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IMPLEMENTATION GUIDE FOR SURVEILLANCE AND MAINTENANCE DURING FACILITY TRANSITION AND DISPOSITION

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FOREWORD

The Department of Energy (DOE) faces an enormous task in the disposition of the nation's excess facilities. Many of these facilities are large and complex and contain potentially hazardous substances. As DOE facilities complete mission operations and are declared excess, they pass into a transition phase that ultimately prepares them for disposition. The disposition phase of a facility's life cycle usually includes deactivation, decommissioning, and surveillance and maintenance (S&M) activities.

Each of these aspects of facility disposition is addressed DOE by a DOE Guide, which DOE has developed to provide implementation guidance for requirements found in DOE O 430.1A, LIFE CYCLE ASSET MANAGEMENT. These Guides specifically address the transition and disposition of contaminated, excess facilities. The Guides are—

- DOE G 430.1-2, IMPLEMENTATION GUIDE FOR SURVEILLANCE AND MAINTENANCE DURING FACILITY TRANSITION AND DISPOSITION;

- DOE G 430.1-3, DEACTIVATION IMPLEMENTATION GUIDE;

- DOE G 430.1-4, DECOMMISSIONING IMPLEMENTATION GUIDE; and

- DOE G 430.1-5, TRANSITION IMPLEMENTATION GUIDE.

The goal of the processes described in the Guides is a continuum of hazard mitigation and risk reduction throughout the transition and disposition phases, leading to a timely, cost-effective disposition of the facility.

Transition activities occur between operations and disposition in a facility's life cycle. Transition begins once a facility has been declared or forecasted to be excess to current and future DOE needs. Transition includes placing the facility in stable and known conditions, identifying hazards, eliminating or mitigating hazards, and transferring programmatic and financial responsibilities from the operating program to the disposition program. Timely completion of transition activities can take advantage of facility operational capabilities before they are lost, thereby eliminating or mitigating hazards in a more efficient, cost-effective manner. Therefore, it is important to prepare for the disposition phase by initiating material, systems, and infrastructure stabilization activities before facility operations end.

Following operational shutdown and transition, the first disposition activity is usually to deactivate the facility. The purpose of deactivation is to place a facility in a safe shutdown condition that is economical to monitor and maintain for an extended period, until the eventual decommissioning of the facility. Deactivation of contaminated, excess facilities should occur as soon as reasonable and for as many facilities as possible. In this way, DOE can apply its resources in a manner that will accomplish the

greatest net gains to safety and stability in the shortest time. Deactivation places the facility in a low-risk state with minimum S&M requirements.

The final facility disposition activity is typically decommissioning, during which the facility is taken to its ultimate end-state through decontamination and/or dismantlement. After decommissioning is complete, the facility or surrounding area may require DOE control for protection of the public and the environment or for environmental remediation.

S&M activities are conducted throughout the facility life cycle, including those times when a facility is not operating and is not expected to operate again. During these last periods of a facility life cycle, it is important that S&M be adequate to maintain the facility safety envelope during the final stages of operations through a seamless transition to the final disposition of the facility. S&M is adjusted during the facility life cycle as transition, deactivation, and decommissioning activities are completed.

S&M activities consist of two elements: surveillance and maintenance. Surveillance includes any activity that involves the scheduled periodic inspection of a facility, equipment, or structure as required by federal and state environmental, safety, and health laws and regulations, and DOE Orders. The purpose of surveillance is to demonstrate compliance, identify problems requiring corrective action, and determine the facility's present environmental, radiological, and physical condition. More specifically, surveillance includes activities performed to determine the operability of critical equipment, monitor radiological conditions, check safety-related items, provide for facility-security controls, and assess facility structural integrity. Maintenance includes any daily activity that is required to sustain property in a condition suitable for the property to be used for its designated purpose; maintenance includes preventative, predictive, and corrective maintenance.

The technical, managerial, and planning perspectives offered in these Guides can be equally effective in conducting activities other than transition and disposition, such as refurbishment and "cleanup" for reuse. As such, this guidance can be adapted for use at facilities that are not being declared excess.

An important objective throughout transition and disposition is to maintain an integrated and seamless process linking deactivation, decommissioning, and S&M with the previous life-cycle phases. Facility transition and disposition activities must incorporate integrated safety management at all levels to provide cost-effective protection of workers, the public, and the environment.

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1. INTRODUCTION

1.1 PURPOSE

This Guide was prepared to provide guidance on surveillance and maintenance (S&M) activities conducted as part of facility transition and disposition activities, for Department of Energy (DOE) facilities that have been declared or are forecast to be excess to any current or future mission requirements. It is one of four Guides developed to provide guidance for facility transition and disposition activities. The other three Guides are–

- DOE G 430.1-3, DEACTIVATION IMPLEMENTATION GUIDE;
- DOE G 430.1-4, DECOMMISSIONING IMPLEMENTATION GUIDE; and
- DOE G 430.1-5, TRANSITION IMPLEMENTATION GUIDE.

Requirements for S&M are stated in DOE O 430.1A, LIFE CYCLE ASSET MANAGEMENT (LCAM), which identifies the minimum requirements for transition and disposition of an excess DOE facility. This Guide is part of the DOE Directives System, and is consistent with the principles and core functions of DOE P 450.4, SAFETY MANAGEMENT SYSTEM POLICY. Other documents to be consulted to support the planning and conduct of transition and disposition activities include—

- DOE-STD-1120-98, *Integration of Environment, Safety and Health Into Facility Disposition Activities*, and

- the Good Practice Guides associated with LCAM.

1.2 ALTERNATIVE METHODS

This Guide presents acceptable methods for implementing the S&M requirements specified in LCAM to ensure effective and efficient management of DOE excess facilities. It does not impose additional requirements. The Department has invested substantial time and effort in developing an S&M framework that–

- meets DOE's requirements and expectations,
- draws on DOE's previous experience, and
- is responsive to oversight entities.

Although alternative methods and approaches to the ones discussed in this Guide may be used, a comparable amount of time and effort may be needed to evaluate the acceptability of those alternatives.

1.3 APPLICABILITY

This Guide may be applied to S&M activities and processes at contaminated DOE facilities. "Contaminated" refers both to radioactive contamination and to hazardous-substance contamination. Nuclear facilities and nonnuclear contaminated facilities are included in the scope of this Guide. Project personnel are expected to apply a graded approach in planning and conducting S&M activities at different types of facilities and with different hazard conditions.

