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Office of Audits and Inspections

SPECIAL REPORT

Allegations Regarding the Sandia National Laboratories Mixed Waste Landfill

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Department of Energy
Washington, DC 20585

February 18, 2016

MEMORANDUM FOR THE MANAGER, SANDIA FIELD OFFICE

FROM: David Sedillo, Director
Western Audits Division
Office of Inspector General

SUBJECT: INFORMATION: Special Report on the "Allegations Regarding the Sandia National Laboratories Mixed Waste Landfill"

BACKGROUND

The Department of Energy (Department) Sandia National Laboratories (SNL) is a Government-owned, contractor-operated laboratory that is part of the National Nuclear Security Administration (NNSA) nuclear weapons complex. As part of its mission, SNL operated a 2.6-acre mixed waste landfill (MWL) at its Albuquerque, New Mexico, location on Kirtland Air Force Base and disposed of classified and unclassified waste in the unlined MWL from 1959 through 1988. The MWL is regulated by the New Mexico Environment Department (NMED) as a solid waste management unit. In 2005, the NMED ordered SNL and the Department to leave the waste in place, cover the MWL, and periodically monitor the MWL site, including the surrounding groundwater, to ensure that the MWL was not contaminating the local aquifer.

Since December 2014, the Office of Inspector General has received multiple allegations and information regarding human health and environmental protection issues due to the waste stored in the MWL. For example, it was alleged that the inventory of the MWL was not complete and that contaminants from the MWL had reached the Albuquerque, New Mexico, aquifer. In response, we initiated a special review to examine the facts surrounding the allegations.

RESULTS OF SPECIAL REVIEW

Our review substantiated only one of six allegations regarding the SNL MWL. Specifically, we substantiated that since the MWL's inception in 1959, SNL and the Department had not maintained a complete inventory of the types and amounts of waste disposed of in the MWL.

The specific allegations and our conclusions follow.

Inventory of the Mixed Waste Landfill

We substantiated the allegation that the inventory of the MWL is not complete. Specifically, it was alleged that SNL poorly inventoried the types and amounts of wastes, and many of the records were destroyed. SNL and the Department informed us of a July 2000 memo titled *Mixed Waste Landfill – Classified Waste Inventory*, which discussed a study where an NMED official traced all 36 randomly selected classified records from various years to specific items or radionuclide inventories. Based on this report, NMED was confident that all classified waste was contained in the unclassified inventory, without specific project names, places, or weapon numbers. However, according to a 2005 report titled *Hearing Officer's Report, Proposed Findings of Fact and Conclusions of Law*, the Hearing Officer was troubled by NMED's July 2000 study. Specifically, the Hearing Officer stated, "I was not convinced that enough was done in this area to verify these records and inventory, particularly given the significant amount of controversy surrounding the inventory." Nevertheless, the Hearing Officer concluded that, "there is a reasonably accurate and complete inventory for the landfill, and that more is known about this landfill than about many other historic landfills." However, we found examples of waste disposed in the MWL that were not documented in the inventory. Specifically, we found records of contaminated rods and of 204,000 gallons of reactor coolant water.

Additionally, it was alleged that the MWL contained 271,000 gallons of reactor coolant water and seven 55-gallon drums of contaminated material from the Three Mile Island nuclear power plant. It was also alleged that the MWL contained 100 drums of plutonium. The complainant also indicated that depleted uranium in the MWL caught fire. Additional information regarding these inventory allegations follows.

- We found that although the existence of reactor coolant water contained in the MWL was widely known through multiple reports, the item was not listed in the MWL inventory. After the inventory was developed for a 2002 report titled *Report of the Mixed Waste Landfill Phase 2 Resource Conservation and Recovery Act (RCRA) Facility Investigation, Sandia National Laboratories, Albuquerque, New Mexico*, the official MWL inventory was never updated. In addition, there were conflicting reports regarding the amount of reactor coolant water that was disposed in the MWL. According to a 1993 NMED report, 270,000 gallons of reactor coolant water from the SNL Engineering Reactor Facility were disposed in the MWL (trench D of the unclassified area). However, in 2005, the amount reported was changed to 204,000 gallons. Specifically, the 2005 Hearing Officer's Proposed Findings of Fact report stated, "this number is sometimes erroneously reported as 270,000 gallons in older reports." More recently, a 2014 report also listed the amount as 204,000, not 270,000 or 271,000, gallons of reactor coolant water. However, we were able to verify the 204,000 number by reviewing pages of a rad protection log book that SNL provided to us for each tanker truck that disposed coolant water in trench D. SNL stated the discrepancy of the number of gallons was due to a 67,500-gallon subtotal calculation that was inadvertently added twice.

