

Comment Number	Report Section	Issue Description	Status	SC&A Preliminary Conclusions
1	1	Some radionuclide lists are not complete. This is especially important for atmospheric testing and for early re-entry workers.	NIOSH has responded to the finding (except as related to Matrix Comment 5)	<p>No further review of this item needed, except as related to issues in Section 5 below.</p> <p>NIOSH Response See response to comment 5 below.</p>
2	2	TBD does not provide adequate guidance for dose estimation to gonads, skin, and gastro-intestinal (GI) tract for early reactor test re-entry personnel. Large hot-particle doses to skin and GI tract have not been evaluated. Naval Radiological Defense Laboratory (NRDL) documents and models have not been evaluated, though one document is referenced.	NIOSH and SC&A agree that NRDL model could be used. NIOSH has been partially, but not fully, responsive to SC&A comments.	<p>Some review of this issue appears to be warranted.</p> <p>NIOSH Response NIOSH has reviewed Hacker (1994) and has determined that much of the information contained within the book related to Rad-Safe operations and operation-specific radiological data represent condensed summaries on detailed information contained within operation-specific Nuclear Defense Agency reports which have been extensively reviewed and currently in the Site Research Data Base. The 2005 review of the NTS Site Profile included a statement that “<i>Dr. Hacker’s book provides extensive references to primary documentation for the policies and controversies discussed in this paragraph (Hacker 1994, Note 52, pg. 327) that would be a very useful guide to the pressures that led to what appears to have been a significant compromise of the integrity of the external dose record in the early period.</i>” Since 2005, NIOSH has extensively researched the integrity of the external dose record both for the atmospheric testing period and for the later underground testing activities in response to finding 13, Section 5.7.5 of SC&A 2005; Intentional Non-Use of Badges. This investigation did not detect a significant compromise of the integrity of the external dose record.</p> <p>SC&A 2005 also stated the following: “<i>There were also tensions between weapons testing and safety, at least in the early period. How this tension between safety and continued testing was resolved and what aspects of the resolution led to more safety and which ones to better public relations is a material issue that needs to be investigated as NIOSH prepares Rev. 01 of the NTS TBD. This is especially relevant since Elements of Controversy documents the “discontent” of the armed forces with AEC radiation exposure limits, which was the context in which the AEC relaxed its rules and allowed armed forces personnel to be present closer to the tests than previously allowed (Hacker 1994, pg. 92). Rad-Safe personnel would also have been present at the same locations as the armed forces personnel.</i>”</p>

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				<p><i>Rad-Safe personnel generally preceded armed forces personnel into areas near ground zero. Both factors would tend to increase external and internal exposure.</i></p> <p><i>Stationing personnel closer to ground zero also raises questions about the extent of neutron exposure during atmospheric testing that bear close examination and analysis. As discussed above, NIOSH's conclusion that personnel were not exposed to neutrons during nuclear weapons tests is premature at best. Study and analysis of primary documentation, including possibly still classified documentation about the tests, may be especially useful. Specifically, the possibility that troops (and hence Rad-Safe personnel) were stationed closer than permitted distances appears to be an important item of investigation.”</i> NIOSH revised the NTS Site Profile (addressed in NTS-6 Rev 01, Sections 6.3.5.3.1, 6.3.5.3.3, 6.5.3, and Attachment in response to Finding 5.7.7 and 5.7.8 of SC&A 2005 to substantiate that neutron doses during atmospheric testing were negligible and not in error for some NTS workers.</p> <p>SC&A 2005 also stated the following: “SC&A suggests that NIOSH make a careful assessment of Barton Hacker’s history and the sources that are cited in it insofar as they concern on-site radiation safety practices.” NIOSH has obtained a copy of Hacker 1994 and has reviewed it to understand the development of on-site radiation safety practices. The book will be entered into the Site Research Data Base for continuing review.</p> <p>A recent review revealed that DOE dosimetry records supplied to NIOSH for NTS employees include reentry logs and survey information for employees involved in these types of activities. These activities would include tunnel reentries as well as reentry into the debris fields resulting from reactor experiments. A review of 42 case files for the NTS between (claim numbers redacted) of a sample of employee records has confirmed that of the 42, 23 contained these types of information (e.g., claim numbers redacted). Of the 19 cases that did not have additional monitoring records, they were individuals that did not routinely work in radiation areas (e.g., storekeeper, lineman, survey crew, bus driver, fry cook, field inspector, electronic tech, and truck driver). Therefore, for claimants documented to be involved in reentering the NRDS, NIOSH believes the reentry and survey information would be available which would allow the application of the NRDL model for exposure scenarios and experiments defined in Hazards To Personnel Re-entering the Nevada Test Site Following Nuclear Reactor Tests, NRDL-TR-68-149 (NRDL 1968).</p>