1.4 CROSSWALK OF DOE O 430.1A REQUIREMENTS TO DOE G 430.1-2

The LCAM requirements that apply to the S&M activities for a contaminated, excess facility are included in Table 1, cross-referenced to the section of this Guide where they are addressed. Though the table quotes the requirements as they appear in LCAM, this Guide addresses only those requirements that apply to S&M activities. Parallel tables in the other three LCAM Guides provide crosswalks between requirements and guidance for deactivation, decommissioning, and transition.

Table 1. Mapping of Requirements—S&M.

Requirement	Where Addressed in Guide
DOE O 430.1A, paragraph 6a: DOE elements shall use a value-added, quality driven, graded approach to life-cycle asset management.	Section 2.4, Graded Approach
DOE O 430.1A, paragraph 6f(8)(c): Conduct surveillance and maintenance activities required to maintain the facility and remaining hazardous and radioactive materials, wastes, and contamination in a stable and known condition pending facility disposition.	Section 4.1, Continue Ongoing S&M; and Section 6, Implementing the S&M Program
DOE O 430.1A, paragraph 6g(1): Application, as appropriate, of guidelines contained or referenced in DOE-STD-1120-98, *Integration of Environment, Safety and Health into Facility Disposition Activities.*	Section 1.1, Purpose; Section 2.2, Integrated Safety Management; Section 2.3, Authorization Basis and Hazard Baseline Documentation; Section 5, Developing the S&M Program; and Section 6, Implementing the S&M Program

Table 1. Mapping of Requirements—S&M (continued).

Requirement	Where Addressed in Guide
DOE O 430.1A, paragraph 6g(6)(a): A method to ensure that the deactivation, surveillance and maintenance and decommissioning activities are appropriately planned, conducted and documented in a manner consistent with the guiding principles and core functions of the Department's integrated safety management and facility disposition policies.	Section 1.1, Purpose; Section 2.2, Integrated Safety Management; Section 2.3, Authorization Basis and Hazard Baseline Documentation; Section 5, Developing the S&M Program; and Section 6, Implementing the S&M Program
DOE O 430.1A, paragraph 6g(6)(a)(i): The collection of baseline data to support a physical, chemical, and radiological characterization, updated as necessary to reflect changes in facility conditions during the disposition process.	Section 4.2, Identify Need to Evaluate/ Reevaluate S&M Baseline; and Section 5.1, Collection of Baseline Data
DOE O 430.1A, paragraph 6g(6)(a)(ii): Surveillance and maintenance activities that correspond with facility conditions, including changes resulting from disposition activities.	Section 4.2, Identify Need to Evaluate/ Reevaluate S&M Baseline; Section 5.1, Collection of Baseline Data; and Section 6, Implementing the S&M Program

2. S&M ACTIVITIES—GENERAL GUIDANCE

2.1 S&M OBJECTIVES

An S&M program consists of two elements: surveillance and maintenance. Surveillance includes any activity at a facility that involves the scheduled, periodic inspection of a facility, equipment, or structure as required by Federal and State environmental, safety, and health laws and regulations, and by DOE Orders. The purpose of surveillance is to demonstrate compliance, identify problems requiring corrective action, and determine the facility's present environmental, radiological, and physical condition. More specifically, surveillance includes activities to be performed to determine the operability of critical equipment, monitor radiological conditions, check safety-related items, provide for facility security controls, and assess facility structural integrity. Maintenance includes any daily activity required to sustain property in a condition suitable for the property to be used for its designated purpose; maintenance includes preventative, predictive, and corrective maintenance (maintenance types are defined in Section 5.3).

S&M activities are performed throughout the facility transition and disposition phases and are adjusted during the facility life cycle as transition, deactivation, and decommissioning activities are completed.

The objectives for S&M programs for contaminated, excess facilities are to—

- ensure adequate containment of contamination;
- provide physical safety and security;
- inspect and maintain facilities in a manner that will eliminate or mitigate hazards to workers, the public, and the environment;
- inspect and maintain selected systems and equipment essential for transition and disposition activities, the safety and health of individuals performing these activities, and/or potential future alternative use;
- provide a mechanism for identifying and complying with applicable environmental, safety and health, and safeguard and security requirements; and
- incorporate safety management into all levels of S&M activities to ensure the protection of workers, the public, and the environment.

2.2 INTEGRATED SAFETY MANAGEMENT

In accordance with LCAM, planning must be sufficient to ensure that the safety management system can be systematically integrated into management and work practices at all levels. DOE's safety management system policy and guidance are identified in DOE P 450.4 and DOE G 450.4-1, INTEGRATED SAFETY MANAGEMENT SYSTEM GUIDE. The major mechanism for integrating safety and health into S&M efforts is the work planning process, during which the safety documentation from the facility's earlier phases is reviewed and evaluated. Worker involvement in all levels of safety/hazards analysis in the planning of S&M activities is key to implementing all elements of transition and disposition.

DOE-STD-1120-98, Section 3.0, "Integrated Safety Management System," provides detailed guidance for developing and implementing an ISMS for disposition activities. Furthermore, Appendix C of the referenced Standard, "ISMS Performance Expectations," provides information that may be meaningful to verify that ISM considerations have been adequately addressed.

2.3 AUTHORIZATION BASIS AND HAZARD BASELINE DOCUMENTATION

The term authorization basis is defined in DOE G 450.4-1 as follows: "Safety documentation supporting the decision to allow a process or facility to operate. Included are corporate operational and environmental requirements as found in regulations and specific permits, and, for specific activities, work packages or job safety analyses." The documentation comprising the facility's authorization basis is established in accordance with the guidelines provided in DOE-STD-1120-98, Section 3.3.4, "Hazard Baseline Documentation,"and Appendixes G, "DOE Office of Nuclear Safety Policy and Standards Guidance Memoranda," and I, "Facility Disposition ES&H Documentation." This documentation (hereafter, referred to as "hazard baseline documentation") provides a formal record of all identified hazards, including those that workers may encounter during disposition work activities, and the controls that are established to support safe work execution.

The type and extent of hazard baseline documentation will vary depending on the S&M and/or other disposition activity work scope and hazards, and the facility hazard category. The hazard category is a classification of a nuclear facility's processes, operations, or activities in accordance with classification categories, inventory of hazardous materials, and the evaluation of potential releases.

