3. Responsiveness Summary

The Responsiveness Summary serves three purposes. First, it provides the U. S. Army, USEPA, and TCEQ with information about community concerns with the preferred alternative at LHAAP-47 as presented in the Proposed Plan. Second, it shows how the public's comments were considered in the decision-making process for selection of the remedy. Third, it provides a formal mechanism for the U.S. Army to respond to public comments.

The U.S. Army, USEPA, and TCEQ provide information regarding LHAAP-47 through public meetings, the Administrative Record for the facility, and announcements published in the Marshall News Messenger. **Section 2.3** discusses community participation on LHAAP-47, including the dates for the public comment period, the date, location, and time of the public meetings, and the location of the Administrative Record. The following documents related to community involvement were added to the Administrative Record:

- Transcripts of the public meetings on January 9, 2013 and July 21, 2021.
- Presentation slides from the January 9, 2013 and July 21, 2021 public meetings.
- Written questions and comments from the public during the public comment period, and the U.S. Army response to those comments.

3.1 Stakeholder Issues and Lead Agency Responses

This section responds to significant issues raised by stakeholders including the public and community groups that were received in written or verbal form.

3.1.1 2021 Revised Proposed Plan, Public Meeting and Presentation Comments

Question/Comment: Has the Army implemented thermal treatment technology at any other sites?

Response: *The Army has not implemented these technologies at this point but have confidence that it will work at Longhorn. ISB would not be effective to treat the residual DNAPL areas, and excavation would not be feasible due to the depth of contamination and total volume that would have to be removed. Dewatering would also be an issue for excavation.*

Question/Comment: Is there a schedule or timeline for implementing thermal technology at the other two Longhorn sites where it is planned?

Response: *Thermal treatment is planned at both LHAAP-29 and LHAAP-18/24. LHAAP-18/24 will likely be the first site, with RD to be completed in mid-2022, and remedy construction and implementation in 2023. LHAAP-29 might possibly be first, depending on additional investigation required to complete the RD. Simultaneous implementation at these two sites is not expected.*

Question/Comment: Where will the power for this come from?

Response: *Power is anticipated to be connected to the lines operated by the co-op that run near the site. This will be evaluated and details for getting power to the site will be developed as part of the RD.*

Question/Comment: What temperature do you need to heat the groundwater to for the technology to work?

Response: *Heating is usually to near the boiling point of water. Heating was to about 90 degrees Centigrade at an Air Force site.*

Question/Comment: None of the metals really represent a problem except for arsenic. If you want to establish a cleanup level for metals at any site, either the MCL should be used or the background study should be redone to obtain reliable values. Was there current testing done for arsenic at Building 46A?

Response: *Arsenic is a naturally occurring metal that is present in groundwater across the state and it has been demonstrated at Longhorn that it is present naturally in site groundwater. Elevated levels of arsenic in LHAAP-47 groundwater data may be the result of suspended particulates (high turbidity). Low-flow sampling is frequently utilized to reduce turbidity during sample collection. Arsenic can also be temporarily mobilized by reducing conditions that may be present within contaminant plumes. Once the plume is remediated, the reducing conditions no longer exist and the arsenic will return to a less soluble form and not occur at such high concentrations in groundwater. Please refer to Appendix B of the Feasibility Study (Shaw, 2011) for a thorough discussion and analysis of arsenic in groundwater at LHAAP-47.*

The PSI conducted for the Building 46A area focused on VOCs due to the discovery of TCE DNAPL and metals were not tested during that effort. Arsenic and other metals have been included as part of LTM and the need for post-remedial monitoring and evaluation of arsenic concentrations can be done at that time.

Question/Comment: The Army's cleanup standard for perchlorate in groundwater is a risk-based level of 26 µg/L. However, the EPA has decided to regulate perchlorate under the Safe Drinking Water Act and has established an Interim Drinking Water Health Advisory of 15 µg/L. The EPA and the Army are currently discussing this issue. Pending the outcome of discussions with the EPA, the Army should assume that the perchlorate cleanup level will be 15 µg/L, and plan accordingly.

Note - the purpose of excavating perchlorate contaminated soils will be to protect the underlying groundwater. A more stringent perchlorate groundwater standard may mean that the cleanup standard for soils will also have to be more stringent.