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3	3	Doses from large (non-respirable) particles to GI tract and skin for workers in the early atmospheric test period have not been evaluated. These doses could be high. Hot-particle doses also need to be evaluated for early drillback and other early re-entry workers during underground testing periods.	Hot particle exposure as a result of nuclear weapon tests is still outstanding for external dose and for oro-nasal breathing.	<p>It would appear useful to examine whether the NRDL model could also be used for weapons testing exposures to calculate partial doses.</p> <p>NIOSH RESPONSE</p> <p>As described in the NRDL 1968 report, models developed for re-entry personnel supporting nuclear propulsion reactor test at the NRDS are not applicable to dose estimates for workers associated with atmospheric nuclear tests, drillbacks and tunnel re-entries following underground nuclear tests, or the accidental venting of underground nuclear tests. These models are based on 1) the expected fission density of the Phoebus 2A, EP=II test which assumes a reactor run for twenty minutes at a power level of 5,000 MW, 2) an infinite field radioactivity measurement one hour post shutdown at three feet above the ground, and 3) a coarse particle (>12 microns diameter) ground deposition density of one particle per square meter. For potential hot particle exposure scenarios outside the NRDS (e.g., exposure to radioactive fallout from atmospheric testing, underground test that vented), these parameters are either unknown or unknowable. Therefore, any attempt to apply the NRDL models would undoubtedly introduce significant uncertainty in the calculated doses and NIOSH will not do so. However, any documented hot-particle NTS external exposures can be addressed through the procedures outlined OTIB-0017, OCAS-IG-001, and the VARSKIN model. Oro-nasal breathing is an overarching issue that will be evaluated on the project level – not specific to the NTS. As a result of the SEC determination for NTS, internal doses (from hot particles) are no longer estimated when bioassay data are absent.</p>
4	4	Ingestion of non-respirable hot particles by reactor testing and nuclear weapons testing workers due to oro-nasal breathing needs to be evaluated.	It may be possible to calculate partial doses for certain non-presumptive cancers.	<p>The investigation of this issue will depend on how the Work Group decides to address matrix comments 2 and 3 above.</p> <p>NIOSH Response</p> <p>See responses to items 2 and 3 above</p> <p>As a result of the SEC determination for NTS, internal doses (from hot particles) are no longer estimated when bioassay data are absent.</p>

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5	5	Resuspension model and resuspension factor are not scientifically defensible or claimant favorable, due to a variety of factors. Doses may be underestimated by an order of magnitude or more. Mass-loading approach would be preferable for internal dose.	Matrix comments 6, 7, 15, and 23 are also covered here. NIOSH and SC&A are in agreement that occupational environmental dose can be estimated. NIOSH has not yet addressed some issues raised by SC&A.	<p>Review of unaddressed items appears to be warranted.</p> <p>NIOSH Response</p> <p>The following assumptions (in black font) are excerpts from (Anspaugh 2008). The replies to the assumptions are in light blue.</p> <p>Assumption 1: No Contamination of the NTS Occurred after July 1962.</p> <p><i>This assumption has already been examined extensively in the section of this document following the Introduction. As noted, there were many contaminating events that produced substantial new depositions on soil. The contribution of the Buggy event was even acknowledged in Rollins (2008a) although it was ignored. Events specifically mentioned in the reports of the environmental surveillance program were Pike, Nash, Hupmobile, Buggy, Door Mist, Schooner, and Baneberry. Events Buggy, Schooner, and Baneberry were even noted to have contaminated potable water at the NTS.</i></p> <p>NIOSH Response</p> <p>While it is true that there were many controlled and uncontrolled releases to the environment after 1962, the vast majority of these releases were of noble gases and volatile iodines which would not have contributed significantly to soil contamination (DOE 1996).¹ Of the non-volatiles reported (e.g., W-187, Sr-91, Cs-138, Ru-106, etc.), most had half-lives on the order of hours or days and would only be a concern to individuals participating in early reentry operations. As shown by Rollins (2007b), exposure to these short-lived fission and activation products would be expected to result in minimal doses to the non-presumptive cancers affecting the larynx (ET2 and LNET), skin, and prostate.</p> <p>Also, it should be noted that DOE evacuated non-essential workers from downwind areas of the NTS prior to all tests to minimize potential for radiation exposure. In addition, after releases, surveys were conducted to characterize the fallout fields and to implement controls to prevent inadvertent entry into these areas.</p> <p>The only mention of potentially contaminated <u>potable</u> water was in December of 1968 and January, 1969 REECo (1971). The maximum concentration was 1.54×10^{-6} uCi/cc measured on January 19, 1969 at the Area 2 Men's Restroom. However, these elevated levels quickly dissipated and the mean concentration for all samples taken at this location for 1969 was 4.60×10^{-9} uCi/cc compared with 6.41×10^{-9} uCi/cc</p>

