

OFFICE OF THE NEVADA ENVIRONMENTAL RESPONSE TRUST TRUSTEE

Le Petomane XXVII, Inc., Not Individually, But Solely as the Nevada Environmental Response Trust Trustee

35 East Wacker Drive - Suite 690

Chicago, Illinois 60601

Tel: (702) 357-8149, x104

March 29, 2019

Mr. Weiquan Dong, Ph.D., P.E.
Bureau of Industrial Site Cleanup
Nevada Division of Environmental Protection
2030 E. Flamingo Road, Suite 230
Las Vegas, NV 89119

RE: Galleria Drive Bioremediation Treatability Study Work Plan Addendum
Nevada Environmental Response Trust
Henderson, Nevada

Dear Dr. Dong:

As you are aware, the Nevada Environmental Response Trust (NERT or the “Trust”) began implementation of the Galleria Drive Bioremediation Treatability Study in April 2018, limited to the Phase 1 pre-design activities as specified in the Galleria Drive Bioremediation Treatability Study Work Plan dated October 6, 2017 (Work Plan) and subsequently approved by the Nevada Division of Environmental Protection (NDEP) on October 31, 2017. At the conclusion of the initial Phase 1 scope of work in June 2018, the Trust determined that perchlorate in the Upper Muddy Creek formation (UMCf) was deeper than anticipated. A Treatability/Pilot Study Modification was submitted to NDEP on August 29, 2018 (Modification) for the purpose of performing additional aquifer testing in the deeper UMCf (90-110 feet below ground surface). The Modification was approved by NDEP on August 30, 2018. All Phase 1 field and laboratory activities specified in the Work Plan and Modification were completed in January 2019. Based on the favorable results of the Phase 1 efforts, inclusive of laboratory testing as defined in the Work Plan, the Trust directed Tetra Tech to prepare the Work Plan Addendum (**Attachment A**) and Cost Basis (**Attachment B**) documents to proceed with implementation of the Phase 2 field program of the study to evaluate the effectiveness of implementing in-situ bioremediation to reduce contaminants present in the shallow UMCf that are migrating through the vicinity of Galleria Drive in the Eastside Study Area. It should be noted that based on the Phase I pre-design activities, in-situ bioremediation technology in the vicinity of the study area is not appropriate for the deeper UMCf; however, alternative technologies will be evaluated for the deeper UMCf during the Feasibility Study. Subsequently, NERT submitted the aforementioned documents to Arcadis, a third-party subject expert, to perform a detailed independent evaluation to ensure the following with respect to the proposed Phase 2 scope of work:

1. Implementability;
2. Scope is commensurate with the study’s objectives; and,
3. Costs are commensurate with the scope of work.

Arcadis submitted its final Review and Comment memorandum (**Attachment C**) to NERT on March 8, 2019.

Although the independent evaluation performed by Arcadis resulted in the comments as detailed in Attachment C, Arcadis concluded that in general, the study is implementable, the scope is commensurate with the study’s objectives, and the costs are commensurate with the scope of work. The comments provided are principally optimization and performance recommendations and do not result in a material change in scope or cost of the study. While Attachments A and B reflect Arcadis comments received through the review process, the following

table presents the Trust’s response to all Arcadis comments provided in Attachment C. Please note the Arcadis comments below have been abbreviated but the full text is available in Attachment C.

