Chronic Beryllium Disease Prevention Program Assessment at the Los Alamos National Laboratory

August 2019

Office of Enterprise Assessments
U.S. Department of Energy

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Acronyms

BHA	Beryllium Hazard Assessment
BIU	Beryllium Inventory Update
CBDPP	Chronic Beryllium Disease Prevention Program
CFR	Code of Federal Regulations
CTS	Comprehensive Tracking System
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
IOP	Interim Operating Procedure
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC
LIHSM	Laboratory Industrial Hygiene Safety Manual
NA-LA	NNSA Los Alamos Field Office
NNSA	National Nuclear Security Administration
OFI	Opportunity for Improvement
OIG	Office of Inspector General
QIHSP	Qualified Industrial Hygiene Safety Professional
Triad	Triad National Security, LLC

Chronic Beryllium Disease Prevention Program Assessment at the Los Alamos National Laboratory April 8-11 and 22-25, 2019

Summary

Scope:
This assessment evaluated the effectiveness of corrective actions at the Los Alamos National Laboratory (LANL) to resolve concerns, issues, and four recommendations identified in the U.S. Department of Energy (DOE) Office of Inspector General (OIG) February 2018 report DOE-OIG-18-20, *DOE Office of Inspector General's Inspection Report of the LANL Chronic Beryllium Disease Prevention Program*. This Office of Enterprise Assessments assessment focused on the aspects of the LANL chronic beryllium disease prevention program identified in the OIG report, including beryllium inventories, hazard assessments and sampling plans, and released areas and archived records. In addition, the National Nuclear Security Administration Los Alamos Field Office (NA-LA) oversight activities associated with these areas were assessed.

Significant Results for Key Areas of Interest:
Chronic Beryllium Disease Prevention Program
LANL contractors[1] have addressed the specific language relating to the four recommendations from the OIG report. The chronic beryllium disease prevention program has improved since the OIG review. However, issues persist in the areas of beryllium inventory records and hazard assessments, sampling plans, beryllium postings, and the release and repurposing of former beryllium areas.

Federal Oversight
NA-LA is not conducting effective oversight of the chronic beryllium disease prevention program, or of other safety and health programs at LANL. NA-LA management indicated the lack of sufficient safety and health resources has presented a challenge to achieving effective oversight in this area.

Best Practices and Findings
There were no best practices identified as part of this assessment.

The assessment team identified one finding as part of this assessment. Contrary to DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*, NA-LA is not maintaining sufficient technical capability and knowledge of site and contractor activities to make informed decisions about hazards, risks, and resource allocation; provide direction to contractors; and evaluate contractor performance.

Follow-up Actions:
No follow-up activities are planned.

[1] The operation of LANL transitioned from Los Alamos National Security, LLC to Triad National Security, LLC on November 1, 2018.

Chronic Beryllium Disease Prevention Program Assessment
at the Los Alamos National Laboratory

1.0 PURPOSE

The U.S. Department of Energy (DOE) Office of Worker Safety and Health Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of selected elements of the chronic beryllium disease prevention program (CBDPP) at the Los Alamos National Laboratory (LANL). This assessment evaluated the effectiveness of corrective actions taken to resolve the concerns, issues, and four recommendations resulting from a February 2018 DOE Office of Inspector General (OIG) report. EA conducted the onsite portions of this assessment during April 8-11 and 22-25, 2019.

2.0 SCOPE

The scope of this assessment is in accordance with the *Plan for the Office of Enterprise Assessments Assessment of the Chronic Beryllium Disease Prevention Program at the Los Alamos National Laboratory, April 2019.* This assessment focused on the aspects of the LANL CBDPP identified in the OIG report, including beryllium inventories, hazard assessments and sampling plans, and released areas and archived records. In addition to the OIG report recommendations, the National Nuclear Security Administration (NNSA) Los Alamos Field Office (NA-LA) oversight activities associated with these areas were assessed.

