Defense Threat Reduction Agency
8725 John J Kingman Road MS 6201
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December 22, 2005

James W. Neton, Ph.D.
Office of Compensation Analysis and Support
The National Institute of Occupational Safety and Health
4676 Columbia Parkway, MS C-46
Cincinnati, OH 45230

Dear Dr. Neton:

This letter responds to your e-mail of October 25, 2005, which included a copy of the National Institute of Occupational Safety and Health (NIOSH) evaluation of Special Exposure Cohort Petition 00020. The proposed class definition includes all Department of Energy (DOE) employees, DOE contractors, or subcontractors employed at the Pacific Proving Ground (PPG) from 1946 through 1962. The evaluation notes that "...the sum of information from the available resources is insufficient to document or estimate the potential maximum internal exposure to members of the class..." and specifically references the Department of Defense (DoD) Nuclear Test Personnel Review (NTPR) Program. After reviewing it, I feel compelled to provide feedback on a number of serious misconceptions, as it appears that the authors were not fully aware of the current operating status of the NTPR Program. Equally concerning are several misrepresentations of a National Research Council (NRC) report in the evaluation.

As you know from previous interactions between our two agencies, the NTPR Program possesses over twenty-five years of experience in supporting veterans and DoD civilian employees and contractors who were potentially exposed to radiation as a result of their participation in U.S. atmospheric nuclear testing or the occupation of Japan. The program has also produced and/or published an extensive body of technical documentation concerning both PPG and Nevada Test Site (NTS) tests and has completed thousands of dose reconstructions for veteran participants. The program has been the subject of numerous external reviews, most recently by the NRC ("A Review of the Dose Reconstruction Program of the Defense Threat Reduction Agency," 2003).

My staff and I have reviewed the NIOSH evaluation report and compiled several comments for your consideration (enclosed), and I would like to highlight a few of them here:

- The technical arguments that support the conclusions of the evaluation appear to be based on a selective citation of factual information from the 2003 NRC report. I'm disappointed that the evaluation cites only the deficiencies identified in section V.C.3.2 of the NRC review (factors tending to underestimate inhalation dose), without any consideration of the countervailing factors in section V.C.3.1. The NRC committee specifically attempted to discourage this practice (p. 210):

"The committee also emphasizes, however, that the discussions of assumptions summarized in Table V.C.7 should not be used to draw conclusions about whether estimates of inhalation dose to atomic veterans in particular scenarios provide credible upper bounds without consideration of the importance of assumptions discussed in the previous section that should tend to result in overestimates of inhalation dose."

Furthermore, there is no discussion of the overall perspective of the NRC findings in regards to methods used by NTPR for estimating upper bounds of internal dose. Neglecting valid and important counterarguments may support your conclusion, but the resulting product fails to meet the stated goal of providing a fair and science-based determination.

- Section 7.1 specifically addresses NTPR dose reconstructions, noting that "In order for NIOSH to consider using the DTRA model for inhalation dose, the model must be able to establish credible upper bounds." In response to the 2003 NRC report, the Defense Threat Reduction Agency (DTRA) issued interim guidance (enclosed) that was intended to establish conservative upper bounds for dose reconstructions. Ongoing efforts to improve methods of uncertainty analysis will likely produce more credible upper bounds, thereby eliminating the need for interim guidance.

- Section 5.0 summarizes available monitoring data, but it appears that several useful DoD publications were not included in the review (enclosed). Some of these documents are publicly available on the DTRA website (http://www.dtra.mil) or at the NTPR reading library in Reston, Virginia. Many others are available through the DTRA Data Archival and Retrieval Enhancement (DARE) Program. Access to DARE is available to Government agencies, their contractors, and other authorized users on a need-to-know basis.

I have also enclosed a review of the NIOSH evaluation report by Dr. David C. Kocher, a member of the 2003 NRC committee. I wholly endorse Dr. Kocher's observations, which address unfortunate distortions of the 2003 NRC findings contained in the NIOSH evaluation report. He raises a number of valid concerns, not the least of which is the NIOSH interpretation that credible upper bounds of PPG internal dose cannot be established. While the NRC report concluded in section V.C.6 (p. 225) that the methods used by the NTPR Program did not consistently provide credible upper bounds, it did not imply that credible upper bounds could not be established.

One could argue that the NIOSH decision to recommend Special Exposure Cohort status for the proposed class may be a proper policy decision. However, the conclusion of this evaluation, namely to treat the proposed cohort presumptively, appears to be insufficiently supported by an incomplete technical analysis despite a search for relevant information. Additionally, I must object to this evaluation on the basis that the NTPR Program has successfully implemented a credible solution for providing defensible dose reconstructions in support of federally-mandated entitlement programs. In this regard, the NTPR Program currently has methods in place that could acceptably assist NIOSH in its support of the EEOICPA.

In conclusion, I believe that DoD could be of significant assistance to your agency in supporting dose reconstructions for individuals involved in atmospheric nuclear testing. I can provide sample post-NRC 2003 dose reconstructions that we have performed for veterans involved in PPG testing. I also can make available to you the NTPR methodology that was developed for atmospheric testing, as well as the supporting data archives. I believe increased collaboration between our two agencies would be of great benefit.

Sincerely,

Paul K. Blake

Paul K. Blake, Ph.D.
Program Manager
Nuclear Test Personnel Review

Enclosures:
1. DTRA comments on the SEC Petition 00020 Evaluation Report
2. DTRA Interim Guidance of July 16, 2003
3. Selected list of publications containing information relevant to the Evaluation Report
4. Dr. Kocher's review of the SEC Petition 00020 Evaluation Report

Copies to:
Chairman, Veterans' Advisory Board on Dose Reconstruction
Chairman, Advisory Board on Radiation and Worker Health

Subj: DTRA comments on the SEC Petition 00020 Evaluation Report

NIOSH Finding 1: Lack of sufficient information from document search

The Evaluation Summary (p. 2) states that NIOSH lacks access to sufficient information to estimate the maximum radiation dose incurred by any member of the class being evaluated, and that the sum of information from the available resources is insufficient to document or estimate the potential maximum internal exposure to members of the class, under plausible circumstances during the period in question at PPG.

