



Allen, Pam, NMENV

From: Cobrain, Dave, NMENV
Sent: Thursday, July 25, 2019 3:51 PM
To: Allen, Pam, NMENV
Subject: FW: [EXT] Dr.Nuttall's Comments for 5Yr Review of MWL
Attachments: Nuttall.5.Yr.Review.Comment..docx

From: dave mccoey <dave@radfreenm.org>
Sent: Tuesday, July 23, 2019 9:12 AM
To: Kenney, James, NMENV <James.Kenney@state.nm.us>; Stringer, Stephanie, NMENV <Stephanie.Stringer@state.nm.us>; Kieling, John, NMENV <john.kieling@state.nm.us>; Cobrain, Dave, NMENV <dave.cobrain@state.nm.us>
Subject: [EXT] Dr.Nuttall's Comments for 5Yr Review of MWL

Dear Sirs and Madame,

There are two separate emails for the comments. One is Word format. The second to follow is a Power Point presentation.

Dr. Eric Nuttall, Ph.D., Emeritus UNM



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**Technical Comment on the Sandia National Laboratories (SNL) Mixed Waste Landfill
(MWL) 5-Year Review for Feasibility of Excavation
July 23, 2019**

By: Dr. Eric Nuttall, Ph.D., Emeritus, Chemical and Nuclear Engineering, Department of
Chemical and Nuclear Engineering, University of New Mexico, Albuquerque, New Mexico
87106

I, Dr. Eric Nuttall, Ph.D. Emeritus, submit this Comment to the New Mexico Environment
Department (NMED) in support of issuance of an Order by the NMED to Sandia National
Laboratories (Sandia or SNL) to provide a Corrective Measures Implementation Plan for the
excavation and offsite removal of long-lived radionuclides and toxic chemicals as submitted in
the Mixed Waste Landfill (MWL) 5-Year Review.

Quote from *Deserts as Dumps?*
By Charles C. Reith & Bruce M. Thomson (1992)
Chapter 6 pg. 197
By Jack A. Caldwell

FUTURE DIRECTIONS FOR SURFACE DISPOSAL FACILITIES

“There is no future for shallow landfills. We should not be planning, building, or operating near-
surface disposal facilities in the future. Deserts may be the most favorable environments for
waste disposal facilities, but we should no more be disposing of waste, particularly long-lived
nuclear waste, in deserts than anywhere else.”

Jack A. Caldwell

Mr. Caldwell is an operations manager for Jacobs Engineering Group. He previously served as
manager of Engineering at Jacobs for the Uranium Mill Tailings Remedial Action Project, where
he supervised engineers working on all aspects of site selection, design, and remedial planning
for mill tailings cleanups. He has been a lecturer in Civil Engineering, and has participated in
consulting, design, environmental impact analysis, and construction oversight on projects across
the United States.

I concur in Mr. Caldwell’s assessment that there is no place for shallow surface chemical and
nuclear waste disposal. This is true especially for Sandia National Laboratories (Sandia) Mixed
Waste Landfill (MWL) that is nothing more than an unlined dump containing mixed radioactive
and chemical waste in pits and trenches that is leaking to the groundwater in the midst of
Albuquerque with a population of ~800,000 persons. There is also a potential for an explosion

of metallic sodium and other incompatible incendiary chemicals that were disposed of in the MWL.

This Comment provides information regarding the potential that High-Level Waste (HLW) and toxic chemicals are disposed of within the Sandia Mixed Waste Landfill (MWL) and should be excavated and removed offsite. Further, Sandia has not provided full information about what is buried in the MWL. The dirt cover installed above the MWL wastes cannot be protective of the public health and safety for the long duration that the radioactive mixed waste will remain hazardous.

In 2000 and 2002, DOE sponsored two independent panel (WERC, Waste Education Research Consortium) reviews of the MWL. I was on the 2000 WERC panel that reviewed the MWL and generated the following report: *Final Report Independent Peer Review of the U.S. Department of Energy Sandia National Laboratories' Mixed Waste Landfill* (August 31, 2001). The WERC Panel unanimously supported the following conclusions:

“6. The hazardous/radioactive waste should ultimately be excavated and stored in a licensed repository if human exposure and/or significant environmental damage become imminent. The panel recommends that retrieval and disposal of the contaminants must be evaluated as part of a comprehensive alternatives evaluation report (please see Recommendation A).

