U.S. Department of Energy
Office of Inspector General
Office of Inspections and Special Inquiries

Inspection Report

Material Control and Accountability at Lawrence Livermore National Laboratory

DOE/IG-0745

November 2006

Department of Energy

Washington, DC 20585

November 15, 2006

MEMORANDUM FOR THE SECRETARY

FROM: Gregory H. Friedman
Inspector General

SUBJECT: INFORMATION: Inspection Report on "Material Control and Accountability at Lawrence Livermore National Laboratory"

BACKGROUND

Lawrence Livermore National Laboratory supports the Department of Energy's core mission of maintaining a safe, secure, and reliable nuclear weapons stockpile and applying scientific expertise toward the prevention of the proliferation of weapons of mass destruction and terrorist attacks. Livermore personnel perform tests and study various characteristics of nuclear material, to include accountable nuclear material, which is a collective term that encompasses all materials so designated by the Secretary of Energy in quantities that require special control. Examples of these materials include plutonium, enriched uranium, americium, and depleted uranium.

The tests and studies performed by Livermore can require the Laboratory to maintain Categories I, II, III, and IV items and quantities of accountable nuclear material. Categories I and II items are those that would be most attractive to an adversary intent on theft or diversion. At Livermore, these categories of accountable nuclear material are maintained in Material Balance Areas located within a special security area known as a Material Access Area (MAA). Categories III and IV items are those that would be less attractive to an adversary intent on theft or diversion, containing smaller quantities of plutonium, uranium, and other materials. Most of these items are maintained in Material Balance Areas outside the MAA.

The capability to deter, detect, and assist in the prevention of theft or diversion of nuclear material is critical. As such, control and accountability of this material is provided through the Livermore Material Control and Accountability (MC&A) Program. The objective of our inspection was to determine if the Livermore MC&A Program was providing timely and accurate information regarding the inventory, transfers, characteristics, and location of accountable nuclear materials.

RESULTS OF INSPECTION

We concluded that, in general, Livermore's MC&A Program provided timely and accurate information regarding the inventory, transfers, characteristics, and location of accountable nuclear material at the Laboratory.

However, we identified a few opportunities for improvement in the MC&A Program. Specifically, we found that:

- When designated personnel at Livermore conducted a required 100 percent semi-annual inventory of accountable nuclear material in the MAA, they did not always follow applicable inventory procedures. For example, inventory personnel did not validate serial numbers, verify the integrity of tamper indicating devices (TIDs), or confirm the net weight of accountable nuclear material accumulated in three containers stored in a sealed glove box within the MAA.

- Livermore's Controlled Materials Accountability and Tracking System (COMATS) was not always accurate or updated to reflect the actual status or location of TIDs or items of Category IV material outside the MAA. We identified status or location issues with 21 of 68 items sampled in one Material Balance Area. Further, TIDs for a number of drums that had been removed from the MAA were not defaced as required, and four of the TIDs were attached to items that were different from what was identified in COMATS.

We made several recommendations to management designed to enhance Livermore's ability to deter, detect, and assist in the prevention of the theft or diversion of accountable nuclear materials. Although the opportunities for improvement identified in this report involved Categories III and IV materials, it is still important that, as part of the Department's graded approach to safeguards, these materials be protected from those seeking to harm this Nation.

MANAGEMENT REACTION

In responding to a draft of this report, the National Nuclear Security Administration (NNSA) stated that "NNSA is hesitant in agreeing with the recommendations contained therein." NNSA stated that the report recommendations only addressed opportunities for improvement related to Category IV materials and did not consider the requirement for a graded approach to safeguards or Livermore's current requirements, which include the accuracy of COMATS. NNSA asserted that the inspection team characterized situations incorrectly.

We do not believe that NNSA has accurately characterized the Office of Inspector General inspection activity. Livermore's graded MC&A Program is documented in its MC&A Plan and implementing procedures. The inspection team evaluated the Laboratory's MC&A Program against the requirements contained in these documents. The findings and recommendations resulting from this evaluation were based upon demonstrated noncompliance with the Plan and procedures and, therefore, were consistent with the concept of a graded approach to safeguards. Thus, we have a fundamental difference of opinion with NNSA regarding these matters.

NNSA's verbatim comments are provided in their entirety in Appendix B of the report. In addition, the Management and Inspector Comments section of the report contains a detailed discussion of the comments.

Attachment

cc: Deputy Secretary
Administrator, National Nuclear Security Administration
Under Secretary of Energy
Under Secretary of Science
Chief of Staff
Director, Office of Security and Safety Performance Assurance
Manager, Livermore Site Office
Director, Policy and Internal Controls Management (NA-66)
Director, Office of Internal Review (CF-1.2)
Audit Liaison, Livermore Site Office

MATERIAL CONTROL AND ACCOUNTABILITY AT LAWRENCE LIVERMORE NATIONAL LABORATORY

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INTRODUCTION AND OBJECTIVE

Lawrence Livermore National Laboratory (LLNL) supports the Department of Energy's (DOE's) core mission of maintaining a safe, secure, and reliable nuclear weapons stockpile and applying scientific expertise toward the prevention of the proliferation of weapons of mass destruction and terrorist attacks. As part of the Laboratory's fundamental science and stockpile stewardship programs, LLNL personnel perform tests and study various characteristics of nuclear material, to include accountable nuclear material. Accountable nuclear material is a collective term that includes all materials so designated by the Secretary of Energy in quantities that require special control. Examples of these materials include plutonium, enriched uranium, americium, and depleted uranium.