Section 4.2 (p. 6) indicates that the document search performed in support of this evaluation included the NIOSH research database, the Internal Dose Monitoring website of Lawrence Livermore National Laboratory, the DTRA website, the DOE Environment, Safety and Health webpage, and the Marshall Islands Document Collection.

DTRA Response 1

The document search appears to have excluded or overlooked the DOE Nuclear Testing Archive (http://www.nv.doe.gov/library/testingarchive.htm), the NTPR public library, and a restricted access, DoD data archive (DARE), arguably the largest archival collections of documents relating to U.S. atmospheric nuclear testing. As described, the search did not include the Los Alamos National Laboratory, which had scientific teams extensively involved in nuclear testing. It appears that at least one source of relevant information cited in the evaluation (the University of Washington) was not investigated, even though this information is likely obtainable from the Nuclear Testing Archive and/or DARE.

NIOSH Finding 2: Availability of information and data

Section 3.0 (p. 5) states that no data or documentation had been located indicating any results or program to monitor for internal exposure due to ingested or inhaled radioactive material, and that the petitioner's declaration that there was no such monitoring was considered as suitable evidence in support of the belief that dose reconstruction would not be feasible.

Section 4.1 (p. 5) indicates that NIOSH reviewed 65 cases meeting the revised class definition to determine whether internal and/or external personal monitoring records (or any other monitoring records) were available for the employee. While there was an external monitoring program and most claimants had external monitoring records, no records of inhalation or ingestion monitoring for these individuals at the PPG were available to NIOSH. References to individual internal monitoring were made in several historical reports on specific test series.

Section 5.0 (p. 7) states that there was only brief mention in the Albuquerque Operations manager's report of limited use of nasal smears, for which NIOSH has been unable to locate the associated data.

Table 5.1 (p. 7) indicates that no internal dosimetry data were located in publicly accessible records and that SAIC confirmed that urine and air data for evaluation of internal exposures are not available. Furthermore, the table indicates that air sampling protocols differed by operation, but that samples were collected according to operational plan. However, no occupational air data had been retrieved to date.

Section 5.0 (p. 8) refers to a report of the Albuquerque Operations Manager (the contents of which are cited as an example of data typically found in test reports), but NIOSH indicates that no data from these samples had been located and that no data regarding the number of samples collected at each test shot had been located as of the date of the report. This section also claims that NIOSH contacted SAIC regarding the availability of urine and air sample data for tests conducted at PPG, but SAIC technical experts indicated that the 2600 urine samples identified for CROSSROADS were unavailable and that few, if any, air sample data are available.

Section 6.0 (p. 10) states that air sampling was performed during Operation CROSSROADS, but was designed to establish fallout patterns rather than monitoring occupational internal exposure. According to SAIC, few of these air sampling data are available and NIOSH had not had the opportunity to examine them. Urine samples were also collected but NIOSH had been unable to retrieve the data. After CROSSROADS, urine sampling was performed for special cases (there were 125 urine samples analyzed), but these data were not available to NIOSH.

DTRA Response 2

"Absence of evidence is not evidence of absence." Admittedly, only limited internal monitoring results are available for Americans who were involved in the PPG tests. Examples of this data, retained in the NTPR public library, include special naval radiological medical exams that documented urine bioassay and film badge results, naval message traffic that summarizes Operation CROSSROADS urine bioassay results, and descriptions in veteran's published recollections. Due to limited PPG internal monitoring results, DoD has determined internal doses based on extrapolation from the radiological environment (e.g. fallout data) and exposure conditions. The DoD internal dosimetry methods are documented in a number of technical reports available on the DTRA-NTPR website (see Enclosure (3)).

In regards to NIOSH inquiries about the availability of internal monitoring data, SAIC technical experts do not recall any follow-up questions pertaining to the availability of air sampling and nasal smear data. Where the CROSSROADS urine bioassay data are concerned, an SAIC analyst indicated that he was not aware that the data in question were available in NTPR files. Because NTPR only requires access to data concerning specific participants (for the purpose of developing dose reconstructions in response to compensation claims or personal inquiries), this does not mean the data are not available to NIOSH.

It may be worth noting that the original stated purpose of the CROSSROADS air monitoring (i.e. fallout monitoring) is generally irrelevant, as fallout sampling data can be used to determine airborne concentrations of radionuclides for use in the calculation of internal dose.

NIOSH Finding 3 – Lack of access to required information

Section 7.0 (p. 10) indicates that NIOSH must determine whether it has access to sufficient information to estimate the maximum radiation dose that could have been incurred under plausible circumstances or to estimate radiation doses more precisely than a maximum dose estimate. If NIOSH were to have access to sufficient information, then dose reconstruction would be deemed feasible.

Section 7.2 (pp. 14-15) states that, although it might be possible to calculate the maximum plausible radionuclide deposition from the detonations, because there are so many variables (e.g.,

size and type of bomb, detonation height, geographical conditions, weather conditions, etc.), each test would need to be evaluated individually to determine the maximum exposed individual or group for that test. This would require access to potentially sensitive information specific to each nuclear device together with extensive information on employee locations and activities. As such, NIOSH has concluded that it cannot determine on a timely basis the feasibility of a source and process-based dose reconstruction effort.

Section 7.4 (pp. 16-17) states that NIOSH lacks access to source term data, bioassay data or internal monitoring data to estimate internal doses associated with potential inhalation of radionuclides, and that methods used by the NTPR Program cannot be considered for application to EEOICPA dose reconstructions until issues identified by the NRC committee have been resolved. Consequently, NIOSH concludes that it is not feasible to estimate with sufficient accuracy internal radiation doses for the class of employees defined in this report.

DTRA Response 3

NIOSH was aware from inter-program communications over several years that clearances would be required to review the sensitive and classified data and information that are vital to producing a credible dose reconstruction (e.g. classified nuclear source and associated radiochemistry data). NIOSH made no request to DTRA for access to classified material. While the true and intended definition of "sufficient information" can be debated, it is unclear how one agency can consider the available information and data to be sufficient for dose reconstruction while another agency does not.

Based on findings of the NRC review (section V.A), the NTPR Program established a detailed process to develop and document a personalized scenario of participation and radiation exposure for each veteran participant. Questionnaires, statements, and interviews (along with official reports and historical documents) form the basis of a participant's location and activities, while personnel monitoring results and other radiological information are used to establish exposure conditions. The radiation environment is characterized in time and space, and matched with the activities and locations of the participant to determine exposure potential. As indicated in the NTPR interim guidance (July 2003), a participant's recollections are to be reflected in the scenario unless demonstrably inaccurate. With over two years of experience in developing detailed participation scenarios since the NRC report was released, the NTPR Program has implemented a credible solution to improving communication and ensuring benefit of the doubt for veteran participants.

