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*Issued by the EPA Chief Information Officer,
Pursuant to Delegation 1-19, dated 07/07/2005*

SYSTEM LIFE CYCLE MANAGEMENT (SLCM) PROCEDURE

1. PURPOSE

The purpose of the System Life Cycle Management (SLCM) Procedure is to reflect the information provided in EPA's SLCM Policy and provide direction to EPA personnel and contractors on the technical management and engineering practices to be used in the planning, acquisition, operation, maintenance, and termination of IT systems. In addition, this Procedure lays the foundation for managing key Enterprise Architecture (EA), Capital Planning and Investment Control (CPIC) or IT Investment Management, and IT Security requirements. The SLCM Procedure provides a system view of the processes related to effective SLCM. Other guidance documents, such as those from EA, CPIC, IT Security, and Quality Management provide different views.

2. SCOPE AND APPLICABILITY

A System Life Cycle (SLC) refers to a framework for developing, maintaining, and disposing of systems. It provides a consistent methodology and schedule to structure development and maintenance tasks associated with Information Technology (IT) systems.

3. AUDIENCE

The primary audience for the SLCM Procedure includes people in roles that have direct responsibility for the acquisition, development, and ownership of EPA systems:

System Sponsors

System Owners

Information and system security personnel

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System Managers (responsible for technical development of the system)

Project Managers (responsible for management of the entire project)

4. BACKGROUND

EPA's SLCM Procedure satisfies applicable federal laws and requirements, ensures orderly and consistent planning with management involvement at key decision points, supports obtaining and sustaining Agency commitment, and coordinates information systems-related activities. The SLCM Procedure provides for the integration of system life cycle management with IT investment management, procedure and practices, quality, and security requirements. As information systems are increasingly interconnected via the internet, security concerns have become of paramount importance. Inclusion of security early in the life cycle is the most cost effective way to address security requirements. Security considerations, activities, and documentation are *required at every phase* of the system life cycle.

EPA depends on information to accomplish its mission. The Agency's data and associated information systems are among its most valuable assets and are critical to EPA's ability to collect, assess and provide reliable environmental information. New laws and federal requirements, in particular the Clinger-Cohen Act of 1996, the Federal Information Security Management Act of 2002, and Office of Management and Budget (OMB) Circulars A-11 and A-130, require EPA to ensure that its life cycle management procedures are comprehensive and up-to-date. This Procedure reflects an improvement in SLCM management practices over and above those previously emphasized by EPA.

Information resources increasingly consume an ever larger share of the federal budget. Development of information systems can be difficult, complex, and expensive. The EPA commits to developing and managing its information assets in a cost-effective manner and ensuring that its systems meet mission needs since such systems are the lifeblood of the Agency.

5. AUTHORITY

Authority to issue this procedure derives from EPA's System Life Cycle Management Policy, document number 2100.5, issued April 7, 2006.

The authorities, as stated in the SLCM Policy, also support this SLCM Procedure.

6. RELATED DOCUMENTS

1. *EPA IRM Policy Manual, 2100.B8*
<http://intranet.epa.gov/oei/imitpolicy/policies.htm>

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2. *EPA Order 2100.1, Accessible Electronic and Information Technology, April 2006*
<http://intranet.epa.gov/oei/imitpolicy/policies.htm>
3. *EPA Order 2195.1A4, Agency Network Security Policy, March 2001*
<http://intranet.epa.gov/oei/imitpolicy/policies.htm>
4. *OCFO Policy Announcement 01-03, May 23, 2001*
<http://intranet.epa.gov/ocfo/policies/policy/pa01.htm>
5. *OCFO Policy Announcement 01-10, September 28, 2001*
<http://intranet.epa.gov/ocfo/policies/policy/pa01.htm>
6. *OCFO Policy Announcement 05-01, December 15, 2004, "Accounting for Information Technology"*
<http://intranet.epa.gov/ocfo/policies/policy/pa05.htm>
7. *EPA Order 2120.3, Enterprise Architecture Policy, November 2005*
<http://www.epa.gov/irmpoli8/pdfs/2120.3.pdf>
8. *EA Governance Procedure, April 2006*
<http://www.epa.gov/irmpoli8/pdfs/ea-procedure-final-04-04-06.pdf>
9. *CIO Policy 2100.3, Information Technology Capital Planning and Investment Control (CPIC), December 2005*
<http://www.epa.gov/irmpoli8/pdfs/2100.3.pdf>
10. *CPIC Procedures for the OMB Exhibit 300, December 2004*
http://www.epa.gov/irmpoli8/pdfs/cpic_procedures_12_29_04_final.pdf
11. *Earned Value Management Procedures, Addendum to CPIC Procedures, December 2004*
http://www.epa.gov/irmpoli8/pdfs/evm_procedures_dec18_2004_v4.pdf
12. *NIST FIPS Pub 199, "Standards for Security Categorization of Federal Information and Information Systems"*
<http://csrc.nist.gov/publications/fips/index.html>
13. *NIST Special Publication 800-60, Guide for Mapping Types of Information and Information Systems to Security Categories, June 2004*
http://csrc.nist.gov/publications/nistpubs/800_60/SP800_60V1_final.pdf
14. *OMB Circular A-11,*
- *Section 52, Information on Financial Management*

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- *Section 53, Revised, Information Technology and E-Government*

15. *OMB Circular A-127, Section 8, Revised, Financial Management Systems*
16. *OMB Circular A-130, Revised, Management of Federal Information Resources*
17. *OMB Memorandum 00-07, Incorporating and Funding Security and Information System Investments, February 28, 2000*
18. *OMB Memorandum 02-01, Guidance for Preparing and Submitting Security Plans of Action and Milestones, October 17, 2001*
19. *EPA National Records Management Program (NRMP)*
<http://www.epa.gov/records/index.htm>
20. *NIST Special Publications for security guidance*
<http://csrc.nist.gov/publications/nistpubs/>
21. *NIST Special Publication 800-64, Security Considerations in the Information System Development Cycle, October 2003*
<http://csrc.nist.gov/publications/nistpubs/800-64/NIST-SP800-64.pdf>
22. *Policy and Program Requirements for the Mandatory Agency-wide Quality System, May 2000*
<http://www.epa.gov/quality/qs-docs/5360-1.pdf>
23. *Senior Information Officials (SIO) Policy Order, (CIO Policy Transmittal 2101), July 2005*
<http://intranet.epa.gov/oei/imitpolicy/qic/ciopolicy/2101.pdf>

7. Procedure

7.1 - Overview

EPA's SLCM Policy mandates establishing key components or processes that must be properly managed in order to effectively define, develop, control, and terminate (retire) information systems within the Agency.

The SLCM Procedure establishes activities that must be conducted to satisfy SLCM Policy requirements. The Procedure describes specific requirements, checkpoints, and authorities that support planning and management practices. This organization helps EPA staff involved in SLCM practices to gain a better understanding of the process and their role and responsibilities.

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The attached documents are organized with the System Manager in mind. They address the specific procedures for the phases and subphases of the SLCM. These appendices provide an overview of the phases and subphases, process descriptions, procedure descriptions, responsibilities, work products, and the necessary project level review for the phase and subphase.

The philosophy used to develop this Procedure was to infuse systems engineering and software development best practices into the EPA culture, honoring the constraints under which the Agency operates. To this end, the SLCM Procedure looks to other mandated (and coordinated) processes to determine what and when they require formal review and approval, in order to leverage these reviews and reduce the administrative requirement on System Owners.

This approach does not mean that review is unnecessary. Rather, it appropriately places the burden on the System Owner for conducting phase-related reviews. The System Owner will document progress to ensure that the IT systems are meeting stated objectives and are within cost and schedule.

7.2 - Oversight

The Office of Environmental Information (OEI) will work with Program Offices and Regions to ensure that SLCM requirements are being met. Program Offices and Regions maintain responsibility for meeting SLCM requirements through Control Gate and Project Level Reviews. OEI provides local offices the tools and guidance necessary to meet SLCM requirements. On an annual basis, the Quality and Information Council's Information Investment Subcommittee will review the effectiveness of this SLCM governance structure.

7.2.1 - Control Gates

Consistent with the SLCM Policy (Section 6.D.4), this Procedure requires periodic, documented management level review of projects by the sponsoring office. Since project management is a program responsibility, program managers must oversee these SLCM activities. Senior Information Officials (SIO) should conduct this review, at least for Major systems. For CPIC-lite and smaller systems the SIO may delegate this review.

Key opportunities to review a project's development occur as the project progresses from one phase to another. These major decision points are called control gates. At each control gate, the system manager must present the required SLCM documentation corresponding to the phase being reviewed to receive appropriate management approval (based on the investment size and importance) to satisfy the control gate requirements. The Office's Information Management Officer (IMO) should ensure that the proper documentation is in place. When appropriate, the IMO recommends that the

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SIO approve the system to move to the next phase of the life cycle (see Appendix 7 – Supporting Document Checklist for SLCM). Although these reviews are described as they occur in the sequential (Waterfall) life cycle methodology, it is not the intent of this procedure to mandate that systems follow this methodology. Offices may tailor these reviews to correspond with the approved methodology for their system.

Table 1 provides a general overview of the SLCM control gates.

Table 1 - SLCM Control Gates

Control Gate	Purpose
EA Compliance Certifications and System Selection Review (<i>End of Definition Phase</i>)	<ul style="list-style-type: none"> • Ensure that all information management and technology development, modernization, enhancement, and acquisitions develop a Solution Architecture that addresses a business need and aligns with the Agency EA. • Approve the IT Investment Business Case for inclusion in the Agency IT portfolio (Majors only) • Verify approvals of all SLCM Definition Phase required documentation.
EA Compliance Certifications Review (<i>End of Acquisition and Design Subphases</i>)	<ul style="list-style-type: none"> • Ensure the system’s design conforms to the planned Solution Architecture and continues to address the business need while remaining in alignment with the Agency EA. • Verify approvals of all SLCM Acquisition and Design Subphase required documentation.
Authorization to Operate Review (<i>End of Acquisition / Development Phase</i>)	<ul style="list-style-type: none"> • Ensure the system is ready to move into an operational state and that the system manager accepts and understands any residual risks. • Verify approvals of all SLCM Development and Test Subphase required documents, and provide final sign-off on SLCM Acquisition/Development Phase activities.
Modify or Terminate Review (<i>End of Operations & Maintenance Phase</i>)	<ul style="list-style-type: none"> • Determine if the IT Investment should continue, be modified, or terminated. • Verify approvals of all SLCM Implementation and O&M Phase required documents.

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The EPA SLC consists of five phases, with the objective of each phase to ensure sound project planning and management practices throughout the SLC. Figure 1 shows these phases and provides a context in relation to EPA’s EA, CPIC, and security processes. The diagram also identifies the principal executive-level reviews that apply during the system life cycle.

The Control Gate reviews are go / no-go decision points that require management approval for continued support. In addition to the Control Gates, there are also project-level reviews at the end of each phase and/or subphase. The reviews ensure compliance with this Procedure. Conduct reviews in accordance with the instructions in the appendices addressing the SLCM phases / subphases. The System Owner documents decisions from these reviews. Evidence of review includes documentation of the decision, a description of what the decision was based on, and the signed approvals from the appropriate official.

The size and scope of the effort required at each phase and subphase depends on the size of the system. The System Owner and management team discuss the size and scope at each project-level and Control Gate review. Not all SLCM events are process-based. Some events are “calendar checkpoints” and include IT Investment Management, EA, and Security submissions where appropriate.

7.3 - System Life Cycle Management Framework

The five phases of the SLCM are *Definition*¹; *Acquisition / Development*; *Implementation*; *Operations and Maintenance*; and *Termination*. The SLCM framework further divides two of these phases, *Definition* and *Acquisition / Development* into subphases. The purpose of the subphases is to organize major functions that must be accomplished within the phase, and to apply some form of additional management control consistent with systems engineering best practices.

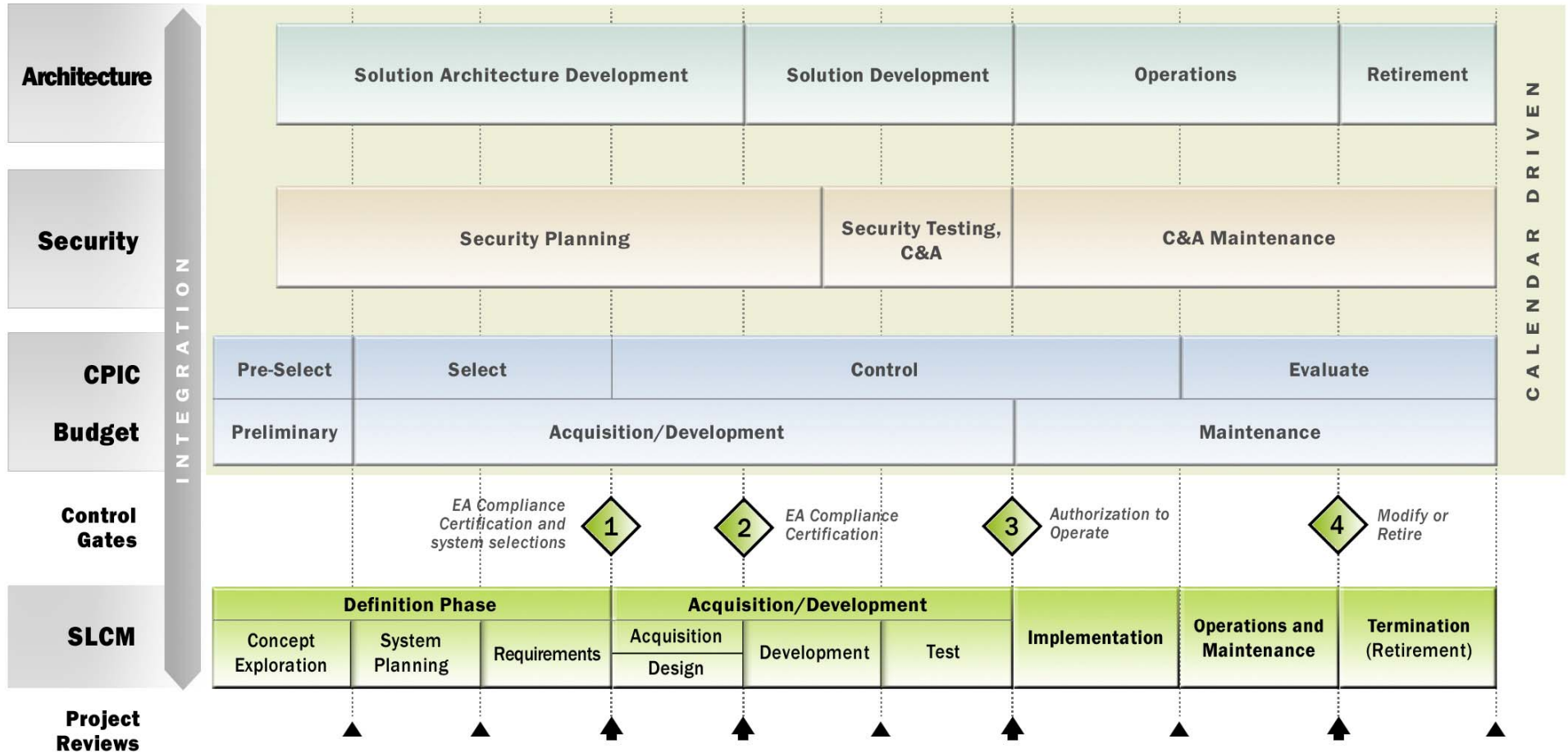
Figure 1 presents the subphases in a linear fashion, however their precise order within a phase may vary depending upon the system development model selected, and the system’s acquisition strategy. Subphases may take place in parallel or consecutively. For purposes of clarity, this section of the procedure presents subphases in the general order they would be sequenced for a system being developed in the “Waterfall” model², complete each subphase before starting the next.

¹ This phase is equivalent to the Initiation Phase in NIST Special Publication 800-64, *Security Considerations in the Information System Development Life Cycle*.

² Other development methodologies are described in the guidance that accompanies this document.

Figure 1: Life Cycle Management – an integrated process for architectural planning, investment management, security planning, and system development that ensures IT solutions align with business needs.

Life Cycle Management Framework



Legend

- C&A : Certification and Accreditation
- CPIC : Capital Planning and Investment Control
- EA : Enterprise Architecture
- SLCM : System Life Cycle Management
- ▲ Project Level Review
- ▲ Project Level and Control Gate Review
- ◆ Control Gate Go/No Go Decision

Note:

- ◆ Reporting requirements for Architecture, Security, CPIC, and Budget are calendar driven and occur annually.
- ◆ Specific system reporting requirements depend on the System Life Cycle Management phase.

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7.4 - DEFINITION PHASE

The *Definition Phase* establishes the business justification for the system and a concrete plan for implementation or acquisition. Upon completion of this phase, the project has approval and funding to proceed. The phase begins when an organization issues a formal approval to explore the need for a system and concludes when the organization has formal approval to proceed with system development. This phase is where essential IT planning begins, revolving around the EA and security. The security activities will ensure that agency information will be properly protected and available only for appropriate uses. During this phase, IT Investment Management and EA activities aim at ensuring the intended systems will support organization and Agency requirements without unnecessary redundancy. Additionally, these activities ensure that system developers and managers properly manage EPA resources in the IT environment. As such, the Control Gate to exit this phase begins with an EA Compliance Certification Review and ends with system selection.

The *Definition Phase* divides into three subphases: *Concept Exploration*, *System Planning*, and *Requirements*.