The tests and studies performed by LLNL can require the Laboratory to maintain Categories I, II, III, and IV items and quantities of accountable nuclear material. Categories I and II items are those that would be most attractive to an adversary intent on theft or diversion and generally include weapon components such as pits, as well as other pure products and high grade materials containing significant quantities of plutonium and uranium. At LLNL, these categories of accountable nuclear material are maintained in Material Balance Areas located within a special security area known as a Material Access Area (MAA). The MAA is located within a Protected Area.

Categories III and IV items are those that would be less attractive to an adversary intent on theft or diversion, containing smaller quantities of plutonium, uranium, and other materials. Category IV materials include lower quantities of plutonium and enriched uranium, which could exist in highly irradiated forms, and depleted uranium. While the MAA at LLNL does contain Categories III and IV items, these categories of accountable nuclear material are generally maintained throughout the Laboratory in Material Balance Areas primarily located in Limited Security Areas and Property Protection Areas.

LLNL maintains an inventory of approximately 1,600 items of accountable nuclear material within the MAA and approximately 2,200 items of accountable nuclear material outside the MAA. The capability to deter, detect, and assist in the prevention of theft or diversion of this material is critical. As such, control and accountability of these materials are provided through the LLNL

Material Control and Accountability (MC&A) Program, which was established under the requirements of DOE Manual 470.4-6, "Nuclear Material Control and Accountability." The objective of our inspection was to determine if the LLNL MC&A Program was providing timely and accurate information regarding the inventory, transfers, characteristics, and location of accountable nuclear materials.

OBSERVATIONS AND CONCLUSIONS

We concluded that, in general, LLNL's MC&A Program provided timely and accurate information regarding the inventory, transfers, characteristics, and location of accountable nuclear material at the Laboratory, particularly within the MAA. However, we identified opportunities for improvement in controls over accountable nuclear material maintained both inside and outside the MAA.

We conducted a random sample of 160 items of accountable nuclear material maintained in the MAA, to include Categories I and II materials. We found all items to be consistent with the characteristics and locations identified in the Controlled Materials Accountability and Tracking System (COMATS), LLNL's official MC&A database. We also found that the limited number of transfers of accountable nuclear material within the MAA were appropriately documented. While we were conducting our sampling, LLNL was conducting a required 100 percent semi-annual inventory of all accountable nuclear materials in the MAA. Notably, LLNL's inventory did not identify any discrepancies in accountable nuclear material items, quantities, or locations. However, as part of our inspection, we observed LLNL personnel while they performed the semi-annual inventory and found that, contrary to MC&A Program requirements:

- Inventory personnel did not validate serial numbers, verify the integrity of tamper indicating devices (TIDs), or confirm the net weight of accountable nuclear material accumulated in three containers stored in a sealed glove box within the MAA. Inventory personnel instead relied on a handwritten note attached to the outside of the glove box and input from technicians familiar with operations in the area to verify the presence and location of the accountable nuclear materials.

- The second team member of a two-person inventory team held the inventory printout and verbally provided item serial and TID numbers to the first team member instead of the first team member finding the item and providing the item serial and TID numbers to the second team member. The MC&A Plan

procedure is intended to assure that all items in a specific location are accounted for, whereas the procedure actually used by the team only assured that all items on the inventory would be located. This modification in procedure created a risk of not accounting for all nuclear material items.

Outside the MAA, we randomly sampled 141 Category IV items of accountable nuclear material in 6 Material Balance Areas. Although all the materials were appropriately characterized, we identified some inventory, transfer, and location issues in two of the Material Balance Areas. Specifically, we found that COMATS was not always accurate or updated to reflect the actual status or location of TIDs or items of Category IV material, as follows:

- TIDs for a number of drums that had been removed from the MAA were not defaced as required, and four of the TIDs were attached to items that were different from what was identified in COMATS;

- Twelve items were found at locations within a Material Balance Area other than the locations specified in COMATS;

- Six items were destroyed, but COMATS was not updated to reflect these changes in status;

- One item was only partially destroyed during testing, but COMATS was not updated to reflect it still existed as part of the inventory; and

- Two items were not on the Material Balance Area printout for the location where they were stored.

Details of Findings

MC&A PROGRAM PERFORMANCE

We concluded that, in general, LLNL's MC&A Program provided timely and accurate information regarding the inventory, transfers, characteristics, and location of accountable nuclear material at the Laboratory, particularly within the MAA. However, we identified opportunities for improvement in controls over accountable nuclear material maintained both inside and outside the MAA.

MC&A Controls Inside the MAA

We conducted a random sample of 160 accountable nuclear material items maintained within the MAA. These items included Categories I and II items, as well as waste materials generated by process operations and classified as Category IV (low level and transuranic waste). We found all 160 items to be consistent with the characteristics and locations identified in COMATS. We also found that the limited number of transfers of accountable nuclear material within the MAA were appropriately documented.

We arranged our inspection activities in order to observe LLNL's process for performing an MC&A inventory within the MAA. While we were conducting our random sample, LLNL Materials Management personnel were conducting a required 100 percent semi-annual inventory of all accountable nuclear items maintained within the MAA, to include all Categories I and II materials at the LLNL site. Notably, this inventory did not identify any discrepancies in accountable nuclear material items, quantities, or locations.

