

MEMO

Date **October 22, 2018**
To **Nevada Environmental Response Trust**
From **John Pekala, Scott Warner, and Chris Ritchie**
Copy to **Nevada Division of Environmental Protection**
Subject **United States Environmental Protection Agency**
In-Situ Bioelectrochemical Laboratory-Scale Treatability Study Monthly Progress Report

Task Progress Update: August 2018

At the direction of the Nevada Environmental Response Trust (NERT or Trust), Ramboll US Corporation (Ramboll) has prepared this memorandum which summarizes Ramboll's progress during August 2018 toward successfully implementing the In-Situ Bioelectrochemical Laboratory-Scale Treatability Study.

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

- Task Leaders – Scott Warner / Chris Ritchie
- Current Status
 - Electrochemical batch tests were performed to assess hydrogen generation, organic carbon generation, and pH conditions at various inorganic carbon loadings and voltages. The data from the batch tests are being used to inform the column testing.
 - Column tests were initiated, operating under both continuous and batch electrochemical treatment modes, to inform a preliminary understanding of electron donor and acceptor removal, as well as identify potential challenges for subsequent flow-through testing.
 - Flow-through column tests, as well as selected confirmatory batch tests, are being designed to resolve details of kinetics and microbial community dynamics.
- Schedule and Progress Updates
 - Due to analytical interferences encountered measuring organic carbon content and inorganic electron acceptors as a result of high total dissolved solids concentration, batch and column testing have been delayed by approximately one month. Analytical solutions to this condition, including a new analytical method for quantifying the concentration of acetate, formate, and other organic carbon species, have been developed to address these interferences. The overall task schedule is not expected to be substantially affected.
 - Presentation of Phase 1 findings and recommendations for Phase 2 testing is expected in Q1 2019.
- Health and Safety
 - There were no safety incidents during August 2018.

ATTACHMENT

Photolog for In-Situ Bioelectrochemical Laboratory-Scale Treatability Study – August 2018

In-Situ Bioelectrochemical Laboratory-Scale Treatability Study Progress Update

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

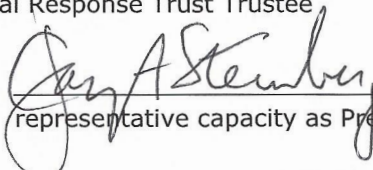
Nevada Environmental Response Trust (NERT) Representative Certification

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 systems(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, not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

Signature:

not individually, but solely as President
 _____, not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust 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:

10/19/18

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 prepared 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. I hereby certify that all laboratory analytical data was generated by a laboratory certified by the NDEP for each constituent and media presented herein.

Description of Services Provided: Prepared In-Situ Bioelectrochemical Laboratory-Scale Treatability Study Progress Update, Nevada Environmental Response Trust Site, Henderson, Nevada



October 22, 2018

John M. Pekala, PG

Date

Principal

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

**PHOTOLOG FOR IN-SITU BIOELECTROCHEMICAL LABORATORY-SCALE
TREATABILITY STUDY
AUGUST 2018**

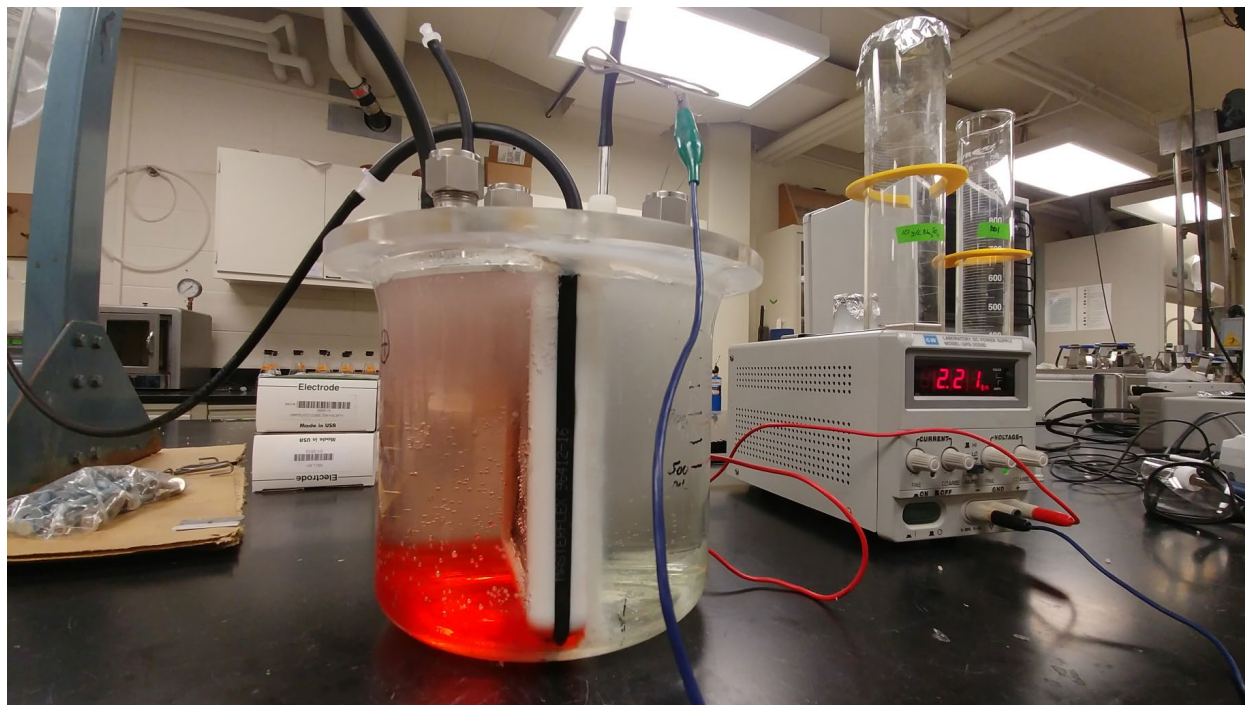


Photo 1. Batch electrochemical reactor setup and testing. Red dye in the anodic (positive, oxidizing) compartment enables visual assessment of seal tightness and complete chamber separation. Electron transfer occurs solely through a central membrane between anode and cathode (white frame at reactor center). Gases are generated in the divided electrochemical reactor: hydrogen, on the (right) cathodic side, is collected in a Tedlar bag. O_2 from the anodic chamber is collected in a separate bag. Both gasses are tested for purity on a gas chromatogram.



Photo 2: Experimental setup for flow-through column testing. This 2" diameter, 5' long PVC test column has equally-spaced sampling ports along the flow path, allowing the research team to obtain detailed information of perchlorate and other competing electron acceptor removal. Not visible in the figure are gas management system and biomass sampling ports on the back side of the column. This photo also shows an electrochemical reactor of the kind used in the batch study phase, in the lower left corner.