



NEVADA DIVISION OF  
**ENVIRONMENTAL  
PROTECTION**

**STATE OF NEVADA**  
Department of Conservation & Natural Resources  
Steve Sisolak, Governor  
Bradley Crowell, Director  
Greg Lovato, Administrator

December 22, 2021

Jay A. Steinberg  
Nevada Environmental Response Trust  
35 East Wacker Drive, Suite 690  
Chicago, IL 60601

Re: **Tronox LLC (TRX) Facility  
Nevada Environmental Response Trust (Trust) Property  
NDEP Facility ID #H-000539**  
Nevada Division of Environmental Protection (NDEP) Response to: *Baseline Health Risk  
Assessment (BHRA) Report for OU-1 Soils, Revision 1, Nevada Environmental Response  
Trust Site, Henderson, NV. October 14, 2021*

Dated: September 29, 2021

Dear Mr. Steinberg,

The NDEP has received and reviewed the Trust's above-identified Deliverable and provides comments in Attachment A. A revised Deliverable should be submitted **by 02/22/2022** based on the comments found in Attachment A. The Trust should additionally provide an annotated response-to-comments letter as part of the revised Deliverable.

Please contact the undersigned with any questions at [wdong@ndep.nv.gov](mailto:wdong@ndep.nv.gov) or 702-668-3929.

Sincerely,

Weiquan Dong, P.E.  
Bureau of Industrial Site Cleanup  
NDEP-Las Vegas City Office

WD:cp

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## Attachment A

### Fatal Flaw

#### **General comment #1          Decision Units**

The rationale for first identifying COPCs on the scale of the entire 143-acre Study Area, and subsequently identifying COPCs in the three Decision Units (DUs) as a subset of those initial COPCs, should be explained. NDEP believes that the size of the decision units should be reconsidered, and an evaluation of potential hot spots should be conducted based on Spatial Quartile plots and Risk/Hazard plots. If hot spots are identified, smaller exposure units may need to be proposed. For the NERT Site, NDEP recommends that exposure units be based on current site usage and exposure potential.

***NERT Response:*** Consistent with an agreement reached during a July 8, 2020 meeting among Nevada Division of Environmental Protection (NDEP) and the Nevada Environmental Response Trust (NERT or the “Trust”), also attended by NDEP consultants and Ramboll (the “July 8th Meeting”), the OU-1 Soil Baseline Health Risk Assessment (BHRA) Study Area was divided into nine exposure units (EUs) based on spatial risk analysis and current land use, replacing the three DUs identified in the January 2020 OU-1 Soil BHRA Report. The chemicals of potential concern (COPCs) for the entire BHRA Study area were first identified to focus the spatial risk analysis on those chemicals that failed the concentration/toxicity screen for the purpose of EU identification. EU-specific COPCs were identified from the list of the Study Area COPCs, while the analytes eliminated as Study Area COPCs were not re-visited for the individual EUs with the rationale provided in Section 6.4.

***NDEP Response:*** *For the most part the response is acceptable. However, there is also a need to consider the spatial plots that have been requested on a continuous scale to ensure that there are no hot spots within the EUs that could potentially present an unacceptable risk based on the size of an industrial exposure unit. See Specific Comment #1 response below.*

#### **General Comment #2          ProUCL**

ProUCL was used to calculate UCLs for each COPC. Historically, NDEP has not accepted ProUCL as a means for UCL calculation. This decision was based on recommendations from Neptune in their review of ProUCL to NDEP in February of 2007 explaining the limitations of ProUCL and why it is not an appropriate software package for estimation of UCLs. ProUCL has changed since then, but the underlying premises for UCL calculations have not. Hence, NDEP’s conclusion remains. Neptune has also provided code in R ([www.r-project.org](http://www.r-project.org)) to perform appropriate UCL calculations. It is recognized that ProUCL has only been used here to provide UCL estimates based on the bias-corrected accelerated (BCa) bootstrap method, however, the ProUCL output includes as many as three different BCa-based calculations (95% KM (BCA) UCL [under Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs], 95% BCA Bootstrap UCL [under Lognormal ROS Statistics Using Imputed Non-Detects], and, 95% BCA Bootstrap UCL [under Nonparametric Distribution Free UCLs]). It is not immediately clear which BCa method has been used when more than one is presented, however, it is clear that the decision logic in ProUCL that leads to presentation of a subset of these BCa results is flawed.