As part of the 100 percent inventory, LLNL's MC&A Plan requires that statistical sampling be used to select items for confirmation measurement to verify the presence of expected nuclear materials. Consistent with this requirement, LLNL selected 129 items using a statistical sampling method designed to place more emphasis on Categories I and II items. No anomalies were discovered.

Validation of Materials

While conducting our random sample and observing the LLNL inventory, we found that, contrary to MC&A Program requirements, inventory personnel did not validate serial numbers, verify the integrity of TIDs, or confirm the net weight of accountable nuclear material accumulated in three containers stored in a sealed glove box within the MAA. The LLNL MC&A Plan states that "the inventory team (two persons) systematically checks the location for nuclear material and identifies each item found by reading the serial number when readily visible, or by using the knowledge of the Material Balance Area Representative or designee and a check of net weight when a serial number is not

readily visible." In addition, "the integrity of applied TIDs is also verified during routine ... inventories of nuclear material." However, for the three containers in the glove box, although the serial and TID numbers were not readily visible, inventory personnel did not perform any check of net weight, as required. Instead, inventory personnel relied on (1) a "sticky note" with handwritten serial numbers and TID numbers that was attached to the outside of the glove box and (2) input from technicians familiar with operations in the area as to the presence and location of the accountable nuclear material stored in the three containers. We determined that the last time the container serial numbers and TID numbers were visually verified was in February 2005.

After we identified this condition, the National Nuclear Security Administration's (NNSA's) Livermore Site Office (LSO) issued a Survey Report that confirmed our finding and stated that the three items "were inventoried by their presence and partial observation of [TIDs] alone," and that "this action does not meet established [inventory] objectives." The Survey Report also stated that "whereas these items were considered part of the inventory population, they are required to have confirmation of attributes of the accountable nuclear materials contained within." The Survey Report stated that "the items should have been measured at the time of the announced inventory," and that "LLNL was directed by LSO to perform confirmation measurements at the earliest opportunity."

Inventory Procedures

While observing LLNL's 100 percent semi-annual inventory in the MAA, we also determined that a two-person inventory team was conducting the inventory in a reverse manner from what is required by the MC&A Plan. The LLNL MC&A Plan states that "To accomplish the 100% inventory of a workstation, a two-person inventory team systematically checks the workstation or location for nuclear material and identifies each item found by serial number and TID number." The LLNL MC&A Plan also states that "One team member examines the location for material while the second team member records the items found on the inventory listing for the assigned location." Contrary to this, we observed the second team member, holding the inventory printout, verbally provide item serial and TID numbers to the first team member instead of the first team member finding the item and providing the item serial and TID numbers to the second team member. The MC&A Plan procedure is intended to assure that all items in a specific location are accounted for, whereas the procedure actually used by the team only assured that all items on the inventory would

be located. This modification in procedure created a risk of not accounting for all nuclear material items.

We also observed that, during LLNL's inventory of low-level and transuranic waste drums in the MAA, inventory team members did not personally verify item TID numbers or the integrity of TIDs, as required by supporting procedures for the MC&A Plan. The procedures state that inventory team members should verify such information as serial numbers and the presence of TIDs, to include confirming TID numbers and examining TIDs to assure they are properly applied and intact. Contrary to this, we observed that an LLNL technician who was not a member of the inventory team and who was responsible for the area being inventoried was allowed to "assist" the inventory team by reading off the item TID numbers and verifying the integrity of the TIDs.

MC&A Controls Outside the MAA

Outside the MAA, we randomly sampled 141 Category IV accountable nuclear material items in 6 Material Balance Areas. Although all the materials were appropriately characterized, we identified some inventory, transfer, and location issues in two of the Material Balance Areas. Specifically, we found that COMATS was not always accurate or updated to reflect the actual status or location of TIDs or Category IV material items, as follows.

Tamper Indicating Devices

We found that the TIDs for a number of drums that had been removed from the MAA were not defaced as required, and four of the TIDs were attached to items that were different from what was identified in COMATS. The LLNL MC&A Plan states that "LLNL has established a TID program to provide, in conjunction with the LLNL material surveillance program, assurances that nuclear materials in Category I Material Balance Areas have not been tampered with when a properly applied TID has been placed on its outermost containment in a secure storage area." The MC&A Plan states that all application and removal/destruction of TIDs are under a two-person surveillance system environment and that all nuclear materials receiving inventory benefit from TIDs are under Category I nuclear material surveillance requirements. MC&A procedures also state that when drums are removed from the MAA, authorized individuals must deface the TID on each drum and document the destruction of the TID in the TID tracking system.

We selected five waste drums in Material Balance Area 170 for verification of the characteristics and locations identified in COMATS. These drums contained low level and transuranic waste generated in a Category I Material Balance Area within the

MAA. We noted that, even though the drums had been removed from the MAA, TIDs were still physically attached to them. In addition, for one of the drums, COMATS showed that the TID assigned to the drum had been destroyed. Based on a further review in COMATS, we determined that the TID attached to the drum was actually assigned to a different drum. This finding resulted in the expansion of our review and the discovery of three other instances where the TID physically attached to a drum was assigned to a different drum in COMATS.

