

March 29, 2007

Ms. Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Semi-Annual Performance Report for Chromium and Perchlorate
dated February 26, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's report identified above and provides comments in Attachment A. Please provide an annotated response-to-comments (RTC) letter **by April 30, 2007**. Additional Deliverables are defined below. These specific items should be submitted under separate cover. Once TRX has had an opportunity to review these comments it is likely that a conference call should be scheduled to discuss these issues.

If there are any questions please do not hesitate to contact me.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Todd Croft, NDEP, BCA, Las Vegas
Mike Richardson, NDEP, BWM, Las Vegas
Keith Bailey, Tronox, Inc, PO Box 268859, Oklahoma City, Oklahoma 73126-8859
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W.,
Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5,
75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-
1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite 100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Chris Sylvia, Pioneer Americas LLC, PO Box 86, Henderson, Nevada 89009
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California
95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380,
Bainbridge Island, WA 98110
Dave Gratson, Neptune and Company, 1505 15th Street, Suite B, Los Alamos, NM 87544

Attachment A

1. Section 2.1 first paragraph last sentence, TRX states that the “dead zone” area between the slurry wall and recharge trenches contains groundwater that is “thought to be trapped and mostly stationary.” Section 3.1.1 fourth paragraph and Section 4.1.1 first paragraph states that a decrease in the infiltration of Lake Mead water in the recharge trenches has allowed the “dead zone” water to slowly move downgradient. Section 2.1 should be modified to reflect the findings of sections 3.1.1 and 4.1.1.
2. Section 2.2 third paragraph, text should be clarified as it is unclear whether ART-5 also experienced the same increase in groundwater elevation as wells PC-55, PC-18, PC-17, and PC-12.
3. Section 2.3 paragraph three, text references wrong well; PC-117 should be PC-116R.
4. Section 3.1.1 and Section 4.1.1, the NDEP does not concur that hydraulic capture is being achieved by the onsite interceptor well field. Data from both the west and east sides on the slurry wall suggest that capture is incomplete. (See 15.a.i and 15.b.i for additional comments.) A groundwater capture evaluation work plan should be submitted **by April 30, 2007**. This item should be a Deliverable that is submitted under separate cover. Capture shall be evaluated as follows:

The target capture zone for the system shall be refined to develop the three-dimensional target capture zone in accordance with the guidelines in Section C of *Elements for Effective Management of Operating Pump and Treat Systems, EPA 542-R-02-009, December 2002*. The development of the target capture zone must be discussed and resolved with the NDEP’s Bureau of Corrective Actions. The lower boundary of the alluvial aquifer includes the saturated portion of the upper portion of the Muddy Creek Formation.

The system must be able to demonstrate effective mass removal for contaminants passing through the target capture zone. This will be accomplished by evaluating the actual capture zone. The actual capture zone will be defined as the three-dimensional zone in which all ground water flow paths converge to the extraction points. At least three converging lines of evidence are required to prove the effectiveness of capture on a quarterly basis. Potential lines of evidence may include:

- calculations of capture zone width based on flow budget and/or analytical models
- demonstrating overlapping cones of depression by interpretation of groundwater flow lines from potentiometric surface maps and flow nets (for vertical capture demonstration) that are based on measured ground water elevations in the alluvial aquifer including the upper saturated portion of the Muddy Creek Formation or demonstration of overlapping cones of depression,
- inward flow relative to compliance boundary based on measured ground water elevations at two or more locations oriented perpendicular to the boundary,
- concentration trends over time at sentinel wells located downgradient of the capture zone,