For transition and disposition activities, hazard baseline documentation typically includes some combination of a Safety Analysis Report, Basis for Interim Operation, Technical Safety Requirements, or other types of documented analysis and work packages used to plan and control work tasks. A Safety Analysis Report or Basis for Interim Operation generally serves as the hazard baseline document for Hazard Category 2 or 3 nuclear facilities, as required by DOE 5480.23, NUCLEAR SAFETY ANALYSIS REPORTS; other, equivalent documents serve as the baseline for hazardous, chemically contaminated (nonradiological) facilities. These documents are the principal safety and health documents that ensure worker hazards are identified, evaluated, controlled, and communicated. This

documentation is used to prepare procedures or work packages for use by the worker before a given activity begins.

Development of hazard baseline documentation is an evolving process. As new information is received or new hazards arise due to removal or shutdown of components, the hazard analysis must be updated to reflect changing conditions. Depending on the quantities and physical forms of radiological hazards, facilities containing such hazards may be subject to nuclear safety requirements, such as those found in DOE 5480.21, UNREVIEWED SAFETY QUESTIONS. [An exception is the specific case of decommissioning activities involving only low-level, residual fixed radioactivity that remains following removal of radioactive systems, components, and stored materials. In this instance, alternative requirements may be applied in lieu of the safety management requirements contained in the Orders applicable to nuclear safety.]

The S&M program supports maintenance of the facility's safety envelope. Therefore, like the hazard baseline documentation, the S&M program will be adjusted as hazards change. As a facility progresses from operations through transition and into the disposition phase, the facility's condition, the transition and disposition activities, and their associated hazards change. The systematic planning, execution, and evaluation of transition and disposition activities (i.e., stabilization, deactivation, S&M, and decommissioning) must be used to provide feedback for evaluating the adequacy of, and if necessary, revision of the authorization basis documentation. The facility's S&M program will be revised accordingly to ensure that transition, disposition, and S&M activities are performed within the safety envelope of the facility's authorization basis.

2.4 GRADED APPROACH

The "graded approach" application of requirements to a particular project, activity, or facility is required by LCAM. Implementation of the tailoring approach, as defined in DOE G 450.3-3, TAILORING FOR INTEGRATED SAFETY MANAGEMENT APPLICATIONS, is an acceptable method of complying with this requirement. DOE G 450.3-3 demonstrates that tailoring is integral to the integrated safety management system. Application of tailoring is appropriate for all steps in facility S&M.

Tailoring allows choices to be made from among a variety of engineering and administrative controls that provide adequate protection for workers, the public, and the environment during the performance of work. Tailoring of higher-level contractual and project agreements enables contractors to establish general standards for work. Individual tasks are tailored so that each task has controls that fit the specific work and the hazards associated with it and that are consistent with higher-level performance expectations.

Tailoring permits the consideration of differences between facilities and provides a means to determine the extent to which actions are appropriate for a particular facility (or portions thereof). The depth of detail required and the magnitude of resources expended for a particular management element is

commensurate with the relative importance of that element to safety, environmental compliance, safeguards and security; the magnitude of any hazard identified, programmatic importance, financial impact, and/or other facility-specific requirements. For projects without any logical delineation between deactivation and decommissioning, the requirements are integrated to serve the overall project and completion objectives. In doing so, planning considers the possibility that priorities may change and should identify the conditions (end-points) where a project may be safely and efficiently slowed or accelerated if it becomes necessary to do so.

Tailoring is cost effective because it does not demand a high level of analysis and/or planning for simple jobs already covered in established procedures. Worker involvement, as stated earlier, has also proven to be cost effective because these employees have often spent many years performing tasks during operations, and they may have a good understanding of the safety and performance requirements of the S&M activities.

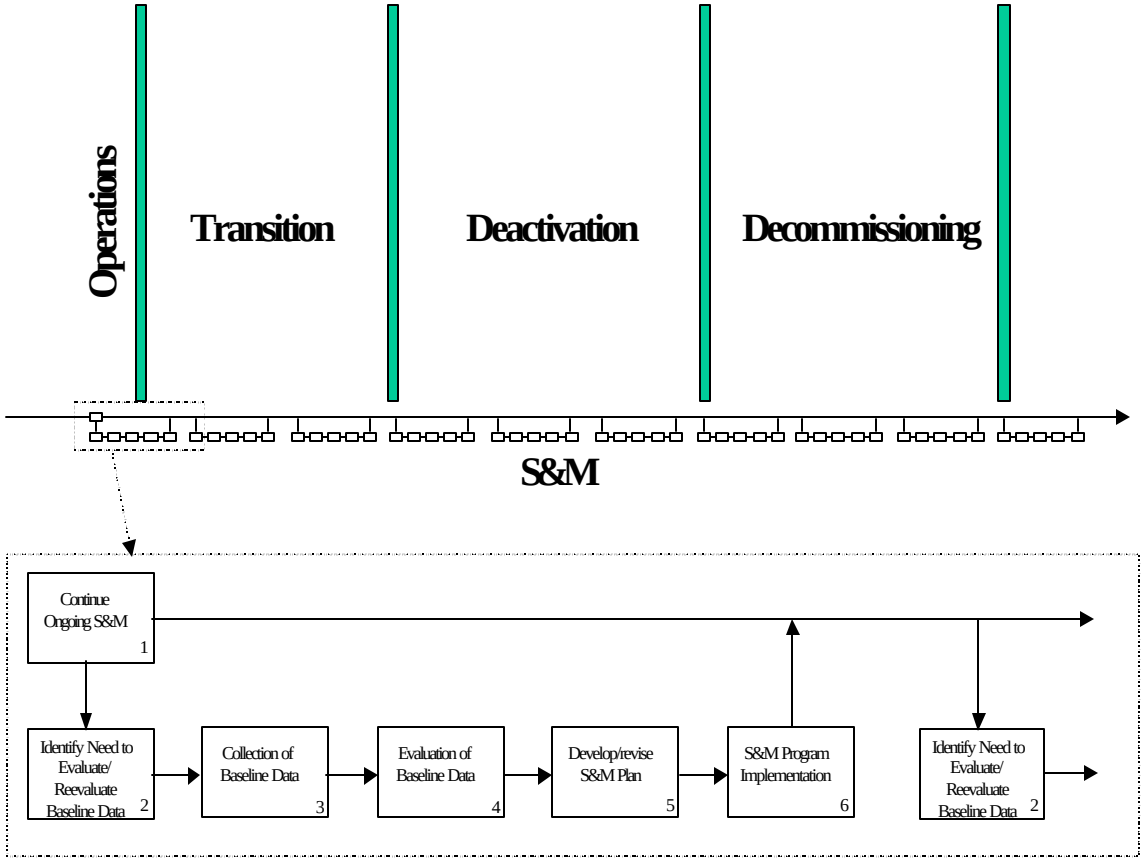
Tailoring the integrated safety management system offers a means to grade activities and processes to different hazards associated with individual facilities. Tailoring is used to scale expectations and acceptable performance to the needs of the site, activity, facility, or work to be performed. When applied to the five core safety management functions, tailoring promotes a work management system that is safe, efficient, and cost effective.

