE

The LMSI SD&I Software Quality Assurance policy (draft) and procedures will be followed during the SWITS Client-Server Conversion. The LMSI "Process SQA" methodology is defined in section 5.5 of the **LMSI SD&I Organization Standard Software Practices (OSSP)**. Process SQA shifts the focus of software quality assurance from the products (deliverables) to the processes (whats & hows). It is a Continuous Quality Improvement initiative aimed at improving both the software products and processes supporting them.

7.0 REFERENCES

Software Engineering Standards, American National Standards Institute for Electrical and Electronics Engineers, 1993 Edition
SWITS Change Control Board Charter, HNF-IP-1259
SWITS Configuration Management Plan, WHC-SD-WM-SWD-007
SWITS Maintenance Plan, WHC-SD-WM-PLN-040
SWITS Software Design Description, WHC-SD-WM-SWD-009, Rev. 8
SWITS Software Requirements Specification, WHC-SD-WM-SD-003, Rev. 1
SWITS System Project Management Plan, WHC-SD-WM-SWD-005, Rev. 1
Computer Desktop Encyclopedia, The Computer Language Co. Inc.
DBMS, "Trigger Happy: A look at the many implementations of database triggers", May 1996, Volume 9, Page 89
Database Programming & Design, "The Procedural DBA", December 1995, Volume 8, Page 40

APPENDIX A
SWITS CLIENT-SERVER CONVERSION WORK BREAKDOWN STRUCTURE

1.0 REQUIREMENTS PHASE

1.1 Project Planning

- 1.1.1 Prepare SWITS C/S Conversion Project Management Plan
- 1.1.2 Project Management Plan Review for Comment
- 1.1.3 Project Management Plan Review for Approval
- 1.1.4 Issue Completed Project Management Plan

1.2 Requirements Definition

- 1.2.1 Prepare SWITS C/S Conversion System Requirements Specification (SRS)
- 1.2.2 SRS Review for Comment
- 1.2.3 SRS Review for Approval
- 1.2.4 Issue Completed SRS

2.0 DESIGN PHASE

2.1 Preliminary Design

- 2.1.1 Prepare SWITS C/S Conversion Preliminary Design Document
- 2.1.2 Preliminary Design Document Review for Comment
- 2.1.3 Preliminary Design Document Critical Design Review
- 2.1.4 Preliminary Design Document Review for Approval
- 2.1.5 Issue Completed Preliminary Design Document

2.2 Detail Design

- 2.2.1 Revise SWITS Software Design Description (SDD)
- 2.2.2 SDD Review for Comment
- 2.2.3 SDD Critical Design Review
- 2.2.4 SDD Review for Approval
- 2.2.5 Issue Revised SDD (Rev 9)

2.3 Data Conversion Planning

- 2.3.1 Prepare SWITS C/S Conversion Database Conversion Plan
- 2.3.2 Database Conversion Plan Review for Comment
- 2.3.3 Database Conversion Plan Review for Approval
- 2.3.4 Issue Completed Database Conversion Plan

2.4 Test Planning
- 2.4.1 Prepare SWITS C/S Conversion Test Plan (SDD)
- 2.4.2 Test Plan Review for Comment
- 2.4.3 Test Plan Review for Approval
- 2.4.4 Issue Completed Test Plan

3.0 IMPLEMENTATION PHASE

3.1 Development Environment Setup and Configuration

3.2 Configuration Management
- 3.2.1 Revise SWITS Configuration Management Plan
- 3.2.2 Configuration Management Plan Review for Comment
- 3.2.3 Configuration Management Plan Review for Approval
- 3.2.4 Issue Revised Configuration Management Plan (Rev 1)

3.3 Database Conversion Construction and Testing
- 3.3.1 Conversion Construction
- 3.3.2 Conversion Testing

3.4 Software Construction
- 3.4.1 Construct Client Application Software
- 3.4.2 Construct Server Application Software
- 3.4.3 Construct Barcode Software

3.5 Component Testing
- 3.5.1 Prepare Component Test Cases and Procedures
- 3.5.2 Component Test Execution

4.0 CERTIFICATION PHASE

4.1 Data Conversion Testing
- 4.1.1 Prepare Data Certification Procedures
- 4.1.2 Data Conversion Test Execution
- 4.1.3 Data Certification

