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System Maintenance Test Plan for the TWRS Controlled Baseline Database System

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Abstract: TWRS Controlled Baseline Database, formally known as the Performance Measurement Control System, is used to track and monitor TWRS project management baseline information. This document contains the maintenance testing approach for software testing of the TCBD system once SCRIPRs are implemented.

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SYSTEM MAINTENANCE TEST PLAN
FOR THE
TWRS CONTROLLED BASELINE DATABASE SYSTEM

Prepared for
Lockheed Martin Hanford Company

TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	PURPOSE AND SCOPE.....	1
1.2	OVERVIEW	2
1.3	DEFINITIONS AND ACRONYMS	2
1.3.1	Definitions	2
1.3.2	Acronyms	3
2	SCR-BASED TESTING APPROACH	3
2.1	MAINTENANCE TEST INFORMATION FORM.....	4
2.1.1	TI Form Description	4
2.1.2	TI Form and SCR/PR Form Relationship	5
2.2	MINOR CHANGES	6
2.3	MAJOR CHANGES	6
3	REFERENCES.....	7
	APPENDIX A: TCBD SCR/PR TEST INFORMATION (TI) FORM	8

1 INTRODUCTION

This System Maintenance Test Plan (MTP) provides an effective process to test the maintenance and enhancements made to the Tank Waste Remediation System (TWRS) Controlled Baseline Database (TCBD) prior to release of these modifications into the TCBD production environment.

The TCBD was developed as the electronic data repository for cost, schedule, and technical administrative baseline information for the TWRS Program. The TCBD requires activity-based cost estimates and selected financial information to be imported from master databases containing this information.

The current baseline software version of the TCBD was released with informal, undocumented testing, but was accepted by the customer as complete. Since the TCBD is in a maintenance state, the current strategy is to identify all changes via the *Software Configuration Management Plan for the TWRS Controlled Baseline Database System* (SCMP) (LMHC 1998a). Approved changes must have testing performed per this MTP prior to release of these modifications into the TCBD production environment.

The MTP activities identified in this plan are to be performed in parallel with the verification and validation activities; refer to the *System Maintenance Verification and Validation Plan for the TWRS Controlled Baseline Database* (VVP) (LMHC 1998b). V&V and testing must be completed before release of changes into the TCBD production environment.

For more information on the relationship between the SCMP (LMHC 1998a), MTP (LMHC 1998b), and this VVP, refer to Appendix C of the SCMP (LMHC 1998a).

1.1 PURPOSE AND SCOPE

The purpose of this document is to provide an effective process to test the maintenance and enhancements made to the TCBD system prior to release of these modifications into the TCBD production environment.

This MTP provides an overall test planning and documentation approach; it does not provide specific TCBD test cases or procedures. It is intended for system developers to work with this plan to document testing aspects that occur on a case-by-case basis when dealing with formal software changes via the SCMP (LMHC 1998a). For example, this MTP directs a person to evaluate whether individual test cases are required for a specific change. However, the actual activity of writing these test cases occurs outside the scope of this plan.

Per this plan, acceptance testing will ensure that the modified TCBD production version is functional, meets the user's requirements, and can be released as the new TCBD baseline.

Proposed changes to the actual TCBD baseline software will be documented via the Software

Change Request/Problem Report (SCR/PR) form process controlled and described in the SCMP (LMHC 1998a). The level of testing used for these SCR-based modifications will be as described in this MTP.

1.2 OVERVIEW

The TCBD project, formally known as the Performance Measurement Control System, was initiated to facilitate specific data integration processes surrounding the project scheduling system environment. The *Performance Measurement Control System Project Management Plan* (LMHC 1997) provides a brief project history and acquisition planning information.

During its initial development, the TCBD was released and accepted by the customer with no formal documentation to capture the test procedure, test cases (and the association back to the requirements) or test results. Since then, several versions of the TCBD have been released, all with undocumented testing. As the TCBD system was recently placed under software configuration management, this MTP allows formal testing to be documented *within* that process.

1.3 DEFINITIONS AND ACRONYMS

1.3.1 Definitions

Acceptance Criteria: Criteria established by the customer that is included in the test procedures during formal testing for system acceptance.