3. S&M FRAMEWORK

The S&M framework consists of six main steps as seen in the lower half of Figure 1. The steps display a process that includes—

- S&M throughout the transition and disposition phases (Step 1);
- a decision point to evaluate/reevaluate the S&M program (Step 2);
- collection and evaluation of data to support a revised S&M program (Steps 3 and 4);
- development of an S&M plan to outline the program to be implemented (Step 5); and
- implementation of the S&M program. (Step 6).

The top of Figure 1 portrays S&M program development and implementation as an iterative process. Over the course of the transition and disposition phases, the scope and hazards of the work evolve. Consequently, S&M requirements and activities will also evolve to address site conditions. Therefore, as S&M continues throughout the transition and disposition phases (Step 1), the S&M program will be frequently reevaluated and updated to reflect changes in facility conditions and activities (Steps 2-6).



Note: The top figure is intended to demonstrate the iterative nature of the S&M Program. It should not be used as a model for the number of times the S&M Program is reevaluated during the transition and disposition process (i.e., ten times in the top figure).

Figure 1. Developing and Implementing an S&M Program

4. EARLY DECISIONS

4.1 STEP 1: CONTINUE ONGOING S&M

From acquisition of facilities to their ultimate disposition, S&M will be ongoing. S&M activities continue as necessary, whether a decision to proceed with disposition is made early on or after some time has elapsed, until the facility's ultimate disposition is accomplished. S&M also continues while the S&M program itself is being evaluated and updated (Steps 2-6). Continuing S&M ensures, at a minimum, that any contamination is adequately contained and that potential hazards to workers, the public, and the environment are minimized.

4.2 STEP 2: IDENTIFY NEED TO EVALUATE/REEVALUATE S&M BASELINE

Execution of the various S&M tasks is performed until facility and/or equipment conditions change such that the activity is no longer required or must be altered to meet a new condition. The completion of these transition and disposition activities may shut down or remove systems or equipment, or otherwise change conditions that directly affect the requirement to continue with a specific S&M activity. As discussed in Step 6, evaluation and feedback from prior S&M activities may also indicate a need to enhance or improve S&M. Additionally, a change in the time horizon (e.g., if decommissioning planned for 3 years in the future is extended to 6 years) or a change in the ultimate disposition objective will affect S&M. In these cases, the need to evaluate/reevaluate the S&M baseline will be identified and the S&M program adjusted accordingly.

Due to the iterative nature of the S&M program, a management of change process should be developed to ensure that the safety basis is current, adequate, and documented. Guidance on management of change is available in DOE-STD-1120-98, Section 3.3.5, "Management of Change."

5. DEVELOPING THE S&M PROGRAM

5.1 STEP 3: COLLECTION OF BASELINE DATA

The primary purpose of collecting baseline data for a facility is to identify hazards and determine the risk posed by the hazards to workers, the public, and the environment. The status and condition of existing equipment used to mitigate or eliminate hazards will also be identified. Another intent of baseline data is to assess structures, systems, and components as they relate to the work to be performed in the facilities (e.g., decommissioning). For example, the status of building cranes should be determined because cranes of various types can be of great value during decommissioning to remove building components, position decontamination and segmentation equipment, and handle waste products.

Ideally, a facility is transferred from the operating program to the disposition program in a stable and known condition with a known operating history. These ideal facilities would then complete the disposition life cycle following progressive stages of deactivation and decommissioning in conjunction with continual S&M activities that correspond with facility conditions, including changes resulting from disposition activities. Such facilities would enter the disposition phase at the deactivation stage directly from having completed its designed mission and actions necessary to place the facility, systems, and materials in stable and known conditions, and to ensure hazards are identified and known.

Conversely, a facility may enter the disposition phase directly into deactivation or decommissioning with its condition and/or operating history unknown. The following paragraphs provide a general overview of suggested sources of baseline data for determining the status and condition of a facility. The level of rigor to which these actions are performed will be commensurate with the known condition and operating history of the facility. Further guidance for determining facility status and condition for contaminated, excess facilities being transferred to the disposition program is provided in DOE G 430.1-5, TRANSITION IMPLEMENTATION GUIDE. Furthermore, DOE-STD-1120-98, Section 3.1, "Work Planning and Hazard Identification," as well as Appendix C, "ISMS Performance Expectations," provide guidance for implementing ES&H considerations while determining facility status and conditions. This guidance discusses integrating ES&H considerations into work planning activities, ES&H considerations associated with resource allocation, hazard identification and characterization, and ES&H requirements identification.

5.1.1 Sources of Baseline Data and Identification of Facility Conditions

Facility condition identification begins with defining the facility's boundaries for disposition. This should include a listing of physical structures and waste sites associated with the facility. Documents essential to the process success include authorization basis documents, environmental documentation, documents containing operating history, and those detailing process knowledge.

Identifying the facility conditions is one key area where the facility status will have a significant impact. In application of the graded approach, if facility operations are ongoing, the facility information and inventory will likely be readily available and current, requiring only minimal efforts to collect and supplement as necessary. In contrast, if the facility has been non-operational for some time, a significantly greater effort is likely to be required to gather and validate the information necessary in this step.

The process of characterization should begin with the use of existing knowledge of the facility and its material inventory, including facility condition assessments from the operations phase. The assessment should address the following baseline data, among others.

- Review the Pre-Transfer Review report. The report is completed by the operating program prior to transfer and documents the condition of the facility at the time of transfer. It is expected that the Pre-Transfer Review report not only documents the existing condition of the facility, but provides the receiving organization with a clear understanding of the current S&M program to maintain the safety envelope of the facility, its systems and contents.

- Assess existing facility knowledge by collecting and reviewing available facility operating information (authorization basis documents, environmental documentation, documents containing operating history of the facility, and documents providing process knowledge of the facility), and existing hazard baseline documentation.

- Interview past and present employees as necessary to supplement information about past facility operations, including mishaps and incidents.

- Identify and document the hazards (material, chemical, radioactive, and others). In particular, note the hazards that can result from changes in facility operational status and resulting conditions (such as the effect of a chemical process system becoming static).

