Description of document:	National Nuclear Security Administration (NNSA) Mission Support Review of Safety Management System, Lawrence Livermore National Laboratories (LLNL) 2009, 2011
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National Nuclear Security Administration

Department of Energy
National Nuclear Security Administration
Office of the General Counsel
P. O. Box 5400
Albuquerque, NM 87185

March 15, 2022

SENT VIA EMAIL

This letter is the final response to your October 6, 2021, Freedom of Information Act (FOIA) request.

Your request stated the following:

"1. Report on the Mission Support Review of the Integrated Safety Management System at the Lawrence Livermore National Laboratory, dated November 2009. 2. Report on the Independent Oversight Review of Integrated Safety Management System Effectiveness at the Lawrence Livermore National Laboratory, dated September 2011."

Your request was received in our office on October 6. Upon receipt, we contacted the Lawrence Livermore Field Office (NA-LL) about your request. NA-LL also asked their Management and Operating (M&O) contractor, Lawrence Livermore National Security, LLC (LLNS) to conduct a search for responsive records. NA-LL and LLNS conducted a comprehensive search of their records.

The following responsive records were located:

Document 1: Mission Support Review of the Integrated Safety Management System at the Lawrence Livermore National Laboratory performed for the Livermore Site Office by the Office of Health, Safety and Security, November 2009, 151 pgs.

Document 2: Office of Health, Safety and Security Office of Enforcement and Oversight, Independent Oversight Review of Integrated Safety Management System Effectiveness at Lawrence Livermore National Laboratory, September 2011, 58 pgs.

NA-LL has determined that the enclosed documents are fully releasable in their entirety and that Document 2 also resides within the public domain @ https://www.energy.gov/sites/default/files/2013/06/f1/2011_LLNL_IRR_of_ISMS_Effectiveness_at_LLNL_%28Sept_2011%29.pdf.

You may contact me, NNSA's FOIA Public Liaison, Office of the General Counsel, at 1-866-747-5994, or by mail to Department of Energy, National Nuclear Security Administration, Office of the General Counsel, PO Box 5400, Albuquerque, NM 87185, for further assistance and to discuss any aspect of your request. Additionally, you may contact the Office of Government Information Services (OGIS) at the National Archives and Records Administration to inquire about the FOIA mediation services they offer. The contact information for OGIS is as follows: Office of Government Information Services, National Archives and Records Administration, 8601 Adelphi Road-OGIS, College Park, Maryland 20740-6001, e-mail at ogis@nara.gov; telephone at (202) 741-5770; toll free at 1-877-684-6448; or facsimile at (202) 741-5769.

There are no fees chargeable to you for processing this request. If you have questions, please contact Mr. Roberto Marquez by e-mail at Roberto.Marquez@nnsa.doe.gov, or write to the address above. Please reference Control Number FOIA 22-00001-R.

Sincerely,

Christina H. Hamblen

Digitally signed by Christina H. Hamblen
Date: 2022.03.15 10:41:28 -06'00'

Christina H. Hamblen
FOIA Officer

Mission Support Review
of the

Integrated Safety Management System
at the
Lawrence Livermore National Laboratory

Performed for the Livermore Site Office
by the
Office of Health, Safety and Security

November 2009

Signature Page

I, by signature below, concur with the recommendations of the HSS review of ISMS at LLNL.

Robert Compton, Management – Assessments and Feedback

Larry Denicola, Operations, Management

Al Gibson, Operations, Management

Joe Lischinsky, Operations, Management

Jim Lockridge, Operations, Management, Industrial Hygiene

Marvin Mielke, Operations, Management

Ed Stafford, Operations, Management

Mario Vigliani, Radiation Protection

Pat Williams, Operations, Management

APPROVED: _____
William Miller, Team Leader

Mission Support Review of the
Integrated Safety Management System at the
Lawrence Livermore National Laboratory

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EXECUTIVE SUMMARY

The purpose of the Office of Health, Safety and Security (HSS) review was to provide information to Livermore Site Office (LSO) that could be used in its Phase II verification of the Lawrence Livermore National Laboratory (LLNL) integrated safety management system (ISMS). LSO has scheduled a Phase II ISMS verification of LLNL for the February 2010 timeframe.

At the request of LSO senior management, HSS designed its review to provide input that is relevant to Phase II verification. Specifically, HSS focused on LLNL's implementation of its ISMS processes. HSS also examined the radiation protection and industrial hygiene programs as focus areas, at the request of LSO. In addition, HSS reviewed the effectiveness of corrective actions for the findings identified during the 2007 Independent Oversight inspection of ISM at LLNL. This HSS review was conducted concurrently with an HSS nuclear safety review at LLNL, which focused primarily on selected aspects of nuclear safety at the LLNL Superblock nuclear facilities. Throughout the review, HSS coordinated with the LSO-appointed leader of the ISMS Phase II verification effort.

The results of the review indicate that LLNL has met the Phase II functional area objectives for the relevant criteria and review approach documents (CRADs), with the exception of the management objective that addresses the LLNL assessment and feedback systems, which was partially met. HSS also determined that most of the subordinate criteria were met, but a few of the individual criteria within the operations, industrial hygiene, and assessment and feedback CRADs were not fully met. In addition, some aspects of the radiation protection program warrant improvement.

Overall, LLNL has improved its processes and has developed many adequate ISMS processes that they are implementing effectively. LLNL management recognizes that some processes are relatively new and warrant continued management attention to ensure that their effectiveness is demonstrated and verified.

It is recommended that the ISMS Phase II lead perform limited-scope follow-up reviews of the weaknesses identified in this report to provide additional information for the LSO Manager in support of decisions about approval of the LLNL ISMS program, with a particular focus on assessment and feedback systems, industrial hygiene workplace exposure assessments, radiological work authorizations, and broad integrated work sheets.

1.0 INTRODUCTION

1.1 Purpose

The purpose of the U.S. Department of Energy (DOE) Office of Health, Safety and Security (HSS) review was to provide information to the Livermore Site Office (LSO) that could be used by LSO management in the Phase II verification of the Lawrence Livermore National Laboratory (LLNL) integrated safety management system (ISMS). LSO has scheduled a Phase II ISMS verification of LLNL for the February 2010 timeframe.

1.2 Scope

At the request of LSO senior management, HSS designed its review to provide input that is relevant to Phase II verification. Specifically, HSS focused on LLNL implementation of its ISMS processes. An ISMS Verification Phase I review of LLNL was completed by LSO in May 2009.

HSS also examined selected aspects of the radiation protection and industrial hygiene (IH) programs as focus areas, at the request of LSO. In addition, HSS reviewed the effectiveness of corrective actions for the findings identified during the 2007 Independent Oversight inspection of integrated safety management (ISM) at LLNL.

2.0 TEAM COMPOSITION AND FUNCTIONAL AREA ASSIGNMENTS

The team composition is as follows:

TEAM MEMBER	FUNCTIONAL AREA(S)
William Miller, HS-64	Team Leader
Ed Stafford	Operations (OP.1), Management (MG.1)
Larry Denicola	Operations (OP.2B), Management (MG.1)
Jim Lockridge	Operations (OP.2A), Management (MG.1), Industrial Hygiene (SME.2)
Joe Lischinsky	Operations (OP.3), Management (MG.1)
Al Gibson	Operations (OP.3), Management (MG.1)
Pat Williams	Operations (OP.4), Management (MG.1)
Marvin Mielke.	Operations (OP.5), Management (MG.1)
Mario Vigliani	Radiation Protection (SME.1, RP.1)
Robert Compton	Management – Assessments and Feedback (MG.2)

3.0 OVERALL APPROACH

This review was conducted in support of LSO expectations and to provide input to LSO that is consistent with the requirements of DOE Policy (P) 450.4 in accordance with DOE Guide (G) 450.4-1B, *Integrated Safety Management System Guide* (the ISMS Guide) and the *ISMS Verification Team Leader's Handbook* (DOE-HDBK-3027-99). As discussed in Volume 2,

Appendix E of the ISMS Guide, this HSS review provided an assessment of the adequacy of ISMS implementation, consistent with the scope of a Phase II verification.

As described in the ISMS Guide, the ISMS verification is divided into two phases. Phase I verifies the adequacy of the ISMS program and the existence and adequacy of policies, processes, procedures, and manuals of practice. Phase II verifies that the ISMS Description and associated processes are implemented in accordance with applicable DOE and site requirements.

The primary goal for the review was to provide input to the LSO Manager concerning the adequacy of LLNL's ISMS program implementation. The LSO Manager can use that information, along with other inputs, to reach a decision on approving the LLNL ISMS program.

The review was conducted using criteria and review approach documents (CRADs). Each CRAD guided the evaluation in determining the adequacy of the ISMS Description, and each CRAD objective included a reference to the applicable ISMS Phase I Core Expectations (CEs) as defined in the ISMS Guide.

The review addressed three CRADs that are relevant to LLNL:

- Operations (OP)
- Management (MG)
- Subject Matter Expert (SME).

The record of the evaluation of each CRAD is shown in the assessment forms (provided in Section 7.2). The discussion of results on the assessment forms includes the adequacy of the described ISMS. An assessment form was prepared for each objective and documents the basis for the conclusions reached concerning the objective and criteria. Notable conditions, both positive and adverse, are identified and discussed on the assessment forms as follows:

Issue: A condition or situation that has led, or could lead, to degradation in ISM. Each issue is categorized as either a Finding or a Weakness:

- Finding—a violation of an identified requirement.
- Weakness—a situation that, while not a direct violation of an identified requirement, may, if not resolved, lead to degradation in ISM. Management attention is recommended to evaluate the situation and take action as deemed appropriate.

Opportunity for Improvement: A condition, practice, or situation for which a best practice or process improvement would result in improved efficiency or improved performance.

Noteworthy Practice: A condition, practice, or situation that is highlighted for management attention for possible expanded implementation or communication to other National Nuclear Security Administration (NNSA) sites.

Detailed instructions for completing the assessment forms were provided to the ISMS review team and were implemented during the review.

4.0 RESULTS

4.1 Operations (OP)

The review of operations sampled work activities from the following five LLNL directorates to provide a range of perspectives on ISMS implementation at LLNL:

- Weapons and Complex Integration (WCI) Directorate (OP.1)
- Science and Technology (S&T) Directorate (OP.2A and OP.2B)
- Operations and Business Directorate (OP.3)
- National Ignition Facility (NIF) and Photon Science (PS) Directorate (OP.4)
- Global Security (GS) Directorate (OP.5).

The review of the S&T Directorate considered two aspects: scientific research, and experimental activities performed by the Physical and Life Sciences (PLS) organization (OP.2A) and engineering activities (OP.2B). Separate assessment forms were developed for these activities to provide perspectives on the implementation of the work controls for both types of activities.

In selecting activities for review, considering LSO input, HSS gave priority to certain higher-hazard activities, including:
- High explosive activities (Site 300)
- Laser activities at the Jupiter Facility
- Activities at the Radioactive and Hazardous Waste Management (RHWM) facility
- High voltage electrical activities
- Biological safety activities.

Also, in selecting activities, HSS recognizes that work control activities at the Superblock were previously reviewed by HSS and determined to be effective, and that HSS was concurrently conducting a review of nuclear safety at the Superblock.

HSS determined that the overall operations objective was met at all five directorates that were evaluated. HSS also determined that the vast majority of the subordinate criteria were met.

Further, many aspects of the LLNL ISMS have been improved and are effectively implemented. Environment, Safety and Health (ES&H) Manual Document 2.2, *LLNL Institution-Wide Work Control Process*, describes the LLNL activity/task-level approaches to ensure that hazards associated with the work are identified and analyzed and that appropriate controls are selected. LLNL has established adequate institutional mechanisms to develop, review, approve and maintain current all elements of the facility authorization basis (AB) documentation, including effective implementation of the resulting requirements within the ABs. The execution of these mechanisms ensure that all necessary personnel (e.g. ES&H professionals, workers, line management, quality assurance) are integrated at the activity level and involved in the work planning process to ensure that hazards are fully analyzed and appropriate controls are developed. Roles and responsibilities within the work planning process are clearly defined and understood, and personnel are held accountable for properly accomplishing their assigned responsibilities. Mechanisms such as comprehensive training and qualification programs are in place to ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities. In general, line management and workers are very knowledgeable about the safety of work – hazards and necessary controls, and their roles, responsibilities, accountabilities, and authorities. LLNL has also established an effective process of work approval, authorization, and release to confirm that the facility or activity and the operational workforce are in an adequate state of readiness prior to authorizing the performance of the work. It was evident from interviews and work observations that operations personnel maintain awareness of all facility activities to ensure compliance with the established safety envelope, and line management is involved sufficiently to verify that their expectations are met. Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented through mechanisms such as post-activity reviews and the use of feedback and

improvement forms on work permits. The implementation of the work release process is particularly effective in the WCI Directorate and the Operations and Business Directorate.

HSS determined that one criterion (i.e., the first operations criteria, which addresses mechanisms to ensure that hazards are identified, analyzed, and controlled) was not fully met at two of the organizations reviewed (i.e., the WCI Directorate and the PLS organization). Although the mechanisms for activity-level hazard analysis and control are in place in the current work control system, the number of broad-based scopes of work and missed or inadequate controls in several of the reviewed new task-based Integrated Work Sheets (IWSs) indicate that implementation still does not meet the portion of the criterion that requires ensuring that all activity-level hazards are fully analyzed and appropriate controls developed for the authorized work. The IWS weakness resulted in observed performance problems at two of the directorates reviewed by HSS during this review and was a key factor in overall weaknesses in proper specification of radiological controls in all directorates. This weakness is viewed by HSS as an institutional weakness that could impact operations at other LLNL directorates and facilities (although some organizations may have supplemental processes or practices that compensate for the institutional weakness).

In addition to the weakness with the broad IWSs, a few other isolated weaknesses were identified. In the S&T Directorate's engineering activities, weaknesses were identified in the hazard analyses and associated controls for powder coating operations. Also, there was no documented hazard analysis of potential worker exposure to hazardous gases while working on roofs near ventilation exhaust streams, and current institutional procedures do not require one. In the Operations and Business Directorate, one subcontractor did not effectively implement LLNL work control requirements, and some safety controls were not effectively implemented because of deficiencies in training and IWS specificity.

Overall, although some weaknesses are evident, HSS work observations, interviews, document reviews, and attendance at safety meetings indicate that most hazards and controls associated with work activities are effectively managed by line management, identified and controlled by responsible individuals, reviewed and verified by ES&H Team members, and executed by staff. Continued management attention is needed to address the identified weaknesses, with a particular focus on the ongoing concern about overly broad IWSs that do no provide a sufficient mechanism to identify and tailor hazards and controls at the individual work activity or experiment level.

Issues -Weaknesses:

OP.1&2A-1/W: In some cases, IWSs at the WCI Directorate and the S&T Directorate are too broad in scope to identify hazards and controls for individual activities/experiments as required by Document 2.2, and as a result the current work control analyses have resulted in missed or insufficiently analyzed hazards and corresponding activity-level controls.

OP.2B-1/W: Within the S&T Directorate's engineering activities, some hazards have not been adequately identified and analyzed for powder coating activities in the Technology Resources Engineering Division (TRED), and, where hazards have been identified, sufficient controls have not been implemented.

OP.2B-2/W: The potential for worker exposure to hazardous gases during building 321/322 complex roof does not have a documented analysis. Ventilation system exhaust streams from welding operations, plating shop baths, and the powder coating oven may contain elevated levels of chromium VI, hydrogen cyanide, nitrogen dioxide, acid fumes, and solvent vapors that may impact workers accessing roofs.

OP.3-1/W: LLNL work control requirements were not effectively implemented by one Operations and Business Directorate subcontractor, resulting in a number of uncontrolled hazards and insufficient verification of worker training.

OP.3-2/W: Insufficient specificity of some Operations and Business Directorate Maintenance Utilities Services Department (MUSD) IWS controls and the ineffectiveness of some training of maintenance craft workers have resulted in some instances of work control deficiencies or observed unsafe work practices.

Opportunities for Improvement:

OP.1&2A-1/OFI: LLNL should consider performing an assessment of activity level definition of the scope and subsequent activity-level hazard and control identification after the transition to task-based IWS has progressed and operating experience has been gained.

OP.2A-2/OFI: LLNL should consider reassessing the performance of pre-job briefs and establish minimum consistent expectations for all PLS pre-job briefs to ensure that pre-job briefs conducted for research consistently meet LLNL expectations for a pre-job brief as described in Document 2.2, and sufficiently discuss hazards and controls with respect to the IWS for the work activities to be performed during the work day.

OP.2A-3/OFI: LLNL should consider reassessing the criteria for evaluating "minor" changes to IWSs to ensure that "minor" changes are not "major" changes requiring a revision to the IWS as defined in LLNL Document 2.2.

OP.2B-1/OFI: For engineering activities within the S&T Directorate, LLNL should consider revising the User Shop sign-in process to include a pre-job safety briefing by the responsible individual or resident machinist to ensure that technicians are aware of site-specific hazards and have been verified as ready to operate machine shop equipment.

OP.2B-2/OFI: LLNL should consider performing additional reviews of powder coating operations across LLNL to determine whether performance problems are evident at other locations, and should consider reviewing work that is not covered by the skill-of-the-craft program to ensure that the controls for such work are sufficient and effectively implemented.

OP.3-1/OFI: To improve analysis and control of health hazards for Operations and Business Directorate maintenance activities, LLNL should consider analyzing hazards associated with materials with potential inhalation hazards that are commonly used in maintenance work by including controls in IWSs and restricting the use of such materials to those that have been analyzed and for which appropriate controls have been entered into IWSs.

OP.3-2/OFI: To enhance LOTO for Operations and Business Directorate maintenance activities, LLNL should consider revising LOTO procedures and training to detail alternate verification methods for non qualified electrical workers to ensure electrical lockouts are in place and zero voltage verifications have been conducted in accordance with NFPA 70E.

OP.3-3/OFI: To strengthen analysis and control of noise hazards for Operations and Business Directorate maintenance activities, LLNL should consider reassessing the need for including maintenance workers in the LLNL hearing conservation program and adding specific requirements to IWSs for training and medical evaluation based on IH exposure assessments.

OP.3-4/OFI: To strengthen the work control process for Operations and Business Directorate maintenance activities, LLNL should consider lowering the threshold for preparing activity-specific IWSs to include complex work, work with multiple permits, and work with hazardous materials for which material-specific controls are not in existing IWSs.

OP.3-5/OFI: To ensure that Operations and Business Directorate construction subcontractor workers have adequate training, LLNL should consider establishing a process to require that training certifications submitted by construction subcontractors for each employee pursuant to Division 1 Specifications, Section 1.07A, are reviewed for adequacy by LLNL.

OP.3-6/OFI: To ensure the analysis of hazards associated with power frequency (60 Hz) magnetic fields, LLNL's Operations and Business Directorate should consider adding guidance to work control processes to evaluate potential hazards associated with magnetic fields generated by AC powered high-voltage electrical equipment and transmission lines.

OP.3-7/OFI: To ensure the safety of individuals working in confined spaces near energized high-voltage conductors, LLNL's Operations and Business Directorate should consider changing the procedures and training of LLNL high voltage technicians to more thoroughly inspect the condition of insulation on energized electrical conductors before the start of work.

OP.3-8/OFI: To improve the safety of future Operations and Business Directorate subcontracted construction work, LLNL should consider performing a causal analysis of work control deficiencies on the Central Area Load Feeder Project. LLNL should consider assessing the causes of inadequate hazard analysis and control by the construction subcontractor, determining why these deficiencies were not identified sooner by LLNL, and taking appropriate corrective actions based upon this analysis.

OP.4-1/OFI: Because the Training Implementation Matrix (TIM) used to track training qualification at NIF does not track medical surveillance data, LLNL should consider completing the NIF initiative to populate the OSP 581.11 IWS "shells" with workers, training, and medical surveillances to ensure that supervisors can effectively ensure that workers have completed the required medical surveillances prior to being assigned to a work activity.

OP.5-1/OFI: LLNL should consider having GS Directorate safety personnel and operational managers spend more time in work spaces to mentor staff on safety issues, such as improving pre-job briefings (e.g., less repetitive), industrial ergonomic concerns, housekeeping, and the value of the pre-job briefings and task IWSs in controlling workplace hazards.

Noteworthy Practices:

OP.1-1/NP: As part of the LLNL work release process, Site 300's implementation of the plan-of-the-day (POD) mechanism is noteworthy in that the spreadsheet is well developed and easy to understand; the presentation style for the meeting and the resulting documentation are simple and effective; the appropriate levels of management and supervision are present for the meetings; and the emergent work approval process is both comprehensive and efficient.

OP.3-1/NP: The Operations and Business Directorate uses a formal and systematic work release process to ensure that facility managers are aware of work to be performed in their facilities and that appropriate controls have been established for facility hazards that may be encountered.

4.2 Management (MG)

The review of management included two CRADs:

- Management processes for identifying and prioritizing specific mission discrete tasks, mission process operations, modifications, and work items operations (MG.1). This CRAD was evaluated by sampling management processes from the same five LLNL directorates identified in Section 4.1.
- Assessment and feedback processes (MG.2). This CRAD evaluated institutional processes and their implementation at selected directorates. In a related effort, HSS reviewed the adequacy of LLNL in addressing corrective actions for findings from the 2007 Independent Oversight inspection.

For the first CRAD, HSS determined that the management objective was met. HSS also determined that all subordinate criteria were met.

LLNL has established and implemented an integrated process to identify and prioritize specific mission discrete tasks, mission process operations, modifications, and work items. At the institutional level, mechanisms such as the LLNL Budget Planning and Execution Process provide the appropriate requirements. At the activity level, ES&H Manual Document 2.2, *LLNL Institution-Wide Work Control Process*, describes the LLNL activity/task-level approaches to ensure that discrete tasks, process operations, modifications, and work items receive the appropriate prioritization during planning and scheduling. Several institutional and facility-specific documents provide clear assignments of roles and responsibilities for scheduling and prioritization of mission discrete tasks, mission process operations, modifications, and work items. These processes were effectively implemented at all the directorates reviewed.

For the second management CRAD, HSS determined that the management objective was partially met. HSS also determined that three subordinate criteria were met, while three others were partially met.

LLNL has implemented the assessment and feedback mechanisms described in the ISMS Description and in the contractor assurance system. Many new processes and strategies for safety assurance have been developed over the past two years. LLNL is establishing more structured processes for planning and conducting assessments, and the functionality and features of the Issues Tracking System (ITS) have been substantially enhanced. Additionally, many assurance system elements are being adequately performed, including internal independent assessments, resolution of employee concerns, performance metrics, sharing of lessons learned, and occurrence reporting.

The Laboratory is on a path to improved and effective assurance system performance, but senior management attention is necessary to ensure that assurance processes are adequately implemented. Most assurance system elements are not yet fully mature, and there are a number of continued weaknesses and opportunities for improvement. Although substantial resources have been devoted to process development and rollout, management attention has not been sufficient to ensure that assurance system elements are implemented in a compliant and effective manner that achieves management expectations and provides management with accurate process and performance evaluations. The planning and performance of management self-assessments needs strengthening; trending, documentation, and management of issues need improvement; and investigations of occupational injuries and illnesses associated with work activities need to better address ISMS work control elements.

HSS's review of the LLNL corrective actions for the 2007 Independent Oversight inspection findings indicates that progress has been made in a number of areas. As discussed in the nuclear safety review report, LLNL has addressed many of the findings or has initiatives in place to address them. Improvements have also been made in various aspects of hoisting and rigging programs, radiation protection programs, construction requirements, activity-level maintenance work processes, issues management processes, and injury and illness investigation and reporting processes. However, some of the corrective actions have not been fully effective in addressing the entire scope of the finding and preventing recurrences. For example, insufficient specificity in some maintenance IWSs's controls and the ineffectiveness of some training of maintenance craft workers have resulted in some instances of work control deficiencies or observed unsafe work practices. Further, some of the effectiveness reviews performed by LLNL were not sufficiently rigorous to identify continued deficiencies and sometimes did not include observations of work activities or review of performance documentation to determine whether process and training enhancements were effective in preventing recurrences.

Issues - Findings:

MG.2-1/F: LLNL has not performed timely, quarterly analyses of events as required by DOE Manual (M) 231.1-2, *Occurrence Reporting and Processing of Operations Information.*

MG.2-2/F: LLNL issues management procedures are not effectively implemented so that issues are accurately documented, issue types are properly classified, and causes are identified and addressed, and so that effectiveness reviews, when performed, accurately determine whether corrective actions have been fully effective in addressing the issue as required by DOE Order (O) 226.1A, *Implementation of Department of Energy Oversight Policy*, and LLNL PRO 0042, *Issues and Corrective Action Management.*

MG.2-3/F: The investigation and corrective and preventive actions for occupational injuries and illnesses have not been sufficient, in many cases, to ensure that causes are adequately identified and appropriate corrective actions and recurrence controls established and implemented as required by DOE O 226.1, *Implementation of Department of Energy Oversight Policy*, and LLNL ES&H Manual Document 4.5, *Events: Notification, Analysis, and Reporting.*

Issues - Weaknesses:

MG.1-1: The use of the risk criteria in the Facilities and Infrastructure (F&I) *Work Control Manual* results in much of the maintenance work performed by F&I being assigned a lower risk category than specified by Document 2.2.

MG.2-1/W: LLNL organizations have not implemented a robust, credible, risk-based management self-assessment program that includes a formal, structured, risk-based process that identifies activities, facilities, processes, management systems, risk levels, and prior performance/events; prioritizes these elements; and produces rigorous self-assessments that evaluate processes and performance and drive continuous improvement.

MG.2-2/W: Although the LLNL issues management procedure requires that, for significance category 3 issues, issue owners conduct an apparent cause review and develop corrective actions that address the identified causes, it does not require the documentation of the analysis results.

MG.2-3/W: Implementation of the LLNL lessons-learned program does not sufficiently demonstrate that external operating experience data is sufficiently screened, evaluated by subject matter experts (SMEs), and applied to safety processes when appropriate.

Opportunities for Improvement:

MG.2-1/OFI: LLNL should consider prioritizing the establishment of an independent quality review process to provide feedback to personnel performing, reviewing, and approving assessments.

MG.2-2/OFI: LLNL should consider clarifying the responsibilities of functional area managers and requiring annual reports on the health of their processes and implementation.

MG.2-3/OFI: LLNL should consider evaluating whether repetitive deficiencies related to pressure system device testing and data accuracy, IWS training, and read-and-sign requirements warrant further analysis as institutional issues.

MG.2-4/OFI: LLNL should consider reviewing data analysis processes and revising as necessary to ensure that screening identifies high frequency issues, consistently from review period to period and/or within a single period.

MG.2-5/OFI: LLNL should consider enhancing the effectiveness of Operations Review Board (ORB) reviews by providing management input and feedback on cause determinations, corrective actions, recurrence controls, and closure information and by including a sampling review of significance category 3 issues.

MG.2-6/OFI: LLNL should consider revising the Laboratory Operating Experience procedure to detail the requirements and process steps for the site operating experience/lessons-learned program and coordinator screening, analyzing, and disseminating externally-generated lessons learned.

MF.2-7/OFI: LLNL should consider issuing a formal Laboratory-level procedure detailing the requirements and processes for establishing and communicating performance metrics.

4.3 Subject Matter Expert and Focus Areas

The review of the SME CRADs and related focus areas evaluated two LLNL programs:

- Radiation Protection Program (SME.1). The review included an assessment of the institutional radiation protection program (RP.1), which is discusses in Attachment 1.
- Industrial Hygiene Program (SME.2). The review focused on the workplace exposure assessment program for non-radiological hazards, which is discussed within SME.2.

For the radiation protection CRAD and program, HSS determined that the management objective was met. HSS also determined that the subordinate criteria were met, although one of the subordinate criteria relies on the application of compensatory measures to compensate for the overly broad IWSs, which do not allow for the proper analysis of radiological hazards and delineation of controls for all work authorized by the IWS.

Radiological work planning requirements are appropriately delineated in the LLNL ES&H Manual. There is appropriate engagement of radiological SMEs in the planning of radiological work through the IWS or work permit process, and controls are developed in written work authorizations and/or technical work documents approved by the Hazards Control Organization.

Roles and responsibilities for the various elements of the Radiological Control Organization, including the Radiation Safety Section, and ES&H Teams are well defined and understood. Radiological staff qualifications and training are of high caliber, and generally adequate mechanisms are in place to effect radiological protection feedback and improvement. The radiation safety program (RSP) has adequate resources to ensure the safety of workers, the public, and the environment.

However, some radiological work authorizations produced by ES&H Teams are deficient in analysis of radiological hazards and specification of controls. This deficiency is partly attributable to the overly broad scope and span of control of some IWSs and insufficient implementing procedures and training for health physicists to define minimum content and format expectations for radiological work authorizations.

In addition to the review of the radiation protection CRAD, HSS reviewed the current design and implementation of RSP elements that are necessary to support the planning and conduct of radiological work. The LLNL RSP is undergoing various improvement initiatives as a result of past assessments and the recent contract change at the Laboratory. LLNL has taken steps to strengthen many aspects of the program, including a recent realignment of institutional requirements in accordance with the DOE Radiological Control (Radcon) Standard. However, the Laboratory recognizes that many challenges remain and further action is needed to ensure fully effective performance. Many of the initiatives and changes discussed above have not been in place long enough to assess their effectiveness in resolving previously identified weaknesses. HSS identified continuing vulnerabilities in two key program elements that have the potential to hinder the ability to ensure effective application of radiological control requirements and commitments. First, less than sufficient clarity and contractual alignment of some institutional requirements with the DOE Radcon Standard resulted in some instances of ineffective application of radiological controls. Second, implementing procedures were not sufficient to ensure flowdown of radiological protection requirements to the working level. HSS provided recommendations to address these vulnerabilities to NNSA, LSO, and LLNL management for their consideration.

For the IH CRAD and program for workplace monitoring, HSS determined that the management objective was met. HSS determined that four of the subordinate criteria were met, while two others were not fully met.

There are a number of established mechanisms for involving IH in the identification and analysis of hazards and development and implementation of controls in the work control process. At the institutional level, the IH Section of the Hazards Control Department (HCD) is responsible for the development and documentation of controls in the LLNL ES&H Manual that address a wide range of worker exposure hazards, such as heat stress, lead, beryllium, and other hazardous materials. At the facility level, IH is in the process of conducting IH facility surveys or baseline hazard assessments for each of the LLNL facilities/buildings that have potential workplace exposure hazards. At the work activity level, each IWS is evaluated by LLNL ES&H Teams for potential workplace exposure hazards.

Although progress in workplace exposure assessments at both the work activity level (i.e., IWS level) and the facility level (i.e., IH facility surveys) is evident, much remains to be done, particularly at the IWS activity level, to develop and/or implement mechanisms to ensure the appropriate hazard controls have been implemented prior to performing work. 10 CFR 851 requires the performance of baseline exposure assessments and periodic updating of these assessments based on risk. The IH facility survey program was initiated in 2008 to satisfy this

requirement. However, the IH facility survey program is a new program, and many buildings have yet to have a completed IH facility survey. 10 CFR 851 also requires the assessment of worker exposures to chemical, physical and biological hazards through appropriate monitoring and documentation of these assessments using recognized exposure assessment methods. LLNL IH developed a process and procedure for conducting and documenting such a review on a Hazard Assessment Worksheet (HAW), which is required for each work activity or for each IWS at a minimum. However, this process is dated, does not reflect changes in the IWS process during the past two years, and is infrequently used by IH personnel during IWS reviews. Unlike the IH facility baseline survey program, the plan for updating, automating, and implementing the HAW for all IWSs has not been developed, and the resources for completion of this task have yet to be defined and allocated.

Issues - Findings:

SME.1-1/F: The radiological work authorization process (IWSs, work permits, etc.) has not always ensured that radiological hazards are fully analyzed and controls clearly identified, tailored to specific work, and conveyed to workers prior to releasing work, as required by Documents 2.2, 20.1, 20.2 and 10 CFR 835.

SME.2-1/F: The IH workplace exposure assessment program for assessing and documenting workplace exposures in LLNL plant areas (i.e., facility baselines) and work activities (i.e., IWS activities) is a work in progress and has not been sufficiently planned and/or implemented to fully meet the workplace exposure assessment requirements of 10 CFR 851.

Opportunities for Improvement:

SME.1-1/OFI: LLNL should consider revising the RSP to establish requirements to ensure that workers receive an initial formal briefing on radiological hazards and controls before being allowed to work under a radiological IWS. LLNL should also consider establishing provisions for radiological briefings following revisions to an IWS and periodically for long-term IWSs.

SME.1-2/OFI: LLNL should consider instituting a Radiological Awareness Reporting system as suggested in the DOE Radcon Standard to enhance workforce awareness, encourage continuous evaluation and improvements, track resolution of concerns, provide feedback to employees, and post results and trends.

SME.2-1/OFI: LLNL should consider developing a plan for updating, automating, and implementing the LLNL HAW for all IWSs that identifies the resources and schedule for completion of this task.

RP.1-1/OFI: Consider revising institutional requirements associated with IWSs to consolidate requirements and better align with the DOE Radcon Standard, especially with regard to minimum content and detail for IWS radiological controls. Ensure the development of implementing procedures to support the flowdown of these requirements.

RP.1-2/OFI: Consider establishing a subordinate radiological work authorization to be used and referenced when the IWS scope and span of control are too broad to define specific radiological controls. With such an authorization system, consider ensuring that existing hold points or language to contact a health physicist are replaced with a clear IWS limiting condition and instruction to request health physics (HP) to create the subordinate radiological work authorization with tailored controls, which would then become part of the IWS record.

RP.1-3/OFI: Consider evaluating approaches that can be implemented to ensure an appropriate level of health and safety technician job coverage and the performance of radiological monitoring to supplement routine survey frequencies. Based on such evaluations, consider identifying revisions to the ES&H Manual and incorporating provisions for requiring job coverage requirements and associated monitoring by health and safety technicians into procedures for developing IWSs, consistent with the intent of the DOE Radcon Standard.

RP.1-4/OFI: Consider prioritizing development of a field operations procedure governing development of radiological work authorizations with sufficient instruction to health physicists on radiological expectations, including required technical content and format, as well as clear expectations as to the level of detail needed to properly address each required element. Consider development of a writers guide to expand on minimum expectations as appropriate.

RP.1-5/OFI: Consider benchmarking other DOE sites for information related to effective radiological work authorization systems and/or radiological work control mechanisms.

RP.1-6/OFI: Consider performing a review of existing and planned HP procedures against DOE guidance (e.g., DOE G 441.1-1C) and developing a list of additional areas of need. As appropriate, consider establishing a schedule to develop needed procedures, as well as revisions to existing procedures.

RP.1-7/OFI: Consider adding a Radiological Work Planner position responsible to support to the ES&H Team Health Physicists. Such a position could provide institutional oversight and assistance in radiological work planning and be responsible for review and oversight of all IWSs, with a focus on consistent definition of radiological controls across LLNL.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The results of the review indicate that LLNL has met the Phase II functional area objectives for the relevant CRADs, with the exception of the management objective that addresses the LLNL assessment and feedback systems. HSS also determined that most of the subordinate criteria were met. However, a few criteria in operations, IH, radiation protection, and assessment and feedback were not fully met.

Overall, LLNL has improved its processes, and has developed many adequate ISMS processes and implements them effectively. LLNL management recognizes that some processes are relatively new and warrant continued management attention to ensure that they are effectively implemented and sustained.

It is recommended that the LSO Manager perform limited-scope follow-up reviews of the weaknesses identified in this report to provide additional support for decisions about approval of the LLNL ISMS program, with a particular focus on assessment and feedback systems, IH workplace exposure assessments, radiological work authorizations, and broad IWSs.

6.0 LESSONS LEARNED

Several lessons were learned during this review that may be helpful for future reviews.

- The use of an HSS team to support an LSO ISMS verification process was effective in providing a detailed review of selected aspects of the LLNL ISMS and allows LSO managers

and safety professionals to continue to focus on their day-to-day responsibilities and improvement initiatives.

- HSS personnel benefited from the leadership of the experienced ISMS Phase II safety manager, who had led various ISMS reviews and was designated by LSO to provide guidance to the HSS team and coordinate interfaces with LSO and LLNL as needed.

7.0 APPENDICES

7.1 Acronyms

AB	Authorization Basis
AC	Alternating Current
AD	Associate Director
ALARA	As Low As Reasonably Achievable
AI	Authorizing Individual
AIHA	American Industrial Hygiene Association
AMTS	Assistant Manager Technical Services
CAO	Contractor Assurance Office
CAP	Corrective Action Plan
CAR	Case Analysis Report
CAS	Contractor Assurance System
CE	Core Expectation
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CRAD	Criteria and Review Approach Document
CSM	Configured System Manager
CY	Calendar Year
DAP	Discipline Action Plan
DOE	U.S. Department of Energy
DPAD	Deputy Principal Associate Director/Directorate
DSA	Documented Safety Analysis
DTL	Designated Team Leader
DTR	Designated Team Leader
DWTL	Daily Work Team Lead
EAS	ES&H Assessment Services
ES&H	Environment, Safety, and Health
ESH	Environment, Safety, Health
FA	Functional Area
FAM	Functional Area Manager
F&I	Facilities and Infrastructure
FLIP	Facility and Laser Integration Project
FM	Facility Manager
FPOC	Facility Point of Contact
FR	Fire Resistant
FSP	Facility Safety Plan
FWP	Facility Work Permit
FY	Fiscal Year
GS	Global Security
HAC	Hazard Assessment and Control Form

HAW	Hazard Assessment Worksheet
HCD	Hazards Control Department
HE	High Explosive
HEPA	High Efficiency Particulate Air
HP	Health Physics
HP-DAP	Health Physics Discipline Action Plan
HPI	Human Performance Improvement
H&S	Health and Safety
HS-64	Office of Environment, Safety and Health Evaluations
HSS	Office of Health, Safety and Security
HVAC	Heating, Ventilation, and Air Conditioning
IAOD	Independent Audit and Oversight Department
IAP	Institutional Assessment Plan
IH	Industrial Hygiene
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
ITS	Issues Tracking System
IWS	Integrated Work Sheet
JHA	Job Hazards Analysis
JLF	Jupiter Laser Facility
LLNL	Lawrence Livermore National Laboratory
LOTO	Lockout/Tagout
LSI	Light Science and Industry
LSO	Livermore Site Office
LTRAIN	Livermore Training Records and Information Network
MG	Management
M&O	Management and Operating
MOVI	Management Observations, Verifications, and Inspections
MSDS	Material Safety Data Sheet
MTOS	Machine Tool Operation Safety
MTS	Machine Tool Services
MUSD	Maintenance Utilities Services Department
NFPA	National Fire Protection Association
NHZ	Nominal Hazard Zone
NIF	National Ignition Facility
NMTP	Nuclear Materials and Technology Program
NNSA	National Nuclear Security Administration
OP	Operations
OPF	Optics Processing Facility
ORB	Operations Review Board
ORPS	Occurrence Reporting and Processing System
OSHA	Occupational Safety and Health Administration
PAD	Principal Associate Director/Directorate
PAS	Passive Air Sampling
PCU	Power Conditioning Unit
PE	Plant Engineering
PEP	Performance Evaluation Plan
PLS	Physical and Life Sciences
PM	Preventive Maintenance
POD	Plan of the Day
POSS	Polyhedral Oligomeric Silsequioxane

POW	Plan of the Week
PPE	Personal Protective Equipment
PS	Photon Science
PTHA	Pre-Task Hazard Analysis
PWS	Procured Work Sheet
QA	Quality Assurance
Radcon	Radiation Control
RBA	Radiological Buffer Area
RCT	Radiological Control Technician
R&D	Research and Development
RHWM	Radioactive and Hazardous Waste Management
RI	Responsible Individual
RPP	Radiation Protection Program
RSP	Radiation Safety Program
RSS	Radiation Safety Section
SAC	Specific Administrative Control
SEG	Similar Exposure Group
SME	Subject Matter Expert
SPA	Safe Plan of Action
SSM	Subsystem Manager
S&T	Science and Technology
TIM	Training Implementation Matrix
TIP	Task Identification Process
TRED	Technology Resources Engineering Division
TSR	Technical Safety Requirement
WAL	Work Authorization Level
WAP	Work Authorization Point
WCC	Work Control Center
WCO	Work Control Officer
WCI	Weapons and Complex Integration
WPRI	Work Permit Responsible Individual

7.2 Assessment Forms and Attachments

LLNL ASSESSMENT FORM

FUNCTIONAL AREA:	OBJECTIVE:	OBJECTIVE MET: YES X NO ___
Operations - Weapons and Complex Integration (WCI) Directorate	OP.1 **DATE:**	

OBJECTIVE

OP.1 The WCI Directorate has implemented the LLNL ISMS Description to effectively plan, authorize and execute the identified work for the facility or activity such that:

- The full spectrum of hazards associated with the work they perform is identified, analyzed, and categorized.
- Controls are developed to mitigate the identified hazards within a facility or activity.
- Controls selected ensure adequate protection of the public, worker, and environment.
- Clear and unambiguous roles and responsibilities are defined and maintained at all levels within the facility or activity.
- Managers at all levels demonstrate a commitment to ISMS through policies, procedures, and their participation in the process.
- Line managers are responsible and accountable for safety.
- Facility or activity personnel are competent commensurate with their responsibility for safety.

(CE II-2, CE II-3, CE II-4, CE II-6)

CRITERIA

1. Mechanisms are utilized by personnel to ensure hazards associated with the work have been identified, analyzed, and appropriate controls selected. The resulting documentation is complete, and meets DOE expectations. The execution of these mechanisms ensures that all necessary personnel (e.g., ES&H professionals, workers, line management, QA) are integrated at the activity level to ensure hazards are fully analyzed and appropriate controls developed. These mechanisms ensure direction and approval from line management and integration of the requirements. (DOE-HDBK-3027-99, DOE M 450.4-1)

2. Mechanisms are utilized to develop, review, approve and maintain current all elements of the facility authorization basis documentation (and work planning and control process) in accordance with the LLNL ISMS Description and 10 CFR 830 for nuclear facilities. (DOE-HDBK-3027-99)

3. Mechanisms are in place to effectively and accurately implement all aspects of the authorization basis. (DOE-HDBK-3027-99, DOE M 450.4-1)

4. Roles and responsibilities within the facility or activity are clearly defined, understood, and consistent with the LLNL ISMS Description to ensure that safety is maintained at all levels. Personnel are held accountable for properly accomplishing their assigned responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

5. Mechanisms are in place that ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

6. Mechanisms are utilized to confirm that the facility or activity and the operational workforce are in an adequate state of readiness prior to authorizing the performance of the work in accordance with the LLNL ISMS Description and DOE requirements for nuclear facilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

7. Workers actively participate in the work planning process. (DOE-HDBK-3027-99)

8. Line managers periodically take steps to reinforce safety, including personal visits and walkthroughs to verify that their expectations are being met. (DOE M 450.4-1)

9. Facility operations personnel maintain awareness of all facility activities to ensure compliance with the established safety envelope. (DOE M 450.4-1)

10. Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented. There is evidence that feedback and improvement information is reviewed and used to improve future work performance in appropriate cases. (MG.2 CRAD Criteria 2)

APPROACH

Records Reviewed:

- Program Description Document, *Integrated Safety Management System,* WSH-PDD-001-06, September 1, 2009.
- *LLNL Institution-Wide Work Control Process Requirements Document*, LLNL-AM-405814, Revision 0, July 30, 2008
- ES&H Manual Document 2.1, *General Worker ES&H Responsibilities,* Implementation Date May 13, 2009
- ES&H Manual Document 2.2, *LLNL Institution-Wide Work Control Process,* Implementation Date July 29, 2009
- *Tier 3 Safety Basis Document for the Physical & Life Science Site 300 Facility*, Revision 0, Change 1, June 2009
- ES&H Manual Document 51.1, *Documented Safety Analysis Program Plan*
- ES&H Manual Document 3.1, *Nonnuclear Safety Basis Program*
- Facility Safety Plan B Division Site 300, FSP-S300.1, Revision 4.1, November 19. 2007
- IWS *High Explosives Pressing – Hot Isostatic,* October 12, 2009
- IWS *High Explosives & Mock Machining,* September 3, 2008
- Site 300 Plan of the Week, October 19 – 23, 2009
- Site 300 Plan of the Day, October 19, 2009
- Lebond (L-485) Safety and Operators Manual
- Isostatic Pressing Log Book
- Isostatic Pressing Checklist
- DOE Explosive Safety Manual Waiver, LLNL Waiver Number 08-20, *Explosive Cart Brakes,* December 1, 2008
- WCI Procedure, *Facility Walkaround Procedure,* WCI-FWP.1, August 2009
- *Plan of the Day 10/20/09 – Exceptions* for the East and West Firing Areas
- *B-851 MK81 Series Crosswalk*, Revision 3, 10/20/2009
- Hazard Assessment and Control Form, *Firing tables and support areas,* September 8, 2009

- *Bunker 851 Mustering and Firing Checklist,* B/S-95-023, Revision 2, March 23, 2009
- *Balloon Setup,* B/S300-09-008, Revision 1
- IWS 15224, Revision 5, *Site 300 Firing Bunkers Experiment Tasks,* October 1, 2009
- *Superblock Work Control Manual,* December 2008
- WCI *Facility Walkaround Procedure,* WCI-FWP.1, August 2009
- RHWM Work Permit *Instructions for Work Permit Form,* WTG 0010 Instructions, Expiration June 10, 2012
- RHWM Work Permit, *Decon and recovery of Room 1023,* B695-09-W-044, July 29, 2009
- RHWM Work Permit, *Decon and recovery of Room 1023,* B695-09-W-143, October 20, 2009
- RHWM Procedure DIS 110, *Performing Lab Pack Operations,* Revision 7, August 17, 2009
- RHWM Waste Treatment Technician Training Plan, September 2009
- *TSR Daily Inspection Log for the Waste Storage Facilities and B696S*, SDF0070, Expiration January 23, 2012
- *Daily Inspection Log for Building 695*, WTG 0024, Expires January 24, 2011
- STO 104, *S&D General Operating Procedures*, Rev. 17, August 18, 2009
- LTRAIN Overdue Training and Training Due in 90 Days Reports for two RHWM Laboratory Waste Pack Technicians
- *Documented Safety Analysis for the B695 Segment of the Decontamination and Waste Treatment Facility*, June 2007
- *Documented Safety Analysis for the B695 Segment*, LLNL-TR-407067 Rev. 0, February 2009 [Effective DSA/TSR Annual Update Implementation November 4, 2009]
- *Technical Safety Requirements for the B695 Segment of the Decontamination and Waste Treatment Facility*, UCRL-TR-234416, Rev. 1, February 2008
- *Technical Safety Requirements for the B695 Segment*, LLNL-TR-407062 Rev. 0, February 2009 [Effective DSA/TSR Annual Update Implementation November 4, 2009]
- *Documented Safety Analysis for the Waste Storage Facilities*, LLNL-TR-404821, June 2008
- *Technical Safety Requirements for the Waste Storage Facilities*, LLNL-TR-404757, June 2008
- LSO *Safety Evaluation Report for the B695 Segment Annual Update*, dated June 2009
- *LLNL Nuclear Facilities/Activities Safety Basis Documents – RHWM* - Includes Safety Basis changes effective through October 2, 2009 (Updated October 13, 2009)
- TSR Implementation Plan, February 2009 B695 Segment DSA/TSR Annual Update, Revision 0, October 7, 2009, Implementation Date November 4, 2009
- Various letters and memorandums between LSO and LLNL regarding AB document revisions, modifications, approvals, and implementation.
- *B695 Segment Technical Safety Requirements Implementation Crosswalk*, January 11, 2008
- RHWM Procedure STO 111, *Combustible Loading Determination,* Revision 2, October 29, 2008
- *Weekly Inspection Log for B696R Radioactive Waste Storage Area & Associated Yards*, SDF0036, Expiration Date May 8, 2012
- ES&H Manual Part 51, Safety Analysis, Limits, and Authorization, September 9, 2009.
- *Weekly Inspection Log for Building 695 S/TUG*, WTG 0028, Expiration Date June 16, 2012
- IWS 10432.21, *Operations Covered in the FSP for Waste Storage Facilities and B696S*, Aug 20, 2009
- IWS 12352.03, Revision 9, *Use of fall protection, ladders, and scaffolds,* October 24, 2008
- IWS 414.08, Revision 10, *(IMD-RIG) TRADE/SERVICE – Rigging Activities,* June 18, 2009
- HP-DAP instruction for RHWM, *Transportation Survey of Vehicles,* HP-DAP-TEMPLATE Rev 5.5 (02/17/2009)

Interviews:

- Deputy Principal Associate Director (PAD), WCI
- Site 300 Manager
- High Explosive (HE) Machinist and Responsible Individual for the HE machining IWS
- HE Machinist
- HE pressing technicians (2)
- Site 300 Work Control Coordinator
- WCI B Division Primary Nuclear Design Operations Manager
- DOE LSO Facility Representative
- Primary Investigator for the MK81 series of experiments
- Explosives handler
- Table Supervisor
- Ramrod
- Table Operator
- RHWM Facility Manager
- NMTP Safety and Work Control Manager
- RHWM Senior Technician
- RHWM Waste Treatment Group Lead Technician
- RHWM Waste Technician (Clean Harbor Contractor)
- RHWM Disposal Operations Supervisor
- RHWM Laboratory Waste Pack Technicians (2) (Clean Harbor Contractors)
- Nuclear Materials and Technology (NMTP) AB Manager
- RHWM Lead Safety Analyst
- RHWM Waste Technician
- ES&H Team Support (2)
- Rigger (Forklift Driver)

Observations:

- Site 300 Plan of the Day Meetings
- HE part machining
- Walkthrough of HE billet manufacture (baking and hot isostatic pressing operations)
- Preparation for and execution of open air detonation of conventional ordnance at B-851
- RHWM Plan of the Day meetings
- RHWM decontamination activity pre-job brief
- RHWM Plan of the Week meeting
- RHWM Building Rounds
- RHWM Laboratory Hazardous Waste Repackaging
- Low-Level Waste Shipment Survey and Certification (Nevada Test Site Shipment of Sea-Land Container)

DISCUSSION OF RESULTS

1. **Mechanisms are utilized by personnel to ensure hazards associated with the work have been identified, analyzed, and appropriate controls selected. The resulting documentation is complete, and meets DOE expectations. The execution of these mechanisms ensures that all necessary personnel (e.g., ES&H professionals, workers,**

line management, QA) are integrated at the activity level to ensure hazards are fully analyzed and appropriate controls developed. These mechanisms ensure direction and approval from line management and integration of the requirements. (DOE-HDBK-3027-99, DOE M 450.4-1)

ES&H Manual Document 2.2, *LLNL Institution-Wide Work Control Process*, is the governing document for work control within WCI, and IWSs or equivalent documents are the primary activity level documents providing documented hazard analysis and control identification for most of the observed activities. During this verification, LLNL was in the process of implementing task based IWS improvements that better divide activities into discrete tasks. HSS reviewed both old and new style IWSs. Division or organization specific work control tools were also used to supplement IWSs or as an approved alternative to the IWS process. Site 300 uses scripts to summarize tasks specific to a particular activity such as shots. The scripts contain crosswalks to link applicable hazards and specific controls to a particular task. For example, the observed Site 300 shot script specified specific tasks and listed the hazards, a summary of the controls, and the location of the specific controls (i.e., a reference to the section number in the HAC, IWS, or FSP). RHWM is transitioning to a system of work permits to supplement IWSs for tracking purposes and, for higher hazard activities, to provide a team based hazard analysis process involving all affected parties including the appropriate ES&H disciplines. For example, the RHWM work permit for decontamination and recovery of B695, room 123, generally addressed the appropriate controls for the observed hazards (although a few discrepancies indicate that continued improvement in rigor is needed as the transition to work permits continue). Finally, for both Site 300 and RHWM, procedures and checklists are used for many specific activities and provide the appropriate specificity for many activity level hazards and controls. For example, procedures and checklists during the B-851 shot were appropriate for the activities, and workers performed them effectively. For the observed activities within WCI, the IWSs and/or the division or organization-specific work control tools such as work permits and procedures adequately addressed the major hazards.

Although most hazards in the observed work were appropriately addressed, many of the reviewed IWSs covered broad work scopes, and there was evidence that not all hazards and controls were specifically addressed for each activity described in the work scopes. Further, in many cases, the stated scopes of work did not provide adequate descriptions to ensure the bounds of allowed and analyzed work would not be exceeded. The *LLNL Institution-Wide Work Control Process Requirements Document* states in its definition of a task description that it "effectively communicates to the workers what they allowed to do and the boundaries of the authorized work activity." Requirement 3.1.3 specifically states that "the work scope boundaries/limits are clearly identified." Examples where the work description did not adequately bound the work or failed to provide adequate controls include the following: **(OP.1&2A-1/W)**

- The IWS description for the HE pressing included storage of chemicals in chemical storage areas, without any limitation of the types of chemicals allowed. As written, storage of essentially any type of hazardous chemicals is authorized by the IWS.
- The IWS for HE machining addressed use of oils and lubricants, but in the observed machining activity, a machinist used Starrett M-1 all-purpose lubricant to clean a machining tool and the IWS controls were not specific for this chemical. Although the material safety data sheet (MSDS) for this chemical calls for nitrile (buna-n) gloves and Occupational Safety and Health Administration (OSHA) approved splash goggles, the IWS does not mention these controls for lubricants, and the technician used the chemical with bare hands to clean the tools. (The IWS does require nitrile gloves for solvents such as alcohols). As written and approved, the IWS authorizes use of any type of lubricant (including potentially hazardous lubricants) without further hazard analysis.

- In the IWS for RHWM laboratory waste repackaging, the activity description and associated hazard descriptions address a broad range of chemical handling and processing, such as stabilization of peroxide-forming and polymerizable compounds, sampling or repacking beryllium, and routine handling of a wide variety of toxic chemicals; however, the controls are not tailored to the activity in the IWS. For example, several controls require the workers to "contact the ES&H Team Industrial Hygienist to determine the need for respiratory protection if any exposure is anticipated." Anticipated exposures should be a part of the hazard identification analysis process, not a control. For other tasks, the control states that other types of personal protective equipment (PPE) than what is specified may be needed on a case-by-case basis, but does not provide the requisite hazard analysis. For the laboratory repackaging activity, many of the appropriate boundaries and controls are outlined in the referenced procedures; however the boundaries are not adequately prescribed in the IWS, which is the document used to authorize work. Although the approved IWS for this activity has not been converted to the new task based process, the new draft of the IWS for this process already has ES&H concurrence and the same type of concerns are evident.
- The IWS for the observed low-level waste shipment did not include a required control from the Health Physics Discipline Action Plan (HP-DAP). The HP-DAP requires vehicles loaded with radioactive material packages to have the wheels chocked or otherwise secured. ES&H Manual Document 2.2 requires work packages (i.e., the IWS, IWS/Safety Plan, or its equivalent, plus supporting documents) to clearly identify the task and work-area-related hazards and associated controls. In this case, this requirement was not addressed in the applicable IWS (IWS 10432.21, *Operations Covered in the FSP for Waste Storage Facilities and B696S*), and the wheels were not chocked.

The above cases were a mix of the old and new style IWSs. In some cases, the old-style IWS was the approved version, but in these cases, drafts of the newer-style task-based IWSs were in the computerized system and had already been reviewed with concurrence by ES&H at the time of this review. Although the newer IWSs showed some improvements, most of the above examples remained in new drafts. **(OP.1&2A-1/W)**

The Hazard Assessment and Control forms (HACs) are used in some cases in WCI to further define hazard controls, particularly PPE when respirators are used. In the observed activities within WCI, HACs provided adequate controls for the identified hazards; however, in two cases at Site 300, established HAC controls were not strictly enforced. For example, although the use of safety glasses is required by the HAC, this requirement was not enforced and several people did not wear safety glasses. In another example, the HAC requires anyone doing hands-on work to be in coveralls, but one person who was in street clothes was performing such activities as mirror alignments and shape charge placement. Following these observations, facility and B Division management took prompt action to address these isolated observations in the post-shot critique.

This criterion was not fully met. Although the mechanisms for activity level hazard analysis and control are in place in the current work control system, the number of broad based scopes of work and missed or inadequate controls in many of the reviewed new task based IWSs indicate that implementation still does not meet the portion of the criterion that requires ensuring that all activity level hazards are fully analyzed and appropriate controls developed for the authorized work. **(OP.1&2A-1/W)**

2. Mechanisms are utilized to develop, review, approve, and maintain current all elements of the facility authorization basis documentation in accordance with the LLNL ISMS Description and 10 CFR 830 for nuclear facilities. (DOE-HDBK-3027-99)

ES&H Manual Document 51.1, *Documented Safety Analysis Program Plan*, provides the overarching process for documenting the safety basis for hazard category 2 and 3 nuclear facilities and operations. This document provides detailed mechanisms used to develop, review, approve, and maintain current all nuclear documented safety analyses (DSAs) and technical safety requirements (TSRs), including submissions to LSO. The two approved DSAs and TSRs for RHWM and associated modifications and amendments were maintained in accordance with the requirements of the chapter. The DSA annual updates were current, and progress toward the next annual update for each DSA was on schedule.

The overall process for the development, use, and maintenance of non-nuclear facility safety analyses is described in ES&H Manual Document 3.1 *Nonnuclear Safety Basis Program*. The Site 300 Safety Basis Document was initially approved August 23, 2006, and a change was published in June 2009. Although a recent reorganization caused the existing document to be somewhat out of date with respect to organization ownership of the site, the June 2009 change indicates that overall, the Site 300 Safety Basis Document is being kept up to date.

The criterion was met.

3. Mechanisms are in place to effectively and accurately implement all aspects of the authorization basis. (DOE-HDBK-3027-99, DOE M 450.4-1)

RHWM uses several tools to ensure that all aspects of the authorization basis are effectively and accurately implemented. First, LLNL maintains a safety basis list, agreed to by LSO, to document what specific documents specifically comprise the authorization basis. Then, institutional procedures specify the mechanisms to ensure that requirements are implemented. For example, the last annual update to the RHWM B695 Segment DSA involved some TSR changes, which were required to be implemented by November 4, 2009. For the RHWM B695 Segment update, a TSR implementation plan was approved, and a TSR crosswalk was being used to ensure that all aspects of the changes are implemented in both field documentation and in necessary training of personnel.

Another example of authorization basis implementation is the implementation of a specific administrative control (SAC) for combustion control in the RHWM *Technical Safety Requirements for the Waste Storage Facilities* (B696R). The SAC was incorporated in the latest annual update for this TSR and was fully implemented prior to this inspection. The SAC establishes a limit of an average of 7 pounds of combustible materials per square foot in the facility (excluding such items as those inside waste drums). The implementation of the SAC included a quarterly inspection requirement for the fire protection engineer, implementation of a procedure to calculate and track combustible loading, and implementation of weekly operator checks to ensure that no major changes to the combustible loading occur between the documented quarterly inspections. Considering the magnitude of the combustible material limit, significant changes to the combustible inventory between quarterly inspections that might approach the limit would be adequately identified by the operator checks.

The primary implementing mechanism for the Site 300 Safety Basis Document is the use of Facility Safety Plans (FSPs). These plans translate the limits of the document into specific controls for field implementation. For example, explosive limits are included in FSPs and are primarily enforced through explosive weight limits for rooms, operations, and individual facilities; worker training; and real time inventory postings using marker boards at each operational area. During activity observations, workers accurately implemented authorization basis weight limit controls. This also applies to the observed shot activities at B-851.

The criterion was met.

4. Roles and responsibilities within the facility or activity are clearly defined, understood, and consistent with the LLNL ISMS Description to ensure that safety is maintained at all levels. Personnel are held accountable for properly accomplishing their assigned responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

At the institutional level, roles and responsibilities for the LLNL work control process are delineated in ES&H Manual Document 2.1, *General Worker ES&H Responsibilities*; and ES&H Manual Document 2.2, *LLNL Institution-Wide Work Control Process.* Roles and responsibilities of workers and supervisors within the HE operations are clearly defined in the Site 300 AB document and the FSP. Roles and responsibilities of workers and supervisors within the RHWM are clearly defined in the associated AB documents and the FSPs. WCI workers understood their roles and responsibilities and performed work in accordance with the associated requirements. For example, interviewed workers had a detailed understanding of all aspects of their respective work control processes. Workers followed requirements as written, facility management actively held workers accountable for adhering to their roles and responsibilities, and supervision actively and appropriately intervened where improved performance or increased rigor was expected.

The criterion was met.

5. Mechanisms are in place that ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

For both Site 3000 and RHWM, IWSs include required training and the current training status of individuals named in the IWS. In addition, the Livermore Training Records and Information Network (LTRAIN) system provides real-time monitoring and reporting of training scheduling, completion, near due courses, and overdue courses as identified by workers' training plans. A sample of workers' training plans and records showed that the appropriate training was assigned for the observed work, and none of the workers were overdue in any required training.

In some cases, workers receive specific qualification for job categories. For example, Explosive Handling qualification consists of an extensive set of classroom and on the job training. All workers with direct work with the observed device were qualified explosive handlers. A similar process exists in RHWM. For example, the position Lab Pack Technicians has a specific training plan listing all the courses necessary for qualification. Any training deficiencies are reported as discussed above.

The criterion was met.