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DRAFT ORAUT/NIOSH responses 01/30/2014

Comment Number	Report Section	Issue Description	Status	SC&A Preliminary Conclusions
				<p>for 1968; well below the alert level of 1.0×10^{-7} uCi/cc for unidentified radionuclides. Thus, anyone drinking water at this location during 1968 and 1969 would be expected to receive inconsequential internal dose.</p> <p>1. DOE. Radiological Effluents Released From U.S. Continental Tests 1961 Through 1992. US Department of Energy Nevada Operations Office; DOE/NV-317 (Rev.1) UC-702; August 1996.</p> <p>Assumption 2: <i>The Air Concentrations Recorded by the Air Samplers of the NTS Environmental Surveillance Program During 1971 and Beyond Can Be Used to Derive the Air Concentrations That Would Have Been Seen at these Same Air-Sampler Locations During 1963–1970.</i></p> <p>As demonstrated above by the detailed consideration of the contaminating events at NTS during 1963–1970 and the results of the environmental surveillance air-sampling program, there were several substantial excursions noted in the air concentrations due to massive releases at the NTS. The last such release occurred in December 1970. Thus, it is impossible for air-sampling results during the 1971–2001 period to reproduce these massive excursions that occurred in 1963–1970.</p> <p>NIOSH Response</p> <p>The purpose of the calculations performed by Rollins (2007b) was not to try to predict air sampler measurements between 1963 and 1970 but was to provide a claimant favorable method of assigning environmental intakes to individuals <u>not</u> associated with operations. This was done by selecting the highest integrated air concentration measured for Pu-239, as part of the environmental surveillance program, anywhere on site between 1971 and 2001 and correlating it with other radionuclides (decay corrected) persisting in the NTS soils across the site to estimate their relative intakes. NIOSH believes the “massive excursions” that occurred as a result of controlled and uncontrolled releases are relatively unimportant to organ dose because of their brief duration and because nonessential personnel were not exposed to them due to the required, pre-test, downwind evacuations.</p> <p>Assumption 3: <i>More Generally, the Air Concentrations Recorded by the Air Samplers of the Environmental Surveillance Program Represent the Air</i></p>

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				<p style="text-align: center;">Concentrations Actually Experienced by the Workers at the NTS.</p> <p><i>This is a more difficult issue, as there do not appear to be any objective data on the inhalation of radionuclides at the NTS as measured with a personal air sampler and in comparison to any of the locations of the environmental surveillance network.</i></p> <p><i>It is known, however, that these air-sampling stations were typically located next to cafeterias and dispensaries, where there would be relatively little dust. On the other hand, there were many types of work that would have raised large amounts of dust. One outstanding example of a major dust raising event was the movement of drilling rigs, such as the one shown in Fig. 18, from one location to another without disassembly. The drill rig was raised with hydraulic jacks, and large steel beams were placed through the rig. Then four "coasters," one of which is shown in Fig. 19, were attached to the beams. The two beams and one of the coasters are shown in Fig. 20. The presumed path of one such movement is shown in Fig. 21.</i></p> <p><i>There has been substantial concern about mass loading and exposure to persons, if there might be a volcanic eruption that would influence the Yucca Mountain waste-storage site. As part of the evaluation process, there has been a substantial effort to evaluate possibly enhanced mass loading due to outdoor activities in a post eruption environment. The evaluation has consisted of reviewing relevant literature and in conducting measurements of mass loadings in Amargosa Valley, Nevada. These studies are described in Bechtel SAIC (2006).</i></p> <p><i>The authors of Bechtel SAIC (2006) considered mass loadings in several environments; two of interest to us are the "Inactive Outdoor Environment," which would be similar to the locations where the NTS environmental surveillance air samplers were located. Their review of data and of measurements made as part of the Yucca Mountain evaluation program resulted in their description of mass loading in this environment with a triangular distribution with a mode of 0.060 mg m^{-3}, a minimum of 0.025 mg m^{-3}, and a maximum of 0.100 mg m^{-3}.</i></p> <p><i>The "Active Outdoor Environment" was also considered, and would include activities such as driving bulldozers, tractors, heavy construction machinery, etc. Their evaluation of literature values and of their contracted measurements in Amargosa Valley was again a description by a triangular distribution, but now with a mode of 3 mg m^{-3}, a minimum of</i></p>

