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PHMC Year 2000 Handbook

Revision 2

June 3, 1998

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Revision #	Description	Date Revised
2	1) Deletion of the Deactivation/Retirement checklist and all references, 2) addition of description of the Deactivation/Retirement Process and where it can be found	June 3, 1998

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Executive Overview

The executive overview is intended to provide an understanding of the primary drivers imposed on the PHMC team to achieve compliance with the Year 2000 problems, the process to achieve compliance and the major responsibilities.

RECOGNIZING THE YEAR 2000 PROBLEM

As the century advances from the 20th to the 21st, information systems (systems) dependant on date processing may fail. Date functions such as comparisons and calculations and use of coded numbers to direct program logic can cause a system to fail or produce erroneous results. Many systems used a two-digit date to minimize data storage, particularly older equipment and infrastructure items. Historically, systems used the values of "00" and "99" as indicators such as file headers, end of file markers, or control records. These systems will encounter problems as Fiscal Year 1999, January 1, 2000 and other dates occur. (See Appendix 3)

The Project Hanford Management Contract (PHMC) work scope is supported by a multitude of information systems. Each system must be evaluated for Year 2000 compliance and the business risk identified for those found to be Year 2000 non-compliant. Because of the constraints on time, funding and resources to fix Year 2000 problems, the PHMC team approach focuses on those systems considered to be mission essential.

Mission essential is defined as: any operational system, item of equipment, or component that processes date information requiring Year 2000 compliance whose failure results in 1) injury to personnel, 2) damage to property (public or private), or 3) delays in the performance of mission essential activities.

Systems that are not Year 2000 compliant and are considered mission essential must be addressed first to ensure uninterrupted business operations of the PHMC team. Failure to identify and resolve mission essential systems could expose a member of the PHMC team to potential litigation.

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YEAR 2000 PROJECT APPROACH

Objectives and Scope

The PHMC Year 2000 Project objective is to ensure Year 2000 problems are fixed or mitigated and status reporting is consistent across the site. The emphasis of the project is on mission essential systems, prioritized to systems whose failure results in 1) injury to personnel, 2) damage to property (public or private), or 3) cessation, or delays in the performance of mission essential activities. Some of the systems will be reported to DOE HQ and have the highest priority for resources. The same approach will be used on the remaining mission essential systems and these will be reported to DOE-RL. The owner will determine Non-mission essential systems disposition. The scope of the PHMC Year 2000 Project encompasses applications, equipment, infrastructure, and external and internal interfaces and services. (See Technical Overview Scope section)

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OMB AND DOE HQ REQUIREMENTS

The Office of Management and Budget (OMB) and DOE HQ have established Milestone requirements for mission essential computer systems. For projects reported to DOE HQ, exception reporting is required should renovations not be complete by September 15, 1998, or implementation completed by March 31, 1999. (See Appendix 1 for reporting guidelines). Contingency plans are required for projects not validated by February 15, 1999. The DOE HQ milestones are:

•	Test Plans	06/15/98
•	Renovation	09/15/98
•	Validation	02/15/99
•	Compliance Certification	02/15/99
•	Implementation	03/31/99
•	Contingency Plan	03/15/99

DOE HQ VERIFICATION AND TRACKING PROCESSES

In addition to milestones and reporting requirements, DOE HQ implemented two processes to verify and track progress. DOE HQ

- 1) established a Year 2000 compliance review process to ensure that Departmental policies and procedures related to Year 2000 compliance are being followed, and
- 2) developed a certification process for all Year 2000 activities.

The DOE HQ reviews will focus on the major subcontractors, DynCorp and FDH Year 2000 plans and processes, by gathering information, reviewing documentation, and results. (See Appendix 1, Compliance Reviews and Certification Process). The PHMC Year 2000 Project, processes and compliance assurance guidelines are intended to meet the requirements identified by DOE HQ.

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RL PERFORMANCE AGREEMENT

The DOE RL has established a FY 1998 Performance Agreement (SID 1.2.1) for the PHMC Year 2000 Project. (Note: the dates for earning fee differ from those directed by OMB and DOE HQ). Performance expectations and increased performance are achieved only when the percentage of mission essential Year 2000 projects fully completing that activity equates to or is greater than the expectation or increased performance. (E.g., see the calculation at the bottom of the chart).

Date	Activity	Performance Expectation	Increased Performance
	ASSESSMENT		
09-30-98	• Infrastructure	100%	-
09-30-98	• Equipment	100%	-
09-30-98	• Applications	80%	100%
	RENOVATION		
09-30-98	• Infrastructure Year 2000	70%	80%
09-30-98	• Projects	70%	80%
09-30-98	• Equipment Year 2000 Projects	30%	40%
09-30-98	• Application Year 2000 Projects		
<i>Percent complete will be calculated by dividing the number of Year 2000 projects 100% completed by the total number of Year 2000 projects</i>			

YEAR 2000 PROJECT DELIVERABLES

The key deliverables of the PHMC team are to complete assessment, renovation, validation and implementation of mission essential systems culminating in a compliance assurance certification, on a schedule that meets the DOE RL Performance Agreement and DOE HQ milestones. The PHMC team must also provide monthly status and support compliance assurance reviews. (See the Technical Overview and Appendix 1)

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YEAR 2000 PROJECT DISPOSITIONS

State diagram where you can end up into a contingency plan state from any other disposition
Decision tree

Repair
Replace
Indicated Compliant
Deactivate

YEAR 2000 PROCESS

The PHMC Year 2000 Project will implement a six-phase process to address the Year 2000 problem. Each phase has set goals and documentation to support compliance assurance, legal and audit reviews. Further detail is provided in the Technical Overview section.

Phase 1 - IMPACT IDENTIFICATION	Phase 2 - ASSESSMENT
<i>Identify the overall size, priority, and initial cost of the project:</i> <ul style="list-style-type: none">• Capture detail inventory• Define ownership• Determine mission-essential status• Assign risk ranking• Determine initial compliance status• Identify systems planned to be replaced or deactivated• Group systems into projects• Develop rough-order-of-magnitude cost• Identify external and internal interfaces	<i>Plan, investigate, and test compliance, determine renovation method, schedule and cost:</i> <ul style="list-style-type: none">• Determine Year 2000 issues through planning, analysis and testing (as appropriate)• Identify the impact of the problems• Develop primary and alternative solutions• Plan the resolution effort if replacement or repair is required• Develop contingency plans• Develop budget cost to renovate• Certify systems found to be compliant• Document assessment activities
Phase 3 - RENOVATION	Phase 4 - VALIDATION
<i>Implement the selected resolution method(s):</i> <ul style="list-style-type: none">• Write Test Plans• Repair, replace, or deactivate• Document renovation activities• Contingency Plan	<i>Verify and certify solution:</i> <ul style="list-style-type: none">• Test renovation changes• Validate• Certify• Document validation activities

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Phase 5 - IMPLEMENTATION	Phase 6 - COMPLIANCE ASSURANCE
<p><i>Put system into operation:</i></p> <ul style="list-style-type: none">• Implement into production• Prepare contingency plan if validation will occur after February 15, 1999• Document implementation	<p><i>Conduct a review that verifies appropriate documentation exists and that due diligence was used to achieve compliance:</i></p> <ul style="list-style-type: none">• Graded review process commensurate with the associated business risks (high, medium or low risk)• Document compliance assurance

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RESPONSIBILITIES

The PHMC Year 2000 Project involves the effective cooperation and participation of the Year 2000 Project Office, FDH Project Direction, FDH Chief Information Officer, major subcontractors and DynCorp.

Year 2000 Project Office

The primary responsibilities of the Year 2000 Project Office is to develop and facilitate a Year 2000 approach, provide an awareness program, report status, and perform compliance assurance reviews. Accomplishing this involves, but is not limited to, the following (see Appendix 2 for more details):

- Establish reporting process; integrate information
- Update the DOE HQ Mission Essential Status Database
- Maintain the Year 2000 Database
- Report progress to RL on the Year 2000 Performance Agreement (SID 1.2.1)
- Provide a Year 2000 compliant laboratory environment for testing
- Conduct an awareness and education program
- Provide technical analysis and support
- Conduct a compliance assurance program
- Facilitate a vulnerability assessment
- Provides Year 2000 project documentation to records storage at completion of project

FDH Project Direction

The primary responsibility of the FDH Project Directors is to direct the major subcontractors, and DynCorp toward the successful completion of Year 2000 activities. Accomplishing this involves, but is not limited to, the following:

- Provide direction on Year 2000 work scope
- Provide funding for assessment, renovation, validation, implementation and compliance assurance
- Accept risk on Year 2000 Project classifications (i.e., mission essential, non-mission essential)
- Concur on Year 2000 project cost/benefit analysis of system renovation alternatives
- Concur on the level of compliance assurance reviews
- Monitor progress against performance agreements and milestones
- Document completion of activities to support performance agreements and milestones
- Prepare documentation file for each Year 2000 project that is provided to the Year 2000 Project Office when the project is completed.

