

TECHNICAL MEMORANDUM

To: Nevada Environmental Response Trust

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

From: Dana Grady and Dan Pastor

Date: June 12, 2017

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

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 made during May 2017 toward successfully implementing the Seep Well Field (SWF) Area Bioremediation Treatability Study.

Task Progress Update: May 2017

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

- Task Leader – Dana Grady
- Current Status
 - Bench-scale studies performed by University of Nevada Las Vegas (UNLV) are ongoing. Preliminary batch microcosm tests have been completed, with results indicating that perchlorate in saturated soil from the SWF area biodegrades very rapidly following biological denitrification with the addition of emulsified oil substrate (EOS®) as the carbon donor. These results are very similar to prior bench-scale tests for the Groundwater Bioremediation Treatability Study conducted on City of Henderson property. Perchlorate concentrations reduced to non-detect levels between 10 and 20 days following inception from a starting groundwater concentration of 13.2 milligrams per liter. Comparatively, the preliminary laboratory batch microcosm studies that were performed as part of the previous City of Henderson (COH) bioremediation treatability study took more than 20 days to witness perchlorate biodegradation. This could be due to the fact that nitrate as well as perchlorate concentrations were higher in the previous COH study compared to the groundwater from the vicinity of the SWF treatability study. Final batch microcosm tests, which will vary the EOS® dosages, are now being performed. EOS® adsorption and desorption tests are being currently being designed and will be completed as the final phase of bench-scale testing.

- The Underground Injection Control (UIC) Permit application package was submitted to the Bureau of Water Pollution Control on May 9, 2017. The application was subsequently approved and UIC Permit issued on May 31, 2017.
- A Water Appropriations Permit application package was prepared and submitted to the Trust for review and signature. Following Trust signature, the application package will be submitted to the Nevada Division of Water Resources.
- Nuclear magnetic resonance (NMR) logging was performed the week of May 16, 2017. Detailed evaluation of the logging results is ongoing. However, preliminary results indicate that the NMR was able to identify zones of higher and lower conductivity reasonably well, based on comparison to lithologic logs. In addition, the NMR estimates of hydraulic conductivity for the well screened intervals generally correlated to the recent slug test results.
- Injection and monitoring well installations began on May 22, 2017 and will continue through June 2017.
- Schedule and Progress Updates
 - Drilling of injection and monitoring wells began on May 22, 2017, which is three weeks ahead of schedule.
- Health and Safety
 - There were no safety incidents related to Task M11 during May 2017.