4.2 System Testing
- 4.2.1 Prepare System Testing Certification Procedures
- 4.2.2 System Test Execution
- 4.2.3 System Certification

5.0 INSTALLATION PHASE

5.1 User Training

- 5.1.1 Revise SWITS Training Handbook
- 5.1.2 Training Handbook Review for Comment
- 5.1.3 Training Handbook Review for Approval
- 5.1.4 Issue Revised Training Handbook (Rev 1)
- 5.1.5 Prepare SWITS C/S Conversion Training Plan
- 5.1.6 Training Plan Review for Comment
- 5.1.7 Training Plan Review for Approval
- 5.1.8 Issue Completed Training Plan
- 5.1.9 Conduct User Training

5.2 Operating and Maintenance Procedures

- 5.2.5 Revise SWITS Maintenance Plan
- 5.2.6 Maintenance Plan Review for Comment
- 5.2.7 Maintenance Plan Review for Approval
- 5.2.8 Issue Revised Maintenance Plan (Rev 3)

5.3 Production Installation

- 5.3.1 Prepare SWITS C/S Conversion Installation Plan
- 5.3.2 Installation Plan Review for Comment
- 5.3.3 Installation Plan Review for Approval
- 5.3.4 Issue Completed Installation Plan
- 5.3.5 Install Software

5.4 Customer Acceptance

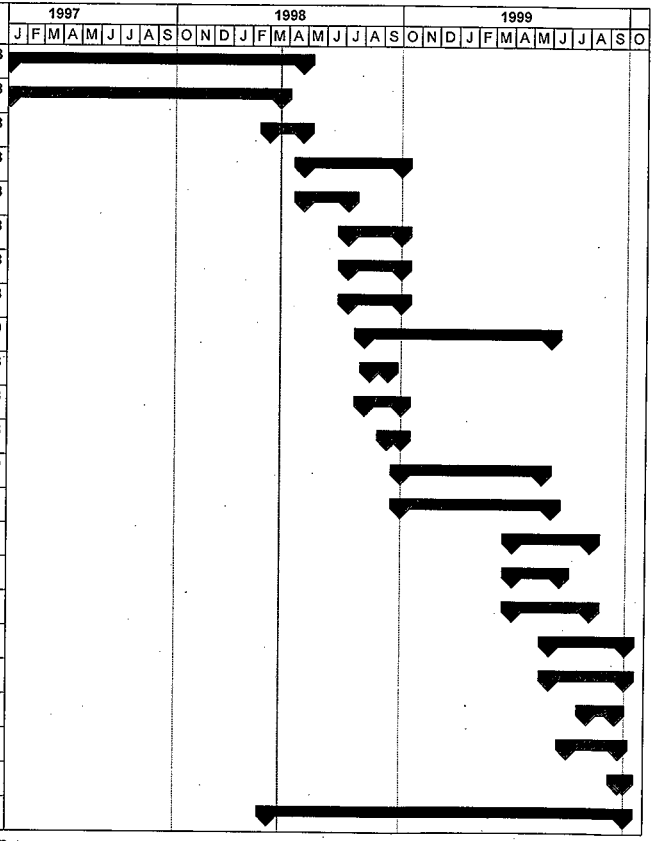
6.0 PROJECT MANAGEMENT & TRAINING

6.1 Project Management

6.2 Training

APPENDIX B
SWITS CLIENT-SERVER CONVERSION SCHEDULE

ID	Task Name	Start	Finish
1	REQUIREMENTS PHASE	1/6/97	4/24/98
2	Project Planning	1/6/97	3/20/98
8	Requirements Definition	3/2/98	4/24/98
13	DESIGN PHASE	4/27/98	9/30/98
14	Preliminary Design	4/27/98	7/6/98
20	Detail Design	7/7/98	9/30/98
26	Data Conversion Planning	7/7/98	9/30/98
31	Test Planning	7/7/98	9/30/98
36	IMPLEMENTATION PHASE	8/3/98	6/1/99
37	Development Environment Setup and Configuration	8/12/98	9/9/98
38	Configuration Management	8/3/98	9/30/98
43	Database Conversion Construction and Testing	9/9/98	9/30/98
46	Software Construction	10/1/98	5/17/99
50	Unit Testing	10/1/98	6/1/99
53	CERTIFICATION PHASE	4/1/99	8/4/99
54	Data Conversion Testing	4/1/99	6/16/99
58	System Testing	4/1/99	8/4/99
62	INSTALLATION PHASE	6/1/99	9/30/99
63	User Training	6/1/99	9/30/99
73	Operating and Maintenance Procedures	8/2/99	9/15/99
78	Production Installation	7/1/99	9/21/99
84	Customer Acceptance	9/22/99	9/30/99
85	PROJECT MANAGEMENT & TRAINING	3/2/98	9/30/99