3.0 BACKGROUND

The OIG reviewed elements of the LANL CBDPP in 2016-2017, as documented in the February 2018 report DOE-OIG-18-20, *DOE Office of Inspector General's Inspection Report of the LANL Chronic Beryllium Disease Prevention Program*. NNSA's response to the report included a commitment that "the NNSA Office of Safety, in conjunction with the Department of Energy's (DOE) Office of Environment, Safety and Health Assessments, will conduct an assessment of the LANS (Los Alamos National Security, LLC) Chronic Beryllium Disease Prevention Program." NA-LA requested this EA assessment to satisfy that commitment.

The OIG report identified concerns with respect to beryllium inventories, hazard assessments and sampling plans, released areas, and field office oversight, and provided four recommendations.

"In order to ensure Los Alamos fully implements a Chronic Beryllium Disease Prevention Program that minimizes workers' exposure to beryllium, we recommend the Manager, Los Alamos Field Office, ensure that:

- ***OIG Recommendation 1:*** *Los Alamos documents beryllium inventory updates, hazard assessments and sampling plans as required by its Federally-approved CBDPP.*

- ***OIG Recommendation 2:*** *Los Alamos reviews and updates the beryllium inventory to ensure its accuracy and completeness.*

- ***OIG Recommendation 3:*** *The Field Office reviews and approves, as appropriate, significant revisions to the Los Alamos CBDPP.*

- ***OIG Recommendation 4:*** *Los Alamos, in coordination with the Field Office, should assess the risk associated with the repurposed beryllium areas and make a risk based judgement on the level of residual contamination and potential of beryllium exposure."*

The site contractor at the time of the OIG assessment, LANS, developed a corrective action plan to address these recommendations. In November 2018, LANS reported to NA-LA that all corrective actions were completed. NA-LA acknowledged completion of these corrective actions. On November 1, 2018, management and operation of the site transitioned to Triad National Security, LLC (Triad).

4.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*. EA implements the independent oversight program through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. Organizations and programs within DOE use varying terms to document specific assessment results. In this report, EA uses the terms "deficiencies, findings, and opportunities for improvement (OFIs)" as defined in DOE Order 227.1A. In accordance with DOE Order 227.1A, DOE line management and/or contractor organizations must develop and implement corrective action plans for the deficiencies identified as findings. Other important deficiencies not meeting the criteria for a finding are also highlighted in the report and summarized in Appendix B. These deficiencies should be addressed consistent with site-specific issues management procedures.

As identified in the assessment plan, this assessment considered requirements based on selected objectives and criteria from EA Criteria and Review Approach Documents EA-32-04, Rev. 0, *Beryllium Safety*, and EA-32-03, Rev. 0, *Industrial Hygiene Program*.

The assessment team reviewed key beryllium documents, including inventory records and hazard assessments, procedures, work documents, and policies; interviewed key personnel responsible for developing, implementing, and overseeing beryllium and related programs; observed beryllium-related work activities; and walked down significant portions of the beryllium inventory entries in three of the five LANL facility operations directorates. The members of the assessment team, the Quality Review Board, and EA management responsible for this assessment are listed in Appendix A. Summaries of the documents reviewed, personnel interviewed, and observations made during this assessment, relevant to the findings and conclusions of this report, are provided in Appendix B. Triad maintained detailed lists of documents obtained by the assessment team, interviews conducted, and work activities observed by the assessment team.

EA has not conducted a recent assessment of LANL's CBDPP, so there were no other items for follow-up during this assessment.

5.0 RESULTS

5.1 Beryllium Inventory (OIG Recommendations 1 and 2)

The OIG identified over 500 LANL beryllium inventory records. The CBDPP, and associated supporting procedures, required that both a beryllium inventory update (BIU) form (Form 2175) and a beryllium hazard assessment (BHA) form (Form 2061) be completed for each inventory record (with some specific exceptions). A beryllium inventory summary to track the status of the records was also required. LANS had issued an interim operating procedure (IOP) prior to the OIG inspection, intending to consolidate the

inventory process. However, the IOP bypassed some CBDPP requirements and was not approved by NA-LA. The resulting beryllium inventory contained inaccuracies as numerous inventory records could not be found, verified, and/or updated.