6. Mechanisms are utilized to confirm that the facility or activity and the operational workforce are in an adequate state of readiness prior to authorizing the performance of the work in accordance with the LLNL ISMS Description and DOE requirements for nuclear facilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

The Site 300 Work Control Center (WCC) is the location where work packages are submitted for release, documentation of release is maintained, and service providers may go to obtain daily release status information for Site 300 work. Site 300 holds a Plan of the Week (POW) meeting on Thursday mornings the week prior to the scheduled start of the work to discuss, resolve

potential conflicts, and authorize upcoming activities. Following the POW meeting, the Work Control Coordinator compiles the information into a spreadsheet that ultimately becomes the POW for the following work week. On this spreadsheet, each activity is given a separate entry that contains the work package identifier (IWS, PWS, etc.); Responsible Individual (RI); title of work; any restrictions, limits, or boundaries; and scheduled work days for that activity. A working version of the POW is published (via e-mail) prior to the close of business each Thursday. As implemented at Site 300, the POW is a particularly effective mechanism to plan and coordinate upcoming work. **(OP.1-1/NP)**

At the Site 300 Plan of the Day (POD) meeting, scheduled work for that day is released by the appropriate Work Control authority and notification of released work is made to the RI or designee. During the meeting, the Work Control Coordinator manages and makes real-time changes to the POW displayed on a video projector for the room to watch. All work that is scheduled each day is marked with an "X", and each scheduled activity is discussed and color coded using a predetermined color coding system (e.g., Green designates work that has been released; Blue designates previously released work that did not occur as planned or was postponed following release; Purple designates planned work that was completed early or deferred prior to release). Any changes or corrections discussed in the POD meeting are captured and added to the POW. At the conclusion of the meeting, the Work Control Coordinator prints the WCC copy of the POD and obtains signatures from the appropriate work release authorities. **(OP.1-1/NP)**

Once the POD has been issued, emergent work, identified as immediately necessary for that day, can be requested by the RI or designee. Release of emergent work is requested through the WCC. The Work Control Coordinator coordinates communications between the Facility Points of Contact (FPOCs) and the person requesting the emergent work. Once the appropriate work package and notifications have been made, the work is released, and the Work Control Coordinator adds the new activity to the POD and distributes the changes as described above. **(OP.1-1/NP)**

As part of the LLNL work release process, Site 300's implementation of the POD mechanism is noteworthy in that the spreadsheet is well developed and easy to understand, the presentation style for the meeting and the resulting documentation are simple and effective, the appropriate levels of management and supervision are present for the meetings, and the emergent work approval process is both comprehensive and efficient. **(OP.1-1/NP)**

For the HE machining activity, the workers performed only a cursory pre-job brief. Hazards were not discussed, and the discussion primarily involved a determination of what HE was being obtained from the vault. In this case, the cursory briefing was partially offset by the fact that the particular set of parts being machined were routine machining activities that had been ongoing for several days.

For the B851 shot, the pre-job brief was comprehensive. Hazards were discussed, positions were assigned, training was verified (including restricting work activities for individuals not current in training), and the evolution was thoroughly discussed.

The RHWM POD ("tailgate meetings") and POW meetings provided adequate coverage of the upcoming activities. During the POD meetings, safety topics on lessons learned from incidents at other sites led to general discussions on how to prevent similar occurrences at RHWM. RHWM supervision, ES&H team members, and workers actively participated in the discussions.

The pre-job brief for the RHWM decontamination activity thoroughly covered the hazards and controls in the work permit. The appropriate personnel were present, and workers and ES&H team members actively participated in the discussion. Suggestions for minor improvements in the process were well-received by facility management. The pre-job brief for the RHWM laboratory waste repackaging activity was conducted by the work supervisor and thoroughly covered the planned activities. The pre-job brief for the observed low level waste shipment discussed how the work was to be done and the major hazards, such as non-riggers staying back from the container during movement.

The criterion was met.

7. Workers actively participate in the work planning process. (DOE-HDBK-3027-99)

In many cases informal interviews indicate that both RHWM and Site 300 workers are actively involved in the work planning process. At Site 300, workers routinely interface with customers to ensure that desired HE products can be made within the mechanical and safety capabilities of the facilities and processes. During shot activities, workers frequently interact with the principal investigator, and it was evident that the workers were extensively involved in the planning process to ensure that the data collected during the shot was appropriate, while keeping personnel and equipment safe. At RHWM, workers are intimately involved with procedure development activities. For example, procedure upgrades for liquid waste processing involve trial runs with clean water to allow workers to validate procedures and make changes where necessary.

The criterion was met.

8. Line managers periodically take steps to reinforce safety, including personal visits and walkthroughs to verify that their expectations are being met. (DOE M 450.4-1)

The Site 300 Facility Manager is frequently out in the field, and interactions with HE workers demonstrated a close working relationship. The Facility Manager documented periodic walkthrough completions in his logbook as required by the ES&H Manual. B Division personnel were also present and closely involved with major activities, such as the observed device detonation.

The RHWM Facility Manager and team supervisors are frequently out in the facilities, and interviews indicated that these line managers maintain adequate operational awareness of facility activities. Interactions with workers were frequent and effective, and any discrepancies between expectations and actual performance were immediately corrected.

The criterion was met.

9. Facility operations personnel maintain awareness of all facility activities to ensure compliance with the established safety envelope. (DOE M 450.4-1)

At both Site 300 and RHWM, workers were knowledgeable of all activities within the facilities during observed activities. Interviewed personnel were aware of their safety envelope controls and responsibilities. For the observed activities, specific positions were assigned, and it was evident that the appropriate personnel were aware of all aspects of the evolutions at all times.

The criterion was met.

10. Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented. There is evidence that feedback and improvement information is reviewed and used to improve future work performance in appropriate cases. (MG.2 CRAD Criteria 2)

At Site 300, interviews indicated that the primary mechanism for activity-level feedback and improvement is the morning meetings. For larger evolutions such as shots, a post-job review is conducted to discuss lessons learned from the shot. For example, the post-job review for the observed shot was comprehensive, was conducted with all workers and relevant staff present, and addressed an extensive list of items needing attention. The discussion of each identified item included the observed condition, the apparent cause, the potential extent of condition, and specific action items to adequately address the problem. The items included several ES&H concerns as well as items to improve the efficiency or mechanics of shot execution.

At RHWM, the primary activity-level feedback and improvement mechanism is the feedback and improvement section of the work permits. RHWM uses these feedback and improvement sections to document items at the close of the work permits. For longer-term work permits, these sections are also used to provide interim feedback, including the need for permit revisions.

The criterion was met.

Conclusion:

The objective was met.

ES&H Manual Document 2.2, *LLNL Institution-Wide Work Control Process*, describes the LLNL activity/task level approaches to ensure hazards associated with the work have been identified and analyzed, and appropriate controls selected, and with one exception, WCI has adequately implemented this document. WCI has also implemented the LLNL institutional mechanisms to develop, review, approve, and maintain current all elements of the facility authorization basis documentation, including effective implementation of the resulting requirements within the authorization bases. The execution of these mechanisms ensures that all necessary personnel (e.g., ES&H professionals, workers, line management, QA) are integrated at the activity level and involved in the work planning process to ensure that hazards are fully analyzed and appropriate controls developed. Although a weakness remains in documenting the bounds of some authorized work (see OP.1&2A-1W), the documentation of work packages is generally complete. Roles and responsibilities within the work planning process are clearly defined and understood, and personnel are held accountable for properly accomplishing their assigned responsibilities. Mechanisms such as comprehensive training and qualification programs are in place to ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities.

LLNL has also implemented an extensive process of work approval, authorization, and release to confirm that the facility or activity and the operational workforce are in an adequate state of readiness prior to authorizing the performance of the work. At Site 300, this process has evolved into a noteworthy practice for use of the POD, morning meetings, and management of emergent work that could be used as a model for work release across the DOE complex (see OP.1-1/NP).

It was evident from interviews and work observations that operations personnel maintained awareness of all facility activities to ensure compliance with the established safety envelope, and line management was involved sufficiently to verify that their expectations were being met.

Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented through mechanisms such as post-activity reviews and use of feedback and improvement forms on work permits.

Overall, WCI has implemented the LLNL ISMS Description to effectively plan, authorize, and execute identified work.

Issues:

Weakness

OP.1&2A-1/W: In some cases, IWSs at the WCI and S&T Directorates are too broad in scope to identify hazards and controls for individual activities/experiments as required by Document 2.2, and as a result the current work control analyses have resulted in missed or insufficiently analyzed hazards and corresponding activity-level controls.

Opportunity for Improvement

OP.1&2A-1/OFI: LLNL should consider performing an assessment of activity-level definition of the scope and subsequent activity-level hazard and control identification after the transition to task based IWS has progressed and operating experience has been gained.

Noteworthy Practice

OP.1-1/NP: As part of the LLNL work release process, Site 300's implementation of the POD mechanism is noteworthy in that the spreadsheet is well developed and easy to understand, the presentation style for the meeting and the resulting documentation are simple and effective, the appropriate levels of management and supervision are present for the meetings, and the emergent work approval process is both comprehensive and efficient.

Submitted by: Signature On File Edward Stafford, Team Member	Reviewed by: Signature On File William Miller, Team Leader

LLNL ASSESSMENT FORM

FUNCTIONAL AREA:	OBJECTIVE:	OBJECTIVE MET: YES X NO __
Operations - Science and Technology (S&T) Primary Directorate – Physical & Life Sciences (PLS) Directorate	OP.2A **DATE:**	

OBJECTIVE:

OP.2: The S&T Directorate has implemented the LLNL ISMS Description to effectively plan, authorize and execute the identified work for the facility or activity such that:

- The full spectrum of hazards associated with the work they perform is identified, analyzed, and categorized.
- Controls are developed to mitigate the identified hazards within a facility or activity.
- Controls selected ensure adequate protection of the public, worker, and environment.
- Clear and unambiguous roles and responsibilities are defined and maintained at all levels within the facility or activity.
- Managers at all levels demonstrate a commitment to ISMS through policies, procedures, and their participation in the process.
- Line managers are responsible and accountable for safety.
- Facility or activity personnel are competent commensurate with their responsibility for safety.

(CE II-2, CE II-3, CE II-4, CE II-6)

CRITERIA

1. Mechanisms are utilized by personnel to ensure hazards associated with the work have been identified, analyzed, and appropriate controls selected. The resulting documentation is complete, and meets DOE expectations. The execution of these mechanisms ensures that all necessary personnel (e.g., ES&H professionals, workers, line management, QA) are integrated at the activity level to ensure hazards are fully analyzed and appropriate controls developed. These mechanisms ensure direction and approval from line management and integration of the requirements. (DOE-HDBK-3027-99, DOE M 450.4-1)

2. Mechanisms are utilized to develop, review, approve, and maintain current all elements of the facility authorization basis documentation (and work planning and control process) in accordance with the LLNL ISMS Description and 10 CFR 830 for nuclear facilities. (DOE-HDBK-3027-99)

3. Mechanisms are in place to effectively and accurately implement all aspects of the authorization basis. (DOE-HDBK-3027-99, DOE M 450.4-1)

4. Roles and responsibilities within the facility or activity are clearly defined, understood, and consistent with the LLNL ISMS Description to ensure that safety is maintained at all levels. Personnel are held accountable for properly accomplishing their assigned responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

5. Mechanisms are in place that ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

6. Mechanisms are utilized to confirm that the facility or activity and the operational workforce are in an adequate state of readiness prior to authorizing the performance of the work in accordance with the LLNL ISMS Description and DOE requirements for nuclear facilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

7. Workers actively participate in the work planning process. (DOE-HDBK-3027-99)

8. Line managers periodically take steps to reinforce safety, including personal visits and walkthroughs to verify that their expectations are being met. (DOE M 450.4-1)

9. Facility operations personnel maintain awareness of all facility activities to ensure compliance with the established safety envelope. (DOE M 450.4-1)

10. Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented. There is evidence that feedback and improvement information is reviewed and used to improve future work performance in appropriate cases. (MG.2 CRAD Criteria 2)

APPROACH

Records Reviewed:

- Program Description Document, Integrated Safety Management System, WSH-PDD-001-06, September 1, 2009
- LLNL Institution-Wide Work Control Process Requirements Document, LLNL-AM-405814, Revision 0, July 30, 2008
- ES&H Manual Document 2.1, General Worker ES&H Responsibilities, Implementation Date May 13, 2009
- ES&H Manual Document 2.2, LLNL Institution-Wide Work Control Process, Implementation Date July 29, 2009
- Tier 3 Safety Basis Document for the Physical & Life Science Site 300 Facility, Revision 0, Change 1, June 2009
- ES&H Manual Document 51.1, Documented Safety Analysis Program Plan
- ES&H Manual Document 3.1, Nonnuclear Safety Basis Program
- Physical Sciences Directorate, Linear Accelerator Facility, Building 194, Facility Safety Plan, August 2008
- EBIT Jobs Hazards Class List
- High Voltage Personnel Safety Interlock Test Procedure for B194 SuperEBIT, September 18, 2006
- Jupiter Laser Facility Overview, September 2009
- IWS 10276.04 r7 “Jupiter Laser Facility Support Operations”
- IWS 12639.01 r12 “Jupiter Laser Facility Experimental Operations
- IWS 11709.05 r14 “decoding Functional Sequences through Comparative Genomics
- IWS 14649.01 r11 “ Identify and characterize Beryllium and Beryllium Articles for Transfer from Cage 100H”
- IWS 1910.04 “Super EBIT/EBIT and Operations in Building B-194
- IWS 11667.01 r20 “Materials Characterization”
- IWS 14372 r2 “Operations in the B197/rm 1015, 1017, 1019”

Interviews:

- Various RIs within PLS for the aforementioned IWSs
- Various Authorizing Individuals (AIs) within PLS for the aforementioned IWSs
- Various Designated Team Leaders (DTLs) within PLS for the aforementioned IWSs
- Various Research Staff within PLS for the aforementioned IWSs
- Director, Jupiter Laser Facility (JLF)
- Area Facility Operations Manager, S&T PAD
- Deputy Division Leader Condensed Mater Materials Division
- Deputy Department Head, HCD
- Acting Section Head, IH
- HCD Assurance Representative
- LLNL Industrial Safety Professional
- LLNL Industrial Hygienists and Subject Matter Experts
- ES&H Team 2, Deputy Team Lead

Observations:

- Observed the performance of seven PLS research experiments/ work activities involving the seven IWSs (listed under Record Review, above) at various PLS buildings
- Observed six pre-job briefings associated with aforementioned research experiments
- Observed a Readiness Review and POD at JLF

DISCUSSION OF RESULTS

1. **Mechanisms are utilized by personnel to ensure hazards associated with the work have been identified, analyzed, and appropriate controls selected. The resulting documentation is complete, and meets DOE expectations. The execution of these mechanisms ensures that all necessary personnel (e.g., ES&H professionals, workers, line management, QA) are integrated at the activity level to ensure hazards are fully analyzed and appropriate controls developed. These mechanisms ensure direction and approval from line management and integration of the requirements. (DOE-HDBK-3027-99, DOE M 450.4-1)**

ES&H Manual Document 2.2, LLNL Institution-Wide Work Control Process, is the governing document for work control within PLS. The primary activity level documents providing documented hazard analysis and control identification for most of the observed activities are the IWSs. During this HSS review, LLNL was in the process of implementing task based IWS improvements that subdivide IWSs into discrete work activities. Of the seven IWSs reviewed within PLS, two had been revised to the new IWS format.

Work is broadly defined in the PLS IWSs reviewed. However, a number of individual experiments observed were not sufficiently detailed in an IWS such that the hazards and controls for the experiment could be readily identified. Within PLS, the IWS, in general, is not a sufficient mechanism to identify and tailor hazards for a specific research experiment or link the necessary controls for that experiment to mitigate those hazards. However, the IWS is generally sufficient to bound the hazards and controls for a range of experiments that may be performed within a lab or facility (e.g., JLF). As a "safety envelope," the IWS for a lab or facility, typically identifies the general classification of work that could be performed (e.g., working with lasers), identifies the range of hazards typically associated with that class of work (e.g., electrical,

radiological, chemical), and provides a menu of hazard controls for each of the potential hazards. However, an IWS or other equivalent work control document addressing activity-specific hazards and controls is typically not prepared for individual experiments that are conducted within a lab or facility. As a result, there is a vulnerability in that at the research experiment or activity level, some hazards could be missed, or an experimental hazard may not have been analyzed, or some expected hazard controls are insufficiently identified or described in the IWS. During work observations, three examples of such vulnerabilities were identified: **(OP.1&2A-1/W)**

- During a work observation within the Chemical Sciences Division of PLS (IWS 11667), thermal gravimetric analysis of a small sample (less than 100 mg) of a polyurethane foam containing the nanomaterial polyhedral oligomeric silsequioxane (POSS) was performed in which the sample weight was measured as the sample was heated to 700 degrees C in a small oven. Although the IWS bounds the type of hazards typically present, the detailed specific work scope, hazards, and controls of this experiment were not documented in the IWS. When the sample is heated in the small oven, a portion of the sample is vaporized (up to 50 mg) and is vented into the lab at the back of the oven (about breathing zone height). Although there are provisions for venting the vapors into a fume hood (i.e., through a section of flexible tubing), according to the RI, the fume hood had not been used to date for this activity. Upon heating, some sample materials could release hazardous vapors or particulates into the room (carcinogens, reproductive toxins, isocyanides, nanomaterials, etc.). There are no controls or thresholds in the IWS to determine when the fume hood connection should be used, and based on discussions with the ES&H Team, IH assumed that all hazardous materials would be handled in the fume hood, although this particular work activity had not been analyzed. **(OP.1&2A-1/W, OP.1&2A-1/OFI)**

- In a few cases, an IWS is too broad or generic for a specific experiment, cannot be (or is not) followed as written, and is open to interpretation by the researchers. As a result, statements in some IWSs are subject to judgment or misinterpretation by the research staff or are not followed as written. For example, at the JLF, the Experimental Operations IWS (IWS 12639) requires that when materials near the center of the Titan chamber become activated, "procedures must be followed." However, the IWS does not include or identify such procedures for the experimenter. Based on discussions with the JLF staff, such procedures are referenced in a separate IWS and are not applicable to the experimenters. In another example, the same JLF IWS identifies controls for "containment areas" and for work in "Nominal Hazard Zones (NHZs)." However, for a specific experiment, "containment areas" are not designated, and "NHZs," although identified in a laser table attached to the IWS, are not clearly defined and communicated for a specific experiment. In a third example, the broad experimental IWS encompasses work within JLF for Class 2, 3b, and 4 lasers. The Experimental Operations IWS states that laser eye protection will be worn when the "alignment laser is turned on, when laser shots are to be fired, or when entering the NHZ." However, in an observed experiment in the Callisto lab, laser eye protection was not worn by the researchers during laser alignment, who indicated that the initial laser alignment was performed via a Class 2 laser, which is typically not hazardous to the eye. No exemption for Class 2 lasers is stated in the IWS. **(OP.1&2A-1/W, OP.1&2A-1/OFI)**

- In one case, at JLF, the magnetic field hazard for an upcoming experiment within Callisto was missed during the conduct of the readiness review for this experiment. Because the description of the magnetic field had been included in a previous version of the IWS, during the readiness review LLNL personnel incorrectly assumed it was included in the current version. As a result of these concerns, JLF line management is developing an improved readiness review process to confirm that hazards are identified within each current IWS. JLF

line management is also evaluating methods for better identifying, tailoring, and communicating experiment-level hazards and controls to the research staff. **(OP.1&2A-1/W)**

As indicated previously, two of the seven IWSs reviewed (i.e., the Facility Support Operations and Experimental Operations IWSs in use at JLF) have been transitioned to the newer IWS work task format to include "tasks related to the facility." However, for the Experimental Operations IWS, the tasks remain too broad to address individual experiments, and in some cases, the listed work tasks appear to constitute hazards rather than tasks. For example, in this IWS, one task is entitled "Experiment Worker" (i.e., too broad), and another task is entitled "Radioactive Material" (i.e., a hazard rather than a task). **(OP.1&2A-1/W, OP.1&2A-1/OFI)**

In general, the process for developing, reviewing, and approving an IWS within PLS is consistent with LLNL institutional requirements. However, the thresholds for revising an IWS are not always clear. For example, several of the comment logs associated with the reviewed IWSs identify "minor changes" (e.g., added controls for nanomaterial waste) that would appear to meet the definition of a "major change" as defined in document 2.2 and therefore require a revision to the IWS. **(OP.2-3/OFI)**

Engineering and administrative controls in all of the PLS labs are robust, and in a number of cases the controls are extensive, such as the Laser SIS Interface Panel in Building B197. Other examples of effective engineering controls include well designed and maintained chemical fume hoods in the labs observed, cipher locks employed at most of the PLS labs, and laser controls within the JLF. Administrative controls, such as the posting of significant lab hazards on the lab doors, beryllium hazard warnings, and beryllium controls in the Building 235 beryllium cage, were accurate and effective in communicating potential risks to workers.

This criterion was not fully met. Although the mechanisms for activity-level hazard analysis and control are in place in the current work control system, the number of broad-based scopes of work and missed or inadequate hazards and controls in several of the IWSs reviewed indicate that implementation does not meet the portion of the criterion that requires ensuring that all activity-level hazards are fully analyzed and appropriate controls developed for the authorized work. **(OP.1&2A-1/W)**

2. Mechanisms are utilized to develop, review, approve, and maintain current all elements of the facility authorization basis documentation (work planning and control process) in accordance with the LLNL ISMS Description. (DOE-HDBK-3027-99)

Mechanisms for establishing the safety basis for non-nuclear facilities are established in ES&H Manual Document 3.1, Non-Nuclear Safety Basis Program. Responsibilities and process requirements for review of planned work to ensure that it is within the envelope of the applicable safety basis are included in Documents 2.1 and 2.2.

With the exception of office buildings, all of the PLS buildings at LLNL have some type of authorization or safety basis document. Many of the PLS buildings are classified as office buildings, and most of the remaining buildings within PLS are classified as Light Science and Industry (LSI) or low hazard. Of those PLS buildings associated with observed work activities, Building 361, 197 and the JLF are classified as LSI; whereas Buildings 194 (EBIT), 132N, and 235 are classified as low hazard. Typically, within PLS facilities, buildings with radiological or explosive hazards or large quantities of hazardous chemicals are classified as low hazard facilities. In addition, buildings 194 and 235 also house accelerators.

There are typically no stand-alone authorization basis documents for PLS office buildings. A screening report serves as the authorization basis for LSI facilities. Authorization basis documents for low hazard facilities consist of a screening report and, in some cases, a hazard analysis (i.e., a Tier 2 document). For those PLS facilities with a Tier 2 document, an FSP is also included as part of their authorization basis.

Sampled PLS authorization basis documents were in accordance with the requirements of Document 3.1. For example, authorization basis documents for Building 235 (i.e., the building that houses the beryllium cage, IWS 14649) were consistent with the expectations of Document 3.1 for the beryllium cage work activity. In addition, the Facility Point of Contact (FPOC) or designee signed each of the IWSs reviewed, indicating that the IWS had been reviewed with respect to the applicable authorization documents.

The criterion was met.

3. Mechanisms are in place to effectively and accurately implement all aspects of the authorization basis. (DOE-HDBK-3027-99, DOE M 450.4-1)

Facility safety basis documents define the work that can be performed within a facility and the ES&H requirements for that work. The Facility Manager is assigned the responsibility for releasing work that can be performed safely in the facility. The Facility Manager's review of the proposed activity, the IWS for the activity, and the ultimate work release authority ensure that work activities that fall outside the scope of the existing facility safety basis are identified.

Within PLS, each IWS is reviewed and concurred by an FPOC who is responsible for ensuring that the applicable requirements and controls from the authorization basis documents are integrated into the IWS. The FPOC also attends the ES&H Team 2 roundtable for each new IWS and participates in the pre-start review and walk down of each new IWS. For those low hazard buildings in which an FSP has been prepared, the FPOC includes administrative controls as needed in the IWS to ensure that the authorization basis is not exceeded. At the initiation of a new IWS or a revision of an existing IWS, the FPOC typically ensures that each chemical quantity identified within the ChemTrack database for that facility has been evaluated for potential worker exposures near the facility and for offsite exposures to the public and environs. In addition, for PLS experiments conducted within the JLF, the impact of the experiment on the facility authorization basis is assessed during the experimental readiness review.

The criterion was met.

4. Roles and responsibilities within the facility or activity are clearly defined, understood, and consistent with the LLNL ISMS Description to ensure that safety is maintained at all levels. Personnel are held accountable for properly accomplishing their assigned responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

Roles and responsibilities for the planning and implementation of PLS research activities are defined in various LLNL institutional and PLS documents. Roles and responsibilities are also defined in the IWS and activities observed, particularly with respect to the roles and responsibilities of the RIs, AIs, and Designated Team Leaders (DTRs). Interviews with RIs, AIs, and DTRs associated with the observed experiments indicated that such individuals were aware of their roles, responsibilities, and authorities with respect to their work activities. In some cases, such as JLF, separate IWSs have been prepared for the JLF facility laser operations staff and the experimental staff; these have enhanced role and responsibility delineation.

The criterion was met.

5. Mechanisms are in place that ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

Document 2.2 requires that individuals who plan and perform work must be appropriately trained and qualified. In addition, the LTRAIN system provides real-time monitoring and reporting of training scheduling, completion, near due courses, and overdue courses as identified by workers' training plans. Training requirements and training status are documented for each participating PLS researcher within the IWS. A sampling of individual training plans and records indicated that the appropriate training was assigned for the observed work. Unique medical surveillance requirements, such as laser eye exams for laser users, were also identified within the IWSs reviewed. A training program has also been established for AIs within the PLS Directorate. In addition, SMEs involved within an IWS activity have been knowledgeable and helpful in the identification of hazards and controls. An example is the extensive planning and continual improvement in controls for the beryllium cage in the basement of Building 235, and the active involvement of the Beryllium IH and the ES&H Team 2 IH in developing and implementing hazard controls for this work activity.

The criterion was met.

6. Mechanisms are utilized to confirm that the facility or activity and the operational workforce are in an adequate state of readiness prior to authorizing the performance of the work in accordance with the LLNL ISMS Description. (DOE-HDBK-3027-99, DOE M 450.4-1)

A number of mechanisms are in place within the PLS Directorate to ensure readiness prior to performing work. For example, a pre-job briefing was conducted for each of the observed experiments prior to performing work each day. At JLF, a special Readiness Review is also required prior to the commencement of any laser experiment to address any unique hazards and controls. In addition, prior to commencement of each new or revised Work Authorization Level (WAL)-C IWS within PLS, the AI responsible for the IWS and the building FPOC (at a minimum) conduct a pre-start review of the activity, including a walkdown of the work site. A confirmation of readiness is required for all WAL-C IWSs.

Six pre-job briefings within PLS associated with the referenced IWSs were observed during this review. Each of the pre-job reviews incorporated an element in which the Facility Manager or designee was contacted by the RI for the activity to ensure that the experimental activities were within the authorization basis and that facility status was confirmed prior to the start of work. In some cases, such as within the Chemical Sciences Division, the RI for the experiment verifies facility status electronically as an element of the pre-job review. At JLF, a daily POD provides a mechanism to ensure that planned work is within the facility safety envelope, and a Readiness Review is required for each new experiment.

Although the pre-job briefings are effective in identifying and confirming facility readiness prior to the start of work, there are a number of opportunities for improvement in the implementation of pre-job briefings within PLS. For example, the purpose and content of pre-job briefings lacks consistency across the PLS Divisions. Of concern is that pre-job briefings, in general, do not systematically address the hazards and controls of the planned activities for the day, and in the five pre-job briefings attended there was no reference to or use of the IWS for the activity during

the pre-job brief. Although Document 2.2 addresses minimum expectations for a pre-job brief, such expectations are not always met. At JLF, although the Readiness Review is an excellent opportunity for a review of experiment level hazards and controls, a hazard that was identified on a researcher's Readiness Review form (i.e., strong magnetic fields) was not addressed in the IWS for the activity. **(OP.2-2/OFI)**

The criterion was met.

7. Workers actively participate in the work planning process. (DOE-HDBK-3027-99)

There are multiple opportunities for the PLS research staff to participate in the work planning process. For example, researchers are actively involved in the pre-planning of research experiments, participate in the ES&H Team 2 roundtable reviews of an IWS, and attend experimental pre-starts. At JLF, the research staff participates in and conducts readiness reviews for each experiment. In addition, prior to the approval of an IWS, the RI for the IWS solicits comments and suggestions from the research staff, many of whom contributed to the drafting of the IWS. Typically, there is a daily interchange among the research staff and line management in the execution of a research experiment. In general, worker participation is an inherent element in the research process, which is collaborative in nature.

The criterion was met.

8. Line managers periodically take steps to reinforce safety, including personal visits and walkthroughs to verify that their expectations are being met. (DOE M 450.4-1)

The RIs and AIs for observed research experiments were actively involved in the oversight, and in some cases in the performance, of the experiment. In a number of cases, Facility Managers or directors are involved in the review and approval of experiments. For example, the JLF director attends POD meetings and experimental readiness reviews and is routinely involved in experimental planning and oversight for JLF operations. Associate Directors conduct walkthroughs of selected PLS facilities 12 times per year. PLS division managers are required to perform 20 walkthroughs per year and to visit each of their work activities at least once per year. Ten percent of all PLS IWSs receive a work observation from a team composed of a division manager, the group assurance manager, and peer reviews from one or more researchers from an outside organization with "fresh eyes."

The criterion was met.

9. Facility operations personnel maintain awareness of all facility activities to ensure compliance with the established safety envelope. (DOE M 450.4-1)

Facility management and staff involvement was evident in each of the PLS experiments observed within those facilities that had assigned facility personnel. In each of the experiments, an interface with facility/building staff was performed each morning prior to commencement of work, and the results were shared with the research staff during the pre-job briefing. The building FPOC reviews and approves each IWS and provides a work release for each experiment, typically on a daily basis. Interviewed personnel were aware of their roles and responsibilities. For the observed activities, specific positions were assigned, and it was evident that the appropriate personnel were aware of all aspects of the evolutions at all times. At JLF, this was particularly evident in that the JLF operations support staff was actively involved in the conduct of all laser operations.

The criterion was met.

10. Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented. There is evidence that feedback and improvement information is reviewed and used to improve future work performance in appropriate cases. (MG.2 CRAD Criteria 2)

A number of effective feedback and improvement mechanisms were observed within the PLS experiments, including pre-job briefings and a variety of staff meetings. At JLF, an "end of experiment or campaign review" is conducted for each experiment. During such a review, the research staff commented on the inadequate ventilation that was evident during the laser experiment. The feedback and improvement process has resulted in a number of improvements to individual experiments that have reduced hazards and risks to workers. Examples include the mechanization of hazardous process in biology labs for preparing and mounting slides for mice tissues, improvements in laser alarm and control systems, and numerous improvements in the 235 beryllium tent project resulting from ongoing feedback and improvement suggestions from workers and SMEs.

The criterion was met.

Conclusion:

The objective was met.

ES&H Manual Document 2.2, LLNL Institution-Wide Work Control Process, describes the LLNL activity/task level approaches to ensure that hazards associated with the work have been identified and analyzed, and appropriate controls selected. At the facility or laboratory level, these requirements are typically met through the IWS process within PLS. However, at the activity or experiment level, work remains in the establishment of mechanisms to tailor these broad-scope IWSs to an individual experiment and to describe and communicate hazards and controls at the experiment level. As a result, there is a vulnerability that hazards at the experiment level may not be sufficiently identified or analyzed, and controls may not be adequately linked to those hazards. Three examples of such vulnerabilities were identified during this review. **(OP.1&2A-1/W)**

Engineering and administrative controls are generally robust in the PLS laboratories reviewed. Roles and responsibilities within the work planning process are clearly defined and understood, and personnel are held accountable for properly accomplishing their assigned responsibilities. Mechanisms for identifying training requirements and training status are in place and documented, by individual, within each IWS.

LLNL has also implemented an extensive process of work approval, authorization, and release to confirm that the facility or activity and the operational workforce are in an adequate state of readiness prior to authorizing the performance of the work. A program for establishing and maintaining authorization basis documents commensurate with the risk has been implemented for each PLS facility. In addition, a strong facility management role within each facility ensures that the authorization basis documents are followed, and that the facility condition is acceptable prior to the conduct of any research. POD meetings at some facilities (e.g., JLF), pre-start walkdowns, and daily pre-job briefs provide assurance that work has been authorized and released. However, opportunities for improvement in the conduct of pre-job briefs were identified, particularly with respect to integrating the IWS in identifying and communicating hazards and controls for the

day's activities **(OP.2-2/OFI)**. Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented through mechanisms such as "end of experiment or campaign reviews" conducted following the completion of each experiment at JLF.

Overall, PLS has implemented the LLNL ISMS Description to effectively plan, authorize, and execute identified work, although some areas for improvement were noted.

Issues:

Weaknesses

See **OP.1&2A-1/W** in OP.1

Opportunities for Improvement

See **OP.1&2A-1/OFI** in OP.1

OP.2A-2/OFI: LLNL should consider reassessing the performance of pre-job briefs, and establish minimum consistent expectations for all PLS pre-job briefs to ensure that the PLS pre-job briefs conducted for research consistently meet LLNL expectations for a pre-job brief as described in Document 2.2, and sufficiently discuss hazards and controls with respect to the IWS for the work activities to be performed during the work day.

OP.2A-3/OFI: LLNL should consider reassessing the criteria for evaluating "minor" changes to IWSs to ensure that "minor" changes are not "major" changes requiring a revision to the IWS as defined in LLNL Document 2.2.

Submitted by: Signature On File___ Jim Lockridge PE, CIH, CSP Team Member	Reviewed by: Signature On File___ William Miller, Team Leader

LLNL ASSESSMENT FORM

FUNCTIONAL AREA:	**OBJECTIVE:**	**OBJECTIVE MET: YES X NO _**
Operations – Technology Resources Engineering Division (TRED), Engineering Directorate, S&T Principal Directorate	OP.2B **DATE:** 11/05/09	

OBJECTIVE

OP.2 The S&T Directorate has implemented the LLNL ISMS Description to effectively plan, authorize and execute the identified work for the facility or activity such that:

- The full spectrum of hazards associated with the work they perform is identified, analyzed, and categorized.
- Controls are developed to mitigate the identified hazards within a facility or activity.
- Controls selected ensure adequate protection of the public, worker, and environment.
- Clear and unambiguous roles and responsibilities are defined and maintained at all levels within the facility or activity.
- Managers at all levels demonstrate a commitment to ISMS through policies, procedures, and their participation in the process.
- Line managers are responsible and accountable for safety.
- Facility or activity personnel are competent commensurate with their responsibility for safety.

(CE II-2, CE II-3, CE II-4, CE II-6)

CRITERIA

1. Mechanisms are utilized by personnel to ensure hazards associated with the work have been identified, analyzed, and appropriate controls selected. The resulting documentation is complete, and meets DOE expectations. The execution of these mechanisms ensures that all necessary personnel (e.g., ES&H professionals, workers, line management, QA) are integrated at the activity level to ensure hazards are fully analyzed and appropriate controls developed. These mechanisms ensure direction and approval from line management and integration of the requirements. (DOE-HDBK-3027-99, DOE M 450.4-1)

2. Mechanisms are utilized to develop, review, approve, and maintain current all elements of the facility authorization basis documentation (work planning and control process) in accordance with the LLNL ISMS Description. (DOE-HDBK-3027-99)

3. Mechanisms are in place to effectively and accurately implement all aspects of the authorization basis. (DOE-HDBK-3027-99, DOE M 450.4-1)

4. Roles and responsibilities within the facility or activity are clearly defined, understood, and consistent with the LLNL ISMS Description to ensure that safety is maintained at all levels. Personnel are held accountable for properly accomplishing their assigned responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

5. Mechanisms are in place that ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities. (DOE-HDBK-3027-99, DOE M

450.4-1)

6. Mechanisms are utilized to confirm that the facility or activity and the operational workforce are in an adequate state of readiness prior to authorizing the performance of the work in accordance with the LLNL ISMS Description. (DOE-HDBK-3027-99, DOE M 450.4-1)

7. Workers actively participate in the work planning process. (DOE-HDBK-3027-99)

8. Line managers periodically take steps to reinforce safety, including personal visits and walkthroughs to verify that their expectations are being met. (DOE M 450.4-1)

9. Facility operations personnel maintain awareness of all facility activities to ensure compliance with the established safety envelope. (DOE M 450.4-1)

10. Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented. There is evidence that feedback and improvement information is reviewed and used to improve future work performance in appropriate cases. (MG.2 CRAD Criteria 2)

APPROACH

Records Reviewed:

- UCRL-AM-133867-VOL-1-PT-2.1-2009 - ES&H Manual Document 2.1; General LLNL Worker ES&H Responsibilities; approved March 13, 2009
- LLNL–AM-409863 – ES&H Manual Document 2.2; LLNL Institution-Wide Work Control Process; approved July 28, 2009
- UCRL-AM-133867-VOL-1-PT-3.1-2009 - ES&H Manual Document 3.1; Nonnuclear Safety Basis Program; issued September 9, 2009
- UCRL-AM-133867 – ES&H Manual Document 3.3; Facility Safety Plans and Integration Work Sheets with Safety Plans; approved December 22, 2006
- WSH-PDD-001-06 – Integrated Safety Management System Program Description Document; effective September 1, 2009
- IWS 15223 r2 – Standard Machine Tool Operation (B-321A Main Bay); approved October 7, 2009
- IWS 15223 Material List and Use Requirements; dated September 22, 2009
- Main Bay/Precision Work Control Pre-Job Briefing form; dated October 19, 2009
- Routing Sheet for Work Order A1000712, Item 001; dated October 19, 2009
- Routing Sheet for Work Order A0910488, Item 055; dated October 16, 2009
- Routing Sheet for Work Order A0910488, Item 019; dated September 21, 2009
- Waste Characterization Summary IGD# 0321-1000-01-H-OG; undated
- Information Gathering Document IGD# 0321-1000-07-H-OG; undated
- Main Bay Training Matrix; undated
- TRED/Manufacturing Supervisor Guide, Developing & Implementing a Shop Training Plan; dated January 30, 2008
- Record of Monthly Safety Meeting for B321A; dated October 7, 2009
- LLNL-AM-417788 - Engineering 900 Series Skill of the Craft Certification Program – TRED08-008, dated January 2008
- Machine Tool Operation Safety (MTOS) Training Program – TRED08-22, dated February 2008

- MTOS Milling Machine Safety – TRED08-032; undated
- MTOS Metal Cutting Lathe Safety – TRED08-031; undated
- IWS #1096.06 r27 – Powder Coating; dated November 26, 2003
- Hazard Assessment and Control Form – HAC B312B Powder Coating R2; dated April 15, 2009
- Material Safety Data Sheet – T013-BK Polyester TGIC Semi Gloss Self Hammer Black; dated March 15, 2004
- Material Safety Data Sheet – E300-BK11 Epoxy Semi Gloss Self FS#37038 Black; dated March 18, 2002
- OSHA Letter of Interpretation – Using Compressed Air for Cleaning an Employee's Body and Clothing; dated January 14, 1994
- CEPE Safe Powder Coating Guideline, 7th Edition, dated April 28, 2005
- Laboratory Chemical Fume Hood Survey, Building 321B Room 1243; dated March 19, 2009
- Air Monitoring Results for Powder Coating in B231[1]-R1010, dated April 28, 2000
- Building 231 Personal Air Sample for Hexavalent Chromium during Powder Coating (IWS 13881); dated July 15, 2009
- Hazard Assessment and Control Form – HAC B321C
- IWS #15231 r23 – MTS Electrical and Controls Installation, Maintenance, and Repair of Machine Tools; dated August 1, 2009
- IWS # 11434.05 r23 - Machine Tool Services Equipment Installation, Modification, Service, Disassembly, and Removal; dated May 18, 2009
- Lockout and Tag Procedure M396; dated March 14, 2007
- IWS #351.07 r17 – Field Support Installation/Electronic; dated April 29, 2008
- Routing Sheet for Work Order A0909709, Item 001 (B543 AV upgrades); dated August 12, 2009
- Institution-Wide Work Control Permit (B543 AV Upgrades); dated October 20, 2009
- Field Support IWS Bridge Document for Work Order #A0909709; dated October 21, 2009
- LLNL Beryllium Checklist for Work Order #A0909709; IH review date October 15, 2009
- N-95 Filtering Facepiece HAC for Moving Non-asbestos Ceiling Tile under IWS #351; dated November 7, 2007
- IWS # 14189.08 r19 – TRED User Shops Machine Tool Operations; dated July 7, 2009
- IWS #11319.05 r11 – Metal Finishing, Standard Operations; dated June 20, 2008
- Hazard Assessment Worksheet Report # 100000456 for IWS #11319.04; dated September 3, 2008
- Plastics list for User Shops; undated
- Material Use Requirements for User Shops; undated
- TRED User Shop Daily Work Activities Check Sheet for IWS #14189.08; Building 383 sign-in dates from September 25, 2009 through October 22, 2009
- Record of Monthly Safety Meeting, Area Machine Shops; dated October 20, 2009
- IWS #10263.02 r39 – Standard Weld Shop Operations (321 Weld Shop); dated December 13, 2006
- UCRL-AM-235580 - Facility Safety Plan Engineering 320 Block Building, dated October 16, 2007
- B321A Safety Basis Document, Rev 0 [LLNL Facility Screening Report for B321A]; approved April 18, 2007
- B3222 Safety Basis Document, Rev 0 [LLNL Facility Screening Report for B322 Complex];

[1] LLNL applied the monitoring results from the powder coating operation in this building (231) to the operation in Building 321B.

approved September 4, 2006
- Engineering Safety Steering Committee Agenda; dated October 20, 2009
- Questions and Answers from the Implementation of New Work Control Process in Engineering (AI-RI) Forum (Follow-Up); intranet version on October 29, 2009
- PowerPoint slide presentation - AI/RI Forum, ISMS Phase II; dated September 8, 2009
- FY09 Safety & Security Contract between Tomas Diaz de la Rubia, Principal Deputy PAD for S&T and LLNL Director; undated
- Directorate Input for S&T PD Safety & Security Contract; dated September 2009
- TRED DL/DDL Walkthrus; dated August 2009
- AD Walkthrus for FY09; database printout from October 29, 2009

Interviews:

- Machinist, CNC Mill
- Machinist, H-Boring Mill
- Machinist, Horizontal Lathe
- MTS Supervisor
- Plating & Coating Supervisor
- Parts Cleaning Operator
- Fabrication Assistant
- Main Bay Supervisor
- Main Bay Shop Foreman
- Main Bay Planner
- Field Services Supervisor
- Field Services Planner and Team Leader
- Powder Coating Operator
- Deputy Team Leader - ES&H Team 2
- Industrial Hygienist - ES&H Team 2
- Industrial Safety - ES&H Team 2
- Fire Protection - ES&H Team 2
- Environmental Analyst - ES&H Team 2
- User Shop Supervisor
- Welder
- TRED Manufacturing Section Leader
- Technology Resources Engineering Division Leader
- Deputy PAD for Operations for Science & Technology Directorate
- Acting Associate Director for Engineering
- Assurance Manager
- Electronics Fabrication Shop Supervisor
- Electrician

Observations:

- Machining Operations
- Main Bay Daily Safety Briefing
- Welding Operations
- MTS Daily Safety Briefing
- Field Services Daily Safety Briefing

- Powder Coating Operations
- Equipment Maintenance
- Network Cable Installation
- Parts Cleaning Operations
- Electronics Fabrication
- Engineering Safety Steering Committee monthly meeting
- Electronic Fabrication & Field Services monthly safety meeting

DISCUSSION OF RESULTS

1. **Mechanisms are utilized by personnel to ensure hazards associated with the work have been identified, analyzed, and appropriate controls selected. The resulting documentation is complete, and meets DOE expectations. The execution of these mechanisms ensures that all necessary personnel (e.g., ES&H professionals, workers, line management, QA) are integrated at the activity level to ensure hazards are fully analyzed and appropriate controls developed. These mechanisms ensure direction and approval from line management and integration of the requirements. (DOE-HDBK-3027-99, DOE M 450.4-1)**

Independent Oversight conducted facility walkthroughs and work observations of WAL B activities performed by personnel from various TRED shops within the Engineering Directorate. The shops included in this review are the Main Bay Machine Shop, Plating Shop, Machine Tool Services Shop, Field Support Shop, User Shop B383, Weld Shop, Electronics Fabrication Shop and Powder Coating operations. The observed work activities were performed under general IWSs, which identified the majority of hazards that are beyond the minimum expected knowledge of workers qualified under the Engineering Division's skill of the craft program. In addition, because some requested work activities may include user-provided materials that introduce unanticipated hazards, the process for accepting work requests was also observed.

Workers certified under the skill of the craft program were knowledgeable of machining operations and associated safety controls. During multiple observations, machinists followed proper work practices, used appropriate PPE, and properly positioned guarding. As part of a hoisting activity to position a knee and a large item for machining, the worker adequately planned and conducted the activity with the assistance of a co-worker. During interviews, machinists demonstrated a clear understanding of safety interlocks, which functions the interlocks disable, and which functions continue to operate with the interlocks disengaged. Workers also demonstrated knowledge of the materials included under the scope of the IWS, proper cutting depth/speed for different alloys, and proper guarding for various pieces of equipment.

For work activities covered by the skill of the craft program, the IWS supplements worker knowledge and experience to provide sufficient detail to identify general activities, hazards, and controls. However, IWSs for work activities not covered by the skill of the craft program do not provide an additional level of detail or specificity of activities, hazards, and controls. In one activity to install network cable above a drop ceiling, a detailed pre-job brief and walkdown supplemented the information in the general IWS; the combination provided adequate coverage of the scope, hazards, and controls for this activity.

For one observed activity involving powder coating application and curing, a variety of hazards were not identified or analyzed, and other hazard controls identified in the work control document were not implemented. For example, the application of the powder was conducted in an open-

faced ventilation booth. Powder residue on surfaces outside of the booth, in addition to particulate observed escaping the booth during application, demonstrated that the booth design and/or ventilation rate was not sufficient to capture entrained particulate. The potential for conditions to permit a dust explosion during spray application and spent material cleanup had not been fully analyzed and, although the booth is of explosion-proof design, standard electrical outlets and equipment are used near the open face of the booth and tools used during powder cleanup are not non-sparking. The April 2009 HAC identified the need to monitor for off-gassing of nitrogen dioxide and hydrogen cyanide during the baking process, but these were not subsequently monitored. The HAC also recommends use of HEPA vacuum to clean up spent material and including the worker in additional medical monitoring beyond medical clearance for respirator use, but these have not been implemented. The MSDS identifies the use of impervious clothing to minimize dermal contact and the HAC recommends using disposable coveralls or lab coat, but neither was implemented. Compressed air at 38 psi was used for cleaning residue from booth surfaces and the worker's body/clothing; under 1910.242, OSHA requires the air pressure to be less than 30 psi for cleaning and, through a related letter of interpretation, recommends against use of compressed air for personnel cleaning. LLNL subsequently adjusted the nozzle to reduce the pressure to 30 psi. **(OP.2B-1/W)**

The criterion was met.

2. Mechanisms are utilized to develop, review, approve, and maintain current all elements of the facility authorization basis documentation (work planning and control process) in accordance with the LLNL ISMS Description. (DOE-HDBK-3027-99)

ES&H Manual Document 3.1 outlines the mechanisms for establishing the safety basis for non-nuclear facilities. Within the Engineering Directorate, the B321A (Main Bay) and B322 (Plating Shop) safety basis documents were reviewed, along with the mechanisms to flow down those requirements. Screening reports serve as the safety basis documents for these facilities and establish the hazard classification level for these facilities as LSI. Hazards outlined in these documents were consistent with the hazards associated with the observed activities.

Methods for controlling and minimizing these hazards, responsibilities and authorities for ensuing safe operation, facility-specific training requirements, and ES&H-related quality assurance (QA) requirements are specified in the FSP. At the activity level, IWSs describe the specific training, hazards, controls, and limiting factors that apply to each activity.

The criterion was met.

3. Mechanisms are in place to effectively and accurately implement all aspects of the authorization basis. (DOE-HDBK-3027-99, DOE M 450.4-1)

The FSP for 320 Block has been developed and approved. Work control center roles and responsibilities are defined and specific individuals are assigned. For User Shops, the RI is responsible for verifying that materials introduced to the shop by technicians are on the authorized materials lists. For Main Bay, the potential for new hazards to be introduced through unreviewed metals, alloys, composites, or contaminated materials are controlled through planner/customer interactions as part of the work acceptance process. The process requires customers to sign the requests to confirm that the customer-supplied material hazards are "toxic," "radioactive," "other," or "none." However, the planner makes the determination based on personal knowledge and discussions with the customer, and customers rely on direction given by

the planner to note the hazards on the request, limiting the independent, added value of the customer signature.

However, the analysis of the potential for worker exposure to hazards during roof access has not been adequately documented. The FSP for these facilities designates roofs as "general access" areas with only ordinary hazards associated with working at heights or with machinery. However, some maintenance activities, such as roof access, may be impacted by routine facility operations. For example, the building 321/322 complex exhausts ventilation systems from welding operations, plating shop baths, and the powder coating oven. These exhaust streams may contain elevated levels of hexavalent chromium VI, hydrogen cyanide, nitrogen dioxide, acid fumes, and solvent vapors that may impact workers accessing roofs. The basis for excluding these potential hazards and designating the roof as general access is not documented. The institutional procedures require documentation of the decisions but not the analysis; however, this procedure is currently undergoing revision. Subsequent information provided by the ES&H team indicates that the decision for the general access designation was based on HEPA filtration of exhaust to eliminate the particulate hazard and a non-quantitative assessment of the adequacy of the stack height to mitigate exposure to gases. **(OP.2B-2/W)**

The criterion was not fully met.

4. Roles and responsibilities within the facility or activity are clearly defined, understood, and consistent with the LLNL ISMS Description to ensure that safety is maintained at all levels. Personnel are held accountable for properly accomplishing their assigned responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

The MTOS training program establishes safety requirements and routine hazards and controls for work for various machine types. It also establishes roles and responsibilities to implement the MTOS program.

In addition, most positions within TRED are covered by the skill of the craft certification program. This program defines the responsibilities, worker knowledge, and skills needed to safely perform activities typically conducted within each covered craft. The program also defines the documentation process. Completion of training outlined in MTOS is required before workers are permitted to use covered TRED equipment. The training requirements and status of training are incorporated into the applicable IWSs.

Technicians from other directorates can be approved to use specific equipment in various User Shops located across the LLNL site. These technicians are required to meet the minimum requirements under the engineering skill of the craft program. The User Shop responsible individual ensures that technicians only use equipment that they are currently certified to operate. Resident machinists monitor and provide assistance to technicians as needed. Failure to comply with the User Shop IWS or hazard controls outlined through the engineering skill of the craft program can result in removal of the technician from the IWS and revocation of access to User Shop facilities and equipment.

In addition, management accountability is established through signed commitment contracts. Annual contracts between the Principal Deputy PAD and the Laboratory Director establish safety-related goals and commitments for personal involvement and accountability of PAD, Associate Director (AD), and division leaders. These commitments flow down to the division level through internal contracts with senior Directorate management. Progress toward meeting these goals is tracked and reported within the Principal Directorate on a monthly basis.

The criterion was met.

5. Mechanisms are in place that ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

The MTOS training program and the skill of the craft certification program provide the framework for meeting this criterion. The shop foreman is responsible for assigning work to machinists certified for the equipment needed to complete the task. In addition to the foreman's knowledge of shop activities and personnel proficiency, one of the tools used in this effort is the Main Bay Training Matrix. This document identifies each machinist's level of proficiency (none, limited, fully trained, proficient, or trainer) on various types and models of machining equipment. This matrix was developed in accordance with the TRED/Manufacturing Supervisor Guide; Developing & Implementing a Shop Training Plan.

Each IWS identifies the training required to conduct the outlined activity, verifies that the training has been completed, and verifies that the worker has read and agreed to conduct work in accordance with the IWS. Supervisors, team leaders, and foremen oversee worker activities.

Several safety, environmental, and fire protection SMEs assigned to support the Engineering Directorate (ES&H Team 2) were interviewed during the course of this review. In general, they are knowledgeable and experienced in their assigned disciplines.

The criterion was met.

6. Mechanisms are utilized to confirm that the facility or activity and the operational workforce are in an adequate state of readiness prior to authorizing the performance of the work in accordance with the LLNL ISMS Description. (DOE-HDBK-3027-99, DOE M 450.4-1)

The shop supervisor conducted a daily walkthrough of the Main Bay machine shop and meets with the machinist at each work station to verify worker readiness and fitness for duty, review the assigned work activity, verify that conditions have not changed from the way the employee previously left the work station (tools, parts, lighting, obstructions, etc.). During one discussion, the supervisor identified that a chuck guard was missing from a small lathe and directed the machinist to 1) post a restriction on using the lathe with a chuck and 2) contact machine service to install a chuck guard.

The MTS shop supervisor conducted a pre-work toolbox talk that included a variety of safety-related information. A main focus of the talk was the impact of the flu on the shop workforce (about 40% of the shop was out due to illness) and the need to not rush work or attempt work alone that should have more than one person involved. The supervisor also stressed that employees should pause work if there are any unresolved safety concerns and that work that cannot be undertaken safely with the available staff will have to be postponed. Employees contributed to the conversation, including a reminder that tarantula season is here and extra care should be taken accessing equipment at site 300, and several follow-up questions on the H1N1 virus.

Although resident machinists receive daily safety briefings from the User Shop RI, technicians are not included. Instead, technicians receive only the daily safety briefings provided by the

technician's assigned supervisor at the primary work location. Work in the User Shop is under a unique IWS specific to machining operations and involves new "situational awareness issues" that would trigger an additional briefing under Chapter 2.2 of the ES&H Manual and the frequently asked questions (FAQ) guidance posted on the Engineering webpage. **(OP.2B-1/OFI)**

The criterion was met.

7. Workers actively participate in the work planning process. (DOE-HDBK-3027-99)

The nature of most of the assignments and the implementation of the skill of the craft program yields a less prescriptive work package and provides significant flexibility on the performance of tasks. Workers indicated on several occasions that they had discussed the specific activities with the supervisor, planner, or foreman before undertaking the specific work assignments. Most of the work activities observed was routine activities performed under skill of the craft and supplemented with general IWSs.

Each Engineering Directorate shop has a "grassroots" safety group that meets on a monthly basis. Each of these groups also sends a representative to the monthly safety committee meeting to raise employee safety concerns, discuss possible solutions, and share safety-related information. Issues discussed at this meeting include both general safety concerns and activity- or location-specific concerns.

Prior to beginning work on a network cable installation project, a pre-job brief was held to review the specific project requirements for activities to be conducted under a general IWS. Workers actively participated in the approach to be taken, cable routing, material staging, and considerations for building occupant safety. The initial plan was modified as a result of the discussion during the pre-job brief and additional information gathered during a walkdown of project.

Workers, supervisors, and an industrial safety SME were involved in the development of the MTOS program. The industrial safety SME conducted inspections of equipment, observed machining activities, and discussed observations with machinists as part of developing equipment specific hazard assessments, operating procedures, controls, and guarding requirements. TRED used this information as the basis for the MTOS training and certification process.

The criterion was met.

8. Line managers periodically take steps to reinforce safety, including personal visits and walkthroughs to verify that their expectations are being met. (DOE M 450.4-1)

Shop supervisors conduct daily walkthroughs of the shops to verify worker readiness, review planned activities, and make general safety observations (such as adequacy of guarding and PPE, housekeeping, etc.).

In addition, senior management is directly involved in periodic walkthroughs. Annual contracts between the Principal Deputy PAD and the Laboratory Director establish safety-related goals and commitments for personal involvement and accountability of PAD, AD, and division leaders. The contracts establish the minimum number of management walkthroughs for the year. Progress toward meeting these goals is tracked and reported within the Principal Directorate on a monthly basis.

The criterion was met.

9. Facility operations personnel maintain awareness of all facility activities to ensure compliance with the established safety envelope. (DOE M 450.4-1)

Work assignments are generally scheduled. In Main Bay, the planner reviews work requests with customers to identify any unique hazards being introduced that are outside of the IWS scope (none observed during review); the supervisor reviews individual assignments during the morning safety brief.

In the user shops, work assignments for resident machinists are scheduled by the RI, and materials being machined by technicians are recorded on sign-in logs. There was only one observation of work being conducted by a technician; this technician failed to log in until noted by Independent Oversight.

For other work conducted by workers from other Directorates, activities are coordinated through the facility point of contact, with involvement of other TRED personnel as necessary. For example, a beryllium decontamination project conducted by MUSD was under way during this review, and this project involved daily meetings with TRED management.

The criterion was met.

10. Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented. There is evidence that feedback and improvement information is reviewed and used to improve future work performance in appropriate cases. (MG.2 CRAD Criteria 2)

For machining activities conducted in Main Bay, machinists provide feedback directly to the shop foreman and planner verbally, and little is documented. In addition, feedback is provided during monthly shop safety meetings and safety-related information is shared at other routine meetings held within the Directorate. Lessons-learned from Occurrence Reporting and Processing System (ORPS) reports and non-DOE incidents are routinely shared by the Assurance Manager and have led to some programmatic changes at LLNL, most recently involving lockout/tagout procedures.

Although there is evidence of worker involvement in the work planning process and sharing of information within and between various levels within the Directorate, there is only anecdotal evidence of feedback on work activities or on the use of that feedback as part of a continual improvement process.

The criterion was met.

Conclusion:

The objective was met.

The shops included in this review are the Main Bay Machine Shop, Plating Shop, Machine Tool Services Shop, Field Support Shop, User Shop B383, Weld Shop, Electronics Fabrication Shop, and Powder Coating operations. The observed work activities were performed under general IWSs, which identified the majority of hazards that are beyond the minimum expected knowledge of workers qualified under the Engineering Division's skill of the craft program. This program adequately defines the required worker knowledge and skills to safely perform activities typically

conducted within each covered function. In addition, pre-job briefings, tailored to the complexity of the specific work assignment, were used to supplement hazard and control information identified in the general IWSs.

Processes have been established and responsibilities identified to control the potential for new hazards to be introduced through unreviewed metals, alloys, composites, or contaminated materials. However, for maintenance, installation, or security work requiring roof access, the potential for worker exposure to hazards from exhaust streams during roof access has not been adequately analyzed or documented. These exhaust streams may contain elevated levels of hexavalent chromium VI, hydrogen cyanide, nitrogen dioxide, acid fumes, and solvent vapors that may impact workers accessing roofs.

Most observed work activities involved skill of the craft work are were performed within established ES&H controls. Additional observations of work activities outside of this envelope may be warranted to evaluate whether the revised IWSs are sufficiently rigorous to bound the scope, hazards, and controls of those activities. **(OP.2B-2/OFI)**

Although the hazards and controls for most of the observed work were adequately addressed through the IWSs, tailored pre-job briefings, and skill of the craft, a number of concerns were identified in the powder coating operations. For this operation, some hazards have not been adequately identified and analyzed and, where hazards have been identified, sufficient controls have not been implemented. Concerns included the potential for dust explosion, possible off-gassing of toxic gases during the curing process, and inadequate dermal protection for the worker. Given the issues identified, additional review of powder coating operations performed elsewhere at LLNL is recommended. **(OP.2B-2/OFI)**

Workers were generally aware of their rights to stop or pause work and believed that they could exercise those rights without fear of retribution. Workers were involved in work planning, pre-job briefings, and periodic safety meetings. They also participated in the development of the Skill of the Craft program. However, the informality of the feedback and improvement process for work planning and control limits the ability to assess the effectiveness of that aspect of worker involvement.

Management is involved and accountable for safety. Shop supervisors conduct daily walkthroughs of the shops to verify worker readiness, review planned activities, and make general safety observations. In addition, the PAD, AD, and division leaders are directly involved in periodic walkthroughs as part of commitments for personal involvement and accountability.

Issues:

Weaknesses

OP.2B-1/W: Within the S&T Directorate's engineering activities, some hazards have not been adequately identified and analyzed for powder coating activities in TRED and, where hazards have been identified, sufficient controls have not been implemented.

OP.2B-2/W: The potential for worker exposure to hazardous gases during building 321/322 complex roof access does not have a documented analysis. Ventilation system exhaust streams from welding operations, plating shop baths, and the powder coating oven may contain elevated levels of chromium VI, hydrogen cyanide, nitrogen dioxide, acid fumes, and solvent vapors that may impact workers accessing roofs.

Opportunities for Improvement

OP.2B-1/OFI: For engineering activities within the S&T Directorate, LLNL should consider revising the User Shop sign-in process to include a pre-job safety briefing by the responsible individual or resident machinist to ensure that technicians are aware of site-specific hazards and have been verified as ready to operate machine shop equipment.

OP.2B-2/OFI: LLNL should consider performing additional reviews of powder coating operations across LLNL to ensure determine whether performance problems are evident at other locations, and should also consider performing reviews of work that is not covered by the skill of the craft program to ensure that the controls for such work are sufficient and effectively implemented.