APPENDIX C
SWITS CLIENT-SERVER CONVERSION ESTIMATED HOURS AND STAFFING PLAN

	WBS Task	Estimated Hours	Staff FTE
FY97 Jan - Jul	1.1 Project Planning	180	.2
FY98 Mar - Apr	1.2 Requirements Definition	240	1.1
	6.0 Project Management & Training	120	
Apr - Jul	2.1 Preliminary Design	420	1.7
	6.0 Project Management & Training	240	
Jul - Sep	2.2 Detail Design	540	2.8
	2.3 DB Conversion Planning	100	
	2.4 Test Planning	100	
	3.1 Development Environment Setup	100	
	3.2 Configuration Management Plan	100	
	3.3 DB Conversion Construction	100	
	6.0 Project Management & Training	280	
FY99 Oct - Jun	3.4 Software Construction	3640	4.5
	3.5 Component Testing	1510	
	6.0 Project Management & Training	790	
Jun - Aug	4.1 Data Conversion Testing	80	3.4
	4.2 System Testing	960	
	6.0 Project Management & Training	200	
Aug - Sep	5.2 Maintenance Plan	140	2.4
	5.3 Production Installation	440	
	6.0 Project Management & Training	200	
Total		**10480**	

APPENDIX D
JUSTIFICATION FOR SWITS CLIENT-SERVER CONVERSION

D.1 OBJECTIVES OF CONVERSION

- Reliability of service

Because of the designation of SWITS as a PHMC mission essential system, its importance for scheduled regulatory reporting, and the dependence on it for daily operations, reliability is considered a prime objective for SWITS. The conversion to a client-server version addresses this objective by distributing processing workload, enabling the use of current, more reliable hardware and software environments, and by ensuring the availability of ongoing vendor support for upgrades, maintenance releases, and technical assistance.

- Avoidance of technological obsolescence

The hardware and software technology used by SWITS should be modern enough to be supported by vendors and a workforce with current skills. Software stability, compatibility with available high-performance hardware, and the ability to share data with other systems are all strong reasons to move SWITS into more current technology.

- Compliance with Year 2000 requirements

The Department of Energy requires that all information systems are certifiably free of Year 2000 problems. SWITS must conform to DOE policies and be prepared for trouble free operation before the arrival of FY 2000 on October 1, 1999.

- Meeting user community needs and expectations

Users expect information systems to assist them in solving business problems or fulfilling business needs. They have come to expect a high standard of usability and strongly prefer all systems they use to operate in a consistent manner. The graphical user interface development tools associated with client-server systems can be used to make SWITS work in ways that are more consistent with other systems.

- Minimize cost of software maintenance

Changes to the system should be easy to do and consume as little programmer time as possible. The design of the information system and the environment that supports it are key factors in meeting this objective. Revising the software architecture of SWITS to conform to client-server methodology will improve its maintainability.

D.2 RISKS OF NOT CONVERTING

- Recovery from hardware failure

Rapid recovery from the failure of hardware components of a system depends on factors such as vendor support, availability of replacement parts, the extent to which hardware design addresses repairability and other considerations. The rate of advance in hardware technology has made vendors reluctant to support older systems indefinitely because of inventory and staffing costs. SWITS hardware is currently maintainable because vendor support for it has not yet been withdrawn. Replacement parts are available for now and limited upgrades can still be done. The vendor considers the equipment to be outdated, however, so it is uncertain how long they will be willing to provide support.

