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To: Shannon Harbour, PE
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Nevada Division of Environmental Protection

**RE: Nevada Environmental Trust (Trust) Property
NDEP Facility ID #H-000539**

Nevada Division of Environmental Protection comments on *Revised Technical Memorandum: Calculation of Leaching-Based, Site-Specific Levels (LSSLs) for the Soil-to-Groundwater Pathway Using NDEP Guidance*, dated February 14, 2011

This memorandum presents a Response to Comments (RTC) provided by NDEP in a March 21, 2011 letter regarding the Revised Technical Memorandum: Calculation of Leaching-Based, Site-Specific Levels (LSSLs) for the Soil-to-Groundwater Pathway Using NDEP Guidance (Northgate, 2010). A summary of revisions and NDEP's comments on the technical memorandum is provided below, followed by individual responses to each of the comments in NDEP's March 21 letter.

On March 8, June 11, and August 23, 2010, Northgate submitted technical memoranda to NDEP presenting preliminary screening evaluations of the potential for SRCs to leach from soil to groundwater (Northgate, 2010a, 2010d, and 2010g). NDEP provided comments on these technical memoranda on March 29, 2010 and July 6, 2010 (NDEP, 2010b and 2010c). On July 22, 2010, Northgate submitted a technical memorandum to NDEP presenting background comparisons for metals in Remediation Zones B through E (RZ-B through RZ-E), using Remediation Zone A (RZ-A) as the background data set (Northgate, 2010e). NDEP provided comments on the July 22 background technical memorandum in a letter dated August 9, 2010, which was partially superseded by comments regarding background issues in a letter from NDEP dated August 17, 2010 (NDEP, 2010d and 2010e). A revised memorandum dated September 9, 2010 comprehensively addressed NDEP's comments on the March 8 and June 11 leaching evaluations, as well as NDEP's comments on the July 22 background evaluation (Northgate, 2010h). The September 9, 2010 memorandum was conditionally accepted with additional comments on the background screening in a letter from NDEP dated October 12, 2010 (NDEP, 2010f). The memorandum was revised and resubmitted to NDEP on November 18, 2010 (Northgate, 2010i). NDEP provided additional comments regarding the selection of COPCs and input parameters used in the November 18, 2010 memorandum in a letter dated

January 13, 2011, and the memorandum was revised and resubmitted on February 14, 2011.

COMMENTS:

Comment 1: The NDEP understands that this soil screening document could presumably be used as reference in support of and/or appended to Health Risk Assessments or other decision documents. Furthermore, calculating LBCLs and LSSLs utilizes RBGCs, thus screening against site soil samples is a risk-based process. The Trust should note and address as necessary that there is a potential problem with this as the current soil screening document lacks certain elements of a risk assessment including:

- a. Electronic copies of the laboratory reports (these are included in the data validation summary report (DVSR), but one or the other should be included in the electronic deliverable for the health risk assessment (HRA) report).*
- b. A summary of the data validation that is reported in the DVSR to verify that the data are of sufficient quality from the laboratory.*
- c. A data usability evaluation to demonstrate that the data are usable for the decision to be made.*
- d. Plots of the data (including spatial plots) as part of exploratory data analysis (potentially focused on the primary contributors to the risk assessment results).*
- e. A data quality assessment to demonstrate that enough data have been collected to support the decisions to be made.*

Response:

The current memorandum is a screening document that evaluates the potential for COPCs in vadose zone soil to impact groundwater at the Site through the leaching pathway at concentrations that exceed drinking water standards. Further evaluation may be necessary to derive RBGCs for use in calculating final soil cleanup goals. In addition, the data set for this screening evaluation includes soil samples that have been or will be removed by excavation, and Northgate anticipates that chemical-specific source lengths and dilution-attenuation factors (DAFs) used in calculating the LSSLs would need to be updated once soil removal at the Site is complete. Northgate agrees that an evaluation of data quality and data usability is an important component of developing Site-specific cleanup goals, but proposes that the evaluation be conducted on the final data set after excavation is complete, to support the derivation of proposed soil cleanup goals.

Comment 2: Introduction, page 1, please note that all review work by consultants is conducted on behalf of the NDEP and should be referenced as such. Please revise as necessary.

Response:

The introduction has been revised to reflect that the consultant's participation in telephone discussions was on behalf of NDEP.

Comment 3: *Summary and Conclusions, page 6, TRX states that "Upon NDEP's review of these initial steps of evaluating the soil-to-groundwater leaching pathway, we recommend proceeding with additional evaluation using Site-specific data (e.g., development of Site-specific Kd values; compiling empirical Site data relating soil quality to groundwater impacts) to refine the assessment of COPCs at the Site." Please revise to address the following comments:*



- a. It is unclear as to what Tronox intends here because NDEP's Guidance (2010) Evaluation a/Soil Leaching to Groundwater specifies the use of site-specific soil data and chemical properties (e.g., ~) to develop leaching-based site-specific levels (LSSLs).
- b. The comparison of soil and groundwater quality data to "refine the assessment of COPCs" is not a recognized procedure by the NDEP. Please remove this language.

Response:

- a. We have revised this paragraph in the Summary and Conclusions section of the LSSL memorandum to clarify that the memorandum calculated LSSLs using Site-specific values of soil pH and fraction of organic carbon, f_{oc} , to derive Site-specific values of the distribution coefficient, K_d , in accordance with NDEP and USEPA guidance.
- b. No chemicals were excluded from the screening of chemicals of potential concern (COPCs) on the basis of groundwater data. The sentence is removed from the Summary and Conclusions.

Comment 4: Tables 1A through 2E, because DAFs used for the LSSL screening are chemical specific, please revise these Tables by adding a column for this parameter.

