

# TECHNICAL MEMORANDUM

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**To:** Nevada Environmental Response Trust

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**Cc:** Nevada Division of Environmental Protection

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**From:** Dan Pastor and Dana Grady, Tetra Tech, Inc.

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**Date:** October 20, 2017

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**Subject:** **Seep Well Field Area Bioremediation Treatability Study Progress Update**

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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 which summarizes Tetra Tech's progress during September 2017 toward successfully implementing the Seep Well Field (SWF) Area Bioremediation Treatability Study.

## Task Progress Update: September 2017

### Task M11 – Seep Well Field Area Bioremediation Treatability Study (SWFTS)

- Task Leader – Dana Grady/Dan Pastor
- Current Status
  - Preliminary column sorption/desorption tests at UNLV have now been completed. These tests were run at 15% of the soil's oil adsorption capacity for both the alluvium and Upper Muddy Creek formation (UMCf). Initial results indicate that 150 milligrams per liter (mg/L) to 300 mg/L of oil (measured as Chemical Oxidant Demand or COD) initially elutes from the alluvium columns. This is similar to the field concentrations of COD that were observed in the 2016 City of Henderson Bioremediation Treatability Study. The initial COD measured in the effluent in the UMCf column was 100 mg/L to 150 mg/L, which is half that in the alluvium column. The difference indicates that the UMCf likely retains more oil due to the finer nature of its soil. Final column tests at medium and high oil adsorption capacities are being conducted and these results will be provided in monthly updates submitted by UNLV to Tetra Tech as they become available.
  - The first injection event began on August 21, 2017, and was completed on September 11, 2017. During this event, a designed carbon substrate solution was injected into all 25 injection wells. The carbon/amendments and associated quantities included the following:
    - 20,000 gallons of emulsified oil substrate (EOS®)
    - 385 gallons of glycerin
    - 300 pounds of sodium sulfite
    - 150 gallons of Aquapure® phosphate solution

- 79,465 gallons of extracted groundwater for dilution of EOS® (ratio of 1 part EOS® to 4 parts water).

Following the addition of the carbon substrate solution, approximately 323,325 gallons of distribution water were injected into the 25 injection wells to enhance subsurface distribution within the injection well transects. The source of the distribution water and dilution water used during carbon injections was groundwater extracted from newly installed monitoring wells upgradient of the injection well transects.

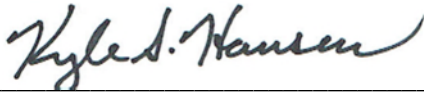
- Weekly groundwater sampling began on September 18, 2017, which was the first week after completion of the first injection event. The weekly groundwater sampling program will continue for four weeks and be completed on October 13, 2017.
- Schedule and Progress Updates
  - Task remains on schedule.
  - Weekly groundwater sampling is on-going and will be completed on October 13, 2017.
  - As noted in the Seep Well Field Area Bioremediation Treatability Study Work Plan, the timing for the second injection event will be determined based on observations from the effectiveness monitoring results.
- Health and Safety
  - There were no safety incidents related to Task M11 during September 2017.

## 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:** Seep Well Field Area Bioremediation Treatability Study Progress Update, Nevada Environmental Response Trust Site, Henderson, Nevada



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

October 20, 2017

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Date

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