Arcadis Comment	NERT Response
<p>Comment No. 1: <i>Installation of 4-inch wells in a minimum of 8-inch boreholes in place of 2-inch wells</i></p>	<p>Dialogue exchanged between the Trust, Tetra Tech and Arcadis on the topic resulted in concurrence from all parties regarding the utilization of 2-inch diameter wells as originally specified in the Phase 2 documentation reviewed by Arcadis. Accordingly, no modifications to the Phase 2 documentation resulted from this comment.</p>
<p>Comment No. 2: <i>Well clusters (separate boreholes) are recommended in place of nested wells (co-located)</i></p>	<p>The original specification of nested wells as opposed to well clusters in the Phase 2 documentation reviewed by Arcadis was specified in part due to lower project costs. After review by the Trust, it was determined that the additional cost of utilizing well clusters would not benefit the objectives of the study. Accordingly, no modifications to the Phase 2 documentation resulted from this comment.</p>
<p>Comment No. 3: <i>Recommendations were made suggesting the Trust should utilize:</i></p> <ul style="list-style-type: none"> • <i>Continuously wire-wrapped stainless-steel screens as opposed to machine slotted PVC screens</i> • <i>Aggressive jetting well development</i> • <i>Grain size influenced filter-pack and 1-2 feet choker sand to prevent seal from cementing filter pack</i> • <i>Neat cement grout seals to ground surface</i> 	<p>Based on experience in the NERT Study Area, it is the opinion of Tetra Tech that the formation will ultimately dictate the injection rates, not the wire-wrap screen, and the use of stainless steel may introduce the possibility of microbial anaerobic corrosion due to the complex groundwater geochemistry in the targeted treatment interval. Furthermore, Cascade (drilling and injection subcontractor) has confirmed that redevelopment techniques involving jetting will not be a problem for the selected machined slotted PVC screens, and are regularly performed by Cascade. However, due to the incomplete dataset surrounding injection performance in the UMCf, and to provide greater material strength, utilization of Schedule 80 PVC and choker sand will be utilized, and the Phase 2 documentation has been modified accordingly.</p> <p>While not explicitly stated in the Phase 2 documentation reviewed by Arcadis, Tetra Tech concurs with Arcadis and had planned on utilizing neat cement which has been utilized in prior NERT treatability studies. Accordingly, the Phase 2 documentation has been modified for clarity.</p>

Arcadis Comment	NERT Response
<p><i>Comment No. 4: Arcadis indicated that Rotosonic drilling is typically not a preferred drilling method for injection or recovery wells; however, deference was given to Tetra Tech due to their past site experience.</i></p>	<p>Tetra Tech and Ramboll have both indicated that the preferred drilling method in the NERT Study Area is rotosonic and this technique has been used without issue throughout the course of the Remedial Investigation and other treatability/pilot studies. During drilling, continuous cores are collected from the boreholes which generally result in 100% recovery or more if any expandable clays are encountered during drilling (such as in the UMCf), caving, or heaving sands. Accordingly, no modifications to the Phase 2 documentation resulted from this comment.</p>

Arcadis Comment	NERT Response
<p>Comment No. 5a: <i>Additional consideration should be given to the selection of study's injectate (i.e. carbon donor). Specifically, the EOS-LS product can be used to maximize content of glycerin in the delivered solution without potentially compromising emulsion.</i></p> <p>Comment No. 5b: <i>Additional consideration should be given to the use of phosphorous as an injected nutrient and sodium sulfite as a dissolved oxygen scavenger.</i></p>	<p>Tetra Tech has had several discussions with the developer of the EOS product since the inception of the various NERT in-situ biological laboratory and field treatability studies over the past four years and looked into the various products from EOS in combination with the site-specific geology and geochemistry. Based on these discussions, lab studies, and field conditions, Tetra Tech selected EOS Pro which has thus far demonstrated very successful results in all laboratory and field studies performed for NERT to-date and believes that the evaluation of an alternative product is not necessary. Accordingly, no modifications to the Phase 2 documentation resulted from this comment.</p> <p>With respect to the use of phosphorous, microcosm laboratory studies performed during a previous UNLV bench-scale study using soil and groundwater from the NERT site provided data indicating a protracted lag time in perchlorate degradation in the absence of phosphorus. While microcosm studies specific to this treatability study did not indicate that phosphorus was required, this treatability study's location has varying but substantial amounts of gypsum, which could bind the available phosphorus and result in similar degradation of lag times. Accordingly, the Phase 2 documentation was modified to state that while phosphorus will be used during the first injection, its usage will be evaluated and may be reduced or eliminated during subsequent injection events if supported by field data.</p> <p>With respect to the use of sodium sulfite, previous studies have indicated shorter lag times and higher apparent field perchlorate biodegradation may be partially attributed to use of an oxygen scavenger in dilution and chase water. Due to the relatively small volumes of water planned to be injected through this treatability study, the Phase 2 documentation was modified to remove the sodium sulfite from the injectate solution as a cost savings. However, for upcoming larger scale studies (i.e. the Las Vegas Wash Bioremediation Pilot Study), sodium sulfite will be utilized due to the substantial amount of dissolved oxygen that will be introduced through the large amounts of chase water that will likely be required.</p>