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FDH Chief Information Officer

The FDH Chief Information Officer, in addition to ensuring that critical functions are not interrupted or produce erroneous information, has the following responsibilities:

- Manages PHMC site wide information systems
- Coordinates FDH Year 2000 activities

Major Subcontractors and DynCorp

The responsibilities of the major subcontractors and DynCorp to meet Year 2000 requirements will be accomplished through the following:

- Inventory and self-identify Year 2000 impacts
- Prioritize impacts and assign risk
- Develop an initial conceptual cost estimate to initiate planning and resource needs
- Prepare baseline change requests, obtain funding, prepare task orders
- Determine renovation requirements
- Review and resolve internal and external electronic data exchange Year 2000 issues (Vulnerability, assessment, Appendix 1)
- Develop contingency plans if renovation cannot be achieved by March 31, 1999
- Certify compliance
- Recommend compliance assurance review risk level
- Participate in compliance assurance reviews
- Provide monthly status as required by the Year 2000 Project Office to include schedules, performance and cost (see Appendix 1)

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Technical Overview

This technical overview is intended to provide a more detailed description of the PHMC Year 2000 Project. Guidelines, reference documents, and technical resources are detailed in the appendices and noted where applicable. All documents are available on the Year 2000 web page (<http://apsql02.rl.gov/Y2K/index.html>). While the process described here may seem straight forward, there are factors that will be limited by both time and resources to resolve PHMC Year 2000 date problems.

OBJECTIVES

The goal of the PHMC team is to ensure that necessary computer systems are Year 2000 compliant and critical dates pass without occurrence. This goal will be accomplished through the following objectives:

- Every computer item will be evaluated for Year 2000 compliance.
- Impacts will be prioritized
- Compliance will be certified
- Compliance activities will be documented and authenticated for field audits and legal accountability
- Progress will be statused
- DOE HQ scope and milestone requirements will be met
- Performance agreements will be met

SCOPE

Computer items evaluated for Year 2000 compliance consist of applications, infrastructure, and equipment. The focus of the PHMC Year 2000 Project will be those projects designated as mission essential. A risk ranking process will be used to delineate those projects that are high priority and are to be statused to DOE HQ. High, medium or low risk will be used to determine compliance assurance review requirements.

Mission Essential Systems, equipment items, or components with date information requiring Year 2000 compliance whose failure may result in 1) injury to personnel, 2) damage to property (public or private) or 3) delays in the performance of a mission activity.

Non-Mission Essential Applications, equipment or infrastructure components that are not mission essential. They may be eliminated or maintained at the discretion of the owner. If they are maintained, it is the owner's responsibility to assess and renovate the system for compliance with Year 2000 problems and to obtain any funding necessary for these efforts.

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Applications

Applications are commonly called software or systems. Examples include FDS (Financial Data System), RLPS (RL Property System), SWITS (Solid Waste Information & Tracking System), JCS (Job Control System), PeopleCORE, etc.

Equipment

Refers to facility related equipment and instrumentation with embedded chips such as instruments, control systems, monitors, surveillance, elevators, HVAC controls, process control, monitoring equipment, elevators, vehicles, etc.

Infrastructure

The basic computer hardware and associated software systems that support the Hanford Site. This includes functions such as the LANs, phones, micro/mainframe hardware, databases, file servers and desktop software such as cc:Mail, etc.

Risk Rank

The ranking (5 = high risk ; 1 = low risk) against eight criteria and a weighting factor (scale 1-5). This risk ranking, in conjunction with a mission essential determination, may be used to prioritize activities.

Reported to DOE HQ

A high risk system whose failure results in 1) injury to personnel, 2) damage to property (public or private), or 3) serious delays in the performance of mission essential activities.

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OVERVIEW

Phase 1 - Impact Identification - The phase during which applications, equipment and infrastructure computer items are inventoried, ownership defined, mission essential status determined, risks ranked, renovation disposition, and the compliance status indicated.

Phase 2 - Assessment - The phase during which planning, analysis and testing are performed, external and internal interface impacts determined, alternative solutions specified and solutions and/or contingency plans determined.

Phase 3 - Renovation - The phase where test plan is prepared and the repair, replacement, or deactivation to achieve compliance is performed.

Phase 4 - Validation - The phase where testing is performed, test results validated and variances, as a control measure, are reviewed. Each test plan is run completely and successfully, the resultant documentation available for review, and compliance certified. Contingency plans are prepared if implementation will not occur by March 31, 1999.

Phase 5 - Implementation - The phase where a renovated Year 2000 project is migrated into production. This phase may result in new issues requiring resolution. Implementation involves user training and documentation updates as needed.

Phase 6 - Compliance Assurance - The phase where the Year 2000 Project Office reviews mission essential compliant systems. This review will verify that appropriate documentation exists and that due diligence was used to achieve compliance. Reviews will be conducted using a graded approach.

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PHASE 1 - IMPACT IDENTIFICATION

The impact identification phase is the starting point for identifying potential Year 2000 compliance issues by producing an inventory of application software, equipment, and infrastructure items. All inventory items will be surveyed, developing a profile of information pertinent to managing and resolving Year 2000 impacts. This information will be maintained in the Year 2000 Database (Y2KAD).

The inventory survey develops a profile by answering the following questions (not a comprehensive listing):

- What applications does the PHMC team use?
- What hardware components are used by an application?
- What infrastructure components are used by an application?
- Who owns a component?
- Does this component meet the DOE criteria as mission essential?
- Is it Year 2000 compliant?
- What risks are associated with Year 2000 failure?
- Is the item active, scheduled to be replaced, scheduled for deactivation, and, if so, when?
- What equipment and hardware are used in association with application software?
- What are the interfaces (input/output)?

Detailed Activities

1.1 - Start Up Inventory

This activity provides the initial data on many applications. Applications will be identified using the Hanford Information System Inventory (HISI) as an initial source of data and expanded through company self-identification in activity 1.2. The compilation of equipment and infrastructure inventories will rely on a variety on a variety of means.

1.2 - Initial Survey

This activity involves the completion of an inventory survey that captures comprehensive information for evaluating and addressing Year 2000 impacts. The survey activity also facilitates the determination of status (mission essential, non-mission essential), disposition (indicated Year 2000 compliant, repair, replace, deactivate, contingency) and ascertains risk should failure occur. All of this information is maintained in the Year 2000 Database (Y2KAD). Selections of reports are maintained on the PHMC Year 2000 homepage (http://apsq102.rl.gov/Y2K_2000/index.html). Other reports are available by contacting the Year 2000 Project Office. Completed surveys are maintained in the Year 2000 Project Office.

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1.3 - Review Survey Results

Inventory survey information is reviewed for completeness, comprehensiveness, accuracy, consistency and questionable data changed.

1.4 - Risk Assessment/Prioritization

The purpose of a risk assessment is to ensure that known risk factors are identified and will be managed. A DOE HQ Risk Assessment format is contained in Appendix 1. Based on the results of risk ranking scores, review and revise the criteria and prioritize the inventory. The risk ranking, along with mission essential status determines the scope of the PHMC Year 2000 Project. The compliance assurance program will be performed considering the seriousness of the potential injury or death to personnel, significant damage to property, or delays in mission activities. High, medium or low risks determine the level of compliance assurance review (see Phase 6).

1.5 - Update Cost Estimate

Produce rough order magnitude cost estimates for items identified as mission essential to complete the remaining phases of the project (assessment, renovation, validation, implementation, and compliance assurance).

1.6 - Determine Year 2000 Projects

Group inventory components into Year 2000 projects for the purposes of project management and status reporting. Projectization refers to grouping related individual components together so they can be managed as a single work product. A Year 2000 Project can be an application and associated hardware and infrastructure items. It may also be a group of the same or similar equipment or infrastructure items, or any other grouping deemed appropriate by the business owners.

PHASE 2 - ASSESSMENT

The purpose of the Assessment phase is to bind the problem for renovation. The assessment leads to an understanding of the exact Year 2000 problems and issues at a source code or component level detail. During this phase plans are prepared and investigations conducted to determine what is compliant and what requires resolution. Solution methods are identified, analyzed and planned using standard project management processes and procedures. All steps must be adequately documented.

The Assessment phase focuses on the following questions:

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- Where are the Year 2000 problems?
- Where are the date fields and calculations that need to be modified?
- How many problems are there and what is the complexity of the problems?
- What external and internal interfaces are affected?
- What testing is required to prove compliance?
- What are the cost, schedule and resource requirements to attain compliance?