Based on the results of these activities, the need for intrusive characterization activities (sampling and analysis) necessary to adequately understand the hazards should be determined. The decision should be based on the level of uncertainty that remains regarding hazardous substances and the facility condition. Additional intrusive characterization should be considered if knowledge of hazards is insufficient to support an understanding of hazardous material types, quantities, forms, potential exposures, locations, and methods for hazard reduction or removal, as well as whether such information is needed to support activities for either transition or disposition.

If existing data does not adequately document the existing condition of the facility and provide a clear understanding of the existing hazards and the S&M program appropriate to maintain the safety envelope of the facility, a facility walkdown is conducted to identify any immediate hazards or potential releases of hazardous material and any required immediate corrective actions. The focus of the walkdown is on facility conditions that represent a credible threat to human health and safety and

potential releases to the environment. Physical, chemical, and radiological data is collected to support the facility's characterization baseline.

The walkdown should be performed by a team of knowledgeable individuals in various disciplines, such as structural analysis, electrical engineering, industrial safety, industrial hygiene, radiation safety, and environmental safety. In addition, a professional photographer can be helpful in documenting findings. The team, and any involved stakeholders, will determine the extent of the safety standards applicable under safety and health requirements from federal, state, local, and DOE Orders and Standards, and nationally and internationally recognized consensus standards. This group also determines the adequacy of these requirements to protect the workers, the public, and the environment. Once agreement has been reached, the safety and health standards are incorporated into the development of the S&M program work tasks.

The results of the facility walkdown are documented and maintained as part of the facility's permanent historical record. DOE-STD-1120-98, Section 3.1.3, "Hazard Identification and Characterization," provides additional information for planning and performing facility walkdowns.

5.1.2 Record Keeping

As a note, record keeping is invaluable to support S&M, transition, and disposition activities. Therefore, baseline data must not only be collected, but maintained and easily retrievable throughout the last phases of the facility life cycle.

5.2 STEP 4: EVALUATION OF BASELINE DATA

In this step, the baseline data is evaluated in terms of hazards in the facility and activities to be performed. This data will serve as the framework for developing the facility S&M program. Upon this framework, information regarding the potential use of personal protective equipment and engineering or administrative controls will be added to allow for the safe, cost-effective inspection and maintenance of the facility throughout all life-cycle phases.

The evaluation of baseline data should address the following items.

- radiological inventory and associated uncertainties, including material form and distribution information;

- hazardous material, hazardous waste, chemical inventories, and any associated uncertainty, including form and distribution information;[1]

[1] Materials inventory, contamination information, and uncertainty are critical inputs to conducting activities in a safe manner. Specific information with respect to inventories in process systems, associated pipe galleries, ventilation systems, and filters should be defined since transition and disposition work will largely focus on

- evaluation of ongoing S&M activities, particularly with regard to the current hazards, authorization basis, and commitments;
- radiological survey data used to identify the radiological working conditions associated with the facility;
- occupational hazards associated with the facility, particularly fixed hazards.
- general facility conditions, particularly structures, existing protective barriers, and systems installed—
  - to prevent migration of both hazardous and radioactive contamination to the environment and
  - ensure the safety of workers, the public, and the environment;
- structures, systems, and components with the potential to support transition and disposition activities (e.g., lighting, tanks, piping, water treatment systems, decontamination systems, overhead cranes, and forklifts);
- applicable permits, licenses, and agreements associated with the facility;
- commitments to regulatory authorities, stakeholders, and the DOE that apply to transition and disposition.

When facility status and condition are determined, the identified hazards and mitigation options are evaluated against the safety and health standards that apply to those hazards and the work to be performed. This determination and evaluation of the findings form the bases for developing, implementing, and maintaining a continuous S&M program (updated as disposition activities are completed), which is required throughout the remainder of the facility's life cycle. Specifically, the S&M plan (Step 5) and detailed work procedures/packages (Step 6), which are core components of the S&M program, rely on this evaluation so that S&M is performed in a safe and hazard-free manner by reducing the likelihood of release and exposure to the numerous hazards that may be present.

In assessing these items to develop the S&M program, particular consideration should be given to certain aspects of the facility. Some of these aspects are summarized in the following paragraphs. In addition, some of the DOE directives that need to be consulted when evaluating baseline data are described. Note that a number of sources contain S&M requirements (e.g., DOE Orders, regulatory requirements, Defense Nuclear Facility Safety Board (DNFSB) commitments, safety basis documentation); therefore, the requirements listed in this section are intended as a starting point only.

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these areas.

5.2.1 Facility Aspects

When evaluating the baseline data, the project manager must focus on the goal of maintaining the facility in a safe, environmentally secure state in an "as low-hazard as economically achievable" manner. Therefore, maintenance measures should include only those absolutely necessary to keep safety controls and systems in satisfactory condition. Maintenance features may be both preventive and predictive, but care should be taken to avoid unnecessary costs, such as repairing a building scheduled to be demolished in a few years. Monitoring systems, if needed, will require periodic attention, but if such systems can be eliminated and portable systems (radiation detection instrumentation, for example) used instead, costs can be reduced. If ventilation systems are required, equipment will need to be maintained. Where possible, deactivation measures taken should result in the ability to shut down fans, filters, and other ventilation system components.

The S&M program should attempt to minimize the need for entry. For example, fire protection systems and fire extinguishers should be inspected and tested periodically. However, if all combustibles can be removed, an appropriate hazard analysis conducted, and a realistic reduced value assigned to the facility, it may be possible to eliminate the fire protection systems and thereby minimize the need to enter the facility for this purpose.

Material security and safeguards may be another consideration. Facilities that house high-value or classified material will require safeguards and security measures. Situations requiring such measures should be reviewed with the goal of removing or otherwise eliminating the causative factors.

Another primary area of concern is roof integrity, an essential element of maintaining the safety perimeter of the facility. Periodic attention to the condition of the roofing and possible repair may be necessary. It should be noted that events involving facility roofs (e.g., personnel falling through or water damage to equipment) have occurred frequently across the DOE complex and should have been prevented.

Building cranes of various types can be of great value during disposition to remove building components, position decontamination and segmentation equipment, and handle waste products. It is likely that cranes should be preserved and maintained during S&M for future disposition needs.

Other existing plant systems and components should be examined for their value during disposition and, if economical, maintained during the interim S&M period. For example, electrical systems and compressed air systems may not warrant preservation for disposition many years into the future. Electrical systems may be old or of unknown condition, and would therefore require significant work to meet code requirements to make them usable during disposition. It may be more economical to use temporary, construction-type electric power for the disposition effort. Similarly, using portable compressed air systems may be more economical than maintaining old systems of questionable reliability for several years while awaiting disposition. Likewise, building communications systems can be useful during disposition, but modern radios are very effective at construction sites and may be a

more economical option. However, public address systems, if available and functional, can have unique value during disposition.