NDEP would prefer that ProUCL is not used for these calculations because it potentially sets a precedent for its more general use within the BMI Complex projects. Note also that the pages of ProUCL output provided in Appendix H are completely unnecessary – nearly all of the ProUCL output is useless for this report, and the formatting makes it difficult to find the relevant parts. NDEP, through Neptune, has provided appropriate code for UCL calculations that has been used across the BMI Complex at least since 2007, and should either be used directly, or, in this case, NERT can develop their own similar code in R. IN either case, the code should be included in an Appendix.

***NERT Response:*** Although ProUCL was used in prior risk assessments approved by NDEP, the calculation of 95% upper confidence limits (UCLs) has been updated using the R code provided by Neptune on May 18, 2020. A copy of the R code used in the UCL calculation is included in Appendix H.

***NDEP Response:*** *The response is acceptable.*

### **Essential Correction**

#### **Specific Comment #1. Section 5.**

The spatial intensity and spatial concentration/risk plots for Section 5 are not well suited to visualizing spatial patterns of contamination. These plots sort the results among a few bins (such as  $HI > 1$  and  $HI < 1$ ,  $< 0.1 \text{ BCL}$ ,  $0.1 \text{ BCL} - \text{BCL}$ , and  $> \text{BCL}$ , etc). The spatial quartile plots in Appendix F use four bins for detected values. This type of plotting works well for asbestos fibers, where the range of detected fibers in any sample is between zero and three. But for many analytes, a continuous measure of soil concentration or risk, such as with bubble plots or color-graded heat map, should be used because the bins don't provide enough resolution to see the actual magnitude of concentration differences.

Section 5.1.2 states, “The purpose of DU identification is to avoid “diluting” or lowering EPCs by averaging concentrations from hot spots (if present) with samples collected from areas with significantly lower concentrations.” And Section 5.4.1 indicates TCDD-equivalent is an important contributor to estimated cancer risks in DU-1 and DU-2. Below, an example is given for TCDD-equivalent in DU-1, 0 – 10 ft, to demonstrate the difficulty of evaluating whether it's appropriate to aggregate all DU samples to estimate an EPC in the context of the statement cited from Section 5.1.2. Please note that DU-1 represents a substantial portion of the 143-acre BHRA Study Area, and no basis is provided in the HHRA for an assumption that individuals under future land use would likely be exposed in a random manner across all of DU-1. This makes the identification of potential areas of elevated soil concentrations of risk-driving analytes critical for the defensibility of the risk assessment results.

The ProUCL output file for DU-1, 0 – 10 ft, shows detections in 473 of 474 observations, with a median of  $1.7\text{E}-05 \text{ mg/kg}$  and a mean of  $2.7\text{E}-04 \text{ mg/kg}$ , and a maximum value of  $0.025 \text{ mg/kg}$ . The TCDD-equivalent data are clearly right-skewed, but do not follow lognormal or gamma distributions at the 5% significance level. The Section 5 plots for TCDD show only where concentrations exceed the TCDD-TEQ action level of  $0.0027 \text{ mg/kg}$ , which for the 0 – 2 ft interval are in the NE corner of DU-1 (Figure 5-18b). Review of the spatial quartile plot (Figure F-34)

shows lower 0 – 10 ft TCDD-equivalent concentrations in the portion of DU-1 below DU-3 (mostly green-yellow) and higher concentrations in an east-west band just south of the Excavation Control Area for the holding ponds (mostly red, orange, and yellow). This observation calls into question whether it's appropriate that EPCs should be calculated for all of the area designated as DU-1. However, a continuous-scale plotting of TCDD-equivalent concentrations is necessary to support a judgment on whether one or more subareas of elevated concentrations warrant separate consideration.

