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To: [Yadav, Priya](#)
Subject: [External_Sender] response to NRC Dec 9 2019 letter
Date: Friday, December 20, 2019 12:00:36 PM

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December 19, 2019

Mr. Stephen Koenick, Chief
Low-Level Waste and Projects Branch
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Koenick:

I appreciated your letter of December 9, 2019 responding to my inquiries and comments over the past year.

Sadly, your letter is exceedingly disappointing as you have dodged many of the issues for which I had inquired with supporting evidence. It appears that you have intentionally chosen to be elusive in your reply and avoid direct response to the issues I raised.

Let me give you a succinct example. I inquired about analyzing one of several of the depleted uranium (DU) spotting round fragments that had been removed from Pohakuloa Training Area (PTA). This analysis would determine if it contained 236-U, transuranics, or other isotopes that might be better indicators of identifying DU to determine migration. Because the sediment sampling and analysis accepted by the NRC is worthless and designed specifically not to find evidence of DU migration, alternative analytical methods would have a better chance of meeting program objectives. The response by the Nuclear Regulatory Commission (NRC) completely and intentionally avoided this issue of analysis and instead stated that any radioactive isotopes present would provide such low levels of radiation as to be inconsequential.

You knew precisely what I asked but you decided to answer it evasively. However, your reply, in attempting to be as oblique as possible, inadvertently does give the answer to the inquiry. Yes, there are other radioactive isotopes present in the Davy Crockett material that could be used as tracers.

Although your overall response is misleading, it also indicated what I had mentioned, that some fragments might have been collected before the license was in place. You seem not to care about those fragments. While this may relieve the Army of penalty for violating terms of the license, it does not relieve the NRC of responsibility. You are aware that \$200 million has been appropriated for remodeling of the cantonment area. If the fragments are at the cantonment area, as implied by the Cabrera report, there must be proper care in handling those fragments when demolition and construction begins and this clearly falls within the NRC purview. As the NRC has chosen an elusive response to this issue, it is proper to ask if those fragments have gone missing. Probably so.

This becomes nothing short of outrageous behavior by the NRC. Cover-up, hiding the facts, and distributing misinformation are hardly representative of your mission to protect the public. It is so easy to provide for ALARA at PTA but you refuse to do it. In fact, the Army had provided an estimate to the NRC about the cost of DU cleanup at PTA. It was about \$60 million. This figure for PTA, more than other training areas covered by the license, is completely reasonable given today's military budget, the opportunity for training in dealing with DU removal, the \$200 million for cantonment remodeling, and the fact that there is a court-ordered cleanup of munitions required for leased training areas at PTA. You should order the cleanup of DU at PTA.

There are other issues that I will point out in subsequent paragraphs, including the September 30, 2019 Army request for amendment of the license SUC-1593.

No Reply On Enhancing Methodology:

I have not heard a reply from you concerning the request from the Army for me to suggest alternative sampling methods for monitoring, although it appeared the Army was suggesting only a different location rather than discussing realistic comprehensive monitoring techniques. My point was that simply changing the location would have to be coupled with technique modification.

This issue now appears to be moot in that the September 30, 2019 request by the Army to modify terms of the SUC-1593 possession license regarding monitoring requirements is before the NRC. It is highly probable that the Army had planned this request well before it asked you to communicate to me the opportunity to provide modification of the monitoring program. This, in turn, certainly gives the appearance that the Army request through you, to suggest changes in the existing monitoring program, was merely a scam and that you were used as an intermediary for its propagation.

There seems little doubt that this is but part of a planned approach, in the future, of an amendment to completely stop all monitoring. The current request to decrease the frequency of monitoring and only use sediment sampling is a step in that plan, as I had previously brought to the NRC's attention. By selecting an approach that is designed to not find any evidence of DU migration at any of the sites covered by the SUC license, the claim will be made that there is no need for monitoring. In effect, if you do not look, you will not find. The NRC should rise above and not be part of this ploy.

The fact that the existing requirements for monitoring are already woefully inadequate, it is inappropriate to grant the September 2019 Army request. You may consider my comments as formally asking for a thorough review of that amendment request. Sediment sampling as established at PTA is useless. There is no evidence that there is a flow pathway from the radiation controlled areas (RCAs) to the single sampling site, thus, no DU from the RCAs would be expected to be found. Use of a single site is a ridiculous sampling method when PTA contains 133,000 acres and there is a nearby County park and Girl Scout camp. It is no wonder that the monitoring program has not showed migration of DU at PTA as the method was undoubtedly established to specifically not to find any DU in sediments.