Arcadis Comment	NERT Response
<p>Comment No. 6: <i>Continuous inline mixing of EVO solution is recommended in place of larger batch mixing.</i></p>	<p>Tetra Tech has experience in using both in-line mixing and large batch mixing for carbon injections. Based on Tetra Tech’s experience and that of the injection contractor, Cascade, batch mixing has been selected because of the flexibility of operation and real-time field changes that may be necessary. Accordingly, no modifications to the Phase 2 documentation resulted from this comment.</p>
<p>Comment No. 7: <i>A continuous diluted EVO concentration is recommended in place of injecting >25% EVO solution and then chasing with water to make up the balance of the injection volume.</i></p>	<p>The Phase 2 documentation reviewed by Arcadis included the flexibility for Tetra Tech to adjust EVO concentrations in the field due to the success this method has demonstrated in other field studies performed for NERT. Accordingly, no modifications to the Phase 2 documentation resulted from this comment.</p>
<p>Comment No. 8: <i>Additional consideration should be given to the use of an inert tracer for the first injection and monitoring post-injection tracer migration for up to 1 year.</i></p>	<p>The primary purpose of a tracer study would be to assess groundwater flow directions and rates in-situ, presumably with the goal of determining where injected water would migrate. Groundwater flow rates and directions were already assessed in the area during the implementation of Phase 1 activities and will also be assessed prior to injection during Phase 2 activities through a combination of single-borehole dilution testing and a detailed potentiometric gradient evaluation. In addition, the injectate itself acts as a tracer (though not conservative), as does the decrease in perchlorate and nitrate concentrations downgradient. Water with this signature must have contacted the injected material therefore the monitoring proposed for total organic carbon, perchlorate, and nitrate will be used to track groundwater movement through the aquifer. While acknowledging the above, the need for a dye tracer study will continue to be evaluated throughout implementation of Phase 2 activities and could be added during an injection event if deemed that the additional data may be useful. Accordingly, the Phase 2 documentation has been modified for clarity to indicate that a tracer study may be implemented if deemed necessary as a component of the treatability study.</p>
<p>Comment No. 9: <i>Additional cost details were requested with respect to the services to be provided by Cascade proposal.</i></p> <p>Comments No. 10: <i>Additional questions were raised with respect to certain details of the Cascade proposal.</i></p>	<p>Dialogue was exchanged between the Trust, Tetra Tech and Arcadis on the topic. While the Trust feels that due to the scale of this study it is not necessary for Arcadis to review the final Cascade proposal for the Phase 2 efforts, the Trust will ensure future Cascade proposals to be reviewed by Arcadis contain the additional details requested.</p>

Office of the Nevada Environmental Response Trust Trustee
March 29, 2019

Acknowledging successful completion of the third-party review process, it is the desire of the Trust to initiate the Phase 2 efforts as detailed in Attachment A as soon possible. The Trust currently estimates field mobilization can begin within 60 days of receipt of NDEP comments and/or approval of the attachments contained herein. Project updates on all facets of this study will continue to be provided through submittal of monthly progress reports.

If you have any questions or concerns regarding this matter, feel to contact me at (702) 960-4301 or at brian.loffman@lepetomaneinc.com.