***NERT Response:*** The revised OU-1 Soil BHRA Report includes spatial quartile plots (Appendix F) spatial intensity plots (Figures 5-2 through 5-18), and spatial risk plots (Figures 6-1 through 6-7).

The spatial quartile plots show the concentration distribution, but without comparing COPC concentrations to the risk-based screening levels. Concentration plots (either quartile plots included in this BHRA or bubble plots/color-graded heat plots requested in the comment) are of limited utility to illustrate risk-relevant spatial patterns for the purpose of EU identification.

The spatial intensity plots (comparing COPC concentrations to basic comparison levels [BCLs]) and spatial risk plots (showing cancer risk or noncancer hazard index [HI] distribution) best serve the purpose of EU identification. Particularly, the spatial risk plots reduce the dimensionality of the analysis by presenting cancer risks and noncancer HIs across COPCs, instead of evaluating the concentration of each COPC individually.

A continuous measure of soil concentration or risk is not necessary, because whether or not the risk is above the NDEP acceptable target is most important for a risk assessment, not the actual magnitude of concentration differences (i.e., when the concentrations are below the risk-based target). Further, for locations with risks above the NDEP acceptable target, the actual cancer risk or noncancer HI is already shown in the spatial risk plots.

Based on the above discussion of various plotting approaches and according to an agreement reached at the July 8th meeting, the spatial risk plots were the approach used in the EU identification of this revised BHRA for OU-1 soil, and the BHRA Study Area was divided into nine EUs based on the spatial risk analysis and current land use to replace three DUs identified in the January 2020 OU-1 Soil BHRA Report.

***NDEP Response:*** *The primary purpose of requesting spatial plots with a continuous color range and/or bubble size is not the identification of EUs, but proof of proper and thorough exploration of potential spatial patterns within the area of concern, which would be an important component of conceptualizing the risk, and whether it is valid to assume exposure would happen randomly across a DU. For example, cobalt was retained as a COPC and potentially shows a spatial pattern with higher concentrations on the east site of the based on the plot in Appendix F. The fate and transport model assumes random distribution of this metal as stated in the report. As such, it is noted that the statement that “a continuous measure of soil concentration or risk is not necessary” is problematic. The plots in Appendix F still show four bins and have not been updated. Figures 5-2 through 5-18 have updated dates on them, but it is not clear what has been changed. They still are binned by screening level values. For the figures in the main body of the*

*report, the argument to use risk-based screening levels to bin the data is likely fine, given that continuous spatial plots exist for exploratory reasons in Appendix F, which they still do not, and are discussed in the text where appropriate. Overall, the lack of continuous scale in the plots does not allow easy identification of potential hot spots. Given the sampling density is not large compared to an industrial exposure unit, this continues to be a concern.*

**Specific comment # 2            Section 6.1.3 Completeness**

This section notes that the percent completeness for the individual DUs are all 99.9%, and that the small percentage of rejected data is not expected to have a significant impact on the spatial coverage of the dataset. There are a total of 132 valid results for cyanide and 20 rejected cyanide results (completeness = 87%). As the cyanide results were rejected for poor matrix spike recovery and exceeded holding time, no conclusions can be reached as to the presence or absence of cyanide in these samples. How was it determined that the valid cyanide data are adequate to support the risk assessment? Thirteen of the rejected results are in DU-1, were these located in one subarea?

***NERT Response:*** For most individual analytes shown in Table A-2, the percent completeness is greater than the completeness goal of 90% established in the Quality Assurance Project Plan (QAPPs; ENSR 2008, AECOM and Northgate 2009, ENVIRON 2014, Ramboll Environ 2017); given the small percentage of rejected data and that there is no apparent spatial grouping of rejected data, these rejected data are not expected to have a significant impact on the spatial coverage of the soil BHRA data set. The percent completeness is less than 90% for a few analytes (including cyanide [total] in EU-1, EU-6, EU-7, and EU-9), and their impacts on the overall risk evaluation are discussed in Section 10.1.3.