- The inventory indicated that seven 55-gallon drums from the Three Mile Island nuclear power plant were in the MWL. The drums contained multiple mission products, including contaminated cables, instruments, and electronic components.

- Our review of available records did not provide any indication that 100 drums of plutonium were buried in the landfill. However, due to the condition of the inventory records, we could not definitively determine the total amount of plutonium disposed in the MWL. Although we identified 12 plutonium-contaminated items from the inventory, the amount of plutonium buried in the MWL was listed only once as 0.1 grams of plutonium 238. According to the Department and SNL's request for Class 3 modification to Hazardous Waste Permit NM5890110518-1, "the cumulative plutonium mass disposed of in the MWL is very small, estimated to be less than 1 gram."

- According to a 1993 SNL form titled *Site Health and Safety Plan Form*, there were two fires in the MWL. In July 1974, a depleted uranium fire was extinguished with carbon dioxide in pit 28. Almost a year later, in June 1975, another fire in trench B was extinguished with more than 5,000 gallons of water. SNL and the NNSA were not aware whether the second fire was caused by depleted uranium.

Upon acknowledging known items missing from the official MWL inventory, NNSA determined that there would be no value in updating the inventory. Instead, according to NNSA and SNL, to mitigate uncertainty in the inventory, they are in the process of addressing NMED's 2005 Final Order. Specifically, they completed construction of the evapotranspirative (ET) cover and are fulfilling the requirement for continued monitoring. To SNL's credit, they perform various monitoring activities of the MWL, including monitoring of radon, tritium surface soil, soil vapor, soil moisture, groundwater, and plant and animal life. They are also required to analyze the continued effectiveness of the ET cover and reevaluate the feasibility of excavation in a report every 5 years. This report will include an update to the "fate and transport model" with current monitoring data and reevaluate any likelihood of contaminants reaching groundwater. The fate and transport model is used to study and predict future movement of contaminants in the MWL and determine whether the contaminants will eventually reach the groundwater level.

Albuquerque Aquifer

We could not substantiate the allegation that contaminates from the MWL had reached the Albuquerque aquifer. Relying primarily on available SNL monitoring reports, we found that there have been reports of contaminants detected in monitoring wells around the MWL. However, investigations for the source of the contaminants have continued to conclude the MWL was not the source. For example, a January 2011 NMED report titled *Notice of Approval Mixed Waste Landfill Toluene Investigation Report* stated, "NMED is confident that the MWL is likely not the source of the low levels of toluene detected in groundwater samples from the new monitoring wells installed in 2008. The likely source or sources are laboratory contamination or error, sampling equipment, drilling equipment, or a combination of these potential sources." Annual groundwater monitoring reports for calendar years (CYs) 2010-2013 have also indicated the MWL has not affected groundwater beneath the site. The reports stated that no chemical substances were detected at concentrations exceeding the associated Environmental Protection Agency maximum contaminant levels in any MWL groundwater samples, except in CY 2013, when there was excessive chromium related to the corrosion of stainless steel well components. Moreover, according to September 2014 SNL soil vapor monitoring results, the hazardous chemicals tetrachloroethene (PCE) and trichloroethene (TCE) had been detected at low vapor

levels 400 feet below the MWL. However, according to a June 2015 NNSA and SNL report, the maximum concentrations detected for PCE and TCE were within the acceptable level, and NNSA and NMED officials stated they were not concerned with the low vapor presence of PCE and TCE at that level.

According to an NNSA official, PCE and TCE monitoring of both soil vapor and groundwater is included as part of the MWL Long-Term Monitoring and Maintenance Plan (LTMMP). Although the September 2014 SNL soil vapor monitoring results identified that PCE and TCE were approaching the aquifer, the levels are low and will be specifically monitored going forward. More recently, the Annual Long-Term Monitoring and Maintenance Report for the reporting period April 2014–March 2015 stated, "no groundwater constituents were detected at concentrations exceeding trigger levels and the results are consistent with historical MWL groundwater monitoring results."