7.4.1 - Concept Exploration Subphase

The *Concept Exploration Subphase* results in the preliminary definition of the business needs of the system sponsor. It explains the concept in enough detail that decision-makers can determine whether or not the IT system is viable, and if so, identifies next steps. Research and feasibility analysis is part of this subphase. This analysis forms the basis of the system's business justification. Create the Solution Architecture during this subphase, and update it in each subsequent subphase.

Key documentation created in the *Concept Exploration* subphase includes:

- Mission Need Statement
- Concept of Operations
- Solution Architecture

Appendix 1.A further defines and describes the *Concept Exploration Subphase*.

7.4.2 - System Planning Subphase and Initial Development of System Management Plan"

The *System Planning Subphase* results in the definition of a management structure to manage and control the system throughout its life cycle. Make and document tailoring decisions during this subphase. Create many of the plans essential to the success of the entire project in this phase: review and revise the plans if necessary throughout the

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remaining SLCM phases. In this subphase, develop the concept further to describe how the business will operate after implementation of the approved system and to assess how the system will impact employee and customer privacy. To ensure that the products and / or services provide the required capability on-time and within budget, define project resources, activities, schedules, tools, and reviews.

Additionally, security planning activities begin with identification of the Federal Information Processing Standard (FIPS) 199 and NIST Special Publication 800-60, *Guide for Mapping Types of Information and Information Systems to Security Categories*, information types, categories, and impact levels expected to be processed in the system. Review these throughout the system's life cycle as information needs increase or decrease. This information leads to identification of required security controls for the system. Also identify real and potential business threats and vulnerabilities to develop a high level assessment of risks to the information system. Identify preliminary baseline

Key documentation created in the *System Planning* subphase includes:

- Project Risk Management Plan
- Change Directive
- Cost-Benefit Analysis
- Security Plan
- Security Categorization
- Configuration Management Plan
- Project Quality Assurance Plan
- Test and Evaluation Master Plan
- Acquisition Strategy
- Solution Architecture
- The System Management Plan (SMP)

controls in accordance with FIPS 200 and NIST SP 800-53, *Recommended Security Controls for Federal Information Systems*, controls listings in line with the FIPS 199 impact levels. Develop initial estimates for security contingencies and restoration needs. Use this information to begin development of the security plan. Designate a person responsible for the security of the system at the beginning of this subphase.

This subphase establishes the development model and acquisition strategy, defines how to tailor the SLCM, and defines the necessary work products for the system at each phase.

Appendix 1.B defines and describes the *System Planning Subphase*.

7.4.3 - Requirements Subphase

The *Requirements Subphase* results in a clear definition of what the system must do to satisfy the business need and security requirements associated with the system and

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comply with the Agency's Enterprise Architecture. The System Owner / Manager gathers critical information concerning user needs, Enterprise Architecture and security requirements, documenting them according to the standards consistent with the size and scope of the system and the sensitivity of the data it processes, the development methodology selected, and the tools selected to manage development. Proper definition of requirements is critical to the success of the system, and requires the active participation of the user organization in OEI to ensure their completeness.

The measure of complete requirements is the degree to which they are specific, complete, measurable, and testable. In connection with the requirements, develop the Test Plan at this phase to demonstrate that the requirements (including security requirements) are sufficiently defined to allow them to be measured and tested. The Test Plan must specify how each requirement will be tested and what specifically constitutes passing results for each requirement. Depending on the system development methodology and acquisition strategy selected, this subphase is likely to iterate once in the *Definition Phase* and then again in the *Acquisition / Development Phase*. Maintaining the requirements specifications document and Test Plan to accurately depict the actual system's requirements and test plan should result in a final detailed requirements specifications document (which must include security requirements) and Test Plan (for all requirements including security). These are formally approved by executive management at the end of this phase. Additionally, if changes are necessary during the subsequent phases/subphases of the Systems Life Cycle, document the reasons for the needed changes and update and approve (by Executive Management) the Requirements Specification Document (which must include security requirements), and Test Plan (for all requirements including security) prior to making the changes to the design of the system.

The Security Risk Assessment is also critical at this subphase. Formalize and analyze the real and potential business threats and vulnerabilities that were identified in the previous subphase to determine their potential impact on the system.

Key documentation created in the *Requirements* subphase includes:

- Preliminary Security Risk Assessment
- Security Plan
- Requirements Specifications
- Functional Requirements Specification
- Test Plan

Appendix 1.C defines and describes the *Requirements Subphase*.

7.5 - ACQUISITION / DEVELOPMENT PHASE

The *Acquisition / Development Phase* results in the acquisition or development of the system that satisfies the mission need established in the *Definition Phase*. The Clinger-Cohen Act of 1996 suggests that agencies evaluate the possibility of using commercial-

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off-the-shelf (COTS) and government- off-the-shelf (GOTS) products, and to use them when practical. However, systems based 100% on COTS or GOTS products may require some degree of modification, integration, and/or configuration prior to implementation. Since that work must be properly documented and controlled, it must adhere to the entire SLCM procedure.

The testing and certification of security also begins in this phase. Testing ensures the integrity of data and confidentiality mechanisms for exchanges between COTS products and through custom-designed components.

As this phase progresses and the development of baseline information takes place, reassess impact levels, controls, risks, and security plans to include technology decisions and reflect changes and modifications to the information system design. These activities may also impact test types and procedures. The subphases of the *Acquisition / Development Phase* are: *Acquisition, Design, Development, and Test*.

7.5.1 - Acquisition Subphase

The *Acquisition Subphase* results in the acquisition of software, hardware, and services necessary to develop the system. The System Owner works with the Agency's Contract Office to ensure that all steps are followed to design and conduct the necessary solicitations consistent with the approved system documentation and the acquisition strategy. This subphase iterates if the development and acquisition strategies call for a phased approach to the development and implementation of the system. Include architecture and security related language and requirements in acquisition documents. Consult NIST SP 800-35, *Guide to Information Technology Security Services*, and NIST SP 800-36, *Guide to Selecting Information Technology Security Products* during this phase. Also identify the Security requirements of-and-for the contractors involved in the development/integration and implementation activities in the acquisition documents.

Key documentation created in the *Acquisition* subphase includes:

- Development Decision Paper
- Acquisition Package
- Full Security Risk Assessment
- Hardware and Software Requirements Specifications

Appendix 2.A defines and describes the *Acquisition Subphase*.

7.5.2 - Design Subphase

The *Design Subphase* results in detailed designs for system components, products, and interfaces and initiates test planning for EPA. The objective of the *Design Subphase* is to transform the detailed, defined requirements into complete, detailed specifications for the system to guide the work of the *Development Subphase*. The decisions made in this phase address, in detail, how the system will meet the defined functional, physical, interface, security, and data requirements.

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Design Subphase activities may take place in an iterative fashion, producing first a general system design that emphasizes the functional features of the system including security, then a more detailed system design that expands the general design by providing all the technical detail. Maintain these system documents to accurately depict the actual system's design. They should result in a final detailed system design document formally approved by executive management at the end of this phase. Additionally, if design changes are necessary during the subsequent phases/subphases of the Systems Life Cycle, document the reasons for the needed changes and update and reapprove (by Executive Management) the System Design Document, Requirements Specifications Document (which must include security requirements), and Test Plan (for all requirements including security) prior to initiating the changes to the system.

For projects involving COTS products, the design phase is still necessary to define the work required to move the product from its generic, out-of-the-box state to the final production-ready system required by EPA.

The *Design Subphase* concludes with a Control Gate: the Enterprise Architecture Compliance review.

Key documentation created in the *Design* subphase includes:

- System Design Document
- Requirements Traceability Matrix
- Data Conversion Plan

Appendix 2.B defines and describes the *Design Subphase*.

7.5.3 - Development Subphase

The *Development Subphase* results in the production and assembly of all system components which complete the design, meeting the mission need. The objective of the *Development Subphase* is to convert the work products of the *Design Subphase* into a complete information system.

Although much of the activity in the *Development Subphase* addresses the computer software and/or programs and integration of components that make up the system, this phase also puts in place the hardware, software, security and communications environment and other important elements of the overall system.

The activities of this subphase translate the system design produced in the *Design Subphase* into a working system capable of addressing the system requirements. The *Development Subphase* contains activities for building the system and conducting internal testing by the developer to ensure that the system satisfies all of the requirements defined in the Requirements Document. (Note: products that have been validated by NIST do not have to be tested again for their conformance to the NIST standards, unless the

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validated component of the software has been modified.)

At the end of this phase, the system is ready for the activities of the *Test Subphase*.

Key documentation created in the *Development* subphase includes:

- System Implementation Plan
- System (Application) Software
- System Security Plan
- User Training Plan
- User/System Documentation
- Contingency Plan.COOP
- System and Security Test Plan

Appendix 2.C defines and describes the *Development Subphase*.

7.5.4 - Test Subphase

The *Test Subphase* results in proof that the system satisfies the requirements defined in the FRD, satisfying the mission need and the security components operate as expected. Types of tests conducted in this phase include: subsystem integration tests; system tests to ensure the developed system meets all technical requirements, including performance requirements; security requirement testing; and user acceptance testing. The agency will perform two levels of independent testing prior to accepting the system from the developer and submitting it to the official to make the decision whether to authorize it for operation. The Office of Environmental Information (OEI) performs the first level and validates/tests all of the of the system requirements using the official authorized test plan. Once the system has passed OEI testing, the user organization may perform all or any portion of the authorized test plan to validate it meets all of the system requirements.

The review to complete this subphase (and the overall *Acquisition / Development Phase*) is another Control Gate, the Authorization to Operate Review. This review could result in either an Authorization to Operate, which allows the project to move forward into implementation, or a decision not to authorize operation. Make a decision not to authorize operation if unacceptable operational risks remain. Authorization to proceed to implementation only follows after addressing all unacceptable risks and meeting all security requirements.

The Authorizing Official can authorize a system to operate with conditions if there are remaining security deficiencies, or risks, for which the Authorizing Official accepts responsibility. Document this decision in either a statement of risk acceptance in the Security Plan or in a Plan of Action and Milestones (POA&M) with a scheduled remediation plan and include a description of the compensating controls that will be in place to mitigate the risks to an acceptable level in the interim until the necessary corrective actions to address the remaining risks/deficiencies have been implemented. In compliance with OMB guidance, interim authorization is not equivalent to accreditation

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(see NIST SP 800-37, *Guide for the Security Certification and Accreditation of Federal Information Systems*).

Key documentation created in the *Test* subphase includes:

- Test Files/Data
- Test Analysis and Test Problem Reports
- Test Analysis Approval Determination

Appendix 2.D defines and describes the *Test subphase*.

7.6 - IMPLEMENTATION PHASE

The *Implementation Phase* results in the establishment of the completed system (or system modifications) into the production environment. Activities in the *Implementation Phase* may include the installation of hardware and / or software into the production environment, data conversion, user training, and post-implementation review. The Implementation Plan, completed in the *Implementation Phase*, guides the phase. The system implementation plan must include configuration and implementation requirements that ensure that system/project managers implement and test the system is as specified and tested in the prior phase.

Key documentation created in the *Implementation* phase includes:

- System Implementation Plan
- Implementation Decision Paper
- Authorization to Operate
- Security Certification and Accreditation

Appendix 3 defines and describes the *Implementation Phase*.

7.7 - OPERATIONS AND MAINTENANCE PHASE

The *Operations and Maintenance Phase* ensures that the system, in its production environment operates properly and maintenance takes place. A typical system can attribute more than half of its life cycle costs to operations and maintenance, making the management of this phase of equal importance to the preceding phases, which deliver the functionality. During this time, maintain schedules and conduct reviews periodically to ensure the health of the system and to validate the suitability of the system for meeting the business requirements. The System Manager uses structured means to detect defects, capture user satisfaction, review the system requirements, and evaluate the suitability of existing and emerging technologies to continue to meet the mission need.

During this phase, maintenance can include performing routine maintenance in accordance with manufacturer's guidelines, installing patches and / or updates to system components, and making enhancements consistent with user needs / desires and consistent with the mission need. It is also possible that major new requirements or

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significant technology refreshment could cause maintenance that requires the system to return to the *Definition* or *Acquisition / Development Phases*.

While all updates and other maintenance activities require some review and updating of documentation created in the *Acquisition / Development Phase*, occasionally these needs require more extensive changes, which could require a formal reiteration through the *Definition and Acquisition / Development Phases*. It is also possible that the changes contemplated are so extensive that it is not economical to continue to support the existing system. Make a determination during the Control Gate: Modify or Terminate Review.

Key documentation created in the *Operations and Maintenance* phase includes:

- Re-Certification and Re-Accreditation
- Security Configuration Management and Control
- User Satisfaction Review

Appendix 4 defines and describes the *Operations and Maintenance Phase*.

7.8 - SYSTEM TERMINATION PHASE

The *Termination Phase* results in the removal of the existing system from the production environment. During the *Termination Phase* at the end of the life cycle process, retire and close down systems that have been declared redundant or obsolete. Occasionally, a system manager will use this phase to shut down a major subsystem while the main system remains in operation. The emphasis of this phase is to ensure the packaging and archiving of data, procedures, and documentation in an orderly fashion, making it possible to reinstall and bring the system back to an operational status, if necessary, and to retain all data records in accordance with EPA policies regarding retention of electronic records. The *Termination Phase* represents the end of the system life cycle.

Key documentation created in the *Termination* phase includes:

- Retirement Decision Paper
- Transition Plan (as appropriate)
- Archive/Incorporate Data and Software

Appendix 5 describes and defines the *Termination Phase*.

7.9 - Calendar Checkpoint Activities Associated with SLCM

While the SLCM is primarily phase-driven, requiring work products on a schedule developed and maintained by the System Manager, certain SLCM-related reporting requirements have a calendar based reporting schedule. Most of these items support the CPIC, EA, Quality, and Security policies.

For Major systems, the key link between calendar-driven reporting and SLCM process-

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driven reporting is the CPIC submission. This data call requires System Managers to submit evidence that they are making progress and completing the necessary phase-driven project reviews.

7.10- System Life Cycle Tailoring

The SLCM Procedure provides a complete list of work products that are necessary to properly manage and control a large-scale, mission-critical, high-risk system. However, not all systems at EPA fall into this category. While all projects require adequate documentation and work products to ensure that they are progressing appropriately and to provide management with enough information to make informed decisions concerning the future of the system, lower risk projects do not need as much documentation to maintain appropriate oversight and control. To meet the needs of non-major systems, the SLCM Procedure contains specific information for tailoring the SLC to meet system needs while maintaining adequate management control.

Consider three key elements when determining how a system's SLCM should be tailored.

These are:

- Tailoring Factors
- Tailoring Considerations
- Security Requirements

Tailoring Factors take into account the size of the project (whether full CPIC procedure, "CPIC-Lite" procedure, or no CPIC procedure applies), the risk level associated with the project, and other programmatic considerations. These identify a general suite of work products required for the system. The work product list is further refined by the Tailoring Considerations, which take into account the acquisition strategy, development model selected, etc. This process also determines the specific phase / subphase arrangements.

There are specific procedures and work products that can never be removed from EPA System Life Cycle as a result of tailoring. These include:

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|---|
| <ul style="list-style-type: none"> • Clear and complete requirements (including security requirements) • Processes and/or procedures that ensure the system will be able to operate within the current and planned IT infrastructure and enterprise architecture. • Adequate system testing • Adequate user training • Operations and maintenance documentation • Test Plan for testing all of the requirements including specifying how each requirement will be tested and what specifically constitutes passing results for each requirement |
|---|

Determine the tailoring strategy during the *System Planning Subphase* of the *Definition Phase*. After approving the tailoring strategy, handle any change to it as though it were a waiver of the SLCM Procedure, for such a change would be a change in the approved procedure for that system.

7.11 - System Management Plan

The System Management Plan (SMP) defines the complete collection of managerial documents required in the life cycle of an information system. The SMP serves as a portfolio of documents used by System Managers to control, assess, and document the system throughout the SLC. EPA uses the SMP as the principal tool for organizing and managing system project/program management information throughout the system life cycle. The development of this plan is of such importance that the SLCM devotes a specific subphase, the *System Planning Subphase* in the *Definition Phase*, to its development. (See Appendix 1, Definition Phase) System managers keep the SMP current by updating its subordinate level plans so that anybody who has a need to know can determine the status of the system.

7.12 - COTS / GOTS Considerations

The Clinger-Cohen Act directs agencies to consider and give preference to the use of COTS software when making plans to procure information systems. The value of COTS and GOTS products (systems developed by and for one government agency that are easily tailored to suit the need of another agency) is that they can dramatically reduce costs and development time. If the COTS / GOTS system satisfies a high enough proportion of an organization’s requirements and / or the organization is willing to modify its requirements so as to be able to adapt to the COTS/GOTS product design, it is worth consideration. Occasionally, COTS or GOTS products may need modifications. Vendors may accommodate changes to their products or they may charge for the changes. System Owners must consider whether modifications may be necessary to satisfy important requirements and whether vendors will maintain these changes within their maintenance fee/update schedule or whether the government must support these customizations.

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There is an occasional misconception among the end-user community and even by information technology professionals that COTS products do not need to observe the Agency's SLCM because some outside organization, usually the vendor, is responsible for determining what features and functionality the system will have. This argument ignores the responsibility an organization has for performing a proper mission needs assessment prior to making certain capital investments. Even if the initial purchase price is below some Agency threshold for taking a more robust approach to SLCM on the COTS product, the Project Manager must consider that operation and maintenance costs are also part of the system life cycle cost that might trigger oversight levels. In addition, developers must choose the COTS / GOTS product that most closely aligns with their requirements, especially mandatory security controls and standards. This requires that developers understand all the Agency requirements for a solution. Written requirements are vital to ensuring an understanding of the trade-offs between COTS / GOTS functionality and organizational and Agency needs.

