

# TECHNICAL MEMORANDUM

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**To:** Nevada Environmental Response Trust

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

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**From:** Arul Ayyaswami and Dan Pastor

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**Date:** March 23, 2018

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**Subject:** Unit 4 Source Area In-Situ Bioremediation Treatability Study Progress Report

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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 through February 2018 toward successfully implementing the Unit 4 Source Area In-Situ Bioremediation Treatability Study.

## Task Progress Update: February 2018

### Task M21 – Unit 4 Source Area In-situ Bioremediation Treatability Study

- Task Leader – Arul Ayyaswami
- Current Status
  - The Revised Unit 4 Source Area In-Situ Bioremediation Treatability Study Work Plan addressing NDEP comments was submitted to NDEP on February 13, 2018 along with a Response to Comments table. NDEP approved the revised work plan on February 21, 2018.

#### Bench-Scale Studies

- The University of Nevada – Las Vegas (UNLV) continues microcosm testing with a combination of soil and groundwater collected from boring locations in the vicinity of the Unit 4 Building, carbon substrates, and mixed microbial cultures. Preliminary microcosm results are summarized below:
  - Hexavalent chromium concentrations reduced by less than 10% within 74 days in microcosms containing EOS Pro and EOS Pro with acetate, groundwater, and a mixed bacterial culture. Hexavalent chromium concentrations decreased from 106 milligrams per liter (mg/L) to 70 mg/L within 42 days in microcosms containing molasses, groundwater, and a mixed bacterial culture. Hexavalent chromium concentrations decreased from 60 mg/L to less than 0.2 mg/L within 21 days in microcosms containing molasses, groundwater diluted at a 1:1 ratio, and a mixed bacterial culture.

- Nitrate concentrations reduced by up to 35% within 74 days in microcosms containing EOS Pro and EOS Pro with acetate, groundwater, and a mixed bacterial culture. No significant reduction in nitrate concentrations were observed after 35 days in microcosms containing molasses, groundwater, and a mixed bacterial culture. However, nitrate concentrations reduced from 758 mg/L to 443 mg/L within 35 days in microcosms containing molasses, groundwater diluted at a 1:1 ratio, and a mixed bacterial culture.
- Chlorate and perchlorate concentrations are expected to decrease following the decrease of nitrate concentrations. Evaluation of the microcosm results are ongoing.

#### **Pre-Field Activities**

- A Tronox ground breaking permit has been obtained for the proposed wells within the Unit 4 Building basement. Preparation and submittal of additional Tronox ground breaking permit applications are in progress for the remaining borings and monitoring wells.
- The proposed route for the extracted groundwater pipeline was discussed with Tronox during a site walk conducted on February 20, 2018.
- The water appropriation permit application for the proposed extraction wells was mailed to the Nevada Division of Water Resources on February 23, 2018.
- **Schedule and Progress Updates**
  - UNLV microcosm testing will continue in March 2018.
  - UIC and well permit applications will be prepared and submitted in March 2018.
  - As required by the Site Management Plan, a contingency plan for the pre-implementation field activities will be prepared and submitted in March 2018.
- **Health and Safety**
  - There have been no health and safety incidents related to Task M21 during February.

## CERTIFICATION

### Unit 4 Source Area Bioremediation 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

*not individually, but solely as  
Pres. NERT*

**Signature:** Jay A Steinberg, 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:** 3/22/18

## CERTIFICATION

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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:** Unit 4 Source Area Bioremediation Treatability Study Progress Update, Nevada Environmental Response Trust Site, Henderson, Nevada.



March 23, 2018

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

Date

Nevada CEM Certificate Number: 2167  
Nevada CEM Expiration Date: September 18, 2018