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				<p>1 mg m^{-3}, and a maximum of 10 mg m^{-3}.</p> <p>Thus, according to the evaluation of the Yucca Mountain evaluation group, the mass loading experienced by a bulldozer driver would be on the order of 3 divided by 0.06, or 50 times higher than the concentration of dust in an inactive outdoor environment. Of course, a person driving a bulldozer would not be exposed to such levels 100% of the time, but it is obvious that a stationary air sampler located next to a cafeteria or dispensary would not give a realistic indication of a working person's exposure.</p> <p>It is also well to remember the words of some of the early investigators of the NTS environmental surveillance program:</p> <p style="padding-left: 40px;"><i>“Results of environmental surveillance in sampling activity values cannot be used in calculating personnel exposure doses.”</i></p> <p>As a final point, it has often been assumed by NIOSH personnel that “Controlled Areas” at the NTS are fenced and that it not possible to enter such areas. This is hardly the case, as many Controlled Areas are “controlled” by nothing more than a warning sign. Fig. 22 is a photo of one such Controlled Area, which actually has a road right through it.</p> <p>NIOSH Response</p> <p>As stated above, the purpose of the calculations performed by Rollins (2007b) was not to try to predict intakes associated with operational activities but was to provide a claimant favorable method of assigning environmental intakes to individuals <u>not</u> associated with operations. Therefore, it would be reasonable to position the samplers (cafeterias and dispensaries) where they would be unlikely to be exposed to dust clouds associated with operational activities (e.g., moving drilling rigs).</p> <p>Assumption 4: <i>There Were No Clean-Ups of Radioactive Materials Between 1962 and the Time Period When Measurements of Surface Radionuclides Were Made by the Radionuclide Inventory and Distribution Program (RIDP in the 1980s.</i></p> <p>The measurements of surface-soil contamination performed by investigators of the RIDP are critical to the methodology developed in Rollins (2008a) for the reconstruction of internal doses via both inhalation and incidental ingestion of soil. The RIDP measurements were</p>

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				<p><i>not made for the purpose of reconstructing doses, but rather for defining the amounts and locations of existing contamination for the purposes of control and future clean-up (Kordas and Anspaugh 1982). Between 1962 and the time of the measurements made by the investigators of the RIDP, there was an active program on cleaning up contaminated soil.</i></p> <p><i>McArthur and Mead (1989) specifically mention that much of the Nuclear Rocket Development Station in Area 25 had been cleaned up before the RIDP measurements were started in February 1984.</i></p> <p><i>Thus, the fourth assumption must be considered as invalid, as well. The surface soil activities measured in the 1980s cannot be depended upon to represent activity present in 1963–1970, decay corrected or not.</i></p> <p>NIOSH Response</p> <p>McArther (1991) identified a total of 510 square miles of contaminated soils (about a third of the total NTS area) containing more than 2,000 curies of radioactivity. This radioactivity was related to radionuclides that are persistent in the environment and are important to organ dose. Although there were efforts to decontaminate some of the more highly contaminated areas, these efforts focused on contaminated equipment and large, nonrespirable particles. The efforts made to decontaminate Nuclear Rocket Development Station in Area 25 would likely have had little effect on the air concentrations measured in Area 7 that were used to estimate environmental intakes.</p>
6	5	The use of the site average air concentration values when worker location is not known is not claimant favorable. Largest value consistent with job-type data should be used in such cases.	See matrix comment 5 above.	See matrix comment 5 above.