NIOSH Finding 4: Urine bioassays at Operation CROSSROADS

Section 6.0 (p. 10) reports that a urine bioassay program was implemented during Operation CROSSROADS. The report correctly states that 2,600 samples were tested, that men used instruments that were on hand and developed techniques, and that the presence of high background made it difficult to determine positive bioassays.

DTRA Response 4

The original source document from which this information was taken (Naval message 150802Z) was misquoted in DNA 6032F, as only 16 of the 2,600 men tested positive for beta activity in the urine. Nevertheless, the excerpted passage is incomplete, as the cited reference goes on the state that "the RadSafe Section reported slight beta activity had been found in the urine of 2,600 men

checked. Despite all the concern and discussion…there is no indication in CROSSROADS documentation that positive alpha counts were found in any urine samples."

Short of consulting with NTPR technical experts, it is unlikely that NIOSH could have known that the cited reference contained erroneous information. However, it is disconcerting that a factual citation was taken out of context. Appropriate consideration of the excluded passage would seem to contradict the overall conclusion of the evaluation report (i.e. that suitable internal monitoring data are not available).

NIOSH Finding 5 – Credible inhalation dose upper bounds
Section 7.1 (p. 12) attributes the 2003 NRC report as concluding that the methods used by the NTPR Program to estimate inhalation doses do not consistently provide credible upper bounds.

DTRA Response 5
This statement, although correct, appears to have been taken out of context. The current usage is somewhat misleading, since the NRC committee judged that concerns about obtaining credible internal dose upper bounds at PPG are less important. According to the NRC report (p. 222):

> *"[Studies] indicate that inhalation doses due to resuspension of longer-lived radionuclides in fallout deposited on residence islands in the Pacific are unlikely to be important in most cases."*

It should be noted that several of the factors that potentially underestimate internal dose upper bounds (as listed in Table V.C.7 on the same page) are relevant only at NTS. If NIOSH wishes to continue quoting the 2003 NRC report in this manner, it would be entirely appropriate to note the following (NRC, p. 212):

> *"An example of a scenario in which credible upper bounds in inhalation dose probably are obtained in dose reconstructions involves exposure to descending fallout throughout the period of descent. Such exposures occurred, for example, on residence islands in the Pacific."*

NIOSH Finding 6 – Uncertainty in estimating radionuclide concentrations in deposited fallout
Section 7.1 (pp. 12-13) outlines what NIOSH considers as the most significant NRC finding with respect to the feasibility of dose reconstruction for non-military personnel (from Table V.C.7):

> "*Sources of error and uncertainty in methods of estimating radionuclide concentrations in deposited fallout based on measured external photon exposures have not been evaluated, and reliability of methods is unknown. The assumption of no fractionation (except for removal of noble gases) should result in substantial underestimates of concentrations of refractory radionuclides (such as plutonium)."*

DTRA Response 6
The model used to assess internal doses based on external photon exposure is consistent with the methodology used in Federal Guidance Report No. 12, which includes dose conversion factors for external exposure based on concentrations of specific radionuclides distributed on the ground. There is a substantial discussion of uncertainties with these values, but the uncertainties

were considered small relative to other factors involved in calculating internal dose for NTPR participants. Furthermore, the NIOSH evaluation does not reflect the NRC committee's conclusion that the primary situation where the characterization of radionuclide concentrations contributing to internal dose could be a substantive issue is for blast-wave resuspension of aged fallout at NTS.

Based on analyses in the NRC report (and considering all associated parameters and uncertainties and assuming that radionuclide compositions in atmospheric clouds are reasonably well-characterized on the basis of cloud sampling data), the NTPR Program concluded that reasonable upper-bound internal dose from inhalation was likely to be 3 to 10 times greater than the values being reported at that time. To remedy this potential underestimate, the program issued interim guidance (July 2003) to multiply existing calculations by 10 to obtain a credible upper bound (except in the situation of blast-wave resuspension of aged fallout in forward areas at NTS).

Given the magnitude of the assessed PPG internal doses to date, the associated level of uncertainty is not likely to significantly affect the probability of causation for most claims. This observation was echoed by the NRC committee in section V.C.6 (p. 226):

> *"Of paramount importance is the issue of whether deficiencies in methods of estimating inhalation dose identified by the committee could have affected decisions about compensation of atomic veterans. The committee believes that possible underestimation of upper bounds of inhalation doses by the NTPR program is unlikely to be unimportant for most participants in the Pacific or occupation forces in Japan. Inhalation doses to most of those participants probably were too low for possible underestimation of upper bounds to have affected decisions about compensation."*

<u>NIOSH Finding 7 – DTRA corrective actions</u>

Section 7.1 (p. 13) notes that DTRA and the Veterans Administration (with support from the National Council on Radiation Protection and Measurements) issued a joint report to Congress in June 2004 that outlined a plan of action to correct deficiencies identified in the 2003 NRC report within two years. The evaluation goes on to state that, in order for NIOSH to consider using the DTRA model for inhalation dose, the model must be able to establish credible upper bounds and that the issues identified by the NRC committee that "question the ability to establish upper bounds" would need to be resolved and the model would need to be validated.

Section 7.4 (p. 16) concludes that the methods used by the NTPR Program for military employees cannot be considered for application to EEOICPA dose reconstructions until issues identified by the NRC committee are resolved.

<u>DTRA Response 7</u>

A significant portion of the NIOSH evaluation seems to revolve around the erroneous contention that DTRA has not revised the methodology for calculating internal dose upper bounds (and to a lesser extent, will not be finished until June 2006). Although this isn't relevant to the feasibility of establishing credible upper bounds, there is no indication that NIOSH inquired about the current status of the corrective action plan, and the evaluation report includes no discussion or analysis of the interim guidance that was issued in July 2003. Consequently, NIOSH failed to

investigate the possibility of using the NTPR interim methods for establishing credible internal dose upper bounds. It seems incongruous that a method can be considered sufficiently credible to one federal agency but not acceptable to another.