Certain activities may reduce the total life-cycle cost with an initial investment of resources. For example, removing residual hazardous materials from a pipeline will reduce the hazards and costs associated with disposition of the facility. For an initial expenditure of resources, acid flushing and triple rinsing of the pipeline may be more economical by reducing the costs associated with handling and disposing of a residually contaminated waste. As another example, decontaminating an area that requires regular entry can reduce associated entry and health physics costs during S&M and will reduce work requirements in the future disposition program. To maximize the associated cost savings, these investment activities need to be addressed and planned as soon as possible in the planning process. Due to uncertainties and delay in the budgeting process, investment activities are frequently delayed while awaiting additional funding. Any delay in investment activities succeeds only in reducing the total effectiveness of the investment. If health and safety and continuing operations will not be adversely affected, investment activities should be reviewed against current planned operations to determine if funds can be better allocated, considering the life cycle of the project.

Finally, baseline data should be evaluated to identify routine housekeeping activities. Examples of these activities include cleanup of debris throughout the outdoor area adjacent to the facility or removal of biological concerns.

5.2.2 DOE Directives

Facility Operations. The baseline data evaluation should address the degree of applicability and compliance with the requirements of DOE 5480.19, CONDUCT OF OPERATIONS FOR DOE FACILITIES, which apply to S&M activities. Because the S&M program for a facility awaiting decommissioning can last for several years, it is likely that the operations and maintenance staff conducting the S&M will not be the original staff. As a result, the S&M staff must be diligent in complying with many of the elements of facility operations required during the operational phase, such as selection, training and qualification of facility personnel; operations/maintenance procedures; and configuration management.

Each of the 18 elements of DOE 5480.19 must be reviewed during the baseline data evaluation. A typical matrix may consist of, but not be limited to, these conduct of operations (CONOPs) elements. The degree to which each of the CONOPS elements is applied depends on the hazards involved in the particular operation.

Facility Maintenance. A commitment to comply with the requirements of DOE 4330.4B, MAINTENANCE MANAGEMENT PROGRAM, until implementation of 10 CFR 830.340, Maintenance Management, must be developed. This Order requires the preparation of a Maintenance Implementation Plan (MIP) to address the 17 maintenance elements identified in the Order.

Contaminated facilities require an analysis of the applicability of each of the 17 maintenance elements. The depth of detail required and the magnitude of the resources to be expended analyzing each maintenance program element must be tailored to the facility.

Quality Assurance. Sufficient information, as determined by using a graded approach, must be developed to demonstrate an appropriate commitment to a quality assurance program as required by 10 CFR 830.120, Quality Assurance for Nuclear Facilities, and DOE 5700.6C, QUALITY ASSURANCE.

Radiological Controls. The evaluation of baseline data must include a review of the requirements specified in DOE O 440.1, WORKER PROTECTION MANAGEMENT FOR DOE FEDERAL AND CONTRACTOR EMPLOYEES, DOE 5400.5, RADIATION PROTECTION OF THE PUBLIC AND THE ENVIRONMENT, and 10 CFR 835, Occupational Radiation Protection.

Hazardous Material Protection. Sufficient information must be developed to demonstrate compliance with applicable requirements and ALARA considerations for control of personnel exposures to hazardous materials. The hazardous materials are those in quantities that can adversely affect the health and safety of the public or that pose a reasonable risk to workers.

Health and Safety. Sufficient information must be developed to demonstrate commitment to DOE P 450.4 by showing that safety management is systematically integrated into management and work practices at all levels. DOE G 450.4 provides detailed guidance on the five core functions of integrated safety management. DOE-STD-1120-98 provides guidance on integrating health and safety into facility disposition activities and applies when conducting S&M activities.

Emergency Preparedness. The baseline data evaluation must demonstrate appropriate commitment to the emergency planning requirements of the DOE 5500 directive series. These directives address DOE emergency preparedness functions, including philosophy, objectives, and organization, for emergencies that range from local area emergencies to those that could affect persons off-site. The activation of emergency organizations, assessment actions, notification processes, emergency facilities and equipment, training and exercises, and recovery actions are also to be addressed by the S&M Program, as appropriate.

Safeguards and Security. The baseline data evaluation must demonstrate compliance with DOE O 470.1, SAFEGUARDS AND SECURITY PROGRAM, which requires Site Safeguards and Security Plans and security plans for all DOE interests from property protection to national security. DOE 5632.1C, PROTECTION AND CONTROL OF SAFEGUARDS AND SECURITY INTERESTS, and DOE 5632.1C-1, MANUAL FOR PROTECTION AND CONTROL OF SAFEGUARDS AND SECURITY INTERESTS, can provide additional guidance.

5.3 STEP 5: DEVELOP/REVISE S&M PLAN

The baseline data evaluated in Step 4 form the basis for the S&M plan. This document provides a plan for implementing an S&M program[1] that ensures that the facility is maintained in a safe, environmentally secure, and cost-effective manner.

Note that development of an S&M plan is more than an exercise in paperwork and documentation tracking. To maintain an effective S&M plan, whether the facility is in transition, deactivation, or decommissioning, the plan must reflect facility changes as they occur. This will require returning to Step 2 of this framework, so that the S&M plan and associated program can be updated and implemented.

The S&M plan is developed in accordance with the principles of integrated safety management, which are articulated in DOE-STD-1120-98, Section 3.0, "Integrated Safety Management System." Furthermore, Appendix C of the referenced Standard, "ISMS Performance Expectations," provides information that may be meaningful to verify that the project plan adequately addresses integrated safety management considerations.

Using the baseline data evaluated in Step 4, the topics in Table 2 are addressed in a facility-specific S&M plan, as applicable and subject to the graded approach. Note that the specific elements of performing facility S&M work for each structure, system, and component (e.g., frequency of inspections, personal protective equipment needed, emergency response procedures) will be provided in detailed work procedures/packages as described in Section 6. Therefore, addressing some of these topics may involve a simple reference to an existing procedure, work package, or plan (e.g., a decommissioning plan, a health and safety plan).

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[1] The scope/definition of an S&M program is provided in Section 2. In certain situations, the scope of the S&M plan, and subsequently the S&M program, may be expanded beyond the LCAM definition (e.g., to include inspection of the site area).

Table 2. Recommended S&M Plan Topics.