Acceptance Test Procedures: Testing procedures conducted by the customer for system acceptance. The procedures should be traceable back to the requirements or to the acceptance criteria.

Development: A module that has been not released for system use because it is in the development stages.

Maintenance Test Plan: A plan that provides guidance to provide an effective process to test the maintenance and enhancements made to a system prior to release of revisions into the production environment.

Production: A module that has been released for system use following customer acceptance.

Software Change Request and Problem Report (SCR/PR): A form that identifies a proposed change to or a suspected problem with the TCBD system. An SCR/PR may identify a new function, modify an existing function, or report suspected problems of the software or system hardware, at varying levels of priority.

Software Configuration Management (SCM): A set of management disciplines within the context of the software engineering process that applies technical and administrative

direction and surveillance. It identifies and documents the functional and physical characteristics of a product, controls changes to those characteristics, and records and reports the change process and implementation.

Test Cases: A set of specific steps that a tester executes to determine a pass or fail criteria. Test cases are performed for purposes of system acceptance and functionality.

Tester: A user that performs test cases in order to pass or fail the test cases for purposes of system acceptance.

Testing Witness: In the case of a quality affecting system, certain test may require an independent (not associated with design or implementation) test witness.

1.3.2 Acronyms

ATP	Acceptance Test Procedure
MTP	Maintenance Test Plan
PMCS	Performance Measurement Control System
SCMP	Software Configuration Management Plan
SCR/PR	Software Change Request/Problem Report
TCBD	TWRS Controlled Baseline Database
TI	SCR/PR Test Information Form
TWRS	Tank Waste Remediation System
VVP	Verification and Validation Plan

2 SCR-BASED TESTING APPROACH

All TCBD system (hardware and software) modifications and enhancements will be documented via the SCR/PR form(s) specified within the SCMP (LMHC 1998a). Table 1 of the SCMP identifies different individual roles and responsibilities. SCR/PR(s) are evaluated by the TCBD Change Control Board before implementation.

SCR/PR form(s) approved for implementation are released into the production environment only after appropriate testing, based on the level of the change (i.e., having a minor or major impact as determined by the Lead Engineer). This approach, of linking testing directly to the SCR/PR, is referred to as an SCR-based testing approach.

The SCR-based testing approach can be used for an individual SCR/PR form or for groupings of multiple SCR/PR forms. This approach ensures that proposed changes and testing are correlated for appropriate evaluation.

Pass/fail criteria are used for determining whether a SCR/PR implementation is successful. Typically, this is based on satisfying a system requirement via a test. Testing criterion are determined by the Design Authority. Testing approach strategies and test results must be verified

and validated per the *System Maintenance Verification and Validation Plan for the TWRS Controlled Baseline Database System* (VVP) (LMHC 1998b). The relationships between the SCMP (LMHC 1998a), VVP (LMHC 1998b) and this MTP are described in Appendix C of the SCMP (LMHC 1998a).

Successful closure of an SCR/PR form(s) occurs when either; testing results in no test exceptions; when test exceptions are resolved with a retest; or when test exceptions are accepted as-is with reasonable rationale. All successfully tested SCR/PR modifications and enhancements will be grouped logically into an appropriate level of production release after completion, per the SCMP (LMHC 1998a).

2.1 MAINTENANCE TEST INFORMATION FORM

The SCR-based testing approach utilizes a SCR/PR Test Information Form (TI), provided in Appendix A. The TI form is the mechanism to help evaluate, design, and document the appropriate level of SCR/PR testing necessary and its supporting documentation. This applies to all individual or grouped SCR/PR form(s).

2.1.1 TI Form Description

The TI form allows the user to enter complete information for simple testing or reference data for complex testing. Simple testing is typically for minor changes involving a single SCR/PR. Complex testing typically involves several SCR/PR form(s) grouped for release as a major revision. The TI form must reference all individual SCR/PR form(s) covered using appropriate notation (e.g., SCR #52, 53, 55-76). This reference and the type of maintenance changes are at the top of the TI form.