Detailed Activities

2.1 - Prepare Year 2000 Plan

Review the impact identification information and verify that only actively used components are included and current versions were accurately documented. Gather documentation such as development documentation, user documentation, and operations documentation. Prepare a Year 2000 Plan detailing the activities necessary to accomplish Year 2000 compliance for mission essential components, taking into account all phases of the process.

2.2 - Prepare Vulnerability Assessment

External Interfaces are defined as those exchanges of information through electronic data file formats to non-PHMC companies. The objective of this activity is to include external interfaces in the planning and management of Year 2000 activities. External interfaces need to be identified, contacted, electronic data exchanges identified, issues determined, and a plan prepared to address the issues. (See Appendix 1)

2.3 - Develop Assessment Test Plan and Schedule

This plan is required only if testing is the method selected to assess compliance. The assessment test plan defines the requirements for the baseline and assessment testing. The baseline is used to ensure that the current active code is being reviewed and current inputs and outputs are captured. Assessment tests are used to assess compliance. Prepare a resource-loaded schedule detailing assessment activities. This planning should identify and determine solutions for resolving issues related to resource availability (in-house and/or contracted staff), other resources (e.g., extra storage devices, parallel equipment, or specialized software that can support the internal clock set to a Year 2000 date), and equipment and/or software purchases.

2.4 - Perform Assessment

This activity carries out the Assessment Test Plan per the assessment schedule. Secure the baseline before conducting the tests according to configuration management procedures. Document all areas affected by pending dates, the nature of the date process and potential solutions and impacts. Include new requirements identified as a solution (i.e., file conversion, bridge program, or new program).

2.5 - Identify Renovation Techniques

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Identify the techniques that will be used to renovate issues discovered during the assessment. Some components may require more than one renovation activity.

2.6 - Develop Renovation Plan

A Year 2000 renovation plan should consider the following:

Technical Approach	A narrative document describing the methods and approach
Schedule	Set the target implementation dates, allowing for such things as: file conversion turnaround time, replacement or upgrade equipment outages, user training, and new problem correction.
Cost Estimate	Based on current information, review and update the cost estimate for the remaining Year 2000 activities.
Configuration Management	Detail the plans for securing components to prevent introducing new Year 2000 problems before being placed into production. Develop plans to manage emergency changes and data and documentation retention and storage.

2.7 - Develop Contingency Plan

A contingency plan is an alternate approach prepared because: 1.) A Year 2000 project will not meet the DOE HQ milestones; thus it will not be compliant in time for sufficient operation of the project to ensure functionality, or 2.) The risk of using a non-compliant project is acceptable to the project owner (the cost/benefit analysis of the impact on the project caused by Year 2000 non-compliance and administrative procedures are cost effective compared to the costs to repair or replace the project components). The Contingency Plan addresses what will be done with a Year 2000 project, how it will be operated, and how business practices will be changed to accommodate noncompliance. These plans could be prepared at any point in the Year 2000 Project phases. (This equates to the DOE HQ Contingency Plan due March 15, 1999 for those Year 2000 projects that did not successfully complete the Validation completion date of February 15, 1999). See Appendix 1, Contingency Plan Guidelines, part of the Compliance Assurance Guidelines.

2.8 - Certify Compliance

When Year 2000 Projects, or the components of it, are assessed to be Year 2000 compliant, the compliance is certified on a compliance certification document. The signatory requirement of the compliance certification document is a manager who assumes responsibility for the system. (See Appendix 1, Compliance Assurance Guidelines)

2.9 - Assessment Documentation

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When the Assessment phase is 100% complete notify the Year 2000 Project Office through your Year 2000 Point of Contact (POC). Notification, via e: mail or letter, should include: project name, project phase, identification of the documentation prepared for the phase, who prepared the documentation, and where the documentation is located. Required documentation for the Assessment phase includes any one of the following:

- Project Plan (preferred, Appendix 4)
- Assessment report (preferred, Appendix 4)
- Inventory survey reviewed, revised, signed and dated
- Documentation of decision to deactivate
- Data Vulnerability Assessment/Risk Assessment (required for DOE HQ reported projects; can be used by RL reported projects, Appendix 4)

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PHASE 3 - RENOVATION

The purpose of the Renovation phase is to carry out the planned changes to achieve Year 2000 compliance in the manner specified during the assessment phase.

Detailed Activities

3.1- Develop Renovation Test Plan

The Renovation Test Plan is developed to detail the test cases and expected results from repairing or replacement solutions. Testing should define the number and types of test cases required verifying Year 2000 compliance.

3.2 - Perform Repair/Replace

Apply the changes or replace the component(s)/entire Year 2000 Project as recommended from the assessment phase. Additional modifications may be identified during renovation. Any new conditions required to support complete testing should be added to the original test plans. Significant additions that will affect the Year 2000 Project may also require changes to the schedule and resources.

3.3 - Renovation Documentation

When the Renovation phase is 100% complete, notify the Year 2000 Project Office through your Year 2000 POC. Notification, via e: mail or letter, should include: project name, project phase, an identification of the documentation prepared for the phase, who prepared the documentation, and where the documentation is located. Required documentation for the Renovation phase includes any one of the following:

- Renovation Test Plan (for replace and repair projects, Appendix 4)
- Proof of receipt of COTS, equipment, firmware
- Contingency Plan (section of the Compliance Assurance Guidelines, Appendix 1)
- Letter from programmer stating coding is complete
- Completion of OSSP System Retirement Process, Step 1 (for Deactivated Projects, Appendix 1)

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PHASE 4 - VALIDATION

The purpose of this phase is it to validate the Year 2000 test results prior to certification and implementation. Contingency plans are required is validation will not occur by February 15, 1999.

Detailed Activities

4.1 - Review Test Plan

Review the test plan. Depending on the risks of the system, recommendation of the business owner, and nature of the renovation, consider involving an independent review team before validation testing to review the results and variances. The benchmark test results will be reviewed prior to beginning validation testing.

4.2 - Run Test

The test plan is executed with the defined test plan criteria. Significant problems encountered during this activity should be escalated and reviewed for impacts to the schedule or other Year 2000 Projects. All test cases must be executed and any issue or conflict with expected results must be dealt with through a variance process.

4.3 - Validate Test Results

Each test plan should be run completely and successfully and the resultant documentation prepared for the compliance assurance review.

4.4 - Resolve Problems and Issues

Coordinate problem and issue resolution identified during validation testing. Impacts may involve external and internal interfaces, schedule, and resources, to name a few, and require rework before compliance is achieved.

4.5 - Certify Compliance

When Year 2000 Projects, or the components of it, are validated for Year 2000 compliance, the compliance is certified on a compliance certification document. Compliance certification signatory requirements involve a manager who assumes full responsibility for the system. (See Appendix 1, Compliance Assurance Guidelines)

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4.6 - Contingency Plan

A contingency plan is an alternate approach prepared because: 1.) A Year 2000 project will not meet the DOE HQ milestones, thus it will not be compliant in time for sufficient operation of the project to ensure functionality, or 2.) The risk of using a non-compliant project is acceptable to the project owner (the cost/benefit analysis of the impact on the project caused by Year 2000 non-compliance and administrative procedures are cost effective compared to the costs to repair or replace the project components). The Contingency Plan addresses what will be done with a Year 2000 project, how it will be operated, and how business practices will be changed to accommodate noncompliance. These plans could be prepared at any point in the Year 2000 Project phases. (This equates to the DOE HQ Contingency Plans due March 15, 1999 for those Year 2000 projects that did not successfully complete the Validation completion date of February 15, 1999)

4.7 - Validation Documentation

When the Validation phase is 100% complete, notify the Year 2000 Project Office through your Year 2000 POC. Notification, via e: mail or letter, should include: project name, project phase, an identification of the documentation prepared for the phase, who prepared the documentation, where the documentation is located and attach the signed compliance certification. Required documentation for the Validation phase includes any one of the following:

- Completion of OSSP System Retirement Process, Step 1 (for Deactivated Projects, Appendix 1)
- Test documents and results validating Year 2000 compliance
- Contingency Plan (required if validation cannot be completed by February 15, 1999; section of the Compliance Assurance Guidelines, Appendix 1)

PHASE 5 - IMPLEMENTATION

The purpose of the Implementation phase is to execute the Year 2000 repaired or replaced systems into a production/operational environment.

5.1 - Implement

Renovated Year 2000 projects are put into production according to the implementation plan developed during the Assessment/Renovation phases.