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7	5	Resuspension doses to monitored workers, especially early re-entry workers, may be underestimated, due to the presence of short-lived radionuclides and higher resuspension expected in the days and months after a test (including safety tests). TBD does not specify procedures for estimating environmental internal doses in such cases.	See matrix comment 5 above.	See matrix comment 5 above.
8	6	Use of 1967 external dose data for 1963–1966 is not claimant favorable. There was no test in 1967 with measurable offsite fallout. Relatively short-lived radionuclides, which were likely present in 1963–1966, would have substantially decayed away by 1967.	NIOSH has pointed out that badging was required for all workers after 1957.	No further review of this comment appears to be needed.

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9	6	Lack of environmental external dose data for 1968–1976 is puzzling. TBD has not specified an approach to estimating external environmental dose for this period. Venting in the 1968–1970 period likely made external dose in that period (and possibly beyond) higher than 1967.	See matrix comment 8 above.	See matrix comment 8 above.
10	7	The TBD does not provide any guidance for pre-1963 external environmental dose. Issues relating to unmonitored workers, as well as time of entry into contaminated areas, could be important.	SC&A has not reviewed the pre-1957 dose assignments suggested by NIOSH. Suggested dose assignments do not appear claimant favorable or compatible with the MDLs.	<p>SC&A's preliminary conclusion is that NIOSH values may reflect subtraction of the badge MDL. NIOSH clarification on how the values were derived is needed. Review of the proposed dose assignments appears to be warranted.</p> <p>NIOSH Response</p> <p>The values in Table 6-11 of <i>Nevada Test Site-Occupational External Dose</i> (ORAUT-TKBS-0008-6, Rev 03) represent an analysis of recorded dose values for the years indicated in the table. In order to provide a complete and claimant-favorable listing of coworker dose, Table 6-11 will be revised with respect to the methodology given in Use of Coworker Dosimetry Data for External Dose Assignment (ORAUT-OTIB-0020). Using this guidance, missed dose equal to [(N-1) *LOD] for a given year (where N is the exchange frequency) will be added to the recorded dose values for the 50th and 95th percentile values in Table 6-11 respectively.</p>

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11	8	Correction factors for external environmental dose due to geometry of organ relative to badge, and angular dependence of the dose conversion factor need to be developed.	NIOSH has provided a table of the photon energy spectra to be used. NIOSH's photon energy groupings may not apply to nuclear testing spectra. NIOSH concluded that the external dose conversion factors would not make a material difference and hence do not need to be applied.	<p>NIOSH's photon energy groupings appear to need review. The correction factors for skin dose may be much greater than one. SC&A's preliminary view is that some aspects of NIOSH's conclusions of external environmental dose correction factors need review to assure that they are claimant favorable.</p> <p>NIOSH Response</p> <p>The issues regarding correction factors for skin dose are addressed by using the beta:gamma methodologies summarized in Section 6.4.2.1 and discussed in detail in Attachment C of <i>Nevada Test Site-Occupational External Dose</i> (ORAUT-TKBS-0008-6, Rev 03). Please note that Attachment C discussed beta:gamma ratio recommendations for geometries involving point sources, contaminated surfaces, and immersion in contaminated clouds. Based on the availability claimant-interview data and work history files, dose reconstructors can choose the general guidance from section 6.4.2.1 (which includes an estimate of uncertainty) or specific guidance given by the detailed data in Attachment C. Finally, the photon energy groupings discussed in OCAS-IG-001 and given again in Attachment B of ORAUT-TKBS-0008-6 are driven by the available energy ranges in IREP, which is used to calculate probability of causation.</p>
12	9	Radon doses in G-Tunnel are not claimant favorable. Gravel Gertie radon doses are not discussed, and could be substantial. (Site status of Gravel Gertie workers needs clarification.)	NIOSH has addressed G-Tunnel issue. Clarification is needed on Gravel Gerties.	<p>NIOSH should clarify whether Gravel Gerties were entered in the post-1992 period. If not, this issue is resolved.</p> <p>NIOSH Response</p> <p>For non-presumptive cancers (e.g., larynx) during all periods and presumptive cancers (e.g., lung) after 1992, exposure to radon and thoron will be calculated and assigned in accordance with ORAUT (2010a) when records indicate the claimant made entries into the Gravel Gerties.</p>