Changes Requested In Recent Amendment:

The cover letter to the September 30, 2019 amendment request notes two major changes: Elimination of water sampling and decreasing sampling frequency. There is an important third that is not prominently listed and that is the abandonment of all sampling activities except sediment sampling. It would be an egregious error on the part of the NRC to grant this request.

It is imperative to note that PTA is very unlike any other site containing DU. Therefore, it is inappropriate to suggest a modification to the license that describes fitting PTA into broad, common methodology. This is not a new problem but one that has been occurring regularly with the NRC's consideration of amendments to the SUC-1593 license.

I strongly suggest that personnel from your amendment reviewing staff and NRC headquarters Office hold public meetings on the Big Island of Hawaii with a visit to the PTA site including members of the Hawaiian community. This site visit should be coordinated to a time when the Army holds exercises that use high explosives (HE) and even aircraft bombing runs. The reviewing personnel will gain first-hand knowledge of the uniqueness of this location and be able to better understand the reasons why a universal environmental radiation monitoring plan is not suitable for Hawaii.

Hawaii PTA Comparisons:

Frequently, in the request for amendment, there are similarities presented attempting to draw comparisons between the spotting rounds and the penetrator rounds that had been used in various conflicts. As an example of how the request for amendment does not apply to PTA, there is the comment that the penetrator rounds hit hard targets whereas the spotting rounds did not, so that there is less

corrosion and spalling from the M101 rounds (p. 3 of 19 and p. 4 of 19 of amendment). This is not an accurate evaluation. The spotting rounds at PTA impacted a basalt surface and Hawaiian basalt hardly provides a soft landing. In addition, the photograph (Figure 2 of the amendment request) shows only fragments of a spotting round, not complete undamaged rounds. In addition, the spotting rounds did contain an explosive charge. Therefore, the comparison suggesting that particulates are less derived from impact with the spotting rounds is inaccurate.

Admitted Inadequate Methodology:

The fact that the Army is aware that their methodology is inadequate is certainly revealed in a comment of the amendment request. By selecting such inadequate methods for monitoring, it is certain that evidence of distant DU migration will not be found. Note this was true even in 1995. The US Army Environmental Policy Institute wrote (USAEPI 1995):

"Investigations of DU migration at U.S. test sites have not identified significant migration in the environment. (p. 7 of 19)."

Significant migration? At least it is acknowledged that some occurs. However, any migration is too much.

The approach to eventually stop all monitoring continues with the acknowledgment that the current methodologies are certain not to find DU: (p. 1 of 19 and p. 2 of 19).

"The "potential gain to be achieved" by collection of environmental radiation samples in a UXO area is knowledge of the concentration of DU in samples of soil, water, air, or biota in the UXO area. However, according to results of RESRAD calculations,⁴ it is almost certain that laboratory results from analyses of these samples will indicate DU concentrations (if any DU is detected at all) and implied average annual doses that are far below NRC standards. That is, the potential gain is minimal.

Therefore, collection of environmental radiation samples in UXO areas generally will not occur. Exceptions will occur only with documented consultation among the License Radiation Safety Officer (RSO), garrison safety personnel, and range control personnel, who will advise the garrison commander (that is, they will prepare a formal risk assessment (US Army 2014a)). The garrison commander will then decide whether to allow the collection."

Note the parenthetical expression in the first paragraph above: '(if any DU is detected at all)'. Here, it is clear that the Army does not expect their methodology to find any DU, an absolute indication of a bogus methodology applied to the objective of finding DU. Then, in the future, relying on the same inappropriate RESRAD calculations as a cover not to collect samples anywhere or anytime, the Army will surely request cessation of all monitoring. The NRC should not fall for such deception.

Collection Of Proper Samples:

The Army presents a case for not wanting to collect environmental radiation samples in areas with unexploded ordnance (UXO). There is a certain risk, to be sure, but as long as the Army continues to conduct high explosive (HE) training utilizing the RCAs, then monitoring must be required. Originally, the license intended to require the Army to notify the NRC anytime HE was used in an RCA but the NRC retreated from this condition. That is unfortunate as the airborne vector for DU migration is the most probable transport vector. In addition, the use of HE along with saltation and disturbance by vehicles, foot traffic, or prop or rotor wash from aircraft overflights all contribute to release or resuspension of DU and DU oxide particulates. Air monitoring is certainly much more realistic at PTA than attempting to detect DU in a sediment sample taken miles away from the RCAs with no connecting flow path. Interestingly, as I had indicated to you previously, there is an Army directive that HE should not be used in areas of known DU, but there is a general exception that the base commander can authorize its occurrence. With such retreat by the NRC in discouraging the use of HE in RCAs, the Army now claims that the NRC approves the use of HE in DU areas. It is interesting how this "permission" has contributed to intentional abuse of a proper monitoring program. The optimum analytical detection techniques are not used. All because the NRC allows Army misinformation to now become disinformation.