5.2 - Implementation Documentation

When the Implementation phase is 100% complete, notify your Year 2000 POC. Notification, via e: mail or letter, should include: project name, project phase, an identification of the documentation prepared for the phase, who prepared the documentation, and where the documentation is located. Documentation to support the Implementation phase could include any one of the following:

Implement
5.1

Implementation
Phase 5

Documentation
5.2

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- Production readiness review board approval
- Operational readiness review approval
- Completion of OSSP System Retirement Process, Step 4 (for Deactivated Projects, Appendix 1)
- Contingency Plan (section of the Compliance Assurance Guidelines, Appendix 1)

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PHASE 6 - COMPLIANCE ASSURANCE

The purpose of the Compliance Assurance phase is to provide assurance that the activities performed to achieve Year 2000 compliance were effective. A graded compliance assurance approach is used. The review level is commensurate with the risk level. A more extensive effort is required for projects with higher risk (where failure could result in a significant adverse impact). The graded approach specified for a Year 2000 Project is reviewed and approved by the appropriate company and FDH Project Director. Some circumstances warrant a greater, or lesser, degree of review. Details of the compliance assurance process and roles and responsibilities are provided in the Compliance Assurance Guidelines. (Appendix 1).

Detailed Activities

6.1 - Establish Risk Level

The compliance assurance requirements are determined based on a graded approach. The graded approach combines risk level and Year 2000 disposition to recommend the compliance assurance requirements. The business owner recommends the compliance assurance level and obtains the FDH Project Director's concurrence.

6.2 - Identify Disposition Alternative

The Year 2000 disposition (deactivate, replace, repair, indicated compliant, contingency plan) is identified as a factor for determining compliance assurance activities.

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6.3 - Identify Requirements

The Compliance Assurance Guidelines detail the requirements resulting from the risk level and associated disposition. Requirements may include documentation, witness testing, a certification document, and a compliance assurance checklist. The type of documentation required is specific to each disposition. For example, the high-risk compliance assurance activities by disposition alternatives are:

DISPOSITION	YEAR 2000 DOCUMENTATION	YEAR 2000 "WITNESS" TESTING	COMPLIANCE ASSURANCE CHECKLIST	COMPLIANCE CERTIFICATION DOCUMENT
DEACTIVATE	Deactivation Notice			
REPAIR	Required	Required	Required	Required
REPLACE	Required	Required	Required	Required
INDICATED COMPLIANT	Required	Required	Required	Required
CONTINGENCY PLANNING	Contingency Plan	Required	Required	Required

6.4 - Conduct Review

The Year 2000 Project Office Compliance Assurance team will perform the compliance assurance as specified for each Year 2000 project. Business managers and technical staff will be involved as designated in the guidelines or as determined.

6.5 - Compliance Assurance Report

The results of the Compliance Assurance team's activities will be documented in a Compliance Assurance Report provided to the business owner and maintained by the Year 2000 Project Office.

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Appendix 1 - GUIDELINES

The following guidelines are available on the PHMC Year 2000 home page (<http://apsql02.rl.gov/Y2K/index.html>) or DOE HQ web site, as indicated. DOE HQ Year 2000 Compliance Reviews and Certification Process, is also included in this appendix.

Status Reporting Guidelines

The process, responsibilities, and timeframe for reporting progress on mission essential Year 2000 projects are described in Status Reporting Guidelines. Status reporting for Year 2000 projects is performed on the PHMC Year 2000 web page. Status entered is maintained in the Year 2000 Database from which status reports are generated. The process is described in the page itself. (Author: PHMC Year 2000 Project Office) Available on <http://apsql02.rl.gov/y2k/index.html>

Compliance Assurance Guidelines

The PHMC Year 2000 Compliance Assurance Guidelines describe the risk based 'graded' approach, implementation and responsibilities for conducting compliance assurance of Year 2000 mission essential systems. Compliance assurance requirements are determined based on one of three risk levels related to the DOE HQ definition of mission essential. The document incorporates the DOE HQ checklist and certification document, and provides guidelines for preparing contingency plans. (Author: PHMC Year 2000 Project Office) Available on <http://apsql02.rl.gov/y2k/index.html>

Year 2000 Vulnerability Assessment on PHMC External Interfaces

The Year 2000 Project Office will facilitate this activity to provide DOE assurance that the PHMC team is aware of the existence of external interfaces, that they have been contacted, and that external interfaces are included as a critical component in their Year 2000 planning and activities. (Author: PHMC Year 2000 Project Office)

Deactivation/Retirement Process

The System Retirement Process, used for applications being deactivated, is the OSSP System Retirement Process, available on the Y2K web site, (<http://apsql02.rl.gov/y2k/index.html>).

DOE HQ Year 2000 Compliance Reviews and Certification Process

This is a recreation of a letter (and attachments) from DOE HQ iterating the process they will use to review progress. The PHMC team will use this information to ensure DOE HQ field audits can be effectively accomplished. This information is included in this appendix and on the Year 2000 webpage. (Author: DOE HQ)

DOE HQ Year 2000 Risk Assessment

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The DOE HQ Year 2000 Risk Assessment is specifically designed to alert an organization to potential problems that can occur as a result of year 2000 and related business functions. A computer system with a year 2000 risk implies that business functions are also in jeopardy. The assessment requires the demonstration of a system's year 2000 compliance in order to show that their system is not at risk. Available on <http://websparc.hr.doe.gov/year2000/riskques.htm>

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DOE HQ Year 2000 Compliance Reviews and Certification Process

Attachments to:

Memorandum for Heads of Departmental Elements

Subject:

Year 2000 Compliance Reviews and Certification Process

Date:

December 22, 1997

From:

S.W. Hall Jr., DOE HQ, CIO

Congress and the Office of Management and Budget (OMB) have repeatedly stressed the need for the Department to verify that it is on track to address the impact of the century date change issue and its effect on various computer systems. Therefore, the following processes are being implemented by this office: (1) establishment of a year 2000 compliance review process to ensure that Departmental policies and procedures related to year 2000 compliance are being followed, and (2) development of a certification process for all year 2000 activities.

Compliance Review Process

The reviews will provide sites an opportunity to describe their year 2000 progress and discuss issues as they move toward self-certification for their year 2000 mission-essential systems. The Year 2000 Compliance Review Team will be meeting and working with the year 2000 site coordinator(s) and system owner(s). The review team will provide a minimum one-month notice to the Year 2000 Information Management Point of Contact prior to the on-site visit. Each review will focus on the site's year 2000 plans and processes. The review team will concentrate on products generated for each mission-essential system to meet OMB and Departmental milestones. The review will include: gathering information, reviewing available documentation, discussing results, and providing a forum on other year 2000 issues. Attachment 1 contains more information as to what will be discussed and reviewed for each site.

Certification Process

Best practices for implementing year 2000 solutions are listed in Attachment 1, Appendix C. As such, the completion of these steps provides general guidance that each system should follow. The certification process includes the completion of these general guidelines and documenting this fact, via a self-certification form (see Attachment 2), for each mission-essential system. The form requires that the System Owner and Year 2000 Information Management Point of Contact certify that the system is in compliance with year 2000 requirements.

We look forward to a productive review cycle aimed at helping the Department achieve year 2000 compliance. Should you have any questions on this memorandum or the year 2000 matter in general, please contact the Year 2000 Team Coordinator, Cliff Hoyt, at 301-903-5237.

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Attachment 1

Department of Energy Year 2000 Program Site Compliance Review Outline

Purpose of the Review

Address Congressional and Office of Management and Budget reporting requirements on year 2000 progress. Review the site plan(s) and/or programs(s) for mission-essential systems to provide an independent assessment that year 2000 activities for those systems are progressing in accordance with the plan toward meeting the overall Department goal of achieving year 2000 compliance for all mission-essential systems. The term "site," as used in this document, refers to DOE and contractor field sites, headquarters organizations, or departmental program offices that have ownership and responsibility for development and maintenance of one or more DOE systems.

Scope of the Review

1. Assist the site project team in attaining a year 2000 audit-ready posture, providing guidance on project management, the DOE Software Engineering Methodology, software quality assurance, and audit readiness activities, as required and appropriate.
2. Validate the existence, assess the completeness, ascertain the execution of:
 - site program and/or project plan(s),
 - project deliverables,
 - project documentation, and
 - related factors, such as the project management approach and testing methodology, that have an impact on the site's ability to complete the year 2000 compliance activities within the established Department target dates.
3. Review planned and established year 2000 software management activities to provide assurance and/or confidence that the year 2000 compliance targets will be met.

Appendices:

- A - Review Methodology and Report
- B - Preliminary List of Items to be Reviewed
- C - Checklists

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Appendix A

Review Methodology

Prepare for review, to be conducted at the site

- Arrange visit schedule (overview meeting, interviews, access to project records, feedback meeting)
- Provide the site project team with a review outline, time expectations, etc.