Submitted by: Signature On File___ Lawrence Denicola, Team Member	Reviewed by: Signature On File___ William Miller, Team Leader

LLNL ASSESSMENT FORM

FUNCTIONAL AREA: Operations - Facilities and Infrastructure (F&I) - Maintenance and Construction	OBJECTIVE: OP.3 DATE:	OBJECTIVE MET: YES X NO ___

OBJECTIVE

OP.3: The Operations and Business Directorate has implemented the LLNL ISMS Description to effectively plan, authorize and execute the identified work for the facility or activity such that:

- The full spectrum of hazards associated with the work they perform is identified, analyzed, and categorized.
- Controls are developed to mitigate the identified hazards within a facility or activity.
- Controls selected ensure adequate protection of the public, worker, and environment.
- Clear and unambiguous roles and responsibilities are defined and maintained at all levels within the facility or activity.
- Managers at all levels demonstrate a commitment to ISMS through policies, procedures and their participation in the process.
- Line managers are responsible and accountable for safety.
- Facility or activity personnel are competent commensurate with their responsibility for safety.

CRITERIA

1. Mechanisms are utilized by personnel to ensure hazards associated with the work have been identified, analyzed, and appropriate controls selected. The resulting documentation is complete, and meets DOE expectations. The execution of these mechanisms ensures that all necessary personnel (e.g., ES&H professionals, workers, line management, QA) are integrated at the activity level to ensure hazards are fully analyzed and appropriate controls developed. These mechanisms ensure direction and approval from line management and integration of the requirements. (DOE-HDBK-3027-99, DOE M 450.4-1)

2. Mechanisms are utilized to develop, review, approve, and maintain current all elements of the facility authorization basis documentation (work planning and control process) in accordance with the LLNL ISMS Description. (DOE-HDBK-3027-99)

3. Mechanisms are in place to effectively and accurately implement all aspects of the authorization basis (work planning and control process). (DOE-HDBK-3027-99, DOE M 450.4-1)

4. Roles and responsibilities within the facility or activity are clearly defined, understood, and consistent with the LLNL ISMS Description to ensure that safety is maintained at all levels. Personnel are held accountable for properly accomplishing their assigned responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

5. Mechanisms are in place that ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

6. Mechanisms are utilized to confirm that the facility or activity and the operational workforce are in an adequate state of readiness prior to authorizing the performance of the work in accordance with the LLNL ISMS Description. (DOE-HDBK-3027-99, DOE M 450.4-1)

7. Workers actively participate in the work planning process. (DOE-HDBK-3027-99)

8. Line managers periodically take steps to reinforce safety, including personal visits and walkthroughs to verify that their expectations are being met. (DOE M 450.4-1)

9. Facility operations personnel maintain awareness of all facility activities to ensure compliance with the established safety envelope. (DOE M 450.4-1)

10. Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented. There is evidence that feedback and improvement information is reviewed and used to improve future work performance in appropriate cases. (MG.2 CRAD Criteria 2)

APPROACH

Records Reviewed:

- South Express Feeder work package
- TSF Power Addition work package
- Building 321 Beryllium Decontamination and Remediation work package
- Building 253 Maintenance Window work package
- Craft LTRAIN training records
- Post-Job Review records
- Maintenance Utilities Services Department Craft IWS(s)
- Building 255 HVAC preventive maintenance (PM) work package
- Building 691 Electrical modification work package
- Building 551E HVAC compressor replacement maintenance work package
- Building 694 Epoxy application maintenance work package
- Building 517 High Voltage breaker preventive maintenance work package
- Building 298 LCW installation facility modification work package
- Building 361 HVAC corrective maintenance work package
- WSH-PDD-001-06, *Program Description Document for Integrated Safety Management System*
- LLNL-AM-408814, *LLNL Institution-Wide Work Control Process Requirements Document*
- ES&H Manual, Document 2.1, *General LLNL Worker ES&H Responsibilities*
- ES&H Manual, Document 2.2, *LLNL Institution-Wide Work Control Process*
- ES&H Manual, Document 3.1, *Nonnuclear Safety Basis Program*
- ES&H Manual, Document 2.5, *Managing Subcontracted Work at LLNL*
- ES&H Manual, Document 11.1, *Personnel Protective Equipment*
- Building 255 Tier-2 Safety Basis Document
- Building 321C Tier-3 Safety Basis Document
- Facilities and Infrastructure Error Prevention Safety Program

Interviews:

- Manager, Project Management, Engineering and Construction Department, F&I Directorate
- MUSD Work Planning and Control SME
- Maintenance planners, F&I Directorate
- Designated responsible individuals and persons in charge for maintenance and construction work
- Facility Managers, Buildings (191, 253, 255, 321, 361, 453, 551, and 694)
- ES&H Team 2 Industrial Hygienist and MUSD Industrial Safety SME
- MUSD Fall Protection SME
- MUSD heavy equipment mechanic
- MUSD heavy equipment supervisor
- MUSD Work Control SME
- B-361 Facility Manager
- B-361 Work Control Center planner
- MUSD qualified electrical worker
- MUSD plumber
- Work Control Review Board members
- Hot Line Construction Company electricians
- MUSD high voltage electricians
- GSE Superintendent, Safety Officer, foremen and craft workers.
- Chair, Electrical Safety Advisory Board
- Lockout Tagout SME, HCD
- MUSD Mechanical Maintenance Division Leader
- MUSD Safety Officer

Observations:

- Installation of conduit for the TSF Power Addition construction project by GSE electricians
- Splicing cables for the Express Feeder Construction Project by Hot Line Construction Company electricians
- Preparations for beryllium decontamination and remediation in Building 321 by LLNL craft
- Roof repairs and HVAC preventive maintenance at Building 253 by MUSD craft
- Building 255 HVAC preventive maintenance by MUSD heavy equipment craft
- Building 691 Electrical modification by MUSD electrical craft
- Building 551E HVAC compressor replacement by MUSD HVAC craft
- Building 694 Epoxy application by MUSD painting craft
- Building 517 High Voltage breaker LOTO and testing by MUSD HV electrical craft
- Building 298 LCW installation facility modification by MUSD plumbing craft
- Building 361 HVAC corrective maintenance motor shim replacement by MUSD craft

DISCUSSION OF RESULTS

1. **Mechanisms are utilized by personnel to ensure hazards associated with the work have been identified, analyzed, and appropriate controls selected. The resulting documentation is complete, and meets DOE expectations. The execution of these mechanisms ensures that all necessary personnel (e.g., ES&H professionals, workers, line management, QA) are integrated at the activity level to ensure hazards are fully analyzed and appropriate controls developed. These mechanisms ensure direction and**

approval from line management and integration of the requirements. (DOE-HDBK-3027-99, DOE M 450.4-1)

Work control mechanisms were used effectively to identify and analyze hazards and establish controls for most observed work activities. For example:

- Hazards and controls associated with roof repairs and HVAC preventive maintenance in Building 253 were properly identified on craft IWSs and associated permits. Controls included a beryllium work permit based upon IH review of work areas and a LOTO of all fume hoods prior to the start of work on the roof of Building 253. Before the work began, the maintenance planner reviewed the training records of assigned workers and discussed the hazards and controls with them during a Maintenance Window Prestart Meeting. Appropriate fall protection was provided for roof work. Workers wore appropriate PPE and used safe work practices. The person in charge effectively coordinated work activities.

- Hazards and controls for beryllium decontamination and remediation in Building 321C were properly identified. Appropriate hazards and controls were documented on a job-specific IWS, pre-task hazard analysis (PTHA), HAC, facility work permit (FWP), and several other permits. Controls included a negative pressure in the work area, posting of the beryllium work area, respiratory protection, hearing protection, Tyvek coveralls, and protection from sharps. A pre-job briefing was well attended. Attendees included the authorizing individual, responsible individual, ES&H, facility manager, craft supervisor and workers. Hazards and controls were thoroughly discussed with good participation by workers, all of whom signed the PTHA acknowledging that they had been informed of the hazards. The authorizing individual and responsible individual demonstrated a thorough understanding of the hazards and controls associated with the work.

- Hazards were adequately analyzed and appropriate controls were selected for heating, ventilation, and air conditioning (HVAC) work in Building 361. The work was appropriately authorized and listed on the Building 361 facility's work control center status board as available for release (green). A pre-job briefing was conducted, which included answering a predetermined question set in accordance with the LLNL Document 2.2 to verify readiness to perform the activity. The work was conducted as a skill of the craft activity and did not require a task specific IWS. Controls used for observed hazards were appropriate. These included a confined space permit and LOTO used to downgrade the confined space entry to a non-permitted entry. Appropriate verification was conducted of the motor electrical LOTO, by attempting to bump the motor manually.

- Hazards associated with high voltage switching and breaker testing were properly controlled. For the switching operation, appropriate PPE included fire resistant (FR) rated clothing and NFPA 70E category 2* PPE including hard hat with rated face shield, hearing protection, and gloves. For the actual breaker removal, Category 4 arc flash PPE was used, including switching suit and hood with voltage rated gloves.

- Appropriate hazard controls were implemented by GSE for construction work associated with addition of a 15Mw power source to the Tera Scale Facility in Building 453. The work area was properly barricaded and was accessible by emergency vehicles. The foreman thoroughly addressed hazards and controls during daily pre-job briefings, and workers provided input for hazard identification. Conservative fall protection requirements were established and were followed. Proper PPE was worn, including double hearing protection for persons in the

vicinity of a chop saw. The responsible individual verified training status of workers assigned to respective IWS(s) electronically, (system flags actual status live time) through the IWS/LTRAIN database. The IWS status was verified as being released by both the responsible individual and Facility Manager prior to placing the work on the scheduled listing of released work for the day.

- Appropriate LOTO zero energy verification was observed during replacement of an air conditioner compressor replacement in Building 571. Appropriate controls, including arc flash PPE and confirmation of the meter used to a known source both prior to conduct of the zero energy verification and following the measurement to confirm meter operability, were established and implemented.

- Hazard identification and control was adequate for application of epoxy paint to floors in B-612 RHWM rooms 102 and 103. A pre-job briefing included a thorough discussion of tasks, hazards and controls. Workers donned organic vapor/P95 respirators in accordance with IWS and MSDS for the product used. These workers were respirator qualified and fit for these particular units. Local ventilation was appropriately established. MSDSs were included in the work package for the paint products; however, no MSDS was included for the acrylic latex caulking used. Appropriate PPE was used for painting activities, including latex gloves, knee pads, safety glasses, and long sleeve shirts and work pants. However gloves were not used when applying caulk, and dermal contact was observed during its use (the MSDS recommends gloves for this product).

Hazard analysis and control was not fully effective for work performed in a vault by one construction subcontractor. Although many hazards were identified, and most controls were appropriate for work performed by a construction subcontractor on the Central Area Load Feeder Project, several deficiencies were identified. The vault contained insulated, energized high voltage cables (13.8 KV), and the work included the use of electric power tools and a propane torch. The contractor, Hot Line Construction Inc, safely controlled most hazards: the vault opening was barricaded to control access; a confined space permit was issued; a hoist was in place for use as a retrieval device; the air inside the vault had been analyzed and forced ventilation provided; an attendant was assigned to monitor the activities inside the space; and the fire department had been notified and was available to provide rescue services. However, several deficiencies were identified: **(OP.3-1/W, OP.3-8/OFI)**

- The attendant did not have the capability to promptly notify the fire department in the event that rescue services were needed. He had a cell phone but did not know the number to call. He said that he would have to leave the area to use another phone or pull box. The attendant had been provided the number in training but did not remember it.
- A worker in the vault was not wearing hearing protection while drilling concrete with a hammer drill. The noise level had not been measured but was well above 85db. Hearing protection was not checked as an applicable control on the back of the PTHA form, and the use of the hammer drill was not listed as a task on the front of the form. **(OP.3-3/OFI)**
- The worker was wearing a respirator to reduce his exposure to airborne silica. However, the company did not have an LLNL-approved respiratory protection program and the worker was not trained or qualified for respirator use as required by OSHA. The Task Identification Process (TIP) list prepared during project planning did not identify the need for an Exposure Control Plan for silica dust or for a respiratory protection program, and neither was established by the construction subcontractor. The LLNL responsible individual stopped drilling by the subcontractor following this observation. **(OP.3-8/OFI)**

- Hazards associated with potential exposures to magnetic fields produced by energized conductors in the vault were not analyzed. The conductors were delivering current at a voltage of 13.8KV and a frequency of 60Hz. The 2008 American Conference of Governmental Industrial Hygienists (ACGIH) Book of Threshold Limit Values and Biological Exposure Indices provides threshold limit values for magnetic fields and states that "Some models of cardiac pacemakers have been shown to be susceptible to power-frequency (50/60Hz) magnetic flux densities as low as 0.1 millitesla" and recommends limiting exposures of persons wearing pacemakers to this value. **(OP.3-6/OFI)**
- An F&I high voltage electrician inspected the condition of cables in the vault before entry by the construction subcontractor. The electrician said that he routinely performed such inspections using infrared examination without entering manholes or vaults when the cables were visible from an open manway. This inspection method is not sufficient to identify missing insulation or other defects that are on portions of cable that are not visible from outside the manhole or vault. **(OP.3-7/OFI)**

In addition, insufficient specificity of some MUSD IWS controls and the ineffectiveness of some training of maintenance craft workers have resulted in a number of instances of work control deficiencies or observed unsafe work practices: **(OP.3-2/W, OP.3-4/OFI)**

- Hearing protection was not always worn when needed. A worker operating a metal shear in the MUSD Sheet Metal shop did not wear hearing protection as require by a sign posted on the shear. Area supervision was advised, and the individual donned hearing protection. In another case, an electrician installing an electrical outlet in Building 691used a power tool without a noise measurement or hearing protection. The IWS for power tool use stated that IH was to measure and document noise levels. In addition, as previously discussed, a subcontractor employee using a hammer drill inside a manhole was not wearing hearing protection. He donned ear plugs when questioned by the HSS team member. **(OP.3-3/OFI)**
- Hazards associated with exposure to fumes from solder and flux during fabrication and installation of chilled water valves and supply lines in Building 298 were not fully analyzed or controlled. The work was conducted as a skill of the craft activity and did not require a task specific IWS. Controls used for most observed hazards were appropriate. These included a hot work permit and fire watch used during torch use for soldering of copper pipe fittings. However, the IWS did not sufficiently address hazards and controls associated with fumes generated during the observed pipe soldering tasks. While the IWS contained controls which mentioned cutting, the burning and welding should be conducted in a well ventilated area or with the use of local ventilation; the specific hazardous constitutions of the soldering media and flux were not discussed, nor was any need for or results from IH assessment of this potential hazard. Furthermore what is "adequate" is overly subjective. The observed room airflow did not readily remove fumes from the workers' breathing zone. **(OP.3-1/OFI)**
- One worker did not use three-point contact when ascending a ladder as specified by OSHA regulations and LLNL training. The worker was assigned to install an electrical outlet in Building 691. The work included working within a suspended ceiling while on the ladder. The worker was observed carrying conduit while climbing the ladder, resulting in the worker not maintaining three point contact. Furthermore the worker was observed working with hands overhead, and in an orientation turned outward from the ladder face, which is not in accordance with site requirements. In another case, a single worker was also assigned to install and solder copper pipe in Building 298 at a height about 10-12 feet above the floor while on a ladder. This elevated work was not observed by HSS, but maintaining three point contact during ascent and descent of the ladder would have been difficult. Potential ladder safety issues can occur when a single worker is assigned to a job requiring use of a ladder.
- Examples of an improper LOTO were observed in B-255 MUSD Heavy Equipment PM on

roof ventilation systems. Zero energy verifications were not performed for several systems following LOTO placement. Heavy equipment mechanics performed several LOTO evolutions. Most of the systems being serviced were running, and workers considered the unit shutting off following opening of the local disconnect as appropriate verification. However, this practice is not allowed by the ES&H Document 12.6 LOTO Program Section 3.1.2 step 6 (verify and test) or the six steps for conduct of a general LOTO according to training provided at LLNL. Additionally, one system was not running and workers failed to attempt to start the system as required by the training provided. None of the LOTOs performed met all six steps of LLNL approved LOTO process, including the failure to test for zero energy electrically prior to conducting hands-on work with potential contact with rotating equipment. **(OP.3-2/OFI)**

- One MUSD Heavy Equipment worker, who was performing HVAC PM on the roof of Building 255, was wearing fall protection PPE (harness and fall arrest system) that was past the inspection requirement. The worker did not fully inspect the harness prior to using it, as required by LLNL procedures. Additionally, a roof permit form in the work package stated 6 feet for fall protection, but the site requirement has changed to 50 feet and the form was not updated. The online version of the form was updated and was correct.

This criterion was met. Although the processes are in place and generally adequate to meet this criterion, the number of observed implementation deficiencies indicates a need for continued LLNL management attention on the effectiveness of implementation of work control processes.

2. Mechanisms are utilized to develop, review, approve, and maintain current all elements of the facility authorization basis documentation (work planning and control process) in accordance with the LLNL ISMS Description. (DOE-HDBK-3027-99)

Mechanisms for establishing the safety bases for non-nuclear facilities are established in ES&H Manual Document 3.1, Non-Nuclear Safety Basis Program. Responsibilities and process requirements for review of planned work to ensure that it is within the envelope of the applicable safety basis are included in Documents 2.1 and 2.2. Safety basis documents prepared by F&I for Buildings 255 and 321C met the requirements of Document 3.1. Work observed by HSS in each of these facilities was within the safety envelopes defined in their respective safety basis documents.

This criterion was met.

3. Mechanisms are in place to effectively and accurately implement all aspects of the authorization basis (work planning and control process). (DOE-HDBK-3027-99, DOE M 450.4-1)

The ES&H Manual defines the mechanisms and assigns responsibilities to ensure that work can be accomplished safely within a facility. Facility safety basis documents define the work that can be performed in a facility and the ES&H requirements for that work. The Facility Manager is assigned the responsibility for releasing the work to be safely performed in the facility. The Facility Manager's review of the proposed activity, the IWS for the activity, and the ultimate work release authority ensure that work activities that fall outside the scope of the existing facility safety basis are identified. This work then would receive additional analysis to determine the appropriate ES&H requirements, and the safety documents would be modified as necessary.

This criterion was met.

4. **Roles and responsibilities within the facility or activity are clearly defined, understood, and consistent with the LLNL ISMS Description to ensure that safety is maintained at all levels. Personnel are held accountable for properly accomplishing their assigned responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)**

Roles and responsibilities for the identification and prioritization of maintenance and construction tasks are defined in various LLNL institutional documents. The ISMS Description clearly states that responsibility for worker safety rests with line management, and more specific responsibilities for workers and managers are described in LLNL-AM-405814, ES&H Manual Documents 2.1 and 2.2, and the Facilities and Infrastructure Work Control Manual. Collectively, these documents adequately define roles and responsibilities for safely planning and performing maintenance and construction tasks.

This criterion was met.

5. **Mechanisms are in place that ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)**

Document 2.2 requires that individuals who plan and perform work be appropriately trained and qualified. This includes training on the Requirements Document and on Document 2.2. They must possess the knowledge, skills, and abilities required for performing assigned work. Personnel with the appropriate functional area expertise must be used to plan the work. Additionally, all personnel involved in planning, controlling, and performing work for LLNL must be trained on the activity-level work planning and control process and understand how their function contributes to and integrates with the process. Formal documentation of training, qualification, and expertise (determined through such tools as hiring, and prescribed training and qualification processes) that demonstrate the required proficiency and expertise must be tracked in LTRAIN. Before a task is performed, the responsible individual must verify the worker is trained and qualified for the task assigned.

Training requirements for construction subcontractors are specified in construction subcontracts. One exception was identified in which training requirements were not met by a subcontractor (Hot Line Construction). Specifically, Division 1 Specifications, Section 1.07A, for the Express Feeder construction project, require the construction subcontractor to submit copies of training certifications for each employee to LLNS for all operations that require such training. Some certifications were not submitted by the construction subcontractor until after work was under way, and the LLNL process for verifying subcontractor training was not fully effective. **(OP.3-1/W, OP.3-5/OFI)**

This criterion was met.

6. **Mechanisms are utilized to confirm that the facility or activity and the operational work force are in an adequate state of readiness prior to authorizing the performance of the work in accordance with the LLNL ISMS Description. (DOE-HDBK-3027-99, DOE M 450.4-1)**

Work activities observed were appropriately authorized and are typically listed on the facility's work control center status board as available for release (green). These listings indicate that the work was appropriately authorized and approved. The Facility Manager then lists the activity on

the facility's work control center status board as available for release (green) if conditions are satisfactory for the performance of the activity. In essence, this process serves as the operations authorization at the facility level, which is used to confirm readiness. Additionally, pre-job briefings are required to be conducted, many of which included answering a predetermined question set in accordance with the LLNL Document 2.2 to verify readiness to perform the activity.

F&I has established and implemented an effective work release process for ensuring readiness to safely perform work. In this process, the Facility Manager or designee reviews the facility schedule on a daily basis to ensure there are no conflicting emergent conditions or unexpected operations, and that the scheduled work can be released. This schedule verification must be documented daily, and in some facilities, is color coded and posted on a board at the facility's work control center. In some facilities, the schedule of released work remains unchanged for several days. In these situations, the Facility Manager or designee manages the schedule and work release by exceptions (i.e., changes will be made as maintenance is required or conditions emerge). In facilities where the schedule of released work is stable and the Facility Manager or designee manages the schedule and release by exceptions, the Facility Manager or designee notifies the affected responsible individuals when it is necessary to suspend their work release. In other facilities, the responsible individuals working in the building check with the facility points of contact and review the schedule daily to ensure that released work can be performed safely. If conditions change during the work shift, such that released work can no longer be performed safely, the Facility Manager or designee is required to notify the affected responsible individual(s) that their work release has been suspended. When a support activity worker (in this case, MUSD maintenance craft) is ready to perform work in another organization's facility or area, they must check with the Facility Manager or designee to ensure the activity is released. This check may be accomplished by checking the facility schedule to ensure the Facility Manager or designee has released the work. If the activity is not released, the support activity worker must coordinate the release of the work with the Facility Manager or designee. Overall, a formal and systematic work release process ensures that Facility Managers are aware of work to be performed in their facilities and that appropriate controls have been established for facility hazards that may be encountered. **(OP.3-1/NP)**

MUSD Maintenance Window Schedule provides the facilities a work interval for PM activities. This allows the facility to plan and coordinate activities. This also provides for adjustment of the window to meet facilities' needs, as the windows are established on an annual basis and the actual dates are not fixed until concurrence is reached with the facility.

This criterion was met.

7. Workers actively participate in the work planning process. (DOE-HDBK-3027-99)

For planning of complex work, representative workers are involved in the hazard identification process for the significant tasks of a work activity. Typically a team approach is used in the work planning for these activities. Workers participated in pre-job briefing process or a toolbox/tailgate type briefing for all jobs observed. The formality and comprehensiveness of some of these were not as robust as others. Briefings which used a predetermined question set or checklist of topics were better than those that did not reference these documents, and some briefings had little discussion of hazards and controls.

This criterion was met.

8. Line managers periodically take steps to reinforce safety, including personal visits and walkthroughs to verify that their expectations are being met. (DOE M 450.4-1)

F&I line managers are expected to periodically walk through work areas to assess safety and provide feedback to workers on safety expectations. F&I management established an error prevention safety program about a year ago to reinforce safety and provide requirements and guidance to the F&I staff for improving safety performance. This document requires that managers at all levels perform walkabouts/worksite visits at scheduled intervals and provides guidance on how these walkthroughs are to be conducted. The program does not specify frequency or documentation requirements, but performance of management walkabouts/worksite visits is assessed during periodic performance appraisals. Responsible individuals, authorizing individuals, and work group supervisors emphasize the importance of safety daily during daily pre-job briefings.

This criterion was met.

9. Facility operations personnel maintain awareness of all facility activities to ensure compliance with the established safety envelope. (DOE M 450.4-1)

The Facility Manager or designee is assigned the responsibility for releasing the work to be safely performed in the facility. The Facility Manager's review of the proposed activity, the IWS for the activity, and ultimate work release authority ensure that work activities that fall outside the scope of the existing facility safety basis are identified. This work then would receive additional analysis to determine the appropriate ES&H requirements, and the safety documents would be modified as necessary.

This criterion was met.

10. Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented. There is evidence that feedback and improvement information is reviewed and used to improve future work performance in appropriate cases. (MG.2 CRAD Criteria 2)

Work orders and IWS(s) each have respective associated feedback and improvement mechanisms to be completed following the performance of work (in the case of the work order) and/or as a result of a noted deficiency, major change, or required periodic review (as is in the case of the IWS). Each of these mechanisms solicits feedback and uses a software process that can be used to track and status of suggested improvements, use feedback in the work planning process, and identify trends. Additionally, LLNL has established a Work Control Review Board which meets on a monthly basis and reviews selected new IWS(s) (either at the request of the responsible individual or at the Board's discretion). The intent of these reviews is to provide feedback to the IWS owner on lessons learned for the other IWS(s) reviewed, best management practices, or deficiencies noted with the IWS.

This criterion was met.

Conclusion:

The objective was met.

The Operations and Business Directorate has implemented the LLNL ISMS Description to effectively plan, authorize, and execute maintenance and construction activities. The F&I Directorate has made significant improvements in work control processes for these activities since the 2007 HSS ISM inspection. A work control manual has been developed to provide instructions and assign responsibilities for implementation of the institutional work control program. The F&I Directorate has strengthened control of maintenance activities by better defining tasks and training requirements on craft IWSs and by developing a Skill of the Craft Manual to provide a qualification process for ensuring that each individual has the knowledge, skills, and ability to safely perform work in low hazard facilities and areas. A more formal work release process ensures readiness to perform work. These work control processes have been applied effectively for most maintenance activities. Exceptions were noted on a few jobs where IWSs lacked sufficient specificity and where training was not fully effective. **(OP.3-1/W)**

The F&I Directorate has also strengthened controls for construction work performed by GSE and other construction subcontractors. Division 1 Specifications have been revised to better define applicable ES&H requirements in construction subcontracts. The current construction work control process includes appropriate elements for effective identification, analysis, and control of hazards. Hazards were effectively controlled for work performed by GSE, the dedicated site contractor with extensive LLNL work experience, but hazards associated with work by a less experienced site contractor were not. The number and nature of uncontrolled hazards associated with work performed by this subcontractor indicate the need for more effective oversight and enforcement of requirements for work performed by construction subcontractors with limited LLNL work experience who may not fully understand DOE and LLNL performance expectations. Similar problems were observed by HSS during the 2007 ISM inspection.

Issues:

Weaknesses

OP.3-1/W: LLNL work control requirements were not effectively implemented by one Operations and Business Directorate subcontractor, resulting in a number of uncontrolled hazards and insufficient verification of worker training.

OP.3-2/W: Insufficient specificity of some Operations and Business Directorate MUSD IWS controls and the ineffectiveness of some training of maintenance craft workers have resulted in some instances of work control deficiencies or observed unsafe work practices.

Opportunities for Improvement

Maintenance Activities

OP.3-1/OFI: To improve analysis and control of health hazards for Operations and Business Directorate maintenance activities, LLNL should consider analyzing hazards associated with materials with potential inhalation hazards that are commonly used in maintenance work, including controls in IWSs, and restricting the use of such materials to those that have been analyzed and appropriate controls have been entered into IWSs.

OP.3-2/OFI: To enhance LOTO for Operations and Business Directorate maintenance activities, LLNL should consider revising LOTO procedures and training to detail alternate verification methods for non qualified electrical workers to ensure that electrical lockouts are in place and that zero voltage verifications have been conducted in accordance with NFPA 70E.

OP.3-3/OFI: To strengthen analysis and control of noise hazards for Operations and Business Directorate maintenance activities, LLNL should consider reassessing the need for including maintenance workers in the LLNL hearing conservation program and adding specific requirements to IWSs for training and medical evaluation based on IH exposure assessments.

OP.3-4/OFI: To strengthen the work control process for Operations and Business Directorate maintenance activities, LLNL should consider lowering the threshold for preparing activity-specific IWSs to include complex work, work with multiple permits, and work with hazardous materials for which material-specific controls are not in existing IWSs.

Construction Activities

OP.3-5/OFI: To ensure Operations and Business Directorate construction subcontractor workers have adequate training, LLNL should consider establishing a process to require that training certifications submitted by construction subcontractors for each employee pursuant to Division 1 Specifications, Section 1.07A, are reviewed for adequacy by LLNL.

OP.3-6/OFI: To ensure analysis of hazards associated with power frequency (60 Hz) magnetic fields, LLNL's Operations and Business Directorate should consider adding guidance to work control processes to evaluate potential hazards associated with magnetic fields generated by AC powered high-voltage electrical equipment and transmission lines.

OP.3-7/OFI: To ensure the safety of individuals working in confined spaces near energized high-voltage conductors, LLNL's Operations and Business Directorate should consider changing the procedures and training of LLNL high voltage technicians to more thoroughly inspect the condition of insulation on energized electrical conductors before the start of work.

OP.3-8/OFI: To improve the safety of future Operations and Business Directorate subcontracted construction work, LLNL should consider performing a causal analysis of work control deficiencies on the Central Area Load Feeder Project. LLNL should consider assessing the causes of inadequate hazard analysis and control by the construction subcontractor, determining why these deficiencies were not identified sooner by LLNL, and taking appropriate corrective actions based upon this analysis.

Noteworthy Practice

OP.3-1/NP: A formal and systematic work release process ensures that Facility Managers are aware of work to be performed in their facilities and that appropriate controls have been established for facility hazards that may be encountered.

Submitted by: Signature On File Signature On File Al Gibson and Joe Lischinsky, Team Members	Reviewed by: Signature On File William Miller, Team Leader

LLNL ASSESSMENT FORM

FUNCTIONAL AREA:	**OBJECTIVE:**	**OBJECTIVE MET: YES _X_ NO___**
Operations: National Ignition Facility and Photon Science (NIF and PS) Principal Directorate	OP.4 **DATE:** 11/9/09	

OBJECTIVE

OP.4: The NIF and PS Principal Directorate has implemented the LLNL ISMS Description to effectively plan, authorize and execute the identified work for the facility or activity such that:

- The full spectrum of hazards associated with the work they perform is identified, analyzed, and categorized.
- Controls are developed to mitigate the identified hazards within a facility or activity.
- Controls selected ensure adequate protection of the public, worker, and environment.
- Clear and unambiguous roles and responsibilities are defined and maintained at all levels within the facility or activity.
- Managers at all levels demonstrate a commitment to ISMS through policies, procedures, and their participation in the process.
- Line managers are responsible and accountable for safety.
- Facility or activity personnel are competent commensurate with their responsibility for safety.

(CE II-2, CE II-3, CE II-4, CE II-6)

CRITERIA

1. Mechanisms are utilized by personnel to ensure hazards associated with the work have been identified, analyzed, and appropriate controls selected. The resulting documentation is complete, and meets DOE expectations. The execution of these mechanisms ensures that all necessary personnel (e.g., ES&H professionals, workers, line management, QA) are integrated at the activity level to ensure hazards are fully analyzed and appropriate controls developed. These mechanisms ensure direction and approval from line management and integration of the requirements. (DOE-HDBK-3027-99, DOE M 450.4-1)

2. Mechanisms are utilized to develop, review, approve, and maintain current all elements of the facility authorization basis documentation (and work planning and control process) in accordance with the LLNL ISMS Description and 10 CFR 830 for nuclear facilities. (DOE-HDBK-3027-99)

3. Mechanisms are in place to effectively and accurately implement all aspects of the authorization basis. (DOE-HDBK-3027-99, DOE M 450.4-1)

4. Roles and responsibilities within the facility or activity are clearly defined, understood, and consistent with the LLNL ISMS Description to ensure that safety is maintained at all levels. Personnel are held accountable for properly accomplishing their assigned responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

5. Mechanisms are in place that ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

6. Mechanisms are utilized to confirm that the facility or activity and the operational work force are in an adequate state of readiness prior to authorizing the performance of the work in accordance with the LLNL ISMS Description and DOE requirements for nuclear facilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

7. Workers actively participate in the work planning process. (DOE-HDBK-3027-99)

8. Line managers periodically take steps to reinforce safety, including personal visits and walkthroughs to verify that their expectations are being met. (DOE M 450.4-1)

9. Facility operations personnel maintain awareness of all facility activities to ensure compliance with the established safety envelope. (DOE M 450.4-1)

10. Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented. There is evidence that feedback and improvement information is reviewed and used to improve future work performance in appropriate cases. (MG.2 CRAD Criteria 2)

APPROACH

Records Reviewed:

Institutional Documents

- Program Description Document, *Integrated Safety Management System*, WSH-PDD-001-06, September 1, 2009
- *LLNL Institution-Wide Work Control Process Requirements Document*, LLNL-AM-405814, Revision 0, July 30, 2008
- ES&H Manual Document 2.1, *General Worker ES&H Responsibilities*, Implementation Date May 13, 2009
- ES&H Manual Document 2.2, *LLNL Institution-Wide Work Control Process*, Implementation Date July 29, 2009.
- ES&H Manual, Document 3.1, *Non-nuclear Safety Basis Program*
- *ISMS, LLNL Safety Toolbox*, LLNL-MI-413381
- *Guide for Identifying Hazards and Environmental Aspects – ES&H Integration Worksheet Preparation*,LLNL-AR-412180, Revision 0, March 24, 2009
- *Tools for Identifying and Analyzing Task and Area Hazards and Selecting Controls*, LLNL-MI-416189, Rev 1, April 2009
- ES&H Manual Document 2.5, *Managing Subcontracted Work at LLNL*, UCRL-AM-133867-VOL-1-PT-2.5-2009, Revision 9, August 14, 2009

NIF and PS Directorate

- NIF Programs Directorate Procedure 5.10, *Safe Plan of Action (SPA) Process*, NIF-5022739-AA
- NIF Self Assessment Program *Safety "Walk About" Process*, Procedure 5.13 NIF-5022196-AB

NIF Operations Directorate

- NIF Work Permits, NIF-5018626-AG

- Tier 2 Safety Basis Document for the Building 581-582 Complex, Rev 1, NIF-5019666-AB, July 28, 2008
- Tier 2 Safety Basis Document for the Building 298 Complex, June 28, 2007
- NIF Safety Basis Document Change Control Process, Procedure 1.20, NIF-5018625-AC
- NIF Project Procedure # 5.19, Work Authorization Review, NIF-5018658-AE, October 30, 2008
- NIF Shot Campaign Work Authorization Point (WAP) Checklist Template, NIF-5022443-AA
- WAP Tracking Status, approved scope changes from 8/23/06-10/21/08
- NIF Work Permits, NIF-5018626-AG, October 06,2009
- NIF Maintenance Procedure Checklist — NIF ECMS#5024879 AA, WFL LRU Replacement Checklist, NWBS: 1.8, completed October 21, 2009
- Training Management at NIF presentation slides, October 23, 2009
- Construction Contractor Training, effective 10/08/09 for all new contractors coming on site
- Procured-Services Work Sheet (PWS) - Installation of Shield Doors
- Contractor Task/Skill Matrix Training Objectives for Contractor JR Griffin
- NIF Training Matrices for:
  - JIS
  - CCE
  - KSI
  - GSE
- JIS Training Matrix
- CCE Training Matrix

Interviews:

- RI, Target, Development, Assembly, and Storage Operations
- Daily Work Team Lead (DWTL), Security Safe (subcontractor to Gowan Construction)
- DWTL, Contra Costa Electric
- DWTL, Jacobs
- WPRI WP#296299,
- WPRI for WP#298198
- WPRI, WP# 297544
- WPRI, WP#295081 Jacob Site Manager,
- WPRI, Contra Costa Electric, WP#296499
- IWS RI, WP # 296299, #295081, #296499
- IWS RI, IWS # 14920,
- IWS RI, IWS/SP#12842.03R17
- IWS AI, WP# 295081 and #296499
- NIF and PS Directorate Training Manager
- NIF Training Manager
- Team 2 Manager
- Team 2, ESH Tech supervisor
- NIF and PS Facility Ops & Program Support Manager
- Operations Manager, NIF Project Division – NA-123.2

Observations:

NIF Operations

- Sub Facility and Laser Integration Plan (subFLIP) meeting
- Work Permit ID: 298198, DANTE-1 and DANTE-II Filter Inspection and Replacement, ref 09160202 rev42/OSP 581.11 CA 42, time period 10/12/09-12/12/09
- Work Permit ID: 298270, Install and Remove DIM 90-45 Based Neutron Diagnostic Cart, Remove Upon Completion of Campaign, IWS 09160202 Rev43/OSP 581.11 C43, time period 10/19/09-11/15/09
- SPA: Install neutron Cart, work area TB 17'6" 90-45, WP# 298270, dated 10/19/09
- NIF Work Permit #: 296299; Installation of Interior Shield Door D225, ref: IWS #: 14235 and 15085, time period 10/06/09-12/31/09
- SPA: Contra Costa Electric "Electricians – 33/HMMA Conduits", Ref: WP#296499, dated October 22, 2009
- JHA/IWS 09160202 Rev 43/OSP 581.11-C43 NIF Laser System Installation, Commissioning and Operation, effective August 10, 2009
- NIF-0115056, Work Package Preparation Checklist associated with NIF Project Procedure 5.10 Safe Plan of Action
- Work Permit ID: 295081, General Carpenter Support for Scaffolding at NIF, ref: IWS: 14235, time period, 9/01/09-12/31/09
- IWS: 14235, WAL B, Construction, Installation and Material Handling of Utilities (NIF complex), approved November 10, 2008.
- SPA: Removing Scaffold, Work area: Target Bay, CL2-3'6", WP #295081, dated October 20, 2009
- Work Permit ID: 296499, CCE to install conduits, I/O Cabinets, junction boxes, pull cable, fiber for HMMS, ref. IWS 14235, time period 9/17/09-12/18/09
- Work Permit ID: 298683, Replace Q16B Beamlines 167-Q2 and B168-Q3 WFLs, IWS 09160202 Rev43/OSP 581.11 C43, time period 10/21/09-10/23/09

Photon Sciences & Applications

- SPA: ELV Station/OPL Clean Room – Work Permit # 238105
- SPA KDP Processing in KDP room 1120, dated 10/29
- SPA: Final Optic LRU Assembly, Work Area Optics Processing Facility (OPF) Class 100, KDP Lab, Ref. Work Permit # 238105, dated 10/23/09
- SPA: OMS Operations, work Area: DMS/MMS/KDP, Reference Work Permit # 292602, dated 10/29/09
- SPA: OPF Tour, Work Area OPF, Dated 10/29/09
- SPA: Custodial duties, Building 391, ref WP# 297406, dated 10/29/09,
- SPA: AMP, Work Area: FS/Etching, ref: WP#292597, dated 10/28/09
- SPA: QA Inspection, Work Area OPF, Work Permit #297419, dated 10/29/09
- SPA: VIEW microscopes, Work Area KDP/OPL, Ref: WP# 2920604, dated 10/29/09
- SPA: Clean and Coat FS Optics, Work Area OPL Class 100 Optics Lab & KDP Lab, 10K area, Ref WP#242855, dated 10/29/09
- IWS/SP # 15043 r2, WAL C, OPF Acid Mitigation Process, Approved 8/3/09
- IWS# 14143.02 r21, WAL B, Target Development, Assembly, and Storage, Approved 5/7/09
- SPA: NIC Target Fabrication, Work Area B381/R600, Dated 10/29/09
- IWS # 13202.02 r10, WAL B, Sol-Gel Optical Coating and Acid Cleaning Operations, approved 10/15/07

- SPA: Diffractive Optics B298/392, ref IWS #'s 12961, 13202, 13206 & 14673, dated 10/21/09
- IWS# 12842.03 r17, WAL C, Advanced Technologies Lab Operations, approved 11/7/07
- SPA Mercury Advance Technology Lab, ref: IWS #12842, dated 10/20/09
- IWS/SP# 13228.04 r43, WAL C, HEPW Advanced Concepts Lab, approved 6/13/08
- SPA: Planned work in HEPW Advanced Concepts Lab, ref. IWS #13228.04, dated 10/26-11/2/09

Optics and Target

- IWS/SP# 14920 r4, WAL C, Materials Effects Testing Laboratory, approved 7/29/09
- IWS/SP# 1466.01, WAL C, NIF PAM Power Conditioning Unit (PCU) Test Facility, Approved 6/10/09

DISCUSSION OF RESULTS

1. **Mechanisms are utilized by personnel to ensure hazards associated with the work have been identified, analyzed, and appropriate controls selected. The resulting documentation is complete, and meets DOE expectations. The execution of these mechanisms ensures that all necessary personnel (e.g., ES&H professionals, workers, line management, QA) are integrated at the activity level to ensure hazards are fully analyzed and appropriate controls developed. These mechanisms ensure direction and approval from line management and integration of the requirements. (DOE-HDBK-3027-99, DOE M 450.4-1)**

ES&H Manual 2.2, *LLNL Institutional-Wide Work Control Process* is the governing procedure for ensuring that hazards associated with the work have been identified, analyzed and controlled. Furthermore, *Appendix C* of this document, and NIF Programs Directorate Procedure 5.10, *Safe Plan of Action (SPA) Process*, provide specific requirements for the work control process for the NIF and PS Principal Directorate. Additionally, the NIF Work Permit procedure defines the activity level requirements at NIF (all areas bounded by the perimeter fence around Building 581/681, exclusive of Building 583 and T6929/6930).

As part of the institutional plan to convert the old IWSs from hazard based to task based IWSs, NIF and PS developed a 3-year risk ranked transition plan (end date 2012) for converting the old IWSs and IWS/Safety Plan (SPs) to the new task based format. Regarding progress on this transition plan, there are 152 IWSs and IWS/SPs identified on the schedule, and 10 were converted to the new IWS format during the period from 8/3/2009 through 10/28/09. Forty-eight of the old IWSs are noted as "on hold" for the scheduled update, with a footnote that "*some IWSs may be designated "on hold" due to lack of immediate need."* There is still some discussion on whether or not the "shell" IWSs created for OSP 581.11 *NIF Laser System Installation, Commissioning and Operation* will actually be converted given the complexity and inter-relatedness of the tasks included in this 250-page procedure. As a result of this review, the NIF Site Manager has been assigned to lead a team to evaluate OSP 581.11 and the feasibility of converting the document to the new task-based IWS system. Over 80% of the work performed at Building 581 is covered under OSP 581.11.

The current process at NIF (i.e., use of work permits and SPAs) meets the intent of the new task based IWS for identifying hazards and control, and authorizing, approving and releasing work. The SPA, as defined in their procedure, is a task-, place-, and time-specific process, which supplements other work authorizations and controls (e.g., JHA/IWS and work permits) to foster

safe, timely, and quality work in the workplace.) In addition, the TIM was created to compensate for not using the IWS to capture worker training. (Refer to Criterion 5 for more discussion on training and qualification.) At other areas within NIF and PS Principal Directorate, the old IWSs are supplemented with the SPA. This also meets the intent of the new task based IWS.

During this review, no work under the new IWSs was scheduled for work observations so the results are based on evaluating the current process under the old IWSs. Work observations covered activities performed by NIF and PS Principal Directorate employees (including matrixed and supplemental labor workers), contractors, and subcontractors. Hazards and controls for tasks were appropriately identified and documented on the SPA form for all work observed, and work was performed in a safe manner.

Regarding documentation, on one of the work permits reviewed, the person assigned as the DWTL was not included on the work permit, nor was a redline change made by the Work Permit Responsible Individual (WPRI) to assign the individual as a DWTL as required by the NIF Work Permit Procedure. Additionally, an earlier IWS revision was referenced instead of the latest revision. The newest revision included changes to the valves required for locking out the system referenced in the work permit. The work was ultimately performed safely, with the correct valves locked and tagged.

The process to convert one of the old IWSs from hazard-based to task-based was also observed. This consisted of two meetings – the first to initially identify the tasks associated with the IWS, and apply the hazards and controls to those tasks. The next meeting was at the workplace, and relevant ESH staff members were invited to participate in finalizing the hazards and controls identification. Feedback from research staff involved indicate that the resulting IWS will be more useful because it reflects the way work is done. The value added is that this format facilitates generating the SPA briefing form. The process is robust.

In general, work was appropriately authorized and performed safely. NIF Project Division and LSO should evaluate the schedule or the need for converting the IWSs that are noted as "on hold" to determine if this is acceptable based on their expectations.

The criterion was met.

2. Mechanisms are utilized to develop, review, approve, and maintain current all elements of the facility authorization basis documentation (and work planning and control process) in accordance with the LLNL ISMS Description. (DOE-HDBK-3027-99)

ES&H Manual, Document 3.1, *Non-nuclear Safety Basis Program*, establishes the safety basis for non-nuclear facilities. The directorate maintains a list of all their buildings and their classifications. NIF and PS Principal Directorate has three facilities (Building 581-582 complex, Building 298 Complex – buildings 298 and 394; and Building 391) that require Tier 2 safety basis documents. The remaining facilities are classified as either Office or LSI facilities. There are completed Facility Screen Reports for buildings classified as LSI.

Requirements in ES&H Manual Document 3.1 are used to manage change and keep the *Tier 2 Safety Basis Document for Building 298 Complex* and Building 391 current.

The *Tier 2 Safety Basis Document B581-582 Complex* is kept current using NIF procedure 1.20, *Safety Basis Document Change Control Process*. Additional NIF procedures, such as the *NIF*

Project and Configuration Management Plan, and *Engineering Change Requests* are used to assure that the authorization basis documentation remains current.

The criterion was met.

3. Mechanisms are in place to effectively and accurately implement all aspects of the authorization basis. (DOE-HDBK-3027-99, DOE M 450.4-1)

Multiple processes are in place to assure that all aspects of authorization basis are implemented.

Several procedures cover configuration management and maintaining the authorization basis. NIF project has a robust system of identifying configured items, assigning Configured System Managers (CSMs) with responsibility for approving work that impacts configured systems. Configured systems (defined as systems important to the safety of workers, the public, and the environment) and quality control and configuration control are required to maintain the requirements (safety basis, mission critical, ES&H, etc.). These systems are identified, and CSMs are assigned responsibility for the configured item and must concur with proposed work that affects the performance of those configured items. Configured items are identified in their safety basis documents.

The work permit process at NIF has a section to flag configured items with special review and instructions required by the CSMs. This was evident in work observed at NIF under Work Permit ID: 298270, *Install and Remove DIM 90-45 Based Neutron Diagnostic Cart, Remove Upon Completion of Campaign* and Work Permit ID 296299, *Installation of Interior Shield Door D225*. Appropriate compensatory measures were taken to maintain the safety requirements during work.

The criterion was met.

4. Roles and responsibilities within the facility or activity are clearly defined, understood, and consistent with the LLNL ISMS Description to ensure that safety is maintained at all levels. Personnel are held accountable for properly accomplishing their assigned responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

Roles and responsibilities are identified in work control procedures at the institutional level and specifically for NIF and PS management and workers. During interviews, it was demonstrated that employees and contractors assigned specific roles (AI, RI, WPRI, DWTL, WCO, etc.) understood and accepted their responsibilities and are held accountable for properly accomplishing their assignment as part of their annual performance appraisal.

On one of the observed activities previously referenced, in which a person was assigned as the DWTL but was not noted on the work permit as a DWTL, he had the required training and was willing and prepared to execute his responsibilities on for the job.

Refer to Criterion 5 for additional comments on training and qualification.

The criterion was met.

5. Mechanisms are in place to ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

The institutional training requirements are assigned, tracked in LTRAIN, and included in the IWS to assure that only trained and qualified workers are assigned to perform work. Personnel assigned to serve in key roles, such as RIs, WPRIs, and AIs, are selected by their knowledge of the systems/research/project and proven ability to manage. Additionally, they must complete specific training requirements that are tracked in LTRAIN.

IWSs in PS include training requirements for those assigned to work under the IWS. Medical Surveillance information must be obtained from the Health Services Department database and manually entered on the IWS. The IWS software sends an e-mail to the medical department when a hazard requiring medical surveillance is checked and they provide the information. ESH staff can also retrieve the medical surveillance information upon request.

However, training requirements for operations covered under OSP 581.11 are captured in the TIM maintained by the NIF Training Manager. Roles and training requirements associated with each of the 20 subsystems are determined by the subsystem RI. The TIM provides the ability to track training based on roles. The roles are tracked through the LTRAIN questionnaire, and workers are added or removed by updating the questionnaire. Each subsystem RI also designates workers that need to be assigned the role. OSP 581.11 is a 250-page procedure that has a set of "shell" IWSs that cover over 80% of the work in Building 581, with more than 300 workers and more than 140 roles assigned, resulting in over 12,000 people-courses to track. Therefore, the TIM will be maintained as long as the "shell" IWS exist. Medical surveillance was not called out for any of these roles because this topic is no longer tracked in LTRAIN due to concerns about privacy of medical information.

As a result of this review, the NIF Site Manager has started an initiative to populate these "shell" IWSs with workers, training, and medical surveillance requirements. At the end of this initiative, the goal is to retire the TIM. The training staff and supervisors will need to complete the population of the IWS "shells" with workers, training, and medical surveillances to ensure that workers have completed the required medical surveillances prior to authorizing them to perform work. **(OP.4-1/OFI)**

The NIF Training Manager creates a monthly printout of the matrix for each subsystem RI for use by WPRIs when assigning work. Training matrices for some of the 20 roles are still undergoing refinement.

Construction subcontractors maintain records of their employees' training and qualifications separately since LTRAIN is used primarily for employees/supplemental labor contractors and LLNL-provided courses.

Overall, completion of training was properly demonstrated by LTRAIN records or other methods.

The criterion was met.

6. Mechanisms are utilized to confirm that the facility or activity and the operational workforce are in an adequate state of readiness prior to authorizing the performance of the work in accordance with the LLNL ISMS Description. (DOE-HDBK-3027-99, DOE M 450.4-1)

The work control procedure requires that responsible individuals ensure that the facility is in a state of readiness prior to work authorization and work release. At facilities outside of Building 581, there is a facility status board. As a rule, each worker checks the board for the status of

systems in their work area to determine if there is any possible impact on their work. At the daily pre-job SPA briefing, the facility status is reviewed with the RI/DWTL to assure that required systems are up and running before work.

Each work activity starts with a SPA briefing. All SPA briefings observed, with one exception, were well done. In this instance, the specific task related hazards and controls were not discussed although they were identified on the SPA form that everyone signed at the end of the meeting. In general, workers actively participated in identifying task and facility hazards and controls. When work activity was adjacent to other worker activities, co-located work hazards and controls were also addressed, as required by the procedure. When additional hazards and controls were identified during the meeting, these were added to the SPA form. For example, a worker noted uneven walking surfaces in a tight workspace, and the resulting need for situational awareness and tethering of tools when working at heights. At the end of the briefing, the supervisor/DWTL and all workers signed the final SPA form.

Additionally, to assess individuals' readiness to do work, the RI or DWTL asks individuals if they are ready to work or if there are issues/concerns that need to be raised that may preclude them from doing their assigned tasks. During all of the SPAs observed, the questions were asked with sincerity and workers responded openly. In fact, a worker mentioned that he was stiff and sore from moving boxes over the weekend so he planned to take it easy and ask for help if he needed to move anything until he feels better. The RI thanked him for sharing this information and encouraged everyone to lend a hand if he asks, and everyone agreed to help. Also, on several jobs, when workers were assigned to do physical tasks, (e.g., climbing or lifting, pulling and pushing heavy objects) they were required to stretch to warm up and loosen muscles.

All workers were very knowledgeable of the tasks assigned. They followed step by step procedures when required by the work permit and IWS. They are also empowered to take the time they need to do the job safely and correctly. An example of this was observed during the installation of the DIM cart-based neutron diagnostic assembly, when workers called a safety pause to check their positions to ensure that the transport cart was properly engaged onto the cable tracks.

The criterion was met.

7. Workers actively participate in the work planning process. (DOE-HDBK-3027-99)

Workers (LLNL employees and supplemental labor contractors, contractors, and subcontractors) were experienced in performing their work and knowledgeable of the associated hazards and controls. Workers were encouraged to ask questions about the scope of work, safety, or any other matter. They were also encouraged and expected to provide input to the SPA. There was active engagement in the SPA. To make the SPA more interesting and encourage ownership, some workers were required to develop the section of the SPA that related to their job hazards and controls and send the information to the RI. The RI would review and add pertinent information. During the SPA, each worker would present his/her section, and then their colleagues would add to it or ask questions, especially if they were working within the vicinity. At another SPA, a contractor employee asked to write in additional hazards and controls, on the SPA form and then presented it to the work team members.

The criterion was met.

8. Line managers periodically take steps to reinforce safety, including personal visits and walkthroughs to verify that their expectations are being met. (DOE M 450.4-1)

In addition to the institutional requirement, the *NIF Self Assessment Program – Safety Walkabout Process,* Procedure 5.13 states that there is an annual master schedule for walkabouts prepared by the Assurance Manager.

- "The schedule shall identify locations to be reviewed and walkabout participants (i.e., applicable management layers, RIs, and appropriate safety support).
- The schedule shall indicate the month in which each work activity review and each annual review will be conducted."

AIs, RIs, and WPRIs indicated that they do walkabouts routinely, in addition to the required annual walkabout for active IWSs. Also, during work observations, several of the WPRIs and RIs visited the jobsites. On one of the jobs, the RI was at the jobsite providing assistance and serving as the safety watch.

The criterion was met.

9. Facility operations personnel maintain awareness of all facility activities to ensure compliance with the established safety envelope. (DOE M 450.4-1)

Mechanisms in the work control process, such as work permits, daily SPA briefings, and the facility status boards, allow facility operations to maintain awareness of the activities and to ensure that established safety controls are maintained. The IWS/work permit process requires checking to assure that work does not violate established safety envelopes. *NIF Work Permits* procedure 5.8 explicitly identifies roles and responsibilities for ensuring compliance. Key roles include the Associate Project Managers, NIF Operations Manager, NIF Integration Manager, Field Control Officer through the WCOs, radiation safety officer, RIs, WPRIs, and DWTLs. These individuals are actively involved in the routine scheduling meetings (e.g., subFLIP, shot operations, POD) that occur in addition to reviewing and approving/authorizing/releasing work permits.

For locations outside NIF, the RI and the Facility Managers (FMs) are key individuals who assure that work will be performed within the established safety envelope prior to releasing work. The FMs are responsible for updating the status boards, and the RIs check the status daily before the daily SPA briefings since that is one of the criteria to address. This was observed during the SPA briefings and reiterated during interviews.

The criterion was met.

10. Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented. There is evidence that feedback and improvement information is reviewed and used to improve future work performance in appropriate cases. (MG.2 CRAD Criteria 2)

For the work observed, there was only one instance of specific feedback noted. However, workers indicated that they were comfortable providing feedback to the RIs, supervisors, or the DWTLs verbally during or after the job, or the next day during the SPA briefings.

When a checklist is used that requires changes in setup or field conditions to be recorded, information is documented on the checklist and provided to the WPRI to update the master

checklist. One such instance observed is the *NIF ECMS#5024879 AA, WFL LRU Replacement Checklist.*

For construction activities at NIF, Safety Observation Report cards are given to workers to solicit feedback. They have the option of including their names on the card or providing input anonymously. The results are compiled, trended. The report for September 2009 indicates 143 cards were submitted in August and 89 cards were submitted in September. In September, 24% of the cards were classified as suggestions, 18% as housekeeping, and 16% as health/work environment. The report did not include status of suggestions and open actions. However, the Construction HSE Manager indicated that he keeps track of open items until they are resolved. If an item or suggestion warrants it, he will discuss it at the daily manager's meeting and/or the weekly Field Safety Working Group meeting chaired by the NIF Site Manager. Feedback is provided back to the group and individual at the all-hands safety meeting.

The criterion was met.

Conclusion:

The objective was met.

ES&H Manual 2.2, LLNL Institution-Wide Work Control Process, and NIF and PS Directorate work control procedures describe the activity/task-level approaches to ensure hazards associated with work have been identified, analyzed and appropriate controls were selected, and NIF and PS has adequately implemented these procedures. NIF and PS have also implemented an effective process to develop, review, approve, and maintain current all elements of the facility authorization bases. The execution of these mechanisms ensures that all necessary personnel (e.g., ES&H professionals, line management, workers, QA) are integrated at the activity level and involved in the work planning process to ensure that hazards are fully analyzed and appropriate controls are developed. Roles and responsibilities within the work planning process are clearly identified and understood, and personnel are held accountable for properly accomplishing their assigned responsibilities. Mechanisms such as comprehensive training and qualification programs are in place to ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities.

Based on work observations and interviews, operations personnel maintained awareness of facility activities to ensure compliance with the established safety envelope, and line management was actively involved to verify their expectations were being met.

Although there was limited documented evidence, during interviews workers stated that they were very comfortable with providing verbal feedback to their line management. This comfort level was evident during the SPA briefings, where workers were actively engaged in identifying hazards and controls for assigned tasks.

Overall, NIF and PS have implemented the LLNL ISMS Description to effectively plan, authorize, and execute work safely.

Issues:

Opportunity for Improvement

OP.4-1/OFI: Because the TIM (used to track training qualification at NIF) does not track medical surveillance data, LLNL should consider completing the NIF initiative to populate the

OSP 581.11 IWS “shells” with workers, training, and medical surveillances to ensure that supervisors are able to effectively ensure that workers have completed the required medical surveillances prior to being assigned to a work activity.

Submitted by: Signature On File Patricia Williams, Team Member	Reviewed by: Signature On File William Miller, Team Leader

LLNL ASSESSMENT FORM

FUNCTIONAL AREA: **Operations –** Global Security (GS) Directorate	**OBJECTIVE:** OP.5 /Marvin Mielke **DATE:**	**OBJECTIVE MET: YES X NO ___**

OBJECTIVE

OP.5: The GS Directorate has implemented the LLNL ISMS Description to effectively plan, authorize and execute the identified work for the facility or activity such that:

- The full spectrum of hazards associated with the work they perform is identified, analyzed, and categorized.
- Controls are developed to mitigate the identified hazards within a facility or activity.
- Controls selected ensure adequate protection of the public, worker, and environment.
- Clear and unambiguous roles and responsibilities are defined and maintained at all levels within the facility or activity.
- Managers at all levels demonstrate a commitment to ISMS through policies, procedures, and their participation in the process.
- Line managers are responsible and accountable for safety.
- Facility or activity personnel are competent commensurate with their responsibility for safety. (CE II-2, CE II-3, CE II-4, CE II-6)

CRITERIA

1. Mechanisms are utilized by personnel to ensure hazards associated with the work have been identified, analyzed, and appropriate controls selected. The resulting documentation is complete, and meets DOE expectations. The execution of these mechanisms ensures that all necessary personnel (e.g,. ES&H professionals, workers, line management, QA,) are integrated at the activity level to ensure hazards are fully analyzed and appropriate controls developed. These mechanisms ensure direction and approval from line management and integration of the requirements. (DOE-HDBK-3027-99, DOE M 450.4-1)

2. Mechanisms are utilized to develop, review, approve, and maintain current all elements of the facility authorization basis documentation (and work planning and control process) in accordance with the LLNL ISMS Description and 10 CFR 830 for nuclear facilities. (DOE-HDBK-3027-99)

3. Mechanisms are in place to effectively and accurately implement all aspects of the authorization basis. (DOE-HDBK-3027-99, DOE M 450.4-1)

4. Roles and responsibilities within the facility or activity are clearly defined, understood, and consistent with the LLNL ISMS Description to ensure that safety is maintained at all levels. Personnel are held accountable for properly accomplishing their assigned responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

5. Mechanisms are in place that ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

6. Mechanisms are utilized to confirm that the facility or activity and the operational work force are in an adequate state of readiness prior to authorizing the performance of the work in accordance with the LLNL ISMS Description and DOE requirements for nuclear facilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

7. Workers actively participate in the work planning process. (DOE-HDBK-3027-99)

8. Line managers periodically take steps to reinforce safety, including personal visits and walkthroughs to verify that their expectations are being met. (DOE M 450.4-1)

9. Facility operations personnel maintain awareness of all facility activities to ensure compliance with the established safety envelope. (DOE M 450.4-1)

10. Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented. There is evidence that feedback and improvement information is reviewed and used to improve future work performance in appropriate cases. (MG.2 CRAD Criteria 2)

APPROACH

Records Reviewed:

- IWS-14076.01-DNDO Red Team Draft
- IWS 14076 Red Team
- IWS-988.07r8-Rad Detector Development & Measurement
- IWS-15157- Draft- International Travel
- IWS-3192.06- Laser Vibrometry
- IWS -13807.01r3 Fabrication of Electronic components
- IWS -12832.06 Real Time PCR
- IWS-988.07- Rad Detector Deployment
- PWS Form Procured Work Services (vendor hazards checklist)
- GS/Suggested Daily Pre Job Brief checklist (optional)
- Lessons Learned Safety Alert 12/8/04
- 2008 Silver Award for Safety to Robert Sawvel
- GS- Safety and Security Training Program Plan Rev 11 PLN 05-003
- ES&H Documents 2.1, 2.2, 3.1, 11.1, 11.2, 12.6, 13.1, 13.2, 13.6, 14.1,14.2, 14.8, 14.10, 14.12, 15.2, 16.1,17.1,18.1, 18.5, 19.1, 20.2, 20.8, 21.3, 22.1, 22.5, 30.1, 31.1, 32.4, 36.1
- Facility Work Control Center spread sheets/released IWS log
- GS briefing slides for new employees
- GS organization charts
- GS Internal spread sheets tracking IWS conversion to tasked based
- Phase I ISMS Review Document
- LLNL Safety Toolbox Guide
- GS Business Operations “Pulse” news letter Sept. issue
- GS monthly safety meeting agenda
- GS Operations Review Board (ORB) agenda/minutes
- GS ORB spread sheet / tracking and ranking review
- GS POD agenda
- Interoffice memo, GS Directorate Guidance: safety performance input for 2008/09

performance appraisals
- 2009 Contract from GS Principal Director to management staff concerning goals for safety security posture
- Samples of Safety walkthrough (Jan 2009, Feb 2009)
- Samples of IWS comment logs
- Samples of Pre Job reviews
- Memo from M Ludwig Re: M&O electrical Boxes
- Integrated safety management system WSH PDD-001-06
- IH Discipline Action Plan / GS
- IH DAP action inventory /GS
- HP DAP Action Plan /GS
- GS LTRAIN Questionnaire

Interviews:

- Principal Associate Director –GS
- GS Business and Operations Division Leader
- GS Deputy Principal Associate Director for Strategic Operations
- GS Assurance managers
- GS Safety Manager
- Operations Manager 132S
- ES&H Team 2 leader, deputy team leader, team members (IH, Safety, Env), and coordinator
- RIs, AIs, technical staff, engineers for all observed work
- Facility work control team
- LSO technical team lead
- LSO Assistant Manager Technical Services (AMTS)
- Consultant LLNL Work Control Pilot

Observations:

- Source Assembly, IWS 14076, 132N
- Laser Vibrometry, IWS3193.06, 132S
- GS Plan of the Day Meeting
- Fabrication of Electrical Components, IWS13807.01, 132S
- Safety Committee Meeting
- ORB Meeting
- Real Time PCR, Analysis of Bacteria Cells, IWS 12832.06, 132N
- Radiation Detector Deployment Prep., IWS 988.07132S
- GS Work Control Center Observation and interview
- GS Roundtable with ES&H Team 2
- Assembly of a DS-3 Detector, IWS 12250, 132N

The team observed lower-hazard work activities at various GS buildings. Work in higher hazard areas, such as the forensic laboratories, was not available at the time of the review.

