



## MEMORANDUM

TO: Nevada Test Site Work Group  
FROM: Arjun Makhijani, SC&A, Inc.  
DATE: December 29, 2016  
SUBJECT: NTS Site Profile Matrix Comments and December 2016 Update by SC&A

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This update to the Nevada Test Site (NTS) issues matrix is to be read in conjunction with the January 30, 2014, version of the matrix (NIOSH 2014) that contains National Institute for Occupational Safety and Health (NIOSH) responses to the December 14, 2012, SC&A issues matrix (SC&A 2012).

Comment #	Issue Description	Status
1	Some radionuclide lists are not complete. This is especially important for atmospheric testing and for early re-entry workers.	<b>SC&amp;A comment, December 2016: Resolved except as it relates to Issue 5.</b>
2	The technical basis document (TBD) does not provide adequate guidance for dose estimation to gonads, skin, and gastrointestinal (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.	<b>SC&amp;A comment, December 2016: The issue can be considered resolved so far as NRDL is concerned if NIOSH will paste the response to Issue 3 applying to the Nuclear Rocket Development Station and add it to the response to Issue 2 (as per the December 2014 Work Group (WG) transcript (pp. 19–26).</b>
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.	<b>SC&amp;A comment, December 2016: This issue can be considered resolved based on the discussion during the December 2014 WG meeting along with the text on page 58 of the NTS site profile, Vol. 6, Rev. 3 (November 2012). The generic oro-nasal breathing issue is pending on a complex-wide basis.</b>

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Comment #	Issue Description	Status
4	Ingestion of <b>non-respirable</b> hot particles by reactor testing and nuclear weapons testing workers due to oro-nasal breathing needs to be evaluated.	<b>SC&amp;A Comment, December 2016: This issue can be considered resolved based on the comments added for Issues 2 and 3 above.</b>
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.	<b>SC&amp;A comment, December 2016: Review is continuing.</b>
6	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.	<b>SC&amp;A comment, December 2016: Review is continuing.</b>
7	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.	<b>SC&amp;A comment, December 2016: Review is continuing.</b>
8	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.	<b>SC&amp;A comment, December 2016: Resolved as per the December 2014 WG meeting transcript.</b>
9	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.	<b>SC&amp;A comment, December 2016: Resolved as per the December 2014 WG meeting transcript.</b>

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10	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.	<b>SC&amp;A comment, December 2016: This issue is resolved, conditional on NIOSH revision of Table 6-11 as per the NIOSH comment in the January 30, 2014, issues matrix. See the December 2014 WG meeting transcript.</b>
11	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.	<b>SC&amp;A comment, December 2016: NIOSH to provide data showing basis for the value of 1.04 for the beta/gamma ratio and the reason for the differences with the Hicks tables. Also, NIOSH to verify the photon energy spectra being used and attenuation factors in that context. See the December 2014 WG transcript.</b>
12	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.)	<b>SC&amp;A comment, December 2016: Resolved conditional upon NIOSH modifying the TBD to reflect that doses will be assigned when workers entered Gravel Gerties. See the December 2014 WG transcript.</b>
13	Environmental doses due to I-131 venting need to be taken into account for non-monitored workers	<b>SC&amp;A comment, December 2016: Review is continuing.</b>
14	There are no internal monitoring 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	<b>SC&amp;A Comment, December 2016: Closed due to grant of the Special Exposure Cohort (SEC); December 2014 WG transcript.</b>
15	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.	<b>SC&amp;A comment, December 2016: Review is continuing as part of Issue 5.</b>

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16	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).	<b>SC&amp;A Comment, December 2016: Closed as per the December 2014 WG transcript.</b>
17	Ingestion doses need to be better evaluated.	<b>SC&amp;A Comment, December 2016: Closed except for the environmental dose part under Issue 5, as per the December 2014 WG transcript.</b>
18	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.	<b>SC&amp;A Comment, December 2016: Closed as per the December 2014 WG transcript.</b>
19	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.	<b>SC&amp;A Comment, December 2016: Review continuing – see Issue 11 above as per the December 2014 WG transcript.</b>
20	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.	<b>SC&amp;A Comment, December 2016: Review continuing – see Issue 11 above as per the December 2014 WG transcript.</b>
21	The TBD does not contain information about extremity dosimetry. Site status of bomb assembly workers is unclear.	<b>SC&amp;A Comment, December 2016: NIOSH to query database regarding extremity cancers, per the December 2014 WG meeting transcript.</b>

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22	<p>There are no neutron dose data until 1966, and partial data until 1979.</p> <p>TBD assertion that neutron doses during atmospheric testing were negligible has not been substantiated and may be in error for some workers.</p>	<p><b>SC&amp;A Comment, December 2016: Once the n/p ratio matter is resolved for Pantex, the same ratio would be used for NTS. Update from NIOSH pending.</b></p>
23	<p>Adequacy of soil data for estimating resuspension doses needs to be evaluated, for instance, in relation to hot spot detection and Pu soil data.</p>	<p><b>SC&amp;A Comment, December 2016: Review continuing as part of Issue 5.</b></p>
24	<p>The presence of high-fired oxides resulting from atmospheric weapons testing and reactor testing needs to be investigated</p>	<p><b>SC&amp;A Comment, December 2016: Closed due to grant of SEC.</b></p>
25	<p>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]</p> <p>Potentially critical archives and documents have not been reviewed, including the NRDL and Barton Hacker primary reference materials.</p>	<p><b>SC&amp;A Comment, December 2016: This issue has been transferred to the Worker Outreach WG. See the December 2014 transcript.</b></p>
26	<p>A number of issues in relation to waste handling, decommissioning, and other post-1992 site activities were reviewed by SC&amp;A in SC&amp;A 2005 or during the SEC review.</p>	<p><b>SC&amp;A Comment, December 2016: NIOSH to review the SC&amp;A 2005 NTS site profile review and provide responses to the waste handling issues raised there, as per the December 2014 WG transcript.</b></p>

## References

NIOSH 2014. *NIOSH Responses to the SC&A NTS Issues Matrix*, National Institute for Occupational Safety and Health, Cincinnati, Ohio. January 30, 2014.

SC&A 2005. *Review of the NIOSH Site Profile for the Nevada Test Site*, SC&A, Inc., McLean, Virginia. December 13, 2005.

SC&A 2012. *Update of the Nevada Test Site (NTS) Issue Resolution Matrix Based on the SC&A Review of the NIOSH Site Profile for the Nevada Test Site*, SCA-SP-IM2012-0042, Revision 1, SC&A, Inc., Vienna, Virginia. December 14, 2012.