***NDEP Response:*** *The added explanation in the text is appreciated. There are no spatial plots of these analytes, so it is not possible for the reviewer to judge for themselves the spatial impact of the rejected data, but the response is acceptable.*

**Specific Comment #3            Table 5-20**

Asbestos Cancer Risks for Individual Decision Units – Why is the Best Estimate 0E+00 for DU-3? Please explain.

***NERT Response:*** When the fiber counts of all soil samples in an EU were zero (see Table 4-3), the best estimate of potential asbestos risk was zero.

***NDEP Response:*** *The response is acceptable.*

**Specific comment # 4            Phase B Area IV Investigation Soil DVSR/EDD**

The dataset provided in Appendix B reports the TEQ for sample SA121009-0.5B. Cross checking this sample to the Phase B Area IV Investigation EDD indicates the dioxin/furan analysis of this sample was not validated (“validated\_flag” = F). This result should not be used in the risk assessment, unless it can be shown to have been validated.

***NERT Response:*** The dioxin/furan data in SA121009-0.5B were marked as unvalidated in the electronic data deliverable (EDD; Northgate 2010), which are incorrect and not consistent with the

associated data validation summary report (DVSR) (see Appendix A). These data are validated and should be included in the BHRA data set.

These errors have been corrected in the NDEP-maintained Black Mountain Industrial (BMI) database when Ramboll and Neptune worked collaboratively to resolve data inconsistencies between the BMI database and the NERT project database in July 2020 through April 2021.

***NDEP Response: The validation flag is still set to “F” in the BMI Regional database, but the response is acceptable. Neptune will update the database for consistency.***



**Specific comment # 5            Phase B Supplemental Sampling Areas I and II DVSR/EDD**  
Similar to the previous comment, perchlorate results for samples SA49009-1.5BR and SA49-1.5BR were not validated (“validated\_flag” = F). These results should not be used in the risk assessment, unless they can be shown to have been validated.

*NERT Response:* The perchlorate data in SA49009-1.5BR and SA49-1.5BR were marked as unvalidated in the EDD (Neptune 2010), which are incorrect and not consistent with the associated DVSR (see Appendix A). These data are validated and should be included in the BHRA data set.

These errors have been corrected in the NDEP-maintained BMI database when Ramboll and Neptune worked collaboratively to resolve data inconsistencies between the BMI database and the NERT project database in July 2020 through April 2021.

*NDEP Response: These errors have indeed been updated in the BMI database. The response is acceptable.*

**Specific Comment #6            GiSdT Code**  
Please provide the GiSdT code so that it may be reviewed.

*NERT Response:* The background evaluation has been updated using the R code provided by Neptune on May 18, 2020. A copy of the R code used for the background evaluation is included in Appendix E.

*NDEP Response: The GiSdT code has been provided. The response is acceptable.*

**Minor Correction**

**Specific comment # 7            Executive Summary (page ES-3)**  
The end of the sentence (“data representative...were selected”) appears to indicate that not all of the data for 0-10 ft bgs, remaining/in-place samples were used in the risk assessment.

“Soil analytical data collected from 0-10 feet...(bgs) in areas that were not excavated...were evaluated and data representative of current Site conditions were selected for purposes of the BHRA.”

If all results for the remaining samples were used, this sentence should be revised for clarity. If results/samples were curated and include less than all of the remaining samples, the process by which the results were excluded needs to be explained.

*NERT Response:* Not all the soil data for the remaining samples collected from 0-10 feet below ground surface (bgs) were used in the BHRA. These data were assessed through the data processing and data usability evaluation (DUE) steps, and only data representative of current Site conditions were selected. This sentence has been revised in the Executive Summary for clarification. The soil data not used in the BHRA and details of the processing of these data are provided in Section 4.1.1 and Appendix B, Attachment B-1.