Due to our identification of this condition, the LSO issued a Survey Report that confirmed our finding and stated that "LLNL must have a documented program, administered by the MC&A organization, to control TID's and to ensure that TID's are used to the extent possible to detect violations of container integrity." The Survey Report also stated that "Previous practice had COMATS performing virtual destruction upon the containers[']removal from the PA [Protected Area]," and that "This practice resulted in a few discrepancies during a recent IG audit." In addition, the Survey Report stated that "It has been agreed that from this date on LLNL MC&A TID's shall be no longer accepted as providing any safeguards value for LLNL's accountable nuclear materials once the container is removed from the MAA." As a result, LLNL removed all TIDs from containers that were no longer under two-person surveillance system safeguards.

Status of Accountable Materials

We found 21 instances in another Material Balance Area where COMATS did not accurately reflect the actual status or location of accountable material. The MC&A Plan states that, for Categories III and IV Material Balance Areas, "the objective of the item inventory is to assure that each item listed in [COMATS] is present in its appropriate location and that no unexpected items are present in any location." The MC&A Plan further states that to accomplish an item inventory for a location in Category IV Material Balance Areas, "The MBA [Material Balance Area] Representative has an inventory listing for the MBA that identifies location number, if applicable, serial number and net weight for all items expected to be present in the MBA." "The Material Balance Area Representative checks the item on the printout as being located or adds the item's serial number to the printout if it is not listed."

We conducted a random sample of 136 items in Material Balance Areas 120, 200, 300, 450, and 570. In most cases, the site inventories were accurate. However, in Material Balance Area 300

we sampled 68 items at 10 locations and identified issues with the status or location of 21 items, as follows:

- Twelve items were found at locations within the Material Balance Area other than the locations specified in COMATS. One item was moved to another location for an experiment, but COMATS was not updated to show the new location. Nine items were located in various storage locations throughout the Material Balance Area. Two items were located in an area adjacent to the location of record.

- Six items were destroyed during destructive testing between March 2005 and September 2005, but COMATS was not updated to reflect the changes in status. For four of the items, COMATS was not updated at the time of destruction and continued to show these items as active inventory items. The other two items remained active in COMATS because both their classified and unclassified identification numbers had been inputted into the database, but only one identifier for each item was removed from COMATS when the items were destroyed.

- One item used in a destructive test was removed from COMATS; however, it was only partially destroyed. Even though the item was returned to storage, COMATS was not updated to reflect it still existed as part of the inventory.

- Two items were not on the Material Balance Area printout for the location where they were stored, so their presence at the location was "unexpected." After additional review, we determined that they were active in COMATS, but no specific Material Balance Area location had been entered into the database by Material Balance Area 300 site personnel.

LSO and LLNL Materials Management personnel were present during the identification of these issues and took immediate action to initiate follow-up activities with regard to the identified issues.

RECOMMENDATIONS

Although, in general, LLNL's MC&A Program provided timely and accurate information, there were opportunities for improvement. Therefore, we recommend the Manager, LSO, ensures that:

1. Inventory personnel validate all serial numbers, verify the integrity of all TIDs, and, if required, confirm the net weight of accountable nuclear material.

2. Inventory personnel conduct inventories in accordance with MC&A Program requirements.

3. The TID program is managed in accordance with MC&A Program requirements, with particular emphasis on the accuracy of information in COMATS and elimination of TIDs when no longer required under LLNL MC&A procedures.

4. COMATS is accurate for Category IV Material Balance Areas, consistent with MC&A Program requirements.

MANAGEMENT AND INSPECTOR COMMENTS

Management's verbatim comments regarding a draft of this report are summarized below and are contained in their entirety at Appendix B.

In general comments, NNSA's Associate Administrator for Management and Administration stated that NNSA is hesitant in agreeing with the recommendations contained therein. Specifically, the Associate Administrator stated that the report recommendations only addressed opportunities for improvement related to Category IV materials and did not consider the requirement for a graded approach to safeguards or LLNL's current requirements, which include the accuracy of COMATS. He asserted that the inspection team characterized situations incorrectly.

Inspector Comment: We found the comments from the Associate Administrator to be non-responsive to our findings and recommendations. The comments misrepresent that the report findings and recommendations are not consistent with a graded approach to safeguards and that the inspection team characterized situations incorrectly.

LLNL's graded MC&A Program is documented in its MC&A Plan, which was approved by the LSO. This Plan, along with

implementing procedures, specifically describes how DOE MC&A requirements are addressed at LLNL, while establishing site-specific requirements from which internal and external reviewers can measure LLNL's performance.

The inspection team used LLNL's MC&A Plan and implementing procedures as the requirements documents against which the Laboratory's MC&A Program was evaluated. The findings and recommendations developed by the inspection team were based upon demonstrated noncompliance with the Plan and procedures, and, therefore, are consistent with the concept of a graded approach to safeguards. Thus, while we have made some minor changes to the report based upon management's comments, we reaffirm our overall findings and recommendations. Following is specific discussion of the findings and recommendations.

Recommendation 1

The Associate Administrator stated that recommendation 1 addresses activities that are "part and parcel" of LLNL's current operations. Further, in comments regarding the finding that supports this recommendation, he stated that the items in question were afforded significantly greater safeguards than NNSA policy directs and that LLNL's MC&A Plan allows verbal verification from the experimenter or the logbook when the presence of an item cannot be verified without disrupting an experiment in progress. He also stated that this issue should not be construed as an item or finding related to the "audit," but was addressed and resolved entirely through LSO and LLNL coordination, then discussed with the Office of Inspector General team.