Frequently, COTS / GOTS products require integration or modification that may affect the final security and cost of the information system. These changes require careful testing.

The foregoing does not infer that COTS / GOTS products cannot have a tailored SLCM; rather, it points out that COTS / GOTS is an acquisition strategy, and therefore is only one consideration for determining how to tailor the SLCM to meet agency objectives and minimize the administrative burden for the organization.

When considering how to tailor the SLCM for use with COTS, System Managers must also consider whether or not the COTS software documentation satisfies the requirements for system documentation. There is a need for additional documents where the Project Manager requests product integration or modification. If the standard vendor documentation contains the necessary information, System Managers do not have to develop and manage a new documentation set. However, the system manager does have to document their implementation of the system, including specific configuration of the system, even if they did not have the vendor modify the system.

7.13 - Project Level Reviews

The SLCM requires three levels of regular review: Control Gates, Calendar Checkpoints, and Project Level Reviews. See above for a description of Control Gates and Calendar Checkpoints. Each phase or subphase of the SLCM also requires Project Level Reviews. These reviews enable key stakeholders to confirm that the system under development is on schedule, that system developers are building it correctly, and that they have applied the appropriate quality standards.

Appendices 1 to 5, referenced at the end of each phase and subphase narrative, contain Project level review descriptions for each phase and subphase. The reviews must address the required elements taking into account approved tailoring strategies and

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accepted waivers. At the conclusion of the review, the System Manager, System Owner, and Lead Architect sign off on the completed review.

8. ROLES AND RESPONSIBILITIES

The **Chief Information Officer (CIO)**, who also is the Assistant Administrator for the Office of Environmental Information, is responsible for:

- Approving the SLCM Policy.
- Ensuring Agency compliance with the SLCM Policy and Procedure by providing guidance and tools to senior level managers for program oversight.
- Approving waivers to the SLCM Policy.
- Delegating review and approval of any waivers to the SLCM Procedure to the CTO.

The **Assistant Administrators, Chief Financial Officer (CFO), General Counsel (GC), Inspector General (IG), Deputy Chief of Staff to the Administrator, Associate Administrators, and Regional Administrators and Laboratory Directors** are responsible for:

- Ensuring compliance, within their organizations, with system life cycle management policies, procedures, and standards.

The **Chief Technology Officer (CTO)** is responsible for:

- Establishing and publishing procedures, technical operational procedures and standards (TOPS), and guidance supporting the Agency's SLCM Policy.
- Reviewing and approving waivers to the SLCM Procedure.
- Approving technical feasibility of solution architectures following Full Sequential Work Pattern during Control Gate 2: EA Compliance Certification Review.

The **Director of OEI's Office of Technology Operations and Planning (OTOP)** is responsible for:

- Approving the SLCM Procedure.
- Maintaining the System Life Cycle Management Policy (SLCMP), Procedure and associated work products.
- Monitoring compliance with the SLCM Policy and Procedure through EA, IT Investment Management, and security processes.

The **Chief Architect** is responsible for:

- Leading the development and maintenance of the Agency's Enterprise Architecture including target architecture, transition strategy, and sequencing plan in conjunction with the SLCM Policy and Procedure.
- Certifying and providing documentation of EA compliance for solution architectures during Control Gates 1 and 2.

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The **Director of the Office of Acquisition Management (OAM)** is responsible for:

- Ensuring the incorporation of the SLCM Policy and Procedure in requests for proposals and contracts as appropriate.

The **Senior Information Officials (SIOs)** are responsible for:

- Apprising the Quality and Information Council (QIC) of major SLCM issues within their office.
- Ensuring compliance with SLCM Policy and Procedure for systems within their office.
- Ensuring that the information technology used and managed by their organization supports its business needs and mission and helps to achieve strategic goals.
- Ensuring EA Compliance of solution architectures before forwarding solution architectures to Chief Architect during Control Gates 1 and 2 (Majors only).
- Reviewing, concurring, and advising on waivers to the SLCM Policy and Procedure, as applicable.

The **Information Management Officers (IMOs)** are responsible for:

- Concurring on or approving waivers to the SLCM Procedure, as applicable.
- Reviewing documents contained in SMPs, as appropriate.
- Supporting the SIO in ensuring compliance with this policy and procedure for systems within their office.
- Certifying Enterprise Architecture as delegated by SIO.

The **Information Security Officers (ISOs)** are responsible for:

- Ensuring that responsible program offices and individuals throughout the AA-ship or Regional Office are cognizant of security requirements and processes which must be considered throughout the system's life cycle.

The **System Sponsors** are responsible for:

- Authorizing, approving, and ensuring adequate funding and resources during the system life cycle of an information system.
- Appointing System Owners and authorizing those individuals to initiate system development.

The **System Owners** are responsible for:

- Monitoring compliance to the SLCM Policy and Procedure.
- Concurring on waivers from the SLCM policy and / or procedure, as applicable. Appointing Project Managers, System Managers, and Solution Architects.
- Coordinating SLCM development activities with those of the EA, IT Investment Management, and security processes.
- Ensuring compliance to Section 508 requirements during the SLCM.
- Accounting for information system costs according to the cost accounting phases defined in the EPA's cost accounting policy.

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- Approving completed Project Reviews.

The **System Managers** are responsible for:

- Providing day-to-day management of the system life cycle process and products within their program(s).
- Ensuring that the system advances through the SLCM phases and subphases.
- Ensuring that the functional requirements of the system are met.
- Recommending and preparing written justification for waivers and documenting them as part of the SMP.
- Providing required documentation to appropriate levels of management regarding risks associated with information technology projects at each phase.
- Identifying and keeping management apprised of project issues and risks.
- Approving completed Project Reviews.
- Ensuring the submission of quarterly reports in a timely manner when applicable.

The **Project Manager (PM)** is responsible for:

- Managing the defined project through its life cycle
- Ensuring the system meets all functional and data requirements to ensure the quality of the system's end product.

The **Privacy Act Officer** is responsible for:

- Ensuring that adequate safeguards against disclosure of information protected under the Privacy Act are incorporated into the system.

Responsibility Chart:

The foregoing descriptions provide a view of responsibilities from an organizational perspective, but do not provide a clear view of the relationships between organizations when completing assigned duties. A Roles and Responsibility Matrix is a tool that shows the relationships between organizations when completing responsibilities. The matrix is a tool for the Project Manager and project stakeholders to understand their roles for each of the high-level project processes. The Roles and Responsibilities Matrix shown in Table 2 illustrates how organizations interact by identifying four specific relationships organizations can have concerning the completion of major SLC management activities. These relationships are:

- **Responsible** – the person or organization who manages the project or activity throughout its lifecycle.
- **Approve** – the person or organization who is responsible for reviewing a product and signing off that it meets the specified requirements.
- **Support** – the person or organization who directly aids in the development, implementation, and execution of the project.
- **Informed** – the person or organization not directly involved in the project but who is kept informed of information necessary for the project's success.

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Table 2 – SLCM Responsibility Chart

Responsibility Chart										
Stakeholders	SLCM Procedure	Compliance with SLCM Policy/Procedure	Waivers to SLCM Policy/Procedure	System Selection	Manage Project through Life Cycle	Funding/Resources	System Development	Capital Planning and Investment Control	Enterprise Architecture	Security
Chief Information Officer (CIO)	A	R	A	A				I	A	I
Deputy Chief Information Officer for Technology	I	S	A						S	S
Chief Financial Officer (CFO)	I	I		S	S	A	S	S	S	S
Senior Budget Officer (SBO)	I	I		S	S	S			S	S
Office of Technology Operations and Planning (OTOP)	R	R	S		S	S	S	S	S	S
Chief Architect	S	R				S	S	S	R	
Enterprise Architecture Coordination Workgroup (EAWG)	I							S	S	
Quality and Information Council Steering Committee	I	I							S	
Quality and Information Council (QIC)	I	I		A		A		A	S	
Information Investments Subcommittee (IIS)	I	I		S		S		S	I	
Office of Acquisition Management (OAM)	I	S			S	S	S		I	
Senior Information Official (SIO)	I	S	A	S					S	S
Information Management Officers (IMO)	I	S	S	S	I				S	R
Information Security Officers (ISO)	S		S		I		S	S	I	R
Application Security Officer (ASO)	I	R	S	S	S		S	S	I	R
System Security Officer (SSO)	I	R	S	S	S		S	S	I	R
System Sponsor	I			R	S	A	S	S	S	S
System Owner	I	R	R	S	S	S	R	S	S	R
System Manager	I	R	R	S	S	S	S	S	S	S
Project Manager	I	R	R		R	R	R	R	R	R
Privacy Act Officer					S		S			S
Records Officer			S		S					

Legend: (R) = Responsible, (A) = Approves, (S) = Supports, (I) = Informed

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9. DEFINITIONS

Acquisition / Development Phase: This phase of the EPA System Life Cycle is where the system is acquired through the purchase of software and services that will yield a system that satisfies the mission need established in the Definition Phase.

Acquisition Subphase: This subphase of the EPA System Life Cycle Acquisition / Development Phase is to plan and complete the acquisition of software, hardware, and services necessary to construct the planned system.

Application: The use of information resources (information and information technology) to satisfy a specific set of user requirements (OMB A-130, App. III). In particular, an application is usually considered to be the software component of a system. An application runs on, and may or may not be part of, a general support system. The terms “application” and “information system” are sometimes used interchangeably although the latter has a broader definition to include general support systems.

Authorization to Operate: The official management decision given by a senior agency official to authorize operation of an information system and to explicitly accept the risk to agency operations (including mission, functions, image, or reputation), agency assets, or individuals, based on the implementation of an agreed-upon set of security controls. Also referred to as Authorization to Process.

Business Case: The official OMB CPIC submission that describes current business processes, possibly using activity and data models. Current costs and performance are also associated with the models. Gaps between current and desired outcomes are identified and analyzed. Alternatives for improving the business are developed and evaluated based on readily available information. This is a document that is a component of the SMP and applies to Major CPIC investments only.

Business Justification: The compelling business rationale for developing or modernizing the system. This document differs from the official CPIC Business Case as described above.

Capital Planning and Investment The decision-making process for ensuring information technology investments. The process integrates strategic planning,

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Control (CPIC) Process: budgeting, procurement, and the management of IT in support of Agency missions and business needs. The term comes from the Clinger-Cohen Act (CCA) of 1996 and generally is used in relationship to IT management issues.

Certification and Accreditation (C&A) Maintenance Phase C&A maintenance includes those activities and processes required to maintain security of information systems, periodically review the security controls, and maintain the certification and authorization of the information system to operate. This process includes activities involved in the security planning and security testing and evaluation phases.

The C&A maintenance phase of the security process is where the system staff (primarily) (outlined in the security documentation) perform the day-to-day functions required to maintain an appropriate level of security to protect the system. This phase is ongoing while the system is in operation.

Checkpoint: A specific calendar driven point during the system life cycle when the system owner assesses the progress of the SLCM process to ensure that the activities associated with this process are coordinated with and support the IT Investment Management, EA and IT Security requirements.

Commercial Off-the-Shelf (COTS): A product or information system available in the commercial market place. COTS products are sold to the general public in the course of normal commercial business operations at prices based on established catalog or market prices (Federal Acquisition Regulations). COTS products are delivered with pre-established functionality, although some degree of customization is possible.

Concept Exploration Subphase: This subphase of the EPA System Life Cycle Definition Phase establishes the preliminary definitions of the business needs of the system sponsor. It explains the concept in enough detail that decision makers can determine whether and how to proceed.

Control Gate: Phase-driven go/no-go decision points where SLCM activities are reviewed to ensure that appropriate OMB and EPA requirements are observed. A system cannot proceed without a “go” decision by the appropriate senior manager for the specific control gate.

Control Phase: This phase of the CPIC process is to ensure that Major IT initiatives are developed and implemented in a disciplined, well-

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managed, and consistent fashion; that project objectives are being met; that the costs and benefits were accurately estimated; and that spending is in line with the planned budget. This promotes the delivery of quality products and results in initiatives that are completed within scope, on time, and within budget.

Contingency Plan/COOP:

Contains emergency response procedures; backup arrangements, procedures, and responsibilities; and post-disaster recovery procedures and responsibilities. Contingency planning is essential to ensure that systems are able to recover from processing disruptions in the event of localized emergencies or large-scale disasters. It is an emergency response plan, developed in conjunction with application owners and maintained at the primary and backup computer installation to ensure that a reasonable continuity of support is provided if events occur that could prevent normal operations.

Definition Phase:

This phase of the EPA System Life Cycle results in a defined business justification for the system and a plan for implementation or acquisition. Upon completion of this phase, the project will have approval and funding to proceed.

Design Subphase:

This subphase of the EPA System Life Cycle Acquisition / Development Phase is established to create detailed designs for system components, products, and interfaces and initiate test planning. The objective of the Design Subphase is to transform the detailed, defined requirements into complete, detailed specifications for the system to guide the work of the Development Subphase.

Development Subphase:

This subphase of the EPA System Lifecycle Acquisition / Development Phase is to produce and assemble all of the system components that complete the design, meeting the mission need. The objective of this subphase is to convert the work products of the Design Subphase into a complete information system.

Enterprise Architecture (EA):

A strategic information asset base which defines business mission needs, the information content necessary to operate the business, the information technologies necessary to support business operations, and the transitional processes necessary for implementing new technologies in response to changing business mission needs. Enterprise architecture includes baseline architecture, target architecture and a sequencing plan.

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Evaluate Phase: This phase of the CPIC process involves comparing actual to expected results once a Major IT investment has been implemented; evaluating “mature” systems on their continued effectiveness in supporting mission requirements, and evaluating the cost of continued support or potential retirement and replacement.

Government Off-the-Shelf (GOTS): A product developed by or for a government agency that can be used by another government agency with the product’s pre-established functionality and little or no customization.

Implementation Phase: This phase of the EPA System Life Cycle is to move the completed system (or system modifications) into the production environment and complete the necessary processes so that users can access the system to perform the work identified in the mission need.

Information Technology (IT): Applied to computer systems, both hardware and software, and often including networking and telecommunications, usually in the context of a business or other enterprise. Often the name of the part of the enterprise that deals with all things electronic.

Initiation Phase: This phase of the security process is where the security requirements are identified, documentation is created, and resources necessary to secure a system are identified.

Major Application: As defined by OMB Circular A-130, Appendix III, an application or system that requires special attention to security due to the risk and magnitude of the harm resulting from the loss, misuse, or unauthorized access to or modification of the information in the application. These include major investments and mission critical applications.

Major Investment: EPA uses the OMB’s definition of a major investment, which can be found in the CPIC Procedures document. For EPA’s OMB budget reporting, all major IT investments must be reported on the Exhibit 53 and must submit a “Capital Asset Plan and Business Case,” Exhibit 300.

Mission Need Statement: Documents the results of a mission analysis, serves as the decision document for the mission need decision, and after final approval, serves as the basis for investment analysis. It provides a clear, unambiguous, and quantitative description of the mission

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area, current capability, capability shortfall or technological opportunity, required operational capability, impact of disapproval, benefits, time frame, criticality, and resource estimate. This product is a component of the SMP.

Minor Application: Any application not considered a major application. Minor applications are typically included as part of a general support system and their security is covered by the security of that general support system.

Non-major IT Investment: EPA uses the OMB's definition of a non-major investment, which can be found in the CPIC-Lite Guidance document. For EPA's OMB budget reporting, all non-major IT investments must be reported on the Exhibit 53.

Project Level Reviews: Reviews are conducted at the project level to determine system readiness to proceed to the next phase or subphase of the IT life cycle. Key project stakeholders will review and agree that the system under development is the system that needs to be built and that it is being built correctly. The System Manager and System Owner will sign off on the completed review.

Operations and Maintenance Phase (O&M): This phase of the EPA System Life Cycle is to provide a working system to users in support of the mission need. More than half of a typical system's life cycle costs are attributable to operations and maintenance, making the management of this phase of equal importance to the other phases, which deliver the functionality. During this phase, time schedules are maintained and reviews conducted periodically to ensure the health of the system and to validate the suitability of the system for meeting the requirements.

Quality Management: The primary goal of EPA's quality management process is to ensure that our environmental data are of sufficient quantity and quality to support the data's intended use. Under the EPA Quality System, EPA organizations develop and implement supporting quality systems. Similar specifications may also apply to contractors, grantees, and other recipients of financial assistance from EPA.

Requirements Subphase: This subphase of the EPA System Life Cycle Definition Phase is to clearly and specifically detail what the system must do to satisfy the mission need. During this subphase, the System Owner / manager will gather critical information concerning user needs,

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and document them according to the standards consistent with the size and scope of the system, the development methodology selected, and the tools selected to manage development.

Security Planning Within the context of this procedure security planning refers to all activities needed to implement security in the system. This includes activities necessary to categorize information systems, develop security plans, and conduct risk assessments. Although the security planning process does not have a finite ending and needs to be revisited at various junctures throughout the life-cycle, for simplicity it is displayed in a linear fashion.

Security Testing and Evaluation (ST&E) An examination or analysis of the protective measures placed on an information system once it is fully integrated and operational. The objectives of the ST&E are to: uncover design, implementation, and operational flaws that could allow the violation of security policy; determine the adequacy of security mechanisms, assurances and other properties to enforce the security policy; and assess the degree of consistency between the system documentation and its implementation. The scope of an ST&E Plan typically addresses computer security, communications security, emanations security, physical security, personnel security, administrative security, and operations security.