The Software Developer and Maintainer (with input from the Software Engineering staff, Lead Engineer, and Design Authority) fills out the TI Form. The TI Form describes or summarizes (via reference) the following informational sections:

- Test Plan
- Test Design

The test design section requires that the Lead Engineer decide whether Readiness Review, Training Review, Safety Review, Independent Testing, or Test Witness are required. A description of Approach and the Pass/Fail Criteria determined by the Lead Engineer with the Design Authority need to be addressed here also.

- Test Cases

Test cases, when performed, are to be filled in with any test data collected. These cases and data collection are signed and dated in pen by the tester, and, if required, signed by a test witness.

If exceptions occur during testing, an incident report is generated and the impact to other testing activities and/or re-testing addressed. Test witnesses will evaluate the test, execution, results, and test incident reports and determine with the Lead Engineer if acceptable and/or if additional action is needed.

- Test Procedures
- Test Item Transmittal Report (Note: Reference in this section is *always* to the *TCBD System Release and Change Record* [LMHC 1998c]).
- Test Log and Test Incident Report
- Overall Result

These sections are from the outline guidance within HNF-PRO-553, *Software Practices – System Test Documentation*. If required, refer to this procedure for more information specific to these sections.

To complete each of these TI form sections (some have several subsections), use one of the following methods:

- Fill in "N/A" in the section, if not applicable *or*
- Fill in the necessary information if there is enough room *or*
- Attach the information to the TI form and write in "See Attached" in the section *or*
- Reference another document number (i.e., SD, HNF, cc:mail, test log, etc.) in the section.

Other guidelines for general testing practices are provided within HNF-PRO-432, *Software Practices – Testing*.

2.1.2 TI Form and SCR/PR Form Relationship

In all the following cases, a reference to the TI form is made from the SCR/PR by writing in the section entitled "Software Programs, Modules or Files Affected (Attach Additional Sheets or Test Information (TI) forms as required, refer to MTP, HNF-3186)". This section is in the gray-colored section in the lower half of the SCR/PR form.

Single SCR/PR Form Reference to an Attached TI Form

"TI Form Attached" or equivalent should be written in the SCR/PR form section.

Multiple SCR/PR Forms Reference to an Attached TI Form

"TI Form Attached" or equivalent should be written in the section for the first SCR/PR form of the group. All other SCR/PR forms should refer back to the first SCR/PR. For instance, the fifteenth SCR/PR form would have written in this section "See SCR #52 for TI Form Information," where SCR #52 is the first of the grouping.

2.2 MINOR CHANGES

A minor change, as determined by the TCBD Lead Engineer, may require limited formal testing or a complete test procedure. If a complete test procedure is required, refer to Section 2.3 for more information.

For a minor change, the Software Engineer determines the impact of the change including impact to the module and interfaces within the system. The testing should be appropriate to the potential evaluated impact of the change and be documented formally. As a minimum recommendation, the TI form in Appendix A is completed and attached to the SCR/PR at the conclusion of testing.

EXAMPLE: Minor Change Using an SCR/PR Form and Attaching TI Form

For the SCR/PR form implemented, the Software Developer and Maintainer (with assistance from the Software Engineer) fills out the TI form in Appendix A. Due to the simplicity of the change and low risk, the developer decides to document all relevant information on the TI form, and include several "N/A" references. V&V is performed (per Design Authority reviewer assignment) on the testing approach and on the results when testing is completed.

In this case, the TI form serves as the SCR/PR test plan and procedure for the minor change. When testing and V&V are completed, the TI form and test results are attached directly to the SCR/PR form and V&V documents for release per the SCMP (LMHC 1998a).

2.3 MAJOR CHANGES

A major change, as determined by the TCBD Lead Engineer for a SCR/PR(s), is typically accompanied by a formal (i.e., HNF document numbered) test procedure. Reference to the test procedure is via the appropriate section in the TI form (Appendix A).

EXAMPLE: Major Change Using Multiple SCR/PR Forms and Attaching TI Form

For the SCR/PR forms implemented, the Software Developer and Maintainer (with assistance from the Software Engineer) fills out the TI form in Appendix A. Due to the complexity of the change, the Lead Engineer and Software Developer and Maintainer decide to

pursue a separate test procedure. In this case, the TI form will reference this test procedure and any accompanying test reports written specifically for this release (e.g., via HNF number, etc.).