Inspector Comment: The items in question were not part of an experiment in progress. Therefore, the MC&A Plan required visual verification of item serial and TID numbers or the use of the knowledge of the Material Balance Area Representative or designee and a check of net weight. In addition, contrary to the statement that this finding "should not be construed as an item or finding" related to the inspection since it was addressed and resolved entirely through normal LSO and LLNL coordination, all findings discussed in this report were the direct result of work performed by the Office of Inspector General inspection team. LSO and LLNL coordination occurred after the inspection team identified the issue.

Recommendation 2

The Associate Administrator stated that the procedure in place at the time of the inspection did not contain specific guidance for "the anomalous situation in which an item is not initially located during the inventory process," and that a clarification of LLNL's accepted practice was added to the procedure. Further, in comments regarding the finding that supports this recommendation, the Associate Administrator stated that the room in question was afforded significantly greater safeguards than policy directs. He stated that most items were in process within incubators, that a few items were not identified during the initial inventory check, and that the second team member verbally provided serial numbers to the other team member so that the items could be reconciled. He stated that describing the approach as conducting the inventory in a reverse manner appears to be an overstated misunderstanding of the inventory practice that was occurring. He also stated that the MC&A Plan does not specify that all inventory team members must be from the MC&A organization and that requesting a knowledgeable workstation person to assist in reading a TID is fully consistent with MC&A procedures.

Inspector Comment: We specifically observed LLNL inventory team members conducting the inventory in a reverse manner from that required by the MC&A Plan. Contrary to the Associate Administrator's statement that this occurred only as part of the reconciliation effort after a few items were not identified during the initial check, the LLNL inventory team began the inventory process by violating the procedure required by the MC&A Plan. In addition, inventory team members allowed a technician responsible for an area being inventoried to read off item TID numbers and verify the integrity of the TIDs. Neither of the inventory team members visually verified the item TID numbers or the integrity of the TIDs as required by the MC&A procedures.

Recommendation 3

The Associate Administrator stated that the recommendation addresses activities that are "part and parcel" of LLNL's current operations. Further, in comments regarding the finding supporting this recommendation, the Associate Administrator stated that at no time after the drums left the MAA were the TIDs used or intended to be used for safeguards and that, regardless of the reaffirmation in LSO's Survey Report, the policy of not using TIDs for safeguard purposes unless they are under effective surveillance has

been practiced at LLNL and explicitly stated in LLNL's MC&A Plan since revision in 2000. He also stated that this issue represented a database error, not a material error, and that the record system must accurately reflect the location and identity of TIDs with 99 percent accuracy. The Associate Administrator stated that having four errors out of thousands of TIDs inspected during the October inventory was indicative of effective performance.

Inspector Comment: The inspection team did not evaluate LLNL's overall performance against the standard that the record system must accurately reflect the location and identity of TIDs with 99 percent accuracy. The inspection team's review of TIDs was very limited (we did not look at "thousands" of TIDs), and the focus of the resulting finding was on management of the TID program in accordance with requirements of the MC&A Program. Specifically, MC&A procedures state that when drums are removed from the MAA, authorized individuals must deface the TID on each drum and document the destruction of the TID in the TID tracking system. In the instances discussed in the report, even though the drums had been removed from the MAA, TIDs were still physically attached to them and the information in the tracking system was inaccurate.

Recommendation 4

The Associate Administrator stated that NNSA does not agree with the recommendation because the report does not consider the requirement for a graded approach to safeguards and that LLNL's current requirements, including the accuracy of COMATS, already meet and generally exceed published requirements for Category IV Material Balance Areas. Further, in comments regarding the finding that supports this recommendation, the Associate Administrator stated that the information included did not accurately describe the requirements specified in LLNL's MC&A Plan or consider current requirements. He stated that the location determination for items in Category IV Material Balance Areas was at the Material Balance Area level and that additional location identification in COMATS was for the Material Balance Area Representative's convenience only. He also stated that updates to COMATS in Material Balance Area 300 could take several months. In addition, he stated that a simple human error resulted in duplicate database entries, which would have been identified and reconciled during the next annual inventory. He stated that Category IV items only needed to be documented as being at

LLNL, and the fact LLNL further specifies the Material Balance Area exceeds requirements.

Inspector Comment: The inspection findings were based upon the requirements of LLNL's MC&A Plan and implementing procedures, which LLNL developed using a graded approach. The primary objective of the MC&A Program is to provide timely and accurate information regarding inventory, external and internal transfer, characteristics, and location of accountable nuclear materials at LLNL. Our recommendation was simply intended to ensure that this objective was being met.

With regard to the comments about specifying item locations, the MC&A Program establishes 24 specific Category IV Material Balance Areas at LLNL and provides specific criteria and procedures for the inventorying of the nuclear materials contained within them. These criteria and procedures include requirements for identifying the location of items in Category IV Material Balance Areas. Specifically, the Plan states that, for Categories III and IV Material Balance Areas, "the objective of the item inventory is to assure that each item listed in [COMATS] is present in its appropriate location and that no unexpected items are present in any locations." The MC&A Plan further states that to accomplish an item inventory for a location in Category IV Material Balance Areas, "The MBA [Material Balance Area] Representative has an inventory listing for the MBA that identifies location number, if applicable, serial number and net weight for all items expected to be present in the MBA." The inspection team performed sample inventories on five Category IV Material Balance Areas, and in all cases the Material Balance Area COMATS printout identified specific locations within the Material Balance Area where the items should be found. Depending on the Material Balance Area, the specific location was designated by building and room, and sometimes additional location information was provided, such as a floor or shelf location.