DISCUSSION OF RESULTS

1. **Mechanisms are utilized by personnel to ensure hazards associated with the work have been identified, analyzed, and appropriate controls selected. The resulting**

documentation is complete, and meets DOE expectations. The execution of these mechanisms ensures that all necessary personnel (e.g., ES&H professionals, workers, line management, QA) are integrated at the activity level to ensure hazards are fully analyzed and appropriate controls developed. These mechanisms ensure direction and approval from line management and integration of the requirements. (DOE-HDBK-3027-99, DOE M 450.4-1)

The GS mission to "Apply multidisciplinary science and technology to anticipate, innovate, and deliver responsive solutions to complex global security needs" requires that many diverse activities need to be considered while establishing an effective work control program, including R&D in a variety of LLNL laboratory settings as well as for work in foreign countries. Interviews, document reviews, and observations indicate that GS senior management has established an organization that can respond to the ES&H Documents 2.1 and 2.2 in an effective and organized manner.

GS has incorporated mechanisms to ensure that the formal work control process as outlined in "LLNL Institutional ES&H Document 2.2" is effective and integrated into facility and mission activities. HSS performed a variety of work observations, interviews, document reviews, and observation of standing meetings that indicated that hazards and controls associated with work activities are effectively managed by line management, identified and controlled by responsible individuals, reviewed and verified by ES&H team members, and executed by staff. The following is a summary of mechanisms observed during the HSS review that demonstrate the GS approach to work control:

- The IWS conversion process is managed and tracked by operations management. IWSs are ranked by level of risk, goals have been set for completion, and new IWSs are required to be tasked-based, in accordance with LLNL institutional requirements.
- Standing meetings by GS line management, such as the Monthly Safety Committee, POD, and ORB, all address the work control and IWS process (as well as general safety and security requirements) in terms of quality, effectiveness, and interfaces with external resources (facilities maintenance, vendors, ES&H teams, etc.).
- Responsibilities and roles are assigned and documented by GS senior management for individuals to ensure that safety envelopes are maintained and work is properly authorized, approved, and released. Safety responsibilities are considered in the performance evaluation for these individuals. The Institutional ES&H Manual effectively describes roles and responsibilities for managers and staff concerning work control, authorization of work, approving work, and releasing work.
- Observations of six GS mission related work activities and several additional IWS examples indicated that the IWS process appropriately identifies the hazards and controls, appropriately identifies required training, and ensures staff awareness of hazards and implementation of controls as stated in the IWS. Pre-job briefs were conducted and documented. Interviews and discussions with RIs and AIs were generally positive and reflected an awareness of their space/work area, hazards and controls, and responsibility for their adjunct staff.
- ES&H Team 2 was engaged in the GS IWS review process. Safety team roundtables were effective and efficient in seeking information concerning the IWS tasks and discussing the hazards and controls associated with the work activities. ES&H Team 2 had established a goal of reviewing IWS comments/concerns within 5 days or less and usually met that goal. The ES&H Team's suggestions and changes are tracked to resolution by the ES&H Team coordinator.
- The integration of LTRAIN into the integrated IWS process was efficient and provided real-time data to RIs concerning staff readiness to work. Senior GS management has taken steps

to reinforce the need to maintain directorate training requirements.

- GS senior management has assigned two operations managers to monitor, train, teach/mentor, and ensure the conversion and quality of all GS mission related IWSs.
- The GS work control center ensures that all maintenance and vendor work activities are released and properly integrated into current mission related work activities to eliminate any negative impact created by maintenance work and that all hazards and controls are identified.
- Publications such as the Pulse newsletter, monthly safety meetings and the GS web site provide valuable safety information to all staff.
- Senior management and assurance management have formal processes in place to maintain operational awareness, review safety awareness, and promote a safety culture within the directorate.

Although controls were adequate, some minor housekeeping issues were noted and ergonomic concerns were not always fully considered. In addition, some GS personnel had questions about the value of the repetitive pre-job briefs and the task IWSs. **(OP.5-1/OFI)**.

The criterion was met.

2. Mechanisms are utilized to develop, review, approve, and maintain current all elements of the facility authorization basis documentation (and work planning and control process) in accordance with the LLNL ISMS Description. (DOE-HDBK-3027-99)

GS has successfully implemented the LLNL ISMS plan and is in compliance with ES&H Document 3.1 Non Nuclear Authorization Basis. GS has provided to LLNL/LSO the required documentation to formally identify, control, and mitigate as necessary hazards that could impact workers, co-located workers, and the public. They have documented a process for the GS facility safety management to notify LSO of any changes or additions of higher hazard facilities in a timely manner; interviews with LSO and AMTS staff indicate that GS has provided the required data to LSO.

LSO technical staff routinely assess and provide surveillance data from the GS Directorate to LSO and regularly attend GS mission related safety meetings, pre-start reviews, safety roundtables, etc. Similarly, required FSPs are tracked through the GS Facility Safety Office and are updated as necessary.

The criterion was met.

3. Mechanisms are in place to effectively and accurately implement all aspects of the authorization basis. (DOE-HDBK-3027-99, DOE M 450.4-1)

The current ES&H Manual Chapter 2.2 Work Control, along with the task based IWS, provides the framework for mechanisms to define, identify, analyze, and control work activities. Other mechanisms, including links to the training database (LTRAIN), ensure that controls such as required training are established and completed for each affected worker. SME reviews are identified to provide consistency and rigor for both the identification and control of hazards as required by the work control process. Similarly the facility and work control center interface located in 132N provides a control point for all scheduled maintenance or subcontracted vendors to “check in” prior to any external maintenance or non-mission related work being authorized and released. As noted in the ES&H 2.2 document, the authorization, approval, and release of work is a mandatory part of the work control process. Based on a risk prioritized model, the current IWS

documentation is being converted to the task based method, and this effort is progressing well.

Consistent with institutional work control requirements, GS management tracks the IWS review process and concurs with completed IWSs. GS Operations managers use spreadsheets to track the IWS review process to ensure that IWS reviews are scheduled and completed as required. WAL B and C activities are reviewed annually by the RI in consultation with ES&H.

The criterion was met.

4. Roles and responsibilities within the facility or activity are clearly defined, understood, and consistent with the LLNL ISMS Description to ensure that safety is maintained at all levels. Personnel are held accountable for properly accomplishing their assigned responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

The combination of required training (LTRAIN and IWS related), institutional requirements (work control 2.2), mentoring and tracking of the IWS conversion process, and integration of the ES&H team has effectively contributed to the successful maintenance of the GS safety envelope. Work control 2.2 addresses/ defines roles and responsibilities for managers, RIs, AIs, and staff. These roles and responsibilities are reinforced by training, tracking (issues, ORPS, safety concerns, lessons learned, assessments) and evaluations of performance to ensure that performance is maintained. For example, ES&H Team roundtables formally review IWS scope, hazard identification, and controls. Also, the LLNL toolkit reinforces safety related roles and responsibilities and facilitates the operational review process (management walkthroughs, pre-job briefs, and pre-start reviews) and the Directorate level self-assessments and tracking database. The GS Principal Associate Director and Operations Manager continually communicate the need to reinforce safety, hold managers and staff accountable for safety, and provide an environment to promote safety.

The criterion was met.

5. Mechanisms are in place that ensure that personnel who perform, supervise, or analyze work have competence commensurate with their responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

Training plans, institutional training criteria, and on-the-job training have been established in accordance with institutional training requirements and are delineated and tracked through the GS IWS process. Specific courses related to activity hazards require managers to complete courses that enhance knowledge and understanding of that hazard category (chemicals, biological, etc.). LTRAIN tracks the status of all directorate staff training requirements and indicates a real time yes or no in the IWS. Because GS management was concerned about the percentage of training that was not completed within the Directorate, a specific policy was developed by the management team to remedy the problem. A GS training coordinator compiles statistics concerning training and posts results during safety meetings and in the Pulse newsletter. Direction from the Operations Manager about performance evaluations and the need to include safety performance in all employee evaluations was disseminated in April 2009.

The criterion was met.

6. Mechanisms are utilized to confirm that the facility or activity and the operational work force are in an adequate state of readiness prior to authorizing the performance of the

work in accordance with the LLNL ISMS Description. (DOE-HDBK-3027-99, DOE M 450.4-1)

Based on observations, interviews and area tours of six GS mission related work activities, HSS determined that the related IWSs were comprehensive and accurate with respect to the identification of hazards and controls. Training was appropriate, and staff members were aware of hazards and followed controls as stated in the IWS. Pre job briefs were conducted and documented. RIs and AIs were generally aware of their space/work area, aware of hazards and controls, and responsible for their adjunct staff. In addition:

- ES&H Team 2 was engaged in the IWS review process, and safety team roundtables were effective and efficient in producing a streamlined review process. The ES&H Team's suggestions and /or changes were tracked to resolution.
- The integration of LTRAIN into the integrated IWS process was efficient and provided data to RIs concerning staff readiness to work.
- In situations where individual staff may work alone or arrive early to a work site, an individual pre job brief is documented to ensure that the work space is free of hazards and that work can be conducted in a safe manner.
- Management and operations personnel perform a variety of walkthrough activities, both for safety awareness and pre operational reviews.

The criterion was met.

7. Workers actively participate in the work planning process. (DOE-HDBK-3027-99)

The observed research and development work assignments within GS were performed by only two or three individuals including the RI/researcher , technical staff, and in some cases a project engineer. For the work observed by HSS, the team members (RI, Tech, Engineer, Operations Management) worked well together, participated in the planning process as a team, and sought help from operations or the safety team to plan work. Evidence from pre job review documents indicated that most effected staff members were present and were included in the IWS review process. Staff participated in revisions and changes to the work control process as indicated by samples of IWS review and comment listings and revisions and updates to IWSs. Interviews with staff during the work observations indicated that active participation is encouraged by GS managers to improve the research and the efficiency and the safety of the project.

The criterion was met.

8. Line managers periodically take steps to reinforce safety, including personal visits and walkthroughs to verify that their expectations are being met. (DOE M 450.4-1)

Interviews with Operations managers, safety managers, and assurance managers confirmed that their roles to reinforce safety and verify expectations were formalized and functioning effectively.

GS senior management has established with line management an annual "safety contract" that includes such items as the safety walkthrough program with related goals, metrics, and outcomes. The metrics are tracked through the safety office and the ITS (issues tracking system) and published in the Pulse newsletter. The actual results from a safety walkthrough are included in the ITS, and any actions can be tracked to completion. The Directorate goal "is to improve the safety culture and assurance so that staff and friends go home safe" each day.

Additionally, RIs and other responsible staff are required to perform a pre-job brief as stated in ES&H Document 2.2. The pre-job briefs are documented in notebooks, checklists, or sign sheets. All work observations during the Phase II included a pre-job brief that discussed hazards, controls, and questions related to the specific activities scheduled for that day.

The criterion was met.

9. Facility operations personnel maintain awareness of all facility activities to ensure compliance with the established safety envelope. (DOE M 450.4-1)

The facility/work control center interface located in 132N provides a control point for all scheduled maintenance or subcontracted vendors to "check in" prior to any external maintenance or non-mission related work being authorized and released. As established in the ES&H Document 2.2, the authorization, approval, and release of work is a mandatory part of the work control process. The facilities work control team maintains lists of released mission work activities and matches approved maintenance and vendor work activities to ensure that work activities do not conflict. The facilities team notifies all potentially affected RIs if any facilities work may conflict with mission work. Postings, e-mails, and tagout signs require a positive response from RIs prior to any maintenance job release. The team ensures that all hazards and controls from the mission and maintenance perspective are understood prior to releasing the work. The facilities team demonstrated that it understood the work control process and provided samples of facility spreadsheets used to track released work.

The effort to convert current IWS documentation to the task based method is progressing well. The conversion to a task based IWS could allow for certain vendors (i.e., those providing recurring services) to be included as a task within the IWS and thus facilitate access by GS staff and facilities staff concerning the scope, hazard identification, and controls of vendor activities.

The criterion was met.

10. Following work performance, observations and suggestions for feedback and improvement purposes are discussed and documented. There is evidence that feedback and improvement information is reviewed and used to improve future work performance in appropriate cases. (MG.2 CRAD Criteria 2)

Interviews with staff and review of the electronic IWS review summary system indicated that revisions and updates of IWS were common. RIs and engineers reported that opportunities for feedback occur on a daily basis among the staff as part of the research process. As one example, for the Red Team Deployment work area, based on feedback, a shielded cabinet was designed that is organized so that sources can be located easily and quickly, categorized so they can be inventoried, and locked for security. The shielded cabinet considered radiation protection concerns and eliminated the use of lead "pigs" for storage. All staff indicated that they could and do contribute to feedback both formally and informally.

The criterion was met.

Conclusion:

The objective was met.

GS has incorporated mechanisms to ensure that the formal work control process as outlined in "LLNL Institutional ES&H Document 2.2" is effective and integrated into both facility and mission activities. HSS work observations, interviews, document reviews, and attendance at standing meetings indicated that hazards and controls associated with work activities are effectively managed by line management, identified and controlled by responsible individuals, reviewed and verified by ES&H Team members, and executed by staff.

Opportunity for Improvement:

OP.5-1/OFI: LLNL/GS should consider having GS Directorate operational managers and safety personnel spend more time in work spaces mentoring staff on the value of pre-job briefings (e.g., less repetitive), how safety issues such as improving industrial ergonomic concerns can enhance workplace safety, housekeeping (chemical storage, excess equipment), and the value of pursuing task based IWSs in controlling workplace hazards.

Submitted by: Signature On File___ Marvin Mielke Team Member	Reviewed by: Signature On File___ William Miller, Team Leader

LLNL ASSESSMENT FORM

FUNCTIONAL AREA: **Operations -** Weapons and Complex Integration (WCI) Directorate	**OBJECTIVE:** MG.1 **DATE:**	**OBJECTIVE MET: YES X NO ___**

OBJECTIVE

MG.1 An integrated process has been established and is utilized to identify and prioritize specific mission discrete tasks, mission process operations, modifications and work items. (CE II-1)

CRITERIA

1. Line management has implemented mechanisms to identify and prioritize mission-related tasks and processes, modifications, and work items. Safety and productivity concerns receive balanced consideration in funding allocation and schedule decisions. (DOE-HDBK-3027-99, DOE M 450.4-1)

2. Roles and responsibilities for the identification and prioritization of mission-related tasks and processes, facility or process modification, and other related work items are defined and understood. Personnel assigned to the roles are competent to execute these responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

3. Mechanisms are in place and utilized by personnel that ensure identified work (mission-related tasks and process, processes or facility modification, maintenance work, etc.) can be accomplished within the safety envelope for the facility. (DOE-HDBK-3027-99)

APPROACH

Records Reviewed:

- Program Description Document, *Integrated Safety Management System*, WSH-PDD-001-06, September 1, 2009
- *LLNL Institution-Wide Work Control Process Requirements Document*, LLNL-AM-405814, Revision 0, July 30, 2008
- *LLNL Budget Planning and Execution Process Description*, Revision 0, July 2009
- ES&H Manual Document 2.1, *General Worker ES&H Responsibilities*, Implementation Date May 13, 2009
- ES&H Manual Document 2.2, *LLNL Institution-Wide Work Control Process*, Implementation Date July 29, 2009
- *Superblock Work Control Manual*, December 2008
- *Tier 3 Safety Basis Document for the Physical & Life Science Site 300 Facility*, Revision 0, Change 1, June 2009.
- ES&H Manual Document 51.1, *Documented Safety Analysis Program Plan*
- ES&H Manual Document 3.1, *Nonnuclear Safety Basis Program*
- *Facility Safety Plan B Division Site 300*, FSP-S300.1, Revision 4.1, November 19. 2007
- *Documented Safety Analysis for the B695 Segment of the Decontamination and Waste*

Treatment Facility, June 2007
- *Documented Safety Analysis for the B695 Segment*, LLNL-TR-407067 Rev. 0, February 2009 [Effective DSA/TSR Annual Update Implementation November 4, 2009]
- *Technical Safety Requirements for the B695 Segment of the Decontamination and Waste Treatment Facility*, UCRL-TR-234416, Rev. 1, February 2008
- *Technical Safety Requirements for the B695 Segment*, LLNL-TR-407062 Rev. 0, February 2009 [Effective DSA/TSR Annual Update Implementation November 4, 2009]
- *Documented Safety Analysis for the Waste Storage Facilities*, LLNL-TR-404821, June 2008
- *Technical Safety Requirements for the Waste Storage Facilities*, LLNL-TR-404757, June 2008
- *LSO Safety Evaluation Report for the B695 Segment Annual Update*, dated June 2009
- *LLNL Nuclear Facilities/Activities Safety Basis Documents – Radioactive and Hazardous Waste Management (RHWM) - Includes Safety Basis changes effective through October 2, 2009* (Updated October 13, 2009)
- TSR Implementation Plan, February 2009 B695 *Segment DSA/TSR Annual Update*, Revision 0, October 7, 2009, Implementation Date November 4, 2009
- Various letters and memorandums between LSO and LLNL regarding AB document revisions, modifications, approvals, and implementation
- *B695 Segment Technical Safety Requirements Implementation Crosswalk*, January 11, 2008
- RHWM Procedure STO 111, *Combustible Loading Determination*, Revision 2, October 29, 2008
- Site 300 Plan of the Week, October 19 – 23, 2009
- RHWM Facility Activity List for the week of October 19 – 23, 2009

Interviews:

- Deputy PAD, WCI
- Site 300 Manager
- Site 300 Work Control Coordinator
- WCI B Division Primary Nuclear Design Operations Manager
- RHWM Facility Manager
- NMTP Safety and Work Control Manager
- RHWM Program Manager
- NMTP AB Manager
- RHWM Lead Safety Analyst

Observations:

- Site 300 POD meetings
- RHWM POD meetings
- RHWM POW meeting

DISCUSSION OF RESULTS

1. **Line management has implemented mechanisms to identify and prioritize mission-related tasks and processes, modifications, and work items. Safety and productivity concerns receive balanced consideration in funding allocation and schedule decisions. (DOE-HDBK-3027-99, DOE M 450.4-1)**

The primary mechanisms to identify and prioritize mission-related tasks and processes, modifications, and work items include budget and performance driven mechanisms such as the LLNL Budget Planning and Execution Process. Each PAD develops a multiyear strategic plan based on both internal and external program requests and input that is fed into the Laboratory's strategic plan. The strategic plans are also aligned with priorities established with NNSA through the Performance Evaluation Plan (PEP). Strategic plan development includes appropriate consideration of risk assessments and level of rigor, as well as actions needed to address the PEP, which contains several ES&H performance objectives.

At the activity level, WCI organizations use POW meetings held the week prior to the scheduled start of the work to schedule activities, discuss and resolve potential conflicts, and authorize upcoming activities. Following the POW meeting, a work control coordinator compiles the information into the POW at Site 300 or a "Facility Activity List" at RHWM for the following work-week. Observed documents and meetings indicated that safety and productivity concerns receive balanced consideration in schedule decisions.

The criterion was met.

2. **Roles and responsibilities for the identification and prioritization of mission-related tasks and processes, facility or process modification, and other related work items are defined and understood. Personnel assigned to the roles are competent to execute these responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)**

Roles and responsibilities for the LLNL Budget Planning and Execution Process are delineated in the *LLNL Budget Planning and Execution Process Description*; ES&H Manual Document 2.1, *General Worker ES&H Responsibilities*; and ES&H Manual Document 2.2, *LLNL Institution-Wide Work Control Process.* At the activity level, roles and responsibilities of appropriate personnel for identification and prioritization of mission-related tasks are further delineated within the HE operations in the Site 300 AB document and the FSP for Site 300 and in the AB documents and the FSPs at RHWM. WCI supervisors and managers understood their roles and responsibilities with regards to identification and prioritization of mission-related tasks and processes, facility or process modification, and other related work items, and effective planning and scheduling processes and products indicated that the personnel assigned to the roles are competent to execute these responsibilities.

The criterion was met.

3. **Mechanisms are in place and utilized by personnel that ensure identified work (mission-related tasks and process, processes or facility modification, maintenance work, etc.) can be accomplished within the safety envelope for the facility. (DOE-HDBK-3027-99)**

RHWM uses several tools to ensure that all aspects of the authorization basis are effectively and accurately implemented. First, LLNL maintains a safety basis list, agreed to by LSO, to document what specific documents specifically comprise the authorization basis. Then, institutional procedures specify the mechanisms to ensure that requirements are implemented. For example, the last annual update to the RHWM B695 Segment DSA involved some TSR changes, which were required to be implemented by November 4, 2009. For the RHWM B695 Segment update, a TSR implementation plan was approved, and a TSR crosswalk was being used to ensure that all aspects of the changes are implemented in both field documentation and in necessary training of personnel.

Another example of authorization basis implementation is the implementation of a SAC for combustion control in the RHWM *Technical Safety Requirements for the Waste Storage Facilities* (B696R). The SAC was incorporated in the latest annual update for this TSR and was fully implemented prior to this inspection. The SAC is a limit of an average of 7 pounds of combustible materials per square foot in the facility (excluding such items as those inside waste drums). The implementation of the SAC included a quarterly inspection requirement for the fire protection engineer, implementation of a procedure to calculate and track combustible loading, and implementation of weekly operator checks to ensure that no major changes to the combustible loading occur between the documented quarterly inspections. Considering the magnitude of the combustible material limit, significant changes to the combustible inventory between quarterly inspections that might approach the limit would be adequately identified by the operator checks.

The primary implementing mechanism for the Site 300 Safety Basis Document is the use of FSPs. These plans translate the limits of the document into specific controls for field implementation. For example, explosive limits are included in FSPs and are primarily enforced through explosive weight limits for rooms, operations, and individual facilities; worker training; and real-time inventory postings using marker boards at each operational area. During activity observations, workers accurately implemented authorization basis weight limit controls. This also applies to the observed shot activities at B-851.

The criterion was met.

Conclusion:

The objective was met.

LLNL and WCI have established and implemented an integrated process to identify and prioritize specific mission discrete tasks, mission process operations, modifications, and work items. At the institutional level, mechanisms such as the LLNL Budget Planning and Execution Process provide the appropriate requirements. At the activity level, ES&H Manual Document 2.2, *LLNL Institution-Wide Work Control Process*, describes the LLNL activity/task-level approaches to ensure that discrete tasks, process operations, modifications, and work items receive the appropriate prioritization during planning and scheduling. Several institutional and facility specific documents provide clear assignments of roles and responsibilities for mission discrete task, mission process operations, modification, and work item scheduling and prioritization. Finally, RHWM uses several tools to ensure that all aspects of the authorization basis are effectively and accurately implemented during planning and scheduling of mission-related projects and tasks.

Submitted by: Signature On File Ed Stafford, Team Member	Reviewed by: Signature On File William Miller, Team Leader

LLNL ASSESSMENT FORM

FUNCTIONAL AREA: Science and Technology (S&T) Principal Directorate	**OBJECTIVE:** MG.1 **DATE:** 11/09/09	**OBJECTIVE MET: YES X NO __**

OBJECTIVE

MG.1: An integrated process has been established and is utilized to identify and prioritize specific mission discrete tasks, mission process operations, modifications and work items. (CE II-1)

CRITERIA

1. Line management has implemented mechanisms to identify and prioritize mission-related tasks and processes, modifications, and work items. Safety and productivity concerns receive balanced consideration in funding allocation and schedule decisions. (DOE-HDBK-3027-99, DOE M 450.4-1)

2. Roles and responsibilities for the identification and prioritization of mission-related tasks and processes, facility or process modification, and other related work items are defined and understood. Personnel assigned to the roles are competent to execute these responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

3. Mechanisms are in place and utilized by personnel that ensure identified work (mission-related tasks and process, processes or facility modification, maintenance work, etc.) can be accomplished within the safety envelope for the facility. (DOE-HDBK-3027-99)

APPROACH

Records Reviewed:

- UCRL-AM-133867-VOL-1-PT-2.1-2009 - ES&H Manual Document 2.1; General LLNL Worker ES&H Responsibilities; approved March 13, 2009
- LLNL–AM-409863 – ES&H Manual Document 2.2; LLNL Institution-Wide Work Control Process; approved July 28, 2009
- UCRL-AM-133867 – ES&H Manual Document 3.3; Facility Safety Plans and Integration Work Sheets with Safety Plans; approved December 22, 2006
- WSH-PDD-001-06 – Integrated Safety Management System Program Description Document; effective September 1, 2009
- Main Bay Training Matrix; undated
- TRED/Manufacturing Supervisor Guide, Developing & Implemented a Shop Training Plan; dated January 30, 2008
- LLNL-AM-417788 - Engineering 900 Series Skill of the Craft Certification Program – TRED08-008, dated January 2008
- IWS 15223 r2 – Standard Machine Tool Operation (B-321A Main Bay); approved October 7, 2009
- IWS 15223 Material List and Use Requirements; dated September 22, 2009
- IWS #1096.06 r27 – Powder Coating; dated November 26, 2003

- IWS #15231 r23 – MTS Electrical and Controls Installation, Maintenance, and Repair of Machine Tools; dated August 1, 2009
- IWS # 11434.05 r23 - Machine Tool Services Equipment Installation, Modification, Service, Disassembly, and Removal; dated May 18, 2009
- IWS #351.07 r17 – Field Support Installation / Electronic; dated April 29, 2008
- IWS # 14189.08 r19 – TRED User Shops Machine Tool Operations; dated July 7, 2009
- IWS #11319.05 r11 – Metal Finishing, Standard Operations; dated June 20, 2008
- IWS #10263.02 r39 – Standard Weld Shop Operations (321 Weld Shop); dated December 13, 2006
- Machine Tool Operation Safety (MTOS) Training Program – TRED08-22, dated February 2008
- UCRL-AM-235580 - Facility Safety Plan Engineering 320 Block Building, dated October 16, 2007
- FY09 Safety & Security Contract between Tomas Diaz de la Rubia, Principal Deputy PAD for S&T and LLNL Director; undated
- ES&H Roles and Responsibilities Contact List for Building 321A; intranet version on October 28, 2009
- ES&H Roles and Responsibilities Contact List for Building 383; intranet version on October 28, 2009
- IWS 10276.04 r7 “Jupiter Laser Facility Support Operations”
- IWS 12639.01 r12 “Jupiter Laser Facility Experimental Operations
- IWS 11709.05 r14 “decoding Functional Sequences through Comparative Genomics”
- IWS 14649.01 r11 “ Identify and characterize Beryllium and Beryllium Articles for Transfer from Cage 100H”
- IWS 1910.04 “Super EBIT/EBIT and Operations in Building B-194
- IWS 11667.01 r20 “Materials Characterization”
- IWS 14372 r2 “Operations in the B197/rm 1015, 1017, 1019”

Interviews:

- Deputy PAD for Operations for S&T Directorate
- Acting Associate Director for Engineering
- TRED Director
- TRED Manufacturing Section Leader
- Assurance Manager
- Director, JLF
- Area Facility Operations Manager, S&T PAD
- Deputy Division Leader Condensed Matter Materials Division
- Deputy Department Head, HCD
- MTS Supervisor
- Main Bay Supervisor
- Main Bay Shop Foreman
- Main Bay Planner
- Field Services Supervisor
- Field Services Planner and Team Leader
- Deputy Team Leader - ES&H Team 2
- Industrial Hygienist - ES&H Team 2
- Industrial Safety - ES&H Team 2

- Fire Protection - ES&H Team 2
- Environmental Analyst - ES&H Team 2
- User Shop Supervisor
- Various RIs within the PLS Directorate for the aforementioned IWSs
- Various AIs within the PLS Directorate for the aforementioned IWSs
- Various DTLs within the PLS Directorate for the aforementioned IWSs
- Various Research Staff within the PLS Directorate for the aforementioned IWSs

Observations:

- Machining Operations
- Main Bay Daily Safety Briefing
- Welding Operations
- MTS Daily Safety Briefing
- Field Services Daily Safety Briefing
- Powder Coating Operations
- Equipment Maintenance
- Network Cable Installation
- Parts Cleaning Operations
- Electronics Fabrication
- Planner/Customer interactions
- Jupiter Laser Facility Support Operations
- Jupiter Laser Facility Experimental Operations
- Decoding Functional Sequences through Comparative Genomics
- Identify and characterize Beryllium and Beryllium Articles for Transfer from Cage 100H
- Super EBIT/EBIT and Operations in Building B-194
- Materials Characterization
- Operations in the B197/rm 1015, 1017, 1019

DISCUSSION OF RESULTS

1. **Line management has implemented mechanisms to identify and prioritize mission-related tasks and processes, modifications, and work items. Safety and productivity concerns receive balanced consideration in funding allocation and schedule decisions. (DOE-HDBK-3027-99, DOE M 450.4-1)**

Prioritization of mission activities within the TRED of the Engineering Directorate and the PLS Directorate is primarily driven by customer requirements. The urgency of work requests is determined during discussions between the planner and customer. Scheduled start and completion dates are established to reflect these priorities. Routing sheets, initial work assignment discussions, and/or daily pre-job briefs are used to communicate these priorities to workers and team leaders. For work activities conducted in field locations, scheduling and sequencing of activities is coordinated with the appropriate FPOC.

During several work observations within TRED, workers were reminded to pause or stop work, if necessary, to correct any unsafe conditions identified. In addition, staff levels in several shops were significantly impacted by worker absences due to influenza. Workers were instructed to ensure work proceeded safely even if work completion needed to be delayed.

Line management within the S&T Principal Directorate takes a balanced approach to safety expenses when allocating resources. Funding reductions to safety support functions, such as the ES&H Team, the ergonomics program, and the grassroots safety committees, have been avoided due to senior management involvement and shifting funding reductions to activities having less impact on safety.

The criterion was met.

2. Roles and responsibilities for the identification and prioritization of mission-related tasks and processes, facility or process modification, and other related work items are defined and understood. Personnel assigned to the roles are competent to execute these responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

Roles and responsibilities are well defined through a variety of institutional-, directorate-, and facility-level documents. The ES&H Manual Chapter 2.1 establishes general roles and responsibilities for senior management, SMEs, AIs, RIs, FPOCs, workers, and onsite personnel not employed by Lawrence Livermore National Security, such as visitors, subcontractors, and visiting scientists.

Roles and responsibilities for the planning and implementation of PLS research activities are also defined in the IWS, particularly with respect to the roles and responsibilities of the RIs, AIs, and DTRs. RIs, AIs, and DTRs associated with the observed experiments were aware of their roles, responsibilities, and authorities with respect to their work activities. In some cases, such as JLF, separate IWSs have been prepared for the JLF facility laser operations staff and the experimental staff which have enhanced role and responsibility delineation.

Within the Engineering Directorate, the MTOS training program and the skill of the craft certification program established a certification process for ensuring that workers are competent to conduct assigned operations. Each machinist's level of proficiency (none, limited, fully trained, proficient, or trainer) on various types and models of machining equipment is recorded on a matrix developed in accordance with the TRED/Manufacturing Supervisor Guide; *Developing & Implementing a Shop Training Plan.* TRED machinists must maintain the appropriate certification to be assigned work on that type of equipment. Workers performing observed activities were knowledgeable of machining operations and associated safety controls. Within TRED, RIs and AIs are designed in writing for each IWS.

A variety of safety, environmental, and fire protection SMEs are assigned to support the S&T Principal Directorate. Based on interactions and interviews with a number of these SMEs, they are knowledgeable and experienced in their assigned disciplines.

The criterion was met.

3. Mechanisms are in place and utilized by personnel that ensure identified work (mission-related tasks and process, processes or facility modification, maintenance work, etc.) can be accomplished within the safety envelope for the facility. (DOE-HDBK-3027-99)

Mechanisms for establishing the safety basis for non-nuclear facilities are established in ES&H Manual Document 3.1, Non-Nuclear Safety Basis Program. Responsibilities and process requirements for review of planned work to ensure that it is within the envelope of the applicable safety basis are included in Documents 2.1 and 2.2.

With the exception of office buildings, all of the S&T buildings at LLNL have some type of authorization or safety basis document. Many of the buildings are classified as office buildings, and most of the remaining buildings being classified as LSI or low hazard. There are typically no stand-alone authorization basis documents for S&T office buildings. A screening report serves as the authorization basis for LSI facilities. Authorization basis documents for low hazard facilities consist of a screening report and, in some cases, a hazard analysis (i.e., a Tier 2 document). For those S&T facilities with a Tier 2 document, an FSP is also included as part of their authorization basis. Sampled S&T authorization basis documents were in accordance with the requirements of Document 3.1.

S&T facility safety basis documents define the work that can be performed within a facility and the ES&H requirements for that work. The Facility Manager is assigned the responsibility for releasing work that can be performed safely in the facility. The Facility Manager's review of the proposed activity, the IWS for the activity, and the ultimate work release authority ensure that work activities that fall outside the scope of the existing facility safety basis are identified.

Within S&T, each IWS is reviewed and concurred by an FPOC, who is responsible for ensuring that the applicable requirements and controls from the authorization basis documents are integrated into the IWS. The FPOC also attends the ES&H Team 2 roundtable for each new IWS and participates in the pre-start review and walkdown of each new IWS. For those low hazard buildings in which an FSP has been prepared, the FPOC includes administrative controls as needed in the IWS to ensure that the authorization basis is not exceeded. At the initiation of a new IWS or a revision of an existing IWS, the FPOC typically ensures that each chemical quantity identified within the ChemTrack database for that facility has been evaluated for potential worker exposures near the facility and for offsite exposures to the public and environs. For example, authorization basis documents for Building 235 (i.e., the building that houses the beryllium cage, IWS 14649) were consistent with the expectations of Document 3.1 for the beryllium cage work activity. In addition, the FPOC or designee signed each of the IWSs reviewed, indicating that the IWS had been reviewed with respect to the applicable authorization documents.

The FSP for the 320 buildings establishes the list of authorized materials that can be processed within these facilities. Within the 321/322 Complex, these restrictions are flowed down to the activity level through the approved IWSs. Responsibility for preventing new hazards from being introduced by materials outside of the approved materials list is assigned to planners and, in the case of User Shops, the RI. The potential for new hazards to be introduced through unreviewed metals, alloys, composites, or contaminated materials are controlled through planner/customer interactions as part of the work acceptance process. Similarly, for User Shops, the RI is responsible for verifying that materials introduced to the shop by technicians are on the authorized materials lists.

The criterion was met.

Conclusion:

The objective was met.

S&T Principal Directorate line management has developed and implemented processes to ensure that roles are clearly defined, individuals are assigned responsibilities within the scope of their authority and competence, and both safety and productivity are considered in funding allocation and schedule decisions.

Mechanisms for establishing the safety basis for S&T non-nuclear facilities are established in ES&H Manual Document 3.1, Non-Nuclear Safety Basis Program. For those S&T facilities with a Tier 2 document, an FSP is also included as part of their authorization basis. Sampled S&T authorization basis documents were in accordance with the requirements of Document 3.1.

Submitted by: Signature On File___ Lawrence Denicola, Team Member Submitted by: Signature On File___ James Lockridge, Team Member	Reviewed by: Signature On File___ William Miller, Team Leader

LLNL ASSESSMENT FORM

FUNCTIONAL AREA: **Management - Facilities and Infrastructure (F&I) Directorate**	**OBJECTIVE:** MG.1 **DATE:**	**IWS OBJECTIVE MET: YES X NO __**

OBJECTIVE

MG.1: An integrated process has been established and is utilized to identify and prioritize specific mission discrete tasks, mission process operations, modifications and work items. (CE II-1)

CRITERIA

1. Line management has implemented mechanisms to identify and prioritize mission-related tasks and processes, modifications, and work items. Safety and productivity concerns receive balanced consideration in funding allocation and schedule decisions. (DOE-HDBK-3027-99, DOE M 450.4-1)

2. Roles and responsibilities for the identification and prioritization of mission-related tasks and processes, facility or process modification, and other related work items are defined and understood. Personnel assigned to the roles are competent to execute these responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

3. Mechanisms are in place and utilized by personnel that ensure identified work (mission-related tasks and process, processes or facility modification, maintenance work, etc.) can be accomplished within the safety envelope for the facility. (DOE-HDBK-3027-99)

APPROACH:

Records Reviewed:

- WSH-PDD-001-06, *Program Description Document for Integrated Safety Management System*
- LLNL-AM-405814, *LLNL Institution-Wide Work Control Process Requirements Document*
- ES&H Manual, Document 2.1, *General LLNL Worker ES&H Responsibilities*
- ES&H Manual, Document 2.2, *LLNL Institution-Wide Work Control Process*
- ES&H Manual, Document 3.1, *Nonnuclear Safety Basis Program*
- ES&H Manual, Document 2.5, *Managing Subcontracted Work at LLNL*
- ES&H Manual, Document 11.1, *Personnel Protective Equipment*
- ES&H Manual, Document 163.1, *Electrical Safety Program*
- LLNL-MI-416189, *Tools for Identifying and Analyzing Task and Area Hazards Selecting Controls*
- MAN-GWM-0004, LLNL Facilities and Infrastructure *Skill of the Craft Manual*
- MAN-GWM-0003, LLNL Facilities and Infrastructure *Work Control Manual*
- LLNL-MI-413381, *LLNL Safety Toolbox*

Interviews:

- Project Management, Engineering and Construction Department, F&I Directorate, Operations and Business Principal Directorate, LLNL
- F&I Work Planning and Control SME, Operations and Business Principal Directorate, LLNL
- Maintenance Planners, Operations and Business Principal Directorate, LLNL
- Designated responsible individuals and persons in charge for maintenance and construction work
- Facility Managers, Buildings (191, 253, 255, 321, 361, 453, 551, and 694)
- ES&H Team 2 Industrial Hygienist and Industrial Safety SME assigned to MUSD
- MUSD Fall Protection Engineer
- Maintenance Planners
- GSE Superintendent, Safety Officer, foreman, and craft workers

Observations:

- Installation of conduit for the TSF Power Addition construction project by GSE electricians.
- Splicing cables for the Express Feeder Construction Project by Hot Line Construction Company electricians
- Preparations for beryllium decontamination and remediation in Building 321 by GSE craft
- Roof repairs and HVAC PM at Building 253 by MUSD craft
- Building 255 HVAC PM by MUSD heavy equipment craft
- Building 691 Electrical modification by MUSD electrical craft
- Building 551E HVAC compressor replacement by MUSD HVAC craft
- Building 694 Epoxy application by MUSD painting craft
- Building 517 High Voltage breaker LOTO and testing by MUSD HV electrical craft
- Building 298 LCW installation facility modification by MUSD plumbing craft
- Building 361 HVAC corrective maintenance motor shim replacement by MUSD craft
- MUSD Work Induction Board Meeting

DISCUSSION OF RESULTS

1. Line management has implemented mechanisms to identify and prioritize mission-related tasks and processes, modifications, and work items. Safety and productivity concerns receive balanced consideration in funding allocation and schedule decisions. (DOE-HDBK-3027-99, DOE M 450.4-1)

The mechanism used by MUSD to identify and prioritize building maintenance work includes conduct of facility condition assessment surveys to identify facility deficiencies. A risk matrix is used in conjunction with input from the PAD to prioritize each identified deficiency. The matrix includes ES&H and mission risk as part of the design. Input from this process, along with the assignment of timelines required to correct the deficiencies, results in development of MUSD project plans and schedules.

Mechanisms for prioritizing maintenance and construction tasks are included in several LLNL directives, including the LLNL Facilities and Infrastructure *Work Control Manual, the* ES&H Manual Documents 2.1 and 2.2, and LLNL-AM-408814, *LLNL Institution-Wide Work Control Process Requirements Document.* For example:

- Document 2.1 requires that an AI be assigned to determine the priorities in completing the work objectives for each job or project and to coordinate the activities of craft workers, facility residents, and users to ensure the safety of all who may be impacted by construction and maintenance work.
- Document 2.2 and the facilities and Infrastructure *Work Control Manual* require planned work to be categorized based on safety significance and that work controls be commensurate with assigned categories.
- Document 2.2 requires that a lead responsible individual be assigned to coordinate work and balance competing priorities when more than one work group is working in a single area.
- Document 2.2 also requires scheduling to be accomplished through POD, POW, facility activities status board, or other method that clearly indicates the status of released work.

Maintenance planners work with FPOCs to prioritize and schedule preventive and corrective maintenance activities. Most maintenance work in facilities where hazards may be encountered is accomplished within windows of time that are defined well in advance of the work. This approach enables maintenance craft to work more efficiently and minimizes disruption of building occupants.

MUSD routinely holds Work Induction Board meetings. These meetings are held three times a week and include attendance by work planners and maintenance supervision. The meeting discusses work requests and individual work scopes, assignment of individuals, designation of responsible individuals, and IWS status. Additionally, the group discusses backlog reduction goals and status, and budget and maintenance funding. Planned and potential work for each facility, work group, and/or site location (e.g., Site 300) is discussed for manpower coordination and utilization.

Document 2.2 categorizes work as WAL A, B, or C based upon safety risk and applies a graded set of controls commensurate with the risk. WAL A, the lowest risk category, is reserved for work commonly performed by the public. The F&I *Work Control Manual* provides similar, but slightly different, criteria to categorize work as dispatch, minor or complex. Appendix B of this Manual states that, "Within F&I, Dispatch Work activities have been identified as WAL A." Much of the work performed by F&I is Dispatch Work. A number of the work activities listed in Appendix B of the F&I Manual do not meet this definition. Examples include LOTO of electrical systems rated less than 600 Volts, test and inspection of electrical equipment, and maintaining cryogenic systems. While such activities may be safely performed by journey level craftsmen, they are not commonly performed by the public. Under the criteria specified by Document 2.2, this work would typically be categorized as WAL B, which would require an additional approval path and/or institute-wide work permit. (**MG.1-1/W)**

The importance of working safely was emphasized in pre-job briefings. Workers understood that they were expected to work safely and to stop unsafe work. Schedule pressures were not evident at the job sites.

This criterion was met.

2. Roles and responsibilities for the identification and prioritization of mission-related tasks and processes, facility or process modification, and other related work items are defined and understood. Personnel assigned to the roles are competent to execute these responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

Responsibilities for identification and prioritization of maintenance tasks are clearly defined in the LLNL ES&H Manual and implementing documents. LLNL-AM-405814, paragraph 3.1.2 requires that the specific tasks necessary to accomplish the scope of work be identified and discernable. Document 2.2, paragraph 2.1.1 requires that, for support activities, the responsible individual/planner ensure that the scope of work is defined in sufficient detail to ensure the identification of hazards associated with the work activity, and also requires a walkdown of the job site by a team of individuals to ensure that the initial identification of tasks was accurate. Document 2.2 also provides criteria and procedures for prioritizing work planning and controls based on the level of risk involved.

All personnel interviewed demonstrated an awareness of their roles and responsibilities related to the identification and prioritization of work. Line managers and workers demonstrated knowledge of how to obtain resources for ES&H issues when needed.

This criterion was met.

3. Mechanisms are in place and are utilized by personnel that ensure identified work (mission-related tasks and process, processes or facility modification, maintenance work, etc.) can be accomplished within the safety envelope for the facility. (DOE-HDBK-3027-99)

Mechanisms are in place to ensure that maintenance and construction work planned for non-nuclear facilities is within the safety envelopes established pursuant to ES&H Manual Document 3.1, Non-nuclear Safety Basis Program. Document 2.1, paragraph 3.1.12, assigns responsibility to the Facility Manager or designee for ensuring that work is within the facility safety envelope. Steps for discharging this responsibility are integrated into the work planning process by instructions provided in Document 2.2 and MAN-GWM-0003.

The ES&H Manual defines the mechanisms and assigns responsibilities that ensure work can be accomplished safely within a facility. Facility safety basis documents define the work that can be done in a facility and the ES&H requirements for that work. The Facility Manager is assigned the responsibility for releasing the work to be safely performed in the facility. The Facility Manager's review of the proposed activity, the IWS for the activity, and the ultimate work release authority ensure that work activities outside the scope of the existing facility safety basis are identified. This work then would receive additional analysis to determine the appropriate ES&H requirements, and the safety documents would be modified as necessary.

Typically, work scope is defined by the designated responsible individual for the task (typically a programmatic requestor) and coordinated with the operations entities within the area. Additionally, the work is approved for conduct and released on a daily basis by the Facility Manager. The designated responsible individual, authorizing individual, and work group supervisor (work planner for this task) hold a meeting prior to commencement of work with facility management staff, (i.e., building manager, production, operations ES&H) to inform them of progress and solicited questions and input. Furthermore, all work performed by service providers at this facility require a permit to be issued by the facility to authorize the work. This can be used to determine any potential conflicts with facility safety requirements.

This criterion was met.

Conclusion:

The objective was met.

An integrated process has been established and is used to identify work items and to include ES&H activities in the prioritization of the work performed. Building maintenance prioritization includes conduct of facility condition assessment surveys to identify facility deficiencies. A risk matrix is used to prioritize each identified deficiency. The matrix includes ES&H and mission risk as part of the design. Mechanisms for prioritizing maintenance and construction tasks are included in several LLNL directives. Responsibilities for identification and prioritization of maintenance tasks are clearly defined in the LLNL ES&H Manual and implementing documents. Mechanisms are in place to ensure that maintenance and construction work planned for non-nuclear facilities is within the safety envelopes established pursuant to the ES&H Manual.

Issue:

Weakness

MG.1-1/W: Use of the risk criteria in the F&I *Work Control Manual* results in much of the maintenance work performed by F&I being assigned a lower risk category than specified by Document 2.2.

Submitted by: Signature On File Signature On File Al Gibson and Joe Lischinsky, Team Members	Reviewed by: Signature On File William Miller, Team Leader

LLNL ASSESSMENT FORM

FUNCTIONAL AREA: Management : NIF and PS	OBJECTIVE: MG.1 DATE: 11/12/09	OBJECTIVE MET: YES _X_ NO___:

OBJECTIVE

MG.1: An integrated process has been established and is utilized to identify and prioritize specific mission discrete tasks, mission process operations, modifications and work items. (CE II-1)

CRITERIA

1. Line management has implemented mechanisms to identify and prioritize mission-related tasks and processes, modifications, and work items. Safety and productivity concerns receive balanced consideration in funding allocation and schedule decisions. (DOE-HDBK-3027-99, DOE M 450.4-1)

2. Roles and responsibilities for the identification and prioritization of mission-related tasks and processes, facility or process modification, and other related work items are defined and understood. Personnel assigned to the roles are competent to execute these responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

3. Mechanisms are in place and utilized by personnel that ensure identified work (mission-related tasks and process, processes or facility modification, maintenance work, etc.) can be accomplished within the safety envelope for the facility. (DOE-HDBK-3027-99)

APPROACH

Records Reviewed:

- *System Description Document for the Lawrence Livermore National Laboratory Contractor Assurance System*, LLNL-BR-406907-Rev-1, August 2009
- Program Description Document, *Integrated Safety Management System*, WSH-PDD-001-06, September 1, 2009
- *LLNL Institution-Wide Work Control Process Requirements Document*, LLNL-AM-405814, Revision 0, July 30, 2008
- ES&H Manual Document 2.1, *General Worker ES&H Responsibilities*, Implementation Date May 13, 2009
- ES&H Manual Document 2.2, *LLNL Institution-Wide Work Control Process*, Implementation Date July 29, 2009
- ES&H Manual, Document 3.1, *Non-nuclear Safety Basis Program*
- *NIF Work Permits*, NIF-5018626-AG, October 6, 2009
- *Tier 2 Safety Basis Document for the Building 581-582 Complex*, Rev1, NIF-5019666-AB, July 28, 2008
- *Tier 2 Safety Basis Document for the Building 298 Complex*, June 28, 2007
- NIF *Safety Basis Document Change Control Process*, NIF-5018625-AC
- NIF *Schedule, Preparation, Status Updates, and Revisions*, NIF-0000320-OH

- NIF *Baseline Change Control*, NIF-5018651-AA
- NIF *Engineering Design Reviews*, NIF-5018587-AB
- NIF Programs Directorate Procedure 5.10, *Safe Plan of Action (SPA) Process*, NIF-5022739-AA
- Excerpts from *WAP Tracking Status*, approved scope changes 8/23/06-10/21/08
- *NIF Shot Campaign WAP Checklist Template*, NIF-5022443-AA
- NIF Project Procedure # 5.19, *Work Authorization Review*, NIF-5018658-AE, October 30, 2008
- *Guide for Identifying Hazards and Environmental Aspects – ES&H Integration Worksheet Preparation*, LLNL-AR-412180, Revision 0, March 24, 2009
- *NIF Plan of the Day*, October 20, 2009
- Work Permit ID: 298683, *Replace Q16B Beamlines 167-Q2 and B168-Q3 WFLs*, IWS 09160202 Rev43/OSP 581.11 C43, time period 10/21/09-10/23/09

Interviews:

- Program Director, Photon Science and Applications/Chief Technology Officer/IWS AI
- NIF Operations Manager and IWS AI
- NIF Work Control Manager
- NIF WPRI
- NIF IWS RI
- NIF WPRI
- Team 2 H&S Tech Supervisor
- Team 2 ES&H Manager
- Contra Costa Electric WPRI
- NIF IWS RI
- NIF IWS AI
- Jacobs Site Manager, WPRI
- Jacobs Project Manager, WPRI
- NIF & PS PD Training Manager
- NIF Training Manager

Observations:

- Sub Facility and Laser Integration Plan (subFLIP) meeting

DISCUSSION OF RESULTS

1. Line management has implemented mechanisms to identify and prioritize mission-related tasks and processes, modifications, and work items. Safety and productivity concerns receive balanced consideration in funding allocation and schedule decisions. (DOE-HDBK-3027-99, DOE M 450.4-1)

The primary mechanism for identifying and prioritizing mission related activities is annually through the Laboratory's strategic planning process. Based on the outcomes and assigned budget, each directorate aligns their research and operations to meet these goals.

At the facility and activity levels, NIF has formal, documented processes and procedures for identifying the mission priorities and resolving safety, productivity, resources, and scheduling

conflicts. Proposals for facility changes or experiments derived from the strategic planning for NIF must be vetted through the work authorization process. The Work Authorization Review process ensures that work activities, such as laser commissioning activities, shot campaigns, controls system software releases, and shot operations, are evaluated for safety prior to being authorized to proceed at NIF. A WAP checklist template is used to assure that changes will not exceed the facility safety basis yield limitations or the FSP. Reviews and status of actions are maintained in a WAP database.

Additionally, there are routine (daily and weekly) meetings held to assure that mission-related tasks, schedules, modifications, and any relevant issues are communicated and priorities are coordinated between functional groups and systems owners. Safety issues are discussed at each of these meetings, including any potential or actual work stoppage or off-normal events. Examples of key routine meetings include:

- Weekly meetings are held to evaluate the NIF operations schedule and to add approved work authorizations to the Facility and Laser Integration Project (FLIP) plan, which is the detailed project plan for activities associated with NIF within Building 581. The output from this process sets the priorities discussed in the weekly subFLIP meetings where tasks on the FLIP that are scheduled for the next three weeks to three months are reviewed, with the objective to de-conflict schedules, resources, safety and maintenance issues. The subFLIP schedule is used to generate the POD/POW, which is posted outside the control room.
- Daily afternoon meetings between construction project managers and subcontractor superintendents are held to discuss the progress on work during the day, to discuss issues and changes, and to schedule work for the next day. Routine work (e.g., scaffold erection or removal) is planned and scheduled in addition to activities scheduled on the NIF POD. Each subcontractor then prepares its own POD.
- Data gathered from all the daily meetings are discussed at the planning meeting for night shot operations to confirm that all is ready to go. Key activities to be accomplished for the following day are also identified. Shot Operations takes control as the RI for the facility after this meeting. It is relinquished in the morning when the day shift starts.

The majority of work at Photon Sciences and Application is work for others. Proposals are evaluated and approved through the institutional strategic planning and review process to assure that the work does not impact the lab's or the facility's authorization basis. Work then follows the project's resource loaded schedule. ESH, security, and quality requirements are integrated in the proposals and included in the funding requests. Daily work follows the LLNL work planning and control process.

An example of a new project under construction is the Materials Effects Testing Laboratory in Building 391. Safety systems, interlocks, etc., are being installed and will be tested and accepted as a condition of the authorization to start. The IWS was already created and approved. The assigned staff has completed required training.

The criterion is met.

2. Roles and responsibilities for the identification and prioritization of mission-related tasks and processes, facility or process modification, and other related work items are defined and understood. Personnel assigned to the roles are competent to execute these responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

Roles and responsibilities are outlined in procedures both at the institutional level and at the PAD level. NIF and PS managers acknowledged their responsibility for safe operations as the AIs.

Key roles in the work planning process – e.g., WPRI, RI, WCO, and Subsystem Manager (SSM) for configuration control – are assigned by the AI. Individuals are assigned to these roles based on their technical competency, working knowledge of the subsystems, and management skills. They participate in the routine coordination meetings to assure that modifications and other related work items on one system do not negatively impact another.

Additionally, assigned individuals receive the required safety training and must acknowledge and accept the responsibilities of these roles. All AIs, RIs, and WPRIs completed the required institutional and facility specific work control training. Training is tracked in LTRAIN for employees and supplemental labor employees. They are rated on their performance in these roles during their routine performance appraisals.

NIF subcontractors are assigned roles as DWTLs and WPRIs. The institutional and facility-provided training to authorize them to serve in these roles is also captured in LTRAIN. Contractual measures are used to assure accountability.

All interviewed managers and supervisors serving as AIs, RIs, WPRIs, DWTLs, and SSMs understood and accepted their responsibilities for identifying and prioritizing mission-related tasks and processes, facility or process modification, and other related work items and are competent to execute them. The individuals have the appropriate education and experience to carry out these responsibilities.

The criterion was met.

3. Mechanisms are in place and utilized by personnel that ensure identified work (mission-related tasks and process, processes or facility modification, maintenance work, etc.) can be accomplished within the safety envelope for the facility. (DOE-HDBK-3027-99)

There are three facilities (Building 581-582 Complex, Building 298 Complex, and Building 391) that require safety basis documents. Procedures such as ES&H Manual, Document 3.1, *Non-nuclear Safety Basis Program, NIF Work Permits,* NIF *Safety Basis Document Control, and* NIF *Baseline Change Control,* have clear requirements for identifying configured items and work requiring safety basis reviews to assure that work is accomplished within the safety envelope. For facilities that do not require a safety basis document, the institutional work control procedures provide the requirements for maintaining the safety envelope.

Roles such as the CSM, WPRI, RI, AI, WCO, and Field Control Officers have been assigned with specific responsibilities, in addition to worker responsibilities, to ensure that the facility safety basis is maintained, as identified in the NIF work permit procedure. This was evident in work observed at NIF on Work Permit ID: 298270, *Install and Remove DIM 90-45 based neutron diagnostic cart, remove upon completion of campaign* and Work Permit ID 296299, *Installation of Interior Shield Door D225* were flagged for configuration control.

At buildings other than 581, there is a facility status board that must be checked before work starts to ensure that there are no facility safety issues that can impact the work and vice versa.

The criterion was met.

Conclusion:

The objective was met.

NIF and PS Principal Directorate has established an integrated process that is utilized to identify and prioritize specific mission discrete tasks, mission process operations, modifications, and work items.

Submitted by: Signature On File Patricia Williams, Team Member	Reviewed by: Signature On File William Miller, Team Leader

LLNL ASSESSMENT FORM

FUNCTIONAL AREA: **Management – Global Security (GS)**	**OBJECTIVE:** MG.1/ Mielke **DATE:**	**OBJECTIVE MET: YES X NO __**

OBJECTIVE

MG.1: An integrated process has been established and is utilized to identify and prioritize specific mission discrete tasks, mission process operations, modifications and work items. (CE II-1)

CRITERIA

1. Line management has implemented mechanisms to identify and prioritize mission-related tasks and processes, modifications, and work items. Safety and productivity concerns receive balanced consideration in funding allocation and schedule decisions. (DOE-HDBK-3027-99, DOE M 450.4-1)

2. Roles and responsibilities for the identification and prioritization of mission-related tasks and processes, facility or process modification, and other related work items are defined and understood. Personnel assigned to the roles are competent to execute these responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

3. Mechanisms are in place and utilized by personnel that ensure identified work (mission-related tasks and process, processes or facility modification, maintenance work, etc.) can be accomplished within the safety envelope for the facility. (DOE-HDBK-3027-99)

APPROACH

Records Reviewed:

- IWS-14076.01-DNDO Red Team Draft
- IWS 14076 Red Team
- IWS-988.07r8-Rad Detector Development & Measurement
- IWS-15157- Draft- International Travel
- IWS-3192.06- Laser Vibrometry
- IWS -13807.01r3 Fab. of Electronic components
- IWS -12832.06 Real Time PCR
- IWS-988.07- Rad Detector Deployment
- PWS Form Procured Work Services (vendor haz checklist)
- GS/Suggested Daily Pre Job Brief checklist (optional)
- Lessons Learned Safety Alert 12/8/04
- 2008 Silver Safety Award August Droege Safety
- GS - Safety and Security Training Program Plan Rev 11 PLN 05-003
- ES&H Documents 2.1, 2.2 3.1, 14.1, 14.2, 14.10, 18.5, 19.1
- Facility Work Control Center spreadsheets/released IWS log
- GS briefing slides for new employees

- GS organization charts
- GS Internal spread sheets tracking IWS conversion to tasked based
- Phase I ISMS Review Document
- LLNL Safety Toolbox Guide
- GS Business Operations "Pulse" news letter Sept. issue
- GS monthly safety meeting agenda
- GS ORB agenda/minutes
- GS ORB spreadsheet/tracking and ranking review
- GS POD agenda
- Interoffice memo, GS Directorate Guidance: safety performance input for 2008 /09 performance appraisals
- 2009 Contract from GS Principal Director to management staff concerning goals for safety security posture
- Samples of Safety walkthrough (Jan 2009, Feb 2009)
- Samples of IWS comment logs
- Samples of Pre Job reviews
- Memo from M Ludwig Re: M&O electrical Boxes
- Integrated safety management system WSH PDD-001-06
- IH Discipline Action Plan (IH-DAP)/GS
- IH-DAP action inventory/GS
- HP-DAP Action Plan /GS
- GS LTRAIN Questionnaire
- GS Project Management Policy, April 2009
- GS Project Management Manual, May 2009

Interviews:

- Principle Associate Director – GS
- GS Business and Operations Division Leader
- GS Deputy Principal AS Director for Strategic Operations
- GS Assurance manager
- GS Safety Manager
- Operations manager 132N
- Operations Manager 132S
- ES&H Team 2 leader, deputy team leader, team members (IH, Safety, Env), and coordinator
- RIs, AIs, technical staff, engineers for all observed work
- Facility work control team
- LSO technical team lead
- LSO AMTS
- Consultant LLNL Work Control Pilot

Observations:

Observed lower-hazard work activities at various GS buildings. Work in higher hazard areas, such as the forensic laboratory or Bio-2 facilities, were not ongoing at the time of the review.

DISCUSSION OF RESULTS

1. Line management has implemented mechanisms to identify and prioritize mission-related tasks and processes, modifications, and work items. Safety and productivity concerns receive balanced consideration in funding allocation and schedule decisions. (DOE-HDBK-3027-99, DOE M 450.4-1)

The GS PAD Acting and GS Deputy PAD (DPAD) for Strategic Operations have extensive management experience and knowledge of the diverse GS mission. They were able to effectively articulate the importance of implementing an effective work control process that supports the mission and safety of employees within GS. They displayed a good awareness of the variety of work activities within the GS mission and support for the new task based work control system. Management emphasizes the importance of having key staff within the operations divisions develop, monitor, and assure that the work control process and all of its components are moving forward (conversion schedule); ensure compliance with ES&H Manual 2.1 and 2.2; and ensure that work control is understood by the staff. Subsequent work observations and interviews confirm a willingness and understanding of Work Control 2.2 by GS senior staff (RIs and AIs).

