

To:

Nevada Environmental Response Trust
35 E. Wacker Drive, Suite 690
Chicago, IL 60601

Copies:

Jo Wang, Arcadis
Rick Kenter, Arcadis

Arcadis U.S., Inc.

630 Plaza Drive

Suite 200

Highlands Ranch

Colorado 80129

Tel 720 344 3500

Fax 720 344 3535

From:

Jeffrey McDonough, Arcadis
Rich Royer, Arcadis

Date:

August 30, 2021

Arcadis Project No.:

30084088

Subject:

Arcadis Comments on the Revised Las Vegas Wash Zero-Valent Iron Enhanced Bioremediation Treatability Study Work Plan Addendum and the Associated Revised Cost Basis

At the request of the Nevada Environmental Response Trust (the Trust), Arcadis U.S., Inc. (Arcadis) respectfully submits this technical memorandum (memo) summarizing technical cost-focused comments on the *Revised Las Vegas Wash (LVW) Zero-Valent Iron (ZVI) Enhanced Bioremediation Treatability Study Work Plan Addendum* (Revised Work Plan Addendum) and the *Revised LVW ZVI Enhanced Bioremediation Treatability Study Phase 2 Cost Estimate and Basis* (Revised Cost Basis). The Revised Work Plan Addendum and the Revised Cost Basis were authored by Ramboll US Corporation (Ramboll) and dated May 6 and May 27, 2021, respectively.

It should be noted that Arcadis, Ramboll, Tetra Tech, and the Trust participated in various structured collaboration conference calls on March 27, 2020, April 29, 2020, and July 8, 2020, to discuss the project objectives and construction execution as the scope of the treatability study continued to be refined. These collaborative discussions enabled participants to share insights on the scope of the treatability study; therefore, Arcadis has only one technical comment on the scope of the Revised Work Plan Addendum.

- Overall, Arcadis finds the design of the treatability study to be well thought out and implementable. We recommend reducing the scope associated with advanced biological characterization and associated specialty analyses.

Comments regarding the cost details associated with the Revised Cost Basis are presented herein.

ARCADIS COMMENTS

Field-Testing Objectives

With respect to the Field-Testing Objectives (Section 7.1 in the Revised Work Plan Addendum), two objectives have been removed and two objectives have been added. The two objectives removed were “Evaluate hydraulic conditions for potential groundwater mounding and ability to maintain appropriate residence time,” and “Evaluate the appropriateness of selected monitoring parameters and determine appropriate monitoring means and methods for assessing system performance.” The intent of these objectives appears to be captured by rewording the remaining objectives. The two objectives added were “Confirm the results of the laboratory testing demonstrating that nitrate, chlorate, and perchlorate can be fully degraded in the field using ZVI, where ZVI acts as both a reactive media and a source of hydrogen,” and “Evaluate methods of increasing and sustaining the numbers of active perchlorate-reducing bacteria in the subsurface via biological inoculation and nutrient addition.” The addition of these two objectives may be the motivation for increased costs associated with research collaboration with the Colorado State University (CSU). If the Trust elects to forgo some of the research-focused scope, as recommended herein, these Field-Test Objectives may need to be removed or revised.

Trenching Capabilities

On page 7-6 in Section 7.3 (ZVI Emplacement Methods), the text reads “...unlike other trenching methods that could allow layering of backfill materials, the ZVI backfill will need to extend to the ground surface.” The Trust may benefit from learning about Mersino’s one-pass trenching capabilities with respect to layering because it could reduce the requisite ZVI cost. As this would need to be balanced against equipment availability and subcontractor quotes, the Trust may also benefit from more justification for the selection of DeWind’s one-pass trencher.

Specialty Analyses

Section 8.8 (Biological Performance) and 8.9 (Advanced Biological Characterization and Monitoring) do a sufficient job explaining and defining the proposed tasks to apparently accomplish the added Field-Testing Objectives. However, the scope and granularity of these sections appear to be excessive. The Trust may be able to fulfill the more practical overall objective of demonstrating that the introduction of ZVI can effectively and efficiently result in the reduction of site-related constituents of concern in groundwater without this degree of specialty analyses and associated costs.

Revised Cost Basis-Specific Comments

For simplicity, the costs associated with the June 17, 2020 Work Plan Addendum will be referred to herein as Cost #1 and the costs associated with the May 27, 2021 Revised Work Plan Addendum will be referred to as Cost #2. Additionally, it is understood that these costs are intended to be all-encompassing costs and only what is billed to the Trust will be spent. However, the Trust may benefit from parsing out contingency separately from the planned scope, which will provide more clarity on the likely cost.

- Cost #2 is approximately \$1,945,822 higher than Cost #1. This increase is distributed as follows: 56.6% increase in labor costs, 35.6% increase in subcontractor costs, and 7.8% increase in other direct costs (ODCs).
- The labor cost increase was calculated to be approximately \$1,102,259. A comparatively small portion of this increase (~\$137,870) was attributed to increased labor rates for the various job functions and will not

be further discussed. The larger increase (~\$1,008,571) is due to the 7,167 overall hours increase between Cost #1 and Cost #2. The following bullets highlight the distribution of this increase so that the Trust may better evaluate whether these increases are necessary.

