

# MEMO

Date **October 7, 2019**  
To **Nevada Environmental Response Trust**  
From **John Pekala, Scott Warner, and Chris Ritchie**  
Copy to **Nevada Division of Environmental Protection  
United States Environmental Protection Agency**  
Subject **In-Situ Bioelectrochemical Laboratory-Scale  
Treatability Study Monthly Progress Report**

## **TASK PROGRESS UPDATE: AUGUST 2019**

At the direction of the Nevada Environmental Response Trust (NERT or Trust), Ramboll US Corporation (Ramboll) has prepared this memorandum that summarizes Ramboll's progress during August 2019 toward successfully implementing the In-Situ Bioelectrochemical Laboratory-Scale Treatability Study for the remediation of perchlorate in water. Treatability study laboratory testing is performed at Colorado State University (CSU) via subcontract with Ramboll on behalf of NERT.

## **TASK M24 – IN-SITU BIOELECTROCHEMICAL LABORATORY-SCALE TREATABILITY STUDY**

- Task Leaders – Scott Warner / Chris Ritchie
- Current Status
  - Microcosm Batch Testing: Final samples for the second round of microcosms, as outlined in the March 2019 progress update, were collected in August 2019. The results of the microcosm samples and associated data will be provided in a forthcoming treatability study modification as described in more detail under the heading "Schedule and Progress Updates".
  - Column Testing: The second stage of column testing, as outlined in the April 2019 progress update, continued through August. The soil columns, which were supplemented with vitamin B12 on May 15, 2019 and molybdate on June 11, 2019, continued to be monitored in August. Since the addition of the vitamin B12 and molybdate, results from the analysis of column effluent indicate minimal and inconsistent reduction in perchlorate effluent concentrations in each of three columns, which may be an indication of the difficulty in establishing the appropriate biological community in the column environment (as opposed to the sand tank testing observations discussed in the following paragraph). Final conclusions regarding the column testing will be included in the final laboratory-scale testing results report.
  - Sand Tank Testing: The sand tank continued to operate as a flow-through system through the month of August. During the first part of August (through approximately August 9) the sand tank was operated to establish a water flow velocity of approximately 0.8 feet per day (ft/day, or 25 centimeters/day) or a residence time (i.e., time that influent water remains in the sand tank) of approximately 7 days within the tank. As shown on Figure 1, the analytical results of water samples collected under these

conditions indicated complete perchlorate reduction, where the perchlorate detection limit is 0.0125 milligrams per liter (mg/L). Monitoring results also indicated that residual amounts of dissolved hydrogen remained within the aqueous environment of the sand tank across its entire flow-through distance regardless of depth, similar to the observations made in July when the sand tank was operated at a 50 percent slower hydraulic velocity, or an approximately two-week residence time. Based on the successful perchlorate removal observed during operation of the sand tank with perchlorate as the sole electron acceptor, competing electron acceptors were added to the sand tank influent on August 12, 2019 while continuing operation of the sand tank at a one-week residence time. The final target influent concentrations of the electron acceptors were 5 mg/L nitrate, 4 mg/L nitrite, 9 mg/L perchlorate, and 6 mg/L chlorate. Preliminary results indicate that all electron acceptors are being consumed along the flow path to non-detectable levels (the perchlorate detection limit is 0.5 mg/L). Monitoring of the competing electron acceptors will continue into September. The sand tank test results will be included in the final laboratory-scale testing results report.

- Schedule and Progress Updates
  - Bench-scale testing is anticipated to continue through mid-September 2019. A report summarizing the results of the laboratory testing program (batch microcosms, column tests, and the sand tank testing) is anticipated to be submitted to NDEP as an attachment to the treatability study modification described below.
  - A modification to the treatability study work plan (Treatability/Pilot Study Modification No. 11) is anticipated to be submitted in October 2019 to (1) obtain site-specific design parameters through a focused assessment of Site microbial conditions and (2) implement a small-scale bioelectrochemical field test based in part on the initial successful results from the sand tank testing. This modification will contain a summary of bench-scale testing done to-date to support an incremental stage small-scale field test.
  - Pending completion of bench-scale testing and the anticipated field efforts to be detailed in Treatability/Pilot Study Modification No. 11 as discussed above, a report will be prepared to present NERT's conclusions on the technology. At that time, a work plan addendum proposing a more comprehensive field test may be prepared if supported by the results.
- Health and Safety
  - There were no safety incidents during August 2019.