LANL Corrective Actions

LANS revised the 2016 beryllium inventory consisting of 512 records to the current (August 2018) list of 390 records. The reduction in the number of records was a result of removing and or updating duplicate, archived, or incorrect beryllium inventory classifications. LANS also verified that a BIU Form 2175 was documented for each of the current records. Beryllium inventory procedures, such as the Laboratory Industrial Hygiene Safety Manual (LIHSM) Chapter 29 on *Identifying and Evaluating Beryllium Hazards*, and the *Beryllium Inventory Management Guide (OSH-Guide-007)*, were revised in December 2017 and August 2018, respectively.

EA Assessment

The assessment team reviewed beryllium inventory records, walked down 35 beryllium inventory entries obtained from the August 2018 LANL Beryllium Inventory List, observed beryllium work activities, and verified that BIUs and BHAs had been prepared for each inventory entry. (Note: A beryllium inventory entry denotes a physical location where beryllium is stored; an area where beryllium contamination or airborne beryllium may be encountered; or other areas or activities involving current or historical beryllium use where an inventory entry has been deemed appropriate by qualified personnel). The assessment team also reviewed the revised and updated forms and procedures for the beryllium inventory process.

The process has improved since the OIG review, particularly with respect to the detail and clarity of the records. LANS and Triad also improved its control over the beryllium inventory summary, which is now a controlled document. Additional or newly-archived areas are updated through a formal, documented process, and the revised beryllium inventory summary is published annually on the LANL beryllium website. LANS and Triad also improved the inventory accuracy by implementing annual audits of at least 10% of the inventory. These corrective actions adequately address the specific language relating to inventory in OIG Recommendations 1 and 2 in that LANL now reviews and updates the beryllium inventory and documents these updates.

However, issues with the accuracy and completeness of beryllium inventory records persist. All beryllium inventory entries reviewed during this assessment had updated BIUs and BHAs, but approximately 20% of the inventory records (BIUs and BHAs) reviewed contained inaccuracies or discrepancies. **(Deficiency-Triad-1 and OFI-Triad-1)** For example:

Multiple records for the same beryllium locations conflicted in how the locations were categorized between the BIU and BHA form, such as indicating the same inventory entry location as both a "Beryllium Storage Area" and "not a beryllium area"; or "Inaccessible Beryllium Contamination Area" and "Accessible Beryllium Contamination Area." As a result, the decision process for specifying beryllium surface sampling requirements was unclear, as LIHSM Chapter 29 assigns different beryllium surface sampling recommendations based on the categorization of the beryllium location.

Other examples of beryllium inventory record inaccuracies or deficiencies associated with BIUs and BHAs were provided to LANL during the onsite outbrief.

5.2 Beryllium Hazard Assessments and Sampling Plans (OIG Recommendation 1)

The OIG determined LANS did not complete BHAs with sampling plans for each beryllium inventory entry as required by the CBDPP. The purpose of a BHA is to determine the potential for employee exposure to airborne beryllium and/or surface beryllium. For the beryllium inventory entries reviewed, the BHAs were typically documented on BHA Form 2061. LIHSM Chapter 29 also requires that a beryllium sampling plan be developed if there is a potential exposure to airborne beryllium, and a surface sampling plan must be developed for each beryllium inventory entry. The OIG determined that only 230 of 512 inventory records (45%) contained in the 2016 inventory spreadsheet had a completed BHA form. Furthermore, the OIG found that of those inventory entries that had completed BHAs, 68% had surface sampling requirements that differed from those documented on the beryllium inventory summary.

LANL Corrective Actions

With respect to BHAs and sampling plans, LANS identified and completed two corrective actions: (1) to verify that documented BHAs had been developed for beryllium operations and other activities involving airborne beryllium or beryllium contamination, and (2) to verify that sampling plans had been developed and documented for beryllium operations and designated beryllium areas.

EA Assessment

The assessment team reviewed 35 BHAs and sampling plans. Most sampling plans were documented on BHA Form 2061, with some data provided on BIU Form 2175. Sampling results were documented in the comprehensive tracking system (CTS). The assessment team walked down the beryllium inventory locations associated with each of these BHAs and identified completed BHAs for all beryllium inventory locations that required them.