Select Phase: This phase of the CPIC process is to ensure that Major IT investments are chosen that best support the Agency's mission and align with EPA's approach to enterprise architecture.

Small Desktop Applications: Refers to end-user programs or application software that resides solely on a desktop or laptop. While they may be interconnected with other applications on the desktop/laptop (e.g. Microsoft Office Suite), they are not involved in controlling, integrating, or managing components of a system.

Solution: A comprehensive architectural response to a business problem. Solutions address all layers of the Enterprise Architecture - strategy, business, data, applications and technology / security.

Solution Architecture: A Solution Architecture describes how an individual information management system, or information acquisition, will comply with the requirements of the Target Architecture, which is the set of

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products that portrays the future state of the Agency. A Solution Architecture is a comprehensive architectural response to a business problem. Solutions address all layers of Enterprise Architecture - strategy, business, data, applications, and technology/security.

System Management Plan (SMP):

A compilation of managerial documents required in the life cycle of an information system. The required documentation varies by the classification of the system and changes over the life of system as it moves through the phases.

System Planning Subphase:

This subphase of the EPA System Life Cycle Definition Phase is to create the necessary management structure to properly manage and control the system throughout its life cycle. Many of the plans essential to the success of the entire project are created in this phase; the created plans are then reviewed and updated throughout the remaining SDLC phases. In addition the concept is further developed to describe how the business will operate once the approved system is implemented and to assess how the system will impact employee and customer privacy.

Target Architecture:

The set of products that portray the future or end-state enterprise, generally captured in the organization’s strategic thinking and plans. Commonly referred to as the “to-be” architecture.

Termination Phase:

This phase of the EPA System Life Cycle is to shut down system operations and arrange for the retirement of the system and orderly disposition of system assets. During this phase a system that has been declared excess or obsolete is retired and closed down at the end of the life cycle process. The emphasis of this phase is to ensure that data, procedures, and documentation are packaged and archived in an orderly fashion, making it possible to reinstall and bring the system back to an operational status, if necessary, and to retain all data records.

Test Subphase:

This subphase of the EPA System Life Cycle Acquisition / Development Phase is to prove that the developed system satisfies the requirements defined in the Functional Requirements, satisfying the mission need. Several types of tests will be conducted in this subphase, including: subsystem integration tests; system tests to ensure the developed system meets all technical requirements including performance requirements; security tests; and user acceptance testing.

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Waivers: Written justification for deviating from the system life cycle process or for omitting sections or documents of the SMP. Waivers may be considered based on the requirements of the system and needs of the developing office. Any waivers for major applications and general support systems and systems considered to be major investments in the CPIC process must receive concurrence from the System Owner and applicable IMO and be approved by the Director of the Office of Environmental Information's Office of Technology Operations and Planning. Waivers for any other applications and / or systems must receive concurrence from the System Owner and be approved by the applicable IMO. Waivers must be documented as part of the SMP.

10. WAIVERS

The Chief Technology Officer (CTO) considers waivers to the requirements of this Procedure based on the requirements of the system and the needs of the developing office. Justify and document all waivers (including all approvals and concurrences) in the System Management Plan.

Any waivers for major applications, general support systems, FISMA systems (e.g., "high risk"), and information systems considered to be major investments in the CPIC process must include a signed concurrence by the System Owner and SIO. Waiver requests require approval by the CTO. Waivers to requirements of this procedure may not translate to other policy.

The System Owner and the SIO must approve and sign waivers for any applications and / or system not required to conform to Agency CPIC or CPIC-Lite management procedures, or not considered "high risk."

11. RELATED PROCEDURES AND GUIDELINES

System Life Cycle Management Guidelines
Enterprise Architecture Program Managers' Guide

12. MATERIAL SUPERSEDED

Interim Agency System Life Cycle Management Procedure

13. APPENDICES

Concept Exploration	System Planning	Requirements			Test			
Definition Phase								

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Concept Exploration	System Planning	Requirements	Acquisition	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
	Definition Phase		Design	Acquisition / Development				

Appendix 1: Definition Phase

A. Concept Exploration Subphase

Process

Description:

The *Concept Exploration Subphase* begins when management determines the need to enhance a business process through the application of information technology. The purposes of the *Concept Exploration Subphase* are to:

- Identify and validate an opportunity to improve business accomplishments of the organization or a deficiency related to a business need
- Identify significant assumptions and constraints on solutions relative to that need
- Recommend the exploration of alternative concepts and methods to satisfy the need

During this initial phase the System Sponsor designates a System Manager who prepares a Concept Proposal. Projects may be initiated as a result of business process improvement activities, changes in business functions, advances in information technology, or may arise from external sources, such as public law or the general public. When the System Manager identifies an opportunity to improve business/mission accomplishments or to address a deficiency, the System Manager documents these opportunities in the Concept Proposal.

Procedure

Description:

Perform the following activities as part of the *Concept Exploration Subphase*:

- Identify and establish the business justification for the proposed system
- Establish the project sponsorship/ownership
- Consider the project team needs
- Document the exploration activities
- Review and approve to proceed to the next phase
- Initiate security planning activities

Concept Exploration	System Planning	Requirements	Acquisition	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
	Definition Phase		Design	Acquisition / Development				

Every project must have a responsible organization and sufficient resources to execute the project. The Concept Proposal should identify why a business process is necessary and what business benefits can be expected by implementing this improvement. It is important to state the needs or opportunities in business terms. Avoid identifying a specific product or vendor as the solution. The Concept Proposal should be approximately 2-5 pages in length. The background information provided should be at a level of detail sufficient to familiarize senior managers with the history, issues, and customer service opportunities that can be realized through improvements to business processes with the potential support of information technology (IT). This background information must not offer or predetermine any specific automated solution, tool, or product.

The System Sponsor is the principal authority on matters relating to the expression of business needs, the interpretation of functional requirements language, and the mediation of issues regarding the priority, scope, and domain of business requirements. The System Sponsor must understand what constitutes a requirement and must take ownership of the requirements and inputs and outputs.

This activity involves the appointment of a System Manager who carries both the responsibility and accountability for project execution. For small efforts, this may only involve assigning a project to a manager within an existing organization that already has an inherent support structure. For new major projects, a completely new organizational element may be formed - requiring the hiring and reassignment of technical and business specialists.

To provide a management structure for the project, the System Manager should adapt, adopt, or create written processes and procedures for recurring project activities. These include requirements management, project tracking, contractor management, verification and validation, quality assurance, change management, records management, and risk management.

The results of the efforts of this phase are documented in the Concept Proposal and the Mission Need Statement. The approval of the Concept Proposal identifies the end of the Concept Exploration subphase. Approval should be annotated on the Concept Proposal by the System Sponsor and/or the Chief Information Officer (CIO).

Once approval to proceed has been given within EPA, a core project team with participation of the System Manager must be established in order to

Concept Exploration	System Planning	Requirements	Acquisition	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
	Definition Phase		Design	Acquisition / Development				

move on to the *System Planning Subphase*. In addition, once the project has been approved, an information resource record should be established in EPA’s system inventory (READ).

Responsibilities:

System Sponsor: The System Sponsor is the senior spokesperson for the project, and is responsible for ensuring that the needs and accomplishments within the business area are widely known and understood. The System Sponsor is also responsible for ensuring that adequate financial and business process resources to address the business area needs are made available in a timely manner.

System Manager: The appointed System Manager leads the efforts to ensure that all business aspects of the process improvement effort are identified in the Concept Proposal. This includes establishing detailed project plans and schedules.

Information Security Officer (ISO): The ISO is responsible for coordinating the Change Impact Assessments.

Records Liaison Officer (RLO): The RLO is responsible for helping the System Manager establish a working file structure for the SLCM files for the project.

Project Level Reviews:

The *Initiation Phase Review* is performed at the end of this phase, which ensures that the Concept Proposal is approved before proceeding to the next phase. The review ensures that the Concept Proposal is sound, does not conflict with the Enterprise Architecture, and that the proposed project is viewed as a good investment for the Agency. This is the first key decision required in the SLCM and IT Investment Management process.

Work Products:

- D** = Draft: Preliminary version of work product/working copy
- B** = Baseline: Completed version of work product (with signoff if applicable)
- U** = Update: Completed version showing changes made to the baseline version
- ✓ = Always Required

Concept Exploration	System Planning	Requirements	Acquisition	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
	Definition Phase		Design	Acquisition / Development				

Work Product	Status
<p>Acquisition Strategy Documents the framework for planning, organizing, staffing, controlling, and leading a program. It provides a master schedule for research, development, test, production, and other activities essential for program success, and for formulating functional strategies and plans.</p>	D
<p>Approvals (Decision Papers) (SMP) Document decisions presented to management. Summarize those aspects of the analysis and decisions of a given phase or subphase that are important to program management and request approval to continue the project. The EPA life cycle model provides for decision papers to be prepared at the beginning of the Definition, Development or Acquisition, Implementation, and Retirement Phases and at the end of the Requirements Subphase. The level of detail for decision papers should be appropriate to the category of the system.</p>	B
<p>Business Case The compelling business rationale and justification for developing or modernizing a system. It describes current business processes, possibly using activity and data models. Current costs and performance are also associated with the models. Gaps between current and desired outcomes are identified and analyzed. Alternatives for improving the business are developed and evaluated based on readily available information. This is a document that is a component of SMP.</p>	D
<p>Change Directive Documents the formal Change Control Document to implement an approved change to the project's requirements.</p>	✓
<p>Change Tracking Log Log that records the status of all changes proposed to the SMP, including a description of the proposed change, the status history, and final disposition.</p>	✓
<p>Concept of Operations Describes a business process and how a specific system is used in support of the process.</p>	B
<p>Concept Proposal Describes the need or opportunity to improve business functions. It identifies where strategic goals are not being met or mission performance needs to be improved.</p>	B
<p>Cost-Benefit Analysis Documents costs and proposed benefits of alternatives.</p>	D
<p>Information Categorization Types of information that will be collected and processed should be identified and categorized in accordance with FIPS 199 and NIST SP 800-60, to the extent known, including Privacy Act type information. Further refinement will be needed throughout the life cycle.</p>	D
<p>IT Project Request Serves as the formal budget request for the project. Most of the information required for the IT Project Request is obtained from the Business Case and the Project Risk Management Plan.</p>	B
<p>Mission Need Statement Documents the results of a mission analysis, serves as the decision document for the mission need decision, and after final approval, serves as the basis for investment analysis. It provides a clear, unambiguous, and quantitative description of the mission area, current capability, capability shortfall or technology opportunity, required operational capability, impact of disapproval, benefits, time frame, criticality, and resource estimate. This product is a component of the SMP.</p>	B
<p>Privacy Impact Assessment Based on the initial FIP 199 categorization and the identification of the need or potential to collect Privacy Act data/information, the assessment required by the Privacy Act and/or E-Government Act of 2002 to conduct assessments on investments before developing or procuring information technology that collects, maintains, or disseminates information that is in an identifiable form.</p>	B

Concept Exploration	System Planning	Requirements	Acquisition	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
	Definition Phase		Design	Acquisition / Development				

Work Product	Status
<p>Project Plan Documents the schedule and time frame for system development activities to occur based on the estimates developed in the previous phases, as well as task dependencies, organization priorities, and resource availability.</p>	D
<p>File Plan Outlines the records management requirements for all files associated with the project and describes how the project team will handle records-related issues.</p>	D
<p>Project Risk Management Plan (SMP) Identifies and categorizes risks to the successful completion of the project. Lists each identified risk, describing its probability of occurrence, potential consequences, and degree to which it can be controlled. Strategies for eliminating or mitigating each risk are documented.</p>	D
<p>Security Concept Documents a preliminary analysis of security considerations for the new system. It provides the first look at the information that might be included in the Security Plan. Areas considered include risks from theft, disclosure, unauthorized access, eavesdropping, programmed attacks, incorrect routing, misplacement, erasure, and accidental damage. Includes an initial analysis of FIPS 199/NIST 800-60 categories and impact levels of the data and resulting information system. Based on this information, an initial baseline of security controls will be identified from FIPS 201 and NIST SP 800-53.</p>	D
<p>Security Risk Assessment Begins assembling and analyzing threat and vulnerability information, drafting an initial qualitative determination of risk to a collection of sensitive data and the people, information systems, and installations involved in transmitting, accessing, and processing that data. Its purpose is to inform the selection or modification of required controls from FIPS 201 and NIST SP 800-53 based on the information's FIPS 199 impact levels to provide cost-effective and adequate security.</p>	D
<p>Solution Architecture Describes how an individual information management system, or information acquisition, will comply with the requirements of the Target Architecture, which is the set of products that portrays the future state of the Agency. A Solution Architecture is a comprehensive architectural response to a business problem. Solutions address all layers of Enterprise Architecture - strategy, business, data, applications, and technology/security.</p>	B
<p>System Concept Document Describes the results of all significant functional analyses conducted during this subphase including: definition of high level requirements, assessment of pertinent existing information processing capabilities, complete formulation of alternative system functional concepts, assessment of the alternatives, and rationale for the selection of the recommended concept. The data portion describes high-level data requirements for the recommended system concept, provides definitions of these requirements, charts the logical structure of the data requirements, and describes sources, uses, and distribution of data. It defines the system concept, and includes, if applicable, a feasibility study, alternatives analysis, and acquisition strategy.</p>	B

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase		Acquisition / Development						

Appendix 1: Definition Phase

B. System Planning Subphase

Process Description: The *System Planning Subphase* begins when the Concept Proposal has been formally approved and funded. This phase requires study and analysis that may lead to system development activities. Following review and approval of the Concept Proposal, some form of EPA approval (tasking directive) should be issued to begin the formal studies and analyses of the need. The issuing of the tasking directive initiates the *System Planning Subphase* and begins the life cycle of an identifiable project. This subphase is also the start of the System Management Plan.

Procedure Description:

The following activities are performed as part of the *System Planning Subphase*. The results of these activities are captured in the System Management Plan, the Business Case and the Project Risk Management Plan and their underlying institutional processes and procedures.

The System Management Plan (SMP) is the primary managerial documentation in the life cycle of an information system. The various components of this document can be tailored to the project's classification and may include:

- Change Tracking Log
- Mission Need Statement
- Business Case
- System Operations and Maintenance Concept
- Responsibilities
- Cost-Benefit Analysis Summary
- Schedule
- Project Risk Management Plan
- Security Plan and Security Categorization
- Quality Assurance Plan
- Configuration Management Plan
- Review Sections
 - Data Standards
 - Enterprise Architecture (EA) Alignment
 - Capital Planning and Investment Control (CPIC)
- Approvals (Decision Papers)

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase		Acquisition / Development						

- Waivers
- Work Breakdown Structure
- Application Deployment Checklist

The project team, supplemented by enterprise architecture experts if needed, determines the acquisition strategy by analyzing all feasible technical, business process, and commercial alternatives to meeting the business need. These alternatives are analyzed from a life cycle cost perspective. The results of these studies produce a range of feasible alternatives based on life cycle cost, technical capability, operational feasibility, and scheduled availability. Typically, these studies narrow the system technical approaches to only a few potential, desirable solutions that then proceed into the subsequent life cycle phases. Avoid eliminating new and/or creative design concepts from consideration.

The project team plans the subsequent phases to allow development of the project schedule and budget requirements, and to define the expected performance benefits. The Business Case summarizes the high level requirements for the project and justifies the need.

The project team identifies all alternatives that may address the need and any programmatic or technical risks. The project team also studies the risks associated with further development. Summarize the results of these assessments in the Business Case and document them in the Project Risk Management Plan.

Present the results of the phase efforts to project stakeholders and decision makers together with a recommendation to do one of the following:

- Proceed into the next life cycle phase
- Continue additional conceptual phase activities
- Terminate the project

The emphasis of the review is on:

- The successful accomplishment of the phase objectives
- The plans for the next life cycle phase
- The risks associated with moving into the next life cycle phase

The Project Review also addresses the availability of resources to execute the subsequent life cycle phases. Document the results of the review, reflecting the decision on the recommended action, and file the documentation for this phase in the appropriate system project

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase		Acquisition / Development						

files. Update the File Plan as necessary.

Responsibilities:

System Manager: The System Manager is responsible and accountable for the successful execution of the *System Planning Subphase*. The System Manager leads the team that accomplishes the tasks shown above, and is ultimately responsible for the quality of the finished product.

Project Team: The project team members (regardless of the organization of permanent assignment) complete assigned tasks as directed by the System Manager.

Procurement Officer: The Procurement Officer prepares solicitation documents under the guidance of the System Manager.

System Sponsor: The System Sponsor authorizes funding and resources and ensures that they are in place to support the system.

Oversight Stakeholders: The oversight stakeholders provide oversight, advice and counsel to the System Manager on the conduct and requirements of the planning effort. Additionally, oversight stakeholders provide information, judgments, and recommendations to the EPA decision makers during project reviews and in support of project decision milestones.