At the project management level, GS policy requires project managers and first line supervisors to determine the appropriate level of formality for all GS projects based on a detailed evaluation of multiple factors including risk. Criteria related to safety, security, environment, budget, scope, and schedule help define the project and determine what is needed to start and end each project. Roles and responsibilities for project management are clearly defined in GS Project Management Manual MAN-09-001. The policy and the manual provide an objective methodology to balance multiple criteria that can determine the balance between safety and productivity. The DPAD is responsible to coordinate and adjudicate issues as they arise and safety and security personnel (both internal and external to GS) are members of the project team. The outcome of the project management process provides important data for project managers to develop IWS controls, training requirements, budget considerations or facility modifications. One example of this decision process involved the installation of a special and costly stainless steel hood and stack needed to process specific chemicals that could not use a standard laboratory hood configuration.

At the work activity level, the current Work Control Chapter 2.2 in the ES&H Manual, along with the task based IWS, provides the framework for GS to identify, analyze, and control work activities. Other mechanisms, including links to the training database (LTRAIN), ensure that controls such as required training for managers and staff are established, consistent with the hazards identified. SME reviews are integrated into the GS work control process to provide consistency and rigor for both the identification and control of hazards as required by the work control process, and ensure that sufficient resources are allocated to meet ES&H requirements. Similarly, the facility work control center interface located in 132N provides a control point for all scheduled maintenance or subcontracted vendors to “check in” prior to any external maintenance or non-mission related work being authorized and released and to prioritize activities, including consideration of work activities and safety concerns. The authorization, approval, and release of work are a mandatory part of the work control process.

GS operational personnel and the LLNL work control team have established the conversion of current IWS documentation to the task based method as a management priority for improving work control. The conversion considers the risk level of the activities. This effort is being tracked by GS operations staff and is progressing on schedule.

The GS ORB members discuss issues of importance to the safety, security, and operability of GS

facilities. Topics ranging from institutional issues to Directorate corrective actions are discussed, assigned, and ranked for disposition. The IWS conversion (to task based IWS) was discussed in detail, and Excel spreadsheets tracked all pending IWS status related to review and authorization. Corrective actions for self assessments and external audits and training deficiencies were ranked and discussed.

RIs and AIs have all been trained in the new task based IWS process and are being mentored by program managers to continuously improve the conversion process. Pre-job briefings are being conducted and documented as required in 2.2 as a compensatory method to support activity based hazard and control recognition.

The criterion was met.

2. Roles and responsibilities for the identification and prioritization of mission-related tasks and processes, facility or process modification, and other related work items are defined and understood. Personnel assigned to the roles are competent to execute these responsibilities. (DOE-HDBK-3027-99, DOE M 450.4-1)

GS project management policy, institutional ES&H Document 2.2, and institutional training requirements ensure that the roles and responsibilities necessary to effectively identify and prioritize mission related tasks are well understood by the safety and operations management staff. RIs and AIs have been trained in the new work control process, and work control procedure 2.2 provides explicit definitions of this management function. GS safety and operations management constantly ensure that roles and responsibilities are clear and managed effectively. The DPAD for operations has issued guidance to managers that all GS staff will be evaluated on their knowledge and performance of safety in the workplace.

GS operations management conducts regularly scheduled safety committee meetings, operational readiness, and POD meetings to discuss and analyze issues related to safety and security including statistics on injuries, illnesses, and incidents, which track safety performance. Managers responsible for the facilities, operations, and infrastructure participate and discuss planned projects, problems, issues, solutions, etc. The “Pulse” used throughout the safety committee is an informational tool that displays graphs and information concerning safety performance, lessons learned, and similar data that can be used to maintain a safety envelope. Facilities management, safety personnel and operations management teams were in attendance at the various meetings attended during Phase II and worked very well together. The committee chair was prepared, the agenda was relevant, the committee responded, and the information was informative. The ORB was also productive.

The criterion was met.

3. Mechanisms are in place and utilized by personnel that ensure identified work (mission-related tasks and process, processes or facility modification, maintenance work, etc.) can be accomplished within the safety envelope for the facility. (DOE-HDBK-3027-99)

GS has incorporated mechanisms to ensure that the formal work control process as outlined in “LLNL Institutional ES&H Document 2.2” is effective and integrated into both facility and mission activities. Through a variety of work observations, interviews, document reviews, and standing meetings, it is clear that hazards and controls associated with work activities are effectively managed by line management, identified and controlled by responsible individuals, reviewed and verified by ES&H team members, and executed by staff. The following is a

summary of the mechanisms observed during the HSS review that demonstrate the GS approach to ensuring work can be accomplished within established ES&H controls:

- To assure the GS work activities remain within the safety envelope, all applicable work is conducted under the requirements of the IWS process.
- RIs and AIs have been trained on the task IWS/work control process and have begun the conversion process to revise all Directorate forms.
- The integration of LTRAIN into the IWS process provides real-time data to RIs concerning staff readiness to work. Senior GS management has taken steps to reinforce the need to maintain directorate training requirements. (see GS training program plan 10/09).
- The GS facilities safety manager is responsible for preparing the FSPs as necessary according to the requirements in ES&H 3.1.
- GS projects follow a formal project management process that evaluates risk, project success, and the balance between productivity and safety.
- GS senior management has assigned two operations managers to monitor, train, teach/mentor, and assure the conversion and quality of all GS mission related IWSs.

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The ES&H Team 2 roundtable meeting was effectively used to initially review new or updated IWSs to ensure safety envelopes are not exceeded. The IWS author could detail the scope, hazards, and proposed controls for the team. The team interacted with the author, asked questions, and suggested changes. The meeting is a formal exercise; notes are kept, actions are tracked, and assignments are made. The meeting saves time and provides a forum for the author to provide information to the team in a single meeting, avoiding multiple phone calls or individual meetings. The meeting was very professionally run, and each discipline had good questions and suggestions for the IWS author.

The criterion was met.

Conclusion:

The objective was met.

Senior and support staff were able to articulate LLNL institutional goals and requirements related to work control, the revised task-based IWS process, and the roles and responsibilities necessary to properly authorize, approve, and release work within the facility and mission safety envelope. The responsibility of management to train, inform, and assess the Directorate's mechanisms that help prioritize tasks and work activities are ensured by operation management's attention to tracking many of the elements that would indicate areas of concern, such as training, safety indicators such as injury/illness, assessment findings or concerns, and the IWS conversion process, that could affect the individual program safety envelope or mission. In addition, GS effectively interfaces with external resources, such as the ES&H Team and facilities work control centers, to review and ensure that all mission and facilities work have defined scopes, analyzed hazards, and implemented necessary controls, prior to the release of work, that maintain the safety envelope as required in ES&H 2.1 and 2.2. Finally, senior management evaluates both line management and staff on their knowledge and effectiveness as they relate to understanding and implementation of the GS safety process. The GS project management process includes detailed evaluations of potential risks and includes a balance between productivity and safety as part of the criteria to determine project success.

Submitted by: Signature On File___ Marvin Mielke, Team Member	Reviewed by: Signature On File___ William Miller, Team Leader

LLNL ASSESSMENT FORM

FUNCTIONAL AREA:	**OBJECTIVE:** MG.2	**OBJECTIVE MET: YES_X*_ NO__**
MANAGEMENT (MG)	**DATE:**	**<u>*Partially met.</u>**

OBJECTIVE

MG.2: An assessment and feedback process, which functions at each level of work and at every stage in the work process, has been implemented such that mechanisms are in place for continuous improvements. (CE II-5)

CRITERIA:

1. The mechanisms identified in the LLNL ISMS Description have been implemented such that rigorous, risk-based, credible self-assessment and feedback and improvement activities, including independent reviews, assess and improve the LLNL ISMS. Personnel assigned these activities are competent to execute these responsibilities. (Contractor Assurance System Contract Clause, DOE-HDBK-3027-99, DOE M 450.4-1)

2. Detailed performance observations and effective feedback and improvement mechanisms are implemented for work activities that analyze deficiencies, individually and collectively, from all sources to identify positive and negative trends of programmatic/systemic issues. The information that is developed at the individual activity level is utilized to provide feedback and improvement during future similar or related activities. (Contractor Assurance System Contract Clause, DOE-HDBK-3027-99)

3. Results from performance observations and feedback and improvement activities are effectively integrated into the performance improvement processes, such that they receive adequate and timely attention. Vigorous corrective and improvement action programs are in place and effective. Managers are actively involved to balance priorities to achieve timely resolutions. (DOE-HDBK-3027-99, DOE M 450.4-1)

4. Mechanisms are utilized by managers to encourage worker suggestions/concerns and resolve recommendations for improvement. (DOE-HDBK-3027-99, DOE M 450.4-1)

5. Performance metrics and targets to assess mission effectiveness, including ISM effectiveness, are established and analyzed in a timely manner to support continuous improvement. (Contractor Assurance System Contract Clause, DOE-HDBK-3027-99)

6. Errors and incidents are promptly reported and causal analysis is performed as necessary. (DOE M 450.4-1)

APPROACH

<u>Records Reviewed</u>:

- Program Description Document WSH-PDD-001-04, Integrated Safety Management System, Program Description Document, 5/10/09

- Contractor Assurance System (CAS), LLNL System Description Document, September 2008
- ES&H Manual Document 4.1, Principal Associate Directorate (PAD) ES&H Self Assessment Program, 03/31/09
- ES&H Manual Document 4.3, LLNL Implementation Procedure for Reporting Occurrences to DOE, 12/10/07
- ES&H Manual Document 4.4, Identifying, Reporting and Tracking Noncompliances with Nuclear Safety and Worker Safety and Health Requirements, 08/08/08
- ES&H Manual Document 4.5, Events: *Notification, Analysis, and Reporting*, 1/6/09
- ES&H Manual Document 4.6, *Incident Analysis Manual*, 11/04/08
- ES&H Manual Document 41.1, *LLNL Quality Assurance Program*, 9/28/07
- ES&H Manual Document 4.7, *ES&H Analysis Methods*, 9/9/09
- PLAN-QA-0002, Facilities and Infrastructure Quality Assurance Plan, 9/1/08
- Program Description, DES 0048, Rev 0, *LLNL Assessment Program*, 8/31/09
- Procedure PRO 0050, Rev 0, *Internal Independent Assessment*, 9/20/09
- Procedure PRO 0052, Rev 0, Management Self-Assessment, 9/30/09
- Draft Procedure PRO 0049, Institutional Assessment Plan (IAP)
- Draft Procedure PRO 0053, Management Observations, Verifications & Inspections (MOVI)
- FY2009 Environment, Safety & Health Assessment Services (EAS) Plan for LLNL, 10/8/08
- Interdepartmental Memorandum, Subject: LLNL Functional Areas (FA), Functional Area Manager (FAM) and Institutional Governance, 9/25/08
- Interdepartmental Memorandum, Subject: CAO-PS-0001, Assessment Protocols, 9/30/08
- Required Assessments Worksheet for FY2010 Input from Line Managers
- Management Self-Assessment of the LLNL Contractor Assurance System, 6/30/09
- Corrective Action Plan for issues from the LLNL Contactor Assurance System MSA, 9/11/09
- LLNL FY09 Institutional Assessment Plan
- Procedure PRO 0042, Rev O, Issues and Corrective Action Management, 6/1/09
- Procedure PRO 0043, Rev 0, *Monthly Assessment Report Response*, 6/1/09
- Lesson Plan for Training Course CA0014, Causal Analysis: Methods and Techniques Overview
- Lesson Plan for Training Course CA2011, *Apparent Cause Analysis*
- Lesson Plan for Training Course CA0020, *Effectiveness Review*
- Lesson Plan for Training Course CA0007, *Incident Analysis*
- Lesson Plan for Training Course CA0300, *LLNL Issues and Corrective Action Management*, 5/30/09
- Interdepartmental Memorandum, Subject: CAO-PM-001, *Measures and Metrics Guidance*, 9/25/09
- Letter from Laboratory Deputy Director to the LSO Manager, Subject: LLNL Safety Performance Objectives, Measures, and Commitments for Fiscal Year 2009, 12/3/2008
- Monthly Performance Review metrics report, September 2009
- Procedure CAO-PARS-0200-ORPS, Rev 2 Draft, Collecting and Tracking Below-ORPS Data Procedure
- Performance Assurance Report, Q3 FY09, 8/17/09
- LLNL-AR-415768, Occurrence Performance Analysis, January 1, 2008-December 31, 2008 (CY09), 8/19/09
- LLNL-AR-415466, Performance Analysis of Occurrences, July 1, 2007-June 30, 2008, 8/10/09
- LLNL –TR-417755Worker Safety and Health and Nuclear Safety Quarterly Performance Analysis (January-March 2008, March 2009)

- LLNL-AR-415769, Worker Safety and Health and Nuclear Safety Quarterly Performance Analysis (October-December 2008, August 2009)
- Procedure PRO 0090, Rev 1, Executive Management Operational Directive, 6/23/09
- Program Description, DES 0086, Rev 0, *Operating Experience Program*, 8/12/09
- Contractor Assurance Office (CAO) Internal Procedure UCRL-AM-219307-Rev 3, Identifying, Preparing, and Distributing LLNL "Lessons Learned," 8/10/2009
- Personnel Policies & Procedures Manual, Section D, *Employee Conduct, Employee Concerns Program*
- Injury and Illness Investigation Checklists for Supervisors and Case Investigators
- Various Injury and Illness Corrective Action Reports from CY2008 and CY2009
- Procedure 1.8, NIF-5023066-AA, *Action Management*, undated
- Procedure 5.11, NIF-5026065-AB, *NIF and PS Management Review*, undated
- Procedure 5.13, NIF-50222196-AB, NIF Self Assessments Program, Safety "Walkabout" Process, undated
- Procedure 5.21, NIF-5023077-AC, NIF Programs Directorate Off-normal Event Initial Response and Notification Procedure, undated
- NIF Off Normal Event Log
- NIF Management Review Log and selected management reviews
- Global Security, *Business Operations Pulse*, August 2009
- NMTP Facilities Management Procedure, *Occurrence Critiques*, undated
- WCI-FWP.1, Weapons and Complex Integration Directorate, *Facility Walkaround Procedure*, August 2009
- WCI-FWP.2, Weapons and Complex Integration Directorate, *Feedback and Improvement Plan*, Draft, October 2009
- ITS reports for Management Walkthroughs June 2009 to October 2009
- S&T Principal Directorate HPI Learning Team Review, May 2009 Titan Incident
- Various FY2009 Internal Independent Assessment Reports and associated ITS issue reports
- Various FY2009 Line Management Self-Assessment Reports and associated ITS issue reports
- Various Occurrence Reports for events occurring in CY2008 and CY2009
- Various directorate management reviews and critiques for events and incidents occurring in CY2008 and CY2009
- Various safety meeting minutes and agendas
- Various LLNL lessons learned reports and Safety Flash reports
- LLNL Operating Experience/Lessons Learned Coordinator's database

Interviews:

- Deputy Laboratory Director
- Associate Deputy Director for Laboratory Operations
- Director, Laboratory Contractor Assurance Office
- Director, Office of Environment, Safety, Health & Quality
- Deputy Principal Associate Director for Operations, S&T
- Deputy Principal Associate Director for Operations, WCI
- Assistant Principal Associate Director for Operations, NIF and PS
- Deputy Principal Associate Director for Operations, GS
- Principal Directorate and Directorate Assurance Managers for NIF, GS, WCI, Operations and Business, F&I, PLS, Engineering, Superblock/RHWM, and Site 300
- Laboratory Quality Assurance Manager

- Director, Independent Audit and Oversight Department (IAOD)
- Manager, Management Oversight Services
- Manager, Staff Relations
- CAO Managers and staff with responsibilities for Assessments, Issues Management, Performance Analysis and Reporting, Lessons Learned, Performance Metrics, and Standards and Requirements Management
- Industrial Health Team Lead
- Industrial Safety Team Lead
- Acting Occupational Injury/Illness Records Manager

Observations:

- Assurance Managers Meeting
- Operations Morning Call
- ORB Meetings for Operations and Business, WCI, and GS
- Contractor Assurance Manager meeting with LSO Staff

DISCUSSION OF RESULTS

1. **The mechanisms identified in the LLNL ISMS Description have been implemented such that rigorous, risk-based, credible self-assessment and feedback and improvement activities, including independent reviews, assess and improve the LLNL ISMS. Personnel assigned these activities are competent to execute these responsibilities. (Contractor Assurance System Contract Clause, DOE-HDBK-3027-99, DOE M 450.4-1)**

The LLNL assessment program has undergone a significant and continuing evolution over the past two years. A new program description document and new procedures for the conduct of management self-assessments and internal independent assessments were issued in August and September 2009. The procedure that described the requirements and processes for ES&H self-assessments, Document 4.1 of the ES&H Manual, *Principal Associate Directorate Environment, Safety, and Health Self-Assessment Program*, was issued in March 2007 and revised in April 2009, but has not been canceled or revised to reflect the new requirements and processes. A new procedure detailing requirements and processes for establishing and maintaining an IAP was issued after conclusion of this review and a new procedure is being drafted to detail requirements and processes for performing management observations, verifications, and inspections. The CAO intends to cancel Document 4.1 when all new procedures have been issued. However, in the interim, there are some conflicts in requirements and processes between these documents (e.g., development of directorate assessment plans, and the annual ISMS implementation assessments required by Document 4.1 and are no longer being performed). The process used to identify topics for internal assessments for FY 2010 is significantly different and more rigorous than for FY 2009. However, at the end of this review, LLNL had not yet finalized the internal assessment schedule for FY 2010, and organizations had not submitted their management self-assessment listing and schedules for incorporation into the IAP for FY 2010. Conducting a valid implementation review of the LLNL assessment program was problematic due to the evolutionary nature of the Laboratory assessment processes and the lack of performance data reflecting current and planned requirements and management expectations. Consequently, the review team conducted a review of the new processes and documentation of FY 2009 assessment activities to evaluate recent performance.

LLNL developed and issued an IAP for FY 2009 that identified and specified a schedule for known external assessments, internal independent assessments, and management self-assessments. The IAP includes business, safeguards and security, and ES&H assessment activities. It is not expected to include management walkthroughs or inspection activities. The FY 2009 IAP, a "living document" that has been updated as required, identifies the types and creators of assessments, the topic and purpose, the owning organization and responsible person (responsibility for assuring assessment findings are addressed), due dates, status, and whether issues were identified. Approximately 94% percent of assessments scheduled on the IAP were completed in FY 2009. However, many of these assessments were not completed when scheduled and were issued in the last week of the fiscal year, an approach that may have contributed to some of the weaknesses and deficiencies discussed below. In general, the internal independent ES&H assessments performed in 2009 were comprehensive, rigorous, and well documented, and they identified meaningful issues for correction and continuous improvement. LLNL established and conducted two independent multi-discipline team assessments identified as "Laboratory Evaluation Board" assessments, focusing on high significance functions or operations within a single facility. Some line management self-assessments were also rigorous and comprehensive in evaluating processes and performance and identifying opportunities for continuous improvement. For example, the PLS principal directorate conducted a thorough review of their laser safety processes and performance.

Although not considered as a formal element of the assessment program and not included on the annual IAP, LLNL has formally recognized the importance and value of the frequent engagement of management and supervision in observing field conditions and work activities and interacting with workers in improving communication of management expectations, soliciting feedback from workers, and increasing management awareness of working conditions and practices. This recognition is reflected in the assessment program description and in the draft procedure for management observations, verifications, and inspections. The performance of management walkthroughs has been made an element of the 2009 security and safety performance contracts between directorate and principal directorate managers and the Deputy Laboratory Director. In addition, in July, the F&I directorate established expectations for all managers and supervisors to conduct documented walkthroughs and has provided a tailored template as guidance. Performance and results of these walkthroughs are being logged into a spreadsheet with the intent of performing trend analysis. A module is established in the ITS database for documenting management walkthroughs, a template for documenting walkthroughs has been provided, and deficiencies from walkthrough activities are now required to be entered into the ITS to track resolution. Between June 1 and October 1, 2009, approximately 120 management walkthroughs had been entered into ITS with approximately 115 issues identified in 35 of the reports. The Superblock in the WCI principal directorate plans and schedules management walkthroughs for targeted topical area and identifies specific facilities to evaluate.

Although many formal self-assessments and management walkthrough activities are being performed and are identifying process and performance deficiencies and opportunities for improvement, many elements of the program are not being implemented in a sufficiently rigorous and effective manner. Some line organizations conducted very few formal ES&H related management self-assessments in FY 2009 (e.g., only two assessments were performed by NIF, both training related; by F&I; and by Engineering, one related to housekeeping). Although many other ES&H assessment-like activities have been documented in ITS as "management self-assessments," almost all do not meet the PRO-0052 definition of a management self-assessment and had not been incorporated in the IAP. Most were facility condition inspections, walkthroughs, or individual IWS reviews. Few of the management self-assessments performed in FY 2009 were risk based or discretionary assessments; many were inspections, summaries of

required inspections performed during the year, or mandatory effectiveness reviews. Directorate identification of non-mandatory management self-assessments to be performed for FY 2009 and drafted for FY 2010 were not based on a formal, structured, risk-based process that identifies activities, facilities, processes, management systems, risk levels, prior performance/events, or documented application of risk analysis. The management self-assessments being proposed for FY 2010 (although at the end of this review they had yet not been formally submitted for incorporation in the IAP) for some organizations do not reflect significant improvement over FY 2009 in breadth, depth or number (e.g., few assessments, failure to include evaluation of management systems, or a reliance exclusively on walkthroughs and work observations). **(MG.2-1/W)**

Many of the management self-assessments performed in FY 2009 lacked sufficient scope or rigor (e.g., summaries of management walkthroughs or inspections without analysis or identification of common or repetitive issues, effectiveness reviews that were verifications of completed actions rather than determination if those actions were effective, and inappropriate and inaccurate classification of results as required by site procedures). Also, these assessments have not been adequately reviewed and approved by assurance managers and approving organization managers. Underlying or cross cutting issues are not being identified in assessments. For example, in one directorate, an assessment evaluating the results of five laser audits conducted in FY 2009 identified that four of the audits had identified the failure to document on-the-job training as individual deficiencies, but failed to consolidate these repetitive issues into the bigger issue. Although LLNL has an action item in ITS to develop and implement a process to evaluate and provide feedback on management assessments, as a result of a contractor transition self-assessment in 2007, it is not scheduled for completion until September 30, 2010. LLNL should prioritize establishing an independent quality review process to provide feedback to personnel performing, reviewing, and approving assessments. **(MG.2-1/OFI)**

Although the CAS description and other LLNL documents indicate that functional area managers are to assess their functional areas, there is currently no defined output for this activity (i.e., functional area managers are not allowed to conduct assessments of program implementation by line organizations and are not required to produce any product such as a periodic "health of the functional area" report). Although functional area managers have input to development of the independent assessment element of the IAP and may participate on assessment teams, they are not routinely and formally assessing their functional areas. LLNL should consider clarifying the responsibilities of functional area managers and require annual reports on the health of their processes and implementation. **(MG.2-2/OFI)**

LLNL has not yet implemented a rigorous, risk-based, credible self-assessment program. The review team recommends that LSO conduct a re-evaluation of the Laboratory's implementation of their assessment program after all new process documents have been issued and implementation has progressed to an appropriate level of stability and maturity.

This criterion was partially met.

2. **Detailed performance observations and effective feedback and improvement mechanisms are implemented for work activities that analyze deficiencies, individually and collectively, from all sources to identify positive and negative trends of programmatic/systemic issues. The information that is developed at the individual activity level is utilized to provide feedback and improvement during future similar or related activities. (Contractor Assurance System Contract Clause, DOE-HDBK-3027-99)**

LLNL implements several mechanisms that provide analysis of deficiencies to identify and address trends and repetitive performance problems. The CAO has performed periodic analyses of worker safety and health and nuclear safety issues reported in ITS to identify adverse trends, repetitive incidents, and dominant problem areas. The CAO has also performed periodic analyses of occurrence reports and below-threshold reporting requirement incidents for recurrence, a requirement of DOE M 231.1-2, *Occurrence Reporting and Processing of Operations Information,* and site procedures. The reports evaluated by the review team used an appropriately rigorous statistical approach to analyze issues and events, identifying trends that warranted continued observation in subsequent analyses. However, numerous errors and inconsistencies in the documentation and categorization of issues in ITS reduce the confidence in the validity of these analyses (see further details in Criterion 3 below). In addition, event data analysis has not been performed and reported in a timely manner. Although DOE M 231.1-2 requires analyses to be performed quarterly, the only two ORPS analyses performed in the past 18 months were issued in August 2009, one addressing events between July 2007 and June 2008 and the other events between January 2008 and December 2008. The CAO had drafted an analysis of events from September 2008 to October 2009 and expected to issue it soon. **(MG.2-1/F)**

While analyses of ITS issues, including management walkthrough observations, were rigorous, statistically-based evaluations, based in large part on numerical changes from previous periods for types of issues, this approach may not identify some repetitive or high frequency issues that may need further analysis. For example, the HSS team observed a large number of deficiencies in meeting training requirements, IWS read-and-sign requirements, and out-of-date testing and calibration of pressure devices and the accuracy of the Pressure Test Record System database that were documented in 2009 management self-assessment and management walkthrough reports in ITS. The high frequency of these types of issues had not been identified or evaluated by LLNL worker safety and health issue analyses. The HSS team recommends that LLNL evaluate whether these deficiencies warrant further analysis as institutional issues. LLNL should consider reviewing data analysis processes and revise as necessary to ensure that screening will identify high frequency issues, identified either consistently from review period to period or as one period data points. **(MG.2-3/OFI, MG.2-4/OFI)**

In addition to the institutional level analysis and trending performed by the CAO, directorates also have been analyzing their issues, events, and injuries and illnesses. For example, GS issues a monthly report called the "Business Operations Pulse" communicating news and a variety of performance data charts including injury/illness, ITS, assessments and walkthroughs, IWS status, occurrences, and ergonomic reviews. However, in several instances, data and performance charts were issued that did not have any accompanying analysis (e.g., a report indicated that 30 to 60 percent of deficiencies reported in previous months involved overdue training, but had no discussion of causes or what was being done about the issue).

This criterion was met.

3. Results from performance observations and feedback and improvement activities are effectively integrated into the performance improvement processes such that they receive adequate and timely attention. Vigorous corrective and improvement action programs are in place and effective. Managers are actively involved to balance priorities to achieve timely resolutions. (DOE-HDBK-3027-99, DOE M 450.4-1)

LLNL has implemented institutional processes for documenting and managing safety issues, including deficiencies and opportunities for improvement. The ITS has been improved with

better reporting capabilities and modules for pre-scheduling assessments. The ITS is used as the single approved vehicle for documenting and tracking the disposition of assessment activity results, events, corrective and preventive actions for occupational injury and illness, and issues resulting from performance analysis. Many safety deficiencies and opportunities for improvement (categorized as observations) are being entered into ITS and managed to resolution using a graded approach to the rigor applied. Records indicate that timeliness for completing actions and closing out issues has significantly improved in recent months as a result of concerted management attention, increasing transparency of performance data, and improvements in ease of use and training in reporting features in ITS.

Notwithstanding the improvements in the processes and performance in managing issues at LLNL, there are weaknesses in processes and in implementation. Documented causal analyses are only required by the Laboratory issues management procedure for significance category 1 and 2 issues. Although the procedure requires that, for significance category 3 issues, issue owners conduct an apparent cause review and develop corrective actions that address the identified causes, it does not require the documentation of the analysis results although ITS has an optional field for identifying cause codes identified for category 3 issues. Since the effective date of the new issues management procedure on June 1, 2009, through October 27, 2009, approximately 1.5 percent of issues in ITS were designated as significance category 2 (no issues had been designated as significance category 1). Thus, the causes for over 95 percent of issues documented at LLNL do not have any record of causal information (LLNL documents the causal analyses for events and nuclear safety violations that are required to be reported to DOE). **(MG.2-2/W)**

Corrective actions for many reviewed significance category 3 issues address only the specific deficiency without establishing recurrence controls to address the underlying causes as required by procedure. Numerous deficiencies were noted in the accuracy and adequacy of the titles and description of issues. Many issues in ITS contained incorrect type classifications (e.g., findings identified as observations or observations identified as findings). Although this should have no direct effect on management of individual issues that is dictated by the assigned significance category, it does affect issue trend analysis (see criterion 2). The CAO has noted these implementation deficiencies during monthly reviews of ITS entries monthly for proper categorization and a sampling of closed ITS actions/issues for adequacy and has provided feedback to originating organizations. However, this review process is informal, is not required by procedure, and lacks a mechanism to measure performance improvement. As detailed in an attachment to this report, the HSS review team determined that corrective actions for many of the findings from the 2007 DOE Independent Oversight inspection had not been effectively addressed, that many of the effectiveness reviews of related corrective actions were not comprehensive or not sufficient to prevent or reduce recurrences, and that findings had been inappropriately closed in ITS and the DOE Corrective Action Tracking System. **(MG.2-2/F)**

Directorate and Principal Directorate ORBs are reviewing the screening for issue type and significant categorization of category 1 and 2 issues as required by the LLNL issues management procedure. This process has the potential to be a valuable tool for improving communication and increasing the engagement of managers more directly in the resolution of safety problems. However, the effectiveness of the ORBs in improving issues management is limited because of the small number of significance category 1 and 2 issues and its involvement only in verification of type and significance categorization. The effectiveness of ORB reviews could be enhanced by providing management input and feedback on cause determinations and corrective actions and recurrence controls, and closure information and by including a sampling review of significance

category 3 issues**.** Some ORBs do not keep minutes of what issues are reviewed or the results. **(MG.2-5/OFI)**

Human performance improvement (HPI) concepts and techniques are being applied in a number of organizations and topical areas to improve analysis of issues and events. HPI techniques have been integrated into guidance on the conduct of pre-job briefings, designated as "SAFER" in the "ISMS Safety Toolbox." A task force appointed by Operations Excellence Council is evaluating ways to encourage the application of HPI techniques and integrate them into LLNL processes.

Issues and problems are also being identified, documented and addressed at the activity level. Maintenance work orders cannot be closed without documenting feedback, both positive and negative, and F&I safety personnel review all comments on a weekly basis and ensure that actions are taken as necessary to address any safety concerns. Feedback comments from work orders and their resolutions are documented in a spreadsheet.

LLNL has implemented an operating experience program that screens, documents, and disseminates internally identified lessons learned and operating experience and product safety bulletins from various external sources. External operating experience information is screened by the Laboratory operating experience coordinator in the CAO and, if deemed applicable, forwarded to selected distributions for further dissemination and application and posted to a site lessons learned website. The website provides a search function to facilitate identification of pertinent lessons for training or work planning purposes. There is much anecdotal evidence that lessons are being disseminated, discussed in staff and safety meetings, posted on bulletin boards, posted on the daily online news page, referenced in IWSs, and discussed at pre-job briefings. Significant or emerging internal safety issues are communicated promptly to site managers and lessons learned points of contact on one-page summary "Safety Flash" notifications. In addition, some directorates have established internal operating experience processes for lessons applicable to their activities or to elaborate on distributed lessons. For example, F&I periodically publishes "Feedback/Improvement Lessons Learned" reports. Eight internally generated lessons learned had been forwarded to DOE Headquarters for sharing with the complex in the DOE list server database

Notwithstanding the widespread distribution and discussion of operating experience information, implementation of the LLNL lessons learned program lacks sufficient formality and rigor to demonstrate that external operating experience data is being sufficiently screened, evaluated by SMEs, and applied to safety processes when appropriate. Although the newly issued (August 2009) Laboratory operating experience procedure describes some general roles and responsibilities for the Laboratory operating experience/lessons learned coordinator, it does not provide process steps for the coordinator to screen, analyze, and disseminate operating experience data from external sources as required by DOE O 210.2, *DOE Corporate Operating Experience Program*. **(MG.2-6/OFI)**

An internal CAO procedure requires that the lessons learned coordinator maintain a database of information screened for potential lessons learned, including applicability, to whom the information was distributed, and actions taken with completion dates. This database has not been maintained, and evidence of screening and dissemination is only retained in electronic mail and not collected in folders that would facilitate review. Information on feedback from SMEs or points of contact on applicability, needed actions, or actual use, if any, would have been on electronic mail that was not readily retrievable. Few lessons have been posted to the site database, although many more appear to have been disseminated to FPOCs and SMEs for further distribution, as reflected on electronic mail. For example, only 12 lessons were posted to the site

database in CY 2009, only two from external sources, and only 15 in CY 2008, six from external sources. This limited posting also provides limited resources for planners or trainers using the database. The team selected a sample of various external operating experience documents issued in 2008 and 2009 on topics with apparent pertinence to LLNL to determine if or how they had been screened, evaluated, and implemented if appropriate. Based on a search of outgoing electronic mail, two of three DOE Operating Experience Summaries had been distributed, three of four DOE Safety Bulletins had been distributed, and five of nine Red (highest significance) lessons from the DOE database had been distributed. These results indicate insufficient rigor in screening and documentation related to pertinent external operating experience information. Feedback information from the distribution (SMEs and responsible line contacts), if any, was not readily retrievable. **(MG.2-3/W**)

This criterion was partially met.

4. Mechanisms are utilized by managers to encourage worker suggestions/concerns and resolve recommendations for improvement. (DOE-HDBK-3027-99, DOE M 450.4-1)

Personnel working at LLNL have many mechanisms available to communicate concerns and make recommendations for improvement. Informal and formal processes are available and used by employees to resolve safety concerns. Workers are encouraged in employee and visitor training and in the ISMS "Safety Toolbox" to report safety concerns or questions to supervision, facility managers, assurance managers, or members of their ES&H team. In June 2009 LLNL added a "quick entry" feature to ITS for employees to easily document conditions that have impacted or could impact performance of its mission safely, securely, efficiently, or in an environmentally sound manner, or a non-compliance with law, policy or procedure. Approximately 40 Quick ITS had been reported in the first four months, most reporting material condition deficiencies and traffic issues. The team reviewed a sample of seven of these reports and determined that each had been adequately resolved and closed in a timely manner.

Another mechanism for employees and subcontractors to report concerns and suggestions and for feedback from management and health and safety professional are various safety committees. "Grassroots Safety Teams" in the directorate and the Laboratory Executive Safety Committee provide effective forums for soliciting and acting upon worker suggestions and concerns.

A Laboratory ES&H employee concerns hotline and links to the DOE employee concerns program are also communicated in training and the Safety Toolbox, as well as on the LLNL internal website and posters on bulletin boards throughout the Laboratory. LLNL has an established formal employee concerns program described in the Personnel Policies and Procedures Manual and administered through the Staff Relations Office. Oversight and coordination of investigation activities are provided by an investigations working group appointed by the Laboratory Director. The team reviewed the case files of the four formal employee concerns related to safety handled by LLNL since October 2007. The case files for three cases investigated by the IAOD were detailed, well organized, and well documented. Investigations were generally thorough. After the investigations were performed, follow-up actions were noted, final resolutions were tracked, and case files were updated until completed. The concerned individuals were contacted with the results of the investigation.

In two of the cases reviewed, the team determined that additional investigative effort would have resulted in a more robust disposition of the concerns. In one case, resolution of an anonymous concern about asbestos abatement activities in an occupied building relied on a generally adequate report from a subcontractor, input from the responsible ES&H team, and the

management of the workers and facility involved. However, the Staff Relations investigators did not independently contact tenants of the facility to verify that the report and actions taken had adequately resolved the situation. In another case, although the investigation report thoroughly addressed the specific details of the concerns (mostly substantiated through numerous interviews and document reviews), it did not address the fact that the issues and adverse safety environment and conditions involved had existed for over ten years and had either been inadequately communicated to Laboratory management or ineffectively addressed by site management, or both.

This criterion was met.

5. Performance metrics and targets to assess mission effectiveness, including ISM effectiveness, are established and analyzed in a timely manner to support continuous improvement. (Contractor Assurance System Contract Clause, DOE-HDBK-3027-99)

LLNL has established basic sets of metrics for safety, including contractor assurance that provide performance status information and trends for each principal directorate, which are rolled up to sitewide measures, and published in a report called the Monthly Performance Review. These metrics are presented and discussed by senior management as a tool for determining needed actions, resource allocation, and continuous improvement. Yearly Safety Performance Objectives, Measures, and Commitments, required by DOE regulations and approved by LSO, reflect the status and performance of the Laboratory in meeting key objectives and are reported to LSO in monthly and quarterly metric reports or as completed deliverables.

Although the CAO issued a guidance document in September 2008 describing LLNL performance measures and metrics processes, there is no formal procedure specifying the requirements and processes for establishing, maintaining, updating, and justifying performance targets and thresholds. The team recommends that LLNL issue a formal Laboratory level procedure detailing the requirements and processes for establishing and communicating performance metrics (**MF.2-7/OFI)**

This criterion was met.

6. Errors and incidents are promptly reported, and causal analysis is performed as necessary. (DOE M 450.4-1)

LLNL identifies, investigates, analyzes, reports, and takes corrective and preventive actions for events and incidents and for nuclear safety and worker safety and health violations as required by DOE directives and site procedures. Supervisors and managers in the directorates and principal directorates are identifying and reporting to senior managers operational events and occupational injuries and illnesses. Three weekday mornings per week, the Laboratory Deputy Director hosts a conference call with managers from principal directorates to communicate and discuss any incidents or events occurring since the last call. LLNL reported approximately 46 events to ORPS in the past year. The Laboratory and LSO have established a set of criteria for "site reportable" events that is below (more conservative) than the DOE threshold criteria for reporting to ORPS, and these events are being identified, categorized, and reported to LSO. The CAO collects details on these events and provides monthly reports to LSO.

Events and issues reported in ITS are screened for violations meeting Price-Anderson Amendments Act reportability to DOE, and worker health and safety issues are analyzed for trends and reportability by the CAO. Most directorates have established and are implementing

processes to identify events that may be reportable, as well as below-reporting-threshold incidents; make management decisions about significance; identify the level of analysis; and, where appropriate, conduct critiques and causal analyses, identified as management reviews. Categorization and reporting of a sampling of event reports were timely. Formal causal analyses reviewed by the team reflected sufficient detail and rigor in identifying root and contributing causes and establishing corrective actions and recurrence controls.

Occupational injuries and illnesses of Laboratory employees and subcontractors are medically evaluated and treated, investigated by subcontractors or Laboratory supervisors and safety and health professionals, and reported as required by DOE directives and OSHA regulations. An investigation of circumstances, causes, and recommended actions were documented on case analysis reports (CARs) for a sample of 12 injuries and exposures reported in the previous 18 months. However, for most of these cases the investigation and corrective and preventive actions for occupational injuries and illnesses were not sufficiently rigorous to ensure that causes were adequately identified and that appropriate corrective actions and recurrence controls were established and implemented as required by DOE directives and Laboratory procedure. Investigation reports lacked sufficient rigor in fully describing all aspects of the incidents, addressing work planning and ISMS elements, identifying proper causes, and establishing appropriate corrective actions and recurrence controls. Submittal of completed reports by line supervisors was often not timely. The monitoring and oversight by directorate assurance managers and directorate management who review and approve these reports were less than adequate. Specific examples of deficiencies in the included the following: **(MG.2-3/F)**

- The "PPE used" block was either not completed or was inadequately described.
- There was no reference to the associated IWS, procedures, pre-job briefings, or FSPs to indicate whether they existed, were required, or were followed.
- The "Activity" block described the event rather than the work activity involved.
- There was a failure to address why workers were apparently performing activities outside of expected job duties (e.g., an engineer loading furniture into a truck).
- Detail was lacking. For example, it was stated that a hazards control team responded to the scene of potential exposure to carbon monoxide without specifying the time delay after the exposure symptoms were reported or specifying that carbon monoxide levels were actually measured ("did not detect any contaminants or unusual conditions"), and an activity was described as "moving drums" without specifying the size or weight or process used.
- Conditions or actions were identified as not being "typical" or "normal," without specifying what these terms mean or identifying whether the conditions or actions were in compliance with Laboratory requirements.
- Actions were recommended without indication of the implementing mechanism (e.g., "before starting work take a moment to survey the work area," or "use only safety type knives," or "a second person should be present when transferring concentrated acids by pouring").

Out of ten cases where additional corrective/preventive actions were specified on the CARs, actions were entered into and tracked in ITS for only five cases.

This criterion was partially met.

Conclusion:

The objective was partially met.

Although the Laboratory is on a path to improved and effective assurance system performance, senior management attention is necessary to ensure that assurance processes are adequately implemented. LLNL has implemented the assessment and feedback mechanisms described in the ISMS description and in the CAS. Many new processes and strategies for safety assurance have been developed over the past two years. LLNL is establishing more structured processes for planning and conducting assessments, and the functionality and features of ITS have been substantially enhanced.

Many assurance system elements are being adequately performed, including internal independent assessments, resolution of employee concerns, performance metrics, sharing of lessons learned, and occurrence reporting. However, most assurance system elements are not yet fully mature, and there are continuing weaknesses and opportunities for improvement. The planning and performance of management self-assessments needs strengthening; trending, documentation, and management of issues needs improvement; and the investigation of occupational injuries and illnesses associated with work activities needs significant improvement in addressing ISMS work control elements.

Some of the issues identified during this HSS review had been previously identified during a management self-assessment conducted in May 2009. The resulting corrective action plan includes issuing an institutional metrics procedure, improving timeliness of ORPS quality performance reviews, and addressing issue significance ranking disparities.

Although substantial resources have been devoted to process development and rollout, insufficient senior management attention and oversight have been applied to ensuring that assurance system elements are implemented in a compliant and effective manner that achieves management expectations and provides management with accurate process and performance evaluations.

Issues:

Findings

MG.2-1/F: LLNL has not performed timely, quarterly analyses of events as required by DOE M 231.1-2, *Occurrence Reporting and Processing of Operations Information,* and LLNL ES&H Manual Document 4.3.

MG.2-2/F: LLNL issues management procedures are not being effectively implemented such that issues are accurately documented; issue types are properly classified; causes are identified and addressed; and effectiveness reviews, when performed, accurately determine whether corrective actions have been fully effective in addressing the issue as required by DOE O 226.1A, *Implementation of Department of Energy Oversight Policy*, and LLNL PRO 0042, *Issues and Corrective Action Management*.

MG.2-3/F: The investigation and corrective and preventive actions for occupational injuries and illnesses were not sufficient, in many cases, to ensure that causes were adequately identified and appropriate corrective actions and recurrence controls established and implemented as required by DOE O 226.1, *Implementation of Department of Energy Oversight Policy,* and LLNL ES&H Manual Document 4.5, *Events: Notification, Analysis, and Reporting.*

Weaknesses

MG.2-1/W: LLNL organizations have not implemented a robust, credible, risk-based management self-assessment program that includes a formal, structured, risk-based process that identifies activities, facilities, processes, management systems, risk levels, and prior performance/events that prioritizes these elements and produces rigorous self-assessments that evaluate processes and performance and drive continuous improvement.

MG.2-2/W: Although the LLNL issues management procedure requires that, for significance category 3 issues, issue owners conduct an apparent cause review and develop corrective actions that address the identified causes, it does not require the documentation of the analysis results.

MG.2-3/W: Implementation of the LLNL lessons learned program lacks sufficient formality and rigor to demonstrate that external operating experience data is being sufficiently screened, evaluated by subject matter experts, and applied to safety processes when appropriate.

Opportunities for Improvement:

MG.2-1/OFI: LLNL should consider prioritizing the establishment of an independent quality review process to provide feedback to personnel performing, reviewing, and approving assessments.

MG.2-2/OFI: LLNL should consider clarifying the responsibilities of functional area managers and require annual reports on the health of their processes and implementation.

MG.2-3/OFI: LLNL should consider evaluating whether repetitive deficiencies related to pressure system device testing and data accuracy, IWS training, and read-and-sign requirements warrant further analysis as institutional issues.

MG.2-4/OFI: LLNL should consider reviewing data analysis processes and revise as necessary to ensure that screening will identify high frequency issues, identified either consistently from review period to period or as one period data points.

MG.2-5/OFI: LLNL should consider enhancing the effectiveness of ORB reviews by providing management input and feedback on cause determinations, corrective actions, recurrence controls, and closure information, and by including a sampling review of significance category 3 issues.

MG.2-6/OFI: LLNL should consider revising the Laboratory operating experience procedure to detail the requirements and process steps for the site operating experience/lessons learned program and coordinator screening, analyzing, and disseminating externally generated lessons learned.

MG.2-7/OFI: LLNL should consider issuing a formal Laboratory level procedure detailing the requirements and processes for establishing and communicating performance metrics.

Submitted by: Signature On File Robert Compton, Team Member	Reviewed by: Signature On File William Miller, Team Leader

LLNL ASSESSMENT FORM

FUNCTIONAL AREA: Subject Matter Expert Radiation Protection	OBJECTIVE: SME.1 DATE:	OBJECTIVE MET: YES X NO_____

OBJECTIVE

SME.1: Within the functional area the LLNL ISMS Description has been implemented such that the tenets of the ISM Guiding Principles and Core Functions are met. (CE II-2, CE II-3, CE II-4, CE II-5, CE II-6)

CRITERIA

1. Mechanisms are implemented such that planning of individual work items ensures that hazards are analyzed and controls are identified for the functional area. (DOE-HDBK-3027-99)

2. Clear roles and responsibilities for the functional area are defined and understood. The functional area is effectively integrated with line managers to ensure that line managers are responsible for safety. (DOE-HDBK-3027-99)

3. Mechanisms ensure that controls for the functional area are implemented, that these controls are effectively integrated, and that readiness is confirmed prior to performing work. (DOE-HDBK-3027-99)

4. Personnel who are assigned to the functional area have a satisfactory level of competence. (DOE-HDBK-3027-99)

5. Mechanisms ensure feedback and continuous improvement within the functional area. (DOE-HDBK-3027-99)

6. The functional area has adequate resources to ensure the safety of workers, the public, and the environment. (DOE P 450.4)

APPROACH

Records Reviewed:

- LLNL-AM-410750, Lawrence Livermore National Laboratory's Radiation Protection Program (RPP) Revision 9.0, February 20, 2009
- UCRL-AM-133867-VOL-2-PT-20.1-2009, ES&H Manual, Document 20.1 Occupational Radiation Protection
- UCRL-AM-133867-VOL-2-PT-20.2-2009, ES&H Manual Document 20.2 LLNL Radiological Safety Program for Radioactive Materials
- DOE-STD-1098-2008, DOE Standard, Radiological Control, October 2008
- HP-FO-003 Air Flow Studies in Radioactive Material Areas
- HP-FO-004 Placement and Use of Air Samplers and/or Real Time (Continuous) Air Monitors for Routine Monitoring for Airborne Radioactivity

- HP-FO-005 Guidance for Identification and Response to Unexpected Radiological Conditions
- HP-FO-020 Development and Implementation of the Health Physics Discipline Action Plan
- LLNL Air Sampling Technical Basis Document
- LLNL Internal Dosimetry Technical Basis Document
- UCRL-AM-230637, Hazards Control Manual, Radiation Safety Chapter 1
- Hazards Control Department Manual, LLNL Web
- LLNL-AM-409863, ES&H Manual Document 2.2 LLNL Institution-Wide Work Control Process
- LLNL-AM-405814, LLNL Institution-Wide Work Control Process Requirements Document
- LLNL-AR-411145, Corrective Action Plan (CAP) for the LLNL Radiation Safety Program
- Memo, October 1, 2008, Liedle to Distribution, Authority and Responsibility of the LLNL Radiological Control Manager
- Memo and Attachments, September 28, 2009, Shingleton to Worley, Implementation plan Completion for DOE STD 1098-2008, Radiological Control
- IWS Numbers 14411, 14410, 12639, 11768, 14076,10882,14649
- RHWM Work Permit No. B695-09-W-143
- Health Physics Discipline Action Plans for RHWM and B321
- Sampling of completed health and safety technician job performance measures and training records
- Various Radiation Safety Section (RSS) Internal and External Audit and Assessment Reports and associated ITS Items
- Various RSS weekly health physics meeting minutes
-

Interviews:

- Radiological Control Manager
- RSS Technical Leader
- ES&H Team 1 and 2 Team Leaders
- ES&H Team 1 and 2 Health Physicists

Observations:

- Pre-job briefing for decontamination work in room 1023 at RHWM
- Decontamination work in room 1023 at RHWM
- Work permit meeting in RHWM
- Pre-job briefing for machining work 321C
- Uranium machining work in 321C
- Be cage work in B235 basement
- Various Chemistry division laboratory walkthroughs

DISCUSSION OF RESULTS

1. **Mechanisms are implemented such that planning of individual work items ensures that hazards are analyzed and controls are identified for the functional area. (DOE-HDBK-3027-99)**

Radiological work planning requirements are delineated in ES&H Manual 20.1 Section 5.0. Radiological hazards are assessed by ES&H Team radiological SMEs and controls specified in written work authorizations and/or technical work documents approved by the Hazards Control Organization (e.g., IWSs, procedures).

Most LLNL Directorates use the IWS process as the principal means for analyzing radiological hazards and establishing activity level controls. Electronic IWSs are drafted by the RI and/or principal investigators and are routed to the ES&H Team Leader who selects appropriate health physicists via notification by e-mail that a draft IWS has been created and needs review and concurrence. The Health Physicist provides comments and any needed changes through the electronic comment log system and will provide an electronic concurrence when he/she is comfortable that all necessary controls have been established. The HSS review of selected directorates indicates that radiological IWSs and SME concurrence logs were maintained and ES&H Team health physicists had been appropriately engaged in the development of comments and controls and in concurring with the IWS.

IWSs are not used in NMTP facilities to define radiological controls. For example, Superblock radiological controls are established through an equivalent work control process that generates operational safety plans and/or work permits for specification of activity level controls. RHWM has transitioned to the use of the NMTP work permit process for planning and approving work activities in Building 695. This NMTP process includes the conduct of bi-weekly work permit meetings with representation by all ES&H Team disciplines to review, modify, and approve draft work permits. The draft work permits are projected on a screen and reviewed and updated, either in real time if possible or through further work assignments. Once a draft work permit is acceptable to all SMEs, it is concurred with and finalized with signatures from all disciplines during the work permit meeting. The work permit meeting for the decontamination of Room 1023 in RHWM was observed and had representation from all applicable ES&H disciplines, including the Team 1 health physicist. The permit was appropriately reviewed and revised with input from the health physicist and approved for work during the meeting.

The criterion was met.

2. Clear roles and responsibilities for the functional area are defined and understood. The functional area is effectively integrated with line managers to ensure that line managers are responsible for safety. (DOE-HDBK-3027-99)

Roles and responsibilities for radiological control at LLNL are well defined. Document 20.1, Section 9 defines the roles and responsibilities for the various tenets of the Radiological Control Organization, including the RSS, which provides institutional policy, function and infrastructure support, and the ES&H Teams, which provide radiological control services and support to line management in performance of mission related work. The Hazards Control Department Manual further delineates roles and responsibilities for ES&H Teams and team members. Interviews demonstrated that RSS and ES&H Team health physicists have a good understanding of their roles and responsibilities.

The criterion was met.

3. Mechanisms ensure that controls for the functional area are implemented, that these controls are effectively integrated, and that readiness is confirmed prior to performing work. (DOE-HDBK-3027-99)

Sitewide radiological requirements and controls are presented in the ES&H Manual and institutional procedures. These requirements are further flowed down through supporting documents, including technical basis documents, Hazards Control Department Manual, and field operating procedures. Sitewide requirements documents have recently undergone significant revisions to accommodate contractual incorporation of the DOE Radcon Standard. However, not all adopted elements of the Standard have been defined or flowed down such that they can be effectively implemented at the working level. (See Attachment 1.)

10 CFR 835 requires that written work authorizations specifying the appropriate radiation protection measures be used to control entry into and to perform work in radiological areas. Activity level radiological controls at LLNL are presented in written work authorizations, principally through the IWS process but also through other technical work documents, such as work permits, safety plans, or procedures, depending on the facility. There is wide variability in the quality and content of radiological work authorization documents used to convey radiological hazard information and specify controls.

Radiological IWSs were reviewed and work was observed across the S&T, GS, and WCI Directorates. The Superblock work control process has generally resulted in effective analysis of radiological hazards and specification of controls within individual Operational Safety Plans prepared for specific plutonium operations. These operations have been reviewed during prior internal and external integrated safety management reviews.

For the other (i.e., outside the Superblock) Directorates and work reviewed during this review, weaknesses in specification of radiological controls were evident in most work permits and IWSs governing activity level work. While some radiological hazards and controls are adequately specified, most radiological work authorizations did not contain sufficient radiological information or clear delineation of required controls as required by Documents 20.1 and 20.2 and as suggested by the DOE Radcon Standard. (See Attachment 1 for discussion of flowdown of Radcon Standard elements.) As discussed in the sections on the individual Directorates, IWSs are often developed with overly broad work scopes and span of control. This situation is beyond the control of the Radiological Control Organization but directly contribute to weaknesses in the ability to define appropriate radiological controls in the IWS. In addition, the Radiological Control Organization lacks sufficiently comprehensive implementing procedures and training for health physicists to delineate the proper methods for developing radiological work authorizations, including minimum content and format expectations. Examples of deficiencies in radiation controls in IWS include: **(SME.1-1/F)**

- A work permit for decontamination of Room 1023 in RHWM contained PPE requirements but was missing other information expected under the DOE Radcon Standard for a radiological work authorization, such as limiting conditions that would void the work permit, survey and monitoring requirements and hold points, and job specific air sampling requirements (personnel were required to wear respirators for radiological hazards but job specific air sampling was not performed).

- The IWS for 321C uranium machining provided a sufficient amount of detail on radiological hazards, anticipated radiological conditions, and PPE requirements but did not clearly specify or ensure proper implementation of various other radiological controls. Specifically, it could not be determined from information in the HP-DAP and the IWS what boundaries for a contamination area must be established around the contaminated equipment, and whether the defined frisking protocol was to be implemented each time the worker contacted the contaminated equipment and moved away into the radiological buffer area (RBA) or whether

it was acceptable to move freely within the RBA after contacting contaminated equipment. In practice, the worker changed gloves after contacting equipment but did not frisk potentially contaminated body areas before moving around the RBA. The full self-frisk protocol is only implemented when securing the work and leaving the RBA. General direction for placement of air samplers is provided in the HP-DAP; however, the IWS did not specify proper placement of the required air sampler for the work evolution.

- A number of IWSs across the Directorates were very broad, covering activities such as radiochemical separations, laser facility experimental operations, and use of sealed sources. Because these IWSs are written so broadly, specific tasks are not clearly delineated and the specific radiological hazards and controls cannot be established. In these cases, the IWS generally provides a boundary and instructs workers to contact the ES&H Team health physicist if the boundary is exceeded, in order for HP to perform special hazard assessments to define any additional needed controls on a case by case basis. However, the IWS is not always revised or a new one created to reflect these special hazards assessments and additional controls before proceeding with the work. This approach does not meet Document 20.1 or Radcon Standard requirements for radiological work authorizations to identify the specific radiological controls for the work. It also reflects a condition under which work has been pre-authorized on the IWS before the specific hazards were evaluated and controls specified, which is contrary to the LLNL Institution Wide Work Control Process Requirements Document and Document 2.2.

Readiness to perform radiological work is accomplished through IWS and radiological pre-job briefings required by Document 20.1. IWS pre-job briefings are required to be held each day to ensure that hazards and controls are understood. The level of formality associated with these briefings varies and does not necessarily ensure that hazards and controls are reviewed. For example, the pre-job briefing for uranium machining did not review the IWS requirements but offered the workers an opportunity to raise any concerns and whether they were comfortable and familiar with the hazards and controls. Radiological pre-job briefing requirements are included in Document 20.1 and are more formal than the IWS pre-job briefing requirements. For example, minimum expectations as to the content of the briefings are defined, and the briefings are required to be documented. However, these briefings are only required for certain higher hazard radiological work. Most radiological work does not require a formal brief to ensure that radiological hazards and controls are reviewed. **(SME.1-1/OFI)**

The criterion was not met. However, the criterion would be met if LLNL implements timely compensatory measures to address broad scope IWSs that do not meet minimum content and detail expectations for radiological work authorizations (also see Attachment 1 for recommended actions).

4. Personnel who are assigned to the functional area have a satisfactory level of competence. (DOE-HDBK-3027-99)

ES&H Teams assigned to support line organizations are staffed with professional Health Physicists and Health and Safety Technicians (H&S Techs) to support radiological control functions. Both the LLNL RSS and hazard control teams have highly qualified professional health physics personnel assigned to support operations. All health physicists have at least a bachelor's degree and many have advanced degrees and/or professional certifications. Approximately half of the professional radiation safety staff at LLNL are certified health physicists.

The radiological control technician (RCT) training and qualification program at LLNL provides consistent instruction expected under the DOE RCT core competencies and includes appropriate job performance measures to facilitate effective performance of health and safety technicians providing radiological control coverage.

The criterion was met.

5. Mechanisms ensure feedback and continuous improvement within the functional area. (DOE-HDBK-3027-99)

Document 20.1 Section 3.6 and Appendix B establish the conduct of an internal assessment program to assess the RPP and evaluate strengths, weaknesses and areas of vulnerability and noncompliance. All functional elements of the RPP are evaluated every three years. Several radiological functional area assessments were reviewed and found to be of sufficient scope and quality to effect feedback and improvement in the topical area. Deficiencies and opportunities for improvement were clearly identified and supported.

Other mechanisms are used to elicit radiological control feedback and improvement, including routine radiological meetings and post-job reviews for radiological work exceeding trigger levels defined in Document 20.1. The RSS holds weekly meetings among all health physicists to review programmatic issues, concerns, and areas for improvement. Minutes of these meetings are recorded.

At the institutional level, the site has not established a Radiological Awareness Reporting System as suggested in the DOE Radcon Standard, to enhance work force awareness, encourage continuous evaluation and improvements, track resolution of concerns, provide feedback to employees, and post results and trends. Such systems normally document radiological deficiencies, including those that fall below the level for reporting or formal corrective action, for trending and evaluation as leading indicators of performance deficiencies. **(SME.1-2/OFI)**

The criterion was met.

6. The functional area has adequate resources to ensure the safety of workers, the public, and the environment. (DOE P 450.4)

The LLNL radiation safety program is supported by a staff of experienced, well-qualified health physicists and environmental analysts to evaluate radiological operations and prescribe and implement requisite controls to protect workers, the public and the environment. LLNL also has sufficient RCT-qualified H&S Techs who support the line organizations in proper conduct of radiological work and in ensuring that radiological conditions are properly characterized and controlled. These resources are also used to evaluate and control items and equipment being released from radiological controls so that radiologically-impacted items are not released to the public.

LLNL also maintains and calibrates sufficient quantities of radiation detection instrumentation to support planned and emergency conditions and has DOE Laboratory Accreditation Program (DOELAP) accredited internal and external dosimetry processes to ensure that occupational exposures are quantified and reported.

The criterion was met.

Conclusion:

The objective was met.

Radiological work planning requirements are appropriately delineated in the LLNL ES&H Manual. There is appropriate engagement of radiological SMEs in the planning of radiological work through the IWS or work permit processes, and controls are developed in written work authorizations and/or technical work documents approved by the Hazards Control Organization. Roles and responsibilities for the various tenets of the Radiological Control Organization, including the RSS and ES&H Teams, are well defined and understood. However, some radiological work authorizations produced by ES&H Teams are deficient in analysis of radiological hazards and clear specification of controls. This deficiency is partly attributable to the unmanageable scope and span of control covered by some IWSs and insufficient implementing procedures and training for health physicists to define minimum content and format expectations for radiological work authorizations. Radiological staff qualifications and training are of high caliber, and generally adequate mechanisms are in place to effect radiological protection feedback and improvement. The radiation safety program has adequate resources to ensure the safety of workers, the public, and the environment.

Issues:

Finding

SME.1-1/F: The radiological work authorization process (IWSs, work permits, etc.) has not always ensured that radiological hazards are fully analyzed and that controls are clearly identified, tailored to specific work, and conveyed to workers prior to releasing work, as required by Documents 2.2, 20.1, 20.2 and 10 CFR 835.

Opportunities for Improvement

SME.1-1/OFI: LLNL should consider revising the radiation safety program to establish requirements that ensure workers receive an initial formal briefing on radiological hazards and controls before being allowed to work under a radiological IWS. LLNL should also consider establishing provisions for radiological briefings following revisions to an IWS and periodically for long-term IWSs.

SME.1-2/OFI: LLNL should consider instituting a Radiological Awareness Reporting system as suggested in the DOE Radcon Standard to enhance workforce awareness, encourage continuous evaluation and improvements, track resolution of concerns, provide feedback to employees, and post results and trends.

