

TECHNICAL MEMORANDUM

To: Nevada Environmental Response Trust

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

From: Carl Lenker and Eric Klink

Date: October 24, 2019

Subject: Unit 4 Source Area In-Situ Bioremediation Treatability 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 September 2019 toward successfully implementing the Unit 4 Source Area In-Situ Bioremediation Treatability Study.

Task Progress Update: September 2019

Task M21 – Unit 4 Source Area In-Situ Bioremediation (ISB) Treatability Study

- Task Leader – Arul Ayyaswami
- Current Status
 - The University of Nevada – Las Vegas (UNLV) continued microcosm and column testing in accordance with the Unit 4 Source Area In-Situ Bioremediation Treatability Study Bench-Scale Work Plan and Treatability Study Modification No. 1. The following is a brief summary of the bench-scale study results to date:
 - UNLV continued microcosm testing with a combination of molasses, molasses with acetate, mixed microbial cultures, and soil and groundwater collected from boring and well locations near the Unit 4 Building. UNLV sampled the test microcosms on September 17, 2019 and this data will be presented in subsequent monthly reports.
 - UNLV continued column testing during this reporting period with two intermediate columns (columns packed with a mixture of sand and soil collected from 75 to 85 feet bgs) and two deep columns (columns packed with a mixture of sand and soil collected from 95 to 105 feet bgs). The columns ran for approximately 156 days using a continuous feed solution of molasses, diluted groundwater from wells U4-E-011, U4-E-021, and U4-E-05D, sodium bicarbonate, mixed microbial cultures, and nutrients. The average retention time for the columns was approximately 5 to 10 days. Hexavalent chromium and nitrate concentrations completely degraded after 6 days. Chlorate concentrations completely degraded after 100 days. Perchlorate concentrations completely degraded after 149 days. Following the observed degradation of perchlorate and the removal of precipitates from the top of the columns, UNLV stopped adding molasses and mixed microbial cultures to the columns for

approximately 16 days. After day 172, the columns ran with a feed solution containing molasses, but not the mixed microbial cultures. Results from these segments of the tests will be included in future monthly progress reports.

- Schedule and Progress Updates
 - The following activities are scheduled to be conducted in October 2019:
 - Continued UNLV microcosm and column testing in accordance with the Unit 4 Source Area In-Situ Bioremediation Treatability Study Bench-Scale Work Plan and Treatability Study Modification No. 1.
 - Development of the Unit 4 Source Area In-Situ Bioremediation Treatability Study Work Plan Addendum for Phase 2 at the completion of laboratory testing, provided the data support moving forward with a field test. The submittal timeline of the Addendum will be dependant on the duration of the microcosm and column studies.
- Health and Safety
 - There were no health and safety incidents related to Task M21 during September 2019.

CERTIFICATION

Unit 4 Source Area Bioremediation Treatability Study Monthly Progress Report

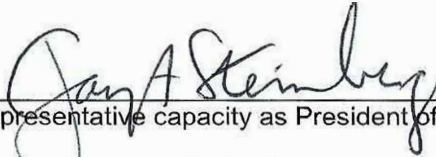
**Nevada Environmental Response Trust Site
(Former Tronox LLC Site)
Henderson, Nevada**

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 in his representative capacity as President of the Nevada Environmental Response Trust Trustee

**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

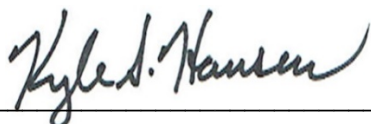
Company: Le Petomane XXVII, Inc., not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

Date: 10/24/19

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 Unit 4 Source Area Bioremediation Treatability Study Monthly Progress Report.



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

October 24, 2019

Date

Nevada CEM Certificate Number: 2167
Nevada CEM Expiration Date: September 18, 2020