## **ATTACHMENT**

Figure 1: Sand Tank Flow Path Sampling Results for 7-day Residence Time

## **In-Situ Bioelectrochemical Laboratory-Scale Treatability Study Progress Update**

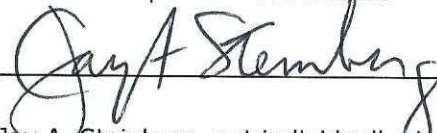
### **Nevada Environmental Response Trust Site (Former Tronox LLC Site) Henderson, Nevada**

#### **Nevada Environmental Response Trust (NERT) Representative Certification**

I certify that this document and all attachments submitted to the Division were prepared at the request of, or under the direction or supervision of NERT. Based on my own involvement and/or my inquiry of the person or persons who manage the system(s) or those directly responsible for gathering the information or preparing the document, or the immediate supervisor of such person(s), the information submitted and provided herein is, to the best of my knowledge and belief, true, accurate, and complete in all material respects.

Office of the Nevada Environmental Response Trust

Le Petomane XXVII, Inc., not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

**Signature:**  **Not Individually, but Solely  
as President of the Trustee**

**Name:** Jay A. Steinberg, not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

**Title:** Solely as President and not individually

**Company:** Le Petomane XXVII, Inc., not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

**Date:** 10/2/19

## **In-Situ Bioelectrochemical Laboratory-Scale Treatability Study Progress Update**

**Nevada Environmental Response Trust  
Site (Former Tronox LLC Site)  
Henderson, Nevada**

### **Responsible Certified Environmental Manager (CEM) for this project**

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and, to the best of my knowledge, comply with all applicable federal, state and local statutes, regulations and ordinances.