Submitted by: Signature On File Mario A. Vigliani, CHP, Team Member	Reviewed by: Signature On File William Miller, Team Leader

LLNL ASSESSMENT FORM

FUNCTIONAL AREA: Subject Matter Expert Non-Radiological Workplace Exposure Assessments	OBJECTIVE: SME.2 DATE:	OBJECTIVE MET: YES _X_ NO____

OBJECTIVE

SME.2: Within the functional area the LLNL ISMS Description has been implemented such that the tenets of the ISM Guiding Principles and Core Functions are met. (CE II-2, CE II-3, CE II-4, CE II-5, CE II-6)

CRITERIA

1. Mechanisms are implemented such that planning of individual work items ensures that hazards are analyzed and controls are identified for the functional area. (DOE-HDBK-3027-99)

2. Clear roles and responsibilities for the functional area are defined and understood. The functional area is effectively integrated with line managers to ensure that line managers are responsible for safety. (DOE-HDBK-3027-99)

3. Mechanisms ensure that controls for the functional area are implemented, that these controls are effectively integrated, and that readiness is confirmed prior to performing work. (DOE-HDBK-3027-99)

4. Personnel who are assigned to the functional area have a satisfactory level of competence. (DOE-HDBK-3027-99)

5. Mechanisms ensure feedback and continuous improvement within the functional area. (DOE-HDBK-3027-99)

6. The functional area has adequate resources to ensure the safety of workers, the public, and the environment. (DOE P 450.4)

APPROACH

Records Reviewed:

- 10 CFR Part 851, Worker Safety and Health Program, February 9, 2006
- DOE-STD-6005-2001, DOE Standard, Industrial Hygiene Practices, April 2001
- DOE G 440.1-3, Implementation Guide for use with DOE Order 440.1, Occupational Exposure Assessment, 3-30-98
- DOE G 440.1-8, Implementation Guide for use with 10 CFR Part 851, Worker Safety and Health Program, 12-27-06
- A Strategy for Assessing and Managing Occupational Exposures, American Industrial Hygiene Association (AIHA), Second Edition, 1998

- Industrial Hygiene Survey Procedures Manual, LLNL-AM-41507, Version 2.2.2, July 22, 2009
- Hazards Control Department, Industrial Hygiene Discipline Action Plan, 2009 Version
- Industrial Hygiene Baseline Program, Power Point Presentation, October 7, 2009
- LLNL Industrial Hygiene Baseline Procedure, Power Point Presentation, October 7, 2009
- Hazards Control Department IWS Review Guidelines, Section 8.0, January 2009
- Fiscal Year 2010, Performance Evaluation Plan for LLNL Contract No. DE-AC52-07NA27344
- LLNL, Industrial Hygiene Section Policy and Information Manual, #17 Hazard Assessment Worksheet, Nov. 2007
- LLNL, Industrial Hygiene Section Policy and Information Manual, #10 Industrial Hygiene Document Management, July 2009
- LLNL, Industrial Hygiene Section Policy and Information Manual, #49 Industrial Hygiene Surveillance, August 2008
- LLNL, Industrial Hygiene Section Policy and Information Manual, #52 Personal Monitoring Reports, April 2008
- LLNL, Industrial Hygiene Section Policy and Information Manual, #93 Hazard Assessment and Control Forms, June 2009
- UCRL-AM-133867- ES&H Manual
- Hazards Control Department Manual, LLNL Web
- LLNL-AM-409863, ES&H Manual Document 2.2 LLNL Institution-Wide Work Control Process
- LLNL-AM-405814, LLNL Institution-Wide Work Control Process Requirements Document
- IWS Numbers 11667, 12639, 10276, 11709, 14649, 14372

Interviews:

- Deputy Department Head, HCD
- Acting Section Head, Industrial Hygiene
- HCD Assurance Representative
- LLNL Industrial Safety Professional
- LLNL Industrial Hygienists and SMEs
- ES&H Team 2, Deputy Team Lead

Observations:

Various locations involving ESH, WCI, S&T, PS, and GS directorates.

DISCUSSION OF RESULTS

1. Mechanisms are implemented such that planning of individual work items ensures that hazards are analyzed and controls are identified for the functional area. (DOE-HDBK-3027-99)

There are a number of established mechanisms for involving IH in the identification and analysis of hazards and development and implementation of controls in the work control process.

At the institutional level, the IH Section of the HCD is responsible for the development and documentation of controls in the LLNL ES&H Manual that address a wide range of worker

exposure hazards, such as hazardous chemicals, heat stress, lead, and beryllium. IH has also developed and implemented an Industrial Hygiene Policy and Implementation Manual, which establishes the mechanisms for conducting elements of a workplace exposure assessment (e.g., facility baseline surveys, hazard assessment worksheets, monitoring and sampling).

At the facility level, IH is in the process of conducting IH facility surveys or baseline hazard assessments for each of the LLNL facilities/buildings that have potential workplace exposure hazards. The purpose of the IH facility surveys is, in part, to evaluate the exposure assessments previously conducted at LLNL and identify any potential issues. The IH facility survey consists of reviewing existing IH information, along with validating such information through interviews and site observations in order to identify hazards specific to the facility and work activities, determine Similar Exposure Groups (SEGs) and whether SEGs have been fully characterized, and determine additional activities to meet the exposure assessment requirements of 10 CFR 851. The design of the IH facility survey program is consistent with the requirements of 10 CFR 851 as further explained in DOE STD 6005.

At the work activity level, each IWS is evaluated by one of two LLNL ES&H Teams for potential workplace exposure hazards. IWSs are initially screened within the ES&H Team to determine the appropriate technical disciplines review (e.g. industrial safety, fire protection, or industrial hygiene). A Team industrial hygienist would be assigned to review potential workplace exposure hazards presented in the IWS and IWS attachments, and then either concur that the recommended hazards and controls are appropriate or indicate changes as necessary. For the sampling of IWSs observed, IH has been involved in the reviews of IWSs. IH is also involved in the preparations and/or review of safety permits with respect to asbestos, lead, beryllium, and other exposure hazards.

The criterion was met.

2. Clear roles and responsibilities for the functional area are defined and understood. The functional area is effectively integrated with line managers to ensure that line managers are responsible for safety. (DOE-HDBK-3027-99)

Roles and responsibility for the IH section lead and industrial hygienists are identified and well defined in individual Roles, Responsibilities, Authorities, and Accountability (R2A2) descriptions for these positions. At the institution level, roles and responsibilities for the conduct of exposure assessments are defined within the various chapters of the ES&H Manual and in chapters of the IH Policy Implementation Manual. Industrial hygienists have also been assigned roles and responsibilities as SMEs for various IH disciplines (e.g., confined spaces, PPE, noise, non-ionizing radiation).

Roles and responsibilities of H&S Techs, who provide various IH exposure monitoring and sampling tasks, are also well defined in the HCD Manual, position descriptions, and ES&H Team Industrial Hygiene Discipline Action Plans. Roles and responsibilities of H&S Techs for performing activities in support of exposure assessments are also prescribed by the ES&H Team industrial hygienists to whom the H&S Techs are assigned.

The criterion was met.

3. Mechanisms ensure that controls for the functional area are implemented, that these controls are effectively integrated, and that readiness is confirmed prior to performing work. (DOE-HDBK-3027-99)

Although progress in workplace exposure assessments at the work activity level (i.e., IWS level) and the facility level (i.e., IH facility surveys) is evident, much remains to be done, particularly at the IWS activity level to develop and/or implement mechanisms to ensure that the appropriate hazard controls have been implemented prior to performing work.

10 CFR 851 requires the assessment of worker exposures to chemical, physical, and biological hazards through appropriate monitoring and to document these assessments using recognized exposure assessment methods. At present, there are few well-documented IH exposure assessments to support the hazard analysis and selection of controls for an individual IWS, even for a WAL-C IWS (i.e., those that typically pose the most significant worker exposure hazards). When IH reviews of IWSs are required (i.e., new IWSs and changes in hazards or controls in existing IWSs), the documentation of that review is often limited to the signature of the industrial hygienists on the IWS review forms. As a result there is no documentation of the exposure hazards that were assumed and evaluated by the industrial hygienist, the assumptions used when performing the review, the basis for the conclusions (e.g., effects of engineering controls on exposures, quantities and physical properties of hazardous materials), the acceptance criteria used, and a statement of recommended hazard controls and/or recommendations.

An expectation for a documented assessment process is provided in the guidance documents for 10 CFR 851 such as *the AIHA Strategy for Assessing and Managing Occupation Exposures.* LLNL IH developed a process and procedure for conducting such assessments; specifically, a HAW is required for each work activity (i.e., for each IWS at a minimum). However, the HAW process is dated and does not reflect changes in the IWS process that occurred during the past two years, and is seldom used by industrial hygienists during the IWS review. For example, of the seven IWSs reviewed for the PLS Directorate (six of which are WAL C IWSs), only two workplace exposure assessments were documented on a HAW. In some cases, an IH workplace assessment for an IWS was documented on a HAC form, but the purpose of the HAC form is respirator selection for chemical, biological, or radioactive hazards, and such a review may be not address other types of hazards (e.g., dermal exposures). At present, the HAW process has only been documented for an estimated 20% the approximate 1200 IWSs currently active at LLNL. To effectively complete the implementation of the activity level workplace exposure assessment process, LLNL envisions an automated HAW process that will also integrate monitoring and sampling data, IH instrument and calibration data, IH facility surveys, medical surveillance requirements and interface with LLNL occupational medicine, and the respirator data base. However, such a process has not yet been implemented. **(SME.2-1/F)**

10 CFR 851 also requires the performance of baseline exposure assessments and periodic updating of these assessments based on risk. The IH facility survey program was initiated in 2008 to satisfy this requirement. A limited review of existing IH facility surveys indicates the facility survey program meets the intent of this requirement of 10 CFR 851. However, the IH facility survey program is a new program, and many buildings have yet to have a completed IH facility survey. In 2008, during the pilot stage of the program, facility surveys (i.e., baselines) were completed for 8 facilities; 84 additional facilities were completed in FY 2009, and approximately 181 facilities have been scheduled for 2010. Of the five buildings in PLS in which research was observed, only one had a completed IH Facility Survey. **(SME.2-1/F)**

The criterion was not met.

4. Personnel who are assigned to the functional area have a satisfactory level of competence. (DOE-HDBK-3027-99)

The professional industrial hygiene staff at LLNL is one of the most experienced and educated group of industrial hygienists within the DOE complex. All of the LLNL staff industrial hygienists are Certified Industrial Hygienists (CIHs). Several of the CIHs are also dual certified as Certified Safety Professionals. Several of the industrial hygienists have advanced educational degrees, and three industrial hygienists have a doctorate in either industrial hygiene or a related field. A number of the industrial hygienists have attended AIHA courses on conducting exposure assessments and related topics, such as statistical analyses of sampling data.

ES&H technicians, who support the exposure assessment program through monitoring and sampling activities, have training requirements defined within their training plans and are mentored by the industrial hygienists on the ES&H Team to whom they are assigned to support.

The criterion was met.

5. Mechanisms ensure feedback and continuous improvement within the functional area. (DOE-HDBK-3027-99)

There are a number of mechanisms for ensuring feedback and improvement within the workplace exposure assessment process. For example, all the industrial hygienists (core and field) participate in a weekly technical discipline meeting in which exposure assessments and processes are discussed. Procedures in the IH Policy Implementation Manual for planning and conducting exposure assessments are peer reviewed. Within the ES&H Teams, all WAL-C IWSs and other selected IWSs receive a roundtable multidisciplinary review prior to approval by the team in which workplace exposure issues are discussed. IH program assessments, including assessments of workplace exposure programs, are conducted by the LLNL Quality Assurance division, and self-assessments and annual management program reviews on various institutional program areas (e.g., asbestos and confined spaces) are conducted annually to meet regulatory requirements.

The criterion was met.

6. The functional area has adequate resources to ensure the safety of workers, the public, and the environment. (DOE P 450.4)

As discussed in Criterion #3, much work remains to be done in completing both the IH facility baseline surveys for all LLNL buildings and in updating, automating, and implementing the HAW process for all IWSs. At present, the completion of the IH facility baseline survey program has a well defined schedule and milestones for completion and is tracked and prioritized by LSO through the PEP process. IH contractor support has been allocated to this task, and funding is available to complete most of the planned work. However, the resources may not be sufficient to complete the task unless the process is modified or resources are shifted. **(SME.2-1/OFI)**

Unlike the IH facility baseline survey program, the plan for updating, automating, and implementing the HAW process for all IWSs has not been developed, and the resources for completion of this task have yet to be defined and allocated. **(SME.2-1/F)**

The completion of both the IH facility survey and HAW programs is of significance, since at the work activity or experiment level the review team identified a number of potential worker exposures within the Business and Operations, S&T, and PS Directorates that had either had not been analyzed or the analysis had not been sufficiently documented to support the selection of controls. **(SME.2-2/F)**

The criterion was not met.

Conclusion:

The objective was met.

There are a number of established mechanisms for involving IH in the identification and analysis of hazards and development and implementation of controls in the work control process. At the institutional level, the IH section of the HCD is responsible for the development and documentation of controls in the LLNL ES&H Manual that address a wide range of worker exposure hazards, such as hazardous chemicals, heat stress, lead, and beryllium. At the facility level, IH is in the process of conducting IH facility surveys or baseline hazard assessments for each of the LLNL facilities/buildings that have potential workplace exposure hazards. At the work activity level, each IWS is evaluated by one of two LLNL ES&H Teams for potential workplace exposure hazards.

Although progress in workplace exposure assessments at both the work activity level (i.e. IWS level) and the facility level (i.e. IH facility surveys) is evident, much remains to be done, particularly at the IWS activity level to develop and/or implement mechanisms to ensure that appropriate hazard controls have been implemented prior to performing work. 10 CFR 851 requires the performance of baseline exposure assessments and periodic updating of these assessments based on risk. The IH facility survey program was initiated in 2008 to satisfy this requirement. However, the IH facility survey program is a new program, and many buildings have yet to have a completed IH facility survey. 10 CFR 851 also requires the assessment of worker exposures to chemical, physical and biological hazards through appropriate monitoring and documentation of these assessments using recognized exposure assessment methods. LLNL IH developed a process and procedure for conducting and documenting such a review, i.e. the HAW, which is required for each work activity (i.e., for each IWS at a minimum). However, this HAW process is dated and does not reflect changes in the IWS process that occurred during the past two years, and is infrequently used by IHs during the IWS review. Unlike the IH facility baseline survey program, the plan for updating, automating, and implementing the HAW process for all IWSs has not been developed, and the resources for completion of this task have yet to be defined and allocated.

Similar concerns were identified during the DOE Independent Oversight inspection conducted in 2007. Although corrective actions were identified and closed by LLNL, issues remain with respect to development and completion of HAWs for all IWSs, and completion of the facility baseline surveys for all applicable facilities.

Issues:

Finding

SME.2-1/F: The IH workplace exposure assessment program for assessing and documenting workplace exposures in LLNL plant areas (i.e., facility baselines) and work activities (i.e., IWS activities) is a work in progress and has not been sufficiently planned and/or implemented to fully meet the workplace exposure assessment requirements of 10 CFR 851.

Opportunity for Improvement:

SME.2-1/OFI: LLNL should consider developing a plan for updating, automating, and implementing the LLNL HAW process for all IWSs that identifies the resources and schedule for completion of this task.

Submitted by: Signature On File Jim Lockridge, PE, CIH, CSP, CHMM Team Member	Reviewed by: Signature On File William Miller, Team Leader

ATTACHMENT 1

Focus Area
LLNL Radiation Safety Program

HSS and other external and internal reviews conducted over the past decade have identified continuing programmatic weaknesses in aspects of the LLNL radiation safety program (RSP) organization, infrastructure, and implementation. These weaknesses also contributed to regulatory enforcement actions against LLNL in the 2006 timeframe.

In support of the DOE Phase II ISM verification effort, HSS reviewed the current design and implementation of RSP elements that are necessary to support the planning and conduct of radiological work, including flowdown of radiological requirements/implementation of the DOE Radcon Standard, radiological work planning, radiological surveys and monitoring, and related areas. Corrective actions taken in response to prior assessment findings were also reviewed.

LLNL Programs and Initiatives

The LLNL RSP is undergoing various improvement initiatives as a result of past assessments and the recent contract change at the Laboratory. LLNL has taken steps to strengthen many aspects of the program, including a recent realignment of institutional requirements in accordance with the DOE Radcon Standard. However, the Laboratory recognizes that many challenges remain and further action is needed to ensure fully effective performance. Current initiatives and challenges include improving conduct of operations and weaknesses in field-level performance through development of health physics field operations procedures to govern specific actions at the working level. Several procedures are currently under development, and many others are identified for development. LLNL also continues to address issues previously identified in the Radiation Calibration Laboratory, including continuing with an organized, multi-year process of replacing obsolete hand-held radiation detectors. While LLNL has made and continues to make progress, LLNL recognizes that the rate of improvement and progress on current initiatives is contingent on the availability of staff and other resources.

Independent Oversight Perspectives and Recommendations

LLNL has taken a number positive of actions over the past several years to address longstanding and recurring weaknesses in radiation protection at LLNL. In concert with the contract change, LLNL committed to strengthen the rigor and formality associated with the RSP. A key step to accomplishing this objective was an initiative to adopt a formal standards based approach to radiation safety, implemented through a contractual requirement for adherence to the DOE Radcon Standard. This major effort entailed substantial revisions to ES&H Manual documents that govern the RSP. These documents are now much improved and generally are adequate aligned with the provisions of the DOE Radcon Standard. Future initiatives need to place a high emphasis on ensuring proper flowdown of these requirements through quality implementing procedures that govern actions of health physicists and health and safety technicians at the working level. As indicated above, some of these initiatives are currently under way.

Weaknesses in authority and accountability for radiological control performance were also recognized and addressed by establishment of a new site Radiological Control Manager position, with more clearly defined authority to hold line organizations accountable for radiological performance. The site also established a new Radiation Safety/As Low As Reasonably Achievable committee, composed of senior managers and staff from the line programs

(Authorizing Organizations). This committee serves as the RSP's Stakeholders Advisory Group and meets on a regular basis to address issues affecting the RSP. As representatives from the line organizations, these individuals can serve as effective conduits to identifying problems and implementing change within their organizations.

Vulnerabilities and Opportunities for Improvement

Many of the initiatives and changes discussed above have not been in place long enough to assess their effectiveness in resolving previously identified weaknesses. However, HSS identified a few vulnerabilities in aspects of some program elements that have the potential to hinder the ability to ensure effective application of radiological control requirements and commitments. These are presented below, along with some opportunities for improvement for consideration by NNSA, LSO, and LLNL management.

In a few areas, institutional radiation protection requirements do not adequately align with the provisions of the DOE Radcon Standard, resulting in ineffective application of radiological control requirements. Specific concerns were identified in requirements for radiological work authorizations (IWSs) and in requirements for formal radiological surveys in support of radiological work, as discussed below.

The IWS is intended to serve as the principal radiological work authorization. Radiological requirements pertaining to the IWS are contained in Documents 20.1, 20.2, and 2.2. However, current requirements defining WAL B work and when an IWS must be used to control radiological work do not address all work that has the potential to generate contamination in areas otherwise free of contamination, consistent with the intent of the Radcon Standard. Additionally, while broad expectations for radiological IWSs are contained in various sections of Documents 20.1 and 20.2, the minimum radiological content required within each IWS is not clearly or concisely delineated in health physicist training and procedural instructions. In a related concern, the scope and span of control of IWSs are often too broad to be able to determine task specific hazards and controls in advance of work. Because the Radiological Control Organization does not have control of the scope of work defined in the IWS, this condition presents a significant challenge in meeting the criteria of the Radcon Standard for adequate definition and specificity of controls in a work authorization.

In the area of radiological monitoring, the DOE Radcon Standard suggests routine monitoring of areas, as well as monitoring before, during, and after work that has the potential for causing changes in levels of radiation and radioactivity. It also requires that monitoring be performed only by individuals who have the appropriate education, training, and skills, and that records of such monitoring be maintained. While LLNL has established appropriate routine monitoring frequencies for areas through individual HP-DAPs, it has not established sufficient requirements for formal, documented radiological monitoring in association with work that may result in changes in radiological conditions. Such monitoring is specifically excluded from any documentation requirements because it is generally only performed by workers rather than qualified as health and safety technicians. While it is appropriate for workers to perform in-process monitoring as part of ALARA efforts, some level of formal job coverage monitoring and recordkeeping is necessary to complement routine survey frequencies and provide evidence to document radiological conditions during and after work. Such information is needed to verify the adequacy of controls during work and to support continuing radiological hazard analysis efforts for work planning and IWS development.

RP.1-1/OFI: Consider revising institutional requirements associated with IWSs to consolidate requirements and better align with the DOE Radcon Standard, especially with regard to minimum content and detail for IWS radiological controls. Ensure the development of implementing procedures to support the flowdown of these requirements.

RP.1-2/OFI: Consider establishing a subordinate radiological work authorization to be used and referenced when the IWS scope and span of control are too broad to define specific radiological controls. With such an authorization system, consider ensuring that existing hold points or language to contact a health physicist are replaced with a clear IWS limiting conditions and instructions to request health physics to create the subordinate radiological work authorization with tailored controls, which would then become part of the IWS record.

RP.1-3/OFI: Consider evaluating approaches that can be implemented to ensure that an appropriate level of health and safety technician job coverage and radiological monitoring is performed to supplement routine survey frequencies. Based on such evaluations, consider identifying revisions to the ES&H Manual and incorporating provisions for requiring job coverage requirements and associated monitoring by health and safety technicians into procedures for developing IWSs, consistent with the intent of the Radcon Standard.

LLNL does not have sufficiently comprehensive implementing procedures to ensure proper flowdown of ES&H Manual requirements in all necessary radiological functional areas. While the ES&H Manual provides generally effective delineation of radiological requirements, there is inconsistent and/or ineffective implementation of requirements at the field level in some areas. For example, the lack of a formal procedure governing the preparation of radiological work authorizations (i.e., IWSs, work permits) appears to be contributing to weaknesses in the quality and content of radiological work authorizations (See SME-1 Radiation Protection Assessment Form). In a related concern, while LLNL has a technical basis and field operations procedure for air sampling, these documents principally address passive air sampling (PAS) needs and do not adequately address criteria and expectations for job specific and/or lapel air sampling. While the technical basis document and procedure allude to "grab" sampling and "breathing zone" sampling, expectations associated with the need for and expectations for conduct of these forms of sampling are not well defined. In RHWM, a work permit governing a decontamination evolution requiring respiratory protection referred to the PAS air sampler; however, the PAS sampler is not intended or capable of characterizing airborne concentrations in the breathing zone during transient operations that may generate airborne radioactivity.

RP.1-4/OFI: Consider prioritizing development of a field operations procedure governing development of radiological work authorizations with sufficient instruction to health physicists on radiological expectations including required technical content and format, and clear expectations as to the level of detail needed to properly address each required element. Consider development of a writers guide to expand on minimum expectations as appropriate.

RP.1-5/OFI: Consider benchmarking other DOE sites for information related to effective radiological work authorization systems and/or radiological work control mechanisms.

RP.1-6/OFI: Consider performing a review of existing and planned HP procedures against DOE guidance (e.g., DOE G 441.1-1C) and developing a listing of additional areas of need. As appropriate, consider establishing a schedule to develop needed procedures, as well as revisions to existing procedures.

RP.1-7/OFI: Consider adding a Radiological Work Planner position responsible to support to the ES&H Team health physicists. Such a position could provide institutional oversight and assistance in radiological work planning and be responsible for review and oversight of all IWSs, with a focus on consistent definition of radiological controls across LLNL.

ATTACHMENT 2

Followup of 2007 Independent Oversight Findings

BACKGROUND

The HSS team reviewed the status of the findings that applied to LLNL from the 2007 Independent Oversight inspection of ES&H programs at LLNL. The review was performed to determine the effectiveness of LLNL corrective action and issue management processes. The results were considered in the evaluation of the assessments and feedback CRAD (i.e., MG.2).

This attachment documents the review of the findings related to the LLNL work control processes and feedback and improvement processes. The findings related to nuclear safety were addressed as part of the nuclear safety review conducted concurrent with this HSS review of ISM, which was conducted at the request of and in support of LSO.

DICUSSION OF RESULTS

Finding C-1: Radiological hazards associated with the use of thoriated welding electrodes at LLNL have not been formally evaluated within the framework of the LLNL ISM program as required by DOE Policy 450.4, *Safety Management System Policy*, to ensure evaluation and development of appropriate radiological controls.

Finding C-1 from 2007 was effectively closed. Hazard assessments were performed and determined that while the exposure and contamination potential at LLNL was low due to short durations of exposure, the use of thoriated welding electrodes should be discontinued in favor of less hazardous alternatives. This information was disseminated to all organizations using the materials. All parties agreed that suitable nonradioactive alternatives could be substituted with no degradation in weld results. Substitutions were made and existing stocks were dispositioned to the Hazardous Waste Management Facility.

Finding C-2: Activity-level hazards and controls for machining and plating work activities in the 321/322 complex are not sufficiently identified, analyzed, or documented, as required by DOE Policy 450.4, *Safety Management System Policy*.

In response to the 2007 Independent Oversight issuance of finding C-2, LLNL developed eight corrective actions that were managed in the site's ITS. Several key corrective actions involved enhancing the MTOS training program and documentation of an Engineering-specific skill of the craft program to add rigor to the worker qualification process. On October 13, 2008, the final action – an effectiveness review of the corrective actions taken – was completed. The effectiveness review concluded that the implemented actions were generally effective in addressing the specific problems identified in the 2007 Independent Oversight report. However, it did not fully address a broader work control and hazard identification issue that persists at LLNL. LLNL requested that LSO postpone an effectiveness review until a revised work control process was developed. The revised process was completed in June 2009 and is in the process of implementation. The HSS Mission Support Review similarly found the MTOS and skill of the craft programs in the B321/322 complex to be generally satisfactory; however, weaknesses were observed in hazard identification and control for operations outside of the skill of the craft program. LSO has not issued a letter approving the closure of this finding.

Finding C-3: Line management has not ensured that radiological conditions and needed controls for radioactive material machining activities in Building 321C are adequately defined and conveyed to workers, as required by DOE Policy 450.4, *Safety Management System Policy*.

Finding C-3 was prematurely closed without performing adequate extent-of-condition and effectiveness reviews. The finding was closed based on preparation of a revised IWS for radioactive material machining. The extent of condition looked only at machining and did not evaluate whether there was a systemic problem with radiological controls in IWSs and whether other IWSs in areas outside machining had problems with delineation of radiological controls. The effectiveness review was not sufficient because it did not include any work observation associated with the revised IWS to determine if the listed controls were indeed being effectively implemented. Similar deficiencies with the existing IWS covering the same work were identified during this ISMS Phase II review.

Finding C-4: LLNL Plant Engineering (PE) trade/service IWSs and bridging documents do not sufficiently identify and analyze hazards or specify controls at the activity level to ensure that the appropriate hazards and adequate controls can be identified clearly, in accordance with DOE Policy 450.4, *Safety Management System Policy*.

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The status of this finding is "closed" in the LLNL ITS. Corrective actions included:

- A CIH reviewed all PE trade/service IWSs and added additional information to identify task specific hazards and controls.
- A revision to the work control process was issued (including benchmarking, a pilot work control process, and an evaluation pilot and expanded pilot work control process).
- An extent-of-condition review was conducted to determine whether the observed finding extended to other areas across LLNL not observed in the inspection.
- An effectiveness review of the (PE, EM-Alarms, and PMEC-Labor Only) work control process was conducted by the LLNL IAOD.
- Revisions were made to the Work Control Manual (Document #MAN-GWM-003).
- An ISMS Description Amendment was submitted to NNSA/LSO 6-24-08, including a description of the F&I work control process.
- F&I conducted a self assessment of the recently implemented work control process.

HSS reviewed the revised trade/service IWSs and conducted a number of work observations. The MUSD work control mechanisms were used effectively to identify and analyze hazards and establish controls for most observed work activities. However, insufficient specificity of some MUSD IWS controls and the ineffectiveness of some training of maintenance craft workers have resulted in a number of instances of work control deficiencies or observed unsafe work practices.

The effectiveness review performed by the LLNL IAOD found corrective actions to be generally effective but noted that, "C-4 does not fully address a broad work control process and hazard identification problem that persists at the Laboratory. The Independent Audit & Oversight Department (IAOD) noted that, in response to recent occurrences, the Laboratory is in the process of implementing Lab-wide work control system enhancements." Performance deficiencies observed by HSS during the current review indicate the need for further improvement in the area of hazard analysis and control.

Finding C-5: LLNL has not applied its work control process to subcontracted construction work with sufficient rigor to assure effective flowdown and enforcement of ES&H requirements in accordance with DOE Policy 450.4, *Safety Management System Policy*.

The status of this finding is "closed" in the LLNL ITS. Corrective actions included revision of the LLNL Plant Engineering Construction Management and Inspection Manual to include a process to ensure that applicable requirements are in safety plans and TIP lists and training of construction managers on the Manual revision. Corrective actions were reviewed and found to be effective by the Facilities and Operations Division and by the IAOD.

HSS reviewed the revised Construction Management and Inspection Manual and determined that it included an adequate process for ensuring that applicable requirements are in safety plans and TIP lists. To assess effectiveness, HSS reviewed the TIP List and Health and Safety Plans submitted by Hot Line Construction Company for installation of 13.8 KV power lines in onsite underground conduits. The TIP list, submitted by the contractor and approved by LLNL, did not accurately define the scope of work to be performed, and the Safety Plans approved by LLNL did not address hazards and controls associated with this out-of-scope work. The consequences of these omissions were workers wearing respirators who were not trained or qualified for respirator use and workers exposed to loud noises without hearing protection. In addition, the site-specific safety plan submitted by this contractor, and approved by LLNL, contained a LOTO program that did not meet the requirements of NFPA70E in that the program did not require the use of locks. The LLNL ES&H Team had reviewed this program and commented that the contractor should be advised to change their program to comply with ES&H Manual Document 12.6, but the plan was approved without this change. This deficiency is mitigated by the fact that work requiring LOTO by Hot Line Construction would be outside the defined scope of this project. Nonetheless, deficiencies identified during this review indicate that corrective actions have not been fully effective.

The effectiveness review performed by the LLNL IAOD found corrective actions to be generally effective but noted that, "based on observations at the job site, it is recommended that Laboratory enforcement of ES&H contractual requirements be strengthened." However, no additional issues or actions were put into ITS. In discussions with the HSS, F&I management described ongoing efforts to strengthen performance in this area, but no corrective actions are being tracked in ITS. Performance deficiencies observed by HSS during this ISMS Phase II review indicate the need for further improvement in the enforcement of ES&H requirements for subcontracted construction work.

Finding D-3: The LLNL self-assessment program lacks sufficient rigor in planning and execution to be fully effective in evaluating ES&H performance, in accordance with DOE Order 226.1, *Implementation of DOE Oversight Policy.*

Corrective actions included conducting an assessment of the LLNL assessment program; performing an extent-of-condition review; preparing a consolidated assessment plan including objectives and criteria; issuing a protocol for independent assessment of the LLNL assessment program; issuing a memorandum listing qualifications and skills and abilities for directorate assurance managers; issuing a consolidated assessment plan addressing overlap, duplications, and risk; and performing an effectiveness review. LLNL performed internal independent verifications of all actions and closed them in ITS, and conducted the effectiveness review in April 2009, concluding that the initial specified actions had been completed and had improved the program but that the original program deserved continued attention. However, the effectiveness review

consisted only of interviews and verification that specified actions had been taken. No objective evidence that would demonstrate program implementation improvement (assessments or assessment plans) was reviewed, and no subsequent review was scheduled or proposed. The issue was closed in ITS three days after the effectiveness review was issued.

Although LLNL has strengthened their assessment processes, most of the corrective actions taken were insufficiently rigorous and not formally integrated as requirements into site procedures or did not contribute to performance improvement. The specified actions were sufficiently focused on ensuring compliant and effective implementation of self-assessment program requirements. Deficiencies in planning and performance of self-assessments identified during this ISMS Phase II review were similar to the deficiencies cited in the 2007 Independent Oversight inspection report. These weaknesses and deficiencies included unstructured assessment selection, few ES&H management self-assessments performed by line organizations, insufficient scope and rigor in management self-assessments performed, underlying or cross cutting (i.e., institutional) issues not being identified, effectiveness reviews that were verifications of completed actions rather than determination if those actions were effective, inappropriate and inaccurate classification of results as required by site procedures, and insufficient quality reviews and oversight by assurance managers and approving organization managers. Overall, the corrective actions taken to address this finding were not sufficiently comprehensive or effective, and the review of effectiveness performed by LLNL was insufficiently rigorous.

Finding D-4: LLNL has not implemented an issues management program that is fully effective in documenting ES&H program and performance deficiencies and ensuring that effective corrective actions and recurrence controls are developed and tracked to timely completion, in accordance with DOE Order 226.1, *Implementation of DOE Oversight Policy*.

Corrective actions included performing an extent of condition review; revising the institutional procedure on developing corrective action plans; developing a training course on causal analysis; implementing improvements to the ITS addressing institutional issue designations, risk ranking, ORB and IORB responsibilities, and better reporting features; and conducting an effectiveness review. LLNL has completed, independently verified, and closed all actions in ITS except for the effectiveness review.

The corrective actions taken by LLNL have been partially effective in addressing the deficiencies and weaknesses identified in the 2007 inspection report. The ITS tool has been strengthened, issues are being consistently entered into ITS for tracking to resolution, timely action for due dates and closures has improved and the issues management procedures have been strengthened, mechanisms for better identifying institutional issues have been provided, and significance categorization and risk based analysis have been formalized.

However, implementation deficiencies remain. Titles and descriptions are often not accurately written, type classification (deficiencies or observations) are often inaccurate, causes are not documented for over 90 percent of issues, multiple similar or identical deficiencies are not rolled up into overarching issues, corrective actions too often focus only on the specific problem without addressing the underlying causes, and significance categorization and trending need to be strengthened.

Finding D-5: LLNL has not adequately addressed known systemic hoisting and rigging deficiencies and issues, ensured that the hoisting and rigging program is adequate, or ensured that requirements are being implemented as specified in

LLNL and DOE safety standards, in accordance with DOE Order 226.1, *Implementation of Department of Energy Oversight Policy,* DOE Order 414.1C, *Quality Assurance,* and DOE Policy 450.4, *Safety Management System Policy.*

Corrective actions included inspection of all hoisting and rigging or placement out of service, users being informed of inspection requirements, all hoisting and rigging equipment not in compliance being taken out of service, a safety extent-of-condition review being completed, and the documentation of completion provided with original CAP submittal to LSO/NNSA. Corrective actions were reviewed and found to be effective by the LLNL hoisting and rigging program owner and by the IAOD.

HSS reviewed the corrective actions and follow-up assessments conducted. A limited sampling of equipment in use or storage was conducted during the conduct of work observations during the most recent HS-64 assessment; no deficiencies were noted. The effectiveness review of the hoisting and rigging performed by the LLNL IAOD found corrective actions to be generally effective. However, the LLNL effectiveness review was not sufficiently rigorous. It consisted of a review of recent occurrence reports and concluded that because there had been no event reports related to hoisting and rigging, the corrective actions had been effective. The effectiveness review did not involve any field observations or review of inspection and testing records. In addition, a recent assessment of LLNL hoisting and rigging and powered industrial truck safety programs conducted by the Quality Assurance Organization, dated October 15, 2009, identified continuing deficiencies (as well as program improvements). The limited nature of the effectiveness review conducted and examples of self-identified continuing deficiencies indicate that corrective actions have not been fully effective.

Finding D-6: LLNL injury and illness program requirements are not being implemented as specified and investigations lack sufficient rigor to ensure that causes are identified and appropriate, effective corrective and preventive actions are identified and implemented, in accordance with DOE Order 226.1, *Implementation of DOE Oversight Policy*.

Corrective actions included conducting an extent-of-condition review, adding online guidance on addressing ISM and PPE in the analysis of injuries, and conducting an effectiveness review. All actions were independently verified and closed in ITS, and the effectiveness review, completed in April 2008, determined that the actions were "somewhat effective" in addressing some of the opportunities for improvement identified in the inspection report, but that no administrative controls had been implemented to prevent recurrence and thus the corrective actions had not been effective. This effectiveness review was rigorous and identified that the causal analysis had been insufficient and that deficiencies similar to those identified by Independent Oversight continued. However, the subsequent resolution to these findings was inadequate: to add another action to revise the ES&H Manual to describe investigator and supervisor training requirements and correct the automatic concurrence function in the case analysis report system. The issue was subsequently improperly closed, with no additional actions or another effectiveness review to determine if the additional action had been effective.

Although LLNL has strengthened their investigation process and provided training, the same deficiencies in the investigation of occupational injuries and illnesses cited in the 2007 inspection report were identified during the ISMS Phase II review. Most investigation reports evaluated by HSS during the ISMS Phase II review lacked sufficient rigor in fully describing all aspects of the incidents, addressing work planning and ISMS elements, identifying proper causes, and establishing appropriate corrective actions and recurrence controls. Submittal of completed

reports by line supervisors was often not timely. The monitoring and oversight by directorate assurance managers and directorate management who review and approve these reports was less than adequate. The corrective actions taken to address this finding were not sufficiently comprehensive or effective, and the review of effectiveness performed by LLNL was insufficiently rigorous.

Finding F-1: An integrated exposure assessment program has not been fully implemented, and as a result some workplace exposure assessments and baseline hazard surveys or periodic resurveys are not being performed and/or documented as required by DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees.*

In response to this finding, LLNL developed ten corrective actions, the first four designated as Immediate Actions/Compensatory Measures. Each of the corrective actions was entered into the LLNL ITS, and as of October 21, 2008, all of the corrective actions were closed, including an effectiveness review indicating that the other actions had been completed and effective. However, the conclusions of this effectiveness review were incorrect in that several specified actions had not been completed and had been inappropriately closed in ITS. For example, Corrective Actions No. 22426.16.1 and 16.4 indicated that a policy memo was issued on 4/4/07 "requiring Hazard Assessment Worksheets (HAWs) to be completed within 30 days of IWS authorization." However, few of the IWSs reviewed by HSS during the current ISMS Phase II review had completed HAWs, and LLNL IH indicated that fewer than 20% of the estimated 1200 IWSs authorized have completed HAWs. In a second example, the agreed upon schedule for completing "baselines for all WAL C IWSs by 6/30/09," specified in Corrective Action No. 22426.16.8, was not met. Of six PLS Directorate WAL C IWSs reviewed by HSS during the Phase II ISMS review, associated with five PLS buildings, only one building had a completed baseline. Because of the delays in completing the IH baselines for the identified LLNL buildings and completing HAWs for IWSs, as well as the significant effort remaining, HSS identified a new finding that is similar to the 2007 finding.

CONCLUSIONS

HSS's review of the LLNL corrective actions for the 2007 Independent Oversight inspection findings indicates that progress has been made in a number of areas. As discussed in the nuclear safety review report, LLNL has addressed many of the findings or has initiatives in place to address them. Improvements have also been made in various aspects of hoisting and rigging programs, radiation protection programs, construction requirements, activity level maintenance work processes, issues management processes, and injury and illness investigation and reporting processes. However, some of the corrective actions were not fully effective in addressing the entire scope of the finding and preventing recurrences. For example, insufficient specificity in some maintenance IWS controls and the ineffectiveness of some training of maintenance craft workers have resulted in a number of instances of work control deficiencies or observed unsafe work practices. Further, some of the effectiveness reviews performed by LLNL were not sufficiently rigorous to identify continued deficiencies and sometimes did not include observations of work activities or review of performance documentation to determine whether process and training enhancements were effective in preventing recurrences and whether the actions were effective in addressing the original issue. (**MG.2-2/F)**

Department of Energy
Washington, DC 20585

October 3, 2011

MEMORANDUM FOR ALICE C. WILLIAMS
MANAGER
LIVERMORE SITE OFFICE

FROM: JOHN S. BOULDEN III
DIRECTOR
OFFICE OF ENFORCEMENT AND OVERSIGHT
OFFICE OF HEALTH, SAFETY AND SECURITY

SUBJECT: Transmittal of Independent Review Report – *Independent Oversight Review of Integrated Safety Management System Effectiveness at Lawrence Livermore National Laboratory – September 2011*

The Office of Health, Safety and Security's (HSS) Office of Enforcement and Oversight, (Independent Oversight), with the support of National Nuclear Security Administration, Office of Nuclear Safety and Governance, conducted an independent targeted review of the Lawrence Livermore National Laboratory (LLNL) integrated safety management system (ISMS). Also included in the scope was a review of the effectiveness of corrective actions taken in response to the HSS 2009 ISMS verification review and the Defense Nuclear Facilities Safety Board (DNFSB) June 2010 review of work planning and control in the Nuclear Materials Technology Program (NMTP). This review was performed at your request in support of Livermore Site Office annual ISMS effectiveness review and declaration for 2011. The review was conducted from July 11-21, 2011.

As documented in the attached report, the review confirmed that LLNL has established an adequate ISMS that is consistent with DOE ISMS policy and requirements. The institutional work control (WP&C) process provides appropriate flexibility to implementing organizations, but implementation has not been fully effective. Similarly, processes established for contractor assurance are adequate, but implementation of these processes has not been fully effective. Although work control and contractor assurance processes have improved since the HSS 2009 ISMS verification review, many of the actions identified and implemented by LLNL to address the weaknesses and findings from the review have not been fully effective. LLNL continues to make progress on addressing DNFSB issues involving WP&C in the NMTP.

If you have any questions, please contact me at (301) 903-2178, or your staff may contact Thomas Staker, Deputy Director for Oversight, Office of Enforcement and Oversight, at (301) 903-5392, or the team lead for the review, Patricia Williams, at (301) 903-7024.

Attachment: *Independent Oversight Review of Integrated Safety Management System Effectiveness at Lawrence Livermore National Laboratory – September 2011*

cc w/attachment:
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Office of Health, Safety and Security
Office of Enforcement and Oversight

Independent Oversight Review of Integrated Safety Management System Effectiveness at Lawrence Livermore National Laboratory

September 2011

Office of Safety and Emergency Management Evaluations
Office of Health, Safety and Security
U.S. Department of Energy

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Acronyms

CAM	Continuous Air Monitor
CAO	Contractor Assurance Office
CAS	Contractor Assurance system
CCP	Change Control Process
CRAD	Criteria Review and Assessment Document
dB	Decibel
DNFSB	Defense Nuclear Facility Safety Board
DOE	US Department of Energy
eCAR	Electronic Case Analysis Report
ES&H	Environment Safety and Health
F&I	Facilities and Infrastructure
FMR	Functional Management Reviews
FPOC	Facility Point of Contact
FSP	Facility Safety Plan
GFCI	Ground Fault Current Interrupter
HAC	Hazard Control Form
HSS	DOE Office of Health Safety and Security
HVAC	Heating Ventilation and Cooling
IAP	Institutional Assessment Plan
IG	Inspector General
IIA	Internal Independent Assessment
IORB	Institutional Operations Review Board
ISMS	Integrated Safety management System
ITS	Issues Tracking System
IWS	Integrated Work Sheet
JFAMLA	Joint Functional Area Manager and Line Assessment
LLNL	Lawrence Livermore National Laboratory
LLNS	Lawrence Livermore National Security LLC
LO/TO	Lockout/Tagout
LSO	Livermore Site Office
MSA	Management Self Assessment
MUSD	Maintenance and Utilities Services Department
NIF	National Ignition Facility
NMTP	Nuclear Materials Technology Program
NNSA	National Nuclear Security Administration
OEC	Operations Excellence Council
ORB	Operations Review Board
OSP	Operations Safety Plan
P&I	Planning and Integration
PIC	Person-in-Charge
PM	Preventive maintenance
PPE	Personal Protective Equipment
RHWM	Radioactive and Hazardous Waste Management
RI	Responsible Individual
SME	Subject Matter Expert
WAL	Work Authorization Level
WPCM	Work Planning and Control Manual
WPCP	Work Planning and Control Process
WP&C	Work Planning and Control

Independent Oversight Review of Integrated Safety Management System Effectiveness At Lawrence Livermore National Laboratory

1.0 PURPOSE

The purpose of this review was to assess the effectiveness of the integrated safety management system (ISMS) established and implemented by Lawrence Livermore National Laboratory (LLNL).

2.0 INTRODUCTION

This review was performed by the U.S. Department of Energy (DOE) Office of Enforcement and Oversight (Independent Oversight), within the Office of Health, Safety and Security (HSS). Support was provided by the National Nuclear Security Administration (NNSA) Office of Nuclear Safety and Governance (NA-171). The onsite portion of the review was performed during the period of July 11-21. The Livermore Site Office (LSO) will use the results of the review to support a DOE integrated safety management (ISM) declaration of the status and effectiveness of the ISMS at LLNL in accordance with DOE Order 450.2, *Integrated Safety Management* and LSO Work Instruction 450.4.1, *Annual ISM Effectiveness Review and Declaration.*

3.0 SCOPE

The review assessed LLNL's implementation of the core functions of ISM as defined in DOE Policy 450.4A, *Integrated Safety Management Policy*, and DOE Order 450.2, *Integrated Safety Management*. The focus of the review was on work planning and control for activities managed by the Nuclear Materials Technology Program (NMTP) and the Maintenance and Utilities Services Department (MUSD), and on corrective actions taken in response to previously identified ISMS deficiencies. The review also included the implementation of the institutional contactor assurance system (ISMS Core Function 5). In addition, the effectiveness of corrective actions taken in response to the February 2010 ISMS report, *Livermore Site Office Integrated Safety Management* System *(ISMS) Phase I and Phase II and Lawrence Livermore National Laboratory Integrated Safety Management System Phase II Verification Final Report, Appendix 5.2 HSS Mission Support Review of the Integrated Safety Management System of the Lawrence Livermore Laboratory* (hereafter referred to as the 2009 ISMS verification report) was reviewed, as were corrective actions taken in response to work planning and control (WP&C) deficiencies identified in a June 14, 2010 letter from the Defense Nuclear Facilities Safety Board (DNFSB).

Throughout the review, LSO, LLNL, and DNFSB staff were briefed on Independent Oversight's observations and emerging issues.

4.0 SUMMARY OF RESULTS

LLNL has established an institutional work control process in Environment, Safety and Health (ES&H) Manual Document 2.2, *LLNL Institution-Wide Work Control Process. Document 2.2* describes the LLNL ISMS process including activity/task level approaches to ensure that hazards associated with all work are identified and analyzed, and that appropriate controls are selected. The institutional process allows implementing organizations to apply a graded approach for classifying and categorizing work according

to the level of complexity and hazards associated with the work. Work is categorized into three authorization levels based on grading criteria that include hazard level, complexity, environmental risk, and mission needs. Work Authorization Level A (WAL A) is the simplest and consists of activities commonly performed by the public in areas where the hazards are those commonly encountered by the public. WAL A requires no supplemental hazard analysis. WAL B is more complex and requires an integrated work sheet (IWS). WAL C is the most complex, involves special hazards, and requires an IWS and a written safety plan. The institutional process includes the involvement of workers and subject matter experts (SMEs) in the analysis of hazards and determination of controls. LLNL has taken steps to better align the work planning processes of the various LLNL directorates with the institutional core requirements. Some organizations, such as NMTP, use equivalent processes designed specifically for their activities at some facilities, while using the site process at others. Other LLNL organizations, such as MUSD, tailor the site process to their needs by further defining work authorization levels and using additional hazard and control documents, such as Safety Plans.

Maintenance and Utilities Services Department Work Planning and Control

The Facilities & Infrastructure Directorate MUSD has established formal WP&C procedures in the *LLNL Facilities and Infrastructure Work Control Manual* and the *LLNL Facilities and Infrastructure Skill of the Craft Manual*. The MUSD Maintenance Management System is consistent with the Document 2.2 institutional process and defines three levels of work authorization that tie the level of hazard analysis to the level of complexity and hazards associated with the work.

Most MUSD work is categorized as WAL B, and tasks, hazards, and controls are identified on IWSs pursuant to the institutional process described in Document 2.2. MUSD implements the institutional IWS requirement through the use of Trade/Service IWSs that specify the hazards and controls associated with various maintenance work activities. In addition, Institution Wide Work Control Permits are used to communicate hazards and controls associated with the areas and facilities in which the work is performed. MUSD has improved IWSs since the last HSS review and subsequent internal assessments. Further hazard analysis has been performed and additional hazards and needed controls, such as the status of each approved worker's medical qualifications, have been added to Trade/Service IWSs.

MUSD has established 45 Trade/Service IWSs to define the hazards and controls associated with commonly performed tasks. Since training and qualifications are included in the specified controls, the Trade/Service IWSs provide a mechanism for ensuring that workers have the knowledge, skills, and abilities to perform assigned tasks.

MUSD has an experienced, well-trained maintenance workforce and relies heavily upon the knowledge, skills and abilities of these workers for the identification, analysis, and control of hazards associated with their assigned work.

MUSD seldom classifies work as WAL C. As discussed above, WAL C work is the most complex, involves special hazards, and requires an IWS as well as a Facility or Site Safety Plan. Complex work involving integration of the efforts of multiple crafts and supervision is often broken down into less complex work segments, each of which is classified as WAL A and/or WAL B. Segmenting complex jobs into multiple WAL A and/WAL B jobs without developing a safety plan can result in lack of adequate coordination and proper hazard control. This shortcoming was evident during the replacement of a pump motor on the U325 cooling tower (which was not classified as WAL C as the task assignments were segmented), when improper work planning and sequencing resulted in an unidentified fall and drowning hazard.

The MUSD workforce is experienced and well trained, and observations by Independent Oversight indicate that most work is performed safely; however, exceptions attributed to inadequate work planning were identified. MUSD does not tailor IWSs for specific jobs, and MUSD craft workers are not normally provided a document that links the work steps that they perform to associated hazards and controls. Institution Wide Work Control Permits are issued by facility points of contact to inform workers of the area- specific or facility-specific hazards that may be present and the controls that are required. However, no work control document specifies the hazards and controls associated with the specific work steps to be performed unless the job has been classified as WAL C and has an associated safety plan. The work scope and span of control of IWSs are too broad to permit effective analysis of task-specific hazards, and these hazards and controls are not typically addressed in work control documents. Tailgate meetings and pre-job briefings are used to remind workers of the hazards and controls associated with their work; however, the quality and content of these meetings are variable, and IWSs are not normally discussed. As previously noted, MUSD relies heavily upon the knowledge, skills, and abilities of their workers for the identification, analysis, and control of task-specific hazards.

Observations of MUSD work by Independent Oversight indicate that most workers are aware of the hazards associated with their work and understand the controls needed to mitigate them. However, several exceptions were identified, indicating the need to better inform workers of hazards that may not be readily apparent and to remind them of required controls. For example, workers testing high voltage circuit breakers were not aware of the magnitude of a high noise level in their work area, and during a fan motor replacement in Building 368 an electrical worker forgot to wear hearing protection for arc flash protection as required by National Fire Protection Association (NFPA) 70E.

Nuclear Materials Technology Program Work Planning and Control

The NMTP Work Planning and Control Manual (WPCM) describes the NMTP Work Planning and Control Process (WPCP) and Change Control Process (CCP), which are the two mechanisms used within NMTP to authorize, approve and release facility and programmatic work. In past years, NMTP WP&C processes differed significantly from those of the rest of the Laboratory, due in part to the more significant nuclear hazards associated with their work. For example, Superblock, and Building 332 in particular, did not use the IWS and had separate WP&C manuals, each with different work categories and rigor requirements than described in the institutional process. For several reasons, including reorganizations and recent concerns raised by the DNFSB with regard to NMTP work planning, NMTP has taken steps to consolidate its work planning processes into a single, cohesive WP&C manual for all its facilities, addressing equivalency and better alignment with the institutional process.

Currently, the NMTP WPCM supplements information contained in Document 2.2 and has defined four categories (A through D) of NMTP work activities. Category A, B, and C activities are in general alignment with institutionally defined work authorization WALs A, B, and C from Document 2.2. These three work categories are performed under a general work permit which references approved authorizing documentation, such as a Facility Safety Plan (FSP), Operations Safety Plan (OSP), or IWS. Category D work activities are generally complex, limited-duration facility or programmatic projects that may involve greater hazards or for which adequate controls are not specified in the FSP or in an approved IWS or OSP. Category D activities require the development of a specific work permit. These work activities are analyzed at the task level on a case-by-case basis to identify potential hazards and controls, and they are documented and controlled by a Category D work permit.

FSPs and OSPs are used in Superblock to describe and bound facility-wide operations and specific programmatic activities, respectively. IWSs are also used to define work scope in some NMTP facilities such as Radioactive and Hazardous Waste Management (RHWM), which only recently became part of

NMTP, and work permits are used in all NMTP facilities to define the scope for Category D work. Work scopes contained in FSPs, OSPs, and work permits are generally well defined and sufficiently detailed to identify hazards and controls for activity-level work. In some cases, particularly when work is controlled by an IWS, the work scope and span of control are too broad to permit effective analysis of hazards at the task level, resulting in inadequate specification of controls.

NMTP processes for identifying and analyzing hazards are generally effective. As with the site process, SME involvement in NMTP work planning is required by the WPCP, and ES&H Teams consisting of SMEs from the various safety and health disciplines are assigned to support the line in analyzing and documenting hazards. Unique to NMTP is an additional requirement for formal face-to-face meetings between personnel with responsibility for planning and executing all Category D work, including SMEs. These meetings take the form of routinely scheduled work permit meetings, work authorization meetings, change control meetings, etc., with the purpose of reviewing, commenting, revising, and approving work permits and other programmatic changes, in a single forum with all planning disciplines present. While similar roundtable type meetings between disciplines can and do occur with IWS planning efforts (both within and outside NMTP), such interactions are not formally required by Document 2.2 as part of the review and approval process. Independent Oversight viewed the NMTP work permit and change control meetings as valuable for enhancing the quality and accountability of work planning efforts.

Most hazards associated with work observed by the Independent Oversight review team were properly identified and analyzed. However there were isolated examples in OSPs and work permits where hazards were not fully and effectively identified. More systematic examples of hazard analysis weaknesses were evident for work controlled by IWSs, resulting from problems with effective implementation of institutional requirements.

Engineered and administrative controls are used effectively and extensively throughout NMTP facilities to control activity-level hazards. OSPs govern most of the operations work in Superblock facilities; these documents are generally of high quality and contain detailed and lengthy discussions of programmatic work to be performed, along with discussion of potential hazards and associated controls. An initiative to better link hazards and controls within OSPs was undertaken through development of task, hazard and control tables as appendices to all OSPs. This appears to be an effective cross reference, but similar initiatives have not been undertaken for FSPs, which could benefit from a complete linkage of OSP-related hazards and controls, or for IWSs and work permits where multiple and discrete tasks are within the defined scope of work. Finally, there are continuing problems with proper specification and clarity of controls within IWSs and/or work permits, particularly with respect to radiological controls and industrial safety/hygiene controls.

NMTP facilities plan and authorize work through formal mechanisms. Building 332 publishes a Daily Activity List and holds a daily meeting to identify and authorize all facility work for the upcoming day. The remaining NMTP facilities publish a Weekly Activity List and hold weekly meetings to identify and authorize work; this frequency is appropriate for their workload and needs. A new requirement for daily work team meetings provides a better way to ensure readiness to perform work, including face-to-face meetings with discussion of work to be performed that day. Pre-job briefings are professional and informative about the task, hazards, controls, and work flow. Fissile material handlers are particularly well trained and qualified, and they were observed to perform plutonium operations in strict accordance with controls and work practices as defined in their OSPs. Notwithstanding some weaknesses in approved work control documentation, observations across other NMTP areas also indicated performance of assigned work activities was in accordance with the approved specifications.

Contractor Assurance System (CAS)

The Laboratory has continued to strengthen its CAS processes, and the Contractor Assurance Office has developed tools and provides data analysis and performance information for management to address areas of weakness and improve performance. New procedures have been issued for some CAS elements to better detail requirements and processes. Many assurance activities continue to be performed thoroughly and comprehensively, and performance has improved since the 2009 ISMS verification. Internal independent assessments are consistently thorough and comprehensive, providing effective feedback for evaluating institutional programs. Many management self-assessments, joint functional area manager and line assessments, and management observations are planned, performed, and documented well, providing line management with essential performance information. The investigation and analysis of operational events are generally thorough, the management of associated issues is comprehensive, and recurrence controls are implemented. Many issues, including opportunities for improvement, are input to the site issues tracking system and effectively evaluated and resolved.

However, LLNL continues to struggle with implementation of several assurance system elements. The selection and performance of management self-assessments need strengthening, and more attention from management is needed to ensure that a structured, risk based methodology is being used to identify activities and processes for timely evaluation and that assessments are thorough and adequately documented. Some self-assessments insufficiently evaluate or document performance. Several aspects of the lessons-learned program need strengthening, and the management of ES&H issues and the performance analysis of events continue to present significant challenges to line and support organizations. Some institutional issues, issues that cross organizational boundaries, and issues that involve both process and line implementation deficiencies have not been effectively dispositioned in a timely manner and with appropriate mitigating actions. Other issues management deficiencies identified in the samples reviewed by Independent Oversight included improper categorization, inadequate problem descriptions, insufficient or inaccurate cause determinations and extent-of-condition reviews, insufficient specification of recurrence controls, and insufficiently thorough effectiveness reviews. LLNL has established some mechanisms to break down barriers and provide more communication, transparency, and management oversight, such as the Operational Review Boards and Operations Excellence Council. However, continued management attention is needed to ensure that assurance system elements are implemented in a compliant and effective manner.

Corrective Actions Taken in Response to the 2009 ISMS Verification Review

Independent Oversight reviewed the scope, status, and effectiveness of LLNL corrective actions taken to address the 13 findings and weaknesses identified in the 2009 ISMS verification report. Each of the issues and all of the associated actions had been completed and closed in the LLNL issues tracking system. Independent Oversight concluded/determined that for 10 of the 13 findings and weaknesses, the actions identified and implemented by LLNL were ineffective or not fully effective in addressing the issues. The issues, for which further action was necessary, involved WP&C, radiological protection, and CAS elements. Although many of the issues involving assurance system deficiencies and weaknesses were primarily implementation deficiencies, the issues were assigned to institutional functional area managers and the actions too often focused on system owners improving institutional processes, with no actions that directly addressed the inadequate performance of line organizations.

In addition, in May 2011, LLNL issued a report of their fiscal year (FY) 2010 ISMS effectiveness review. The results of this Independent Oversight review indicate that LLNL's effectiveness review was not sufficiently rigorous. The description of the approach used to evaluate effectiveness used vague terms, such as "considered" relevant activities and "use of" ISM-related assessments, which did not convey how

the information was evaluated. Many of the data sets that were included did not apply, predated the previous review, or presented facts with little or no analysis or linkage to how the data reflected ISMS effectiveness. The listing and discussion of "improvement areas" documented actions that could affect ISMS performance but did not provide useful information on the effectiveness of ISMS or these changes. The review did not identify any conclusions as to ISMS effectiveness and did not identify the issues noted by Independent Oversight during this review.

Corrective Actions taken in Response to March 2010 DNFSB Letter

In a letter to NNSA dated June 14, 2010, the DNFSB expressed concern about the NMTP work control process. The letter stated that because the NMTP process did not define work activities and boundaries in sufficient detail to support analyzing hazards and establishing controls, many operations relied too heavily on workers' knowledge and experience. LSO responded by a letter dated August 16, 2010, with commitments to better align the NMPT work control process with the LLNL institutional process. The status of this realignment is summarized in Appendix C of this report. Most actions are proceeding on schedule, and all are scheduled to be completed by the end of December 2011.

5.0 CONCLUSIONS

LLNL has established an adequate ISMS that is consistent with DOE ISMS policy and requirements. The institutional work control process provides appropriate flexibility to implementing organizations, but implementation has not been fully effective. In particular, the work scope and span of control of MUSD and NMPT IWSs are too broad to permit effective analysis of hazards, resulting in inadequate or incomplete specification of hazards and controls for some work. Similarly, processes established for contractor assurance are adequate, but implementation of these processes has not been fully effective. Although work control processes have been improved since the 2009 ISMS verification review, many of the corrective actions taken in response to this review have not been fully effective. Most observed work was performed safely, and most observed deficiencies were attributed to inadequate process implementation. CAS processes and performance have been improved since 2009, and all system elements are generally providing management with needed information about processes and performance. However, improvement in implementation is needed in all assurance system elements. Assessments are not always sufficiently thorough or well documented. Issues management continues to present LLNL with challenges in addressing ES&H issues in a thorough and timely manner. Many of the actions identified and implemented by LLNL to address the weaknesses and findings from the HSS 2009 ISMS review have not been fully effective. LLNL continues to make progress on addressing DNFSB issues involving WP&C in the NMTP.

6.0 ISSUES AND RECOMMENDATIONS

The LSO annual ISM effectiveness review and declaration for 2011 will identify strengths and weaknesses in ISM implementation and opportunities for improvement. In support of these objectives, and to be consistent with LSO contractor assurance procedures, this Independent Oversight ISMS review report describes indentified areas of weakness as "issues" and provides recommendations for improving performance. LSO Work Instruction 226.1.1 defines an issue as "a generic term for any outcome, positive or negative, significant enough to be reported, tracked, and trended for use in continuous improvement activities." The six issues below are based on and referenced by the text in Appendix A of this report. Recommendations for addressing these issues are provided in Appendix D.