As noted previously, V&V is performed (per Design Authority reviewer assignment) on the testing approach and on the results when testing is completed. When testing and V&V are completed, the TI form and V&V documentation are attached to the first SCR/PR form for release per the SCMP (LMHC 1998a). All other SCR/PR forms reference the first SCR/PR form in the group.

Note that this approach depends *completely* on the complexity of the change involved. However, the SCR-based approach is flexible and allows the testers to capture the applicable test aspects in a single location. For the given example, the Software Developer and Maintainer could have, in lieu of a separate test procedure, used the TI form and referenced all documentation (e.g., test cases, test procedures, test reports, etc.) as "See Attached" in the appropriate sections, and then released this documentation set per the SCMP (LMHC 1998a).

3 REFERENCES

HNF-PRO-432, *Software Practices – Testing*, Fluor Daniel Hanford, Richland, Washington.

HNF-PRO-553, *Software Practices – System Test Documentation*, Fluor Daniel Hanford, Richland, Washington.

LMHC, 1997, *Performance Measurement Control System Project Management Plan*, HNF-SD-TWR-PMP-001, Rev. 0, Lockheed Martin Hanford Company, Richland, Washington.

LMHC, 1998a, *Software Configuration Management Plan for the TWRS Controlled Baseline Database System*, HNF-2429, Rev. 0, Lockheed Martin Hanford Company, Richland, Washington.

LMHC, 1998b, *System Maintenance Verification and Validation Plan for the TWRS Controlled Baseline Database*, HNF-2430, Rev. 0, Lockheed Martin Hanford Company, Richland, Washington.

LMHC, 1998c, *TCBD System Release and Change Record*, HNF-3357, Rev. 0, Lockheed Martin Hanford Company, Richland, Washington.

APPENDIX A: TCBD SCR/PR TEST INFORMATION (TI) FORM

A tester may fill out a "SCR/PR Test Information" Form describing relevant testing information related to a particular SCR. This form should be attached to the appropriate SCR/PR prior to release of the SCR/PR for the production environment. In each section, enter in the appropriate information, or "N/A," or "See Attached," or reference another document by number.

SCR/PR TEST INFORMATION (TI) FORM**TO BE COMPLETED BY THE TCBD SCMP DESIGNATES PER HNF-2429**

1. Related SCR/PR Number(s): 2. Type of Maintenance
☐ New Development ☐ Problem ☐ Enhancement ☐ Y2K

IF A SEPARATE TEST PROCEDURE AND ASSOCIATED DOCUMENTATION WAS DEVELOPED FOR THIS SCR/PR FILL OUT APPLICABLE HNF REFERENCE NUMBER(S) IN THIS SPACE AND DO NOT FILL OUT THE REMAINDER OF THIS FORM:

1.0 TEST PLAN

- 1.1 Test Items: 1.2 Features to Test/Not Test:

- 1.3 Deliverables: 1.4 Acceptance Criteria:

- 1.5 Testing Tasks: 1.6 Environmental Needs:

- 1.7 Responsibilities: 1.8 Staffing and Training:

- 1.9 Schedule: 1.10 Risks and Contingencies:

- 2.0 TEST DESIGN requires (attach if checked): ☐ Readiness Review ☐ Training Review ☐ Safety Review
☐ Independent Testing ☐ Test Witness

- 2.1 Approach:

- 2.2 Pass/Fail Criteria:

- 3.0 TEST CASES ☐ N/A ☐ See Attached ☐ Reference:

Note: Ensure That Incident Report(s) are Generated and Retest Criteria are Addressed if any Test Case(s) Fails.

- 4.0 TEST PROCEDURES ☐ N/A ☐ See Attached ☐ Reference:

5.0 TEST ITEM TRANSMITTAL REPORT

Reference the "TCBD System Release and Change Record" (HNF-3357)

- 6.0 TEST LOG AND TEST INCIDENT REPORT ☐ N/A ☐ See Attached ☐ Reference:

- OVERALL RESULT: ☐ Passed ☐ Passed with Exception (See Attached)