System Owner: The System Owner is designated at an appropriate level within the EPA as the project decision authority (may or may not be the same individual designated as the sponsor in the previous phase). This individual assesses the:

- Completeness of the planning phase activities
- Robustness of the plans for the next life cycle phase
- Availability of resources to execute the next phase
- Acceptability of the acquisition risk of entering the next phase

For applicable projects, this assessment also includes the readiness to award any major contracting efforts needed to execute the next phase. During the end of phase review process, the decision maker does one of the following:

- Directs the project to move forward into the next life cycle phase (including awarding contracts)
- Directs the project to remain in the planning phase pending

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase		Acquisition / Development						

completion of delayed activities or additional risk reduction efforts

- Terminates the project

Project Level Reviews:

Perform a review at the end of the *System Planning Subphase*. The review ensures that the system manager identifies the goals and objectives of the system and establishes the feasibility of the system. Review the products of the *System Planning Subphase* including the budget, risk, and user requirements. The System Manager organizes, plans, and leads this review. Approval of the Business Case by the SIO grants approval to proceed to the *Requirements Phase* of the SLC. It is important in this effort not to eliminate new and creative approaches. Emphasis should be on the total cost of ownership and not just a single system concept. Support and training issues may become very important from this perspective.

After the approval of the Business Case and the SIO and System Sponsor accept a recommendation, the system project planning can begin.

As identified in the *Definition Phase*, each project has an individual designated to lead the effort. The individual selected has appropriate skills, experience, credibility, and availability to lead the project. Clearly defined authority and responsibility must be provided to the System Manager.

The System Manager works with the SIO and System Sponsor to verify the scope of the proposed program, participation of the key organizations, and potential individuals who can participate in the formal reviews of the project. This decision addresses both programmatic and information management-oriented participation as well as technical interests in the project that are known at this time.

In view of the nature and scope of the proposed program, the key individuals and oversight stakeholders who are the approval authorities for the project should be identified, including the sign-off for quality assurance.

The System Manager and System Sponsor determine if any particularly unusual programmatic, technical, or information management skills or experience are needed. Organizations not participating directly in the project may be notified, if appropriate, including external organizations. Whenever the concept is shared among multiple organizations, data administration plays a strong role. The sharing organizations must determine ownership and stewardship

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase		Acquisition / Development						

of data and develop a shared understanding of data management throughout the project.

Management approval to commit resources to the proposed program marks the beginning of the subsequent system development life cycle phases.

The feasibility analysis and cost benefit analysis confirm that the defined information management concept is significant enough to warrant an IT project with life cycle management activities.

The feasibility study analysis confirms that the information management need or opportunity is beyond the capabilities of existing systems and that developing a new system is a promising approach.

The Cost-Benefit Analysis confirms that the projected benefits of the proposed approach justify the projected resources required.

Work Products:

D = Draft: Preliminary version of work product/working copy

B = Baseline: Completed version of work product (with signoff if applicable)

U = Update: Completed version showing changes made to the baseline version

✓ = Always Required

Work Product	Status
Acquisition Strategy	B
Application Deployment Checklist - (SMP) The expected or projected platform(s) and locations on which an application will reside, requires knowledge of the requirements for deployment on that platform. Application deployment checklists should be obtained and requirements identified and factored into the system planning as soon as possible.	D
Approvals (Decision Papers) - (SMP)	B
Business Case - (SMP)	B
Change Directive	✓
Change Tracking Log - (SMP)	✓
Configuration Management Plan - (SMP) Describes the overall plan for identifying and controlling the parts of the system to ensure their proper functioning according to their requirements.	B
Contract Security Requirements Requirements for contractor background checks, and controls to protect any data used in development, non-disclosures, and separation of duties or “need-to-know” controls need to be spelled out for inclusion in any contracts in the next phase.	B

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase		Acquisition / Development						

Work Product	Status
Cost Benefit Analysis - (SMP)	B
Data Standards - (SMP) Technical specifications for the defining, naming, and using of data within the system.	D
Feasibility Study Analyzes whether the information management need or opportunity is beyond the capabilities of existing systems and that developing a new system is a promising approach.	B
Mission Need Statement - (SMP)	U
Project Plan	B
Project Quality Assurance Plan - (SMP) Describes the planned and systematic pattern of all actions necessary to provide adequate confidence that the system optimally fulfills the organization's expectations.	B
Project Risk Management Plan - (SMP)	B
Records Management Disposition Schedule Documents length of time that all SLCM records are retained and when inactive material is moved to storage.	D
Responsibilities - (SMP) Describes roles and responsibilities of the key participants in the system life cycle development process. It identifies, by name, the System Sponsor, System Owner, System Manager, and other points-of-contact. It lists the organization(s) supporting the system and delineates organizational responsibilities.	B
Schedule - (SMP) Documents the time frame for system development activities to occur based on the estimates developed in the previous phases, as well as task dependencies, organization priorities, and resource availability. Adjustments are made throughout the life cycle based on enterprise goals, objectives, and priorities. Schedule adjustments also take into account task dependencies and resource availability.	B
Security Plan - (SMP) Begins the development of the security plan, which describes the plan to meet security and privacy protection requirements. The security plan addresses what is known to-date about the impact levels, conceptual information system architecture, risks, required controls, contingency or continuity of support needs, laws, and penalties that may apply to breach of confidentiality, etc.	D
Security Categorization	B
Solution Architecture	U
System Operations and Maintenance Concept - (SMP) Describes the general manner in which the system will be managed to include the level of operational support required. Identifies whether the system will be distributed to the Regions or operated from a central location. Describes how the system will be extended to a user's desktop, i.e., whether it requires a support person to install a client component or the system or is Web-based with no client footprint required. Identifies the number and locations of required servers. Estimates the number of operational support personnel and provides an estimate of the number of hours per user required to support the system annually. Identifies the number of users expected by organization and location.	D
Waivers (SMP) Written justification for deviating from the system life cycle process or for omitting sections of documents from the SMP. Consider waivers based on the requirements of the system and needs of the developing office. Any waivers for major applications and general support systems and systems considered to be major investments in the CPIC process must receive concurrence from the System Owner and applicable IMO and be approved by the Director of the Office of Environmental	B

Concept Exploration	System Planning	Requirements	Acquisition	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase		Design	Acquisition / Development					

Work Product	Status
Information's Office of Technology Operations and Planning. Waivers for any other applications and / or systems must receive concurrence from the System Owner and be approved by the applicable IMO. Waivers must be documented as part of the SMP.	
Work Breakdown Structure (SMP) Lists all of the individual task activities and associated dates and resources for completing the project.	B

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Appendix 1: Definition Phase

C. Requirements Subphase and Control Gate # 1 – EA Compliance Certification Review and System Selection

Process Description:

The *Requirements Subphase* begins when the previous phase documentation has been approved, or by management direction. Documentation related to user requirements from the *System Planning Subphase* is used as the basis for further user needs analysis and the development of detailed user requirements. The analysis may reveal new insights into the overall information systems requirements. In such instances, revise all work products to reflect this analysis.

During the *Requirements Subphase*, define the system in more detail with regard to system inputs, processes, outputs, and interfaces (both internal and external). This definition process occurs at the functional level. Describe the system in terms of the functions to be performed, not in terms of computer programs, files, and data streams. The emphasis in this phase is on determining what functions must be performed rather than how to perform those functions, and on ensuring the consideration of data quality. This is best done through first identifying outputs, inputs, and processes. During the *Requirements Subphase*, the project team:

- Further defines and refines functional and data requirements.
- Completes business process engineering of the functions to be supported.
- Develops detailed data and process models.
- Defines functional and system requirements that are not easily expressed in data and process models. Functional and system requirements also include the requirements of the business process, the user requirements, and operational requirements.
- Refines the high level architecture and logical design to support the system and functional requirements.
- Continues to identify and mitigate risk that the technology can be phased-in and coordinated with the business.

Concept Exploration	System Planning	Requirements	Acquisition	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase		Design	Acquisition / Development					

Procedure Description:

The tasks described below are performed during the *Requirements Subphase*.

Consolidate and affirm the business needs. Consolidate the functional requirements and the data requirements. Connect the functional requirements to the data requirements.

The Functional Requirements Document (FRD) is a record of the above requirements. The FRD can be established as a matrix and tracked for satisfaction of every module of the system as development progresses.

The SIO and System Sponsor conduct the Functional and Data Requirements Review in the *Requirements Subphase* to ensure that the business requirements have been accurately linked to functional and data requirements.

The *Concept Exploration Subphase* documentation may need to be revised or updated. The *System Planning Subphase* documentation may also need to be updated in this phase.

Responsibilities:

System Manager: The System Manager is responsible and accountable for the successful execution of the Requirements subphase. The System Manager leads the team that accomplishes the tasks shown above.

Project Team: The project team members (regardless of the organization of permanent assignment) complete assigned tasks as directed by the System Manager.

Procurement Officer: The Procurement Officer prepares solicitation documents under the guidance of the program manager.

Quality Assurance Staff: The Quality Assurance Staff continually reviews the state of the product so the rest of the team can focus on their tasks. Quality Assurance’s goal is to support the product development processes.

Oversight Stakeholders: The oversight stakeholders provide oversight, advice and counsel to the System Manager on the conduct and requirements of the planning effort. Additionally, oversight stakeholders provide information, judgments, and recommendations to the EPA decision makers during project reviews and in support of project decision milestones.

Concept Exploration	System Planning	Requirements	Acquisition	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Design	Acquisition / Development				

**Control Gate 1
System Selection:**

At the end of the *Definition Phase* is the EA Compliance Certification Review and System Selection Control Gate. This ensures the business justification is accurate and complete and allow management to approve the IT Investment Business Case for inclusion in the EPA IT Portfolio. *EPA Order 2100.3, Capital Planning and Investment Control (CPIC) Program Policy for Management of Information Technology (IT) Investments* describes the system selection decision process.

Upon completion of all *Requirements Subphase* tasks and receipt of resources for the next phase, the System Manager, together with the project team, prepares and presents a project status review for the SIO, IIS, System Sponsor, and other stakeholders. The review addresses:

- *Requirements Subphase* required work products, which must be complete, approved, and verified
- Planning status for all subsequent life cycle phases (with significant detail on the next phase, to include the status of pending contract actions)
- Resource availability status
- Acquisition risk assessments of subsequent life cycle phases given the planned acquisition strategy

Work Products:

- D** = Draft: Preliminary version of work product/working copy
- B** = Baseline: Completed version of work product (with signoff if applicable)
- U** = Update: Completed version showing changes made to the baseline version
- ✓ = Always Required

Work Product	Status
Acquisition Strategy	U
Approvals (Decision Papers) - (SMP)	B
Change Directive	✓
Change Tracking Log	✓
Concept of Operations	U
Contract Security Requirements	B
Cost Benefit Analysis	U
Functional Requirements Document Serves as the foundation for system design and development. Captures user and data requirements to be implemented in a new or enhanced system. The systems subject matter experts document	B

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Work Product	Status
these requirements into the requirements traceability matrix, which shows mapping of each detailed functional requirement to its source.	
Hardware Requirements Specification Includes specific requirements for the hardware necessary to support the project.	B
Information Categorization	B
Interface Requirements Specification Specifies the requirements imposed on one or more systems, subsystems, Hardware Configuration Items, Computer Software Configuration Items, manual operations, or other system components to achieve one or more interfaces among these entities.	B
Project Plan	U
Records Management Disposition Schedule	B
Security Concept Documents a preliminary analysis of security considerations for the new system. It provides the first look at the information that might be included in the Security Plan. Areas considered include risks from theft, disclosure, unauthorized access, eavesdropping, programmed attacks, incorrect routing, misplacement, erasure, and accidental damage. Includes an initial analysis of FIPS 199/NIST 800-60 categories and impact levels of the data and resulting information system. Based on this information, an initial baseline of security controls will be identified from FIPS 201 and NIST SP 800-53.	B
Security Plan - (SMP) Begins the development of the security plan, which describes the plan to meet security and privacy protection requirements. It addresses what is known to date about the impact levels, conceptual information system architecture, risks, required controls, contingency or continuity of support needs, laws and penalties that may apply to breach of confidentiality, etc. Establishes the security requirements and formalizes security process for system. Required for every system.	B
Preliminary Security Risk Assessment	B
Software Requirements Specification Includes specific requirements for the software necessary to support the project.	B
Solution Architecture	U
System Engineering Management Plan Documents the plan, articulation, and approval of the strategy to execute the technical management aspects of the project (SEMP).	D
System Test Plan Describes the specific tests and test cases to be used to evaluate the system at appropriate points in the system's SLC, consistent with the TEMP. Security testing comes primarily from NIST SP 800-53a, and will correspond to each security control. Additionally, usability and other programmatic acceptance criteria testing should be planned that will contribute to system acceptance and authorizations.	D
Test and Evaluation Master Plan (TEMP) Defines the overall strategy for ensuring that the developed and implemented system conforms to all requirements. The TEMP describes the types of testing that will be acceptable for use at various points in the system's SLC and what constitutes "successful" testing.	B

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Appendix 2: Acquisition/Development Phase

A. Acquisition Subphase

Process

Description:

The purpose of acquisition planning is to allocate the requirements among development segments, research and apply lessons learned from previous projects, identify potential product and service providers, and secure funding.

The *Acquisition Subphase* describes how all government human resources, hardware, software, and telecommunications capabilities, along with contractor support services, are acquired during the life cycle of the project. The *Acquisition Subphase* helps ensure that needed resources can be obtained and are available at the time they are needed. The *Acquisition Subphase* includes a schedule that lists activities for completion and work products to be produced with appropriate estimated completion dates.

Procedure

Description:

Perform the following activities as part of the *Acquisition Subphase*. Capture the results of these activities in the Acquisition Plan and the Acquisition Strategy document and their underlying institutional processes and procedures.

- Requirements Analysis
- Analysis of Alternatives
- Full Security Risk Assessment
- Procurement of Government Human Resources and Services
- Procurement Plan
- Acquisition of Contractor Services
- Solicitation of Services
- Technical Evaluation Report
- Source Selection Recommendation
- Contract Award
- Adjustment of Funds
- Contract Performance

Follow the applicable elements of the outline to complete the

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Acquisition Subphase. The information in the plan includes:

- Adequate information for making management decisions concerning procurement of government human resources and services, contractor services procurement, including ensuring the availability of funding
- Adequate information for performing a technical analysis and evaluation of vendor proposals
- Adequate information for vendors to prepare bids
- Adequate information for the source selection official to base a selection

Consider the following when submitting a request for hardware, software, and/or related services:

- Resources are consistent with applicable laws, regulations, policy/procedural guidance from central management agencies, Congress, and senior Agency management
- Acquisitions are consistent with Agency objectives and initiatives as defined in the EPA EA
- Obtain resources only in direct support of the EPA missions and programs of the acquiring office/organization
- Acquisitions are not redundant or duplicative efforts resulting in wasted money, time, and resources
- Resources represent the most efficient and cost-effective means of providing automated support

Avoid eliminating new and/or creative design concepts from consideration. The *Acquisition Subphase* typically has its own mini-life cycle of pre-solicitation, solicitation and award, and post award. The life cycle model varies according to the system development effort; this means that the activities in each differ significantly. The model Acquisition Plan includes a milestone schedule, with estimated completion dates.

The *Acquisition Subphase* becomes critical after the Functional Requirements Document has been approved. Several acquisitions may be needed to procure an entire system and are a continuous part of the life cycle. Update the Acquisition Plan continuously with the active involvement of the System Manager.

Responsibilities: **System Manager:** The System Manager works directly with acquisitions personnel to ensure the timely award of the needed

Concept Exploration	System Planning	Requirements			Test			
Definition Phase								

resources. The System Manager ensures that the *Acquisition Subphase* progress in accordance with the Federal Acquisition Regulation (FAR) Part 7. The System Manager is responsible and accountable for the successful execution of the *Acquisition Subphase*. The System Manager leads the team that accomplishes the tasks shown above.

Project Team: The project team members (regardless of the organization of permanent assignment) complete assigned tasks as directed by the System Manager. May include Program Analysts or Programmers who interpret user requirements, and design and write the code for specialized programs.

Procurement Officer: The Procurement Officer prepares solicitation documents under the guidance of the System Manager.

Oversight Stakeholders: The oversight stakeholders provide oversight, advice and counsel to the System Manager on the conduct and requirements of the planning effort. Additionally, oversight stakeholders provide information, judgments, and recommendations to the EPA decision makers during project reviews and in support of project decision milestones.

System Owner: Each EPA Office must designate an individual as the project decision and quality authority (may or may not be the same individual designated as the sponsor in the previous phase). This individual assesses:

- The completeness of the *Acquisition Subphase* activities
- The robustness of the plans for the next life cycle phase
- The availability of resources to execute the next phase
- The acceptability of the risk of entering the next phase
- The quality of the products produced in each phase

For applicable projects, this assessment also includes the readiness to award any major contracting efforts needed to execute the next phase. At the end of phase review process, the decision maker does one of the following:

- Directs the project to move forward into the next life cycle phase (including awarding contracts)
- Directs the project to remain in the acquisition subphase pending completion of delayed activities or additional risk reduction efforts
- Terminates the project

Concept Exploration	System Planning	Requirements		Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Development					

Project Level Reviews:

Perform a review at the end of the *Acquisition Subphase*. The review ensures that the system manager identifies the requirements of the system and establishes the feasibility of the system. Review the products of the *Acquisition Subphase*, including the Acquisition Plan and the requirements specifications. The System Manager and/or representative organizes, plans, and leads this review. Approval of the Contract for Services by the Procurement Officer grants approval to proceed to the *Design Subphase*.