Topic	Description
Facility History	Discusses the facility's operational history, includes prior usage of the facility, previous processes that resulted in hazardous and radioactive contamination, and completed disposition activities.
Facility Operations	Describes the major structures and operations of active systems; includes status of systems such as ventilation, fire protection, radiation detection, remote monitoring, utility distribution, compressed air, water, and auxiliary.
Facility Surveillance	Describes the surveillance activities to be conducted on a routine and nonroutine basis. Routine activities ensure that structural and confinement integrity is maintained. Nonroutine activities include major responses to undesirable observations (e.g., action to be taken if damaged friable asbestos is present).
Facility Maintenance	Describes the preventive, corrective, and predictive maintenance to be performed. Preventive maintenance is conducted on a pre-scheduled basis to ensure proper functioning of operational equipment. Corrective maintenance is performed after equipment has malfunctioned, has required structural repair due to degradation, or to upgrade facilities and/or equipment. Predictive maintenance monitors, determines trends, and analyzes equipment to forecast equipment degradation so that maintenance can be performed prior to equipment failure.
Waste Management and Environmental Compliance Requirements	Discusses requirements that are applicable to the S&M scope of work and the S&M activities governed by these requirements.
Quality Assurance	Includes descriptions of the processes used at the facility for design control; procurement control; instructions, procedures, and drawings; document control; control of processes; inspection, surveillance, and testing control; control of measuring and test equipment; receiving, storage, and shipping control; control of nonconforming materials, components, and fabrication/construction features; corrective actions for identified conditions adverse to quality; control of personnel training and qualification; quality improvement; quality assurance documents and records; and independent quality audits.

Table 2. Recommended S&M Plan Topics (continued).

Radiological Controls	Includes a discussion of the "as low as reasonably achievable" (ALARA) policy and program; external radiation exposure control; external dosimetry; internal radiation exposure control; internal dosimetry; radiological protection instrumentation programs (both calibration and use); respiratory protection program; air monitoring; radiological monitoring and contamination control; radiological protection record keeping; radiological area boundaries, posting, and controls; radiological protection training; and entry and exit control program.
Hazardous Material Inventory, Management, and Protection	Discusses the hazardous substances that will be managed and includes known radiological, hazardous material, and toxic chemical inventory data (e.g., locations, activities of nuclides, quantities); may also include a discussion of biological hazards and a listing of contaminated equipment.
Training and Qualification	Includes a discussion of the training requirements for the personnel performing and/or supporting S&M activities.
Health and Safety	Discusses the activities to ensure the health and safety of the workforce; other topical areas such as radiological controls and facility maintenance may be driven by health and safety requirements; therefore, health and safety are discussed throughout the plan.
Emergency Preparedness	Describes the philosophy, objectives, and organization of the emergency preparedness functions for a spectrum of emergencies covering a range from local area emergencies to those that could affect persons off-site. Addresses the activation of emergency organizations, assessment actions, notification processes, emergency facilities and equipment, training and exercises, and recovery actions.
Safeguards and Security	Describes the requirements and procedures for controlling access to the facility; provides an evaluation of the adequacy of existing physical controls (e.g., fencing, signs, entrance points into exclusion areas, door locks, and other barriers); provides a plan for the placement and monitoring of intrusion alarms; and describes the duties and scheduling of security patrols.
Cost and Schedule	Lists the work breakdown structure and project-correlated schedule of S&M activities and planned and expected capital expenditures. Includes a summary of S&M costs applicable to each facility, identified milestones for all significant events, and the frequency of planned S&M activities.

6. STEP 6: IMPLEMENTING THE S&M PROGRAM

Implementation of the S&M program is a key element that supports the seamless process (from operations to final disposition) occurring over the entire life cycle of a facility. It is highly probable that S&M tasks during the transition and disposition phases of its life cycle will change to a great degree. As a result, implementation of the S&M program should be monitored constantly to ensure that the tasks properly monitor and/or maintain the facility's safety envelope and the critical or required systems and equipment.

During the transition from operations to disposition, implementation of the S&M program essentially is a continuation of the operating plant maintenance and Conduct of Operations program. The transition period may last several years as personnel and equipment are moved out of the facility. As areas of the facility are vacated, the transition tasks monitor and maintain critical systems, such as roofs, electrical, fire protection, chemical/radiological alarms, etc., to keep them operable and/or in a safe configuration. Other tasks monitor the remaining process materials and residues to keep them in a stable condition.

Once the transition phase is completed, the S&M tasks ensure that the facility is maintained in a stable configuration while awaiting deactivation and/or decommissioning, which may not occur for several years. During deactivation, activities that support the continued stabilization of the facility, removal of hazardous process materials/wastes, and overall reduction of the hazards associated with the facility will continue or will be initiated. Tasks that monitor or maintain systems no longer needed for safety purposes or disposition activities will be discontinued. Tasks implemented during this phase are intended to support deactivation activities and to maintain the facility safety envelope and long-term requirements on building infrastructure, including modification and/or changes to facility configuration.

After deactivation is complete, implementation of S&M tasks continues to ensure protection of the worker, the public, and the environment during the time between deactivation and decommissioning which may be an extended period. Continued radiological surveillances, exhaust stack monitoring, roof inspections (including possible repair), and maintenance of building cranes are a few examples of activities implemented during this time.

Similar to the deactivation phase, S&M activities implemented during decommissioning are intended to maintain and inspect the facility in order to—

- contain the radiological and/or hazardous contamination present; protect safety and health of workers and the public;
- support the facility safety envelope;
- maintain systems and equipment required for decommissioning activities; and
- avoid impacts on the environment due to changes that occur in the facility's condition and associated hazards as the facility undergoes decommissioning.

Implementation of S&M tasks is revised over the course of the transition and disposition phases to the extent and degree of seriousness of the hazards and dependent on the status of systems, controls, and alarms, and the authorization basis of the facility. Therefore, a phased implementation of the S&M program that adjusts the S&M activities to the changes is appropriate. When this occurs, the S&M is revisited, beginning at Step 2 where baseline data is reevaluated. For example, during deactivation, residual hazardous materials and wastes from operational activities and storage areas are consolidated and removed. Costs can be reduced as the hazardous material is discontinued, and safety concerns are alleviated.

When a facility is placed in long-term monitoring status after decommissioning activities are complete, S&M tasks are implemented to provide for the physical safety and security of the facility and to ensure compliance with restricted end conditions established for the facility. This is typically a low-cost program that could continue for many years.