***NDEP Response: The response is acceptable.***

**Specific Comment #8      Section 4.6.1 Criterion V – Data Review, page 21 (including Table 4-1 Data Usability Evaluation and Section 6.1 Uncertainties Identified in the Data Usability Evaluation, page 73)**

The report refers to the DVSRs regarding rejected data; however, the data usability section, its associated table and the uncertainty analysis section do not describe the impacts of the rejected data in terms of how it affects COPC selection and/or exposure point concentrations in the soil BHRA. This additional information would help to inform whether there is a potential underestimation of the worker health risks quantified in the report.

***NERT Response:*** In the revised OU-1 Soil BHRA Report, the Uncertainty Analysis has been moved to Section 10. The impacts of the rejected data on the COPC selection, exposure point concentrations, and overall risk evaluation have been added to the Uncertainty Analysis and are provided in Section 10.1.3.

***NDEP Response: The response is acceptable.***

**Specific Comment #9      Section 6.2.3 Toxicity Assessment, page 87 (Uncertainties Identified in the Risk Assessment)**

This section focuses on the uncertainty related to toxicity criteria for zirconium, 4,4-DDE, and asbestos. However, a discussion of the uncertainties associated with the toxicity criteria for other chemicals of potential concern (COPCs) such as dioxins, cobalt, and manganese would also provide context around the uncertainty and conservatism with the values used in the risk assessment.

***NERT Response:*** Besides asbestos, the uncertainty analysis focused on the discussion of chemicals with toxicity criteria obtained from the Provisional Peer Reviewed Toxicity Values (PPRTV) appendix, as required by the NDEP BCL User's Guide. According to an agreement reached at the July 8<sup>th</sup> Meeting, discussion of uncertainties related toxicity criteria for major driver COPCs with cancer risks above 10<sup>-6</sup> (chromium VI and dioxin TEQ) or noncancer HQs above one (manganese and perchlorate) has been added to Section 10.2.3.

***NDEP Response: The response is acceptable.***

**Specific comment # 10      Section 5.1.2.2**

The text of this section (Determination of DUs) indicates that DU-3 potentially has a “different exposure profile” than the other DUs. What does this mean, and is there a reference or basis for the statement?

***NERT Response:*** In the revised OU-1 Soil BHRA Report, Section 5.1.2.2 (Determination of Decision Units) has been replaced with Section 6.2 (Determination of Exposure Units). EU-4 (previously DU-3) is the Central Retention Basin. The Basin has a flat bottom with sloped sides. There is a ramp on the west side of the Basin (where the former Beta Ditch or current drainage channel is located) that allows for vehicles to drive in. In the southwest corner of the Basin, there is a large stormwater outfall with rock stabilization. A photograph log of the Central Retention

Basin is presented in Appendix I. Because of its geography and existing features, no regular commercial/industrial or construction activity is expected in this area. As described in Section 7.3.1, in addition to the default commercial/industrial and construction worker scenarios, an outdoor utility/maintenance worker scenario was also evaluated for EU-4, conservatively assuming potential exposure through direct contact only with shallow soils at less frequencies.

*NDEP Response: The response is acceptable.*

**Specific comment # 11      Section 6.1.5 (pages 76-78)**

References to “reporting limit exceedance” should be revised to “reporting limit criterion exceedance.” As written, it sounds as though the results were qualified because the reporting limit was high. Also “reporting limit” should be changed to PQL for consistency with NDEP terminology.

*NERT Response:* The text has been revised to “PQL criterion exceedance” where necessary.

*NDEP Response: The response is acceptable.*

**Specific comment # 12      Tables 4-1 and A-5**

The summary of qualified data presented in A-5 would provide more information if the reason codes had been retained and defined in the table footnotes (like Table A-2). Equivalently, listing the reason codes along with the qualifiers in the provided dataset (Appendix B) would allow for an independent assessment of the statement on page 14 of Table 4-1, that qualifications do not indicate a “systematic or widespread impact” on data quality.

*NERT Response:* The reason codes have been added to the BHRA data set (Appendix B, Tables B-1 and B-2) along with the qualifiers.