- particle tracking in conjunction with a numerical ground water flow model calibrated/verified by actual ground water elevations under flow conditions, and
 - implementation and analysis of data from tracer tests.
5. Section 3.1.2, provide a cross-section in the area of the single point anomaly along Sunset Road in the next semi-annual report. In addition, there is no control for defining the plume in this area. It is the belief of the NDEP that the plume is traveling to the east-northeast in this area (based upon a review of potentiometric surface maps). If existing wells are found to be suitable, they should be sampled. If wells do not exist, TRX should develop a work plan to address this data need.
 6. Section 3.2, text does not match Figure 7 and the text is not clear regarding the origin of the 1 – 3 gal/min that is recycled to GW-11.
 7. Section 4.1.2 second paragraph, the data provided in Table 7 does not support the claim made in this paragraph that there is a 97 pound per day difference at the Athens well field. The average monthly mass removed for the year before ART-9 became operational is approximately equal to the average monthly mass removed after ART-9 became operational. Please provide additional discussion and justification.
 8. Section 4.1.3 second paragraph, if the pumping rate at the seep well field is being decreased and the hydraulic loading rate of the FBR system is still being reported at capacity, then provide discussion on where the additional hydraulic loading is originating.
 9. Section 5.0 second and third paragraphs, the hydraulic and contaminant capture has not been demonstrated to the NDEP. (See comments 4, 15.a.i, and 15.b.i for additional information.)
 10. Figures, the NDEP has the following comments and suggestions:
 - a. Figure 2, the groundwater elevation for well I-K is shown lower than the screened interval and does not agree with the water elevation reported in Appendix A. This figure should be checked for accuracy and modified as necessary.
 - b. Figure 3, the NDEP has following suggestions and comments:
 - i. The groundwater elevations shown for several wells do not agree with the water elevations reported in Appendix A. This figure should be checked for accuracy and modified as necessary.
 - ii. The perchlorate concentration for ART-5 is noted as being collected on November 3, 2006, however, no groundwater elevation is shown on the Figure.
 - iii. All pumping well designations do not agree with Table 2 and this issue needs to be rectified.
 - iv. According to Appendix A, “Pre-Pumping water level on April 30, 2002” was not collected in several wells. The figure should be modified to reflect this.
 - v. The NDEP suggests that the historical and current perchlorate concentrations be combined at the top of the figure and historical and current chromium concentrations be shown at the bottom of the figure.

- c. Figure 4, the NDEP has the following suggestions and comments:
 - i. The NDEP requests that the vertical scale on this figure be exaggerated to improve readability and details shown are more obvious.
 - ii. This figure should be checked for accuracy and modified as necessary.
- d. Figure 5, the NDEP has the following comments:
 - i. Note the significance of the dashed line on this figure.
 - ii. Add the total chromium concentrations for wells I-G and I-T for November 2006 as the concentration data was presented in Appendix A.
- e. Figure 6, the significance of the dashed line should be noted on this figure.
- f. Figure 7, the NDEP has the following suggestions and comments:
 - i. Add approximate flow rates from GWTP to BT-40 and BT-45, Lift Station #2 to Bioplant Equalization Area, Biological Treatment Plant to the Las Vegas Wash (if this is a bypass that is normally closed, a note should be added that discusses this; otherwise, please post the flow rate of water that is bypassed), and Bioplant Equalization Area to GW-11.
 - ii. Label components that comprise the FBR system.
 - iii. Label where samples are collected.
 - iv. Remove description of system from GWTP, Bioplant Equalization Area, and Biological Treatment Plant blocks and move to a legend at the bottom of the figure.
 - v. Update Biological Treatment Plant system description for 5 primary reactors.
 - vi. The NDEP suggests that TRX consider labeling and referring to BT-40 and BT-45 as Storage Tanks to eliminate confusion with the Bioplant Equalization Area.
 - vii. Figure 7 and the text in Section 3.2 do not agree. Modify text and/or figure as necessary.
- g. Figure 9, the NDEP has the following comments:
 - i. Note the significance of the dashed line on this figure.
 - ii. Add the perchlorate concentrations for wells I-G and I-T for November 2006. The concentration data was presented in Appendix A.
- h. Figure 11, the NDEP has the following comments:
 - i. Note the significance of the dashed line on this figure.
 - ii. Add the perchlorate concentration for well I-G for November 2006. The concentration data was presented in Appendix A.
 - iii. The NDEP suggests using the same colors and markers for each time series in Figures 5, 9, and 11.
- 11. Tables, the NDEP has the following comments and suggestions:
 - a. Table 2, add ART-6 to table and modify table to same format as Table 1. In general, notes or a legend would be helpful to define which wells are extraction wells and which wells are their co-located “buddy wells”.
 - b. Table 3, modify table to same format as Table 1 and clarify if PC-99R2/R3, PC-115R, and PC-116R are the same wells as PC-99, PC-115, and PC-116, respectively, in Appendix A. Modify Appendix A and/or the Tables as necessary.