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13	10	Environmental doses due to I-131 venting need to be taken into account for non-monitored workers.	NIOSH's method for estimating I-131 exposure due to Baneberry venting does not appear to be claimant favorable. A similar approach for other ventings may also underestimate dose.	<p>Development of a method for assigning more claimant-favorable partial I-131 doses appears to be warranted.</p> <p>NIOSH Response</p> <p>A review of the personnel decontamination efforts following the Baneberry event indicated that of the 900 individuals evacuated from forward areas following the event, 145 underwent decontamination and submitted bioassay samples. These sample results would be available for internal dose reconstruction.</p> <p>Another 69 individuals underwent prompt thyroid counts and all but 17 of these workers were assigned doses to their thyroids which are included in the dosimetry records and are available for dose reconstruction.</p> <p>A review of the technical Basis for Internal Dosimetry at the Nevada Test Site dated 1993 (SRDB Ref. ID 1948) indicated that the minimum detectable dose for the prompt thyroid counter was less than 0.001 rem for I-131, 132, and 133. It is reasonable to assume that the 17 workers that had calculated doses of zero likely had thyroid doses < 0.001 rem.</p> <p>NIOSH believes that the DOE decontamination efforts following the Baneberry event identified several workers with a potential for internal exposure and that the doses assigned were appropriate for the techniques in use at the time. The bioassay sample results for those individuals assigned internal dose are contained in the dosimetry records and will be available for future dose reconstruction as needed. For workers that may have been involved with the Baneberry incident but have no bioassay results in their dosimetry records, as a result of the SEC class for NTS, NIOSH has determined, and the Secretary of Health and Human Services has concurred that internal doses cannot be reconstructed between January 27, 1951 and December 31, 1992, inclusive, for the energy employee.</p> <p>NIOSH agrees that the bounding calculation currently contained in ORAUT-TKBS-0008-5 may not be appropriate and will replace that discussion with the one above.</p> <p>NIOSH has responded to the issue of contaminated potable water in Section 5.4 above.</p>
14	11	There are no internal monitoring	This issue has been resolved, due to granting of	This issue can be closed.

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		data until late 1955 or 1956; some Pu from then on; some tritium from 1958; Pu, T, and mixed fission products from 1961; and full radionuclide coverage established in about 1967. The TBD does not provide significant guidance for estimating internal dose for the pre-1967 periods for many radionuclides.	the SEC up to the end of 1992. NIOSH uses available individual internal dose data for partial dose estimation.	
15	12 (details in Section 5)	Resuspension of radionuclides by the blast wave, fractionation of relatively non-volatile radionuclides, and the variability of Cs-137 to Sr-90 ratios need to be taken into account in internal dose estimation.	See matrix comment 5 above.	See matrix comment 5 above.
16	13	Use of photon dose, as done by Defense Threat Reduction Agency (DTRA), as the basis for estimating internal dose during periods when there are no data or scattered internal monitoring data has significant uncertainties. These uncertainties are compounded by the data integrity issue associated with NTS (see comment 20 below).	This issue has been resolved by the granting of the SEC.	This issue can be closed.

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17	14	Ingestion doses need to be better evaluated.	NIOSH had suggested the use of ORAUT-OTIB-0018. This is not applicable to outdoor NTS work.	<p>NIOSH should consider partial ingestion dose estimation based on resuspension models. See Section 5 above.</p> <p>NIOSH Response</p> <p>Current practice for reconstructing internal dose at the NTS does not include the application of OTIB-0018 methods. However, ingestion doses are determined using methods described in ORAUT 2008b. These methods assume the ingestion of 100 mg per day of (soil which is twice the amount recommended by the EPA [1989])¹ contaminated to the highest levels measured for all areas at the site excluding Area 30. Although Area 30 provided the highest levels of contaminated soil, it was not included in the consideration for soil ingestion because of its size (0.03 sq. mile), remoteness, and inaccessibility (ORAUT 2008b). The ingestion model described in ORAUT (2008b) includes decay correction back to 1963 and organ-specific corrections for exposure to early fission and activation products from 1963 through 1970.</p> <p>It should be noted that the calculation of environmental intakes through the inhalation pathway was not based on a resuspension model but rather on maximum measured atmospheric concentrations of Pu-239. For the inhalation intakes, a resuspension model was only used to estimate increased resuspension factors realized during early times after initial deposition. This phenomenon would not be important to ingestion intakes.</p> <ol style="list-style-type: none"> EPA (U.S. environmental Protection Agency), 1989, Risk Assessment Guidance for Superfund. Vol.1 Human Health Evaluation Manual, Part A, EPA/540/1-89/002, Office of Emergency and Remedial Response, Washington D.C. [SRDB Ref. ID: 35528]
18	15	Recommended use of ORAUT-OTIB-0002 for post-1971 tunnel re-entry workers is contrary to guidance in that document, and its scientific validity has not been established. Its use may not be satisfactory even with restrictions, for instance for reactor testing early re-entry workers.	This issue has been resolved by the granting of the SEC.	This issue can be closed.