In addition, contrary to the Associate Administrator's comment that the accuracy of COMATS already meets and generally exceeds published requirements for Category IV Material Balance Areas, the accuracy of COMATS for Material Balance Area 300 was substantially below published requirements. Specifically, the MC&A Plan states that "The accounting records system . . . establishes a complete audit trail on all nuclear material from receipt through disposition." In addition, the Plan states that "The accounting system accurately reflects item identity and location in at least 95% of cases," and "The accuracy of COMATS for identity

and location is calculated **for the population of accountable nuclear material being currently inventoried** [emphasis added]." In the case of Material Balance Area 300, we inventoried 68 items and identified issues with the status or location of 21 items. Therefore, the accuracy of COMATS for the accountable nuclear material we inventoried for this Material Balance Area was 69 percent, substantially below published requirements.

Further, we believe that taking several months to update COMATS in Material Balance Area 300 belies the timely and accurate information objective of the MC&A Program. In addition, the MC&A Plan requires that "The accounting records system is capable of generating listings for SNM [Special Nuclear Material] within 3 hours and all other nuclear material within 24 hours." From our observations of Area 300 operations, it appeared to be highly unlikely that accurate listings could be generated within established timeframes.

Appendix A

SCOPE AND METHODOLOGY

We conducted our inspection fieldwork between September and November 2005. LSO and Laboratory personnel were interviewed regarding LLNL MC&A procedures, the MC&A Program, COMATS, the 2001 and 2005 Site Safeguards and Security Plans, the supporting Vulnerability Assessment, and the scoping document for future Vulnerability Assessments. We conducted a number of random samples at various Material Balance Areas, to include 100, 120, 150, 170, 200, 300, 450, and 570. Documents of primary interest were:

- DOE Order 470.4, "Safeguards and Security Program."
- DOE Manual 470.4-6, "Nuclear Material Control and Accountability."
- Lawrence Livermore National Laboratory Material Control and Accountability Manual, Volume A, MC&A Plan.
- Lawrence Livermore National Laboratory Material Control and Accountability Procedures.

Also, pursuant to the "Government Performance and Results Act of 1993," we reviewed LLNL's performance measurement processes as they relate to the MC&A Program.

This inspection was conducted in accordance with the "Quality Standards for Inspections" issued by the President's Council on Integrity and Efficiency.

Department of Energy
National Nuclear Security Administration
Washington, DC 20585

July 10, 2006

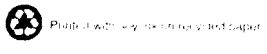
MEMORANDUM FOR: Alfred K. Walter
Assistant Inspector
for Inspections and Special Inquiries

FROM: Michael C. Kane
Associate Administrator
for Management and Administration

SUBJECT: Comments to LLNL Draft MC&A Report:
S05IS038/2005-23347

The National Nuclear Security Administration (NNSA) appreciates the opportunity to review the Inspector General's (IG) draft report, "Material Control and Accountability at Lawrence Livermore National Laboratory." We understand that the IG wanted to determine if the Laboratory's Material Control and Accountability (MC&A) Program is providing timely and accurate information regarding the inventory, transfers, characteristics, and location of accountable nuclear materials in accordance with requirements. While the draft report acknowledges that the program is, in fact, timely and accurate, the IG submitted recommendations that they believe provide process improvement in selected areas.

As we stated, we are pleased that the inspectors were able to locate all the sampled accountable nuclear materials and to be able to conclude that the Laboratory's MC&A Program provided timely and accurate information regarding the inventory, transfers, characteristics, and location of accountable nuclear material, particularly within the Material Access Area (MAA). However, the recommendations made related to opportunities for improvement relate only to Category IV materials and does not consider the requirements for a graded approach to safeguards, or the Laboratory's current requirements, which include accuracy of Controlled Materials Accountability and Tracking System (COMATS). The use of COMATS meets and generally exceeds published requirements for Category IV Material Balance Areas. NNSA agrees with the Site Office's belief that the recommendations for providing greater emphasis on Category IV material controls, especially in an era of limited safeguards and security resources, is contrary to the requirements for implementing graded safeguards. Equally, the items of concern that are mentioned in the report that subsequently generated the recommendations appear to characterize situations incorrectly, possibly because the test conditions were not fully known at that time or were not considered fully. Therefore, NNSA is hesitant in agreeing with the recommendations contained therein.



The report does not mention Special Nuclear Material (SNM), nor does it distinguish SNM from "Source" and "Other Accountable Nuclear Material." We believe that most issues discussed in this report involved an isolated incident that occurred some nine-months ago and some issues in the report were not mentioned during the audit. Had they been mentioned during the course of the audit, NNSA personnel could have clarified any concerns as the part of the IG. For example, the alleged failure to follow the MC&A Plan in which a knowledgeable workstation individual read a Tamper Indicating Device (TID) was a simple misunderstanding of the procedure that should have been resolved before the draft report was issued.

Our specific comments regarding the factual accuracy, clarity and the correction of errors presented in the report follow:

- For clarity, throughout the report we recommend that you refer to the Laboratory as LLNL instead of Livermore. That way it is clear when you are referring to Livermore Laboratory versus the Livermore Site Office (LSO).

- Page 1, Introduction and Objective, paragraph 1, the list of current accountable nuclear materials is not accurate. Nuclear materials that have been omitted include normal uranium and uranium-233. In addition, the accountable lithium material is enriched lithium; lithium-6 is the entry for only the isotope weight. The plutonium material listed, plutonium 238-242, is actually three accountable materials: plutonium-238, plutonium 239-241, and plutonium-242.