Five-Year Review

We did not substantiate the allegation that a 5-year review of the ET cover performance and feasibility of excavation was not performed on time, as mandated in the 2005 Final Order. Specifically, it was alleged that NMED's approval of the LTMMP was unlawful because the LTMMP disregarded a condition of the Final Order. That condition required SNL to submit a report every 5 years, the first of which, according to the allegation, was due in May 2010. The purpose of the 5-year report was to reevaluate the feasibility of excavation of the MWL and to analyze the continued effectiveness of an NMED-ordered remedy (i.e., ET cover). In addition, in each 5-year report, SNL is to update the fate and transport model for the site with current data, and reevaluate any likelihood of contaminants reaching groundwater. On February 18, 2015, the New Mexico Court of Appeals made its decision affirming the NMED's approval of the LTMMP, therefore requiring the Department and SNL's first 5-year report be completed 5 years after the NMED approved the LTMMP. Because the LTMMP was approved in 2014, the first 5-year report is due in 2019.

Monitoring Well System's Design and Location

We were unable to substantiate the allegation that the current monitoring wells were incorrectly designed and placed in the wrong location. We did note that, according to a 1993 NMED study, NMED had concerns with the wells. The study noted, "The detection monitoring system that currently exists at the MWL is inadequate because the direction and gradient of groundwater flow cannot be determined with reasonable certainty." In addition, according to a 2006 NMED evaluation titled *Evaluation of the Representativeness and Reliability of Groundwater Monitoring Well Data, MWL, SNL*, the concentration of total nickel in groundwater samples had shown a marked increase over time. This inference indicated a progressive corrosion of the stainless steel well screens. During 2008, four monitoring wells were plugged and abandoned, and four new monitoring wells were installed. Three of the four new wells were installed directly west of the MWL to detect any contaminants because the direction of groundwater flow at the MWL is toward the west/northwest. In addition, the stainless steel well screens were replaced with polyvinyl chloride screens. According to prior annual reports, including the Annual Long-Term Monitoring and Maintenance Report for the reporting period April 2014–

March 2015, groundwater sample results for nickel were within acceptable levels. NMED approved the decommissioning of the monitoring wells of concern and installation of the new monitoring wells.

High-Level Radioactive Wastes in the Form of Nuclear Fuels

We could not substantiate the allegation that high-level radioactive wastes in the form of mixed oxide nuclear fuel and nuclear fuel canisters from Sandia Transient Axial Relocation (STAR) experiments were disposed in the MWL. According to the 2005 Hearing Officer's Proposed Findings of Fact report, NMED investigated the nature of the experiments that involved mixed oxide nuclear fuels. NMED's investigation concluded that SNL received spent nuclear fuel from the Experimental Breeder Reactor-II at the Idaho National Environmental Engineering Laboratory and the Belgian Reactor 3 in Mol, Belgium, and part of one fuel pin from the Karlsruhe-II Reactor in Karlsruhe, Germany. NMED's investigation verified that the fuels that were used in experiments were stabilized in epoxy and then removed from the canisters, and that all experimental packages containing spent fuel were accounted for in storage at SNL, and were not buried in the MWL. In the same report, the Hearing Officer stated, "NMED's investigation, however, confirmed that the STAR canisters were not opened after the experiments. NMED verified the location of these specific canisters and confirmed they were not disposed of in the landfill." Further, we reviewed a 1997 SNL memo confirming that the mixed oxide nuclear fuel was removed from the canisters. In our initial review of a small subset of MWL disposal records provided to us by the complainant, we found that waste from the SNL Annular Core Research Reactor and components and equipment from the hot cell buildings may have been in contact with high-level waste. However, according to Department Guide 435.1-1, *High-Level Waste Requirements*, such materials are not considered to be high-level waste. The guidance states that there is neither precedence nor basis for including high-level waste-contaminated components and/or equipment within the definition of high-level waste.