The NTPR Program is confident that the interim guidance qualifies as progress toward establishing credible upper bounds. Corrective actions continue to be evaluated and implemented, and they will undoubtedly be reviewed by the Veterans' Advisory Board on Dose Reconstruction.

It is important to note that the NRC committee did not question the *ability* to establish credible upper bounds, but rather the credibility of the upper bounds that were being estimated at the time of the review. This contention is addressed by Dr. Kocher in more detail.

NIOSH Finding 8 – Correction factors and assumptions

Section 7.1 (p. 13) acknowledges that issues associated with NTPR external dose reconstructions (as identified by the NRC committee) are similar to issues that NIOSH has already encountered. NIOSH expects it could apply uncertainty factors to ensure a reasonable estimate of external dose and that the dose could be bounded by making claimant favorable assumptions to overcome data gaps (e.g. the assignment of a dose from the highest exposed group).

Section 7.2 (p. 16) states that NIOSH can utilize film badge monitoring data or field radiation surveys to determine external dose, and if no acceptable film badge data are available, maximum credible exposure scenarios (with the appropriate application of correction factors for beta dose and uncertainty) could be developed for individuals given the roles, responsibilities, and location associated with the task unit they were assigned to and exposure rate information for various work assignments.

Section 7.3 (p. 16) indicates that it is not clear whether individuals at the PPG site underwent chest X-ray examinations, but that NIOSH could make claimant-favorable assumptions regarding the frequency and the type of X-ray equipment used. NIOSH has published an official procedure for assigning dose from X-ray examinations, concluding that it is feasible to determine the maximum potential occupational medical exposures.

Table 5.1 (p. 7) notes that suitable monitoring data to estimate intakes of radionuclides generally were not obtained (aside from a number of urine samples analyzed during Operation CROSSROADS).

DTRA Response 8

Although NIOSH seems to be comfortable with external dose correction factors and claimant-favorable assumptions to overcome a lack of data (for external gamma and medical X-ray doses), there is no rationale provided in the evaluation report that refutes the appropriate use of similar correction factors and assumptions to develop and ensure credible internal dose upper bounds. In this regard, the conclusion that NIOSH could not use the DTRA dose reconstruction process seems to be unfounded.

NIOSH Finding 9 – Sufficient accuracy

Section 8.0 (p. 17) concludes that it is not feasible for NIOSH to estimate with sufficient accuracy radiation doses from potential internal exposures.

DTRA Response 9

The definition of "sufficient accuracy" is not only vague, but it's unclear how a requirement of accuracy pertains to credible upper bound doses. It would make sense that a most probable (mean) dose should be accurate. However, the requirement for upper bound doses is that they be *credible* (i.e. at least a 95th percentile estimate), as opposed to *accurate*. This contention is addressed by Dr. Kocher in more detail.

NIOSH Finding 10: Health endangerment

Section 8.0 (p. 17) states that doses from potential internal exposures may have endangered the health of some members of the proposed class, based on the "facts" that there was likely to have been some inhalation exposure to plutonium and other alpha-emitting radionuclides and the lack of reliable information to establish plausible maximum limits to this exposure.

DTRA Response 10

There seems to be no justification or evidence provided in the evaluation to support the conclusion that inhalation exposure was *likely* or that the potential exposure may have *endangered* the health of exposed individuals (especially since the evaluation repeatedly states that information and data were unavailable). As such, these "facts" of likely exposure and endangerment are more appropriately considered as *assumptions*, bordering on *concessions* (which are sometimes granted when there is no evidence to either prove or disprove a given hypothesis).

Furthermore, it is unclear why there is a need to establish "plausible maximum limits" when a credible 95th percentile upper bound is already considered adequate and acceptable. Ultimately, it's likely that most PPG doses (and the associated probability of causation) are well below the applicable threshold for compensation. Internal dose might not be relevant in all cases, or may not involve scenarios where the validity of the upper bound was questioned by the NRC. It follows that the assignment of SEC status to the proposed class would not be scientifically founded. This conclusion is substantiated in section VII.C of the 2003 NRC report (p. 263):

> *"The committee notes that the established policy of using upper-bound estimates of dose (95th percentiles) with the more extreme lower-bound estimates of doses that correspond to a 50% probability of causation of various cancers is highly favorable to the veterans' interests. If credible upper bounds of dose are obtained in dose reconstructions, atomic veterans can be compensated for nonpresumptive diseases even when the true probability that radiation exposure cause the diseases is low.*
>
> *None of this is to say that the veterans do not have legitimate complaints about their dose reconstructions; in many cases, the committee believes they do. Rather, the committee hopes that veterans will understand that their radiation exposure probably did not cause their cancers in most cases and that reasonable changes in methods of dose reconstruction in response to this report are not likely to greatly increase their chance of a successful claim for compensation when a dose reconstruction is required."*

NIOSH Finding 11: Miscellaneous corrections

The table in Section 6.0 (p. 9) implies that Shot ABLE (Operation CROSSROADS) and Shot KING (Operation IVY) were airbursts, and reports that Operation DOMINIC I included only airdrops.

Appendix A, Section 3.1 (p. 25) cites the yield of both detonations at Operation CROSSROADS as “23 KT.”

DTRA Response 11

According to DOE/NV-209 (and to maintain consistency with the convention used elsewhere in the evaluation report), Shots ABLE and MIKE should be listed as airdrops and it should be noted that DOMINIC I included underwater and rocket (airburst) detonations. The same reference lists the yield of the two CROSSROADS detonations as 21 kT.

Defense Threat Reduction Agency
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JUL 16 2003

Mr. Steve Powell
Titan Corporation
Deputy Division Manager,
Communications Engineering and
Information Services Division
11410 Isaac Newton Square N.
Suite 103
Reston, VA 20190

Subject: DTRA01-01-C-0007

Dear Mr. Powell,

The purpose of this letter is to provide interim guidance for the preparation of responses to Department of Veterans Affairs(VA) and individual veterans requests for participation and dose information for veterans confirmed or assumed participants in U.S. atmospheric nuclear tests and in the post-war occupation of Hiroshima and Nagasaki. This interim guidance is necessary to respond to the May 8, 2003 findings of the National Academy of Sciences/National Research Council (NAS/NRC) concerning Defense Threat Reduction Agency's (DTRA) dose reconstruction program. The NAS/NRC report has been carefully reviewed and your staff has helped us understand where program improvements could be implemented immediately. Below is a description of these areas in detail, you are requested to begin implementation as soon as you receive this letter.

