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To: Greg Lovato, PE
Nevada Division of Environmental Protection (NDEP)

RE: Relative Risk Reduction Associated with Arsenic Removal in RZ-B-9 and RZ-B-6 at the Tronox LLC Site, Henderson, Nevada

The following information is presented to address the Action Item noted in the comment 7a iii of the Tuesday June 15, 2010 conference call meeting notes regarding the above subject matter.

RZ-B-9

The draft proposed excavation area for RZ-B-9 is approximately 2,000 cubic yards (yds³) based on an excavation depth of 10 feet and is driven exclusively by arsenic (SA203 and SA04).¹ During the June 15, 2010 conference call, Tronox questioned the risk reduction that would be afforded if soils down to 10 feet below ground surface (bgs) were removed and replaced with other soils containing a “representative background” concentration of arsenic. The arsenic concentrations detected in the two soil sample locations represented by RZ-B-9 are shown below. As soil samples have been collected over a variety of depths within the 0 to 10-foot soil column for both samples, an average concentration is also provided. This depth-weighted average concentration represents the overall average concentration of soil that would be used to evaluate a construction worker scenario associated with exposure to soils down to 10 feet bgs.

Depth fbgs	SA203	SA204
0.5-2	7.56	13.4
2.0-3.0	11	15
4.0-5.0	12	21
6.0-7.0	8.9	11
8.0-9.0	8.7	14
Depth- weighted concentration	9.6	14.9

¹ Some surface scraping of asbestos is expected in this area based on the results of the collected at SA04 in which chrysotile fibers were detected at 0 to 0.17 feet bgs. Asbestos data are pending for the 0.33 to 0.5 ft depth.



Risk calculations were conducted to determine the overall risk reduction associated with removing arsenic-impacted soil in the RZ-B-9 area down to 10 feet and replacing it with other native soils with a “representative background” concentration. For purposes of the evaluation, a variety of “representative background” concentrations were evaluated including the maximum and mean arsenic concentrations from the 2005 BRC/TIMET shallow background McCullough Range and the RZ-A shallow data set.

The attached spreadsheets present the carcinogenic risk estimates associated with exposure to arsenic concentrations under a commercial and construction worker scenario using the exposure equations and assumptions outlined in the approved March 9, 2010 Health Risk Assessment Work Plan. For the commercial worker scenario, arsenic data representative of the top two feet of soil are used as the exposure point concentration (EPC). For the construction scenario, the depth-weighted soil concentration is used as the EPC. Consistent with scientific literature recommendations on arsenic bioavailability (Roberts *et al.* 2001; Ruby *et al.* 1999; USEPA 2001), as well as the approved HRA Work Plan and NDEP guidance, an arsenic oral bioavailability of 25 percent is used. Risk estimates using an oral bioavailability of 100 percent are shown for comparison purposes. The resultant risk estimates are summarized below:

**Summary Table for Comparison of Risk Estimates
Based on Various Arsenic Concentrations**

Scenario	Sample Description	EPC Value (mg/kg)	Carcinogenic Risk (Bioavailability = 25%)	Carcinogenic Risk (Bioavailability = 100%)
Outdoor Commercial Worker	BK (max)*	7.2	2.E-06	4E-06
	BK (mean)*	4.1	9E-07	2E-06
	RZA (max)	4.7	1E-06	3E-06
	RZA (mean)	2.5	5E-07	1E-06
	SA203 0.5-2'	7.56	2E-06	4E-06
	SA04 0.5-2'	13.4	3E-06	8E-06
Construction Worker	BK (max)	7.2	3E-07	7E-07
	BK (mean)	4.1	2E-07	4E-07
	RZA (max)	4.7	2E-07	4E-07
	RZA (mean)	2.5	1E-07	2E-07
	SA203 0.5-9' (mean)	9.6	4E-07	9E-07
	SA04 0.5-9' (mean)	14.9	6E-07	1E-06

*BK max and mean based on 2005 BRC/TIMET shallow background McCullough Range

Based on these risk estimates, we conclude the following regarding arsenic excavation in RZ-B-9:

- There is no risk-based rationale for removing soil down to 10 feet bgs in RZ-B-9 as the depth-weighted concentrations of 9.6 mg/kg (SA 203) and 14.9 mg/kg



(SA04) result in risk estimates below 1×10^{-6} for the construction worker scenario. Therefore, removing soil to 10 feet and replacing it with somewhat lower arsenic soil concentrations provides little to no risk reduction benefit for a construction worker.

- With regard to the commercial worker scenario, there is a small risk reduction factor of approximately 2-3 if the top two feet of soil are removed and replaced with “representative background” concentrations. For example, the risk estimate would be reduced from 3×10^{-6} (based on SA04 at 13.4 mg/kg) to 2×10^{-6} (based on background of 7.2 mg/kg) or 1×10^{-6} (based on background concentration of 4.7 mg/kg). However, removing the top two feet of soil without replacing the soil would result in increased risks, as the arsenic concentration increases with depth. As this is a unique area of the site, i.e., it is a roadway where workers would not be routinely present, it is impacted by arsenic only, and arsenic concentrations increase with depth, there may be little actual risk reduction afforded by removing and replacing soil in a road down to 2 feet. There are no other areas at the Site that represent a similar situation.

RZ-B-6

Tronox does not propose to make any changes to the RZ-B-6 excavation area or depth, as data collected to date indicate arsenic impacted soil concentrations up to 30 mg/kg to a depth of 5 feet.

Conclusions

Based on this evaluation, Tronox proposes not to excavate arsenic in the RZ-B-9 area. Tronox does not propose to make any changes to the RZ-B-6 excavation area or depth. Tronox also proposes to use a similar depth-weighted approach to evaluate the risk reduction to a construction workers afforded by deep excavations in the few RZ-C and RZ-D areas where adequate soil depth data have been collected and arsenic has been detected above background concentrations in soils between 2-10 feet bgs.