Conduct on-site review

- Brief the project team on review objectives and activities
- Receive an overview and status of the project(s)
- Conduct interview(s) with key project personnel
- Review project records/files
- Review project deliverables

Brief the site project team on preliminary findings

- Present the summary of preliminary findings
- Receive validation/clarification on the preliminary findings, if required

Prepare Compliance Report

- Obtain clarifications from the site, if required
- Revisit project documentation, as appropriate
- Prepare recommendations (if any)
- Review assessment with the site project team
- Review assessment and recommendations (if any) with the Year 2000 Project Office

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Appendix B

List of Items to be Reviewed

System Inventory

Copy of inventory of systems under the purview of the site, as available.

Mission Essential Systems

List of all systems that have been identified as mission essential.

Plans

For all identified mission essential systems, review information contained in any or all of the plans listed under the following two groups. It is understood that some information may presently exist imbedded in other documents; e.g., Test plan may be imbedded in the Project Plan.

Required Group:

- Project Plan(s)
- Test Plan(s)
- Contingency Plan(s)
- Year 2000 Risk Assessment
- Data Vulnerability Evaluation

Optional Group:

- Software Development Plan(s)
- Documentation Plan(s)
- Implementation Plan(s)
- Acceptance Plan(s)
- Verification and Validation Plan(s)
- Compliance Plan
- Disaster Recovery Plan

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Appendix C

Checklists

(to be used during interviews)

Phase 1 (Awareness):

- Has a year 2000 awareness campaign been conducted? Have site personnel been made aware of the year 2000 problem and its potential implications?
- Are the year 2000 efforts supported by all levels of management?
- Are appropriate levels of management involved in the project management process?
- Has/have a Year 2000 program/project manager(s) been appointed?
- Has/have a Year 2000 project team(s) been identified and assembled?

Phase 2 (Assessment):

- Was a process used for identifying the site's mission essential systems?
- Are generally accepted project management practices (project planning, tracking and reporting, quality assurance, configuration management, etc.) being followed?
- Has/have required year 2000 resources and capabilities been identified and mobilized?
- Are year 2000 status reviews being conducted?
- Are year 2000 status reports being created and distributed to appropriate persons?

Phase 3 (Renovation):

- Are the budget and schedule for the conversion for targeted applications, platforms, databases, or interfaces being met?
- Are the budget and schedule for developing bridges and filters to handle nonconforming data being met?
- Are the budget and schedule for the replacement of targeted applications and system components being met?
- Are all code and system modifications being documented?
- If formal configuration management being used to control changes?
- Are unit, integration, and system tests being scheduled?
- Are budget and schedule for applications or components targeted for elimination being met?
- Are changes to information systems components being coordinated with all internal and external users?
- Are the conversion and replacement processes being tracked? Are metrics collected and used to manage the conversion and replacement processes?

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Phase 4 (Validation):

- Are test plans being developed, conducted, and documented for each converted or replaced application or system component?
- Is any independent verification or validation being done at the site on systems that have year 2000 changes? (Note: Verification is the process of evaluating a software product to determine whether or not the work products of a stage of the software life cycle fulfill the requirements established during the **Checklists, continued**
- previous stage. Validation is the process of evaluating software at the end of the software development process to assure compliance with established software and system requirements.)
- Is an isolated year 2000 test facility being implemented?
- Are automated test tools and scripts being implemented?
- Are unit, integrated, and system tests being performed on each converted or replaced component? The following types of tests should be included:
 - Regression
 - Performance
 - Stress
 - Forward and backward time
- Are the system owner(s) involved in the validation and acceptance testing activities?
- Is the testing and validation process being documented and tracked? Are test metrics collected and used to manage the testing activities?
- Are acceptance tests being initiated?

Phase 5 (Implementation):

- Are transition environments and procedures being defined?
- Are schedules for the implementation of all converted or replaced applications and system components being developed and documented?
- Are data exchange and system interface issues being resolved?
- Are database and archive concerns being addressed?
- Is acceptance testing being implemented?
- Are contingency plans being developed?
- Are the converted and/or replaced system(s) and related databases being integrated into the production environment?
- Has a "Year 2000 Compliance Certification" been signed and forwarded to the Year 2000 Project Office (FAX: 301-903-2261) for each compliant system?

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Attachment 2

Year 2000 Compliance Certification

Congress and the Office of Management and Budget (OMB) have repeatedly stressed the need for the Department to verify that it is on track to address the impact of the century date change issue and its effect on various computer systems. As a final step in implementing a compliant mission-essential system, a certification process is necessary.

This form implements this certification process. When completed and signed, this document constitutes certification that the referenced system has been implemented as year 2000 compliant.

Forward (via FAX) this certification to the Year 2000 Project Office after the system has completed testing designed to validate year 2000 compliance.

I certify that the referenced system has been implemented as year 2000 compliant. The system has hardware, software, and firmware that are able to accurately process dates (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries. In addition, the system is able to accurately exchange (provide and/or receive) data with external systems as required.

Mission-Essential System Name _____
(As provided in the Year 2000 Mission-Essential Status System)

Organization _____
(Organization as provided in the Year 2000 Mission-Essential Status System)

Name _____
(System Owner)

Name _____
(The Information Management Point of Contact)

Title _____

Title _____

Signature _____

Signature _____

Date _____

Date _____

Forward (via Fax) signed form to:

Cliff Hoyt (DOE Year 2000 Project Office)
Fax Number: (301) 903-2261
Phone Number: (301) 903-5237

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Appendix 2 - YEAR 2000 SUPPORT AND TECHNICAL ASSISTANCE

There are three primary resources for PHMC Year 2000 activities: Year 2000 Project Office, Lockheed Martin Services, and Fluor Daniel Northwest.

The Year 2000 Project Office, in addition to its responsibilities for site wide guidance and awareness, is a central repository of site status. The office maintains a knowledge base of existing site wide software, hardware and equipment compliant status, solutions, and year 2000 tools. A Year 2000 compliant laboratory, with file servers and personal computers, is maintained in the instance that site compliant resources are not large enough. The culmination of all this information provides the foundation for performing the compliance assurance program.

Lockheed Martin Services, has technical experts to perform Year 2000 assessment and renovation and Fluor Daniel Northwest

YEAR 2000 PROJECT OFFICE

Year 2000 Database (Point of Contact: Kelly Layfield 376-6785)

The Year 2000 Database (Y2KAD) is the central repository for PHMC Year 2000 data. It is a Microsoft Access 97/Microsoft SQL Service database application that stores and reports data required by the Year 2000 Project. Each phase of the Year 2000 Project (see the Technical Overview section) has specific data requirements and different focuses (e.g., DOE-HQ reporting, awareness, program control, status reporting, compliance assurance, etc.). All changes to the database are controlled by the Configuration Management Plan for the Y2KAD. Monthly status reporting, provided by FDH, the major subcontractors, and DynCorp are input through an on-line report screen on the Year 2000 web page to the database. Selected reports are available on the web page or as requested from the PHMC Year 2000 Project Office.

Year 2000 Web Page (Point of Contact: Kelly Layfield 376-6785)

The Year 2000 web page has several objectives: general Year 2000 awareness and education; PHMC requirements and guidelines; site specific technical information; lessons learned, on-line status reporting; who to contact, current activities, project status and accomplishments. (<http://apsq102.rl.gov/Year2000/index.html>). The Year 2000 Project Office also conducts a comprehensive awareness program; the webpage is one of the mediums for providing this awareness and education.

Year 2000 Technical Support (Point of Contact: Vic Forney, 376-3643)

Technical support is available in several areas:

Solutions - The PHMC Year 2000 Technical References Library maintains information about all site wide hardware, software and equipment in terms of current compliance status and source of information.

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Hardcopy reference information is maintained at the Year 2000 Project Office and on the PHMC Year 2000 web page, with links to associated sites as applicable.

Year 2000 Tools for Assessment and Renovation - The Year 2000 Project Office conducted an exhaustive research of tools to support assessment and renovation activities. Several tools were purchased and are available for use. Detail information is available from the Year 2000 Project Office and on the Year 2000 web page, (<http://apsql02.rl.gov/Y2K/index.html>).

Year 2000 Compliant Lab (Point of Contact: Vic Forney 376-3643)

The Year 2000 Support lab is a combination of compliant servers and desktop systems that may be used to support assessment and renovation testing efforts. The Year 2000 Support Lab provides an isolated and independent environment for testing activities. A lab configuration Management plan provides the guidelines and procedures for general use. (The plan is available on the Year 2000 web page <http://apsql02.rl.gov/Y2K/index.html>)

The PHMC Year 2000 Compliance Assurance Program (Point of Contact: Tom Crocker 943-5333)

Compliance assurance is the activity to be performed by the PHMC contractors and the Year 2000 Project Office to ensure that all mission essential systems have been made Year 2000 compliant and the information reported accurate. The Year 2000 Project Office is responsible for implementing this program. See Appendix 1, Compliance Assurance Guidelines, for further details.