The BHAs included detailed and well-written descriptions of the area or operation, such as the BHAs reviewed for beryllium inventories in the TA 3 buildings. Surface sampling requirements were documented on most BHAs (although some content issues were identified, see below), and sampling records were easily obtained through CTS. Sampling plan guidance is provided in beryllium procedures, such as LIHSM Chapter 29. Beryllium sampling work activities observed in the Beryllium Technology Facility were methodical and performed in accordance with beryllium sampling procedures. Overall, LANS and Triad have developed adequate and informative instructions and procedures on conducting BHAs and sampling plans. The assessment team concluded that the corrective actions completed by LANS and Triad adequately address OIG Recommendation 1 in that BHAs and sampling plans are now documented.

LIHSM Chapter 29 identifies sampling plan requirements, such as requiring a surface sampling plan for each beryllium inventory entry, to include the frequency, locations, and minimum number of samples to be collected. However, the sampling plans documented in more than 20 of the 35 (?) BIU and/or BHA forms reviewed did not meet one or more of the sampling plan requirements of LIHSM Chapter 29. **(Deficiency-Triad-2)** For example:

- Few of the records reviewed identified sampling locations within the area covered by the inventory entry. Designation of beryllium sampling locations is typically based on professional judgement and not documented in sampling plans.

- In some cases, the sampling performed (as documented in CTS) does not agree with the sampling plan documented in the BIU/BHA. For example, for one beryllium inventory location associated with a chemical fume hood, the BIU/BHA identified a minimum number of six samples per

sampling event, including sampling outside the hood and storage cabinet. However, the CTS record indicates that only four samples were obtained, all within the hood.

- In a number of BIU/BHA records, the sampling plan guidance within the same record set is conflicting. For example, an accessible beryllium contamination area is identified in one description section in the BIU as "subject to routine wipe sampling by the assigned IH [Industrial Hygienist]." However, the BHA indicates that "surface wipe samples" are not required, and there is no sampling plan or minimum number of wipe samples indicated.

- In the majority of BIUs reviewed, the section on "approximate size of area" is not completed or is indicated as "N/A." Consequently, it could not be verified if the minimum number of samples was in accordance with LIHSM Chapter 29 recommendations, which are based on the square footage.

- In a number of BIU/BHA records, the sampling plan does not meet the minimum sampling recommendations provided in Table 2 of LIHSM Chapter 29. For example, a room identified as an airborne beryllium area requires quarterly sampling with a minimum of ten samples, according to LIHSM Chapter 29. However, the BHA sampling plan record for one such room requires only an annual wipe sampling with a minimum of five samples.

Overall, the beryllium surface sampling plans and sampling records do not consistently meet the requirements of the CBDPP and/or associated beryllium procedures, or consensus standards on sampling plans such as ASTM-D7659, *Standard Guide for Strategies for Surface Sampling of Metals and Metalloids for Worker Protection*.

In addition to identifying sampling requirements and sampling plans, BHAs also identify beryllium area posting requirements. The assessment team observed two examples of beryllium areas that lacked the posting required by Section 13.12.1 of the CBDPP. These examples were discussed with Triad and were being addressed. In addition, the health hazard communication postings on the doors of most rooms containing beryllium are inconsistent in identifying the beryllium hazard, resulting in confusion among the qualified industrial hygiene safety professionals (QIHSPs) interviewed as to the purpose, necessity, and the data to be entered on these postings for beryllium areas. For example, for beryllium storage areas, some health hazard communication postings identify the beryllium hazard, while others do not. **(Deficiency-Triad-3)** There is no guidance for facility industrial hygienists or facility management concerning how beryllium hazards should be identified and communicated to workers through health hazard communication postings.