“7. The human health risk and the ecological risk screening assessment for the MWL is adequate and it would appear that the risk posed to human health and the environment from radiological and non-radiological contaminants of concern (COCs) is below that requiring action. This conclusion is based on the review of the existing risk assessment reports and assumes that existing conditions remain. It should be noted that the human health and ecological risk assessments are strictly based on the levels of contaminants that have been detected in soil and groundwater sampling. The assessments did not consider risks posed by other chemicals that are present in the MWL, based on the inventory, that have not been released into the environment.”

Those conclusions would have been impacted and altered had Sandia disclosed the nuclear meltdown experiments and the related Radioactive and Toxic Waste Disposal sheets. Those sheets were not released through the Freedom of Information Act until after both WERC panels had completed their reports.

The Sandia risk assessment reports omitted key information that would have altered the conclusions of the WERC reviews. Sandia only presented to WERC that the MWL was a mixed low-level waste site. Sandia intentionally decided in FOIA documents not to excavate the MWL based on cost, too high a risk of excavation and worker exposure. Sandia did not fully reveal to this day its robotic capability to safely excavate mixed high-level waste. Appendix G of the Corrective Measures Study (November 2002) was not provided to the WERC panels. Appendix G is part of SNL03:R5264-G.doc that is a restricted document that Sandia refuses to provide even today. I requested from David Rast, NNSA the full report that Appendix G came from.

Appendix G demonstrated the following capability for remote excavation that included 34 canisters from a presumably unidentified location at Sandia:

1.2.3 Historical Radioactive and Mixed Waste Disposal Request Validation and Disposal Project (HDRV), Sandia National Laboratories, Albuquerque, New Mexico

A remote robotic system was developed, deployed, and operated to perform drilling, cutting, and manipulation tasks on 34 unknown radioactive contaminated cylindrical objects. A fully integrated robotic system was developed and deployed. The system consisted of robot manipulator, a tool rack, and a workbench. Site operations were conducted for approximately 11 days, followed by removal of the system over a two-day period.

During site operations, individual cylindrical objects were robotically retrieved and placed in the vise. A hole was drilled into the end of the object, and Tritium, O₂, and lower explosive level (LEL) sensors were utilized by the robotic system to characterize the contents. In Addition, the robotic system was used to consolidate the contents of the cylinders into a single 5-gallon container.

If the WERC panel had known of the nature of the mixed High-level wastes and the capacity of Sandia for safe, remote, robotic excavation, the conclusions of the WERC would have been far different. The information presented to WERC was intentionally deceptive and supportive of Sandia's concealed plan generated in 1997-98 by Sandia management to never excavate the MWL. The current plan places the MWL under long-term stewardship and circumvents the 5-year review requirement of the Final Order for consideration of excavation. Ultimately, Sandia intended to leave the MWL wastes only subject to institutional controls and that violates the 5-year review consideration. Under the provisions of the Resource Conservation and Recovery Act (RCRA) credit for institutional controls cannot be taken for more than 100 years. The radionuclides and toxic chemicals in the MWL will remain a hazard for tens of thousands if not millions of years.

The issue of HWL waste within the MWL was of concern to the WERC. Sandia National Laboratory denied ever having conducted experiments using uranium fuel pins. Sandia stated that the only fuel pins at SNL were in the ACRR (Annular Core Research Reactor) and those were regulated by the NRC. In fact, NRC has not had regulatory authority over the ACRR. Sandia's statement of denial redirected the questioning of the WERC panel away from the issue of HLW disposal in the MWL. Hence the topic was not further investigated by either WERC panel and misled the conclusions of the two panels. Sodium was listed in the inventory descriptions and was identified as metallic sodium, but Sandia refused to disclose the quantities and how the metallic sodium had been used or disposed of. The refusal to state how the metallic sodium was used further misled the WERC panel review. This appears to have been premeditated deception regarding the use of metallic sodium in the meltdown experiments for studying the Liquid Metal Fast Breeder Reactor (LMFBR) in which metallic sodium was used as a coolant. The WERC panel was also deceived as to the risk assessment for the MWL. In the

Phase 2 RCRA Facility investigation, sodium was described only as an “Essential nutrient” and it was not disclosed that it was mixed inseparably in the experiments.