If a serious hardware failure occurred today that necessitated a complete system replacement, Hanford's equipment nationalization pool contains equipment that could be put to use. This available hardware tends to be older units of lower capacity, however. At best, such a replacement would take several days to set up and would only support a limited number of users.

The most significant risk to SWITS is therefore a major failure occurring after vendor support has been withdrawn and when there is no spare hardware onsite. Further risk is incurred because the type of hardware available at the time of failure may no longer support the operating system and database software versions needed for compatibility with the SWITS application as it now exists. These risks would be minimized by the use of newer hardware and the redevelopment of SWITS using software that is likely to remain supported for some time by software and hardware vendors.

- Recovery from software failure

Most software failures on mature systems are associated with minor application software defects. These are usually problems of limited scope rather than system-wide failures, and are repaired quickly by available technical support staff. A more significant risk to SWITS concerns the discovery of hidden problems in vendor-supplied software components for which the vendor no longer takes responsibility. In such a case, there is no known third party organization to resort to for the type of support that would be needed. Although the probability of such an event is small because of the maturity of the software environment used by SWITS, the impact of such an event could be severe.

Currently, Oracle Corporation no longer supports the application software environment used by SWITS, although the underlying database management software is still supported. Oracle recently began shipping a major new upgrade to its database software, however. Such major releases by Oracle have traditionally been followed at some point with a discontinuation of support for older versions.

- System capacity and performance issues

Most SWITS users consider the system's current performance to be barely acceptable. Meanwhile, new users continue to be added at the rate of a few each week. Access to SWITS is now available from networks operated by Washington Department of Ecology, Bechtel Hanford and PNNL. Because site computer security measures have been changed and new connectivity technology has been implemented, it is now possible for more users to connect to SWITS from offsite. Therefore, overall system load is expected to increase as time goes by.

Options to address this problem include exploiting the limited upgradeability of the current hardware, replacing the hardware entirely, and implementing a client-server architecture in which some of the processing load is shifted to client workstations. For now, an upgrade of the existing system could be undertaken without changing software, but hardware support staff do not predict great benefit from this measure. Hardware upgrades or replacements will not be available indefinitely that can support the older software used to operate SWITS. The time period during which SWITS hardware can be upgraded or replaced without disabling the software is predicted to be about one to three years.
The strategy that minimizes the risk of capacity and performance problems is to replace the existing SWITS hardware with new technology equipment and develop a client-server version SWITS to run on the new machine

- Cost of Year 2000 modifications to the existing system

If no conversion takes place, or the conversion cannot be completed in advance of October 1, 1999, the current version of SWITS must be modified to allow for the change of century. Although the SWITS database already stores dates in the proper format, there are many places in reports and screens where two digit years were used for convenience. All such usage will have to be examined and most instances will need to be modified, tested, and documented. Software engineering cost of this work is estimated at $75,000. User participation in testing and certification will be an additional cost factor. Year 2000 preparation will be included in the conversion to client-server architecture, and it is considered to add no cost to the project except where additional certification of Year 2000 compliance may be required by DOE or contractor policy.

- Dissatisfaction with the user interface

User dissatisfaction with SWITS has existed since its inception. Although the dissatisfaction is partly attributable to the complexities of a system designed to address a broad set of business processes, discontent has increased over time because of the users' awareness of better interface technology in other systems. The risks associated with this factor include diminished productivity, lack of acceptance by new users, and disenchantment by existing users with the usability shortcomings of SWITS.

- Availability of technically qualified support staff

Many older applications, often referred to as legacy systems, become increasingly difficult to support as knowledgeable technical staff retire, change jobs, or upgrade their skills and move to newer systems. SWITS may be vulnerable to this problem at some time in the future. Maintaining SWITS in relatively current technology should make staffing issues easier to manage.

- Ability to meet new requirements

Certain proposed features for SWITS could not be addressed due to limitations posed by the older generation software development tools used with SWITS. Examples of these features include complex reports requiring the integration of text and graphics with SWITS data, dynamic connections to a Geographic Information Systems (GIS), and Internet access to SWITS screens or data. Client-server software using a graphical user interface and better communication with other systems will be able to provide features well beyond the capabilities of the present software environment.

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Systems Development & Integration	Date 3/18/98
Project Title/Work Order		EDT No. 624102
SWITS		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
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