Work Products:

- D = Draft: Preliminary version of work product/working copy
- B = Baseline: Completed version of work product (with signoff if applicable)
- U = Update: Completed version showing changes made to the baseline version
- ✓ = Always Required

Work Product	Status
Acquisition Package Documents allocation of the requirements among development segments, research and applies lessons learned from previous projects; identifies potential product and service providers, and secures funding.	B
Acquisition Strategy	U
Approvals (Decision Papers) (SMP)	B
Bidders List List of eligible and interested bidders bidding on a contract.	B
Change Directive	✓
Change Tracking Log	✓
Contract Document that establishes an offer and consideration for goods and/or services.	B
Full Security Risk Assessment	B
Project Plan	U
Request for Proposal	B
Solution Architecture	U

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Appendix 2: Acquisition/Development Phase

B. Design Subphase and Control Gate # 2 - EA Compliance Certification Review

**Process
Description:**

The objective of the *Design Subphase* is to transform the detailed, defined requirements into complete, detailed specifications for the system that will guide the work of the *Development Subphase*. The decisions made in this phase address, in detail, how the system will meet the defined functional, physical, interface, and data requirements. *Design Subphase* activities may be conducted in an iterative fashion, producing first a general system design that emphasizes the functional features of the system, then a more detailed system design that expands the general design by providing all the technical detail.

For Commercial Off-the-Shelf (COTS) products, some tasks and activities may have been performed by the vendor and vendor documentation may be appropriate to meet some documentation requirements. This is acceptable as long as each task and activity is performed and each document is available.

**Procedure
Description:**

The following tasks are performed during the *Design Subphase*.

The System Manager and the project team develop the System Design Document, identifying the steps used in the design of the application/system. The prerequisites for this phase are the Business Case, Project Plan, and Functional Requirements Document (FRD). The System Manager and project team identify/specify the target environment, the development environment, and the design environment. The business organization, roles, and procedures for designing this system/application are articulated. The System Design Document is a work product in the *Design Subphase*. Revise documents from the previous phases during the *Design Subphase*. The System Manager signs off on the updates, with significant changes approved by the System Sponsor and CIO.

In the system design, first define the general system characteristics. Design the data storage and access for the database layer. the user interface at the desktop layer and the business rules layer or the application logic. Also design and document the interfaces from

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

application to application and application to database.

Conduct a security risk assessment by addressing the following components: assets, threats, vulnerabilities, probability of risk occurrence, consequences and safeguards. The risk assessment evaluates compliance with baseline security requirements, identifies threats and vulnerabilities, and assesses alternatives for mitigating or accepting residual risks. Develop a Contingency Plan/COOP containing emergency response procedures; backup arrangements, procedures and responsibilities; and post-disaster recovery procedures and responsibilities. It is included in this phase because many of these factors will affect the design of the system. The developer obtains the requirements from the Security Risk Assessment and the FRD and allocates them to the specific modules within the design for enforcement purposes. For example, if a requirement exists to audit a specific set of user actions, the developer may have to add a workflow module into the design to accomplish the auditing. Security operating procedures are guidance documents that provide users and administrators with detailed requirements on how to operate and maintain the system securely. They should address all applicable computer and telecommunications security requirements, including: system access controls; marking, handling, and disposing of magnetic media and hard copies; computer room access; account creation, access, protection, and capabilities; operational procedures; audit trail requirements; configuration management; processing area security; employee check-out; and emergency procedures. Security operating procedures may be created as separate documents or added as sections or appendices to the user and operations manuals. Develop security operating procedures during the *Design Subphase*.

Include the system user community in *Design Subphase* actions as needed. New or further requirements might be discovered that are necessary to accommodate individuals with disabilities. If so, these requirements are added to the FRD.

Start the development of the following system documents in this phase:

- **Maintenance Manual:** to ensure continued operation of the system once it is completed. Complete this manual as a work product in the *Development Subphase*.
- **Operations Manual for mainframe systems/applications and the System Administrators Manual for client/server systems/applications.** Complete these manuals as work products in the *Development Subphase*.

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

- Conversion Plan, if current information needs to be converted/migrated/transitioned to the new system. The Conversion Plan is needed especially if system developers re-engineer the processes.
- Design the Implementation Plan and Contingency Plan/COOP in this phase and complete them as work products in the *Development Subphase*.
- The Training Plan and the User Manual are begun during the *Design Subphase*. Complete these as work products in the *Development Subphase*.
- The Training Plan outlines the objectives, needs, strategy, and curriculum to be addressed when training users on the new or enhanced information system. The plan presents the activities needed to support the development of training materials, coordination of training schedules, reservation of personnel and facilities, planning for training needs, and other training-related tasks. Develop training activities to teach user personnel the use of the system as specified in the training criteria. The Training Plan includes a description of the target audience and topics on which training must be conducted on the list of training needs. It includes how the topics will be addressed and the format of the training program, the list of topics to be covered, materials, time, space requirements, and proposed schedules.

The decisions of this phase re-examine in greater detail many of the parameters addressed in previous phases. The design prepared in this phase is the basis for the activities of the *Development Subphase*. The overall objective is to establish a complete design for the system. A number of project approach, project execution, and project continuation decisions are made in this phase.

Project approach decisions include:

- Identification of existing or COTS components that can be used, or economically modified, to satisfy validated functional requirements
- Use of appropriate prototyping to refine requirements and enhance user and developer understanding and interpretation of requirements

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

- Selection of specific methodologies and tools to be used in the later life cycle phases, especially the *Development and Implementation Phases*
- Determination of how user support will be provided, how the remaining life cycle phases will be integrated, and newly identified risks and issues handled

Project execution decisions include:

- Modifications that must be made to the initial information system
- Modifications that will be made to current procedures
- Modifications that will be made to current systems/databases or to other systems/databases under development
- How conversion of existing data will occur

Project continuation decisions include:

- The continued need for the information system to exist
- The continued development activities based on the needs addressed by the design
- Availability of sufficient funding and other required resources for the remainder of the system's life cycle

There is an ongoing interim review of the system design as it evolves through the *Design Subphase*. Review detailed objective system functions, performance requirements, security requirements, and system platform characteristics. The System Manager conducts the final design review with approval or disapproval by the SIO and the System Sponsor. Conduct this review at the end of the *Design Subphase* to confirm that modifications prompted by earlier reviews are incorporated.

Responsibilities: **System Manager:** The System Manager is responsible and accountable for the successful execution of the *Design Subphase*. The

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

System Manager leads the team that accomplishes the tasks shown above.

Project Team: The project team members (regardless of the organization of permanent assignment) complete assigned tasks as directed by the System Manager.

Procurement Officer: The Procurement Officer prepares solicitation documents under the guidance of the program manager.

Oversight Stakeholders: The oversight stakeholders provide oversight, advice and counsel to the System Manager on the conduct and requirements of the planning effort. Additionally, oversight stakeholders provide information, judgments, and recommendations to the EPA decision makers during project reviews and in support of project decision milestones.

Chief Architect: The Chief Architect certifies EA compliance of the Solution Architecture to complete Control Gate #2.

System Sponsor: The System Sponsor participates in the final design review and gives approval or disapproval with the SIO.

Senior Information Official (SIO): The SIO participates in the final design review and gives approval or disapproval with the System Sponsor.

**Control Gate 2 –
EA Compliance
Certification
Review:**

The purpose of the EA Compliance Certification Review is to Ensure the system’s design conforms to the planned Solution Architecture and continues to address the business need while remaining in alignment with the Agency EA.

The Chief Architect conducts the EA Compliance Certification Review for all Major applications. The Chief Architect is responsible for certifying that the Solution Architectures are compliant with the Enterprise Architecture. The SIO or designee conducts the EA Compliance Certification Review and certifies architecture compliance for non-major and small or other systems. The Solution Architecture is certified as architecturally compliant prior to project development unless the system manager obtains a waiver.

During the Control Gate #2 Review, all *Acquisition* and *Design Subphase* required work products must be completed, approved, and verified to satisfy the Control Gate requirement.

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Joint Management Reviews:

A system requires joint management reviews when multiple offices manage and/or fund the project. Make the determination of who should participate in joint management reviews during the initial tailoring process. Hold joint management reviews for both requirements and design during the *Design Subphase*. Prior to the design reviews, the acquirer shall have reviewed the work products initiated, updated, or completed during the *Design Subphase*.

Hold system/subsystem and software requirements reviews at the beginning of the *Design Subphase* to resolve open issues regarding the specified requirements for a software system or subsystem.

Hold a system/subsystem design review at the end of the *Design Subphase* to resolve open issues regarding any of the following:

- The system-wide or subsystem-wide design decisions
- The architectural design of a software system or subsystem

Hold a software design review at the end of the *Design Subphase* to resolve open issues regarding one or more of the following:

- The software-wide design decisions
- The architectural design of a software item
- The detailed design of a software item or portion thereof (such as a database)

Upon completion of all *Design Subphase* tasks and receipt of resources for the next phase, the System Manager, together with the project team should prepare and present a project status review for the SIO, System Sponsor, and other stakeholders. The review should address:

- *Design Subphase* required work products, which must be completed, approved, and verified
- Planning status for all subsequent life cycle phases (with significant detail on the next phase, to include the status of pending contract actions)
- Resource availability status
- Acquisition risk assessments of subsequent life cycle phases given the planned acquisition strategy

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Work Products:

D = Draft: Preliminary version of work product/working copy

B = Baseline: Completed version of work product (with signoff if applicable)

U = Update: Completed version showing changes made to the baseline version

✓ = Always Required

Work Product	Status
Application Deployment Checklist (SMP)	B
Approvals (Decision Papers) (SMP)	B
Change Directive	✓
Change Tracking Log	✓
Contingency Plan/COOP Contains emergency response procedures; backup arrangements, procedures, and responsibilities; and post-disaster recovery procedures and responsibilities. Contingency planning is essential to ensure that systems are able to recover from processing disruptions in the event of localized emergencies or large-scale disasters. It is an emergency response plan, developed in conjunction with application owners and maintained at the primary and backup computer installation to ensure that they provide a reasonable continuity of support if events occur that could prevent normal operations.	B
Data Conversion Plan Describes the strategies involved in converting data from an existing system to another hardware or software environment. It is appropriate to re-examine the original system's functional requirements for the condition of the system before conversion to determine if the original requirements are still valid.	B
Functional Requirements Document	U
Hardware Requirements Specification	U
Interface Requirements Specification	U
Maintenance Manual Provides the definition of the software support environment, the roles and responsibilities of maintenance personnel, and the regular activities essential to the support and maintenance of program modules, job streams, and database structures.	D
Operations Manual Provides system administrators/computer control personnel/computer operators with a detailed operational description of the information system and its associated environments, such as machine room operations and procedures.	D
Project Plan	U
Requirements Traceability Matrix Graphically depicts the relationship between requirements, design modules, and tests used to establish that all requirements have been addressed within the system and that the tests planned for the system will both test all of the components and demonstrate that the requirements have been met.	B
Solution Architecture	U
System Design Document Describes the system requirements, operating environment, system and subsystem architecture, files and database design, input formats, output layouts, human-machine interface, detailed design, processing logic, and external interfaces. It is used in conjunction with the Functional	B

Concept Exploration	System Planning	Requirements	Acquisition Design				Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Work Product	Status
Requirements Document, finalized in this phase, to provide a complete system specification of all user requirements for the system and reflects the user's perspective of the system design. Will include Database Models – Logical/Physical and Physical Network Topologies – Logical/Physical	
System Implementation Plan (SMP) Describes how the information system will be deployed and installed into an operational system. The plan contains an overview of the system; a brief description of the major tasks involved in the implementation; the overall resources needed to support the implementation effort (such as hardware, software, facilities, materials, and personnel); and any site-specific implementation requirements.	D
System Test Plan (SMP)	B
User Manual Contains all essential information for the user to make full use of the information system. This manual includes a description of the system functions and capabilities, contingencies and alternate modes of operation, and step-by-step procedures for system access and use.	D
User Training Plan Outlines the objectives, needs, strategy, and curriculum to be addressed when training users on the new or enhanced information system. The plan presents the activities needed to support the development of training materials, coordination of training schedules, reservation of personnel and facilities, planning for training needs, and other training-related tasks.	D

Concept Exploration	System Planning	Requirements	Acquisition	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Appendix 2: Acquisition/Development Phase

C. Development Subphase

Process

Description:

The objective of the *Development Subphase* is to convert the work products of the *Design Subphase* into a complete information system. Although much of the activity in the *Development Subphase* addresses the computer programs that make up the system, this phase also puts in place the hardware, software, and communications environment for the system and other important elements of the overall system.

The activities of this phase translate the system design produced in the *Design Subphase* into a working information system capable of addressing the information system requirements. The *Development Subphase* contains activities for integration and installation and acceptance related to software products. At the end of this phase, the system is ready for the activities of the *Test Subphase*.

For COTS products, some tasks and activities may have been performed by the developer and developer documentation may be appropriate to meet some documentation requirements. This is acceptable as long as the developer performs each task and activity and makes each document available.

Procedure

Description:

This activity consists of several tasks that are the responsibility of the developer. The developer places the outputs under configuration control and performs change control. The developer also documents and resolves problems and non-conformances found in the software products and tasks.

The developer selects, tailors, and uses the appropriate standards, methods, tools, and computer programming languages documented and established by the organization for performing the activities in the *Development Subphase*.

Develop, document, and execute plans for conducting the activities of the *Development Subphase*. The plans include specific standards, methods, tools, actions, and responsibility associated with the development of all requirements including safety and security. Separate plans may be developed. Expand the detailed project Work Breakdown Structure (WBS) developed during the *Planning Subphase* to incorporate the WBS structure into each module or

Concept Exploration	System Planning	Requirements	Acquisition	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Design	Acquisition / Development				

software configuration item to be developed.

Responsibilities:

System Manager: The System Manager is responsible and accountable for the successful execution of the *Development Subphase*. The System Manager leads the team that accomplishes the tasks shown above.

Project Team: The project team members (regardless of the organization of permanent assignment) completes assigned tasks as directed by the System Manager.

Procurement Officer: The Procurement Officer prepares solicitation documents under the guidance of the program manager.

Oversight Stakeholders: The oversight stakeholders provide oversight, advice and counsel to the System Manager on the conduct and requirements of the planning effort. Additionally, oversight stakeholders provide information, judgments, and recommendations to the EPA decision makers during project reviews and in support of project decision milestones.

Project Level Reviews:

Upon completion of all *Development Subphase* tasks and receipt of resources for the next phase, the System Manager, together with the project team prepares and presents a project status review for the SIO, Program Sponsor, and other stakeholders. The review should address:

- Development subphase activities status
 - Planning status for all subsequent life cycle phases (with significant detail on the next subphase, to include the status of pending contract actions)
 - Resource availability status
 - Acquisition risk assessments of subsequent life cycle phases given the planned acquisition strategy
-

Concept Exploration	System Planning	Requirements	Acquisition	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Work Products:

D = Draft: Preliminary version of work product/working copy

B = Baseline: Completed version of work product (with signoff if applicable)

U = Update: Completed version showing changes made to the baseline version

✓ = Always Required

Work Product	Status
Acquisition Package	U
Application Deployment Checklist	U
Change Directive	✓
Change Tracking Log	✓
Contingency Plan/COOP	U
Data Conversion Plan	U
Hardware Requirements Specification	U
Integration Document Explains how the software components, hardware components, or both are combined and the interaction between them.	B
Maintenance Manual	B
Operations Manual	B
Project Plan	U
Requirements Traceability Matrix	U
System Design Document	U
Security Risk Assessment	U
Software Development Document Contains documentation pertaining to the development of each unit or module, including the test cases, software, test results, approvals, and any other items that will help explain the functionality of the software.	B
Solution Architecture	U
System (Application) Software Entails the disks (or other media) used to store the application software used for the Test Phase and finalized in this phase before implementation of the system. Necessary hardware is also included.	D
System Implementation Plan	U
System Modules (Code, Test, Implementation, and Operational) Includes development units such as the source code modules, object code modules, load modules, and job control streams developed to automate the required business functions. Although these modules are not typically documents but files that reside on the developed system, source code and job control listings can be printed and included in system documentation for each unit / module.	D
System Security Plan	B
System Test Plan	U

Concept Exploration	System Planning	Requirements	Acquisition	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Work Product	Status
Test Analysis Report Documents the formal documentation of the software testing.	B
Test Files / Data Provide the actual test data and files used for system testing.	B
User Manual	B
User Training Plan	B

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Appendix 2: Acquisition/Development Phase

D. Test Subphase and Control Gate # 3 - Authorization to Operate

Process Description:

The objective of the *Test Subphase* is to prove that the developed system satisfies the requirements defined in the Functional Requirements Document (FRD). Another purpose is to perform an integrated system test function as specified by the design parameters. This function is the responsibility of the system testers and heavily supported by the user participants.

Prerequisites of this phase are the FRD, project management plan and schedule, system baseline software and documents, and a test plan containing all test requirements and schedules.

This phase consists of several types of phases. First, the development team executes and evaluates subsystem integration tests to prove that the program components integrate properly into the subsystems and that the subsystems integrate properly into an application. Next, the testing team conducts and evaluates system tests to ensure the developed system meets all technical requirements, including performance requirements. Next, the testing team and the Security Manager conduct security tests to validate that the access and data security requirements are met. Finally, users participate in acceptance testing to confirm that the developed system meets all user requirements as stated in the FRD. Users perform acceptance testing in a simulated “real” user environment using simulated or real target platforms and infrastructures.

Procedure Description:

Complete the following tasks during the *Test Subphase*.
The test and evaluation team establishes the test team and creates the Test Files/Data.

The test and evaluation team create or load the test database(s) and executes the system test(s). The team documents all results on the Test Analysis Report, Test Problem Report, and on the Test Analysis Approval Determination. Any failed components are migrated back to the *Development Subphase* for rework, and the passed components migrated ahead for security testing.