Issue WP&C-1: MUSD has not implemented institutional and departmental ISM processes sufficiently to ensure that workers are adequately informed of the hazards and controls as required by 10 CFR 851. (Appendix A, Sec. A.1.2, Core Function 3)

Issue WP&C-2: NMTP has not sufficiently implemented the IWS system as required by Document 2.2 and as needed to ensure adequately bounded work scopes, sufficient hazard analysis, and specification of controls tailored to discrete work tasks. (Appendix A, Sec. A.1.3, Core Functions 1 and 5)

Issue F&I-1: LLNL has not consistently implemented an effective management self-assessment program that thoroughly evaluates processes, performance, and management systems for protecting worker safety and health as specified in DOE Order 414.1D, *Quality Assurance*; the LLNL CAS description; and LLNL procedures. (Appendix A, Sec. A.2.1)

Issue F&I-2: LLNL has not fully implemented an effective program that thoroughly evaluates the causes and extent of safety issues related to operational events/incidents, injuries, and assessment activities and establishes and implements effective corrective actions and recurrence controls as required by DOE Order 414.1D, *Quality Assurance*; the LLNL CAS description; and LLNL procedures. (Appendix A, Sec. A.1.3, Core Functions 3 and 5, and Sec. A.2.2)

Issue CAS-3: LLNL has not fully implemented timely performance analysis of events or ensured that results of other performance analyses results are appropriately evaluated and dispositioned in accordance with DOE Order 414.1D and LLNL issues management procedures. (Appendix A, Sec. A.2.4)

APPENDIX A

ISMS Core Function Review Results

The review assessed LLNL's implementation of the core functions of ISM as defined in DOE Policy 450.4A, *Integrated Safety Management Policy*, and DOE Order 450.2, *Integrated Safety Management*. Implementation was assessed through review of WP&C processes and by observation of work activities performed by the Weapons and Complex Integration Directorate, the Operations and Business Directorate, and the ES&H organization. Work activities assessed included those at NMTP facilities and maintenance activities conducted by MUSD, including high voltage electrical work. The effectiveness of corrective actions taken in response to the February 2010 ISMS report, *Livermore Site Office Integrated Safety Management System (ISMS) Phase I and Phase II and Lawrence Livermore National Laboratory Integrated Safety Management System Phase II Verification Final Report*, (hereafter referred to as the 2009 ISMS verification report) was also reviewed.

A.1 Work Planning and Control Results

A.1.1 Introduction

ES&H Manual Document 2.2, *LLNL Institution-Wide Work Control Process*, describes the LLNL ISMS process, including activity/task level approaches to ensure that hazards associated with all work are identified and analyzed and that appropriate controls are selected. The institutional process revolves around a graded approach to classify and categorize work according to the level of rigor needed for planning and execution. There are three basic categories of work, Work Authorization Levels A through C (WAL A through WAL C). WAL A work activities are activities commonly performed by the public in areas where the hazards are those commonly encountered by the public. WAL A activities can be self-authorized with knowledge of the supervisor. For all work that is beyond WAL A, the LLNL institution-wide WP&C process relies on the electronic IWS to ensure a conscious, formal process for planning and performance. This process includes involvement of workers and SMEs to properly plan and document the hazards and controls associated with the work. With some exceptions described below (NMTP), the IWS is the principal mechanism used at LLNL to plan and control activity level work that is beyond WAL A.

Since the 2009 ISMS verification review, LLNL has made significant efforts in attempting to align the work planning processes of the various LLNL directorates with institutional expectations. However LLNL's institutional WP&C process continues to provide flexibility to individual directorates and departments. Although some flexibility is appropriate, it has led to implementation that deviates from institutional expectations, resulting in missed hazards and controls (discussed later in this report). Certain organizations, such as NMTP, use equivalent processes designed specifically for their activities at some facilities while using the site process at others. Other LLNL organizations, such as MUSD, use the site process and tailor it to their needs.

A.1. 2 Maintenance & Utilities Services Department Work Planning and Control

Maintenance at LLNL is conducted primarily by the Facilities & Infrastructure Directorate (F&I) within MUSD. The conduct of maintenance work is managed through the use of preventive maintenance task codes and job or work orders. Preventive maintenance is scheduled on an annual basis and, in some cases, is collected into a maintenance windowing program to minimize program impact and more

efficiently use available resources. In FY 2010, MUSD had a total of 164 workers and completed 76 job orders using 45,454 labor hours, 15,329 dispatch/minor work orders using 301,654 labor hours, and 23,106 preventive maintenance work orders using 85,509 labor hours

ISM is primarily implemented through Trade/Service IWSs and Institution Wide Work Control Permits, which are issued by facility points of contact (FPOCs) and used to communicate, review and document all known facility/area hazards and controls. MUSD has 45 Trade/Service IWSs that are intended to govern the different craft and shop work performed in connection with maintenance. Progress has been made in improving Trade/Service IWS(s), such as inclusion of more hazards and general controls, as well as information such as the status of each approved worker's medical monitoring requirements. Some of these items were noted as missing either during the last HSS review or subsequent internal assessment(s).

This assessment focused on all types of work performed by the MUSD including maintenance performed through the preventive maintenance windowing, and work order systems. Tasks observed included building heating, ventilation, and air conditioning (HVAC) preventive maintenance, roof access preparations, ventilation system troubleshooting and repairs, electrical lockout/tagout (LOTO), paint and heavy equipment shop activities, and work at elevation.

Core Function 1 - Define the Work

The scopes of work for MUSD maintenance activities are adequately defined for most activities. The scopes are adequately defined on most minor work orders, but in some cases, the scope descriptions lack accuracy and/or sufficient detail to accurately and clearly define the scope of work to be performed. Additional effort is needed to better define the scopes of work on minor work orders to ensure that the scopes are defined with sufficient accuracy and detail to support effective hazard analyses. **(See Issue WP&C-1.)** Work orders for larger jobs were typically more accurate and contained more detailed work descriptions. Planning & Integration (P&I) planners, supervision and/or craft personnel visit the job site and perform a walkdown when necessary to fully understand the scope of work. For emergent work, walkdowns are normally conducted by the assigned craft person before the work is performed. Additional work scope information obtained during walkdowns conducted by supervision or the crafts is not normally documented in work requests. However, additional work orders may be requested for newly identified scopes of work.

For preventive maintenance, the craft are provided with facility level work windows and task codes that further detail the work to be performed. This process may include the use of Institution Wide Work Control Permits, issued by FPOCs, which further define the scope of work to be performed.

The scope of work defined on Trade/Service IWSs is too broad to fully support the analysis of hazards associated with work steps to be performed for specific jobs. Maintenance activities performed by MUSD craft have been divided into 45 categories, and a Trade/Service IWS has been prepared for each of these categories. These IWSs are not tailored for each job and do not describe the work steps for accomplishing specific jobs.

Core Function 2 - Analyze the Hazards

The MUSD Maintenance Management System is consistent with the Document 2.2 institutional process and defines three levels of work authorization, which tie the required hazard analysis to the work authorization level. As previously discussed, WAL A is the simplest and consists of those tasks that would normally be conducted by the general public. WAL A requires no supplemental hazard analysis.

WAL B is more complex and requires an IWS. WAL C is the most complex, involves special hazards, and requires an IWS in connection with a Facility or Site Safety Plan. Most MUSD work falls into a WAL B classification.

Since most jobs are classified as WAL B and an IWS is required for WAL B work, the IWS process is the primary means of hazard identification and analysis for MUSD maintenance activities. Institutionally, the IWS is structured to identify discrete tasks, determine the hazards associated with each task, and then identify the controls necessary to minimize or eliminate the hazards. MUSD has reviewed and revised many of the Trade/Service IWS(s) to better identify hazards and general controls, and to provide additional information, such as the status of each approved worker's medical monitoring requirements, that was noted to be missing either during the last HSS review or subsequent internal assessment(s). Additionally, corrective actions have resulted in numerous industrial hygiene (IH) surveys and/or assessments to document and/or support hazard analysis and decision making for requisite controls.

MUSD relies primarily on a set of Trade/Service IWS(s) as well as Institution Wide Work Control Permits for the performance of most maintenance work. The work control permits are issued by FPOCs to provide information about facility or area specific hazards and controls. As used in MUSD, the IWS lists activities, workers, hazards, hazard analysis, and controls, including training and medical surveillance, however it is are rarely used or referenced during the conduct of work. (i.e. it is not a tool to assist workers with field implementation of hazard controls). The Trade/Service IWSs provide discussions of the potential hazards that may be encountered. This information is useful for ensuring that workers are qualified to perform assigned tasks and can be useful to individuals planning work: however, the IWS does not link hazards or controls to work steps or the sequence of tasks being performed for specific jobs and this information is not normally included in work control documents provided to workers for WAL B work. Tailgate meetings and pre-job briefings are used to remind workers of the hazards and controls associated with their work however the quality and content of these meetings are variable and IWSs are not normally discussed. Maintenance workers performing WAL A and WAL B work must rely primarily on their knowledge, skills, and abilities to identify, analyze, and control hazards without the aid of work control documents.

Workers were adequately informed of most hazards associated with the work observed by Independent Oversight. Two exceptions are noted below:

- Laborers conducting core drilling of concrete at Cooling Tower U325 for removal and replacement of bolts in advance of a cooling tower pump motor replacement conducted the work with an approved work order under their work group's Trade/Service IWS. The poor sequencing of the work, along with work planning deficiencies (no additional facility hazards were identified), allowed workers to be exposed to a fall hazard and potential drowning hazard as the pit below the now open hole (large enough for a large individual to easily fall through) was filled with churning cooling tower water six to ten feet deep (according to the workers). The work order identified no additional location hazards and called for no barricades or fall protection controls, and the workers did not recognize the hazard until the Independent Oversight observer and escort called it to their attention and requested that they cover the hole. Neither the work order nor the Labor Trade/Service IWS (IWS# 413.09 r6), identified these potential fall or drowning hazards. Additionally, no Institution Wide Work Control Permits were issued by the FPOC(s) for this work.

- A noise hazard was noted during conduct of high voltage preventive maintenance for breaker testing, and no hearing protection was required or utilized. During the conduct of testing the breaker is repeatedly exercised. The impact noise was noted as being quite high, and when questioned, the workers thought the equipment had been evaluated and were unaware of any need for hearing protection. The Trade/Service IWS requires hearing protection for greater than 85 dB and requires

that signs and postings be followed, again placing the burden on the worker to determine the appropriate controls. The individual conducting most of the testing was not enrolled in the medical surveillance portion of the hearing conservation program but had received hearing conservation training. The MUSD Noise Survey (Equipment Noise Surveys) December 2010 – April 2011 indicated the equipment as having a sound level of 55.3 dB; however, the noise monitoring was not conducted during actual equipment use in the field. This study also stated: "Not all employees who worked in the High Voltage Shop at the time of this assessment were enrolled into the LLNL hearing conservation program." Following an interview with the industrial hygienist who conducted measurements for the MUSD Noise Survey (Equipment Noise Surveys), it appeared that some of the measurements may not have reflected the actual noise hazards that workers may be subjected to, since the breakers were not being exercised when the measurements were made. This may provide a false basis for the determination of the need for hearing protection and/or enrollment into the hearing conservation program for some individuals.

Inadequate work planning contributed to each of the above examples. In the first example, a complex job involving multiple craft and hazards was not classified as WAL C , so no safety plan was prepared. Instead, the work was broken down into less-complex work segments, each of which was classified as WAL B. The segmenting of this complex job into multiple WAL B jobs without developing a safety plan resulted in lack of adequate coordination and proper hazard control. In the second example, the noise hazard was not analyzed as part of work planning before the work began. The workers were aware that the noise level in their work area was high, but they incorrectly assumed that it had been measured and that they would have been told if hearing protection was required. While improvements have been made, MUSD work planning continues to lack sufficiently detailed hazard analysis through job specific IWSs, accurate and complete Institution Wide Work Control Permits, and adequate pre-job briefings and tailgate meetings. These weaknesses have resulted in some hazards not being adequately addressed during work planning. **(See Issue WP&C-1)**

Core Function 3 - Define and Implement Controls

There are a variety of controls that can be applied by MUSD crafts at times during conduct of maintenance work. Controls include LOTO, roof access permits, confined space permits, low voltage outage permits, soil excavation and penetration permits, respirators and other personal protective equipment (PPE) and clothing, and fall protection.

Overall, the process for coordinating and controlling high and low voltage electrical work is sufficiently established and implemented through ES&H Manual Chapter 12.6, *LLNL Lockout/Tagout Program,* and the respective Trade/Service IWSs. Work observations demonstrated that high voltage electrical work was being conducted in accordance with most requirements established in this ES&H Manual Chapter. One exception was noted by Independent Oversight when an LLNL F&I HVAC technician while conducting a zero voltage verification of a 480 volt electrical panel LOTO did not meet the requirements of NFPA 70E. The HVAC technician donned the appropriate PPE required by the NFPA 70E for arc flash and shock protection. However, he did not test his volt meter to a known reliable source after the zero voltage check, as required by NFPA70 E. When interviewed, the technician was not aware of the requirement contained in Chapter 12.6 and NFPA 70E for the conduct of a meter functionality verification after performing a zero energy check. **(See Issue WP&C-1)**

Some IWSs identify controls external to the documents that are provided, and the work documents do not always specify exactly which controls are required for which task or activity. The following example relates to conduct of high voltage preventive maintenance for breaker testing in accordance with an approved work order and General Electrical Utility System Trade/Service (skill of the craft) IWS. The work observed was conducted safely and an adequate pre-job briefing was held. Following completion of

the work the workers were interviewed about their understanding of the task specific hazards and controls. Neither the procedure for the activity, the IWS, nor the safety plan contained in the IWS for the task (task 7) specifically states the required PPE. However, workers stated that they used the standard PPE of safety glasses, company uniform, voltage rated gloves and hard hats for work in this location and at this voltage (roughly equivalent to NFPA 70E CAT 2). Additionally, the Operations Manual for this group (MANOPS-0004 Rev-0) does not discuss the testing of breakers. It does contain information related to the testing of medium voltage cables. The observed activity is not included in the manual. The direction in the IWS to follow controls in PLAN-SAFT-0001, NFPA 70E, and ES&H 16.1 for PPE may not be sufficient in all cases and places the burden on the worker, when additional analysis maybe needed.

A second observation of a LOTO associated with Fan Motor Replacement Work Order in Bldg. 368 was conducted under an approved work order, facility release, and fall protection plan. The LOTO for the work (with the exception of one PPE omission) was conducted under institutional or NFPA 70E requirements. The assigned task required a qualified electrical worker to conduct LOTO of the 480V breaker supplying power to a disconnect serving a roof top mounted exhaust fan and verify absence of energy prior to conducting the assigned maintenance activities. Arc flash postings were not evident at the location where the work was performed (since the structure is newer than 2004, it should have been posted); however, the worker did verify that the power supplied to the facility met Category 2 PPE, which the worker used while conducting the zero energy verification. During conduct of the LOTO, meter functionality was verified (both before and after zero energy check) to a known source and the zero energy verification confirmed absence of energy. The PPE requirements specified by NFPA 70E for activity were met except for hearing protection, which the worker acknowledged forgetting. **(See Issue WP&C-1)**

In another concern, management would not authorize a worker to remove damaged equipment from service, despite a potential for injury from use of damaged equipment. A vacuum pump for use during core drilling of concrete at Cooling Tower U325 (for removal and replacement of bolts in advance of a cooling tower pump motor replacement) was damaged prior to the start of the job; a major chunk of the casing around the moving parts was broken away, and the gap was only partially covered with duct tape, leaving exposed, moving parts that could cause injury. Apparently the worker had previously taken the unit back to the shop and asked whether the pump could be replaced. Management denied a verbal request by the line supervisor to replace the damaged pump, and the unit was returned to service. The core-drilling unit does have an alternate configuration that would allow it to operate without the vacuum pump (i.e., the drilling unit would have to be lagged down). However, neither this option nor the option of borrowing another vacuum pump from elsewhere on site was pursued. The worker was asked to remove this equipment from service following this observation.

In a final example, while appropriate fall protection was observed for preventive maintenance activities conducted on the roof of building 691, planning deficiencies related to materials needed for completion of this task could have put workers at unnecessary risk. **(See Issue WP&C-1)** The FPOC for the facility required all individuals accessing the roof to sign in on a roof access permit. A fall protection planning worksheet was developed by the work supervisor, and workers donned appropriate fall protection (including harnesses) within their inspection interval. A fall restraint sling was anchored to the roof fan housing base of the unit being serviced. On inspecting the fan unit, the workers determined that the replacement belt specified by the work order was the wrong item. In this case, there was a spare belt within the fan housing which was used to complete the job. Planning deficiencies such as this could unnecessarily expose workers to additional fall hazards by requiring workers to climb up and down the ladder to obtain the correct replacement part and re-perform the potentially hazardous portions of the work assignment, (i.e. LOTO, roof access with requisite fall protection planning implementation).

In a related concern, the ladder used to access the roof for a repair activity at building 368 had a yellow tag (observed by an Independent Oversight team member) stating "Do Not Use Without First Contacting the Fall Protection Competent Person and the building FPOC for information about minor ladder defects." The FPOC for the facility required all individuals accessing the roof to sign in on a roof access permit, a fall protection planning worksheet was developed by the work supervisor, and appropriate training was verified. However, the competent person for the roof was not the individual for the ladder, and neither this individual nor the FPOC could locate the yellow tag issues on either the database or specific ladder documentation. Workers were already on the roof, and both the FPOC and the individual writing the fall protection plan felt that the ladder issues most likely involved rung spacing and/or obstruction of the side rail in one location. Once made aware of these issues, the remaining individuals were allowed to access the roof. The yellow tag was not addressed in the pre-job briefing for this job. **(See Issue WP&C-1)**

The use of broad Trade/Service IWS and work control documentation, which in some cases do not specify controls for the performance of work, has resulted in a system where planners do not identify hazards and controls associated with specific work steps in work control documents, hazards and controls are not always adequately addressed in pre-job and tailgate meetings, and workers are expected to choose the controls they believe are applicable (rather than being provided with a set of controls that must be implemented prior to performing work). Directions to workers to seek assistance from external requirement documents (i.e., NFPA 70E or ES&H Manual chapters) or documents that have been renamed in order to establish controls assume that the crafts have sufficient time, knowledge, and resources to find, understand, and implement the information; this methodology is not in accordance with institutional expectations for linking or embedding controls.

Core Function 4 - Perform Work within Controls

Pre-job briefings and tailgate meetings are held to discuss planned activities and to remind workers of the hazards and controls associated with their work; however, the quality and content of these are variable and IWS content was rarely discussed at the meetings observed by the Independent Oversight team. Additionally, FPOCs routinely discuss location-specific hazards and controls with craft workers before the start of work.

A number of work evolutions observed by Independent Oversight were performed safely, in accordance with established controls, and without incident. Examples include the conduct of preventive maintenance in Building 391 by the heavy equipment craft of the Joy Fans; the troubleshooting of Building 663 Exhaust fans in response to a foul odor trouble call; the conduct of preventive maintenance of the Building 691 roof fan; the application of powder coating in the Building 418 paint shop; and the implementation of controls associated with most other work when those controls were sufficiently identified.

However, for some activities observed by Independent Oversight, hazards were not identified and controls were not understood, implemented, or followed as discussed in the following examples. **(See Issue WP&C-1)**.

HVAC mechanics conducting a compressor replacement for the computer room air conditioning in building 439 were conducting the work under an approved work order, facility release, and fire permit. However, the LOTO for the work was not established in accordance with institutional or Occupational Safety and Health Administration (OSHA) requirements. The assigned task required two individuals, one HVAC mechanic and one helper; both individuals were observed handling the compressor body, unbolting the unit, and touching grounding wires and the metal portions of the compressor stand/air conditioner frame. After walkdown of the LOTO, it was observed that only one individual had signed on the tag and only one lock was utilized. When the worker who actually conducted the LOTO was

interviewed, the individual stated that the unit was isolated and the wires and fuses had been removed, so the second individual was not required to be on the LOTO. However, the wires that had been disconnected by the craft were not terminated (i.e., tapped, capped, and/or pulled back to the junction box); in actuality, the electrical box removed from the compressor was lying on the metal railing above the compressor unprotected, with a nest of wires sticking out and bare. The fuses, which had been removed, were unsecured and out of the workers' immediate control (i.e., around the corner and left unattended during lunch, end of shift, etc.), as was the circuit panel where the LOTO was in place. This condition is inconsistent with the institutional and OSHA requirement, which would have the second worker observe the zero voltage verification (if not a qualified electrical worker) or walk down the LOTO and discuss the verification and apply their own lock, to ensure positive control of the hazardous energy potential. Subsequent review with the LLNL ES&H Electrical Safety SME concluded that the condition observed was a violation of chapter 12.6 requirements (one worker; one lock; one tag). **(See Issue WCP-1)**

Laborers conducting core drilling of concrete at Cooling Tower U325 for removal and replacement of bolts in advance of a cooling tower pump motor replacement, conducted the work with an approved work order under their work group's trade service IWS. While most hazards were appropriately controlled, including potential silica exposure (wet drilling with vacuum was employed), noise (NRR 22 hearing protection utilized), and electrical hazards in wet environs (corded ground fault current interrupter (GFCI) power receptacles and tools), some hazardous conditions were created and/or uncontrolled during the conduct of the work. The task observed was a sequenced work evolution; prior work crews had de-energized and removed the pump assembly over the cooling tower basin and covered it with plywood. The core drilling crew, while drilling the concrete, removed the protective covering to access the drilling locations because the protective cover extended beyond the bolt locations. Removing the plywood exposed workers to a fall hazard and potential drowning hazard since the pit below the now open hole (large enough for a large individual to easily fall through) was filled with churning cooling tower water six to ten feet deep (according to the workers). **(See Issue WP&C-1)**

Work control, as currently implemented within MUSD, relies heavily on the individual workers' experience and situational awareness at the time of work, rather than written instructions that supplement individual knowledge and skills. Work observation indicates that for some jobs, work planning deficiencies continue to potentially adversely impact worker safety. Typically workers attempted to follow controls when controls were clearly established, but in some cases workers were either unaware of or confused about some hazard controls. These conditions represent some potential safety vulnerabilities.

Core Function 5 – Activity Level Feedback and Improvement

Feedback related to conduct of MUSD maintenance tasks is typically the responsibility of the line supervisor, responsible individual (RI), or person in charge (PIC) of the work assignment or craft performing the work. This individual is responsible for collecting safety feedback associated with performing the work and documenting feedback information on the work order or work permit. The information is then entered into the Work Control System and is automatically forwarded to an F&I Safety Team representative. For complex work, feedback information is documented on the work order (Work Planning Feedback) and IWS. The RI/PIC is responsible for ensuring that a copy of the information is provided to the work planners, an F&I Safety Team representative, and the ES&H Team, as appropriate. An F&I Safety Team representative is responsible for determining whether a safety issue exists and identifying the appropriate path for resolution. This process may include notifying appropriate personnel to determine the actions needed to resolve the identified safety concern (e.g., FPOC, facility manager or designee, ES&H Team and work planners). An F&I Safety Team representative ensures that the safety concern is addressed and communicates back to the RI/PIC and planner for complex work.

A.1.3 Nuclear Materials Technology Program Work Planning and Control

The NMTP Work Planning and Control Manual (WPCM) describes the NMTP Work Planning and Control Process (WPCP) and Change Control Process (CCP), which are the two mechanisms used within NMTP to authorize, approve and release facility and programmatic work. The NMTP WPCM supplements information contained in ES&H Manual Document 2.2, *LLNL Institution-Wide Work Planning and Control Process*, and has defined four categories (A through D) of NMTP work activities.

Category A, B, and C activities are in general alignment with institutionally defined WAL A, B, and C activities from Document 2.2. Category A is for routine, low hazard activities that require little or no coordination and have a low probability of impacting facility operations. Category B and C have the potential to impact facility operations, programmatic activities, and other groups, and require coordination. These three work categories are performed under the control of approved authorizing documentation such as an FSP, OSP, or IWS. Category D work activities are generally complex, limited-duration facility or programmatic projects that may involve greater hazards or for which adequate controls are not specified in the FSP or in an approved IWS or OSP. Category D activities require the development of a specific work permit. These work activities are analyzed at the task level on a case by case basis to determine potential hazards and controls and are documented and controlled by a Category D work permit.

Core Function 1 - Define Scope of Work

NMTP uses several mechanisms to address work scope definition at the facility and activity levels. These include authorization basis documents for NMTP nuclear and radiological facilities (documented safety analysis, safety analysis report, etc), and a combination of FSPs, OSPs, IWSs, and work permits for activity level work. Facility level program activities are described in currently approved authorization basis documents (documented safety analysis, etc.) and further described in the FSPs. At the activity level, FSPs and OSPs are used in Superblock to describe and bound facility-wide operations and specific programmatic activities, respectively. IWSs are also used in some NMTP facilities, such as RHWM (which only recently became part of NMTP) to define work scope, and work permits are used in all NMTP facilities to define the scope for Category D work.

Work scopes contained in FSPs, OSPs, and work permits are generally well defined and sufficiently detailed to identify hazards and controls for activity level work. The FSPs, OSPs, and work permits that were reviewed clearly identified the work to be accomplished and the basic tasks necessary to perform the work, and they adequately described work scope boundaries and limits. FSPs for Buildings 332 and 331 provide detailed descriptions and appropriate bounding of the facility level work scopes and support activities addressed by the FSP. OSPs within these facilities are detailed documents that thoroughly describe specific programmatic work to be performed at each workstation within a particular lab. Category D work permits are specific permits written for discrete activities and for the most part contain sufficient detail on the work to be performed, identified hazards, and established controls.

In some cases, particularly when work is controlled by an IWS, the work scope and span of control are too broadly defined to allow effective analysis of hazards at the task level, resulting in inadequate specification of controls. As a result, controls listed in the IWS were either too generic and/or require the worker to evaluate hazards, select from a wide range of generic controls, or request verbal direction from ES&H before or during performance of the work. **(See Issue WP&C-2)**

Following are work control documents that contained overly broad scope. Examples of cases where inadequate work scope contributed to inadequate specification of controls are described in the following section and in Core Function 3:

- IWS 15242.02, for container crushing, combined both radiological and hazardous waste crushing activities as one task, although the hazards and controls for operation of these units are different and must be evaluated separately. For example, in the general hazard control section, it is impossible to determine whether reference to "contamination" and PPE are intended to apply to processing of hazardous waste containers, radioactive containers, or both.

- IWS 15241.01 r2, for waste handling and shipment, covers a wide range of waste handling, including repackaging, overpacking, transportation, venting, etc., of waste containers, including those contaminated with radiological materials and/or chemicals. The scope was found to be too broad to permit hazard evaluation for discrete activities. This is evidenced by open-ended control statements requiring hazard evaluation by workers in the field (further described in core Function 3). Open-ended radiological controls are prohibited by HP-FO-103

- NMTP Work Permit RHWM-11-D-095, for RHWM maintenance – programmatic equipment, was in its final review and approval at a work permit meeting. The Facility Manager asked whether there were any final questions or comments prior to approval. Independent Oversight inquired about the general nature of the work description in the work permit; the specific tasks necessary to accomplish the scope of work were not identified or discernable. After further reviewing the RHWM Maintenance Manual, where, according to the work permit, the "full scope of work is detailed," it was determined that the description of work was insufficient. The RHWM Facility Manager, the RHWM Safety Officer, and the NMTP Safety and Work Control Manager agreed to improve the description of work in the IWS.

Similar concerns about inadequately defined work scopes in IWSs were identified during the 2009 ISMS verification review. The LLNL management self assessment of the LLNL work control process completed in November 2010 did not specifically identify any concerns in this area. See Section A.2 of this appendix, on the LLNL CAS, for additional discussion of weaknesses in the rigor of self assessments.

Core Function 2-Identify and Analyze Hazards

NMTP uses a combination of processes to identify hazards associated with activity-level work. FSPs are prepared and used to identify and document hazards and controls at the facility level. For example, gloveboxes are used throughout the Plutonium Facility, and hazards and associated controls for routine glovebox operations, such as bag-in and bag-out activities, are identified in the Building 332 FSP. For specific laboratories and workstations, OSPs include a narrative discussion of workstation activities, including identification of potential hazards associated with the work. The IWS process generates sections for user-defined tasks to identify unique hazards associated with each task. Category D Work permits includes a hazard checklist and Job Hazard Analysis table to convey the task specific hazards and controls.

SMEs from the various safety and health disciplines are assigned to support the line in identifying and analyzing hazards, and SMEs from all relevant disciplines are involved in the development and review of FSPs, OSPs, IWSs, and work permits. This includes analysis of hazards, and concurring with their issuance. A positive aspect of the NMTP work control process is that Category D work permits and programmatic changes require periodic face-to-face interactions between all personnel with responsibility for planning and execution, including SMEs, to review and approve work control decisions. This is accomplished through routine meetings such as work permit meetings, change request meetings, and work acceptance meetings, all of which include participation by affected personnel such as RIs, SMEs,

cognizant system engineers, facility management, and approval authorities. The Independent Oversight review team considered these meetings to be valuable in enhancing quality and accountability in work planning. This level of interaction is not required by ES&H Manual Document 2.2 for work governed by and planned using an IWS.

Several work permit meetings were observed and found to be effective in reviewing individual work permit planning efforts of all disciplines present and ensuring hazards had been appropriately analyzed and controls established prior to approval. Draft work permits were projected on an overhead screen for all personnel to review and comment. Minor changes can be made immediately and reviewed, and work permits can be finalized and signed off at these meetings if all comments are resolved and signatories are in agreement.

Several proposed work request discussions were observed during the Superblock Change Request Meeting. One of those work requests is a modification project for a centralized TRU waste processing line in B332, Room 1329. A preliminary design review of this project was scheduled for later in the week at a Facility Acceptance Review Meeting (also observed). Other work reviewed was an improvement to the vault continuous air monitor (CAM) system and gauge valve changeouts in the plenum equipment building. These meetings had strong participation and attendance by NMTP and Superblock management, SMEs, and RIs. The NMTP Safety and Work Control Manager facilitated the meeting and focused the discussions on critical review and documentation of comments for later resolution. The change request for gauge valve change outs was determined to not need this more robust review process and will proceed through the normal process for work requests in the work permit meetings.

Overall, NMTP hazard analysis processes used for OSPs and work permits are generally effective; however there were isolated examples where hazards were not properly identified and/or analyzed, indicating the need for additional rigor and diligence in work planning, particularly with regard to industrial and radiological hazards. Examples included the following:

- Both an OSP and a Category D work permit in 332 did not fully address the hazards and controls associated with elevated work. The work permit developed for replacing gloveport plugs in Rooms 1010 and 1006 included a potential for falling objects (5-8 pound tooling to remove and install new plug) from the ladder, and the potential to lose center of balance and fall while manipulating tooling at gloveports, which were offset from the ladder center. The OSP did not address routine access to elevated glove ports for inspections. Facility management appropriately suspended this work until enhancements can be made.

- Radiological hazards associated with tritium contamination inside a 331 glovebox were not quantified and analyzed prior to performing the work.

As discussed under Core Functions 1 and 3, other systematic weaknesses in implementing the IWS process were observed at RHWM, resulting in ineffective hazard analysis and/or controls.

Core Function 3 - Develop and Implement Controls

Engineered and administrative controls are used effectively and extensively throughout NMTP facilities to control activity level hazards. Engineered controls include containment devices, such as gloveboxes and hoods, ventilation systems, and alarm/air monitoring systems that are designed to contain or control radioactive materials and to provide ample warning to ensure personnel safety. Engineered controls are complemented by a variety of administrative controls including FSPs, OSPs, IWSs, postings, work permits, administrative procedures, and work instructions prepared to control a particular activity.

OSPs govern most of the operations work in Superblock facilities, and these documents are generally of high quality containing detailed and lengthy discussion of programmatic work to be performed, along with discussion of potential hazards and associated controls. WP&C issues at NMTP have been identified in recent external assessment reports and correspondence from the DNFSB, including failure to systematically link specific tasks, hazards, and controls in their OSPs. As a result, NMTP has undertaken an initiative to provide this linkage through a tasks, hazards and controls table in the appendix to each OSP. Most OSPs have been upgraded with Task Based Hazard and Control Tables, and all OSPs will have been upgraded by December 31, 2011. Review of these revised OSPs indicates that specific tasks for each OSP have been clearly identified and associated with hazard types and specific controls in these tables. The tables further improve the description of work in OSPs and thereby encourage improved application of OSPs during Daily Work Team Meetings to support tasks identified in Daily Activity Lists. However it should be noted that because OSPs also invoke FSP-defined hazards and controls, the OSP tables may not be a complete representation of hazards and controls for all OSP work. A similar effort to address FSP hazards and controls would be beneficial to address comprehensive linkage of all hazards and controls.

Comprehensive training and qualification programs have been in place within NMTP for many years. At the activity level, NMTP uses a systematic method to validate and verify that worker training is maintained current. Training requirements for all personnel are tracked using the institutional L-Train system. Worker training tables are posted monthly in each NMTP facility, with highlighted indications of workers due for retraining within 30 and 60 days. Training lists in Buildings 331, 332, and 695 were posted within the last month and demonstrated that no workers had lapsed training in any area. Workers' training was verified as current by RIs during the pre-job briefs observed by the review team. Although compliance with required reading requirements was not directly reviewed by the review team, LSO Facility Representatives reported they had identified instances where workers had not completed required reading as required by OSPs, IWSs, or work permits.

In addition to programmatic work governed by OSPs, the review team also observed various planning efforts and operations associated with work governed by Category D work permits and IWSs. Most Category D work permits provided adequate specification of controls. However, work planning deficiencies identified on one Category D work permit and several IWSs resulted in inadequate and/or incomplete specification of radiological, industrial safety, and industrial hygiene controls. Based on the number of similar concerns in the small sample of work packages reviewed by Independent Oversight, these deficiencies were not considered isolated (**see Issue WP&C-2**). Examples are discussed below.

RHWM IWS # 15242, for container crushing unit operations, did not adequately address differences between radiological and hazardous drum crushing and did not adequately define the specific controls needed for each type of operation (**see Issue WP&C-2**). Examples of these deficiencies included the following:

- PPE was incorrectly defined in the General Hazards and Controls section and therefore applied to both radiological and hazardous waste crushing. However, the specified PPE did not meet ES&H Manual Document 20.2 guidelines for contamination area work.

- The Hazard Descriptions and Controls section did not discuss radiological contamination hazards and requisite controls, including establishment of a contamination area (from the crusher procedure), and associated contamination area requirements (posting, step off pads, waste receptacles, etc.).

- The Radioactive Waste section of the hazard description and controls did not address disposition of PPE and/or leather gloves as radioactive waste, as would normally be required

for contamination area work with low level waste materials.

- Radiological survey and release/down-posting requirements following operation of the radioactive crusher were not addressed.

Facility management appropriately suspended work on this IWS until it could be improved.

RHWM IWS 1345.09 r5, for waste sampling, did not follow all institutional requirements for the intended use of subordinate work control documentation, such as Waste Processing Plans (WPPs) and Hazard Assessment and Control forms (HACs), and these subordinate documents did not always provide sufficient basis for controls (**see Issue WP&C-2**). Examples include:

- There are open ended IH/IS controls throughout, such as "*If exceeding an occupational exposure limit is anticipated, contact the RI/AI who will consult with the Team Industrial hygienist prior to start of work*"; "*If direct contact with the material to be sampled is anticipated and prolonged, the selection of gloves will be made on a case by case basis in consultation with the Industrial Hygiene Professional*" "*The designated competent person and/or the ES&H Team Industrial Safety Professional will determine fall protection requirements*". The presence of open ended controls indicates that the specific hazards could not be fully evaluated, which is a concern when the scope of work is being authorized by the IWS. Open ended radiological controls are not allowed by HP-FO-103.

- The relationship and linkage between the IWS and subordinate WPPs required by RHWM procedure number WIC 110 are not well defined nor systematically implemented through the IWS process. WPPs are noted as required for some hazards and conditions, but not for others that might also require one, such as whenever a solid material is to be sampled. With documented exceptions, WIC 110 requires development of WPPs for all solid waste sampling as a means of identifying specific hazards and controls tailored to the work. However, the current IWS task breakdown does not facilitate recognition of different hazards and controls for liquid and solids. A task description entitled "solid waste sampling" or "solid radioactive waste sampling" could be used to better reflect the use of WPPs and possibly eliminate many of the existing generically identified IWS hazards and controls, with reference instead to a WPP.

- WIC 110 and WIC 111 contain various radiological and other controls that are not properly referenced, extracted, and/or attached to the IWS, in conflict with Document 2.2 requirements. These procedures have also not been subject to health physicist review for compliance with HP-FO-103.

- WPP WGS-11-010 did not include all information required by RHWM procedure number TRE 106, such as description of process knowledge, past analytical results or data, and relevant hazard information. Similarly, neither the WPP nor the associated HAC contained all radiological information required by HP-FO-103. The HAC also did not clearly indicate the contaminant for which respiratory protection was being prescribed (beryllium, uranium, or both). If for uranium, radiological air sampling or characterization data would also be required to meet institutional and 10 CFR 835 requirements for air sampling.

RHWM IWS 15241.01r2, for waste handling and shipment, did not contain sufficiently specific controls tailored to individual work activities because its scope and span of control are too broad to permit effective analysis of task specific hazards. This IWS was also the subject of Issues Tracking System (ITS)

item 30069.1, from a June 2010 Joint Functional Area Manager and Line Assessment (JFAMLA), which identified weaknesses in specification of radiological controls. This issue was closed in January 2011, even though many of the same problems remained uncorrected (**see Issues WP&C-2 and F&I-2**). Examples included the following:

- There are open ended IH and radiological controls throughout, such as "*Additional PPE such as respiratory protection may be required on a case-by-case basis*"; "*If any operation has potential for dermal or respiratory exposure to beryllium, contact the ES&H Industrial Hygienist for additional guidance*" ; "*If the work involves uncontained radioactive material (direct contact handling of the material, opening previously packaged material, etc.) contact the Health Physicist for the work area to see if there are requirements beyond those listed here*". The presence of open ended controls indicates that the specific hazards could not be fully evaluated, which is a concern when the scope of work is being authorized by the IWS. Open ended radiological controls are not allowed by HP-FO-103.

- The IWS still referenced a General Hazards and Controls section that was not attached in the current revision r2. The same concern was identified in the June 2010 JFAMLA but had not been corrected after closure of the issue.

- Radiological controls are incomplete and not in keeping with HP-FO-103 requirements. For example, radiological PPE requirements are not specified despite allowing for work in a contamination area, high contamination area, or airborne radiation area. If the correct radiological PPE had been specified, it would in some cases conflict with PPE specified for IH hazards elsewhere in the IWS.

- The most recent IWS change made in response to ITS 30069 was improperly processed as minor change, in conflict with Document 2.2 requirements when changing hazards and/or controls.

Work permit 331-10-D-048, for removing/installing glovebox window access panels in the 331 tritium science station workstation, did not contain adequate radiological controls. Examples included the following:

- The work permit had an open-ended radiological control "*Notify HP prior to each window/access panel removal for additional controls,*" in conflict with HP-FO-103.

- The work permit did not reflect the necessity for a radiological hold point to take and evaluate a swipe on the pump after window removal. A swipe was taken and there was discussion of actions to be taken based on the swipe results, such as use of double gloves if high levels were found. The permit did not reflect these considerations or the need for additional PPE based on swipe results.

- Swipe results indicated contamination area levels on the interior of the glovebox. The work permit did not require establishment of a localized contamination area in the vicinity where plastic was draped and where contaminated materials were to be removed.

- PPE requirements did not include shoe covers. When the window was removed, it was placed on the draped plastic but was later moved back into position. Workers were observed walking across the draped plastic where the contaminated window had been placed, resulting in the potential for inadvertent contamination spread.

- PPE requirements did not include coveralls. Workers had to kneel and remove contaminated equipment during the work, making lab coats inadequate.

- A prerequisite to ventilate and monitor the glovebox to less than 1 curie of tritium as measured on the glovebox ion chamber appears to have no basis for health and safety and cannot be measured directly as indicated by the permit. This value appears to be an FSP control related to air emissions during glovebox operations and must be calculated based on the volume of the glovebox and the tritium concentration as measured by glovebox air monitoring instrumentation.

Swipes of the glovebox interior could easily be taken and analyzed to ascertain contamination levels and therefore improve the specification of radiological controls before starting the job and breaching containment.

Core Function 4 - Perform Work within Controls

NMTP facilities plan and authorize work through formal mechanisms. Building 332 publishes a Daily Activity List and holds a daily activity list meeting to identify and authorize all facility work for the upcoming day. The Daily Activity List is generated from currently approved facility work permits and planned programmatic activities addressed in the FSP and OSPs. This list is reviewed and updated each day during a formal meeting with representatives from all program elements. The remaining NMTP facilities do not need the rigor of a Daily Activity List but do utilize a Weekly Activity List that is developed and implemented in a similar manner.

Final readiness to perform work within NMTP facilities is accomplished through several mechanisms, including pre-job briefings and a newly implemented daily work team meeting for programmatic work. The new daily work team meetings provide an improved method to ensure readiness to perform work for routine programmatic operations that did not previously include pre-job briefings. Several such meetings were observed during the week. They provide a daily opportunity to address the work activities of the day and to emphasize the safety considerations and integration needs for various tasks. A fissile material handlers work group meeting was found to include good discussion of each work group's planned work activities for the day, including the governing work control documents and whether scope was adequately defined and hazards and controls were addressed.

Pre-job briefings were observed for RHWM container crush activities (IWS 15242.02) and Superblock activities in Room 1378 (OSP 332.184) and Room 1353 (OSP 332.184). Each briefing was professional and informative to workers, and provided appropriate interaction on the task and related hazards and controls. The RHWM container crushing operation pre-brief was particularly detailed and well run. This activity had also been discussed at the daily work team meeting as part of the safety moment training. In each case, workers were focused on controls and their implementation during the pre-job briefing and subsequent operations.

Fissile material handlers performed plutonium operations in strict accordance with controls and work practices as defined in their OSPs. Work was observed in Building 332, Room 1353, to transfer a fissile material part out of GB5308 and to machine a non-fissile (aluminum) part in GB5306 in accordance with OSP 332.002, Fissile Material Machining Operations. Fissile material operators were knowledgeable of the controls in the OSP and competently implemented those controls. The two activities in Room 1353 and the fissile material part move between GB5308 and the vault were well coordinated for radiological and contamination control, security considerations, and work flow.
The disassembly of a stainless steel part was observed in B332, Room 1378 Fume Hood in accordance

with Superblock OSP 332.184. Two person surveillance system (TPSS) performance was observed throughout the activity to initially establish the room under these conditions and also receive the part from the vault. Fissile material room totals were systematically confirmed, updated and posted as the fissile material moved about the facility. Additional PPE (leather gloves) were donned upon opening the container and discovering protrusions on the part that were determined to be sharps.

Calcination of chips, turnings, compounds and powder activities were observed in Building 332, Room 1378, GB7801, in accordance with OSP 332.005. Fissile material handlers were knowledgeable of the hazards and controls for the activity and demonstrated the controls were met in Appendix C, Task Hazard Analysis Table, and Appendix E, Hazardous Material Table, for GB7801. During routine glovebox work in Building332, handlers were diligent about surveying hands and arms upon removal from the gloves and where appropriate, and showed good awareness of dose rates and techniques to minimize exposures. In Room 1353, a fissile material handler appropriately requested and received a new radiation survey of their work station after moving a radioactive object from their glovebox. The survey was competently performed by a Health and Safety Technician, and the posting on the glovebox was revised to reflect the survey results before the handlers resumed their work.

Workers across NMTP facilities reviewed demonstrated appropriate conduct of operations and performed their work in accordance with the specifications in approved work control documentation.

Core Function 5 - Activity Level Feedback and Improvement

NMTP uses a variety of methods to foster and utilize feedback and improvement into its work planning and execution. At the facility level, NMTP holds facility standup meetings twice a week where general safety and administrative items are discussed, including an opportunity to convey information on safety and lessons learned that should be disseminated. A safety feedback and improvement meeting is also held bimonthly to discuss matters relevant to facility feedback and improvement including initiatives and process changes that have transpired. Formal post-job reviews of OSP work is required at least annually, and can be performed more frequently if needed. A record of OSP changes from the prior review period is documented and maintained. All work permits are formally closed out upon completion of the work. Part of the closure process is to review the feedback section of the work permit and to solicit input from RIs if feedback is missing or incomplete. Work permit feedback is reviewed and important items are extracted and documented in an electronic database in for use in future work planning. Review of several recent work permit closures indicated that appropriate feedback information was being captured.

Corrective actions to a deficiency identified during a JFAMLA at RHWM in 2010 (ITS 30069) failed to address most of the specific concerns documented in the assessment. That assessment identified problems with specification of radiological controls similar to those identified during this review. The ITS item was closed in January 2011. Review of this IWS indicates it still contains a number of deficiencies in both work scope, radiological and industrial safety/hygiene controls. The IWS revision was also incorrectly processed as a minor change, which did not require full SME review. **(See Issues WP&C-2 and F&I-2)**

Work scopes identified in FSPs, OSPs, and work permits are generally well defined and sufficiently detailed to identify hazards and controls for activity level work. However, the work scope and span of control of the IWSs that were reviewed were too broad to permit effective analysis of hazards, resulting in inadequate or incomplete specification of controls for some work.

NMTP processes for identifying and analyzing hazards are generally effective. SME involvement in work planning is required by the NMTP WPCP and ES&H Teams consisting of SMEs from the various safety and health disciplines are assigned to support the line in analyzing and documenting hazards.

Periodic face to face meetings between personnel with responsibility for planning and executing work, including SMEs, are held to review and approve work control efforts for work permits and programmatic changes. These meetings were seen as valuable in enhancing the quality and accountability of work planning efforts. Most hazards associated with work observed by the Independent Oversight review team were properly identified and analyzed. However there were isolated examples in OSPs and work permits where hazards were not fully and effectively identified. More systematic examples of hazard analysis weaknesses were evident for work controlled by IWSs, due to problems with effective implementation of institutional requirements.

Engineered and administrative controls are used effectively and extensively throughout NMTP facilities to control activity level hazards. OSPs govern most of the operations work in Superblock facilities, and these documents were generally of high quality containing detailed and lengthy discussion of programmatic work to be performed, along with discussion of potential hazards and associated controls. An initiative to better link hazards and controls within OSPs was undertaken through development of task, hazard and control tables as appendices to all OSPs. This appears to be an effective cross reference; however, similar initiatives have not been undertaken for FSPs, which would be beneficial for a complete linkage of OSP-related hazards and controls, or IWS and work permits where multiple and discrete tasks are within the defined scope of work. Finally, there are continuing problems with proper specification and clarity of controls within IWSs and/or work permits, particularly with respect to radiological controls and industrial safety/hygiene controls.

NMTP facilities plan and authorize work through formal mechanisms. Building 332 publishes a Daily Activity List and holds a daily meeting to identify and authorize all facility work for the upcoming day. The remaining NMTP facilities publish a Weekly Activity List and hold weekly activity meetings to identify and authorize work; this frequency is appropriate for their workload and needs. A new requirement for daily work team meetings provides an improved method to ensure readiness to perform work, including face to face meetings with discussion of work to be performed that day. Pre-job briefings are professional and informative about the task, hazards, controls, and work flow. Fissile material handlers are particularly well trained and qualified and performed plutonium operations in strict accordance with controls and work practices as defined in their OSPs. Notwithstanding some weaknesses in approved work control documentation, observations across other NMTP areas also indicated performance of assigned work activities in accordance with the approved specifications.

A.2 LLNL Contractor Assurance System Results

The objective of this review was to determine whether LLNL has established and implemented a robust, credible, and effective feedback and continuous improvement processes as part of their ISMS to generate and capture safety performance feedback, appropriately analyze this feedback, and establish and implement effective actions that result in continuous improvement in safety programs and performance. Independent Oversight performed this review by reviewing process documents and performance records, interviewing responsible personnel, and observing various governance committee meetings. The results of these activities were compared to criteria in four areas as detailed in the review plan to establish whether the overall objective had been met by LLNL.

A.2.1 Assessments

A key element of an effective feedback and improvement program is a rigorous line management assessment program that performs comprehensive evaluations of all functional areas, programs, facilities, and organizational elements, including subcontractors, with a frequency, scope, and rigor based on appropriate analysis of risks. As indicated in the 2009 ISMS verification review, LLNL has established an adequate set of processes and requirements for conducting a credible self-assessment program including formal internal independent assessments (IIAs), management self assessments (MSAs), and JFAMLAs. These assessment processes have been strengthened since 2009, especially in the area of formalizing the process for coordinating and assessing functional area performance on an institutional level. In addition, expectations and requirements for less-formal assessments, including management walkthroughs and observations, verifications, and inspection activities, designated as "MOVIs," are defined in a formal procedure issued since the 2009 review. In the summer, the Quality Assurance Office identifies proposed institutional independent assessments for the next fiscal year and line managers, including functional area managers, determine what mandatory and elective topical areas they want to assess in the next fiscal year. The Contractor Assurance Office (CAO) provides assistance, coordination, and an assessment planning tool to aid organizations in the planning process. The resulting proposed internal and known planned external assessments are compiled by the CAO into a draft Institutional Assessment Plan (IAP), which is submitted to the Operations Excellence Council (OEC) and the Deputy Director for review and approval. The plan identifies the type of assessment, the assessed and assessing organizations, and the fiscal year quarter for completion. Each assessment in the approved IAP is entered into ITS, providing a base identifying number for documenting and managing any issues resulting from the assessment.

In both FY 2010 and FY 2011, LLNL conducted or has planned 15 internal independent assessments and 21 JFAMLAs in ES&H related areas. In FY 2010, approximately 80 ES&H related MSAs were conducted, and in 2011 approximately 60 ES&H related MSAs were conducted or are scheduled on the IAP. In addition, Lawrence Livermore National Security, LLC (LLNS) corporate governance committees conducted or chartered independent reviews in targeted programmatic and functional areas, called Functional Management Reviews (FMRs). Several ES&H related FMRs were performed in 2010 and 2011. The IIAs were consistently comprehensive and rigorous with substantive issues identified for resolution. Many JFAMLAs and MSAs were also rigorous and well documented, identifying deficiencies and improvement items that are contributing to continuous process and performance improvement. Approximately 1260 management observations were performed in FY 2010 and FY 2011 and documented in ITS.

Another form of assessment activity that has provided or has the potential to provide feedback and input to continuous improvement in ES&H processes and performance at LLNL are analysis projects employing Six Sigma techniques. Although primarily serving as a tool to identify process improvements that provide cost and efficiency benefits, some ES&H and performance improvements can result from these analyses. Several Six Sigma reviews with pertinent recommendations for ES&H process and performance improvement conducted since the 2009 ISMS verification review included projects addressing timely entry of issues into ITS, determining issue significance, the National Ignition Facility (NIF) energy isolation procedure development process, and the LSO documented safety analysis/technical safety requirement annual update review process.

Although a comprehensive suite of formal self-assessment processes has been established and many self assessments are being performed and issues are being identified, implementation remains less than fully effective (**see Issue F&I-1**). Some organizations are still not comprehensively and rigorously identifying and evaluating activities, processes, and risks in their assessment planning efforts. Documentation for selection of MSAs and JFAMLAs, such as the planning tool matrix, reflects an end product of proposed

assessments, but not the larger scope of assessment topics and risk analysis and ranking. Although 21 functional area assessments are planned or performed each year, only about three functional areas are reviewed (other than radiation protection, emergency management, and environmental management, which are typically mandatory, requirements-driven assessments). For example, radiation protection was the subject of 12 of the 21 JFAMLAs conducted in 2010, 6 of those planned in 2011, and 12 of the 23 proposed for 2012. As noted in the 2009 ISMS review report, the output mechanisms for functional area managers' assessments of the overall health of their programs based on assessment and performance analysis as specified in the CAS description are not well defined. Although the scheduling and conduct of functional area assessments are more structured in current site procedures and these assessments provide one mechanism, they only exist for a relatively few of the over 40 designated functional areas formally assessed each year.

While most of the management self assessments reviewed by the Independent Oversight team were appropriately comprehensive and rigorous, some were found to be insufficiently documented, thorough, or comprehensive to effectively accomplish the stated objectives of the assessment (**see Issue F&I-1**). For example, three of the sample of ten assessment reports reviewed by Independent Oversight, identified in the IAP and ITS as MSAs, were in fact management work observations. Further, in none of these reports was actual work observed because none was ongoing in the facilities visited by the management team. In one case, a planned review of hoisting and rigging activities consisted of a "demonstration" of "general electronics work" (i.e., a different work type and not a real work activity). In another case, the supervisor performed a walkthrough of a previous work activity where the assessment conclusion was that "workers," not the supervisor, "understood and followed the elements of the work package." In the third case, a worker "demonstrated" a process conducted previously; observing such a demonstration can provide some measure of knowledge, training, and behavior, but it is much less valuable than observation of real-time performance.

The stated purpose and scope in the report of an Engineering MSA for working at heights, for which the scope included hoisting and rigging program and aerial lifts, was "to review as broad a sample of work process and activities... as possible." However, the report did not identify any work observations, and the scope and locations of facility walkthroughs and types of hoisting and rigging equipment examined in the field were not identified. No field inspection of fall protection equipment was documented. No criteria, lines of inquiry, or requirements references were identified in the report. The one issue, cited incorrectly as an observation rather than a deficiency, was inappropriately documented as an action to document the policies and procedures for inspection of fall protection equipment, rather than a statement of what the issue was.

In the self assessment of implementation of the LLNL work control process completed in September 2010, the attention to detail and rigor of performance or issue characterization were not sufficient to identify the type of deficiencies identified through a similar evaluation conducted by the Independent Oversight review team. The 2010 self-assessment, conducted by nine qualified members of the Work Control Review Board, evaluated IWSs, observed work, and interviewed workers and other responsible personnel. It was performed in accordance with the NNSA criteria review and assessment documents (CRADs) and lines of inquiry in the Activity Level Work Planning and Control Processes Guide. Twenty-nine observations, including eight strengths, were identified, and 20 issues were entered into ITS (only four as significance level 3, "action with limited analysis and follow-up," and 16 as significance level 4, "trend/action optional"). However no deficiencies (i.e., non-compliance with requirements) were identified in any of the observations or in the review of 34 converted IWSs. The assessment concluded that the WP&C process was being successfully implemented. Potential weaknesses in the approach to this assessment included selecting IWSs that had been specifically identified in the 2009 HSS ISMS review as being too broadly written in the sample of IWSs reviewed. It would be expected that these documents would have been carefully evaluated and substantially improved during conversion. In

addition, only eight work activities were observed, even though almost 100 interviews were cited, indicating that efforts needed to focus more on implementation and performance.

In some of the assessments that were otherwise generally well written, issues were sometimes poorly characterized, categorized, or documented. For example, in one case the issue, identified as an observation, lacked specificity, stating that "some" IWSs reviewed need to be "updated," when the actual issue was that workers had not completed training or were delinquent in training. Other issues that were identified as separate ITS "observations" reported that three of the five IWSs in the assessment sample needed to be converted to the task based format, without identifying why they had not been previously identified as needing conversion or had not been converted. A JFAMLA report of the implementation of the radiation protection program consisted primarily of descriptions of the content of procedures and IWSs rather than an evaluation of how they were implemented. Some of the specified lines of inquiry were insufficiently rigorous (e.g., "past deficiencies put into ITS and tracked to closure" rather than verifying the adequacy of the actions, verifying implementation, or validating effectiveness). Most of the specified lines of inquiry were not addressed in the text of the report. An issue identified as an IWS that did not adequately identify safety standards and requirements was documented as an "opportunity for improvement" rather than a deficiency. This issue was subsequently entered into ITS, screened as a significance level 4 issue, and closed with no action taken. See Section A.2.2, below, for further discussion of similar issues involving management implementation weaknesses.

Effectiveness reviews, where the adequacy of corrective actions and recurrence controls are evaluated, are not considered formal assessments by LLNL, but are essentially self assessments that are conducted using an assessment approach and documentation. As discussed in the following section, some of these "assessment-like" reports also reflected insufficient attention to detail and rigor in performance to support conclusions.

A.2.2 Issues Management

An effective contractor assurance system must have an established and effectively implemented comprehensive, structured issues management system that provides for the timely and effective identification, risk-based evaluation, and correction and appropriate recurrence controls for process and performance deficiencies and weaknesses. LLNL has appropriately defined and established generally adequate procedures that detail processes and requirements for the various elements of issues management including the overall process of identification, screening, analysis, action plan development, closure, verification and validation. Procedures and guidance are provided for the conduct of apparent and root cause analysis and effectiveness reviews. Formal procedures detail the processes and requirements for identifying, analyzing, reporting, and managing actions for events and injury and illness incidents, as well as reporting and addressing noncompliances with nuclear and worker safety requirements. ITS provides a robust issues management and tracking tool documenting source documents, issues, and the various decisions and response elements in managing the issues and actions. ITS also serves as the source for performance trending data. ITS data is easily manipulated to provide users and managers with concise, pertinent information on issue disposition status to support more effective and compliant management of issues.

Issues are risk ranked into five significance levels ranging from 1 (actions with extensive analysis and follow-up) to 5 (not actionable). Significance levels 1 to 3 require some level of analysis and action, evaluation and actions are optional for significance level 4 issues. In FY 2010 and FY 2011, over 98 percent of issues requiring action were categorized as significance level 3. The significance level appropriately establishes the level of rigor applied to analysis and management of the issues, such as approval authority, the type of causal analysis, extent of condition, verification of action completion, and reviews for effectiveness.

LLNL has established several collaborative boards and committees such as organizational and institutional Operations Review Boards (ORBs) with responsibilities to review, monitor, and approve various element of the management of significant issues. The OEC, composed of operations management representatives from each Principal Associate Directorate and representatives from the ES&H directorate and the CAO, is chartered to review and provide direction for many elements of safety significant issues management. Issues management areas required to be addressed by the OEC include the accuracy of root cause determinations and associated actions, events, adverse trends, institutional issues, Laboratory metrics, and Safety Performance Objectives and Commitments status. Workers have a direct mechanism for identifying and getting resolution of safety concerns and issues through organizational safety committees and the integrating Institutional Grassroots Safety Committee with access to the monthly Senior Safety Committee. These entities serve to improve communication between the organizations at LLNL and the communication of senior management expectations and keep management informed of the status of safety issues and performance.

When issues rise to the level of reporting thresholds to the DOE Occurrence Reporting and Processing System (ORPS) or to DOE as nuclear or worker safety non-compliances, LLNL generally performs rigorous analysis and development of effective corrective actions and recurrence controls. In these cases, LLNL generally applies appropriate priority to ensure timely management to closure.

OSHA recordable cases and first aid cases for worker injuries and illnesses are investigated and OSHA recordable and days away and restricted cases are reported to DOE in accordance with formal procedures. Injury and illness investigations, performed by the injured or exposed worker's supervisor and the safety professional from the assigned ES&H Team, are documented on an electronic Case Analysis Reports (eCAR). The eCAR contains documentation of the details about what happened, to whom, probable causes, recommended actions, and other information needed for case management and reporting to DOE.

Although generally adequate formal issues management processes have been established and many safety issues have been effectively identified, processed, and managed to resolution in the areas discussed above, fully effective implementation of these processes continues to be a challenge for LLNL (**see Issue F&I-2**). Performance deficiencies were identified by Independent Oversight in every element of these issues management processes. Of particular concern are the difficulties management has in effectively monitoring and ensuring that issues are being managed in a timely and adequate manner (i.e., holding personnel accountable for meeting high performance standards), especially for institutional issues that involve both process owners and implementing line organizations. In addition, Independent Oversight identified numerous examples of deficiencies and inconsistencies in managing issues, including improper categorization (i.e., deficiencies identified as observations), improper description of issues (e.g., stated in the form of an action statement or copying multiple findings/results from an assessment into the issue description field), insufficient/inaccurate cause determination (both formal and informal) and extent-of-condition reviews, insufficient specification of recurrence controls, and insufficiently rigorous effectiveness reviews. Following are some examples of these problems:

- Several significance level 2 issues, including issues that were also reported to the DOE Noncompliance Tracking System (NTS) as significant nuclear safety or worker safety and health issues, have not been managed or resolved in a timely or effective manner. An LLNL identified deficiency involving the lack of vendor or engineering documentation reflecting analysis or testing and certification of the capacity of 69 forklift attachments and required marking of capacities on forklifts provides a case study in inadequate management of an institutional safety issue. This significance level 2 NTS reportable deficiency (i.e., violations of OSHA, DOE, and LLNL requirements) was identified in the summer of 2009 and documented in an October 2009 internal independent assessment report on powered industrial truck safety programs. Because of the

indeterminate status of the engineering analysis, capacity certifications and markings on these attachments, there was a potential for exceeding device capacities during use and thus an increased potential for accidents. Although the site issues management procedure requires that significance level 2 issues be evaluated for the need to take mitigating measures, it does not require documentation of this evaluation, and no evaluation was documented in this case. LLNL personnel indicated that no mitigating actions (e.g. taking undocumented/noncompliant equipment out of service until evaluated by Engineering) were taken because a search of LLNL and DOE lessons learned databases did not identify events involving forklift attachments. Independent Oversight considered this undocumented decision to be non-conservative in that the extent of condition was not known for over nine months. At the time of this ISMS effectiveness review, over 18 months after issue identification, the use and status of compliance of these forklift attachments has not been documented in ITS. None of the various response elements to address this safety issue were executed or documented in a timely manner. The issue was not entered into ITS until four months after the report was issued, it took five months before the causal analysis was completed, nine months passed before completion of the extent-of-condition review (which identified 69 noncompliant devices), the issue was presented to the Institutional ORB (IORB) 13 months after report issue, and the corrective action plan was not approved until May 2011 (19 months after report issue). A Safety News "Flash" lessons learned was issued in June 2011, 20 months after report issue.