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19	16	There are no beta dose data until 1966; the TBD does not specify a procedure for estimating pre-1966 beta dose. When the approach is developed, the large hot-particle issue will need to be taken into account.	NIOSH suggests the use of beta:gamma ratios. SC&A agrees in principle, but some suggested ratios may not be claimant favorable.	<p>Review of the beta:gamma ratios suggested by NIOSH appears to be warranted.</p> <p>NIOSH Response Please see the response on comment 11 for a discussion of the variety of approaches that are available for dose reconstructors to address the assignment of beta dose. NIOSH can address specific issues once a full review is done by SC&A.</p>
20	17	There appears to have been intentional non-use of badges in some circumstances to avoid approaching or exceeding operational dose limits. The practice may have occurred until the mid-1960s or even extended into the 1970s. NIOSH has not investigated this problem, which raises questions on the integrity of the external dose record possibly into the 1970s, which need to be explicitly addressed.	This issue was extensively researched and discussed during the SEC review process.	In SC&A's view, this issue can be closed.

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21	18	The TBD does not contain information about extremity dosimetry. Site status of bomb assembly workers is unclear.	According to NIOSH, there were no claims of device assembly workers involving extremity cancers as of 2007.	<p>An update of claims with non-covered cancers to check whether there are still no extremity cancer claims through 2012 would be useful.</p> <p>NIOSH Response Current practice for dose reconstruction includes the evaluation of extremity dose when these data are provided in the dosimetry records. Evaluation of extremity dose is typically performed to determine the appropriateness of the application of glove box factors (dose to the prostate and gonads) and to determine claimant favorable doses applicable to skin cancers appearing on the hands and forearms. In rare cases where extremity monitoring included other parts of the body such as the head, an evaluation would be made to determine appropriate adjustments necessary to cancers appearing above the shoulders (e.g., larynx). Therefore, when cases of device assembly workers require dose reconstruction, the extremity doses will be evaluated for application to cancers appearing on the extremities.</p>
22	19	There are no neutron dose data until 1966, and partial data until 1979. TBD assertion that neutron doses during atmospheric testing were negligible has not been substantiated and may be in error for some workers.	NIOSH's analysis regarding the low exposure potential for Department of Energy (DOE) and contractor test personnel appeared reasonable. There are still some outstanding questions, e.g. choice of n/p ratios.	<p>Some further review of this issue appears to be warranted on specific points (e.g., n/p ratios for device assembly workers).</p> <p>NIOSH Response Although the N:P ratio for nuclear device assembly workers can vary, the recommended value from Pantex can be applied as a reasonable value to use given the variety of devices and workplace geometries. Information regarding TRU handling and handling of neutron sources is provided in Tables 6-9, 6-15, and 6-16 of <i>Nevada Test Site-Occupational External Dose</i> (ORAUT-TKBS-0008-6, Rev 03). NIOSH can address specific issues if a further review is done by SC&A with respect to the post-1992 period.</p>

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23	20 (Details in Section 5)	Adequacy of soil data for estimating resuspension doses needs to be evaluated, for instance in relation to hot spot detection and Pu soil data.	See matrix comment 5 above.	See matrix comment 5 above.
24	21	The presence of high-fired oxides resulting from atmospheric weapons testing and reactor testing needs to be investigated.	This issue has been resolved due to the granting of the SEC.	This issue can be closed.
25	22	NOISH documentation of site expert interviews is inadequate, and crucial site expert interviews have not been performed or performed in an incomplete manner, notably Barton Hacker and [Redacted]. Potentially critical archives and documents have not been reviewed, including the NRDL and Barton Hacker primary reference materials.	NIOSH has extensively modified its interview documentation approach.	This issue is now part of Worker Outreach review.
26	23	A number of issues in relation to waste handling, decommissioning, and other post-1992 site activities were reviewed by SC&A in SC&A 2005 or during the SEC review.	This is a new matrix comment. It has been added to this matrix update as a placeholder for WG discussion.	