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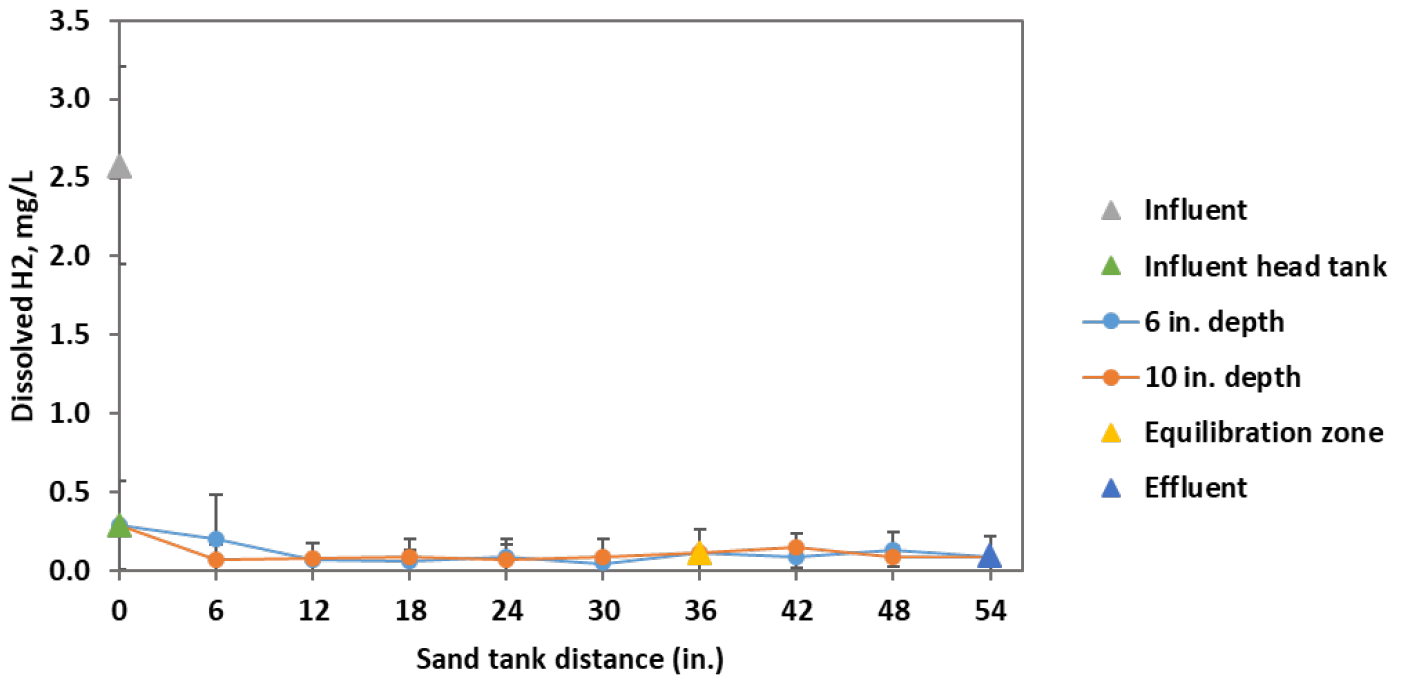
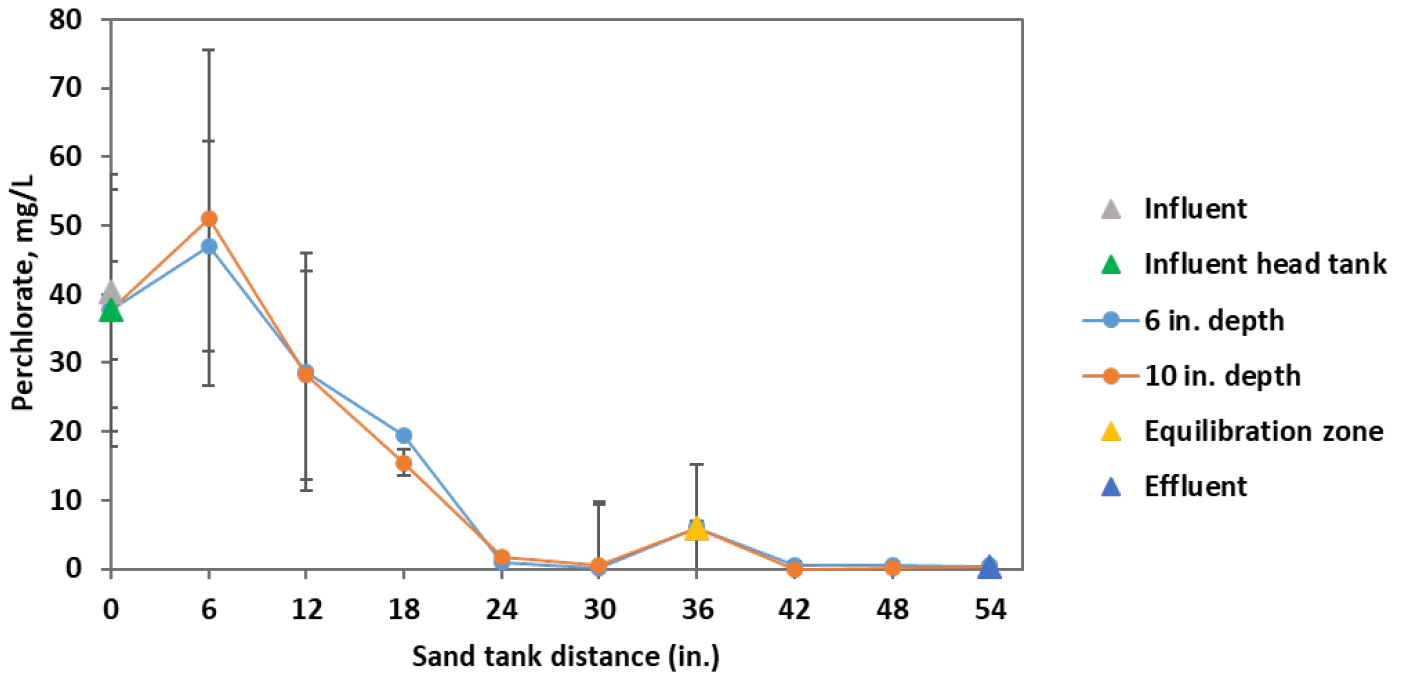
**John M. Pekala, PG  
Principal**

October 7, 2019

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**Date**

Certified Environmental Manager  
Ramboll US Corporation  
CEM Certificate Number: 2347  
CEM Expiration Date: September 20, 2020



Note: The top panel shows the perchlorate concentrations in the influent, influent head tank, and along the sand tank flow path at depths of 6 inches (in.) and 10 in. The bottom panel shows dissolved hydrogen distribution in the influent, influent head tank, and along the sand tank flow path at depths of 6 in. and 10 in.



**Sand Tank Flow Path Sampling Results for 7-day Residence Time**  
 Nevada Environmental Response Trust  
 Henderson, Nevada

Figure  
**1**