5.3 Beryllium Released Areas and Archived Records (OIG Recommendation 4)

The IOP LANS implemented in 2015 omitted elements of the CBDPP. One impact was that documents related to the beryllium inventory were not controlled. The OIG determined that "Los Alamos released potentially contaminated areas for other purposes without a formal evaluation to ensure that any residual contamination was within the acceptable threshold for release." No formal process existed to outline the specific steps needed to determine whether required sampling and hazard evaluations were performed.

LANL Corrective Actions

LANS issued OSH-ISH-Guide-011, *Guidance Document for Release of Selected Beryllium Facilities, Work Areas, or Environmental Sites*, in February 2018 to supplement the CBDPP and LIHSM Chapter 29 requirements. OSH-ISH-Guide-011 provides a step-by-step process description for the release of

beryllium facilities, including defining the acceptable knowledge of a process/area, sample strategy considerations, wipe sampling strategy, and release criteria.

EA Assessment

The assessment team walked down six areas in the Sigma Facility that were on the beryllium inventory and under consideration for release from the inventory. BIU and BHA documentation for these six areas was reviewed and compared with each area's current status with regard to beryllium work or contamination; in each of these areas, the status was accurately described. The Sigma Facility QIHSP had recommended archiving these areas for release and had conducted extensive surface wipe sampling. OSH-ISH-Guide-011 provides supplemental guidance to allow QIHSPs to statistically demonstrate that an area recommended for removal from the active beryllium inventory is at or below the release criteria. In most cases, in order to achieve this statistical nonparametric upper tolerance limit, a minimum of 59 wipe samples were taken. The assessment team observed the LANL Beryllium Team and the Sigma Facility QIHSP conduct an archive review of the beryllium records and wipe sampling results for the purpose of releasing the areas mentioned above. Each criterion for release was considered as part of a thorough, conservative deliberation.

Additional studies of the background levels of beryllium from natural sources (e.g., dust) would assist in the ultimate disposition of some areas on the current beryllium inventory. These background levels confound efforts to archive certain areas, especially where past beryllium operations have little to no impact on the current status of contamination. Future studies were discussed by the LANL Beryllium Team during this assessment. While LIHSM Chapter 29 mentions considerations for comparing beryllium ratios found in wipe samples to those from natural sources, progress in this area is ongoing.

5.4 Review and Approval of the CBDPP (OIG Recommendation 3)

An internal LANS assessment report in 2016 identified that the IOP had introduced new definitions and terminology, identified additional responsibilities and new requirements not in the approved CBDPP, and eliminated the BIU Form 2175; as a result of these changes, critical elements of the beryllium inventory were no longer documented, such as BHAs and sampling results. The OIG report also noted that the CBDPP lacked sufficient oversight. While acknowledging that NA-LA personnel participated in a contractor assessment of the CBDPP in 2015, the OIG noted that oversight was insufficient due to the lack of personnel and the volume of safety and health programs.

LANS and NA-LA Corrective Actions

LANS rescinded the Interim Operating Procedure in November 2016. NA-LA approved a major revision (Revision 6) of the LANL CBDPP in October 2017 which became effective December 2017. In June 2018, LANS completed minor revisions to the CBDPP and submitted a revised CBDPP to NA-LA, along with an explanation of the changes and a justification of why the revisions did not constitute a significant change or addition requiring Field Office approval. With the transition from LANS to Triad, a technical revision of this document (Revision 7.2) was issued on November 1, 2018, and a major revision (Revision 8) was submitted to NA-LA for review and approval on April 25, 2019.

EA Assessment

Based on the corrective actions above, NA-LA has adequately addressed OIG Recommendation 3.

However, the OIG noted that NA-LA in 2017 acknowledged that "oversight of the LANL beryllium program was insufficient due to the lack of personnel and the volume of safety and health programs."

Federal oversight of the CBDPP has not improved since then; in fact, it has declined. NA-LA formerly had two full-time industrial hygienists on staff to provide oversight of safety and health, including beryllium program oversight. Since August 2016, both of these positions have been vacant. A new (and not yet qualified) Facility Representative with a Certified Safety Professional certification was available to provide very limited assistance in safety and health oversight since August 2018. This involvement consisted primarily of a monthly interface meeting with LANS and Triad occupational safety and health division and/or industrial hygiene group leadership, where a multitude of safety and health matters were discussed, and occasional conversations/meetings with LANL beryllium program team members. This employee also completed the NA-LA review of the revision to the CBDPP.