Interface with Veterans and Benefit of the Doubt:

It is essential that we take every opportunity to elicit the veteran's statement of what he did regarding his test participation. Be sure that we have all descriptive participation information from VA that was submitted in support of a claim. Next, we should contact the veteran or claimant to confirm what we have and to ask if further information can be provided, either by anecdote, by record, or by fellow veterans. We will not assume the veterans' information invalid at any time even if the description of the event cannot be documented with historical records.

In determining the exposure scenario, NTPR will give the veteran the benefit of the doubt. This means that the veteran's version of his activities will be reflected in the exposure scenario unless demonstrably inaccurate. In preparing the scenario, it is essential

Enclosure (2)

that we be complete and open to what the veteran states he did even if it might be inconsistent with other factual information. While we can discuss these inconsistencies, we must not use them as a reason to discount what the veteran says he did. Use what the veteran states as his participation scenario, unless it can proven to be false. Next, the basic assumptions for the events in which the veteran participated and for the scientific assessment of the radiation environment should be developed.

To document these assumptions, NTPR will create a matrix consisting of (1) the veteran's version of his activities, (2) the historical information from the Operation Plan and/or other pre-event documents, (3) historical information from After-Action reports and/or other post-event documents and (4) other assumptions, as necessary.

When this step is completed, the scenario and assumptions that will be used in the dose reconstruction will be communicated to the veteran or claimant for review and comment. Next, the dose reconstruction will be completed.

Benefit of Doubt:

To summarize, the basic steps in preparation for the dose reconstruction are:

-obtain all descriptive and factual information provided to the VA from a veteran
-make contact with the veteran or claimant to confirm information
-ask for additional information from the veteran concerning fellow participants
-develop scenario of the veteran's participation activities
-describe the assumptions that will factor into the dose reconstruction
-follow-up with the veteran to reach closure on the scenario and assumptions
-complete the dose reconstruction

Dose Reconstruction: We shall introduce every easy-to-implement recommendation described in the NAS/NRC report regarding the dose reconstruction process. These recommendations include:

-Simplify combining film badge upper bound uncertainties
-Factor in damaged film readings for benefit of doubt on upper bound estimates
-Use unknowns in issue and turn in dates to give upper bound dose estimates
-Factor in unknowns and possible participant variation in cohort badge doses
-Factor in uncertainties in neutron and alpha RBE coefficients
-Use the generic dose reconstruction for Hiroshima/Nagasaki whenever possible
-Estimate Operation DOMINIC doses as specified for non-exposure conditions

-Ensure that eye/skin doses reflect the extended upper bound for external doses
-Ensure skin doses account for the possibility that bare skin conditions prevailed
-Ensure that fallout that could infiltrate buildings, shelters, internal ship compartments is accounted for in internal dose assessments
-Apply the uncertainty in resuspension to upper bound internal doses
-Compute ingestion doses to demonstrate significance with inhalation doses
-Account for uncertainty in cloud sample data for surface deposition/fractionation
-Reserve internal dose estimates for NAS/NRC identified highly uncertain scenarios for validation by independent contractor chosen by DTRA, such as scenarios involving internal doses from previously deposited fallout impacted by the shock wave of the shot scenario under definition.

Upper Bound Estimating: The following rules of thumb should be applied to upper bound results:

-apply a factor of 3 times the average value to external gamma doses
-apply a factor of 6 times the average value to external neutron doses
-apply 3X uncertainty factor for external gamma doses to eye and skin doses
-apply a factor of 10 times to the internal dose estimate for scenarios not identified by NAS/NRC report as highly uncertain
-refer internal dose upper bound estimates for highly uncertain scenarios to an independent contractor chosen by DTRA
-communicate dose results to VA with summary statement of improved measures implemented since NAS/NRC's May 2003 report.

These rules of thumb, based on our review of the results in the NAS/NRC report, are intended to facilitate the processing of VA claims while ensuring upper bound doses are not underestimated.

Doses Prepared Since May 8, but not Released by the DTRA program Manager: Please re-review the dose estimates that have accumulated since May 8, 2003 to ensure that they conform to the interim guidance above and provide a short summary of what was done to change them.

The interim guidance provided above has been compared with the contract Statement of Work and is considered to be within scope. It is not intened to change the terms or conditions or result in a change to the cost/price. If you do not agree with the preceeding statements, no action should be taken pursuant to the above interim guidance, and the PCO should be so notified in writing within fifteen (15) days of the date of Titan receipt of this letter.

Please provide temporary procedures for implementing the above interim guidance as soon as possible for DTRA review and approval. If you have any technical questions, please contact the Contracting Officer Representative, Mike Schaeffer, by phone, email or in person. Any questions regarding the contract should be directed to Mr. Mike Logan at telephone number (703) 325-1168.

Catherine Benavides.
Contracting Officer

cc: Robert Kronenbitter, Contracts Manager

Subj: Selected List of Publications Containing Information Relevant to the Evaluation Report

1. DoD publications applicable to this review are available under three categories:

a. Unclassified and approved for public release; distribution unlimited. Many of these are available at the DTRA-NTPR website (http://www.dtra.mil). Others are available through other Government websites and in libraries across the country.

b. Unclassified but limited distribution. In most cases, these are available to federal agencies and their contractors. These are available from DTRA's DARE program.

c. Classified. In many cases, these can be cited, although they are only available for review by individuals holding appropriate security clearances.