- c. Table 4, the NDEP notes that the total chromium inflow concentrations have generally been decreasing, however, the total chromium outflow concentrations have been increasing. Please explain and discuss this decreased removal efficiency. In addition, please provide a discussion and schedule for how TRX plans to mitigate this issue.
 - d. Tables 5, 6, and 8, modify Tables 5 and 6 to have the same format as Table 8.
 - e. The NDEP suggests that TRX create tables that list the date and elevation of the historic data used for drawdown calculation, the elevation data from the current sampling event, and the calculated drawdown for each well in each well field.
12. Plates, the NDEP has the following comments and suggestions:
- a. Plates 1, 5, and 6, in comparison to similar plates in the July 2006 Semi-Annual report, there seem to be many wells missing from these figures. These wells should be shown on Plates 1, 5, and 6.
 - b. Plate 2, 3, and 4: has the overall groundwater elevation in each of these areas increased or decreased so that there is a significant impact to the calculated drawdown?
 - c. Plate 3, explain how drawdown was calculated for several wells shown that do not have April 2002 elevation data listed in Appendix A.
 - d. Plate 4, the NDEP does not fully concur with the drawdown contours presented by TRX. In general, TRX lacks sufficient control to present contours as solid lines to the northwest, north, and northeast of the ARP wells, to the east and southeast of PC-122, and to the south of ART-3, ART-4, and ART-8.
 - e. Plate 5, the NDEP does not fully concur with the total chromium concentration contours presented by TRX. In general, TRX lacks sufficient control to present solid contours in several locations mainly to the east and west of the main body of the plume. Additionally, the NDEP does not believe that the total chromium concentration exhibited by PC-58 is an isolated detection; however, since groundwater elevation and contaminant concentration data were not provided for wells PC93/94, PC-1, and PC-2, the NDEP is unable to accurately make this determination. Therefore, TRX should provide groundwater elevation and analytical data for all wells associated with this site. (See comments 12.a, 13.a, 15.a.iv, and 17 for additional information.) In addition, this comment has been made previously to TRX, please refer to previous NDEP comments, For further clarification, also post the groundwater elevation and analytical data in this vicinity collected by BRC. If adjacent data cannot resolve this issue, perhaps a work plan should be developed to address this data gap. The connectivity of the hexavalent chromium plume with the Las Vegas Wash is an issue that should be resolved expeditiously.
13. Appendix A, the NDEP has the following comments:
- a. Add wells to this table so that all TRX wells are listed with their corresponding monitoring and analytical data as requested by the NDEP in a June 13, 2006 letter to TRX. (See comment 15.a.iv for additional information.)
 - b. Based on the text of the report and Figure 3, the data listed in Appendix A for April 2002 appears to be mislabeled as May 2002.