Findings through FOIA documents and careful review of SAND reports showed that Sandia had extensively conducted nuclear reactor meltdown experiments. The disposal sheets were never shown to the panel and the conclusions of WERC would likely have been different, i.e. requiring Sandia to excavate the MWL. The disposal sheets were not shown to NMED and Roger Kennett for his report. NMED was unaware of the disposal sheets until April 2015. The different conclusion would have been made by the WERC panels because it would have been shown that the MWL contained Mixed High-Level Waste that would have contained metallic sodium intimately mixed with Enriched Uranium-235, and multiple fission products. Some disposal sheets refer to fuel pins.

Since Sandia has intentionally not disclosed the details of the experiments and the comprehensive disposal of all the waste, I asked for a mass balance at a meeting with Sandia and the NMED in April 2015 and none has been provided. Waste disposal sheets are not necessarily complete and we have no way to know that all the disposal sheets were provided. Therefore, we can only give a best interpretation of Sandia’s disposal operations at the MWL. By Sandia not disclosing the three aspects of the meltdown programs -- that included receiving the commercial fuel pins, the use and further irradiation of the fuel pins in a wide spectrum of meltdown experiments and not providing the MWL detailed and complete disposal sheets – it has limited our ability to provide answers to every aspect of the process.

Definition of High-level Waste

1. DOE revised the Order on radioactive waste management for several reasons:

- After thorough technical reviews and analyses, DOE and the Defense Nuclear Facilities Safety Board concluded that DOE Order 5820.2A did not adequately address the Department’s radioactive waste management and disposal practices.
- There had been significant advances in radioactive waste management practices and changes in DOE since the Order was issued in 1988.
- Risk-based and performance-based requirements were determined to be prudent and necessary components of DOE’s new directives system.
- Opportunities for stakeholder involvement, a key element of DOE decision making, needed to be provided.
- The technical basis for the DOE’s radioactive waste management requirements and guidance needed to be documented.

DOE ORDER 435.1 SECTION 1 – HIGH-LEVEL WASTE REQUIREMENTS

DEFINITION OF HIGH-LEVEL WASTE

High-level waste is the highly radioactive waste material resulting from the reprocessing of spent nuclear fuel. High-level waste includes

- liquid waste produced directly in reprocessing;

- any solid material derived from such liquid waste that contains fission products;
- and
- other highly radioactive material that requires permanent isolation.

2. <http://www.epa.gov/radiation/glossary/termghi.html#highlevel>

High-Level Radioactive Waste

the highly radioactive material resulting spent nuclear fuel reprocessing:

- liquid waste directly produced in reprocessing
- any solid material derived from the liquid wastes having a sufficient concentration of fission products.

Other highly radioactive materials can be designated as high-level waste, if they require permanent isolation. This determination is made by the U.S. Nuclear Regulatory Commission based criteria established in U.S. law.

Hormesis

High-Level Waste is any highly radioactive material that requires permanent isolation. High-level radioactive wastes are the highly radioactive materials produced as a byproduct of the reactions that occur inside nuclear reactors. According to the Nuclear Regulatory Commission:

Because of their highly radioactive fission products, high-level waste and spent fuel must be handled and stored with care. Since the only way radioactive waste finally becomes harmless is through decay, which for high-level wastes can take hundreds of thousands of years, the wastes must be stored and finally disposed of in a way that provides adequate protection of the public for a very long time.

Source: <http://www.nrc.gov/waste/high-level-waste.html>

The life cycle of commercial fuel pins through Sandia National Laboratories severe reactor safety (meltdown) experiments conducted in the Annular Core Research Reactor (ACRR) and other reactors led to disposal in the MWL. One example is of the D-10 experiment that was an experiment for the *Coolability of UO₂ Debris in Sodium with Downward Heat Removal*. SAND 84-1144 (December 1984). The D-10 Experiment is available online as SAND84—1144. Also there were disposal of debris from the TRAN experiments as indicated on disposal sheets.

Sandia has demonstrated since 1997-98 a consistent path to not excavate the MWL. The consistency is demonstrated in every action and is based the Sandia management decision seen in the four memoranda from 1997-98.

The 5-Year Review determines that excavation with offsite disposal is feasible and now viewed for many reasons as a preferred option rather than excavation with onsite disposal. My conclusion is that NMED should forthwith order SNL to prepare a Corrective Measures Implementation Plan for the excavation with offsite disposal of the MWL waste.

I hereby swear under penalty of perjury under the laws of the United States of America and the State of New Mexico that the above statement is true and correct to the best of my knowledge.

Dated this 23d day of July 2019.

Dr. Eric Nuttall, Ph.D. Emeritus

With Attachment