Response:

A column has been added to Tables 1A-2E, showing the chemical-specific dilution attenuation factors (DAFs) used to calculate LSSLs.

Comment 5: Table 2D, the electronic file included with this Deliverable contains Excel error (#VALUE) for Count, Detection Count, and Detection Frequency columns. Please correct this error for re-submittal.

Response:

The Excel™ error (#VALUE) in Table 2D occurred because formulas in the spreadsheet required an additional Excel™ spreadsheet (Table 2 – Raw Data.xlsx) to be opened in order to complete the calculations. We replaced the formulas with their values in order to avoid this problem.

Comment 6: Attachment 1, Response to Comment (RTC) 1, Table 2B of Attachment 3 contains no bold type as indicated in TRX's response to this comment so please clarify whether any adjustments were made for organic chemicals.

Response:

None of the RBGCs for organic COPCs in Table 2B of Attachment 3 were adjusted based on the hierarchy of standards approved by NDEP for the Site. The footnotes have been revised to reflect this.

Comment 7: Attachment 1, RTC3, TRX states that "The samples exceeding the LSSL for chloroform that were previously identified in RZ-B were samples collected in the UMCf, which were excluded from the data set used to measure source lengths and compared with LSSLs in the revised memorandum." Please explain and justify why the samples from the UMCf were excluded.

Response:



The Upper Muddy Creek formation (UMCf) is overlain by Quaternary alluvium (Qal) and is generally saturated below the source areas at the Site, as determined by soil moisture content and comparison of the elevations of the UMCf samples to the interpolated groundwater potentiometric surface and capillary fringe height (for silty clay, the capillary fringe is estimated to be 6.3 feet above the potentiometric surface). In order for a given COPC to have a complete exposure pathway from soil to groundwater, it must leach from the Qal before it reaches the UMCf, where the infiltration rate is expected to be significantly reduced because the vertical hydraulic conductivity in the UMCf is much lower than that of the Qal. Therefore, the UMCf is not considered to be a source for the leaching pathway.

Comment 8: Attachment 1, RTC4a, there was no Table 6 found in Attachment 3 of the NDEP's files. Please provide this Table in the Revised Deliverable.

Response:

Table 6 of Attachment 3 was inadvertently not included in the February 14, 2011 submission. It has been included with the current version of the technical memorandum.

Comment 9: Attachment 1, RTC 6d, NDEP provides the following comments:

- a. Attachment 2, Tables 5A through 5D, sodium significantly exceeds background in RZ-A but is not carried forward and there is no discussion in the text to explain the rationale for this decision. Please resolve this issue.
- b. TRX states that "A comprehensive evaluation of the fate and transport of detected chemicals with no established RBGCs would require significant effort and has not been included in this technical memorandum. The purpose and scope of such an evaluation will be discussed further with NDEP and the Nevada Environmental Response Trust, which is now responsible for management of the project." Attachment 2, Table 6 has 20 chemicals with detections and no RBGCs that are not carried forward and there is no discussion in the text to explain the rationale for this decision. The NDEP cannot approve a risk-based evaluation such as the subject LSSL screening that does not consider all detected chemicals. Please resolve this issue.

Response:

The selection of COPCs in Attachment 2, Tables 5A through 5E and Table 6, has been revised so that all detected chemicals for which risk-based groundwater concentrations (RBGCs) have not been established are selected as COPCs by default. Attachment 4 provides a discussion of the relationship of these chemicals to the Conceptual Site Model (CSM) and the fate and transport of these COPCs.

Comment 10: Attachment 1, RTC 9, please refer to the previous NDEP Comment 8.

Response:

Attachment 1, RTC-9 of the February 14, 2011 version of this technical memorandum referred to Attachment 2, Table 6, which was included in the February 14, 2011 submission. Please also refer to Attachment 2, Table 6 of the current version of this document.

Comment 11: Attachment 2, page 2-17. Please refer to the previous NDEP Comment 8.



Response:

Attachment 2, page 2-17 of the February 14, 2011 version of this technical memorandum referred to Attachment 2, Table 6, which was included in the February 14, 2011 submission. Please also refer to Attachment 2, Table 6 of the current version of this document.

Comment 12: *Attachment 3, Input Parameters for Calculation of Dilution Attenuation Factors; page 3-3, last paragraph on page, TRX states that "This suggests that any contaminants present in the deeper UMCf that pass beneath the barrier wall will eventually "daylight" into the alluvium and be captured downgradient at the Athens Well Field (AWF)." This hypothesis needs to be supported with site data; however, not within the context of the subject document.*

Response:

The endpoint analysis (particle tracking) presented in Section 6.2.6 and Figure 6-5 of the Capture Zone Evaluation Report indicates that concentrations of perchlorate in the UMCf upgradient of the barrier wall will be captured by the Interceptor Well Field (IWF) or the Athens Road Well field (AWF).

Comment 13: *Attachment 3, Figures 3-11 (Manganese in Soil) and 3-13 (perchlorate in Soil), It appears from the particle path line that TRX assumes that source length starts at the southern boundary but stops at the Interceptor Well Field (IWF). Please explain the rationale for excluding the areas with DAF greater than 20 in the north east corner of the site.*

Response:

Source length measurements were based on the assumption that leaching of chemicals from soil to groundwater is potentially additive along a given groundwater flow path. Soil containing concentrations greater than LBCLs for DAF=20 represented by polygons downgradient from the IWF/Barrier Wall would not contribute additional mass to groundwater that is intercepted and extracted by the IWF/Barrier Wall. These polygons were not excluded from consideration in the source length measurement, but the flow paths under these polygons were shorter than the ones used to measure the longest source lengths.