DU Oxide Inhalation Risk:

The most appropriate sampling methodology should include air sampling because that is the most likely method of transport of DU. At PTA, the DU is claimed to be in defined RCAs. As those RCAs are still used for HE and other training, oxidized DU becomes airborne within the plumes created by the explosions and transports fine particulates to altitudes where they can be carried for miles by ambient winds. Most importantly, this is the transport mechanism that can lead to inhalation of the DU oxide particulates that would produce the highest health risks for the population, soldiers and civilian employees at the training facility, and island visitors. Whole body internal organ exposures are not relevant when the primary decay posing risk is by an alpha particle in the lung. Thus, RESRAD using whole body dose is not reflective of the specific relative risk. An individual sitting in their office in Hilo, Hawaii is not exposed to uranium alpha decay occurring at PTA but if they have inhaled a DU oxide particle from airborne transport, then they have a specific increased risk. What is the dose received by an adjacent cell from an oxidized DU particle imbedded in a human lung? That particle may release a dozen or so alpha particles a year to many adjacent cells. This leads into the dose analysis. You state that the calculated lung dose is added to other external and internal organ doses to determine the whole body dose. This is clearly a means to dilute the effective dose to lung cells. There is no question that DU oxides with their long residence time will cause lung cell mutations. I refer you to an article, Wise, Sandra S., W. Douglas Thompson, AbouEl-Makarim Aboueissa, Michael D. Mason, and John Pierce Wise: 2007: Particulate Depleted Uranium Is Cytotoxic and Clastogenic to Human Lung Cells: *Chem. Res. Toxicol.*, 20, 5, 815-820, that indicates that insoluble uranium oxides are clearly more damaging as presenting chronic exposures than soluble uranium but that both do cause cytotoxic effects. When the primary risk from DU exposure is inhalation, it is improper to lump inhalation and resultant effects to the lungs with other organ radiation exposure.

This issue will be argued for decades to come. As long as the U.S. EPA supports the linear, no threshold model for radiation risk, and until convincing evidence shows otherwise, the public will hold that any radiation exposure creates risk. Even the natural background radiation exposure presents risk. Lung cancers are known to be in excess for certain occupations that have higher exposures to inhaled radiation. The dose to adjacent lung cells from alpha-emitting inhaled particulates is enormous, far exceeding protection standards. Given the appropriate size range, the insoluble DU oxide particulates can reside in the lung for years providing a chronic source of radiation. There are even recent studies that suggest that small particulates enter the blood stream and can cross the blood brain barrier, accumulate in the central nervous system and cause neurological effects.

There are many residents of Hawaii who are genuinely concerned about the risk of exposure to DU, particularly airborne DU. It does not ease their fear and anxiety when the NRC supports a spurious sampling program. It should be incumbent upon the NRC to provide the residents of Hawaii with factual information and to make every effort to address their concerns about the current risk from DU and DU oxide exposure. That is why I suggested in the sections above, ('Changes Requested In Recent Amendment' and 'DU Oxides Inhalation Risk') that the NRC arrange for a site visit and hold open forums with residents to seek their input, learn how to address their concerns, and work with them on exposure risks. There is a pronounced need for NRC to recognize the social concerns of DU presence and risks. Certainly, airborne analysis should be the primary monitoring approach at PTA.

NRC Bypass Of Identifying DU From U Isotope Ratio:

In regard to the $^{238}\text{U}/^{234}\text{U}$ ratio, it now appears from your response to me that the NRC has taken the position that the ratio is really inconsequential in that the total uranium is in compliance with NRC regulations. This, of course, creates an issue in that the Army uses the ratio to determine if a sample should be sent for additional analysis using a method with greater sensitivity that is capable of detecting isotopes. Because the NRC now claims the ratio is inconsequential, then all analyses should be performed by an isotope detection technique, such as ICP-MS or, preferably, TIMS, and that should include the transuranics, ^{236}U , and other fission isotopes. Of course, as pointed out in the section above ('DU Oxide Inhalation Risk'), it is the dose to lung cells that most accurately determines the risk, not a whole body dose.