- Page 1, Introduction and Objective, paragraph 2 is not accurate with respect to the information presented. First, line 3 should replace "materials" with "quantities or items." Second, the positioning of all Category II quantities within a MAA is specific to LLNL. NNSA allows Category II quantities to be located within a Protected Area (PA). The description of Category III and IV is incorrect. Depleted uranium cannot be Category III. It is always Category IV. Except for SNM and separated neptunium, americium-241, and americium-243, all accountable material is Category IV, Attractiveness Level E. Third, and perhaps most significant, the MAA at LLNL contains numerous Category III and Category IV items, not just Categories I and II items of SNM. Finally, NNSA requires a graded approach to safeguards based on category and attractiveness level of material and this fact has not been sufficiently emphasized in the report.

- Page 4, Validation of Materials, paragraph 5. The items in question were Category IV items. They were afforded significantly greater safeguards than NNSA policy directs. They were located in a glove box for which operations had been temporarily suspended due to safety issues specific to that box. The glove box was located in a PA in an MAA and in a room that was under two-person surveillance. The items had been inventoried during previous inventories, and no operations were conducted in that box since those inventories.

  The situation resulting from the safety concerns with this glovebox was an anomaly from typical inventory conditions. LLNL's MC&A Plan does stipulate: "If the presence of an item cannot be verified without disrupting an experiment in progress or opening a container, then verification may be accepted verbally from the experimenter or from the experimenter's logbook entries." The LLNL designated MC&A management official, who is responsible for MC&A at LLNL, was present at the time of the incident in question and concurred with the inventory team's action because he believed the intent of the Plan was satisfied by using knowledge of experimenter personnel and MC&A personnel from previous inventories. The LSO MC&A Program Manager, who was also present at that time, invoked his oversight prerogative to overrule the LLNL MC&A official. Facility personnel were contacted to permit net-weighing the items. However, in order to ensure safe operations, the facility deferred approval until it was certain that all hazards had been identified and all controls implemented.

  This issue should not be construed as an item or finding related to the audit but was addressed and resolved entirely through normal LSO and LLNL coordination, then discussed with the OIG team. Representing this as an issue identified by the OIG and requiring further LSO action is inaccurate.

  The comments above on this issue also pertain to the summary statement on this issue on Page 2, first bullet.

- Page 5, Inventory Procedures, Paragraphs 1 and 2. The room in question contained only Category IV items that were afforded significantly greater safeguards than policy directs. Of the approximately 70 items, most were no larger than one- or two-gram samples and were in process within incubators or other enclosures. The methods to account for these items until these processes are completed include log book entries and/or operator knowledge.

The activity described in the report appears to have involved the interaction between the MC&A inventory team member, who had the workstation printout, and the knowledgeable workstation person who had just finished verifying location data with this team member. A few of the items were not identified during the initial check. The second team member verbally provided serial numbers to the other member so that these items could be reconciled. Describing the approach taken as conducting the inventory in a reverse manner appears to be an overstated misunderstanding of the inventory practice that was occurring.

The comments above on this issue also pertain to the summary statement on this issue on Page 2, second bullet.

- Page 6, Inventory Procedures, Paragraph 1, includes the description of the incident as contrary to LLNL MC&A procedure is incomplete and factually inaccurate. The room in which this incident occurred contained only Category IV waste drums even though it was in a Category I process area and afforded significantly greater safeguards than policy directs.

  The MC&A Plan does not specify that all inventory team members must be from the MC&A organization. These details are provided in MC&A Procedure MM-IV-02, *Item Inventory of Accountable Nuclear Materials*. This procedure explicitly states: "In the Category I process area Material Balance Area (MBA), the Inventory Team consists of at least one knowledgeable and trained Inventory Taker from the Materials Management Section and the MBA Representative or knowledgeable workstation person." Consequently, requesting that a knowledgeable workstation person assist in reading a TID is fully consistent with MC&A procedures.

  The comments above on this issue also pertain to the summary statement on this issue on Page 2, second bullet.

- Page 6, Tamper Indicating Devices, beginning at Paragraph 3. MBA 170 contained only Category IV waste drums, which were located inside a PA and afforded significantly greater safeguards than required.

  The waste drums in question were part of a specific operation involving measurements performed by representatives of the Waste Isolation Pilot Plant (WIPP). These measurements were performed in an area at LLNL outside of the MAA and PA. The waste manager anticipated that some drums taken for measurement would not meet the waste acceptance criteria and would need to be returned to MBA 170 and eventually to the

MAA. In order to provide the facility some assurance that the drums had not been tampered with and additional safety issues created, LLNL coordinated with the LSO MC&A Program Manager to allow the TIDs to remain in tact for these drums, rather than deface them as was the standard practice.

The TIDs were initially applied to the waste drums inside the MAA, and the drums then placed under two-person surveillance. When the drums were removed from the MAA for WIPP measurement, the TIDs were administratively removed in the COMATS database. At no time after the drums left the MAA were these TIDs used or intended to be used for safeguards. Regardless of the reaffirmation in LSO's October 28, 2005, Survey Report, the policy of not using TIDs for safeguard purposes unless they are under effective surveillance has been practiced at LLNL and explicitly stated in LLNL's MC&A Plan since revision of the Plan in 2000.