We performed a more in-depth review of the 5,257 disposal records provided to us by NNSA and SNL, but we could not substantiate that high-level waste was disposed in the MWL. We found that 573 of the records (11 percent) were not legible. Of the remaining 4,684 legible records, we found 36 records that contained terminology that potentially indicated the presence of high-level waste. For example, the terminology included descriptions of pins and rods that could be indicative of high-level waste, if the waste is assumed to be nuclear fuel pins and rods that were irradiated in the core of a nuclear reactor to the point of being spent. We asked NNSA and SNL subject matter experts to review some of the records with high-level waste terminology. The subject matter experts concluded that based on their analysis, the records do not indicate high-level waste was disposed in the MWL. For example, one of the disposal records specifically identified 11 "fuel rods" versus "rods" that were disposed. According to the experts, although the records stated "fuel rods," in their view, the rods did not contain high-level waste. Specifically, SNL subject matter experts stated that because the fuel rods were contaminated with nuclear material below a measurable amount, which is stated in the disposal record as "negligible," the fuel rods did not contain nuclear fuel and therefore could not have been high-level waste. Further, the experts stated that actual nuclear fuel, if present, would always have an amount of material greater than a negligible amount. In addition, NNSA subject matter experts stated that the fuel rods were empty containers or parts of containers that may have been

cylindrically shaped metal tubes with various internal parts like springs, spacers, or discs that were used to hold the fuel material in the appropriate position within the rod. Because there was no additional supporting documentation available about the fuel rods and other records in question, we have no basis to question NNSA and SNL's conclusions that the MWL does not contain high-level waste.

Evapotranspirative Cover

We did not substantiate the allegation that a 2006 technical review considered the ET cover placed over the waste site to be unprotective. According to the review, contracted by NMED, there was no reference that the cover was not protective. The report stated, "if the scenario runs indicate the potential for erosion of the soil cover, then design modifications may be necessary to demonstrate ongoing integrity during the performance period" (1,000 years). The report recommended the soil cover be designed to require little maintenance and preferably none at all. According to a NMED official, SNL addressed the erosion by growing native vegetation on top of the MWL. Further, there are requirements in the LTMMP for the Department and SNL to ensure that the ET cover is performing as designed and to confirm that site conditions remain protective of human health and the environment. We reviewed the 2014 Annual Long-Term Monitoring and Maintenance Report and noted that inspections were performed on a quarterly basis. Erosion repairs were conducted in August and November of 2013 to address small rills that formed on the northern and western ET cover side slopes during strong monsoonal rainfall events that occurred in July and September of 2013.

SUGGESTED ACTION

In discussing a path forward, NNSA did not find value in updating the MWL inventory due to their various required activities of the MWL, which include monitoring. However, to mitigate the remaining uncertainty with the MWL inventory, we suggest that the Manager of the Sandia Field Office ensure adherence to the requirements presented by the NMED for long-term monitoring and maintenance as well as 5-year reporting to reevaluate the feasibility of excavation of the MWL and to analyze the continued effectiveness of an NMED-ordered remedy.

Attachment

cc: Deputy Secretary
Administrator of the National Nuclear Security Administration
Chief of Staff

OBJECTIVE, SCOPE, AND METHODOLOGY

OBJECTIVE

The objective of the special review was to determine the facts surrounding the Sandia National Laboratory (SNL) Mixed Waste Landfill (MWL) allegations.

SCOPE

We performed the review between March 2015 and February 2016 at SNL and the Sandia Field Office in Albuquerque, New Mexico. This review was conducted under the Office of Inspector General project number A15AL026.

METHODOLOGY

To accomplish the objective, we:

- Reviewed the hotline complaint and supporting documentation provided.
- Toured the SNL MWL.
- Evaluated relevant laws, regulations, and Department and SNL policies and procedures related to the SNL MWL.
- Interviewed key personnel at SNL, Los Alamos National Laboratory, Department of Energy's Office of Environmental Management, NNSA, and New Mexico Environmental Department (NMED).
- Reviewed and analyzed relevant SNL, NNSA, and NMED documentation.
- Examined the SNL MWL inventory.
- Reviewed 5,257 available MWL disposal records. Approximately 11 percent, or 573 records, were not legible. Of the remaining 4,684 legible records, we examined the records for high-level waste terminology.

We believe that the evidence obtained provided a reasonable basis for our findings and conclusions based on our objective. Because our review was limited, it would not have disclosed all internal control deficiencies that may have existed at the time of our review.

Management waived an exit conference.

FEEDBACK

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