- c. Explain why no data for ART-5 was recorded for November 2006. Figure 3 indicates that a perchlorate sample was collected at ART-5 on November 3, 2006 and Plate 3 shows a calculated drawdown for ART-5.
 - d. Check the table for errors and modify as necessary. The NDEP noted that the groundwater elevation calculated for ART-8A and ART-9 were not correct.
14. Appendix B, the NDEP has the following comments and suggestions:
- a. General comment, to simplify review, TRX should consider setting one range for the groundwater elevation so that all graphs in Appendix B have the same groundwater range and scale. TRX should also consider setting two or three ranges for the total chromium concentrations so that each graph does not have a different concentration range and scale. This should be considered for the perchlorate concentration graphs as well.
 - b. M-69(A) graphs, clarify whether this well should be M-69 or M-69A. Check all tables, graphs, and maps to make sure this well is consistently labeled.
 - c. M-71 graphs, modify graphs to reduce the range of the groundwater elevation scale, which is currently too large to show any variation. Also, correct the data point for Mar 02.
15. Appendix D, the NDEP has the following comments and suggestions:
- a. TRX's Response to Comments on NDEP comment letter dated June 13, 2006.
 - i. Response to Comment (RTC) 3, this report neither demonstrated hydraulic and chemical capture at each of the well fields nor demonstrated system removal efficiencies at each of the well fields. Hydraulic and contaminant transport modeling to demonstrate capture and removal efficiency should be submitted as noted above.
 - ii. RTC 4, a proposal containing a list of key wells for quarterly, semi-annual, and annual sampling should be submitted by April 30, 2007. This Deliverable should be submitted under separate cover to the NDEP.
 - iii. RTC 5.d, TRX states that they assume that the entire plume is hexavalent chromium in their response to comment 5.d and at a September 14, 2006 NDEP – TRX meeting yet in the text of the report (Section 3.1) TRX states that “between 10.8 and 104.2 percent of the total chromium is hexavalent chromium.” This discrepancy should be corrected in the text of the report. In addition, it is necessary to make this issue obvious on the Figures. Since TRX appears to have hexavalent chromium data for these wells, the NDEP requests that two Figures be submitted; one for total chromium and one for hexavalent chromium. Alternately, the total and hexavalent chromium data could be presented on the same figure. For example, “well XXX, total chromium concentration (hexavalent chromium concentration).”
 - iv. RTC 8, the table presented in Appendix A needs to be updated as it does not contain all TRX wells. Please note that the table included in the quarterly/semi-annual reports may be time limited (e.g. the last five quarters of data) and that all analytes for any given well should be listed in the table, not just total chromium, perchlorate, and TDS. Additionally, the tables provided in the electronic version of the report do not include all wells, analytes, and historical data.

- v. RTC 9, the NDEP has responded to the Upgradient Results Report comparison and evaluation of low flow sampling methods under separate cover.
 - b. TRX's Response to Comments on NDEP comment letter dated August 29, 2006.
 - i. RTC 2, the NDEP does not concur that capture is being achieved of the eastern portion of the plume. Plate 1 does not show that there is sufficient well coverage east and northeast of the slurry wall to demonstrate hydraulic and/or chemical capture. Additionally, the perchlorate concentrations on Plate 6 illustrate that hydraulic capture is not complete to the east. If TIMET has wells located to the east and northeast of the slurry wall (e.g. CLD2R), TRX should include their locations, groundwater elevations, and analytical data on all maps of this area. To date, the NDEP has not received an e-mail from TRX proposing an approach to quantify capture as stated in TRX's response; therefore, TRX should submit their proposed approach for demonstrating hydraulic and chemical capture as noted above.
 - ii. RTC 3, an evaluation of the interim remedial measure should be submitted by April 30, 2007.
 - iii. Additionally, since TRX has stated that they assume the entire plume is hexavalent chromium and that the total chromium concentration equals the hexavalent chromium concentration, then contour lines for 0.01 mg/L and 0.005 mg/L should be added to the Total Chromium in Groundwater map.
16. Appendix E, the NDEP has the following comments:
- a. Future Reports. To facilitate review it is requested that future reports include a table that lists all applicable samples included in the Data Validation Summary Report (DVSR) along with their Sample Delivery group (SDG) ID, correspondence between Sample ID and sample location, the analyses conducted.
 - b. Table E-3, Sample EB-2_08/03/06. The Table indicates the Chromium VI analysis for sample EB-2_08/03/06 was performed 28 days from sampling. The units are wrong; this should be 28 hours from the time of sampling.
 - c. Hexavalent Chromium Holding Time. During this sampling period two analytical methods were utilized for hexavalent chromium analysis, EPA method 7196 and 218.6. During the year 2006 when this chromium study was conducted the holding time using either method for hexavalent chromium in water was 24 hours, as stated in the DVSR. However, recently the holding time for EPA method 218.6 (Rev 3.3) has been extended to 28 days if the sample is preserved at the time of collection or within 24 hours with the ammonium sulfate buffer solution specified in the method. This extended holding time only applies to EPA method 218.6 when the sample has been preserved with buffer within 24 hours of collection. Please clarify what was completed for these analyses.
17. Electronically submitted data, per the September 14th meeting, TRX was to supply all parts of their database used for the development of the report. This information was not included.