- On a task basis, the largest increases in labor costs are associated with: Task 1.1 (Access and Permitting; ~128.1% increase), Task 1.2 (Pre-Construction Pilot Borings and Monitoring Well Installation; ~232.7% increase), Task 1.4 (Baseline Aquifer Testing; ~53.4% increase), Task 1.7 (Post-Construction Monitoring Well Installation; ~45.3% increase), Task 1.9 (Performance Monitoring; ~102.2% increase), and Task 2 (Reporting; ~49.4% increase).
- Approximately 71.6% (\$789,558) of the total \$1,102,259 labor cost increase is associated with Tasks 1.1, 1.2, and 1.9.
 - Labor costs associated with Task 1.1 increased from ~\$73,705 to \$168,157; however, the text between the Cost Basis and the Revised Cost Basis appears to be largely similar. The Trust may benefit from more granularity around this labor cost increase.
 - Labor costs associated with Task 1.2 increased from ~\$59,306 to ~\$197,285. Based on a comparison of the Cost Basis and Revised Cost Basis documents, this appears to be related to 17 additional pre-construction borings, 6 additional borings in the Test 2a/2b/2c location, and specialty analyses related to X-ray diffraction, passivation testing, and biological inoculum development. If the Trust elects to pursue these additional analyses, it is logical that the subcontractor and analytical laboratory costs would increase. However, the Trust may benefit from further justification as to the substantial increase in labor cost.
 - Labor costs associated with Task 1.9 increased from ~\$544,968 to ~\$1,102,095. Based on a comparison of the Cost Basis and Revised Cost Basis documents, the number of monitoring wells monitored appears to increase from 57 to 94 monitoring wells. However, the sampling will be conducted by a subcontractor (OGI Environmental, LLC) whose cost appears to have increase from ~\$89,760 to \$146,740. The Revised Cost Basis does include more detail with respect to advanced biological analyses with CSU and Microbial Insights, but the Trust may benefit from further justification associated with the sizable labor cost increase.
 - If the substantial increase in labor costs is mostly attributable to sample collection, data management, and data evaluation associated with increased specialty analyses, then Arcadis recommends that the scope of these specialty analyses be considerably reduced to only that data which support a practical evaluation of the effectiveness of the treatability study and provide critical information to refine the basis of design parameters.
- The increases in Subcontractor costs appear to be due to three changes.
 - First, some of the subcontractor costs included in the Revised Cost Basis were not included in the Cost Basis and this may be related to the construction implementation discussion on July 8, 2020. Site Grading (\$27,390), Dirt Road Reconfiguration (\$23,650), Bench Down Area Excavation (\$60,060), Backfill Mixing for ZVI Borings (\$26,180), Bench Down Area Backfilling (\$72,160), and Security (\$69,790) represent ~\$279,230 (~40.3% of the total subcontractor cost increase) and are necessary costs to implement the treatability study.
 - Second, there appears to be an unexplained increase in the subcontractor quotes. For example, clearing and grubbing is a line item in the Earth Resource Group quote for \$47,500. Clearing and

grubbing has been entered into Table 1: ZVI-Enhanced Bioremediation Treatability Study Phase 2 Cost Estimate as \$57,640, a 21.3% increase. There are many instances where this appears to have occurred, ranging from analytical laboratories to construction subcontractors to materials quotes. A list of these cost differences follows with the calculated percentage increase listed in parenthesis: Prima (31%), BC Bioaugmentation Injection (16%), Sirem (88%), CSU (62%), BC Drilling (15%), DeWind (24%), Earth Resource Group (21%), Fence Installation (264%), OGI Environmental (16%), ZVI (32%), Multi-sensor sticks (16%), Survey (38%), and GPR (16%). The Trust may benefit from a clear justification as to why the provided subcontractor quotes have been increased in Table 1. These increases constitute a \$632,566 increase versus the subcontractor quotes. If the subcontractor quotes were insufficient to cover the estimated scope, then revised subcontractor quotes should be requested to match those subcontractor costs listed in Table 1 for transparency.

- Third, more breadth was added to the advanced biological characterization and new multi-sensor sticks were added to the scope. These additions, which appear to comprise ~\$508,560 in subcontractor costs, may be excessive. In the collaborative discussions, it was recommended that the advanced biological characterization be reduced to only that scope which supported the Field-Testing Objectives. This may be why new Field-Test Objectives were added. The Trust may benefit from a considerable reduction in the scope and costs allocated for advanced biological characterization and multi-sensor sticks. While difficult to infer from the Revised Cost Basis document, a considerable reduction in these areas may also translate to a considerable reduction in labor and subcontractor costs (potentially associated with Task 1.9).
- The ODCs represented a comparably smaller percentage of the total cost increase (7.8%); however, the ODCs did increase from \$280,497 to \$431,706 (54%). Correspondingly, the largest percentages of this ~\$151,209 increase are associated with Task 1.7 (17.9%), Task 1.8 (48.6%), and Task 1.9 (21.0%), which is reasonable for the scope described. Refinements to the scope associated with Task 1.2 and Task 1.9 with respect to labor costs discussed above should have a corresponding influence on the requisite ODCs.

CLOSING COMMENTS

Arcadis appreciates the opportunity to review the Revised Work Plan Addendum and the Revised Cost Basis. The proposed Revised LVW ZVI Enhanced Bioremediation Treatability Study describes an in situ anaerobic treatment mechanism using ZVI to address elevated concentrations of perchlorate, chlorate, and nitrate. Notwithstanding the excessive specialty analyses, the proposed scope of work is appropriate and is anticipated to be a successful field-scale demonstration of ZVI chemistry to the extent practicable. The cost-focused comments presented herein are intended to provide the Trust with more clarity around the nature of some of the costing assumptions and recommends a reduction in the scope of the specialty analyses. Arcadis is pleased to answer any questions the Trust may have on our comments presented in this memorandum.