2. NIOSH Evaluation, Table 5.1 (Internal Dosimetry Data) states that no data is available in publicly accessible records. The following unclassified documents that discuss internal dosimetry are available on the DTRA-NTPR website:

a. DNA 6032F – Operation CROSSROADS 1946, Chapter 2.0, pg. 51.
http://www.dtra.mil/toolbox/directorates/td/programs/nuclear_personnel/docs/DNA6032F.pdf

b. DNA-TR-84-119 – Internal Dose Assessment – Operation CROSSOADS
http://www.dtra.mil/toolbox/directorates/td/programs/nuclear_personnel/docs/DNATR84119.pdf

c. DNA-TR-88-260 – Low Level Internal Dose Screen – Oceanic Tests
http://www.dtra.mil/toolbox/directorates/td/programs/nuclear_personnel/docs/DNATR88260.pdf

d. DNA-TR-86-120 – Analysis of Radiation Exposure, Service Personnel on Rongerik Atoll, Operation CASTLE, Shot Bravo, Section 4.0
http://www.dtra.mil/toolbox/directorates/td/programs/nuclear_personnel/docs/DNATR86120.pdf

e. DNA-TR-84-375 – FIIDOS – A Computer Code for the Computation of Fallout Inhalation and Ingestion Dose to Organs
http://www.dtra.mil/toolbox/directorates/td/programs/nuclear_personnel/docs/DNATR84375.pdf

3. NIOSH Evaluation, Table 5.1 (Environmental Sampling Data) describes only University of Washington and Public Health Service samples. Many unclassified and approved for public release DoD publications are available for review. The following is a small sampling of radioactive fallout documents available from DTRA's DARE program:

a. Item number: 08482
Title: 4-pi Gamma Ionization Chamber Decay Measurements of Fallout Samples from Operation CASTLE
Authors: Shipman W.H. ; Lai`J.R.
Corporate Authors: Naval Radiological Defense Lab. (San Francisco, CA)
Publication date: 5601
Report Numbers: USNRDL TR 147 ; NRDL TR 147

b. Item number: 08494
Title: Activity Size Relationship of Fallout Particles from Two Shots, Operation REDWING
Author: Chan H.K.
Corporate Authors: Naval Radiological Defense Lab. (San Francisco, CA)
Publication date: 5902
Report Numbers: NRDL TR 314

c. Item number: 20601
Title: Solubility Characteristics of Radioactive Bomb Debris in Water and Evaluation of Selected Decontamination Procedures
Authors: Lowe H.N. Jr. ; Lindsten D.C. ; Pruett P.B. ; Lacy W.J. ; Kennedy J.P.
Corporate Authors: Army Corps of Engineers (Ft. Belvoir, VA.)
Publication date: 19590212
Report Numbers: AERDL TR 1569

d. Item number: AFSWP 0155
Title: Residual Radiation Pattern for Various Surface Wind Velocities, Underwater Atomic Burst, 20 P
Authors: Gibson T.A. Jr.
Publication date: 195203
Report Numbers: AFSWP 0155

e. Item number: DNA 6034
Title: Operation GREENHOUSE 1951 (U), 334 P.
Authors: Berkhouse L. ; Davis S.E. ; Gladeck F.R. ; Hallowell J.H. ; Jones C.B. ; Martin E.J. ; McMullan F.W. ; Osborne M.J.
Corporate Authors: DASIAC (SANTA BARBARA, CA)
Publication date: 198306
Report Numbers: DNA 6034F ; KT 82 046(F)

f. Item number: XRD 185
Title: Operation Crossroads; Radiological Decontamination of Target And Non-Target Vessels; Vol. 1, 145 P
Authors: Fee J.J.
Corporate Authors: Navy/Director Of Ship Material
Publication date: 4906
Report Numbers: XRD 185

REVIEW OF NIOSH's SEC PETITION EVALUATION REPORT
PETITION SEC-00020

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Introduction

I have reviewed the evaluation report of the National Institute for Occupational Safety and Health (NIOSH) that covers a class of employees proposed for addition to the Special Exposure Cohort (SEC) under the Energy Employees Occupational Illness Compensation Program Act (EEIOCPA) of 2000 and applicable regulations in 42 CFR Part 83. The NIOSH evaluation report, which was issued on October 20, 2005, in response to Petition SEC-00020, covers all employees of the Department of Energy (DOE), DOE contractors, or subcontractors that were employed at the Pacific Proving Ground (PPG) from 1946 through 1962.

My perspective in reviewing the NIOSH evaluation report is the following. First, I take no position on the question of whether energy workers at the PPG should be granted SEC status under the EEIOCPA. I am concerned only with NIOSH's technical justifications for its conclusion that SEC status should be granted.

Second, my review is greatly influenced by my role as a member of the committee of the National Research Council (NRC) that prepared the 2003 report on "A Review of the Dose Reconstruction Program of the Defense Threat Reduction Agency." In concluding that energy workers at the PPG should be granted SEC status, NIOSH relied heavily on findings in the NRC report concerning deficiencies in methods of dose reconstruction for atomic veterans used by the Defense Threat Reduction Agency (DTRA) in the Nuclear Test Personnel Review (NTPR) Program, especially methods of estimating dose from inhalation of radionuclides. Thus, I have a strong personal and professional interest in whether the NIOSH evaluation report discusses findings in the NRC report in a fair and balanced manner, and my review of the evaluation report focuses mainly on Section 7.1 on NTPR Dose Reconstructions.

Discussion of Principal Concerns

Based upon my review of Section 7.1 of the NIOSH evaluation report and my intimate familiarity with discussions and analyses in the 2003 NRC report, I am forced to conclude that the evaluation report does not present a fair and balanced discussion of findings in the NRC report on deficiencies in methods of estimating internal doses, especially inhalation doses, in the NTPR Program. Indeed, in some important respects, I believe that discussions in the evaluation report present a highly distorted and misleading view of findings in the NRC report. My concerns about Section 7.1 of the evaluation report center on two points, as described below.

Presentation of Findings in 2003 NRC Report

[1] My first major concern about Section 7.1 of the evaluation report involves a discussion in the section on Internal Dose Issues that begins on page 11. The second paragraph starts by noting, correctly, that "[t]he NRC review raised a number of issues associated with the methods used by DTRA to estimate inhalation dose." The discussion then notes, again correctly, that those issues are summarized in two tables in the NRC report, one of which "identified issues that potentially overestimated internal doses" (i.e., assumptions that should tend to result in overestimates of inhalation dose to atomic veterans). However, the evaluation report then states that "**[t]hese issues were not evaluated in this SEC evaluation**" (emphasis mine). Following this statement is a presentation and discussion of the second table in the NRC report, which summarizes findings on ways in which methods of dose reconstruction for atomic veterans could result in substantial underestimates of credible upper bounds (at least upper 95% credibility limits) of inhalation doses. It is those findings that are used in the evaluation report to support NIOSH's conclusion that energy workers at the PPG should be granted SEC status.