Finally, TIDs on two waste drums, perhaps four, had been reversed in the COMATS database. (Due to shipment to WIPP, the data on the other two drums could not be positively confirmed). This was a database error and not a material error. The requirement applicable to this situation is that the record system must accurately reflect the location and identity of TIDs with 99 percent accuracy. Having four errors out of the thousands of TIDs inspected during the October inventory is indicative of effective performance. Additionally, this requirement for 99 percent or greater accuracy is specifically addressed in LLNL's Annual Operating Plan and is explicitly assessed as a part of each inventory.

The comments above on this issue also pertain to the summary statement on this issue on Page 3, first bullet.

- Page 7, Status of Accountable Materials, Paragraphs 1 and 2 and Bullets 1 and 4, includes information that does not accurately describe the requirements specified in LLNL's MC&A Plan or consider current requirements. The MBA in question contained only Category IV, Attractiveness Level E, items (depleted uranium and a small quantity of lithium deuteride).

  At LLNL, location determination for items in Category IV MBAs is at the MBA level. Additional location identification (e.g., building, room, etc.) listed in the accounting system for Category IV MBAs is for the MBA Representative convenience only. Section 7.2.6.3 of the MC&A Plan states: "To accomplish the 100 percent item inventory for a location in

Category IV MBAs, the MBA Representative systematically checks the *MBA* for nuclear material and ..." This statement is in contrast to all other inventory descriptions that state: "...checks the *location* for..." (italics added here for emphasis). Consequently, the location of 14 items in MBA 300 were specified consistent with MC&A Plan requirements.

In addition, requirements for the type of items located in MBA 300 are specified in DOE M 470.4-6, Section A, Chapter 1, paragraph 3c. These items are exempt from most MC&A requirements. Regarding location, the inventory and transactions for these materials must be documented only as being at LLNL. The fact that LLNL further specifies the MBA exceeds that requirement.

The comments above on this issue also pertain to the summary statement on this issue on Page 3, second and fifth bullets.

- Page 7, Status of Accountable Materials, Paragraphs 1 and 2, Bullets 2 and 3, presents information that is incomplete and misleading. The MBA in question contained only Category IV, Attractiveness Level E, items (depleted uranium and a small quantity of lithium deuteride).

  The items in question (depleted uranium) were destroyed as part of an explosive test. Prior to deleting an item from the COMATS database, the MBA representative verifies that identification of destroyed items is documented by programmatic personnel on both a Job Order and Shot Card, and that these documents are consistent. Depending on programmatic operations, completion of both these documents may take several months, so that a time delay in updating COMATS is not unusual and is not a deficiency. In the event that an annual inventory occurs before this process is completed, the MBA representative relies on partial documentation and experimenter knowledge to reconcile items not readily available for immediate physical inventory.

  Regarding the comment on duplicate identification numbers of two parts, the parts were initially entered into the system using the vendor's identification numbers. At a later time these parts were assigned a new number consistent with LLNL's designated system. This practice is commonplace and generally applied to all parts received from outside organizations. A simple human error resulted in the database duplicating the listing. This error would have been identified and reconciled during the next annual physical inventory.

Finally, the partially destroyed item had been initially documented on a Shot Record and Job Order as being destroyed. However, upon recovering shot debris, the program recovered this item as being only partially destroyed. When such items are returned to the MBA representative for storage, they are reentered into the COMATS database. This particular item had not yet been returned to the MBA representative at the time of this review.

The comments above on this issue also pertain to the summary statement on this issue on Page 3, third and fourth bullets.

Our comments related the recommendations are as follows.

Recommendation 1: Ensure that Inventory personnel validate all serial numbers, verify the integrity of all TIDs, and, if required, confirm the net weight of accountable nuclear material.

Management Comment

This recommendation addresses activities that are, and have been, part and parcel of our current operations.

Recommendation 2: Ensure that inventory personnel conduct inventories in accordance with the procedures identified in the MC&A Plan, to include complying with the specified inventory team member duties and team composition.

Management Comment

Inventories being conducted are not contrary to the MC&A Plan and Procedures. The procedure in place at the time of the audit, however, did not contain specific guidance for the anomalous situation in which an item is not initially located during the inventory process—specifically allowing information useful to the reconciliation to be told to the second inventory team member. This clarification of our accepted practice has been added to the procedure and no further action is required.

Recommendation 3: Ensure that the TID program is managed in accordance with the MC&A Plan, with particular emphasis on the accuracy of information in COMATS and elimination of TIDs when no longer required under Livermore MC&A procedures.

Management Comment

This recommendation addresses activities that are, and have been, part and parcel of our current operations.

Recommendation 4: Ensure that greater MC&A programmatic emphasis is placed on the accuracy of COMATS for Category IV Material Balance Areas.

Management Comment

NNSA does not agree with this recommendation. This report does not mention Special Nuclear Material, nor does it distinguish Special Nuclear Material from Source and Other Accountable Nuclear Material, and does not consider the requirement for a graded approach to safeguards, as stated in DOE Manual 470.4-6, Chapter 1, paragraph 2. LLNL's current requirements, including accuracy of COMATS, already meet and generally exceed published requirements for Category IV MBAs. Providing greater emphasis on Category IV, especially in an era of limited safeguards and security resources, is contrary to the requirement for graded safeguards.

cc: Manager, Livermore Site Office
NNSA Senior Procurement Executive
Director, NNSA Service Center

IG Report No. DOE/IG-0745

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