Office of the Nevada Environmental Response Trust



Brian K. Loffman, CEM
Senior Program Manager
CEM Certification Number: 2265, exp. 9/21/20

Attachments:

- Attachment A: Galleria Drive Bioremediation Treatability Study Work Plan Addendum
- Attachment B: Galleria Drive Bioremediation Treatability Study Phase 2 Cost Estimate and Basis
- Attachment C: Arcadis Review and Comment Memo on the Galleria Drive Bioremediation Treatability Study

Cc (via NERT Sharefile Distribution):

Jeff Kinder, NDEP, Deputy Administrator
Frederick Perdomo, Deputy Administrator
James Dotchin, NDEP, Chief, Bureau of Industrial Site Cleanup
Carlton Parker, NDEP, Bureau of Industrial Site Cleanup
Weiquan Dong, NDEP, Bureau of Industrial Site Cleanup
Alan Pineda, NDEP, Bureau of Industrial Site Cleanup
Christa Smaling, NDEP, Bureau of Industrial Site Cleanup
Alison Fong, U.S. Environmental Protection Agency, Region 9
Mark Duffy, U.S. Environmental Protection Agency, Region 9
Jay Steinberg, as President of the Nevada Environmental Response Trust Trustee and not individually
Andrew Steinberg, as Vice President of the Nevada Environmental Response Trust Trustee and not individually
Steve Clough, Nevada Environmental Response Trust
Tanya C. O'Neill, Foley and Lardner, LLP
Allan DeLorme, Ramboll
John Pekala, Ramboll
Kim Kuwabara, Ramboll
Derek Amidon, Tetra Tech
Dan Pastor, Tetra Tech
Kirk Stowers, Broadbent Inc.
Kurt Fehling, The Fehling Group

Cc (via NERT Stakeholder Sharefile Distribution):

Betty Kuo, Metropolitan Water District of Southern California
Brenda Pohlmann, City of Henderson
Carol Nagai, Metropolitan Water District of Southern California

Office of the Nevada Environmental Response Trust Trustee
March 29, 2019

Dave Johnson, LV Valley Water District
Eric Fordham, Geopentech
Jill Teraoka, Metropolitan Water District of Southern California
Kevin Fisher, LV Valley Water District
Marcia Scully, Metropolitan Water District of Southern California
Maria Lopez, Metropolitan Water District of Southern California
Mickey Chaudhuri, Metropolitan Water District of Southern California
Orestes Morfin, Central Arizona Water Conservation District
Peggy Roefer, Colorado River Commission
Steven Anderson, LV Valley Water District
Todd Tietjen, Southern Nevada Water Authority

Cc (via NERT BMI Companies Sharefile Distribution):

Anna Springsteen, Neptune Inc.
Kirk Stowers, Broadbent Inc.
Kristen Lockhart, Neptune Inc.
Kurt Fehling, The Fehling Group
Patti Meeks, Neptune Inc.
Paul Black, Neptune Inc.
Paul S. Hackenberry, Hackenberry Associates
John Edgcomb, Edgcomb Law Group
Andrew Barnes, Geosyntec
Brian Waggle, Hargis + Associates
Chinny Esakkiperumal, Olin Corporation
Chuck Elmendorf, Stauffer
Curt Richards, Olin Corporation
Dave Share, Olin Corporation
Ebrahim Juma, Clean Water Team
Ed Modiano, de maximus
Gary Carter, Endeavour LLC
George Crouse, Syngenta
Harry Van Den Berg, AECOM
Jeff Gibson, Endeavour LLC
Joanne Otani, Joanne M. Otani LLC
Joe Kelly, Montrose Chemical
Joe Leedy, Clean Water Team
Kelly McIntosh, GEI Consultants
Kevin Lombardozzi, Valhi
Kyle Gadley, Geosyntec
Lee C. Farris, Landwell
Mark Paris, Landwell
Michael Bogle, Womble Carlyle Sandridge & Rice, LLP
Michael Long, Hargis + Associates
Nick Pogoncheff, PES Environmental, Inc.
Ranajit Sahu, BRC
Richard Pfarrer, TIMET
Rick Kellogg, BRC
Jack Luna, Tronox
John Holmstrom, EMD
Mike Skromyda, EMD