Lockheed Martin Services, Inc. (Point of Contact: Bob Kouchoukos, 373-2634)

Lockheed Martin Services, Inc. (LMSI) Systems Development and Integration (SD&I) has the technical expertise to perform Year 2000 assessment, renovation, testing and can assist in preparing for Year 2000 compliance assurance. SD&I provides the configuration management for interface dependencies and the production environment. SD&I resources include support from other LMSI departments such as Telecommunications and Network Engineering, and Operations and Support. These departments provide Year 2000 support for networks, file servers, equipment assessment, renovation, testing and preparation for Year 2000 compliance Assurance.

Support from SD&I is provided through Task Orders, all of which are reviewed and approved by the FDH Chief Information Officer.

Fluor Daniel Northwest (Point of Contact: Robert Tanner 372-2111)

Fluor Daniel Northwest (FDNW) has the technical expertise and resources to perform Year 2000 assessment, renovation, and testing in the area of embedded controllers systems. The Fluor Daniel Northwest resources are available to assist in preparation for Year 2000 compliance assurance. FDNW has the tools and personnel to perform or provided Year 2000 training support in the area of embedded controllers (e.g., instrumentation and process control). Support from FDNW is provided through Task Orders, which have been reviewed and approved by FDH.

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APPENDIX 3 -YEAR 2000 CONSIDERATIONS

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YEAR 2000 COMPLIANCE DEFINITION

Neither performance nor functionality is to be affected by dates before, during, or between the 20th and 21st centuries (19XX and 20XX), and after the year 2000. The following requirements must be met:

Rule 1. No value for current date will generate erroneous information or cause any interruption in normal business operation.

Rule 2. Date based functionality must behave consistently for dates prior to, during and after the Year 2000

Rule 3. In all interfaces and data storage, the century in any date must be specified explicitly, by unambiguous algorithms or implicitly inferred rules.

Rule 4. Year 2000 must be recognized as a leap year.

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COMMON DATE USES

How can date-related problems be recognized? A starting point for assessing date impacts is to look at the most common uses of dates:

- **Date functions**
 - Calculating the duration between two dates
 - Calculating a date based on a starting date, plus or minus duration
 - Calculating day of week, day of month, day within a year, week and month of year
 - Evaluating leap year (or total days in a leap year)
 - Comparing two dates, less than, equal to, greater than
 - Converting between various date representations (Gregorian/Julian/Relative)
 - Storing and retrieving date data with two-digit years
 - Date calls from the operating system (four-digit years may require changes to calls)
 - Subroutines or library routines that return or receive dates
 - Moving date data across interfaces (conversion on either side of the interface).
- **File/table**
 - Dates in keys or indexes
 - Extracts that select or sort records by date
 - Programs that use 99 or 00 as special indicators or special values (e.g., start or end of file).
- **Reports/queries**
 - Reports/queries sorted/summarized by a date
 - Reports/queries produced for a date range.
- **Screens**
 - Repeatable data presented in date sequence
 - Data capture or selection via a date
 - Inconsistent use of date formats within a single system MM/DD/YY & YY/MM/DD (What date is 01/02/03?)
- **Interfaces**
 - Data associated with a single date or date range is to be passed from one system to another (selection of a group of records based on date)
 - Dates trigger the function or type of data to be passed (day of week or weekend processing).

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COMMON SOLUTIONS FOR DATE ISSUES

The most common solutions for date issues are date expansion, fixed date window, sliding window, and century indicator. Display date issues are not as frequent as issues using date calculations. However display dates may be an issue when some dates are MM/DD/YY and others are YY/MM/DD causing misinterpretation.

- **Date Expansion**

Expanding the date to contain the century values. For example dates that are currently held as YYMMDD are converted to CCYYMMDD format. This conversion may include holding the date in a packed or binary format to save space. Date expansion will require that history files be converted to the new format or that bridge programs be developed to read the old formats on unconverted history files converting the data on demand.

- **Fixed Date Window**

If the century value can be determined by the value range of the year alone, a fixed date window can be used. Example: The system has no dates prior to 1959 and the date format is YYMMDD. A date value of 650102 can be identified as 19650102, and a date value of 050102 can be identified as 20050102. Fixed date windows are most commonly addressed through a business rule placed directly into the source program as a sub-routine. Each date field can have unique value ranges such as: field A has no dates prior to 1935 and field B has no dates prior to 1948. In this case two business rules can be used. Because this technique is only a temporary fix, it is suggested that the fixed window date be no less than 20. (Note: The fixed window date is often preferred to date expansion. This type of renovation does not affect file formats or file history. Expansion is the preferred method only in cases where file keys or indexes are two-digit years.)

- **Sliding Window**

Sliding windows are most commonly supported through a date parameter. This parameter can be today's run date, a control file, or file header date. The parameter date field value checks can be used to determine the date with century. Example: Today's system date (CCYYMMDD) is 20011105, the date field (YYMMDD) value is 950103. The year value of the data date is greater than the system date year, so the century can be calculated as being the system date century minus 1. Sliding window dates should not be used on any date field where there is the possibility of having a date before 1901, such as a birth date.

- **Century Indicator**

Files often have unused space at the end of the record or old fields no longer used. These unused areas can be used to hold a flag indicating the year is for the 1900s or 2000s. This method can often be implemented without file conversions once it has been confirmed that the value to identify year 2000 dates is not found where the new century indicator fields will be placed on the file. If the year 2000 flag value is found then the date is for year 2000, otherwise it is a 1900 date. Note: One drawback of this technique is the number of creative and inconsistent solutions that are employed to indicate centuries.

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GUIDELINES FOR EVALUATING DATE FUNCTIONS

During assessment, date functions will be encountered that will have no significant impact if left unchanged. Other functions will cause termination. When evaluating date functions, the following guidelines can help determine the level of assessment and renovation effort applicable for each situation.

- **Inconvenient** - these are conditions that it would be nice to correct, but do not impact the implementation of activities, or a component thereof. An example of an inconvenient condition is:

Incoming supply list is in due-date sequence and the century is not available. As materials are received they fall off the list. The clerk will be inconvenienced for a short duration but a simple work around and brief training may be all that is required to achieve compliance.

- **Show Stoppers** - these are conditions that will result in immediate failure or produce erroneous information. These conditions are most likely a calculation where overflow conditions have not been planned for. As example of a show stopper condition is:

A common date routine is used to calculate the number of weeks between two dates. This routine uses a two-digit year for both dates. The routine will not calculate weeks across the millennium correctly, causing the system to fail immediately or to return incorrect information to a critical system.

- **Performance Impact** - these are conditions that will result in slow performance or require more frequent re-organization of the data. Performance alone is rarely cause for change, but the impact should be identified as part of the problem, and considered when developing a solution. An example of a performance impact condition is:

A random access file has date as the first field in the key. The bulk of the daily updates are new entries made in real time using today's date in the key. Originally the file was set up with the largest free space at end of the file to accommodate the new days updates. When the year 2000 dates are added to the file they will be added to the front of the file. This will cause data management problems even if there are no business problems related to dates. Any file or table with dates in the key needs to be reviewed for performance problems because of this issue. Dates used in alternate indexes can also impact performance.

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ASSESSMENT TECHNIQUES

Year 2000 assessment techniques are varied depending on the situation. Each must have resultant evidence (documentation) that is retained. The following lists the evidence expected, based on the assessment technique:

- **Manually scanned** - Hard copies of application program and utility listings with date-related areas highlighted and notations discussing the Year 2000 impact
- **Automated scan** - Hard copies of scan results (reports or screen prints) with notations discussing the Year 2000 impact
- **Black box testing** - Hard copies of test results or an independent confirmation of the test results (when compliant). Black box testing is most commonly used for equipment and infrastructure items. Software packages may also use a black box approach when there is no ability to change the software, such as a COTS.
- **Baseline testing** - Hard copies of test results or an independent confirmation of the test results (when compliant). Baseline testing usually involves all of the components for a project, such as all of the programs and utilities for an application running on the architecture currently in use.
- **Vendor certification** - Certification document on file
- **Vendor fix available** - Fix document on file
- **Third-party certification** - Certification document on file
- **Third-party fix available** - Fix document is on file
- **Internal technical review** - Local technical experts meet and determine if a component is Year 2000 compliant. Hard copy of a review document provides details and results of the review.
- **Other (explain)** - Document giving details on the method used and the results of the analysis.

See Appendix 1, Compliance Assurance Guidelines. This document can be found on the Year 2000 web page, (<http://apsql02.rl.gov/Y2K/index.html>).

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TESTING CONSIDERATIONS

One of the areas that are commonly underestimated for Year 2000 projects is testing. In an application environment, testing for Year 2000 is different from testing for common maintenance. Normally, a production environment is copied down either totally or partially to a test environment and modifications are verified. For Year 2000 testing, the test environment has to be 'fast forwarded' to a date in the future. The following items describe some common testing considerations.

