

TECHNICAL MEMORANDUM

To: Nevada Environmental Response Trust

Cc: Nevada Division of Environmental Protection
United States Environmental Protection Agency

From: Katie Hendrickson

Date: January 25, 2021

Subject: Hydrogen-Based Gas Permeable Membrane Pilot Study Monthly Progress Report

At the direction of the Nevada Environmental Response Trust (NERT or Trust), Tetra Tech, Inc. (Tetra Tech) has prepared this memorandum that summarizes Tetra Tech's progress made during December 2020 toward successfully implementing the Hydrogen-Based Gas Permeable Membrane Pilot Study.

Task Progress Update: December 2020

Task M26 – Hydrogen-Based Gas Permeable Membrane Pilot Study

- Current Status
 - Test Scenario #1B, which involves treatment of the existing FBR influent obtained from the FBR equalization tank, began on November 24, 2020 and system acclimation occurred in December 2020. The system was operated between 1 and 2 gpm during acclimation.
 - Pilot system influent water temperatures were between 52 and 65 degrees Fahrenheit for the first two weeks in December due to low ambient temperatures, which slowed system acclimation. Water heaters were installed on the influent lines between the frac tanks and the pilot system on December 16, 2020 to maintain the influent water temperature above 70 degrees Fahrenheit consistent with the FBR influent water temperature. (The flow rate was reduced to 1 to 1.5 gpm during this time due to the lower microbial activity.) Improved system acclimation was noted after the water heaters were installed and the influent water temperature subsequently increased.
 - Operational samples showed influent perchlorate concentrations ranged from 40,400 to 55,000 µg/L and generally showed the treatment system was reducing perchlorate concentration by greater than 99% starting December 21, 2020 but additional acclimation was needed following installation of the heaters. The water heaters were able to raise the influent water temperature to a sustained level of 70 degrees Fahrenheit after four days of operation, which improved system performance. On December 23, 2020, the flow rate was increased to 2 gpm based on effluent perchlorate concentrations between non-detect (<5 ppb) and 50 ppb and the increased performance from elevating the influent water temperature. A figure showing the perchlorate concentrations and percent reduction from operational sampling is attached.
- Schedule and Progress Updates

- Once the planned acclimation is completed, weekly steady state performance sample collection will begin and these results will be presented in future monthly progress reports.
- Operation of the Pilot System under Scenario #1B using FBR influent water is anticipated to continue through mid February (a minimum of 12 weeks).
- Health and Safety
 - There were no health and safety incidents related to Task M26 during December 2020. Safety measures continue to be implemented to minimize potential exposure to COVID-19, including the use of face coverings, gloves, and hand sanitizer, as well as protocols for monitoring temperatures, minimizing the number of people on site at one time, and evaluating tasks to increase physical distance between personnel.

CERTIFICATION

Hydrogen-Based Gas Permeable Membrane Pilot Study Monthly Progress Report

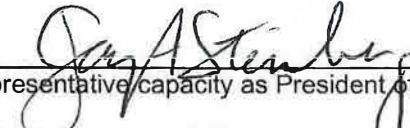
**Nevada Environmental Response Trust Site
(Former Tronox LLC Site)
Henderson, Nevada**

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 of the Trustee, 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: 1/25/21

CERTIFICATION

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 Hydrogen-Based Gas Permeable Pilot Study Monthly Progress Report.



Kyle Hansen, CEM
Field Operations Manager/Geologist
Tetra Tech, Inc.

January 25, 2021

Date

Nevada CEM Certificate Number: 2167
Nevada CEM Expiration Date: September 18, 2022

Figures

Figure 1. Perchlorate Concentrations and % Reduction

Scenario 1B Biomass Growth/Acclimation Period