According to an agreement reached at the July 8th meeting, the reason codes were not added to Table A-5 because the purpose of Table A-5 is to summarize the comparison of the maximum J qualified data for each analyte against corresponding BCLs.

*NDEP Response: The response is acceptable, and it is appreciated that the reason codes have been added to Tables B-1 and B-2.*

**Specific Comment #13      Dataset Issues**

Tables B-1 (Soil BHRA Data Set – Chemicals and Radionuclides) and B-2 (Asbestos Soil Data Summary) provide a list of samples that were used in this report. An attempted was made to verify the dataset by querying data from the BMI database versus the information provided in Appendix A. These sample IDs and data were then compared to the sample IDs and data provided in Tables B-1 and B-2.

A number of issues were encountered:

**Sample ID matching.** From Table B-1, the “sys\_sample\_code” was used to match the sample ID in the BMI database. In many cases, the sample IDs were slightly different, but most could be

made to match the sample by location, sample date, sample time, analyte, or result. For example, CTMW-04D-0.5-201703201703201355 in Table B-1 has the sample ID CTMW-04D-0.5-20170320 in the BMI database. Another example is sample CS-E14C-1 in Table B-1 which has the corresponding sample ID of CS-E14C-1a or CS-E14C-1b in the BMI database.

Sample IDs should have a one-to-one match with the BMI database to ensure that they can be matched correctly, and that the BMI database contains the same data as used by the companies.

**Missing sample IDs.** Not all sample IDs listed in Tables B-1 and B-2 were found. The missing samples were primarily from Tronox from 2007 and 2010. See attached Tables 1 and 2 (provided in Excel format).

A subset of the sample IDs that were matched to the database were checked to ascertain if the sample results matched the BMI database (see Tables 3 and 4 attached). The items below describe issues identified with some of the sample results in Table B-1.

**Detection limits.** For the soil data, some results did not match because Table B-1 reported non-detected concentrations at the PQL while the BMI database reports the SQL. There are also other non-detects that do not match any of the non-detected values or limits in the BMI database. 7,892 non-detect results could not be matched to the BMI database.

**Analyte name.** Differences in the analyte name also made it difficult to match the results between the two sources of data (CAS IDs were also used to try to match the data results). Examples include 4-methylphenol (reported as 3,4-methylphenol in the database), trans/gamma-chlordane, benzo(a)pyrene (TEQ), nitrate and nitrite.

**Results.** Based on a match of location, sample ID, CAS ID and sample date, multiple records were identified for both detected and non-detected concentrations that did not match results in the database. A small number of results were NULL in the BMI database. Most results that did not match were for nitrate and nitrite. Various reporting bases and CAS IDs likely contribute to this issue.

**Subset samples.** The samples not found in the database included a series of samples that did not match the database because the database had them subset into two samples (e.g., CS-C10B-1a and CS-C10B-1b). A new row was created in a working version of Table B-1 to catch each sample in these scenarios, but this was not successful as the same analytes are not present in each sample. Some results that did not match are from sample CS-C10B-1b. It is a case where a few of the same parameters were analyzed in both CS-C10B-1a and CS-C10B-1b. The values that do not match for those parameters for CS-C10B-1b are matched to CS-C10B-1a. Additionally, some of the asbestos sensitivity results do not match the database.

Attached:

Table 1: Sample IDs from Table B-1 with no BMI database records found

Table 2: Sample IDs from Table B-2 with no BMI database records found

Table 3: Data set for Soil Data from BMI database (reference Table B-1)

Table 4: Data set for Asbestos data from BMI database (reference Table B-2)

***NERT Response:*** Ramboll and Neptune worked collaboratively to resolve data inconsistencies between the NDEP-maintained BMI database and the NERT project database in July 2020 through April 2021. On April 27, 2021, Ramboll and Neptune confirmed that the soil data collected within OU-1 are consistent between the BMI database and the NERT project database.

The BHRA data set presented in Appendix B was extracted from the NERT project database, and then data processing was performed for the risk assessment as described in detail in Appendix B, Attachment B-1.

***NDEP Response: The response is acceptable.***