In addition, the causal analysis for this issue was inappropriately included as part of an analysis of all five issues identified in the report. The analysis distilled the five disparate issues down to a broad issue statement that DOE hoisting and rigging requirements were not being adequately identified or implemented and identified four causes, one of which applied to the forklift attachment issue. This cause was determined to be that Engineering-generated Safety Notes had not been effectively communicated to forklift operators and their supervisors. Safety Notes are LLNL Engineering department analyses of equipment to ensure a safe design; specify testing, inspection, and maintenance requirements; and provide other information necessary to operate the equipment properly. This analysis did not result in determination of a root cause and did not address all elements of the issue (e.g., why the Safety Notes were not effectively communicated; Safety Notes did not exist for at least some, maybe most of these attachments; and there are other means for determining design capacity, such as contacting the manufacturer).

Further, the corrective action plan for this issue did not address the specified cause or provide any recurrence controls. The corrective actions were to disposition each of the noncompliant devices to tag out or dispose of unused devices, obtain approval for use and the capacity for noncompliant devices in use from the manufacturer or Engineering, and to modify or add capacity plates to forklifts describing attachments and capacity modifications.

- In addition, this review team identified other DOE and ES&H Manual requirements that were not being met for forklift attachments at LLNL and not addressed in the evaluation and resolution of this issue. The annual preventive maintenance procedure for forklifts does not address the inspection of attachments as required by DOE Standard-1090-2007, *Hoisting and Rigging*, and Section 15.4 of the LLNL ES&H Manual, *Powered Industrial Trucks*. A review of engineering calculations for some RHWM forklifts and attachments specified the allowable operating load limits, but did not indicate any needed load testing as required by section 10.4.3 of DOE-STD-1090-2007.

These deficiencies indicate a longstanding failure of many persons and organizations, including the IORB, to recognize non-compliant forklift attachments used in many organizations at LLNL as a real safety issue, to identify and address the failure, to take mitigating actions, and to ensure timely and rigorous completion of response elements.

- Other examples of untimely and inappropriate management of significant issues included the following. A significance level 2 boiler safety maintenance issue was identified in September 2008 and put into ITS in November 2009; the cause analysis was completed in June 2010; the corrective action plan was approved three weeks before the cause analysis was approved; and corrective actions were completed two weeks before the action plan was approved. Actions for a February 2008 significance level 2 electrical PPE compliance issue are still open, and no corrective/recurrence actions have been documented in ITS for LOTO violations and issues identified in October 2010 (over nine months from identification).

Despite significant effort by the CAO to assist ORBs with strengthening the oversight of issues management, including observation of meetings of each of the organizational ORBs and providing written feedback on how well the ORBs performed on 26 criteria, CAO determined in a follow-up review to the same criteria that performance had actually degraded for three of the ten ORBs.

The sample of eCARs for work activity related injury and illnesses occurring during 2010 and 2011 reviewed by Independent Oversight exhibited deficiencies similar to those identified in the 2009 ISMS review. These deficiencies included lack of documentation and analysis of work planning and control elements of ISMS (e.g., the work documents used and adequacy, pre-job briefing, and scope changes, and supervision), insufficient causal analysis, failure to address all issues (e.g., late reporting or repetitive incidents or failures of previous corrective actions), insufficient corrective actions (e.g., vague actions such as "ensure" without responsible owners or implementation mechanisms), and inadequate recurrence control (e.g., no linkage to identified or actual causes). Examples of these problems included the following:

- Five personnel were exposed to resin that caused rashes and irritation, including two OSHA recordable cases over a six-day period. Four workers reported to medical on November 2, 2010 with complaints of irritation and rashes. Per LLNL ES&H personnel, symptoms were initially noted by three persons on that day and for one worker they were noted the previous week on October 28th. The eCAR for these cases stated that supervisors had been aware of skin rash problems "for several weeks" (although no workers had reported to Medical, per the case logs) and that the ES&H Team, workers, and management evaluated the operation and "corrective actions were determined and implemented immediately." However, LLNL ES&H personnel stated that work was stopped and corrective actions were initiated on November 2. These actions were specified as new PPE requirements for long sleeve tyvec labcoats and latex or nitrile gloves and use of high efficiency particulate air (HEPA) vacuums. Ten days later (November 12) another worker was sent to Medical with a facial rash, although ES&H personnel stated that the symptoms had first appeared on October 29. The specified corrective action for this case was to ensure workers' compliance with new PPE requirements – none of which would address the facial exposure. The specified corrective actions did not address the late reporting of symptoms or the inaction of supervisors who were aware of the symptoms for some period of time (weeks per the eCAR) to address the problem operationally or to send workers for medical evaluation. Further, there were no new corrective actions to address the exposure of the worker reporting to medical on November 10 who, according to the eCAR was adhering to the new PPE requirements specified 8 days earlier or any evaluation of the effectiveness of the HEPA vacuums in controlling exposure.

- The eCAR for the exposure of two mechanics to high pressure hydraulic fluid when they exceeded the scope of an inadequately planned and briefed sprinkler modification job inadequately addressed the failure to stop work when conditions change and did not address work hazard controls (such as LOTO) or describe work planning documents or pre-job briefings. Further the eCAR specified actions to identify the pipes that will be affected during the pre-job walkthrough without identifying how this was to be achieved and by whom. No preventive actions were specified in the eCAR to

address two other work planning deficiencies cited in the cause fields that "the plan was flawed" and that the planner had not verified the drawings before issuing the plan. This event was reported in ORPs with a better analysis. However, corrective actions focused on identifying piping labeling for other hydraulic elevators on site rather than the work planning performance weaknesses.

The adequacy of corrective actions for Finding MG2.-3/F from the 2009 ISMS review is further discussed in Appendix B.

This review team also identified a number of other similar issues management problems and weaknesses for issues that were identified in various documents (e.g., assessment reports and performance analyses). Some examples included the following:

The ITS is not being effectively used to track the evaluation and resolution of recommendations from parent corporation FMRs, Six Sigma reviews, and formal performance analysis reports. These issues are not being documented in ITS or otherwise monitored to ensure that the results of these comprehensive process improvement reviews are appropriately acted upon.

- The extent-of-condition reviews for two ORPS reportable chemical exposures events were not appropriately focused on the issues. One case involved a skin contact exposure to hydrofluoric acid involving a student who did not report the exposure until the next day, when conditions prompted medical care. The extent–of-condition review was limited to identifying that no other cases of late reporting of exposure or potential exposure to hydrofluoric acid had occurred rather than evaluating if delayed reporting of injuries and exposures had occurred. Another case, involving significant WP&C deficiencies, resulted in two workers being exposed to high pressure elevator hydraulic oil; in this case, the extent-of–condition review was limited to identifying and inspecting piping for all hydraulically operated elevators on site for proper labeling, rather than addressing the extent of condition of the WP&C deficiencies.

- Failure to schedule and perform required monthly inspections of a crane was categorized as a level 4 deficiency, and the action was to schedule and perform monthly inspections. There was no discussion of why inspections were not performed or why operators who were cited as trained and knowledgeable of the requirements for monthly inspections did not identify the issue or perform the inspections (i.e., address the cause).

- A deficiency noting that DAP surveillance records had not been reviewed as required by procedure was addressed by reviewing the records, without any discussion or actions to address why these records had not been reviewed as required (i.e., address the cause).

- The FY2010 ISMS effectiveness review was not sufficiently rigorous. Many of the data sets did not apply (e.g., number of occurrences in each principle directorate and the breakdown of events by category and reporting group), predated the previous review (e.g., emergency management system), had no data (e.g., future activity is "continuous improvement," and the yet-to-be-issued Inspector General audit report of the beryllium program), or presented facts with little or no analysis of how the data reflected ISMS effectiveness (e.g., injury data, regulatory compliance inspections, and the beryllium consent order). The listing and discussion of "improvement areas" documented that actions that could affect ISMS performance had been taken but did not provide useful information on the effectiveness of ISMS or these changes. The description of the approach used to evaluate effectiveness used vague terms, such as "considered" relevant activities and "use of" ISM-related assessments that did not convey how the information was evaluated.

- The recently completed effectiveness review of the corrective actions for the injury and illness investigation finding from the 2009 ISMS review inaccurately determined that the actions for quality of investigations had been effective.

As discussed in Appendix B, many of the corrective actions for the 2009 ISMS review findings and weaknesses were not effective were or only partially effective. These included issues weaknesses and deficiencies directly involving issues management, including documentation of apparent cause determinations and injury and illness investigations. In many of these cases, although the issues were primarily implementation deficiencies, the issues were assigned to institutional functional area managers, and actions too often focused on system owners improving institutional processes, with no actions that directly addressed the inadequate performance issues of line organizations.

A.2.3 Operating Experience

Contractor management has established and effectively implemented formal processes to identify, communicate, and apply to processes and future work activities the operating experience and lessons learned from work activities, process reviews, and incident event analyses occurring at LLNL and in the DOE complex and other external sources. LLNL has established generally adequate formal processes to identify, screen and evaluate, communicate, and act upon internally and externally generated lessons learned. A system description document details the objectives and processes of the LLNL operating experience program; an institutional procedure describes responsibilities and requirements for identifying, communicating, and applying lessons learned; and a CAO procedure describes responsibilities and processes for the site Lessons Learned Coordinator and SMEs to identify, prepare, and distribute internally and externally generated lessons learned. An internal LLNL lessons learned website is maintained by the site Lessons Learned Coordinator. The Coordinator maintains a log of HSS list server published lessons learned documenting the applicability screening results, who was on distribution, and for what purpose. Where local incidents provide immediate learning opportunities that are deemed important enough for quick dissemination without extensive analysis or defined actions, are summarized in documents called a Safety Flash. Independent Oversight observed multiple instances of anecdotal evidence of lessons learned being communicated on bulletin boards, in staff and committee meetings, in work documents, and in pre-job briefings. In addition, the F&I organization develops and distributes internal lessons learned reports communicating opportunities for improvement within their organization.

Although there is much evidence of screening, communication and application of lessons learned from local and external operating experience, weaknesses remain in some elements of the program. The process steps for generating internal lessons learned are not detailed in site level procedures, and the CAO procedure defining the responsibilities and processes for the site Lessons Learned Coordinator to screen, engage reviewers, distribute, and manage lessons learned has not been issued as a site level procedure in the SBMS format although it specifies responsibilities and action steps for parties outside of the CAO. Further, the site level procedure, PRO-87, *Identifying, Communicating, and Responding to Lessons Learned*, lists a variety of responsibilities, but contains no action steps for the Site Lessons Learned Coordinator. The Coordinator's log does not reflect screening of any source documents except HSS list server lessons learned, does not include documentation of feedback from SMEs or other reviewers on applicability or needed action, and does not reflect any feedback on how lessons were further distributed or applied in a more formal manner. Although this log is not required, it provides the mechanism to track and demonstrate implementation of the operating experience program at LLNL. Operating experience data from several sources available on the HSS website and cited in the CAO procedure to be screened by the site Coordinator has not been screened for applicability or use at LLNL. The site LL coordinator was not aware of the websites or availability of subscribing to the DOE Operating Experience Weekly or ES&H Safety Bulletins and Safety Advisories. See further discussion in Appendix B related to inadequate LLNL resolution of Weakness MG.2-3/W from the 2009 ISMS review.

A.2.4 Performance Analysis and Metrics

Line management has established programs and processes to routinely identify, gather, verify, analyze, trend, disseminate, and make use of performance measures that provide LLNL and DOE management with indicators of overall performance, the effectiveness of assurance system elements, and identification of specific positive or negative trends. LLNL has established and implemented a variety of processes for the analysis of data to identify trends, communicate performance information and potential issues to site management, the LLNS Board of Governors, LSO and NNSA. An "LLNL Dashboard," administered by the CAO, provides graphical presentations of the data and analysis of metrics and measures against goals and decision thresholds. Metrics and measures, selected by management and a stakeholders advisory group and approved by the OEC are defined with goals and action thresholds by measure owners, typically functional area and line managers, who monitor and analyze performance data, identify trends, and input results into the dashboard. The dashboard is presented and discussed at the Director's senior mangers monthly performance review meetings.

LSO and LLNL identify, monitor, and report ES&H performance objectives, measures, and targets as part of the annual Performance Evaluation Plan.

The CAO performs performance analysis of ORPS reportable events and below reporting threshold events and has conducted in-depth analysis of performance data for selected topical areas in 2010 and 2011, including bicycle accidents, work planning and control, and hazardous energy control. These analyses identified a number of systemic weaknesses and cultural performance issues and made recommendations to management, organizations, and personnel responsible for these areas or working on addressing related issues. The bicycle accident analysis identified a recommended action that was specified in an eCAR report but had not been addressed. This action, based on the eCAR cause determination, was to investigate buying bicycle pedals with more traction. Subsequently, Fleet Operations replaced the pedals on a significant number of site bicycles.

The following areas related to the implementation of performance analysis at LLNL warrant further evaluation by LLNL management (**see Issue F&I-3**):

- As discussed in Appendix B, the quarterly analyses of ORPS events for recurrence as required by DOE Manual 231.1-2 are still not being done in a timely manner, although alternative topical analyses are being performed and partial ORPS analysis are being conducted.

- As discussed in Section A.2.2, site management has not effectively acted on performance information provided by the CAO related to untimely completion of evaluation, actions, and final resolution of several significant institutional issues.

- The human performance, cultural, and performance issues identified in the special performance analysis reports on WP&C and hazardous energy control were not documented in ITS or directed at any specific owners other than "management." It is not clear whether or how any actions were taken to evaluate or implement these recommendations.

- Although the CAS description states that functional area managers are required to analyze performance measures, metrics, and ITS data for adverse trends and opportunities for improvement, this requirement and an associated output mechanism are not incorporated in site procedures. While a site procedure describes the process to conduct performance analysis, there

are no documents with specific reporting requirements and there is no process for functional area manager analysis (e.g. when, how often, reported how, and to whom).

A.2.5 Contractor Assurance System Conclusions:

The Laboratory has continued to strengthen CAS processes, and the CAO has developed tools and provides data analysis and performance information for management to address areas of weakness and improve performance. New procedures have been issued for some CAS elements to better detail requirements and processes. Many assurance activities continue to be performed in a rigorous and comprehensive manner, and performance has improved since the 2009 ISMS verification. Internal independent assessments are effective feedback mechanisms for evaluating institutional programs, and many MSAs, JFAMLAs, and management observations are providing line managers with essential performance information. The investigation and analysis of operational events are generally thorough, the management of associated issues is comprehensive, and recurrence controls are implemented. Many issues, including opportunities for improvement, are being input to ITS and effectively evaluated and resolved.

However, LLNL continues to struggle with compliant and rigorous implementation of several assurance system elements. The planning and performance of management self-assessments need strengthening and more attention from management. Effective management of ES&H issues, the foundation of continuous improvement, continues to present significant challenges to line and support organizations. One of the major challenges is how to more effectively manage the disposition of institutional issues that cross organizational boundaries and involve both process and line implementation deficiencies. Although some mechanisms have been established to break down barriers in this area and provide more communication, transparency, and management oversight, significant management attention is needed to ensure that assurance system elements are implemented in a compliant and effective manner. Management at all levels must communicate higher expectations for acceptable performance and identify and remove barriers to achieving that high level of performance. Oversight mechanisms such as the organization ORBs, the IORB, and the OEC should be strengthened to provide guidance and leadership in demonstrating expectations and holding personnel accountable. Cultural elements, such as the need for continuous attention to detail, situational awareness, and ownership of issues and institutional responsibilities need to be reinforced by supervision and managers.

APPENDIX B

Status and Evaluation of Corrective Actions from 2009 ISMS Verification Review

OP.2B-2/W: The potential for worker exposure to hazardous gases during building 321/322 complex roof does not have a documented analysis. Ventilation system exhaust streams from welding operations, plating shop baths, and the powder coating oven may contain elevated levels of chromium VI, hydrogen cyanide, nitrogen dioxide, acid fumes, and solvent vapors that may impact workers accessing roofs.

Action and Status: O&B worked with FMD and ES&H to ensure a Roof Access Hazard Analysis was performed and documented on building 321. This documentation has been inserted into the Roof Access Plan that has been developed for B321 and B322. A hazard analysis was not performed on B322, as all operations are shut off when access to the roof is necessary. (Complete/Closed 06/01/2010).

Assessment: This action was completed on schedule. A total of four procedures were developed for this complex to restrict roof access, the construction guide was amended to address roof access, and the hazard control team conducted exposure estimates for the roof tops of these two buildings. Additionally Independent Oversight observed the use of roof access permits in use at other facilities. Furthermore, institutional requirements are contained in the ES&H Manual and requirements for roof access is controlled site-wide through permits issued by facility managers.

OP.3-1/W: LLNL work control requirements were not effectively implemented by one Operations and Business Directorate subcontractor, resulting in a number of uncontrolled hazards and insufficient certification of worker training.

Action and Status: The subcontractor performing this work activity has received an official note of their lack of attention to safety. F&I PMEC performed an assessment to identify opportunities to strengthen the process to ensure contractors provide qualified workers and evaluate the revised Subcontractor Work Control process to ensure that it addresses the observed weaknesses regarding adequacy of task description, hazard identification and controls. These issues are addressed in OP.3-5/OFI and OP.3-8/OFI, and corresponds to ITS entries 30309.8 and 30309.11 where the actions taken are documented in detail. (Complete/Closed 04/15/2010).

Assessment: This action was completed on schedule. Revisions have been made to the ES&H manual section related to managing subcontractors, the general safety provisions of the LLNL Facility Specifications and the LLNL Facilities & Infrastructure Construction Manual. Additionally subcontractor training was augmented to address this issue.

OP.3-2/W: Insufficient specificity of some Operations & Business Directorate Maintenance Utilities Services Department integrated work sheet controls and the ineffectiveness of some training of maintenance craft workers have resulted in some instances of work control deficiencies or observed unsafe work practices.

Actions and Status: Specific actions related to this Weakness are captured in the following OFIs

OP.3-1 thru OP.3-4, OP.3-6 and OP3-7/OFI. This corresponds to ITS entries 30309.4, 30309.5, 30309.6, 30309.4, 30309.9 and 30309.10, respectively. The actions will be tracked to closure at those ITS entries. (Complete/Closed 06/01/2010).

Assessment: The actions reviewed indicate that there has been significant effort made in review and revision of many of the Trade/Service IWS(s) to include hazards and general controls, as well as, the inclusion of information such as the status of each approved worker's medical monitoring requirements observed as missing either during the 2009 ISMS verification review or subsequent internal assessment(s). Additionally, corrective actions have resulted in the conduct of Management Self assessments and numerous IH surveys and/or assessments to document and/or support hazard analysis and decision making for requisite controls. However the continued observation of work planning and control deficiencies during the conduct of LSO assessment of MUSD, work as well as this assessment raises concern as to the effectiveness of actions taken and/or the effectiveness review process for the actions as implemented. As such Independent Oversight considers this item to have been prematurely closed, and should be re-evaluated as part of any action to address new issue WPC-1.

MG.1-1/W: Use of risk criteria in the Facilities and Infrastructure Work Control Manual results in much of the maintenance work performed by F&I being assigned a lower risk category than specified by Document 2.2.

Actions Status: F&I Work Control Manual has been updated to identify Dispatch work activities as WAL A and WAL B. Each MUSD and EMD Division manager and Planners have reviewed the Dispatch Work Activities to ensure their accuracy. Some changes have been included in the updated revision of the manual. Changes have been communicated to affected work areas. (Complete/Closed 02/24/2010).

Assessment: This action was completed on schedule. Revisions have been made to the F&I Work Control Manual section and communication to effected individuals was confirmed through the use of notification of revisions, emails and conduct of briefings.

OP.2B-1/W: Powder Coating Hazard Analysis, Within the Science and Technology Directorate engineering activities, some hazards have not been adequately identified and analyzed for powder coating activities in TRED and, where hazards have been identified, sufficient controls have not been implemented.

Actions and Status: Review Personal Protective Equipment and medical surveillance requirement for B321B Powder Coating operations. Develop additional controls if appropriate. Review HAC associated with B321B Powder Coating operations for consistency and adequacy. Develop additional controls if appropriate. Analyze B321B Powder Coating operations for out-gassing of toxics during oven operations. If any additional hazards are defined develop appropriate controls. Analyze B321B Powder Coating Booth ventilation performance. If any additional hazards are defined develop appropriate controls. As determined by previous reviews, implement any additional procedures or controls identified. Review, update and release of IWS1096.07 completed. Summary of IWS Revisions: Scope of work edited to be more descriptive and complete. Converted to Task Based system. Attached the Powder Coating Air Sampling report HCD-T2-10-068. Updated PPE requirements and clarified statements (noise, gloves, shop coats) based on Air Sampling report/assessment. Updated chemical and explosive hazard controls based on the Air Sampling report/ assessment. A Work Observation was conducted on 12/14/10 which included a review of the

new IWS, worker training status, discussion with the RI, Alt RI, and workers, and a walk through of the work area and observation of powder coating work activity. Significant process and control improvements based on Actions 2-7 were determined to have been effectively implemented. All aspects of this work activity were found to be effective in the application of ISMS, work controls and ES&H requirements. (Complete/Closed 09/02/2010).

Assessment: This action was completed on schedule. Identified items were implemented through IWS revision, Additionally conduct of IH review and sampling of the powder coating activities in B321B resulted in the issuance of six required actions which have all been subsequently addressed, however the report also contains one recommended action to "purchase powder coating paint products that are free of 1,3,5-triglycidyl isocyanurate. This chemical can cause allergic contact dermatitis, respiratory sensitization, asthma, eye irritation, and is a known male reproductive hazard (i.e., mutagen). Cardinal manufactures powder coating materials that do not contain this substance." The status of this proposed "Recommended Action" is not addressed in the closure and the extent of this recommendation to the other major powder coating users at the LLNL was not addressed. The powder coating operations within MUSD utilizes paint materials containing the same 1,3,5-triglycidyl isocyanurate constituents.

SME.1-1/F: The radiological work authorization process (IWSs, work permits, etc.) has not always ensured that radiological hazards are fully analyzed and controls clearly identified, tailored to specific work, and conveyed to workers prior to releasing work, as required by Documents 2.2, 20.1, 20.2 and 10 CFR 835.

Actions and Status: ES&H Manual Document 20.2 was revised to explicitly reflect the requirement of DOE-STD-1098 which requires a written work authorization for work that could create contamination in an area otherwise free of radiological contamination. The Radiation Safety Section also developed procedure HP-FO-103 *Radiological Review of Technical Work Documents* to provide guidance to health physicists regarding minimum radiological expectations for technical work documents that provide radiological controls. (Complete/Closed 6/1/2010)

Assessment: The corrective action was not fully effective in resolving weaknesses in proper specification of radiological controls, particularly for work covered by an IWS. A key action item for resolution of this finding was the development of procedure HP-FO-103, *Radiological Review of Technical Work Documents*. This document was developed and became effective June 14th 2010, after ES&H Team health physicists were briefed on its purpose, content and use. While the document successfully conveys the institutional expectations with regard to radiological work authorizations, similar problems as those seen in 2009 were identified during this review, calling into question the quality of the independent verification of effectiveness used to formally close the finding. As such Independent Oversight considers this item to have been prematurely closed, and should be re-evaluated as part of any action to address new issue CAS-2.

SME.2-1/F: The IH workplace exposure assessment program for assessing and documenting workplace exposures in LLNL plant areas (i.e., facility baselines) and work activities (i.e., IWS activities) is a work in progress and has not been sufficiently planned and/or implemented to fully meet the workplace exposure assessment requirements of 10 CFR 851.

Actions Status: A baseline schedule has been completed including IH Baselines to be finalized by contractors and teams. The baseline schedule includes appropriate resources to accomplish/meet the

deadlines. Contractor resources have been aligned with team resources to ensure adequate completion. (Complete/Closed 04/02/2010).

Assessment: This action has been closed based on a schedule and identification of resources as provided for in the LLNL action tracking process. Additionally, for Calendar Year (CY) 2011, LLNL started the year with 46 periodic baselines scheduled. Based on when the previous surveys were completed, they decided to move 5 of those surveys to CY 2012. To date (58% of the way through the CY), 29 surveys have been completed (63% of the surveys), with 24 of these having final reports written. ES&H has identified 28 deficiencies and 14 observations from the completed surveys. Deficiencies identified were in turn entered into the action tracking process.

MG.2-1/F: LLNL has not performed timely, quarterly analyses of events as required by DOE M 231.1-2, *Occurrence Reporting and Processing of Operations Information*.

Actions and Status: This issue was addressed as an observation from a previous management CAO self assessment. The action was to issue a performance analysis report for the period ending 12/31/09 (issued in January 2010). The action was closed in January 2010. A CAO "verification" statement posted in ITS on July 5, 2011, stating that timely completion of the required analyses were challenging due to resource availability and describing a CAO management decision to conduct several targeted, in-depth analyses of events in areas of concern to LLNL management (i.e., control of hazardous energy in September, 2010, work planning and control in November 2010, and bicycle accidents in January 2011) instead of the quarterly ORPS and non-reportable incident analyses required by DOE M 231.1-2. This policy decision was documented in an internal CAO memorandum dated May 4, 2011. (Complete/Closed 1/28/2010)

Assessment: The corrective action did not prevent recurrence of the deficiency in 2010 as there were no recurrence controls. However, the three cited targeted performance analyses were comprehensive and rigorous, identifying a number of causal factors for consideration by others addressing institutional problems in these areas. In addition, in 2011CAO did perform limited analyses of occurrences with reports written in April, June, and July covering 2010 events and the two calendar quarters of 2011.

MG.2-2/F: LLNL issues management procedures are not effectively implemented so that issues are accurately documented, issue types are properly classified, causes are identified and addressed, and so that effectiveness reviews, when performed, accurately determine whether corrective actions have been fully effective in addressing the issue as required by DOE O 226.1A, *Implementation of Department of Energy Oversight Policy*, and LLNL PRO 0042, *Issues and Corrective Action Management*.

Actions and Status: 1) The CAO office instituted a mentoring process to provide feedback to organization ORBs regarding the implementation of their issues management responsibilities specified in procedure PRO-0042 their review and handling of issues, 2) Revised PRO-0042 to add issue screening information action steps for determining if issues are "systemic" or "repetitive" (a single Y/N field in ITS) and definitions for these terms (see same action in MG.2-2/W) and, 3) Revised PRO-0042 to require that a root cause analysis or a "symptom/problem/cause" analysis be performed prior to developing corrective actions as a prerequisite for conducting effectiveness reviews. This last action has since been included in a prerequisites section of PRO-0077, *Conducting an Effectiveness Review*. (Completed/Closed 6/30/2010)

Assessment: These corrective actions have not been effective in preventing recurring deficiencies in the implementation of a fully effective issues management program. See Appendix A for the analysis of the effectiveness of the LLNL issues management program.

MG.2-3/F: The investigation and corrective and preventive actions for occupational injuries and illnesses were not sufficient, in many cases, to ensure that causes are adequately identified and appropriate corrective actions and recurrence controls established and implemented as required by DOE O 226.1A, *Implementation of Department of Energy Oversight Policy*, and LLNL ES&H Manual Document 4.5, *Events: Notification, Analysis, and Reporting*.

Actions and Status: Posted examples of eCARs that were considered to reflect appropriate documentation of rigorous investigations on the ES&H intranet site and discuss these examples with PAD assurance managers and with industrial safety professionals responsible for participating in injury and illness investigations. (Complete/Closed 7/28/2010)

Assessment: The actions taken were not fully effective. A sample of eCARs for work activity related injury and illnesses occurring during 2010 and 2011 reviewed by Independent Oversight exhibited similar weaknesses including lack of documentation and analysis of work planning and control elements of ISMS (e.g., the work documents used and adequacy, pre-job briefing, and scope changes, and supervision), insufficient causal analysis, failure to address all issues (e.g., late reporting or repetitive incidents or failures of previous corrective actions), insufficient corrective actions (e.g., no implementation mechanism or responsibility), and inadequate recurrence control (e.g., no linkage to identified or actual causes).

MG.2-1/W: LLNL organizations have not implemented a robust, credible, risk-based management self-assessment program that includes a formal, structured, risk-based process that identifies activities, facilities, processes, management systems, risk levels, and prior performance/events that prioritizes these elements, and produces rigorous self-assessments that evaluate processes and performance and drive continuous improvement.

Actions and Status: 1) Issued formal procedure for management observations, verifications and inspections (MOVIs) describing expectations for conducting, documenting, and managing results from assessment like activities that are less formally planned and documented than internal independent assessments, management self-assessments (MSAs) , joint functional area manager and line (JFAML) assessments. 2) Revised the Institutional Assessment Plan procedure to "recommend" that organizations and functional area managers consider their work activities, facilities, processes, management systems, risk level, prior performance/events to prioritize assessment activities and updated the planning tool to support these considerations. 3) Revised the procedure governing MSAs to define minimum criteria for report content, established training for conducting MSAs, and offered an option workshop on conducting MSAs. (Completed/Closed 4/22/2010)

Assessment: The actions taken were partially effective. The process documents now provide more guidance on proper assessment planning and the availability of training can enhance assessment performance. More management observations are being performed in many organizations and often these activities are identifying ES&H issues that are being entered into ITS for tracking to resolution. However, based on a review of the FY2010 and FY2011 IAP and a limited review of organizational planning documentation, it is no apparent change in the rigor applied to comprehensive assessment planning and few ES&H related MSAs and discretionary JFAML assessments are being scheduled by some organizations.

MG.2-2/W: Although the LLNL issues management procedure requires that, for significance category 3 issues, issue owners conduct an apparent cause review and develop corrective actions that address the identified causes, it does not require the documentation of the analysis results.

Actions and Status: Revised PRO-0042 to add issue screening information action steps for determining if issues are "systemic" or "repetitive" (a single Y/N field in ITS) and definitions for these terms. This action was established by IORB rather than documenting the identified causes for "lower significance" (e.g., level 3) issues. (Completed/Closed 6/30/2010).

Assessment: The action taken was not effective. The action taken only addresses a small subset of issues that require apparent cause determinations and still does not require any statement of the identified cause(s) or cause coding. Therefore, it does not provide any benefit to enhancing effective preventive action development that a simple statement of the cause determination would provide. In 2010 and 2011, "lower significance" Level 3 issues comprise approximately 98.5 percent of LLNL issues requiring action and well over 99 percent of all issues entered into ITS. However, because NTS and ORPS reportable issues require casual analysis, approximately 13 percent of Significance Category 3 issues have had cause determinations documented. Further, although general definitions and guidance are provided in PRO 0042 for "systemic/repetitive" issues, there is no direction or guidance to address the level of effort to be applied, or the scope, or mechanisms to use in determining if the issue is systemic or repetitive (e.g., look within the organization or beyond, search of ITS or other data sources, for what period).

MG.2-3/W: Implementation of the LLNL lessons learned program does not sufficiently demonstrate that external operating experience data is being sufficiently screened, evaluated by subject matter experts, and applied to safety processes when appropriate.

Actions and Status: The action taken was to "revise the lessons learned procedure to ensure external operating experience is reviewed, incorporated and documented." (Completed/Closed 7/20/2010).

Assessment: The action taken was not effective. Although the CAO procedure for identifying, preparing, and distributing LLNL Lessons Learned, not yet issued as an institutional procedure in the SBMS format, identified HSS operating experience source documents such as Operating Experience Summaries, ES&H Safety Bulletins, and Safety Advisories, the Lessons Learned Coordinator had not been screening them (they were not included in the database of screened information) and was unfamiliar with these sources and their location on the HSS website. These were the specific examples of DOE source documents not being screened cited in the 2009 HSS ISMS review.

APPENDIX C

Status and Evaluation of Corrective Actions for 2010 DNFSB WP&C Issues

The Defense Nuclear Facilities Safety Board (DNFSB) forwarded work planning and control deficiencies at NMTP facilities to NNSA in June 2010. The Laboratory responded to NNSA with planned and completed actions in August 2010 and these actions were later forwarded to the DNFSB in September 2010. The NMTP plans and schedule commitments were based upon an NMTP assessment of the DNFSB deficiencies and a gap analysis of the NMTP Work Control Requirements and the LLNL Institute-Wide Work Control Process Requirements. A summary of observations regarding the progress/completion of LLNL commitments follows:

- Task Based Hazard and Control Tables have been established for most Superblock OSPs and the remaining (low risk) OSPs are due to be completed by December 31, 2011. Established tables are comprehensive and effective in communicating identified hazards and established controls with specific tasks. An initiative to better link hazards and controls within OSPs was undertaken through development of task, hazard, and control tables as appendices to all OSPs. This appears to be an effective cross reference, but as noted in Appendix A of this report, similar initiatives have not been undertaken for FSPs, which could benefit from a complete linkage of OSP-related hazards and controls, or for IWSs and work permits where multiple and discrete tasks are within the defined scope of work. Finally, there are continuing problems with proper specification and clarity of controls within IWSs and/or work permits, particularly with respect to radiological controls and industrial safety/hygiene controls.
- The NMTP Work Control Manual has provided detailed instructions to work planners with a common work permit form for RHWM and Superblock. Implementation instructions are provided in an Appendix to the Manual and systematically addressed by the NMTP organization. The Manual also details expectations for procedures and work instructions in work permits, OSPs and change requests. Engineered and administrative controls are used effectively and extensively throughout NMTP facilities to control activity-level hazards. OSPs govern most of the operations work in Superblock facilities; these documents are generally of high quality and contain detailed and lengthy discussions of programmatic work to be performed, along with discussion of potential hazards and associated controls
- NMTP was observed in the conduct of meetings for change requests and work permits. These meetings are part of the compensatory measures employed until all OSPs are modified. These meetings are providing effective mechanisms for implementing the work planning requirements and reaching sound decisions.
- The prioritized update of Superblock OSPs has proceeded on or ahead of schedule with compensatory measures in place. LLNL reports that these compensatory measures are intended to remain as permanent improvements to the work planning and control process.
- NMTP is behind schedule in implementing a database search capability for providing feedback and lessons learned data to responsible individuals as work permit modifications are developed. Beta testing of the electronic permit process and population of the database is in progress for a system that was promised in March 2011. Full implementation is expected in December 2011.
- Finally, NMTP Work Permit Review Team members are trained to Hazard Analysis Techniques. A course was offered in July 2010 and currently, three subject matter experts from ESH Team 1 are not trained. Additional training for all Work Control Team members was released on July 9, 2011 and is a further improvement to establish fully functional teams.

Implementation of the LLNL WPCP is generally effective but, as discussed in Appendix A, further improvement is needed. For example:

- FSPs and OSPs are used in Superblock as required by the WPCP to describe and bound facility-wide operations and specific programmatic activities, respectively. IWSs are also used to define work scope in some NMTP facilities such as RHWM and work permits are used in all NMTP facilities to define the scope for Category D work. Work scopes contained in FSPs, OSPs, and work permits are generally well defined and sufficiently detailed to identify hazards and controls for activity-level work. In some cases, particularly when work is controlled by an IWS, the work scope and span of control are too broadly defined to allow effective analysis of hazards at the task level, resulting in inadequate specification of controls. As a result, controls listed in the IWS were either too generic and/or require the worker to evaluate hazards, select from a wide range of generic controls, or request verbal direction from ES&H before or during performance of the work. **(See Issue WP&C-2.)**
- SMEs are involved in work planning and control as required by the WPCP. Pre-job briefings are professional and informative about tasks, hazards, controls, and work flow. Although most hazards associated with work observed by the Independent Oversight review team were properly identified and analyzed, there were isolated examples in OSPs and work permits where hazards were not fully and effectively identified. More systematic examples of hazard analysis weaknesses were evident for work controlled by IWSs, resulting from problems with effective implementation of institutional requirements.

Notwithstanding some weaknesses in approved work control documentation, observations indicated that performance of assigned work activities was in accordance with the approved specifications.

APPENDIX D

Recommendations

Work Planning and Control Recommendations

MUSD

1. **Improve the quality and completeness of information provided to workers and supervisors in order to enhance both safety and efficiency. Specific actions to consider include:**
   - Revise the existing work order processes to provide workers and supervisors with information which further details work steps for workers to ensure appropriate controls (e.g., lockouts, PPE) and provide system information prior to the conduct of field assignments. Currently, workers, in many cases, must self-identify such information, often causing delays and potentially resulting in safety vulnerabilities.
   - Populate the existing PM Windowing equipment maintenance databases (e.g., PM procedures provided to workers and supervisors) with equipment-specific LOTO procedures, panel schedules, arc flash calculations etc.

2. **Strengthen analysis and control of arc flash hazards. Specific actions to consider include:**
   - Ensure workers provide feedback of locations where arc flash posting are either missing or study information is not available and provide information or post as appropriate.
   - For areas identified as needing redress, prepare labels as part of routine PM activities (and/or corrective maintenance as appropriate), since this information is required for PM conduct. Adding this information to both the PM database and the actual location will keep workers from having to track this information down so often. For properly marked installations, qualified workers would need only to confirm there have been no configuration changes or sources of back-fed energy.
   - Consider use of a check-list or other documentation method to ensure briefings conducted include all the appropriate information including EH&S requirements, and workers understand hazard and requisite control information presented.

3. **Strengthen the current hazard identification efforts conducted by work planners and by Facilities Point of Contacts. Specific actions to consider include:**
   - For multi sub task work activities, consider treating these as complex work to avoid the pitfall of one skill of the craft activity generating additional hazards, which were not considered in the planning process.
   - Further integrate information about the work location hazards provided by Facility Point of Contacts (either contained in permits or through activity specific IWS development) with planning efforts conducted by individuals assigned to work planning to ensure activities are evaluated for potential hazards, through analysis, anticipation, elimination and/or mitigation of potential hazards.
   - Consider conducting activities such as joint walk-downs by work planners, FPOCs and coordination with the crafts to identify and control hazards.
   - Consider additional training of MUSD line management and FPOC(s) in the conduct of pre-job briefing process, which not only reviews maintenance tasks to be performed, but also reviews salient IWS or other work permit (i.e. hot work, fall protection, etc.) hazard controls; any

established ES&H hold points (i.e. required ES&H monitoring, fall protection controls etc.); facility specific health and safety requirements.

- Consider use of a check-list or other documentation method to ensure briefings conducted include all the appropriate information including ES&H requirements, and workers understand hazard and requisite control information presented.

NMPT

4. **Improve implementation and quality of IWSs and work planning within NMTP. Specific actions to consider include:**
   - NMTP should consider performing an extent of condition to determine the causes and extent to which deficient IWS's are being used to control work. Compensatory measures and additional corrective actions should be evaluated and considered.
   - RHWM should consider using Category D work permits or other mechanisms such as waste processing plans as subordinate work control mechanisms if broadly written IWSs are used to control work with variable hazards and controls
   - RHWM should consider strengthening requirements in procedures such as FRE 106 to ensure consistency of subordinate work control mechanisms with Document 2.2 requirements.
   - NMTP should consider extending its work permit meeting structure to include work planning efforts associated with development of IWS's.
   - NMTP should consider developing task, hazards and control tables for FSPs which are also used to control some hazardous activities, and to IWS's.
   - NMTP should consider creating separate work packages for each glovebox maintenance activity to ensure task specific hazard analysis and assessment of actual radiological hazards prior to performing the work. Alternatively, the existing work permit should be modified to include a hold point for assessment of glovebox contamination levels prior to removal of access panels. Swipes of the glovebox interior could easily be taken and analyzed to ascertain contamination levels and therefore improve the specification of radiological controls before breaching containment.

Institutional

5. **Improve implementation of institutional work planning requirements. Specific actions to consider include:**
   - LLNL should consider evaluating root causes for inconsistent/incomplete implementation of important ES&H Manual Document 2.2 requirements, and determine appropriate corrective actions. Specific examples of concern that should be addressed include:
     - IWS changes that meet criteria for major changes are being processed as minor changes without review and concurrence of ES&H
     - Information such as hazards and controls from divisional documents or procedures are not are being properly extracted, attached and or linked to the governing IWS and included in the IWS hazard analysis and control output
     - Work scope and span of control is sometimes too broad to permit effective work planning and tailoring controls to specific hazards

   - LLNL should consider revising Document 2.2 to include a prohibition on the use of open ended controls, the use of which anticipates and requires worker hazard analysis and request for additional SME review and verbal direction during work. Additional requirements and

clarification should be considered with respect to the difference between and proper use and meaning of hold points, with work able to continue, and a suspension limit or boundary, where work cannot proceed under the IWS is revised.

- LLNL Industrial safety/Industrial hygiene should consider development of procedural guidance for ES&H team members responsible for preparing IWSs, and should also consider a prohibition on open ended IH/IS controls.
- LLNL should undertake a formal effectiveness review of closure to Finding SME 1-1 from 2009. This effort is needed to determine extent of condition with regard to ineffective implementation of HP-FO-103 by ES&H Team members across the site, and to implement any additional corrective actions needed.

Contractor Assurance Recommendations

1. **Strengthen implementation of the self-assessment program to ensure that safety programs, topical areas, management systems, and work activities are rigorously assessed and documented on an appropriate frequency. Specific actions to consider include:**
   - Establish an independent review process and/or a cadre of trained and qualified reviewers to provide feedback on self assessment performance and documentation quality to performers, reviewers and approvers.
   - Include a quality review of a sampling of self assessment reports to the responsibilities of ORBs.
   - Include review of organization assessment planning tool content and assessment selection processes to ORB responsibilities to ensure full scope of activities, risks, processes, past performance, performance and available resources are being appropriately evaluated in determining assessment priorities, selection, and scheduling.

2. **Strengthen implementation of the issues management program to ensure safety problems are more rigorously evaluated for causes and extent of condition and that appropriate and effective corrective actions and recurrence controls are identified, implemented and confirmed. Specific actions to consider include:**
   - Revise PRO-0042 to require a statement of the result of the cause analysis to promote linkage of actions to causes for recurrence control.
   - Perform Six Sigma process improvement analysis to improve the rigor and timeliness of the management of high significance and institutional level issues that will address the interface and cooperation between functional area managers and implementing organizations.
   - Revise PRO-0042 to provide guidance on the scope (i.e., institutional or organizational), mechanisms (e.g., search of ITS) and expected level of effort (e.g., time period or source/mechanisms) to be applied to making categorization decisions on systemic or repetitive issues.
   - Establish review mechanism for SME(s) to monitor and provide feedback on the quality of line management implementation of response elements such as causal analyses, extent of condition reviews, and effectiveness reviews.
   - Document issues and recommendations from performance analysis reports, FMRs, and Six Sigma analyses into ITS to ensure assignment to an appropriate owner and to provide a documented evaluation and disposition.
   - Revise the eCAR fields to better conform to current terminology and concepts of ISMS and establish an independent SME review of the quality of completed eCARs before approval.

3. **Strengthen the implementation of the operating experience program to provide greater assurance that the lessons are effectively applied to improve processes and programs and applied by end users. Specific actions to consider include:**
   - Establish more formal expectations and/or strengthen the procedure to ensure feedback on use is provided to the site Lessons Learned Coordinator.
   - Use the site Lessons Learned Coordinator's Log to document screening of sources other than lessons from the HSS list server and to document a summary of responses from SME reviewers and to document feedback on how lessons were applied by users.

4. **Provide necessary resources for conducting event performance analysis to ensure that the required analysis and reporting to contractor line management and DOE specified in DOE M 231.1-2 are performed.**

APPENDIX E

Documents Reviewed, Interviews and Observations

WP&C-Maintenance & Utilities Service Department

Documents Reviewed:

- Maintenance & Utilities Service Department Craft IWS(s)
- Building U325 Heavy Equipment corrective maintenance work package
- Building 543 Electrical modification work package
- Building U424 High Voltage breaker testing preventive maintenance work package
- Building 439 HVAC Compressor replacement maintenance work package
- Building 391 Heavy Equipment Joy Fan preventative maintenance work package
- Building 691 Semi-Annual fan preventative maintenance work package
- Building 691 Heavy Equipment Condensing Unit preventative maintenance work package
- Building 368 Exhaust Fan Facility Modification maintenance work package
- Building 418 Powder Coating Application and facility walkdown
- ES&H Manual, Document 2.1, *General LLNL Worker ES&H Responsibilities*
- ES&H Manual, Document 2.2, *LLNL Institution-Wide Work Control Process*
- ES&H Manual, Document 11.1, *Personnel Protective Equipment*
- ES&H Manual, Document 12.6, *LLNL Lockout/Tagout Program*
- ES&H Manual, Document 16.1, *LLNL Electrical Safety Program*
- LLNL-MI-416189, *Tools for Identifying and Analyzing Task and Area Hazards Selecting Controls*
- MAN-GWM-0004, *LLNL Facilities and Infrastructure Skill of the Craft Manual*
- MAN-GWM-0003, *LLNL Facilities and Infrastructure Work Control Manual*
- LLNL-MI-413381, *LLNL Safety Toolbox*
- MANOPS-004 (Rev-0), *High Voltage Operations Manual*
- Management Self-Assessment of LLNL Work Control Process
- MUSD Noise Study-High Voltage Shop

Interviews:

- Designated responsible individuals and persons in charge for maintenance work
- Facility Managers, at various Buildings
- ES&H Team 2 Industrial Hygienist
- Work Control Review Board members
- Maintenance & Utilities Services Department Fall Protection Subject Matter Expert
- Maintenance & Utilities Services Department Safety Officer
- Maintenance & Utilities Services Department heavy equipment mechanic
- Maintenance & Utilities Services Department heavy equipment supervisor
- Maintenance & Utilities Services Department Work Control Subject Matter Expert
- Maintenance & Utilities Services Department Low Voltage electrician
- Maintenance & Utilities Services Department painter
- Maintenance & Utilities Services Department High Voltage electricians
- LLNL Hazards Control, Electrical Safety, Lockout/Tagout Subject Matter Expert
- Maintenance & Utilities Services Department HVAC mechanical worker
- Maintenance & Utilities Services Department HVAC mechanical supervisor

- Maintenance & Utilities Services Department Fleet Maintenance worker
- Maintenance & Utilities Services Department Fleet Maintenance supervisor
- Maintenance & Utilities Services Department Hoisting and Rigging worker
- Maintenance & Utilities Service Department Hoisting and Rigging supervisor

Observations:

- Installation of conduit for the Building 543 facility modification
- Heavy Equipment core drilling, anchor bolt removal and replacement facility Modification corrective maintenance Building U325
- HVAC preventive maintenance Building 691 Semi-Annual fan preventative maintenance
- LOTO for Building 691 Heavy Equipment Condensing Unit preventative maintenance
- High Voltage breaker testing Building U424
- Exhaust fan troubleshooting Building 663
- HVAC compressor replacement Building 439
- Heavy Equipment Joy Fan preventative maintenance Building 391
- HVAC Condensing Unit preventative maintenance, breaker lockout/tagout (LOTO) and testing Building 691
- Exhaust Fan Facility Modification maintenance breaker lockout/tagout (LOTO), air gapping, roof access and fall protection planning, Building 368
- Powder Coating Application and facility walk down Building 418

WP&C-Nuclear Materials Technology Program

Document Reviews:

- LLNL-AM-47919 WCI NMTP Work Planning and Control Manual, March 2011
- LLNL-AM-405814 LLNL Institute-Wide Work Control Process Requirements, July 30 2008
- NMTP OSP Development and Implementation Guide, 60% Draft, June 2011
- MM-001 Radioactive and Hazardous Waste Management (RHWM) Maintenance Manual, April 2011
- NMTP Work Permit B696-10-C-153, Container Crushing Unit Operation, 10-18-10
- NMTP IWS#15242.02 for Container Crushing Unit Operation, 4-5-11
- NMTP Work Permit RHWM-11-D-095, RHWM Maintenance – Programmatic Equipment, 7-12-11
- NMTP Work Permit RHWM-10-W-088, RHWM Maintenance – Programmatic Equipment
- NMTP Work Permit 332-10-C-002, OSP Activities, 11-1-10
- Operational Safety Plan (OSP) 332.002-06 Change Memo, 6-8-11
- Operational Safety Plan (OSP) 332.002-05 Change Memo, 12-15-10
- Operational Safety Plan (OSP) 332.002-04 Change Memo, 10-18-10
- NMTP Work Permit 332-11-C-0249, OSP Activities (Room 1378 previously 332.005), 5-31-11
- NMTP Work Permit 332-10-C-005, OSP Activities (Room 1378), 12-28-10
- Operational Safety Plan (OSP) 332.005-01 Change Memo, 12-28-10
- NMTP Work Permit 332-10-C-184, OSP Activities (Room 1378), 11-2-10
- Superblock Off-Hours Work Request, Fire Suppression System 5 Year Check Valve Inspection, 4-6-11
- Superblock Off-Hours Work Request, Circuit Breaker Maintenance B335 Panel 1080A1-22 and 1094A, 4-6-11
- Superblock Off-Hours Work Request, Replace AC Compressor, 4-7-11
- Building 332 Daily Activity List for Tuesday, July 12, 2011

- Buildings 239, 334, 331, and Superblock Yard Weekly Activities List for July 11-18, 7-11-11
- Facility Change Request List for 2011 in Superblock, 7-7-11
- 2011 History Log of planned/completed Work Permits for FY12Q3, 7-7-11
- Course Completion Log for Hazard Analysis Techniques, 7-11-11
- NMTP B332 Daily Work Team Meeting Summary Log for July 12, 2011
- NMTP Standing Order for Defining Scope of Work in Work Control Documents, 9-17-10
- RHWM Standing Order for Work Control, 1-8-10
- RHWM Standing Order Extension for Work Control, 1-4-11
- Letter from Don Cook (NA-10) to Peter Winokur (DNFSB), September 9, 2010
- Letter from Bruce Goodwin (LLNL) to Alice Williams (LSO), LLNL Response to issues identified in the DNFSB letter on Activity Level Work Planning at LLNL as directed by LSO, August 9, 2010
- Letter from Alice Williams (LSO) to Thomas Gioconda (LLNL), Recent Operational Events and Work Control Implications, August 31, 2010
- Letter from Thomas Gioconda (LLNL) to Ronna Promani (LSO), Contract DE-AC52-07NA27344, Clause I-091, Integration of ES&H into Work Planning and Execution, April 29-2011
- LLNL Fiscal Year 2010 Integrated Safety Management System (ISMS) Effectiveness Review, May 2011
- Superblock OSP Priority Listing, 10-1-10
- Record of Course Completion for HS8011, Hazard Analysis Techniques, (2003-2011), printed 7-11-11
- B132N IWS #16523, High Explosives Analytical Laboratory, Proposed 7-3-11
- RHWM IWS 1345.09 r5 Waste Sampling Operations 7-15-11.
- B331 Work permit 331-10-D-048 –Remove/Install Glovebox Window access Panels 7-14-11
- B332 Room 1006 OSP 332.194 General Glovebox Operations
- B 332 Work Permit 11-D-0079 Decontaminate and/or Replace Gloveport Plugs Rooms 1010 and 1006
- B332 Work Permit 332-11-D-0236 Install Glovebox Flush Gas Supply Orifices in Room 1353

Interviews:

- Program Leader, Nuclear Materials Technology
- NMTP Operations and Engineering Manager
- NMTP Safety Officers
- NMTP Safety and Work Control Manager
- NMTP QA and Configuration Management Manager
- NMTP Training Manager
- NMTP Conduct of Operations Manager
- NMTP Fissile Material handlers
- RHWM Facility Manager
- RHWM Division Leader
- RHWM RIs and AIs
- RHWM Safety Officer
- LLNL Radiation Protection Functional Area Manager
- ES&H Team 1 Managers
- ES&H Team 1 Health Physicists

Observations:

- RHWM IWS 1345.09 r5 Waste Sampling Pre-Job Briefing 7-15-11
- RHWM IWS 1345.09 r5 Waste Sampling Operations 7-15-11.
- RHWM IWS 15241.01.01r2 Waste Handling and Shipment
- B331 Work permit 331-10-D-048 –Remove/Install Glovebox Window access Panels Pre-job Briefing 7-14-11
- B331 Work permit 331-10-D-048 –Remove/Install Glovebox Window access Panels 7-14-11
- RHWM IWS # 15242 Container Crushing Unit Operations
- B332 Room 1006 OSP 332.194 General Glovebox Operations
- B 332 Work Permit-11-D-0079 Decontaminate and/or Replace Gloveport Plugs Rooms 101 and 1006
- B332 Work Permit 332-11-D-0236 Install Glovebox Flush Gas Supply Orifices in Room 1353 Pre Job Briefing 7-13-11
- B332 Work Permit 332-11-D-0236 Install Glovebox Flush Gas Supply Orifices in Room 1353
- B332 Operations Daily Work Team Meeting for 7-12-11
- B332 Room 1353 GB5308 part move pre-job brief under OSP 332-002, 7-12-11
- B332 Room 1353 GB5308 part move under OSP 332-002, 7-12-11
- B332 Room 1353 GB5306 machining under OSP 332-002, 7-12-11
- B332 Daily Activity List meeting, 7-12-11
- Superblock Change Request Meeting, 7-12-11
- RHWM Work Permit Meeting for RHWM-10-D-095, 7-12-11
- RHWM Weekly Maintenance Coordination Meeting 7-13-11
- RHWM Daily Program Operations Meeting, 7-13-11
- RHWM Container Crushing Pre-Job Brief, 7-13-11
- RHWM Container Crushing operation, 7-13-11
- B332 Daily Meeting for Room 1010 and 1378 operations, 7-14-11
- B332 Room 1378 part disassembly pre-job brief for OSP 332-184, 7-14-11
- B332 Room 1378 part disassembly operations under OSP 332-184, 7-14-11
- Superblock Level 3 Facility Acceptance Process Meeting, 7-14-11
- B132N IWS Roundtable Meeting for High Explosives Analytical Laboratory, 7-18-11
- B332 Room 1378 calcining activity under OSP 332-005, 7-18-11

Institutional/ES&H/ Followup Activities:

Documents reviewed

- Lawrence Livermore National Laboratory B-511 Facility Hazard Ranking B Final Periodic Industrial Hygiene Survey Report, 5/19/2011
- Lawrence Livermore National Laboratory B-858 Facility Hazard Ranking [A] Industrial Hygiene Survey Final Report, 4/7/2011
- Schedule and Performance of IH Surveys spreadsheet
- LLNL-AM-409863 LLNL Institutional ESYH Document 2.2 – Work Planning and Control Process, January 31, 2011

Interviews

- Deputy Director, LLNL
- Work Control Functional Area Manager
- ESH Director (Acting)
- O&B Deputy Principal Associate Director for ISMS and Waste Management Services

- Industrial Hygienists
- Observations:
- Work Control Review Board meeting
- Tour of HEAF highlighting some of the facility safety controls
- Physical and Life Sciences IWS 16523 Roundtable Discussion

Contractor Assurance System

Documents Reviewed:

- Program Description DES 0541, *Integrated Safety Management System* , 3/1/11
- Program Description DES 0600, *Contractor Assurance System* , 9/30/10
- Program Description DES 0080, Rev 0, *Event Notification and Reporting*, 8/18/10
- Program Description DES 00048, *LLNL Assessment Program* , 5/3/11
- Program Description, Rev 1, DES 0086, Rev 0, *Operating Experience Program*, 11/16/10
- LLNL Multi-Year Performance Strategy, May 2011
- LLNL Contractor Assurance System (CAS) Annual Assurance Letter for FY2010, 12/20/10
- Contractor Assurance System Quarterly Report, 6/2/11
- ES&H Manual Document 4.7, *Analysis Methods*, 9/9/2009
- Procedure PRO 0042, Rev 3, *Issues and Corrective Action Management*, 10/8/10
- Procedure PRO 0050, Rev 0, *Internal Independent Assessment*, 9/20/09
- Procedure PRO 0052, Rev 2, Management Self-Assessment, 10/1/10
- Procedure PRO 0049, Institutional Assessment Plan (IAP), 5/3/11
- Procedure PRO 0053, *Management Observations, Verifications & Inspections (MOVI)*, 6/2/11
- Procedure PRO 0069, Rev 2, *Configuration Control for Performance Measures and Metrics on the LLN Dashboard*, 2/11/11
- Procedure PRO 0072, Rev 0, *Conducting a Critique*, 6/30/11
- Procedure PRO 0073, Rev 2, *Analyzing Events and Condition for Apparent Cause*, 6/28/11
- Procedure PRO 0077, Rev 2, Conducting an Effectiveness Review, 2/11/11
- Draft Procedure PRO 0079, *Determining Culpability When Analyzing for Causes*
- Procedure PRO 0081, Rev 1, *Accident/Incident Scene Management (Post Emergency Response)*, 11/16/10
- Procedure PRO 0082, Rev 0, *Reporting Occurrences to DOE*, 7/9/10
- Procedure PRO 0084, Rev 0, *Incident Analysis Committee Manual*, 8/27/10
- Procedure PRO 0087, Rev 1, *Identifying, Communicating, and Responding to Lessons Learned*, 11/16/10
- Procedure PRO 0089, Rev 0, *Reporting and Tracking Noncompliances with DOE Safety*, 5/27/10
- Procedure PRO 0090, Rev 1, Executive Management Operational Directive, 6/23/09
- CAO Procedure, Identifying, Preparing, and Distributing LLNL "Lessons Learned", Rev 5, 2/23/11
- CAO Summary of 2010 ORB Feedback on Issues Management, 2/9/11
- Report, *Fiscal Year 2010 Integrated Safety Management Systems (ISMS) Effectiveness Review*, May 2011
- Office of Independent Oversight Nuclear Safety and Integrated Safety management System (ISMS) Phase II Corrective Action Plans (CAPs), January 28, 2010
- Management Self-Assessment, LLNL Contractor Assurance System (CAS) Level of Functional Maturity, July 2010

- Corrective Action Plan for issues from the LLNL Contactor Assurance System MSA, 9/11/09
- LLNL FY10 and FY11 Institutional Assessment Plans
- CAO Performance Analysis Report, *Bicycle Accidents 2008-2010*, 1/11/11
- CAO Performance Analysis Report, *Control of Hazardous Energy*, September 2010
- CAO Performance Analysis Report, *Work Control*, November 29, 2010
- Performance Analysis of Events: Data Through December 31, 2009, 1/25/11
- Partial Analysis of Occurrences, July 1, 2010-June 30, 2011, July 6, 11
- Partial Analysis of Occurrences-CY2010, April 29, 11
- LLNL-AR-490323, Partial Analysis of Occurrences April 1, 2010-March 31, 2011
- Performance Analysis: ITS Data through March 30, 2010, 7/10
- Injury and Illness Investigation Checklists for Supervisors and Case Investigators
- Various Injury and Illness electronic Corrective Action Reports from CY2010 and CY2011
- ITS reports for Management Walkthroughs FY 2010 and FY2011
- Various FY2010 and FY2011 Internal Independent Assessment reports, Joint Functional Area Manager and Line Assessment reports, and line Management Self-Assessment reports and associated ITS issue reports
- Various Occurrence Reports for events occurring in CY2010 and CY2011
- Various LLNL lessons learned reports and Safety Flash reports
- LLNL Operating Experience/Lessons Learned Coordinator's log
- F&I HPI/Behavior Observation Tool form
- Mission and Vision Statement/Charter for Institutional Grassroots Safety Committee
- Minutes and Agendas from various committees (e.g., ORBs, IORB, OEC, Assurance Managers meetings)

Interviews:

- Acting Principal Associate Director, Operations & Business
- Director, Office of Environment, Safety, Health & Quality Directorate Assurance Managers for WCI, Operations and Business, and F&I
- Director, Laboratory Contractor Assurance Office
- Laboratory Quality Assurance Manager
- CAO Managers and staff with responsibilities for Assessments, Issues Management,
- Performance Analysis and Reporting, Lessons Learned, Performance Metrics, and Six Sigma analysis
- Alternate Worker Safety & Health Functional Area Manger
- Injury and Illness Analysis Office Lead
- Industrial Hygiene, Subject Matter Expert
- Past Chairman of the Institutional Grassroots Safety Committee
- LSO CAS Subject Matter Expert

Observations:

- Assurance Manager's meeting
- Institutional Operations Review Board meeting
- ORB Meetings for Operations and Business and ES&H
- Operations Excellence Council meeting
- Contractor Assurance Manager's meeting

APPENDIX F

Supplemental Information

Dates of the Review July 11-21, 2011

Management

Glenn S. Podonsky, Chief Health, Safety and Security Officer
Williams A. Eckroade, Deputy Chief for Operations, Office of Health, Safety and Security
John S. Boulden III, Director of Office of Enforcement and Oversight
Thomas R. Staker, Deputy Director for Oversight, Office of Enforcement and Oversight

Quality Review Board

William Eckroade	John Boulden	Thomas Staker
George Armstrong	Michael Kilpatrick	Robert Nelson

HSS Team Composition

HSS Team Members
Patricia Williams, HS-45, Team Leader
Bob Compton
Joe Lischinsky
Mario Vigliani
Al Gibson, Technical Writer
Mary Anne Sirk, Administrative Assistant

NNSA Team Member
Jim Winter