- **Test Plans for Leap Year**

Test plans including testing for years 1999, 2000, and 2001 can effectively most conditions to confirm Year 2000 compliance. However, one unique condition is not considered; year 2000 is a leap year and 1900 is not. The basic rule for determining leap years is that if the year can be evenly divided by 4 it is a leap year, but when the year is evenly divisible by 100 it is not a leap year; however, when the year is evenly divisible by 400 the year is a leap year. Most information systems in use today rarely have information dated 1900, and this calculation is not well known.

- **Windowing versus Expansion**

It is expensive and time consuming to modify file formats during Year 2000 renovations. A windowing technique can minimize the file modifications required. File modification can affect historical backup information and disaster recovery data, as well as cause a significant number of program modifications unrelated to Year 2000. If the logic in the program can interpret the year through a windowing strategy (if year < 30 century=19 else century = 20), file modifications can be minimized.

- **Architectural Considerations**

Other considerations that are not always obvious include the impacts of upgrading to compliant architectures.

When new versions of operating systems, hardware, databases, compilers, etc, are involved in an upgrade, unexpected work not necessarily related to date processing could surface. Changes to date call to the operating systems, system macros, or compilers can cause code to fail that previously compiled or ran correctly. This is particularly true when migrating from 16- to 32-bit architectures. Be aware that these 'unexpected' enhancements can generate additional work scope in a Year 2000 renovation effort.

Many systems may have to cope with a mixed architecture; plans must be established to address the unique problems that this presents. One additional caveat is the consideration for setting system clocks forward.

When this occurs, software licenses can expire, files can expire; passwords may not work, etc. It is important to research these types of considerations before system clocks are modified to accommodate testing.

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TESTING CONSIDERATIONS (Continued)

• Incorporating Existing Maintenance

The difficulty of Year 2000 testing is increased when a system being modified for Year 2000 has other maintenance enhancements taking place. As a rule, the only modifications that should be taking place in a Year 2000 effort are those modifications that impact Year 2000. Mixing maintenance enhancements and Year 2000 modifications is not permitted. If maintenance enhancements must occur simultaneous with Year 2000 enhancements, the Year 2000 work must be broken up into small increments (2-4 weeks per upgrade) with the other maintenance scheduled between these upgrades.

• Test Data Considerations

Application testing often involves the creation of programs to generate 'future' dates in the test environment. The cost of Year 2000 renovation increases with the number of test conditions identified. Each test must be evaluated and the proper subset for the business environment must be ascertained. The cost of each test must be weighed against the probability of failure of that criterion in the specific environment. It may be desirable to maintain the programs that create the test environments under configuration management so they are readily reusable. The following examples discuss several potential test cases that might be used for Year 2000 validation.

- Test cases for the boundary years (if windowing used e.g., $YY < 30$)
 - Lower year limit of the 100-year interval (e.g., 29)
 - Upper year limit for the 100-year interval (e.g., 30)
- Test cases for the century rollover and split
 - Less than 2000
 - Equal to 2000
 - Greater than 2000
- Test cases that place the date within the 20th and 21st centuries
- Test cases that co-mingle dates within the 20th and 21st century
- Test cases for year end 99 or fiscal year 00
- Test cases for leap year (existence of 02/29/2000, day of week, total days in year)
- Test cases for library or custom date routines
- Testing for tables or algorithms using dates as pointers or indexes. Note: One strategy for creating future dates is to add "28" to every year in the file. When 28 is added, the day of the week falls out the same as the original year. Be careful when using a windowing technique (make sure that it is 30 or greater).
- September 30, 1998 to October 1, 1998 (FY test 1998 to 1999)
- September 8, 1999 to September 9, 1999 (Tests 9999)
- December 31, 1999 to January 1, 2000 (Change of millennium)
- September 30, 1999 to October 1, 1999 (Project reacts to FY 2000 correctly)
- February 28, 2000 to February 29, 2000 (Recognition of leap year)
- February 29, 2000 to March 1, 2000 (Does not go to February 30 or 31)

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- February 29, 2001 (Should create error as 2001 is not a leap year)
- September 30, 2000 to October 1, 2000 (Project reacts to FY 2001 correctly)
- December 30, 2000 to January 1, 2001 (Checks for a bad leap year calculation)
- December 31, 2000 to January 1, 2001 (Shows project is aware 2000 has 366 days)

- **Minimal Compliance Testing**

William Ulrich, an authority on Year 2000, has devised a minimal validation strategy to determine if a system is compliant. It consists of the following steps. This set of tests may not be sufficient to certify compliance, but it can be used as a starting point for validation.

- Establish a baseline environment, run testing, save results
- Test the baseline against a small number of testing scenarios (e.g., boundaries)
- Compare limited test results to the baseline
- Test using post-2000 dates (e.g., add 28 to each year)
- Compare results to the baseline results
- Obtain certification and move into production.

- **Equipment Considerations**

Equipment testing may be complicated by an inability to actually set clocks within specific components. Even if clocks can be set, determining the impact on a specific piece of equipment and the combinations of components that must be tested in conjunction with each other can be a complicated task.

A number of databases are available to support validation of compliance of various pieces of equipment. The Year 2000 Project Office provides a contact in the technical support area to provide information about access to available databases (there is a fee associated with these types of access). Vendor validation is the simplest method of ensuring compliance, although compliance is often related to implementation and configuration. The external databases that are available can provide information related to compliance in various configurations (if it is available). Equipment assessment may consist of the following:

- Has the hardware been declared Year 2000 compliant (ask the vendor what sort of testing has been done to verify)?
- Has the vendor offered a fix?
- Has some other firm found a fix?
- Is there no way to fix the problem?
- Is a Year 2000 project underway to renovate the problem (in another company)?

- **User Considerations**

Year 2000 testing often involves the user community to support validation activities. It may be difficult for the users to see the benefits of participating in Year 2000 testing because the system behaves just as it always

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has, except that the dates are processed correctly. They may see no 'added value' (enhancements) in the Year 2000 maintenance. It is important to gain user support up front so that they understand the importance of their contribution and commitment to Year 2000 testing.

APPENDIX 4 - SAMPLE DOCUMENTS

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Sample Project Plan

A full example is provided in the 'Technical Information' section of the Year 2000 webpage
<http://apsql02.rl.gov/y2k/index.html>

- 1.0 Scope
- 2.0 General System Description
- 3.0 Year 2000 Compliance Status
- 4.0 Test Case Listing (if known)
- 5.0 Deliverables/Documentation
- 6.0 Milestones
- 7.0 Schedule of Activities
- 8.0 Responsibilities

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PHMC Year 2000 Vulnerability Assessment Form

A full example and instructions are provided in the 'Technical Information section of the Year 2000 webpage <http://apsql02.rl.gov/y2k/index.html>.

PHMC Acronym

Owner Company

Application Description

Owner POC

Phone

External Interface Identification

External Interface Acronym

Interface Direction

Owner Company

Interface Description

Owner POC

Phone

Vulnerability Check List

	Question	Response
1.	Is the PHMC external interface correctly identified?	Yes / No
2.	Do date fields exist within this PHMC external interface? If "Yes", how many date fields exist in the interface?	Yes / No 1-5 5-10 10 or more
3.	Are all date fields represented with a full four digit year within the interface file?	Yes / No
4.	Does the PHMC external interface contain data that was selected based on a date?	Yes / No
5.	Has the owner of the external interface been contacted to assess Year 2000 issues within the interface in writing?	Yes / No
	If "No", this contact must be established prior to March 1, 1998.	Date of Contact:
6.	Has a plan been created to coordinate Year 2000 changes to the interface?	Yes / No
	If "No", please provide a date (prior to April 30, 1998) when a plan will be completed.	Date:
6.1	Does the plan identify the possible impacts associated with Year 2000?	Yes / No
6.2	Does the plan identify a schedule for performing Year 2000 work?	Yes / No
6.3	Does the plan provide agreed upon implementation plans?	Yes / No
6.4	Is there a documented method for resolving interface-related issues between organizations?	Yes / No
7.	Can all Year 2000 external interface renovation work be completed by 09/15/1998?	Yes / No
	If "No", a contingency plan must be developed by 09/15/1998. Please provide a date when the contingency plan will be completed.	Date:
8.	Is or will funding be available to correct any identified Year 2000 problems created by the external interface system?	Yes / No

System Owner

Date

PHMC Year 2000 Representative

Date

Sample Risk Assessment

A full sample of a risk assessment is provided in the 'Technical Information' section of the Year 2000 webpage at <http://apsql02.rl.gov/y2k/index.html>.