Concept Exploration	System Planning	Requirements	Acquisition	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

The test and evaluation team create or load the test database(s) and execute security (penetration) test(s). The team documents all tests as noted above. Failed components are migrated back to the *Development Subphase* for rework, and passed components will be migrated ahead for acceptance testing.

The test and evaluation team create or the test database(s) and execute the acceptance test(s). The team documents all tests as noted above. Failed components are migrated back to the Development subphase for rework, and passed components migrate ahead for implementation.

During this phase, finalize the documentation from all previous phases to align it with the delivered system. The System Manager coordinates these update activities and is responsible for ensuring that the functionality of the systems meets all quality requirements specified in the Quality Assurance Plan.

Responsibilities:

System Manager: The System Manager is responsible and accountable for the successful execution of the *Test subphase*. The System Manager leads the team that accomplishes the tasks shown above.

Project Team: The project team members (regardless of the organization of permanent assignment) complete assigned tasks as directed by the System Manager.

Oversight Stakeholders: The oversight stakeholders provide oversight, advice and counsel to the System Manager on the conduct and requirements of the planning effort. Additionally, oversight stakeholders provide information, judgments, and recommendations to the EPA decision makers during project reviews and in support of project decision milestones.

Control Gate 3 – Authorization to Operate:

The purpose of the Authorization to Operate Review is to ensure that the system is ready to move into an operational state.

The designated approving authority conducts the Authorization to Operate Review, and uses the certification package to make a determination as to the appropriateness of allowing the system to function. The system must be accredited for operations prior to the system being moved into an operational state. The approving authority can provide full authorization to operate or denial of authorization to

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

operate.

Upon completion of all integration and *Test Subphase* tasks and the receipt of resources for the next phase, the System Manager, together with the project team prepares and presents a project status review for the SIO, System Sponsor, and other stakeholders. The review should address:

- *Test Subphase* required work products, which must be completed, approved, and verified
- Planning status for all subsequent life cycle phases (with significant detail on the next phase, to include the status of pending contract actions)
- Resource availability status
- Acquisition risk assessments of subsequent life cycle phases given the planned acquisition strategy
- Completion of quality assurance and quality control activities for this phase

The Information Management Officer (IMO) issues the final statement of Authorization to Operate.

Work Products:

D = Draft: Preliminary version of work product/working copy

B = Baseline: Completed version of work product (with signoff if applicable)

U = Update: Completed version showing changes made to the baseline version

✓ = Always Required

Work Product	Status
Change Directive	✓
Change Tracking Log	✓
Project Plan	U
Solution Architecture	U
System Implementation Plan	U
System Modules (Code, Test, Implementation, and Operational)	U

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					
System Test Plan								U
Test Analysis Approval Determination Summary of the perceived readiness for migration of the software; attached to the Test Analysis Report as a final result of the test reviews and testing levels above the integration test.								B
Test Analysis Report								B
Test Problem Report								✓

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Appendix 3: Implementation Phase

Process Description:

In the *Implementation Phase*, the developers install the system or system modifications and make them operational in a production environment. Initiate the phase after the user has tested and accepted the system. Activities in this phase include notification of implementation to end users, execution of the previously defined training plan, data entry or conversion, completion of security certification and accreditation and post implementation evaluation. This phase continues until the system is operating in production in accordance with the defined user requirements.

The new system being implemented can fall into three categories: replacement of a manual process, replacement of a legacy system, or upgrade to an existing system. **Regardless of the type of system, all aspects of the implementation phase should be followed.** This ensures the smoothest possible transition to the organization's desired goal.

Procedure Description:

Perform the following activities as part of the *Implementation Phase*. See below for a description of these tasks and activities.

Send the implementation notice to all users and organizations affected by the implementation. Additionally, it is good policy to make internal organizations not directly affected by the implementation aware of the schedule so that allowances can be made for a disruption in the normal activities of that section. The notice should include:

- The schedule of the implementation
- A brief synopsis of the benefits of the new system
- The difference between the old and new system
- Responsibilities of end user affected by the implementation during this phase
- The process to obtain system support, including contact names and phone numbers

Typically, implementation includes converting existing data for use in the new system. The tasks for this effort are two-fold: data input and data verification. When replacing a manual system, hard copy data is entered into the automated system. Some sort of verification that the data is being entered correctly should be conducted throughout this process. This is also the case in data transfer, where data fields in the

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

old system may have been entered inconsistently and therefore affect the integrity of the new database. Verification of the old data becomes imperative to a useful computer system.

One of the ways verification of both system operation and data integrity can be accomplished is through parallel operations. Parallel operations consist of running the old process or system and the new system simultaneously until the new system is certified through the C&A process. In this way if the new system fails in any way, the operation can proceed on the old system while the bugs are worked out.

To ensure that the system is fully operational, install the system in a production environment.

After implementing the system, conduct a post-implementation evaluation to determine the success of the project through its implementation phase. The purpose of this evaluation is to document implementation experiences, to recommend system enhancements, and to provide guidance for future projects.

In addition, Change Implementation Notices are used to document user requests for fixes to problems that may have been recognized during this phase. It is important to document any user request for a change to a system to limit misunderstandings between the end user and the system programmers.

During this phase, finalize the documentation from all previous to align it with the delivered system. The System Manager coordinates these update activities.

Responsibilities:

System Manager: The System Manager is responsible and accountable for the successful execution of the *Implementation Phase*. The System Manager leads the team that accomplishes the tasks shown above and finalizes all of the documentation from previous phases.

Project Team: The project team members (regardless of the organization of permanent assignment) complete assigned tasks as directed by the System Manager.

Oversight Stakeholders: The oversight stakeholders provide oversight, advice and counsel to the System Manager on the conduct and requirements of the planning effort. Additionally, oversight stakeholders provide information, judgments, and recommendations to the EPA decision makers during project reviews and in support of project decision milestones.

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Project Level Reviews:

Conduct a post-implementation review to ensure that the system functions as planned and expected; to verify that the system cost is within the estimated amount determined by the Cost-Benefit Analysis; and to verify that the intended benefits are derived as projected. Normally, this is a one-time review, and it occurs after a major implementation; it may also occur after a major enhancement to the system. The results of an unacceptable review are submitted to the SIO for review and follow-up actions. The SIO may decide it is necessary to return the deficient system to the responsible system development System Manager for correction of deficiencies.

During the *Implementation Phase* review, recommendations may be made to correct errors, improve user satisfaction or improve system performance. For contractor development, perform analysis to determine if additional activity is within the scope of the statement of work or within the original contract.

Work Products:

- D** = Draft: Preliminary version of work product/working copy
- B** = Baseline: Completed version of work product (with signoff if applicable)
- U** = Update: Completed version showing changes made to the baseline version
- ✓ = Always Required

Work Product	Status
Acquisition Package	U
Application Deployment Checklist	U
Approvals (Decision Papers)	B
Authorization to Operate The official management decision given by a senior agency official to authorize operation of an information system and to explicitly accept the risk to agency operations (including mission, functions, image, or reputation), agency assets, or individuals, based on the implementation of an agreed-upon set of security controls. Also referred to as Authorization to Process or Accreditation. Addressed during Control Gate #3.	B
Change Directive	✓
Change Implementation Notice Documents a formal request and approval document for changes made during the Implementation Phase.	B
Change Tracking Log	✓

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Work Product	Status
<p>Post Implementation Review Report Documents the conducted review to ensure that the system functions as planned and expected, to verify that the system cost is within the estimated amount, and to verify that the intended benefits are derived as projected. Create this report at the end of the Implementation Phase.</p>	B
<p>Project Plan</p>	U
<p>Security Certification and Accreditation Certification results in a security assessment report that results in findings and recommendations. These are used to revise and approve the security plan any develop any Plans of Action and Milestones (POA&Ms) to correct deficiencies. The approved security plan, security assessment report and POA&Ms are components of an Accreditation package. From this the approving authority will develop the “Accreditation” which contains their decision to accredit, decision rationale, and any terms and conditions. The term “No accreditation” signifies identified deficiencies must be corrected before the system can move to production/implementation. Full accreditation allows for implementation in the production environment. There may be POA&Ms that must be fulfilled, but these do not represent a significant security risk. (see NIST SP 800-37 for further details). The Security Accreditation Package includes the Certifier’s Statement.</p>	B
<p>Solution Architecture</p>	U
<p>System Modules (Code, Test, Implementation, and Operational)</p>	B
<p>Version Description Document Serves as the primary configuration control document used to track and control versions of software released to the operational environment. It is a summary of the features and contents for the software development, and identifies and describes the version of the software to be delivered.</p>	B

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Appendix 4: Operations & Maintenance Phase

Control Gate # 4 – Modify or Terminate

Process

Description:

More than half of the life cycle cost of a system can be attributed to its operation and maintenance. In this phase, it is essential that system developers perform all facets of operation and maintenance. The system is being used and scrutinized to ensure that it meets the needs initially defined during planning. Problems may be detected and new needs arise that may require modification to existing code, new code to be developed, and/or hardware configuration changes. Providing user support such as providing training to new users is an ongoing activity. The emphasis of this phase is to ensure that the users' needs are met and the system continues to perform as specified in the operational environment. Additionally, as operations and maintenance personnel monitor the current system, they may become aware of ways to improve the system and therefore make recommendations. Changes will be required to fix problems, possibly add features, and make improvements to the system. This phase continues for as long as the system is in use.

Procedure

Description:

Operations support is an integral part of the day-to-day operation of a system. In small systems, all or part of each task may be done by the same person. But in large systems, each function may be done by separate individuals or even separate areas. The Operations Manual was developed in previous phases. This document defines tasks, activities, and responsible parties and needs to be updated as changes occur. Systems operations activities and tasks need to be scheduled, on a recurring basis, to ensure that the production environment is fully functional and is performing as specified. The following is a checklist of systems operations key tasks and activities:

- Ensure that systems and networks are running and available during the defined hours of operation
- Ensure all processes, manual and automated, are documented in the operating procedures. These processes should comply with the system documentation
- Acquisition and storage of supplies, e.g., paper, toner, tapes, removable disks

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

- Perform and test backups (day-to-day protection, contingency)
- Perform the physical security functions including ensuring adequate uninterruptible power supply and ensuring that personnel have proper clearances and proper access privileges, etc.
- Ensure contingency planning for disaster recovery is current, tested, and funded according to the Contingency Plan/COOP
- Train users on current processes and new processes. Provide periodic refresher training and ensure funding
- Ensure the monitoring and accuracy of service level objectives
- Maintain performance measurements, statistics, and system logs. Examples of performance measures include volume and frequency of data to be processed in each mode, order and type of operations
- Monitor security controls and performance statistics, report the results, and escalate problems when they occur

Data/software administration ensures that input data and output data and databases are correct and continually checked for accuracy and completeness. This includes system managers ensuring that developers submit and correctly complete any regularly scheduled jobs. Software and databases should be maintained at (or near) the current maintenance level. The backup and recovery processes for databases are normally different than the day-to-day data/software administration volume backups. The backup and recovery process of the databases should be performed as a data/software administration task. A checklist of data/software administration tasks and activities includes the following:

- Performing production control and quality control functions (job submission, checking and corrections)
- Interfacing with other functional areas for day-to-day checking/corrections
- Installing, configuring, upgrading and maintaining database(s). This includes updating processes, data flows, and objects (usually shown in diagrams)
- Developing and performing data/database backup and recovery routines for data integrity and recoverability
- Ensuring all processes are properly documented properly in

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

the Operations Manual

- Developing and maintaining a performance plan for online process and databases
- Performing configuration, security and design reviews/audits to ensure software, system, parameter, and configuration are correct
- Perform patching of software for the system if and when required
- Manage and control configuration and changes to the system

One fact of life with any system is that change is inevitable. Users need an avenue to suggest changes and identify problems. A User Satisfaction Review which can include a Customer Satisfaction Survey can be designed and distributed to obtain feedback on operational systems to help determine if the systems are accurate and reliable. System administrators and operators need to be able to make recommendations for upgrades to hardware, architecture and streamlining processes. For small in-house systems, modification requests can be handled by an in-house process. For large integrated systems, modification requests may be addressed in the requirements document and may take the form of a change package or a formal Change Implementation Notice and may require justification and cost benefits analysis for approval by a review board. The requirements document for the project may call for a modification cut-off and rollout of the system as a first version and all subsequent changes addressed as a new or enhanced version of the system. A request for modifications to a system may also generate a new project and require a new project initiation plan.

Daily operations of the system/software may necessitate that maintenance personnel identify potential modifications needed to ensure that the system continues to operate as intended and maintains quality data. Daily maintenance activities for the system must take place to ensure that any previously undetected errors are fixed. Maintenance personnel may determine that modifications to the system and databases are needed to resolve errors or performance problems. Also, modifications may be needed to provide new capabilities or to take advantage of hardware upgrades or new releases of system software and application software used to operate the system. New capabilities may take the form of routine maintenance or may constitute enhancements to the system or database as a response to user requests for new/improved capabilities. New capability needs may begin a new problem modification process described above.

At the beginning of this phase any outstanding security-related Plans of Action and Milestones (POA&Ms) must be completed. Throughout the

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

phase, continuous security monitoring of selected controls must be conducted. In addition, conduct periodic reviews of controls, periodic re-evaluation of information categorization and re-certifications and revision of risk assessments and security plans, and re-certification and re-authorizations to process (re-accreditation) as required. Because systems undergo periodic maintenance, enhancements and improvement, mini life cycles may be required throughout this stage. Continuous vigilance should be given to virus and intruder detection. The System Manager must be sure that security operating procedures are kept updated accordingly.

Review and update system documentation including the operations from the previous phases. In particular, as needed, update and finalize the Operations Manual, Business Case, and Contingency Plan/COOP (including results of tests during this phase) as required, during the *Operations and Maintenance Phase*. The System Manager must report on any security incidents related to the system during this phase.

Responsibilities: **System Manager:** The System Manager develops documents and executes plans and procedures for conducting activities and tasks of the maintenance period and conducts quality assurance activities on those documents. To provide for an avenue of problem reporting and customer satisfaction, the Systems Manager should create and discuss communications instructions with the systems customers. Systems Managers should keep the Help Desk personnel informed of all changes to the system especially those requiring new instructions to users, and must report on all security incidents.

Technical Support: This support may involve granting access rights to the program, setup of workstations or terminals to access the system, and maintenance of the operating system for both server and workstation. Technical support personnel may be involved with issuing user IDs or login names and passwords. In a client-server environment, technical support may perform systems scheduled backups and operating system maintenance during downtime.

Vendor Support: The technical support and maintenance on some programs are provided through vendor support. Establish a contract outlining the contracted systems administration, operators, and maintenance personnel duties and responsibilities. One responsibility which should be included in the contract is that all changes to the system will be thoroughly documented.

Help Desk: Help Desk personnel provide the day-to-day users help for the system. Help desk personnel should be kept informed of all changes

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

or modifications to the system. The users contact Help Desk personnel when questions or problems occur with the daily operations of the system. Help Desk personnel need to maintain a level of proficiency with the system.

Operations or Operators (turn on/off systems, start tasks, backup etc): For many mainframe systems, an operator provides technical support for a program. The operator performs scheduled backup, performs maintenance during downtime and ensures the system is online and available for users. Operators may be involved with issuing user IDs or login names and passwords for the system.

Customers: The customer needs to be able to share with the systems manager the need for improvements or the existence of problems. Some users live with a situation or problem because they feel they must. Customers may feel that change will be slow or disruptive. Some feel the need to create workarounds. A customer has the responsibility to report problems or make recommendations for changes to a system.

Program Analysts or Programmer: Interprets user requirements, designs and writes the code for specialized programs. User changes, improvements, enhancements may be discussed in Joint Application Design sessions. Analyzes programs for errors, debugs the program and tests program design.

Process Improvement Review Board: A board of individuals may be convened to approve recommendations for changes and improvements to the system. This group may be chartered. The charter should outline what should be brought before the group for consideration and approval. The board may issue a Change Directive.

Users Group or Team: A group of computer users who share knowledge they have gained concerning a program or system. They usually meet to exchange information, share programs and can provide expert knowledge for a system under consideration for change.

Contract Manager: The Contract Manager has many responsibilities when a contract has been awarded for maintenance of a program. The Contract Manager should have a certificate of training for completion of a Contracting Officer's Technical Representative (COTR) course. The Contract Manager's main role is to protect the interests of the Procurement Office and ensure that no modifications are made to the contract without permission from the Procurement Office.

Data Administrator: Performs tasks to ensure that data entered into the system is accurate and valid. Sometimes this person creates the information systems database, maintains the databases security, and develops plans for disaster recovery. The data administrator may be called upon to create queries and reports for a variety of user requests.

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

The data administrator responsibilities include maintaining the databases data dictionary. The data dictionary provides a description of each field in the database, the field characteristics and the data maintained with the field.

Telecommunications Analyst and Network System Analyst: Plans, installs, configures, upgrades, and maintains networks as needed. If the system requires it, they ensure the availability of external communications and connectivity.

Information Security Officer (ISO): The ISO has a requirement to review system change requests, review and in some cases coordinate the Change Impact Assessments, participate in the Configuration Control Board process, and conduct and report changes that may be made that affect the security posture of the system. The ISO is also responsible for ensuring the appropriate tracking of all POA&Ms.

Records Liaison Officer (RLO): The RLO assists with any records retirement scheduled to occur at the end of this phase.

**Control Gate 4 –
Modify or
Terminate
Review:**

The purpose of the Modify or Terminate Review is to determine if the IT Investment should continue, be modified or terminated.