NA-LA is not conducting effective oversight of the LANL beryllium program, or of safety and health programs in general. Contrary to DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*, paragraph 4.a.2, NA-LA is not maintaining sufficient technical capability and knowledge of site and contractor activities to make informed decisions about hazards, risks, and resource allocation; provide direction to contractors; and evaluate contractor performance. (See **Finding F-NA-LA-1**.) NA-LA management indicated the lack of sufficient safety and health resources has presented a challenge to achieving effective oversight in this area.

6.0 FINDINGS

Findings are deficiencies that warrant a high level of attention from management. If left uncorrected, findings could adversely affect the DOE mission, the environment, the safety or health of workers and the public, or national security. DOE line management and/or contractor organizations must develop and implement corrective action plans for EA appraisal findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 227.1A to manage these corrective action plans and track them to completion. In addition to the findings, deficiencies that did not meet the criteria for a finding are listed in Appendix C, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

One finding was identified, which applies to NA-LA.

Finding F-NA-LA-1: Contrary to DOE Order 226.1B, paragraph 4.a.2, NA-LA is not maintaining sufficient technical capability and knowledge of site and contractor activities relating to worker safety and health to make informed decisions about hazards, risks, and resource allocation; provide direction to contractors; and evaluate contractor performance.

7.0 OPPORTUNITIES FOR IMPROVEMENT

The assessment team identified one OFI to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in appraisal reports, they may also address other conditions observed during the appraisal process. EA offers these OFIs only as suggestions for line management consideration; they do not require formal resolution by management through a corrective action process and are not intended to be prescriptive or mandatory. Rather, they are offered to assist site management in implementing best practices or potential solutions to issues identified during the assessment.

Triad National Security, LLC

OFI-Triad-1: Consider combining the BIU form (Form 2175) and the BHA form (Form 2061). Each form currently contains either (1) repetitive information (e.g., designated beryllium areas) that has resulted in inconsistencies and inaccuracies between the forms, or (2) only partial information that does not effectively communicate how a CBDPP requirement is being fulfilled. For example, both forms have beryllium sampling information, but neither succinctly communicates the sampling requirements or sampling data. The BIU form has the "latest sampling information," whereas the BHA form has a "review of existing sampling data."

Appendix A
Supplemental Information

Dates of Assessment

Onsite Assessment: April 8-11 and 22-25, 2019

Office of Enterprise Assessments (EA) Management

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Appendix B
Deficiencies

Deficiencies that did not meet the criteria for a finding are listed below, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

All deficiencies apply to Triad National Security, LLC.

Deficiency-Triad-1: Triad has not ensured that the characteristics and locations of all beryllium inventory entries at the facility were documented, as required by 10 CFR 850.20(b)(3) and/or LANL procedures.. Approximately 20% of the beryllium inventory records (BIUs and BHAs) reviewed by the assessment team contained inaccuracies or discrepancies with other beryllium inventory records.

Deficiency-Triad-2: Triad has not ensured that beryllium sampling plans include the frequency, locations, and minimum number of samples to be collected, as required by LIHSM Chapter 29 Section 3.5.1. Beryllium sampling plans documented in 20 of the 35 BIU/BHA forms reviewed did not meet one or more of the sampling plan requirements of LIHSM Chapter 29. LIHSM Chapter 29 Section 3.5.1, for example, requires a surface sampling plan for each beryllium inventory entry and, at a minimum, the sampling plan must include the frequency, locations, and minimum number of samples to be collected. For a number of sampling plans, one or more of these requirements were not met.

Deficiency-Triad-3: Triad has not ensured that beryllium areas are posted as required by Section 13.12.1 of the CBDPP. The assessment team observed two examples of beryllium areas not posted as required by Section 13.12.1 of the CBDPP. Also, the health hazard communication postings on the doors of most rooms containing beryllium are inconsistent in identifying the beryllium hazard.