Sample Assessment Document

Hanford PeopleCORE Y2K Assessment

The Hanford PeopleCORE System (HPC) is a collection of information of people associated with the Hanford Site. HPC is a DB2 relational database that resides on the Enterprise Server. The batch processing is done with JCL run streams that use COBOL and EASYTRIEVE to process data. The data entry screens use GENER/OL to enter data on-line. Therefore the products that need to be assessed for Y2K compliance are the **DB2** database, **JCL** run-streams, **COBOL** programs, **EASYTRIEVE** programs, and **GENER/OL** screens. Data is collected from several sources and disbursed to approximately 60 systems. Both the **internal input and output files** need to be assessed for Y2K compliance.

The **DB2** database is Y2K compliant in that all dates are stored in the date format mm/dd/yyyy, which includes the century. A date must be a valid date to be entered into the database. DB2 recognizes 02/29/2000 as a valid leap year date.

There are no date functions, sorts or calculations in the **JCL** runstreams.

The **COBOL** programs are currently compiled using older versions. The main concern for HPC was the 'ACCEPT DATE' function did not have the century included in the date. The century was hard-coded using 'MOVE 19'. The MVS COBOL Compiler that was received and tested a couple of weeks ago does a 'MOVE FUNCTION CURRENT-DATE' that includes the century. 'CURRENT-DATE' was used differently in the older version of COBOL. Some of the older COBOL programs used a 'CALL CHBCSDT' routine. This call routine did not include the century.

Some of the **EASYTRIEVE** programs in HPC have 'MOVE 19' hard coded into the programs that need to be changed.

The **GENER/OL** screens have the option of entering the century or if the year < '30' then century = '20' else century = '19'.

Some of the **input, internal and output files** do not have the century included and have been assessed to see which files need changing.

HPC does not have any date calculations, fiscal date processing, or counting of days. The Last Update of a record is compared to a Parameter Last Processing date when change data is collected for some of the interfaces. Both of these dates are DB2 stored dates, which includes the century.

Hanford PeopleCORE Y2K Assessment, continued

The following scans were done to find Y2K date problems:

- COBOL - scanned for 'ACCEPT DATE' - 9 programs need to be modified.
- scanned for 'MOVE 19' - the same 9 programs need to be modified.
- scanned for 'CALL CHBCSDT' - 2 programs need to be modified.
- scanned for 'CURRENT-DATE' - no programs found.

EASYTRIEVE - scanned for 'MOVE 19' - 8 programs need to be modified.

Input Files - scanned documentation for dates without century - 3 files and related programs need modification.

Internal Files - will have the century added when the COBOL or EASYTRIEVE programs are changed.

Output Files - scanned documentation for dates without century - 6 files were found. After contacting users, only one output file needs to be modified to include century.

The following changes need to be made:

COBOL Programs -	HPCI100W - input file
	HPCI110W " "
	HPCI300W " "
	HPCI400W " "
	HPCI500W " "
	HPCI600W " "
	HPCI600X " "
	HPCI700W " "
	HPCI800W " "
	HPCO075W - output file
EASYTRIEVE Programs -	HPCR020R - report
	HPCR051R - labels
	HPCR053R "
	HPCR054R "
	HPCR055C "
	HPCR055E "
	HPCR055R "
	HPCR055W "

Prepared by
Adele M Lewis, LMSI
Programmer/Analyst
April 30, 1998

Sample Assessment Document, continued Hanford PeopleCORE Y2K Assessment

March 13, 1998

Estimate of work needed to make PeopleCORE (HPC) Y2K Compliant

The HPC system resides on the Enterprise Server in a DB2 database. The data base itself is Y2K compliant in that all dates are stored using the date format of DB2 which includes the 2 digits for the century. The GENER/OL screens that are used for on-line data access also include the 2 digits for the century. I have not found any date calculations in the GENER/OL Screen processing that are not Y2K compliant.

The only HPC processing that I have found not to be Y2K compliant are the COBOL programs that process incoming and outgoing interfaces to HPC. The version of COBOL now being used does not utilize the 2 digit century in date functions. Usually in the HPC system the century '19' is hard coded into the programs. LMSI has a new version of COBOL coming in at any time that does use the 2 digit century. I have identified 39 COBOL programs that use date functions that will need to be changed for Y2K compliance. This includes data base updates, reports, and feeds to other systems.

I have also identified 3 incoming files and 4 outgoing files that do not have the 2 digit century. The system POCs have been notified and are evaluating their needs for Y2K. If all of these 46 COBOL programs need to be updated, it would take from 5 to 10 hours for each program. This includes program modifications, testing, implementing, and documentation. That works out to a low of 230 hours and a high of 460 hours.

I am not 100% sure that there aren't going to be other Y2K date problems identified later.

Submitted by
Adele Lewis, LMSI
HPC Systems Analyst

Test Plan for Year 2000 Compliance (Simple) (Plan with Test Cases and Procedures)

I. PURPOSE

State the purpose of this test plan.

II. SCOPE

Identify the scope of this test plan.

III. SYSTEM FUNCTION

Identify the system and briefly state the function of the system

IV. SYSTEM ENVIRONMENT

Identify the system or test environment:

- Hardware
- Operating system
- Compiler(s)
- Development platform(s)
- Utilities (if used)

If system environment is exactly as described in the Year 2000 inventory, simply refer to this documentation.

V. DATE RELATED PROBLEM AREAS

This would be the result of the discovery phase of the assessment activity. Identify the general category of date problem areas - current date, general integrity, etc. It is acceptable to cite where the appropriate assessment documentation can be accessed.

VI. RESOLUTION APPROACH

Given the date related problem areas what resolution(s) have been selected for this system - explicit date, implicit date, etc. If a mixed solution approach is being used, briefly explain the strategy in the approach. It is acceptable to cite where the appropriate assessment documentation can be accessed.

VII. TESTING APPROACH

State, in general terms, what the test case(s) and/or test procedure(s) will be accomplishing. These "scenarios" will be represented as test case(s) and test procedure(s) in the following documentation.
For example:

Test Plan for Year 2000 Compliance (Simple), continued

Testing Scenario 1

"Current Date" has been expanded to allow the inclusion of the additional year digits.

Testing Scenario 2

"Current Date" as captured in testing scenario 1 is moved to Working Storage and re-formatted. This scenario will validate this action.

VIII. TESTING CONCLUSION(s)

Document, on a summary level, the results of testing. If all went as planned simply state this fact. If there are any issues they may be documented in this section.

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Test Design Scenario 1 & 2	TEST DESIGN SPECIFICATION ID: ABC-01 TESTING PHASE: System	APPLICATION: Alpha Beta Charlie PLATFORM: Development	Acronym: ABC
<p><u>TITLE:</u></p> <p><u>FEATURES TO BE TESTED</u> Retrieval of "current date" from system clock. Re-format of date data in the move to working storage.</p> <p><u>Approach Refinements</u> N/A</p> <p><u>PREREQUISITES</u> ABC system will be tested from the Development area.</p> <p><u>PASS/FAIL CRITERIA:</u> Witness must affirm the accurate retrieval and working storage movement of date data.</p> <p><u>REFERENCES</u></p>

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Case #	Procedure	Expected Output	Witness
SETUP			
TEST FOR "CURRENT DATE"			
1	Invoke module ABC.EXE. Module will retrieve "Current Date" from system clock..	Current date will appear on Form XYZ in "yyyy-mm-dd" format	
TEST FOR MOVE TO WORKING STORAGE			
2	Module ABC.EXE in addition to retrieving "Current Date", re-formatted the date in Working Storage in "dd-mm-yyyy" to be used on output report. Invoke module RPT.EXE and retrieve printed output	Verify that the date is in the format "dd-mm-yyyy" and is correct as entered in step 1.	
	Etc.

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Test Plan for Year 2000 Compliance (Detail) (Plan with Test Cases and Procedures)

The basic outline of the test plan is shown below. A full example is provided in the 'Technical Information' section of the Year 2000 webpage at <http://apsql02.rl.gov/y2k/index.html>.

INTRODUCTION

SCOPE

ASSESSMENT FORMS FOR DATE RECORDING

PREPARATION FOR TESTING BASELINE TEST RESULTS

CONFIGURATION MANAGEMENT APPROACH

EXECUTE BASELINE TESTING

APPENDIX A - INITIAL RECORDING OF DATES

Tables/Files

Screens

Reports

Programs

Libraries

Utilities

Other (date sources)

APPENDIX B - INTERNAL, IMPORTED, EXPORTED DATES

APPENDIX C - TEST REQUIREMENTS SPECIFICATION

APPENDIX D - TEST DESIGN SPECIFICATION

APPENDIX E - Y2K TEST PROCEDURE INCIDENT REPORT

APPENDIX F - PROBLEM/CHANGE REQUEST FORM