6.1 DEVELOPMENT OF DETAILED WORK PROCEDURES/PACKAGES

The S&M program will change over time as the excess facility transforms from operations to its final environmental end-state. For this reason, S&M procedures and work tasks must be added, changed, or eliminated as required to meet the objectives of the current S&M program. The results of the newly developed or revised S&M program form the bases for the preparation of specific S&M activities that meet the objectives of the program. The S&M program identifies these objectives and the specific requirements and constraints to the organization responsible for the planning and performance of work activities.

As stated previously, the purpose of the S&M program is to ensure the facility safety envelope is maintained in a safe, efficient, compliant, and cost-effective manner. It should be noted that there may be a tendency to plan and schedule more S&M work tasks or to conduct them at a greater frequency than actually required. These tasks are intended to implement the objectives of the S&M program and must be requirements-driven. Requirements are found in a number of sources, such as regulatory requirements, DOE Orders, Defense Nuclear Facility Safety Board commitments, safety basis documentation, or technical or vendor specifications for equipment. The *Requirements Based Surveillance and Maintenance Review Guide*, DOE/EM-0341, found on the EM-60 Web page (http://www.em.doe.gov/info/nucmat.html) is a useful tool to aid in determining if the current or planned S&M activities and/or their frequency are planned at an appropriate level to maintain the safety envelope and meet requirements.

As part of the overall project team, the planning organization is also responsible to ensure that the facility safety envelope is maintained and that the worker, the public, and the environment are adequately protected. These criteria are met by developing specific implementing procedures and work task documents that provide the safety and health requirements as well as the step-by-step instructions to the workers responsible for the conduct of the work. As the level of detail improves in the S&M program, existing work tasks are improved and new tasks are developed and scheduled.

These tasks are identified, evaluated, and controlled within the facility's existing job-control system. As indicated in Section 2.2 of this Guide, the principles of integrated safety management must be an integral part of each procedure or work package and the job-control system.

Much of the S&M work includes routine surveillances (e.g., radiological surveys, monitoring instrumentation required by RCRA regulations, etc.) and preventive or predictive maintenance (e.g., roof inspections, emergency generator tests, HEPA filter changes, etc.) and is conducted at routine frequencies. It is important to ensure that the frequency level of a specific task is adequately planned to maintain the integrity and/or operation of the facility component or item of equipment and is not in excess of what is required. Other S&M tasks will be non-routine or on-demand work that occurs, for example, when an equipment item deteriorates or fails due to wear over time. It is important that the existing job-control system contains a priority system that allows for the planning and implementation of maintenance work on safety related work tasks to be completed as soon as possible.

The detailed procedures and work packages provide the details of the work to be accomplished, the frequency (if applicable), and the process for doing such work safely and efficiently. To be effective, the S&M procedures or work packages need to include the following items:

- a description of specific work scope to be performed;
- identification of the type of hazard analysis required for the activity and verification that the analysis was performed;
- a method to ensure that hazards associated with each of the planned activities are documented and shared with workers together with the steps to eliminate, minimize or reduce the risk of those hazards to an acceptable level;
- work and radiological permits necessary to conduct such work;
- the necessary training requirements to perform each task;
- a listing of specialized equipment and each item's intended use;
- the personal protective equipment needed to limit exposure to the identified hazards;
- the emergency response procedures applicable to the task and the area of work;
- a description of the management structure, including communication and reporting channels; and
- the expected results upon completion of the task.

The procedures and work packages also provide the structure of activities needed to sufficiently inform all involved parties of the work to be accomplished and its potential impact on other activities planned

to be conducted in the same area. This documentation ensures that impacts, including safety and health, have been verified and that controls are established prior to proceeding with the work.

Finally, the planned work activities are evaluated against the potential impact to the safety authorization of the facility. A safety review is conducted to ensure that work activities are authorized to be performed within the facility safety envelope. The formality and rigor of this type of process may vary due to the existing hazards or the hazard classification of the facility.

6.2 S&M EXECUTION

Following the development of the work packages, the surveillance or maintenance activity is performed in accordance with the procedure or work package developed specifically for a given S&M task. S&M work execution is highly variable due to the specifics contained in each procedure or work package used. Provisions of the facility's safety and health plans must be followed during the conduct of S&M activities to ensure that field activities adequately protect workers, the public, and the environment. One method of ensuring safety at the job site is to conduct re-job briefings. These briefings include the procedures to be used, a review of the hazards and adopted controls, a review of the emergency procedures, and consideration of all additional activities ongoing in the facility. This also provides an excellent opportunity to verify that all permits are in place, the emergency response plan is ready for implementation, and that personnel have completed the appropriate training to accomplish the activity. Wastes (radiological and otherwise) generated during the performance of S&M activities must be handled in compliance with applicable regulatory and DOE Order requirements.

Execution of the various S&M tasks is performed until facility and/or equipment conditions change such that the activity is no longer required or must be altered to meet a new condition. It is necessary to continuously revisit, both formally and informally, the requirements for specific S&M activities as transition and disposition activities are completed (i.e., to return to Step 2 in this process). The completion of these activities may shut down or remove systems, equipment, or otherwise change conditions that directly affect the requirement for the continued execution of a specific S&M activity.

6.3 EVALUATION AND FEEDBACK

Just as the pre-job briefing is important to the conduct of work, a post-job briefing serves as a means to evaluate work performance. Lessons learned during execution can help improve planning of procedures and work packages, thereby resulting in enhanced safety or improved efficiency in future executions. Evaluations at this time can also enhance and improve other related procedures and work packages. Some routine S&M tasks, especially those that involve few or no hazards, may not benefit from a post-job briefing. S&M tasks are evaluated and post-job briefings are conducted on a case-by-case basis.

As tasks are executed, project personnel ensure that the planned S&M activities are sufficient to meet the objectives of the S&M program. At the same time, proper preventive and predictive maintenance

of the facility and its systems and equipment must be planned to keep the facility in an operational status as required by the transition or disposition activities to be conducted. Establishing a feedback mechanism is necessary to provide information to the planning organization in order to assess the need for additional S&M or the removal of existing S&M as a result of a lowering of risks in the facility. The implementation of unplanned S&M activities may be required due to changes in schedule of planned transition or disposition activities.

Continued evaluation and feedback ensures that adequate monitoring and preventive, predictive, or corrective maintenance activities are planned and executed throughout the life cycle of the facility to provide for the safety of the worker, the public, and the environment. It's important to emphasize that the implementation of the S&M program is ongoing until the facility no longer requires any form of surveillance or maintenance action due to its environmental and structural condition.