Additional DU At PTA From Main Davy Crockett Warheads:

The issue is that there is additional DU, more than is covered by the license from the M101 spotting rounds. I brought to your attention that there were 3 types of main warheads; the fission warhead, the dummy warhead, and a practice warhead that could be reused when recovered, with replacement fins and nosepiece available. At least one of the non-fissionable warhead types contained DU. The evidence for this additional DU at PTA is twofold. First, there were an estimated 600 pistons for the main warhead firing at PTA from a contractor scoping report, so at least that number of warheads were fired. Second, there is a photograph of a tail assembly of a warhead that clearly shows yellow coating. This is evidence of that claim of additional DU. Such confirmatory evidence is readily available in either training manuals, field manuals, or blueprints or technical documents that may be obtained from Los Alamos, if the NRC would bother to check. In addition, the tail assembly in the photograph can be retrieved, as all such findings were supposedly marked and left in place or removed for safekeeping to the cantonment area. Simply obtain that piece and analyze it. As DU was used for attaining similar characteristics for the spotting rounds, it is likely that one of the two types of dummy warheads also contained DU for the same reasons.

For this, the burden of proof is with the NRC. If you don't want to analyze the tail fragment, consider sending it to me and I will have it analyzed. If, as you claim, it is not DU, then there should be no restrictions on sending the piece to me. Keep in mind, your letter states that the residue is not DU. While technically correct, such a claim is misleading in that it is more likely DU oxide. What is the yellow residue if not DU oxide? Your staff that refuted my claim apparently offered no suggestion to an alternative in your letter. In any event, preponderant evidence is overwhelming and indicates additional DU present. The license must be amended to show more DU than the 714 M101 spotting rounds.

Beyond the Possession License:

In addition, DU occurrence at PTA goes beyond possession covered in the license SUC-1593. With removal and storage of some Davy Crockett DU components at PTA and no removal or mitigation plans at the RCAs, PTA is being used as, and must be considered, a low-level radioactive storage facility and all regulations pertaining to such facilities should be followed for PTA. An excuse of low quantities is not relevant as the sites are open and exposed. Social input is imperative.

Background Samples:

There are situations where natural occurring uranium is depleted or enriched in the ^{234}U isotope. This is particularly true for water but also can be found in rock or soil material. To use this claim of invariance to justify no need for background sampling is absolutely incorrect. Background sampling is imperative. In addition, the ^{235}U isotope should be used when analyzing waters by a technique that will have the necessary sensitivity to show isotope variations. It is no wonder that the Army does not want to continue sampling water as it would require an analytical technique capable of determining the $\text{U}^{235}/\text{U}^{238}$ ratio, a better indicator of DU.

Ground Water Issues:

Section i, Groundwater, (p. 12 of 19 and p. 13 of 19 of the Army amendment request) contains interesting comments:

"The Army will sample only existing wells potentially influenced by DU in the RCA. The Army will create no new wells solely for the purpose of DU sampling because the cost benefit ratio is highly unfavorable."

Also,

"The Army will make available for NRC review upon request the results of all Army measurements of uranium concentration in groundwater that were taken with the purpose of meeting Safe Drinking Water Act requirements."

At PTA, the Army recently drilled several wells in an attempt to obtain potable water from a local source rather than have it trucked into PTA. Drilling surprisingly encountered water, a perched source, at levels as shallow as 700 feet. The NRC must make such a request for the analyses and the methods used for collection and analysis, specifically including DU, and not just elements and compounds required by the

Safe Drinking Water Act. Without such a request from the NRC, it is possible that the information would otherwise never be reported. I would appreciate a copy of those analyses.

Improving The Program:

What you clearly do not understand is that I am trying to improve the program and give it credibility. Instead, your evasiveness gives the full appearance of consigning any offers of assistance into an “us-versus-them” situation. Therefore, you play word games to avoid direct responses and have allowed the Army misinformation to become disinformation.

When license conditions, the environmental radiation monitoring plan, and other documents were being prepared over a decade ago, many of the issues I bring up today were included. At that time, the staff recognized the importance of full and comprehensive monitoring. Those conditions have been eradicated slowly over the years as the pathway to no monitoring at all is being fulfilled.

I strongly recommend that your reviewing staff include an experienced exploration geochemist, especially one experienced in particulates and aerosol transport, to provide viewpoints that you now overlook or have abandoned.

Citizen Participation:

I also note that you did not reply to my inquiry if the NRC is willing to participate by funding a citizen science project in Hawaii to study DU migration at PTA. Surely, NRC has access to some programs to provide student research funding. I was hoping you might present that concept to the Army and ask for it to contribute to a program. As I had mentioned, I feel confident that I could get a program off the ground if you commit to the funding.

Regards,

/s/

Michael Reimer, Ph.D.
Retired Geologist

cc: Yadav, Priya

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