In my opinion, the approach in the NIOSH evaluation report of presenting only those findings in the NRC report that address deficiencies in methods used in the NTPR Program to estimate upper bounds of inhalation doses to atomic veterans, while ignoring other findings concerning assumptions used in dose reconstructions for atomic veterans that should tend to overestimate inhalation doses, is unfair and unbalanced, with the result that the NRC report is misrepresented in important ways. I expected that NIOSH's evaluation of findings in the NRC report would be based on a less biased presentation of those findings.

My criticism is not meant to imply that an unbiased evaluation of the NRC report would not support NIOSH's conclusion that the SEC petition should be granted. The NRC report did identify many issues with methods of estimating internal dose to atomic veterans, and some of those issues have not been fully resolved. However, a balanced discussion of findings in the NRC report concerning methods of estimating inhalation dose to atomic veterans, which I believe is important, would have acknowledged and taken into account the following:

- discussions in Section V.C.3.1 of the NRC report on assumptions that should tend to overestimate inhalation dose, as summarized in Table V.C.5, which parallel discussions in Section V.C.3.2 on assumptions with substantial uncertainty that is not taken into account or assumptions that should tend to underestimate inhalation dose, as summarized in Table V.C.7 and reproduced on page 12 of the evaluation report;

- discussions in Section V.C.3.3 that present the NRC committee's evaluation of methods of estimating inhalation dose to atomic veterans, which is summarized below;

- discussions in Section V.C.5 that summarize the principal findings related to methods of estimating internal dose and attempt to provide an overall perspective on those findings;

- discussions in Section V.C.6 that present conclusions on the credibility of estimated upper bounds of inhalation dose to atomic veterans; and

- discussions in Section VI.C which emphasize that methods used in the NTPR Program to estimate inhalation dose on the basis of estimates of external exposure rates due to radionuclides in fallout deposited on the ground are valid as long as assumed exposure scenarios are reasonable representations of conditions of exposure of atomic veterans.

Discussions in Section V.C.3.3 of the NRC report are particularly relevant to the NIOSH evaluation report, in my opinion. Those discussions consider all the favorable findings on methods of estimating inhalation dose, as summarized in Tables V.C.5, and all the unfavorable findings, as summarized in Table V.C.7, and attempt to address the question of whether, on the whole, methods used in the NTPR Program to estimate inhalation doses to atomic veterans provide credible upper bounds. The NRC report indicates that this question is difficult to answer in general terms, but that certain conclusions about the credibility of estimated upper bounds of inhalation dose in particular exposure scenarios appear to be warranted.

Section V.C.3.3 of the NRC report noted that a scenario in which credible upper bounds of inhalation dose to atomic veterans probably are obtained involves exposure to descending fallout throughout the period of descent on residence islands at the PPG. This scenario is particularly relevant to exposures of NIOSH's cohort of energy workers at the PPG. The NRC report also noted that there are clear examples of scenarios in which estimated inhalation doses to atomic veterans are not credible upper bounds. However, those scenarios occur at the Nevada Test Site (NTS) and are not directly relevant to exposures at the PPG. Finally, the NRC report considered scenarios that involved inhalation of previously deposited fallout that was resuspended by such disturbances as walking or light vehicular traffic. Such scenarios were common at the PPG. The NRC report concluded that assumptions used in dose reconstructions for atomic veterans more likely than not overestimate actual doses in the assumed resuspension scenarios. Although the NRC committee could not determine whether estimated inhalation doses in those scenarios are credible upper bounds, discussions and analyses in the NRC report indicate that it is highly unlikely that estimated doses are far below credible upper bounds (e.g., that credible upper bounds could be higher by an order of magnitude or more).

[2] My second major concern about Section 7.1 of the evaluation report involves the first sentence in the Conclusion section at the top of page 14. This sentence begins as follows (again, emphasis mine): "Based on issues identified by the NRC that **questioned the ability to establish an upper bound dose reconstruction**, NIOSH has determined ..." A similar statement appears on page 13 in the second sentence of the paragraph immediately preceding the section on External Dose Issues. I believe that both statements are highly objectionable, essentially because they basically misrepresent findings in the NRC report. Such a conclusion does not even follow from the biased discussion of the NRC report's findings on methods of estimating inhalation dose to atomic veterans, as discussed above.

I can say with great confidence that there is not a single discussion in the NRC report that indicates or implies that credible upper bounds of internal doses to atomic veterans cannot be established, i.e., that there is no "ability" to establish credible upper bounds on the basis of available data and reasonable assumptions about exposure scenarios. Rather, the NRC report is concerned only with the question of whether estimated upper bounds of doses to atomic veterans are credible, which is a very different issue from the one implied by the statements in the evaluation report noted above. A 2000 report to Congress by the General Accounting Office (GAO) noted in the evaluation report had concluded that dose reconstruction is a valid method of estimating doses to atomic veterans for purposes of adjudicating claims for compensation, and nothing in the NRC report contradicts or questions that conclusion.

Role of 2003 Interim Guidance

In justifying its conclusion that energy workers at the PPG should be granted SEC status, the NIOSH evaluation report noted that a 2004 report to Congress from the Department of Defense presented several plans of action to correct deficiencies in DTRA's dose reconstruction program that were identified in the NRC report. The evaluation report also noted, correctly, that some issues discussed in the NRC report and the report to Congress have not been fully resolved for incorporation in methods of dose reconstruction for atomic veterans.

However, I was surprised that the NIOSH evaluation report did not mention the Interim Guidance that was issued by DTRA on July 16, 2003, in response to the NRC report. The Interim Guidance specified improvements to the dose reconstruction process for atomic veterans to be implemented immediately. Certain findings in the NRC report on methods of dose reconstruction were addressed by specifying simple adjustment factors to be applied to estimated doses as a means of obtaining more credible upper bounds. For example, the adjustment factor of 10 to be applied to estimates of inhalation dose in most scenarios was intended to address important deficiencies in methods of estimating inhalation dose identified in the NRC report.

NIOSH may have been unaware of DTRA's Interim Guidance. However, given the importance of the Interim Guidance to current methods of dose reconstruction in the NTPR Program, I believe that discussions of the NTPR Program in Section 7.1 of the evaluation report need to take the Interim Guidance into account.

Other Comments on NIOSH Evaluation Report

Additional comments on the NIOSH evaluation report are given below. Some of these comments provide additional discussion of the more general concerns described above.