OEI coordinates the Modify or Terminate Review. OEI ensures the IT Investment Business Case is accurate and complete. The package is then forwarded to the QIC, who relies on the IIS to provide a through Business Case review in accordance with the EPA’s CPIC Evaluation Phase criteria, determining if it can optimally continue to support mission/user requirements and the EPA’s strategic direction. The IIS develops recommendations for the QIC to make a decision on whether to keep this investment as part of the EPA’s IT Investment Portfolio as is, modify or terminate the investment.

Review activities occur several times throughout this phase. Each time the system is reviewed, the system manager/owner must make one of three of the following decisions:

- The system is operating as intended and meeting performance expectations
- The system is not operating as intended and needs corrections or modifications
- The users are/are not satisfied with the operation and performance of the system

During the Control Gate #4 Review, all *Implementation* and *Operations*

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

& *Maintenance Phase* required work products must be completed, approved, and verified to satisfy the Control Gate requirement.

Conduct the In-Process Reviews (at least annually) in this phase. Perform an In-Process Review to evaluate system performance, user satisfaction with the system, adaptability to changing business needs, and new technologies that might improve the system. This review is diagnostic in nature and can lead to development or maintenance activities. Any major system modifications needed after the system has been implemented follow the life cycle process from planning through implementation. Develop a project management plan, including a feasibility study, to identify modifications to existing system documentation (change pages) rather than new system documentation (for example, a functional requirements document, a system design document, etc.). Conduct the appropriate reviews and testing based on the scope of the modification.

Work Products:

- D** = Draft: Preliminary version of work product/working copy
- B** = Baseline: Completed version of work product (with signoff if applicable)
- U** = Update: Completed version showing changes made to the baseline version
- ✓ = Always Required

Work Product	Status
	U
Acquisition Strategy	U
Change Control Depending on the type and magnitude of changes made during O&M, modifications to the system may have to cycle through some or all of the development phases with attention paid to the security requirements and impacts of the required changes.	
Change Directive	✓
Change Tracking Log	✓
Cost-Benefit Analysis	U
Functional Requirements Document	U
Hardware Requirements Specification	U
In-Process Review Documents the In-Process Review which occurs at predetermined milestones; usually quarterly, but at least once a year. The performance measure should be reviewed along with the health of the system. Performance measures should be measured against the baseline measures. Ad hoc reviews should be performed when deemed to be necessary.	B

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Work Product	Status
Project Plan	U
Re-Certification and Re-Accreditation	B
Records Management Disposition Schedule	U
Requirements Traceability Matrix	U
Solution Architecture	U
System Design Document	U
System Modules (Code, Test, Implementation, and Operational)	U
User Satisfaction Review Documents User Satisfaction Reviews which can be used as a tool to determine the need to proceed with a Process Improvement Review Board meeting or initiate a proposal for a new system. This review can be used as input to the In-Process Review	B

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Appendix 5: Termination Phase

Process Description: Implement the *Termination Phase* to either eliminate a large part of a system or, in most cases, close down a system and end the life cycle process. At this point, the system has been declared surplus and/or obsolete and will be scheduled for retirement and shutdown. The emphasis of this phase is to ensure the packaging and archiving of data, procedures, and documentation in an orderly fashion, making it possible to reinstall and bring the system back to an operational status, if necessary, and to retain all data records in accordance with policies regarding retention of electronic records. The *Termination Phase* represents the end of a system's life cycle. Prepare a Retirement Plan to address all facets of archiving, transferring, and disposing of the system and data. Give particular emphasis to proper preservation of the data processed by the system so that it is effectively migrated to another system or archived in accordance with applicable records management regulations and policies for potential future access. The system retirement activities preserve information not only about the current production system but also about the evolution of the system through its life cycle.

Procedure Description:

The objectives for all tasks identified in this phase are to retire the system, software, hardware and data. The tasks and activities actually performed are dependent on the nature of the project. Perform the retirement activities at the end of the systems life cycle. The retirement activities ensure the orderly retirement of the system and preserve vital information about the system so that some or all of it may be reactivated in the future if necessary. These activities may be expanded, combined or deleted, depending on the size of the system.

The Retirement Plan must be developed and implemented. The Retirement Plan identifies how the retirement of the system/data will be conducted, and when, as well as the system retirement date, software components to be preserved, data to be preserved, retirement of remaining equipment, and archiving of life cycle products.

Implement the data from the old system into the new system or if it is obsolete, archive it.

Similar to the data that is archived or transferred, the software components will need to be transferred to the new system, or if that is not feasible, dispositioned appropriately.

The documentation that resulted from the development of the application or system needs to be archived, where it can be referenced,

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

if needed, at a later date.

Follow the Retirement Plan for the orderly breakdown of the system, its components and the data within.

If the equipment can be used elsewhere in the organization, it should be recycled. If it is obsolete, notify the property management/Facilities Office to dispose of all hardware components.

Perform this review at the end of the *Termination Phase* and again within six months after retirement of the system.

Responsibilities:

System Manager: Authors the Retirement Plan and ensures completion of all aspects of the Retirement Plan. The Retirement Plan should outline all roles and responsibilities for all actions related to the close down and archive of the system. Prepares Post-Retirement Review Report.

Technical Support or Vendor Support: The Retirement Plan may call for the Technical Support Personnel to send system related hardware to a warehouse or may reassign equipment to a new or replacement system. Technical Support Personnel or Operators may perform the cutoff of users’ access per instructions from the Security Manager. Technical Support personnel may assist with the archive of the Information Systems data. They would perform the actual archive process.

Data Administrator: The Retirement Plan may direct that only certain systems data be archived. The Data Administrator would identify the data and assist technical personnel with the actual archive process. The Data Administrator may be involved with identifying data which due to its sensitive nature must be destroyed. They would also be involved with identifying and migrating data to a new or replacement system.

User Services (Training & Help Desk): User Services includes training, telecommunications, and Help Desk personnel. The training component coordinates and schedules the development and delivery of all training and facilitates the development of systems training methods and materials. In this phase, User Services may assist with the retraining of users to facilitate the transfer to a new or replacement system.

Operations: (turn off systems, start tasks, backup etc) Operations interfaces with the computer facility that hosts the system being terminated. This group also schedules, executes, and verifies production job streams; distributes specified outputs; handles other production control activities; and maintains and monitors centralized mainframe database management system software and runtime environments. It also acquires, maintains, customizes and tunes

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

operating system software, assesses the affect of new or changed systems upon the operational environments, manages system software capacities, and advises on or arranges accommodation of new application systems. In this phase, the Operators would assist Technical Support, the Security Manager, Data Administrators, and the Quality Manager with the actual archive process.

Program Manager/Analysts: Program Managers need to plan and schedule a smooth shutdown. They also should ensure the collection of all documentation for archiving.

Customers (User Groups): The user group ensures the active participation of users at all levels in the definition, design, and development of a re-engineered automation system for the capture, processing, tracking, and reporting. The purpose of the user group is to provide a forum for end users' input, coordination, and validation of their automation requirements. The group provides a consistent work force responsible for initiating and resolving issues relating to system development efforts and expeditiously resolves issues relating to the identification and documentation of requirements.

Security Managers: The security managers need to make sure that all access authority has been eliminated for the users. Any users that only use the application should be removed from the system while others that use other applications as well as this one may still need access to the overall system, but not the application being shutdown.

Records Liaison Officer (RLO): The RLO assists with the retirement of the system's records as necessary.

Project Level Reviews:

Perform the Post-Retirement Review after the end of this final phase. Conduct this phase-end review within six months after retirement of the system in order to notify all parties that the final shut-down of the system has occurred. The Post-Retirement Review Report also documents the lessons learned from the shutdown and archiving of the terminated system.

Work Products:

- D** = Draft: Preliminary version of work product/working copy
- B** = Baseline: Completed version of work product (with signoff if applicable)
- U** = Update: Completed version showing changes made to the baseline version
- ✓ = Required

Concept Exploration	System Planning	Requirements	Acquisition Design	Development	Test	Implementation	Operations and Maintenance	Termination (Retirement)
Definition Phase			Acquisition / Development					

Work Product	Status
Approvals (Decision Papers)	B
Archive/Incorporate Data and Software The packaged set of data and documentation containing the archived application.	B
Change Directive	✓
Change Tracking Log	✓
Close-Out Certification Documents the verification that all procedures and steps were successfully carried out in the termination of a system.	B
Post Retirement Review Report Documents the detailed findings of the Termination Phase review. It includes details of where to find all products and documentation that has been archived.	B
Retirement Decision Paper Documents the decision to retire, or terminate the life cycle of, the system.	B
Retirement Plan Documents the plan to end the operation of the system in a planned, orderly manner and to ensure that system components and data are properly archived or incorporated into other systems. This will include removing the active support by the operations and maintenance organizations.	B
Solution Architecture	U
System Disposition Report Describes the rationale for ceasing system operations, documents the plan for ceasing operations and effectively archiving the various components of the system, including hardware, and provides information about the location of archived materials. This report is vital to ensure that information about the system can be accessed to support reactivation of the system, or future reuse of portions of the current system by other systems.	B
Transition Plan (as appropriate)	B

Appendix 6: Control Gate Reviews

This section contains information on each of the required Control Gate Reviews. The descriptions of these reviews as presented here represent the most complete set of requirements that could be imposed on a system during the SLCM process. Depending on the system's tailoring methodology, some of these Control Gate requirements may not be applicable. Further guidance on tailoring your system's SLCM process will be made available in a separate guidance package which is currently under development.

Control Gate 1 - EA Compliance Certification and System Selection Review

Purpose

The purpose of the System Selection Review is to approve the IT Investment Business Case for inclusion in the Agency's IT Investment portfolio. Perform an initial EA Compliance Certification review at the Control Gate (see Control Gate 2 for official definition of EA Compliance Certification).

Scope

The Office of Environmental Information (OEI) coordinates the System Selection Review, ensuring the IT Investment Business Case is accurate and complete. Forward the reviewed package to the Quality and Information Council (QIC), who relies on the Information Investment Subcommittee (IIS) to provide a thorough Business Case review in accordance with the Agency's CPIC Select Phase criteria. The IIS then forwards its investment recommendation to the QIC for its final decision.

Work Products

All work products required during the SLCM Definition Phase must be completed, approved, and verified during the Control Gate 1 review. These products include but are not limited to:

- Business justification for the investment
- Established performance goals and quantifiable performance measures
- Project plan
- Identified costs, schedule, benefits, and risks
- Established security, and architecture goals and measures
- Privacy Impact Assessment
- Solution Architecture

Control Gate 2 - EA Compliance Certification Review

Purpose

The purpose of the EA Compliance Certification Review is to ensure the system's design conforms to the planned Solution Architecture and continues to address the business need while remaining in alignment with the Agency EA.

Scope

The Chief Architect will conduct The EA Compliance Certification Review for all Major applications, certifying that Solution Architectures developed for information management and technology development, modernization, and enhancement, are compliant with the Enterprise Architecture. The SIO or designee conducts the EA Compliance Certification Review and certifies architecture compliance for non-major and small or other systems. Certify the Solution Architectures as architecturally compliant prior to project development unless the system manager obtains the appropriate waivers.

Work Products

System managers must ensure the completion, approval, and verification of all work products required during the SLCM Acquisition and Design Subphases during the Control Gate 2 review. In addition, the system manager must present the Solution Architecture, which describes how an individual information management system or information acquisition complies with the requirements of the Target Architecture.

Control Gate 3 – Authorization to Operate Review

Purpose

For general support systems and major applications, the Authorization to Operate Review ensures that the system is ready to move into an operational state.

Scope

The details of the requirements for this Gate depend on whether the information system is subject to FISMA as a general support system, major application, or whether it is considered a minor application residing on a general support system. The Information Management Officer (IMO) conducts the Authorization to Operate Review using the certification package to make a determination as to the appropriateness of allowing the system to function. The system must be accredited for operations prior to the system being moved into an operational state. The IMO can provide full authorization to operate or denial of authorization to operate. Minor applications generally have their security proved as part of the general support system; therefore each general support system will have application deployment requirements to ensure integrity of their security and consideration in their maintenance scheme.

Work Products

All work products required during the SLCM Development and Test Subphases must be completed, approved, and verified during the Control Gate 3 review. In addition, a certification package including system security plan, security assessment report (risk assessment and system test and evaluation), and Plan of Action and Milestones (POA&M) must be presented.

Control Gate 4 – Modify or Terminate Review

Purpose

The purpose of the Modify or Terminate Review is to determine if the IT Investment should continue, be modified or terminated.

Scope

The Modify or Terminate Review will be coordinated by OEI, who ensures the IT Investment Business Case is accurate and complete. The package is then forwarded to the QIC, who relies on the IIS to provide a thorough Business Case review in accordance with the Agency's CPIC Evaluation Phase criteria, determining if it can optimally continue to support mission/user requirements and the Agency's strategic direction. The IIS develops recommendations for the QIC to make a decision on whether to keep this investment as part of the Agency's IT Investment Portfolio as is, modify or terminate the investment.

Work Products

All work products required during the SLCM Implementation and Operations & Maintenance Phases must be completed, approved, and verified during the Control Gate 4 review. These products include but are not limited to:

- Updated Business Case
- Post-Implementation Review (PIR) Results
- Operational Analysis Report

Appendix 7: Supporting Document Checklist for System Life Cycle Management

The following matrix lists potential work products generated during the system life cycle. Work products in bold must be included for every system and serve as the basis for control gate reviews. Senior managers must ensure that these work products are properly in place and approved to manage a system through the life cycle phases. At the end of each phase the sponsoring office's Information Management Officer (IMO) should review and sign the checklist and recommend that the Senior Information Official (SIO) approve the system to move to the next phase of the life cycle. The SIO's signature is necessary for the system to proceed. Although products are listed in sequential order, it is not the intent of this checklist to mandate that all systems follow a sequential (waterfall) methodology for system development.

Definition Phase

System Name:

Sponsoring Office:

System Manager Name:

System Manager Phone:

SLC Phase	Work Products
Definition	
	System Categorization
	Initiation Decision Paper
	Concept Proposal
	Change Impact Assessment/Change Directive
	IT Project Request
	Project Plan
	Security Risk Assessment
	Change Tracking Log
	System Management Plan
	<i>Mission Need Statement</i>
	<i>Solution Architecture</i>
	<i>Security Plan</i>
	<i>IT Investment Business Case</i>
	<i>Business Justification</i>
	<i>System Concept Document</i>
	<i>Cost-Benefit Analysis</i>
	<i>Schedule/Responsibilities</i>
	<i>Project Risk Management Plan</i>
	<i>Functional Requirements Document</i>
	<i>Project Quality Assurance Plan</i>
	<i>Configuration Management Plan</i>
	<i>Approvals (Decision Papers)</i>
	<i>Waivers</i>
	<i>Work Breakdown Structure</i>
	<i>Application Deployment Checklist</i>
	<i>Privacy Impact Assessment</i>
	Feasibility Study
	Acquisition Strategy
	Records Management Disposition Schedule
	Concept of Operations
	Requirements Specifications (Hardware and Software)
	System Engineering Management Plan

SLC Phase	Work Products
	Test and Evaluation Master Plan (Baseline)

I certify that this system has met the appropriate requirements to move to the Acquisition/Development phase:

Approving Official/Title: _____ **Date:** _____

Retain a copy of this signed checklist in the System Management Plan.

Acquisition/Development Phase

System Name:

Sponsoring Office:

System Manager Name:

System Manager Phone:

Acquisition/Development	
	Development Decision Paper
	Acquisition Package
	System and Software Design Documents
	Requirements Traceability Matrix
	Data Conversion Plan
	User/System Documentation
	System Implementation Plan
	User Training Plan
	Contingency Plan/COOP
	System and Security Test Plan
	Software Development Document
	Test Files/Data
	Integration Document
	Test Analysis and Test Problem Report
	System (Application) Software
	Test Analysis Approval Determination
	Certifier's Statement

I certify that this system has met the appropriate requirements to move to the Implementation phase:

Approving Official/Title: _____ **Date:** _____

Retain a copy of this signed checklist in the System Management Plan.

Implementation Phase

System Name:

Sponsoring Office:

System Manager Name:

System Manager Phone:

Implementation	
	Implementation Decision Paper
	Authorization to Operate
	Security Accreditation Package
	Delivered System & Modified Software
	Change Implementation Notice
	Version Description Document
	Post Implementation Review Report

I certify that this system has met the appropriate requirements to move to the Operations and Maintenance phase:

Approving Official/Title: _____ **Date:** _____

Retain a copy of this signed checklist in the System Management Plan.

Operations and Maintenance Phase

System Name:

Sponsoring Office:

System Manager Name:

System Manager Phone:

Operations & Maintenance	
	Re-Authorization to Operate
	Security Configuration Management and Control
	In Process Review
	User Satisfaction Review

I certify that this system has met the appropriate requirements to move to the Retirement phase:

Approving Official/Title: _____ **Date:** _____

Retain a copy of this signed checklist in the System Management Plan.

Retirement Phase

System Name:

Sponsoring Office:

System Manager Name:

System Manager Phone:

Retirement	
	Retirement Decision Paper
	Archive/Incorporate Data and Software
	System Disposition Report
	Retirement Plan
	Post Retirement Review Report
	[Security] Information Preservation/Media Sanitation
	Close-Out Certification
	Deactivation Plan
	[Security] Hardware and Software Disposal

I certify that this system has met the appropriate requirements and can now be retired.

Approving Official/Title: _____ **Date:** _____

Retain a copy of this signed checklist in the System Management Plan.

- End of Appendices -



*Molly A. O'Neill, Assistant Administrator
and Chief Information Officer
Office of Environmental Information*