[1] The evaluation report often uses the term "sufficient accuracy" to describe how NIOSH must be able to estimate doses (e.g., see page 4, first paragraph of Section 2.0). However, I did not find what I would consider to be a satisfactory discussion of what "sufficient accuracy" means, especially since upper credibility limits of dose are of primary importance in the

compensation program for energy workers, not best estimates. The "accuracy" of an estimated dose doesn't matter much as long as an assumed uncertainty or bias in that estimate is credible.

[2] On page 6, a statement at the end of the paragraph immediately preceding Section 4.2 notes that dose reconstructions have been completed for three claims for compensation by energy workers at the PPG. Given NIOSH's conclusion that inhalation doses to those workers cannot be estimated reliably at the present time, I think it would be of interest to discuss how doses to the three claimants were estimated (e.g., how difficulties in estimating dose were addressed).

[3] On page 7, the first row in Table 5.1 notes that there have been reports of defective seals in film badges used at Operation DOMINIC I. This table might also note that there are concerns about damaged film at other operations in the Pacific, including Operation REDWING. The NRC report provides discussions on this issue.

[4] The 2000 GAO report to Congress, which led to the 2003 NRC report, is mentioned in the second paragraph of Section 7.1 on page 11. However, in the interest of fairness and accuracy, I believe that the NIOSH evaluation report should mention the GAO report's conclusion that dose reconstruction is a valid method of estimating doses to atomic veterans for purposes of adjudicating claims for compensation. I also noticed that the GAO report is not included in the reference list beginning on page 19.

[5] If Table V.C.7 from the NRC report, as given on page 12 of the evaluation report, is retained, I believe that the evaluation report should note that some of the points in that table apply only at the NTS and, thus, are not relevant to dose reconstructions at the PPG.

[6] On page 12, the statement immediately following Table V.C.7 from the NRC report is correct. However, as discussed in a previous comment, that statement probably is misleading in regard to dose reconstructions at the PPG, where concerns about obtaining credible upper bounds of inhalation dose to atomic veterans appear to be less important.

[7] The beginning of the last paragraph on page 12 notes that "[m]ost of the issues dealing with uncertainty are similar to issues NIOSH has already or is currently dealing with ..." I think it would be helpful to be more explicit about particular issues that are similar in the two programs. That statement also begs the question of why NIOSH believes that it isn't able to deal with those issues at the PPG when they are dealing with them in other cases.

[8] In regard to the last paragraph of the section on External Dose Issues on page 13, I would argue that the approach of applying uncertainty factors to ensure that reasonable estimates of external dose are obtained, which NIOSH expects to use in its dose reconstructions, also can be applied in estimating internal dose. Indeed, just such an approach is specified in DTRA's 2003 Interim Guidance, as noted in a previous comment.

[9] I do not object to discussions in the section on Ingestion on page 15. However, I do think that an important implication of analyses of ingestion scenarios in the NRC report is that

reasonable bounding estimates of ingestion dose can be obtained for use in dose reconstructions for specific individuals. This point perhaps deserves greater emphasis.

[10] In the section on Neutrons on page 16, there are two statements that, if I understand them, don't seem right. The first is a statement that, in addition to detonation events, a potential source of neutron exposure is "accessing the detonation locations for recovery of monitoring equipment." A later sentence then refers to access controls that were implemented "following the detonations," as if this had something to do with controlling exposures to neutrons. I don't know what the authors of this section intended (and the summary of neutron dosimetry data in Table 5.1 on page 7 does not help me), but the fact of the matter is that all exposures to neutrons occurred essentially at the time of detonation (or within a few seconds after a detonation, as short-lived fission products that are delayed neutron emitters decayed), and exposures to neutrons did not occur during post-detonation recovery of monitoring equipment.

I would also note that although NIOSH did not complete an evaluation of the feasibility of estimating neutron doses, such doses can be estimated, in the rare instances when they occurred at the PPG, on the basis of information given in reports issued by the NTPR Program.

[11] Section 7.3 on Occupational Medical Exposures on page 16 interested me in the following way. This section basically argues that doses from occupational medical exposures of energy workers at the PPG can be estimated even in the absence of directly relevant data. I do not take issue with that conclusion; indeed, I believe that the approach to estimating dose outlined there is reasonable. However, in the interest of fairness, I believe that NIOSH should acknowledge that simple approximations based on available data also can be used in estimating internal dose, when this is indeed the case.

[12] As in previous comments, I believe that the statement at the end of the third paragraph on page 17 about "the lack of reliable information to establish plausible maximum limits to this exposure" is highly misleading. Again, the concern here, as I see it, is the crucial difference between establishing the degree of reliability of models and data (i.e., the magnitude of uncertainties or biases), which is an issue that has not been fully resolved in dose reconstructions for atomic veterans, and an inability to establish the reliability of models and data, which is not an issue when data do exist that can be used to establish reliability.

Summary

I believe that NIOSH's evaluation report on the SEC petition for energy workers at the PPG should be revised with two important goals in mind:

(1) The evaluation report should present a fair and balanced discussion of findings in the 2003 NRC report on the adequacy of methods of dose reconstruction for atomic veterans used in the NTPR Program, especially methods of estimating inhalation dose, and the implications of those findings for dose reconstructions for energy workers at the PPG. The evaluation report also should discuss DTRA's 2003 Interim Guidance, which was

issued in response to the NRC report, and its importance in improving the credibility of estimated upper bounds of doses to atomic veterans.

(2) The evaluation report should not contain any statements that imply that methods of dose reconstruction used in the NTPR Program are invalid. Discussions and analyses in the 2003 NRC report do not support any such conclusion. Indeed, I believe that NIOSH should acknowledge explicitly that the validity of methods of dose reconstruction used in the NTPR Program is not at issue, even though some uncertainties or biases in estimates of dose to atomic veterans obtained using those methods have not been fully assessed.

I also believe that a fair and balanced discussion of findings in the 2003 NRC report, combined with a finding by NIOSH that potentially important issues identified in the NRC report and the 2004 report to Congress have not been fully resolved, could still support NIOSH's conclusion that energy workers at the PPG should be granted SEC status. However, as noted previously, I take no position on whether SEC status should be granted. My only concern is that NIOSH's arguments should be sound and defensible.