Response: *The groundwater cleanup level for perchlorate is 17 µg/L the TRRP Tier 1 PCL for residential groundwater use as established through the dispute resolution process. The potential for groundwater impacts from perchlorate will be evaluated as part of the LTM program and if it appears that perchlorate levels are not decreasing, the need for additional action will be evaluated.*

Question/Comment: Surface Water Modeling. The Army recognizes the deficiencies in modeling performed to assess the effect of groundwater contaminants on surface water in Goose Prairie Creek. The Army will re-do the modeling. This is the correct course of action.

Response: *As noted, surface water modeling will be updated as part of the RD.*

3.1.2 2013 and 2021 Proposed Plan, Public Meeting and Presentation Comments

The following comments were received for both the 2013 and 2021 public meetings/public comment periods.

Question/comment: Time to complete cleanup. All of the alternatives evaluated by the Army have an estimated cleanup time of more than 100 years. It is not possible to determine whether this is a reasonable length of time because the Army did not design an alternative with a significantly shorter cleanup time. Remediation methods that might result in shorter cleanup times include:

- Bioremediation or pump and treat in areas beyond the hot spots.
- Air sparging/vapor extraction in areas beyond the hot spots.
- Horizontal wells or trenches along the axes of contaminant plumes.

Recommendation: The Army should design and evaluate at least one alternative that will result in a cleanup time that is significantly less than 100 years.

Response: *Based on the extents of the TCE and perchlorate plumes, and current concentrations, any alternative that is designed to achieve cleanup time shorter than 30 years (or significantly shorter than 100 years) will cost at least an order of magnitude more than the current alternatives evaluated. As shown below for comparative analysis, a cost estimate was developed for a remedial scenario in which ISB using EVO will be implemented in a combination of grid and biobarriers across the entire TCE and perchlorate plumes in the shallow and intermediate zones. The objective of this scenario is to reduce the time frame to achieve cleanup levels by actively targeting the entire TCE and perchlorate plumes. The total estimated time frame for this scenario is ten years including remedial action, O&M, and LTM. The table below provides a summary of the estimated costs.*

Remedial Activity	Estimated Cost (1)
Remedial Design	$315,592
Remedial Action	$15,779,620
Operation and Maintenance	$64,822,490
Long-term Monitoring	$423,525
TOTAL	**$81,341,227**

(1) The estimated cost was developed using Remedial Action Cost Engineering and Requirements software (AECOM, 2013b), accepted for government environmental project estimating purposes.

Based upon the reuse of the property as a wildlife refuge, the high cost of this alternative makes it unreasonable to carry forward beyond this point in the CERCLA process. It is also noted that implementation of this aggressive approach would not ensure that cleanup goals will be met given the properties of the COCs and the type and complexity of the hydrogeologic regime. In addition, ISB or biobarriers would not be effective to treat the newly discovered residual TCE DNAPL since the high concentrations are toxic to the microbes needed to metabolize the TCE and other VOCs. The proposed thermal treatment is anticipated to reduce TCE concentrations by more than 99% within the estimated implementation duration of 137 to 183 days.

Question/Comment: Evidence that natural attenuation is occurring. The Army cites reduction in contaminant concentrations in specific wells as evidence that natural attenuation is occurring at LHAAP-47. However, while natural attenuation appears to be reducing perchlorate and PCE concentrations, it is not as effective for TCE.

TCE is the most widespread contaminant at LHAAP-47, but TCE concentrations are decreasing in only about half of the contaminated wells. In the remainder of the wells, TCE concentrations either fluctuate without a clear trend, or are increasing.

Because TCE is so widespread, the overall effectiveness of natural attenuation at this site is questionable.

Response: *As indicated in the Proposed Plan, if MNA is not found to be effective, a contingency remedy may be implemented. This MNA evaluation will be completed after 8 quarters of monitoring.*

Question/Comment: Evaluation of MNA Effectiveness. The Army would use several criteria to determine whether natural attenuation is reducing contaminant concentrations at an acceptable rate. However, the Army's primary criterion is vague:

- Demonstrate that MNA is occurring according to the expectations.

Recommendation: The Army should use quantifiable criteria to determine whether natural attenuation is reducing contaminant concentrations at an acceptable rate (e.g., a reduction in contaminant concentrations by a given percentage within two years).

Response: *The USEPA Guidance Document, Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater (USEPA, 1998) will be used to evaluate MNA remedy. In addition, as indicated by the TCEQ, the non-parametric Mann-Kendall statistic may be used to evaluate solute plume stability. Specific quantifiable criteria that may be used will be discussed in the RD.*

Question/Comment: Estimation of natural attenuation rates. The Army calculated contaminant half-lives as a means of estimating natural attenuation rates. However, most of the half-life calculations do not satisfy the EPA's requirement for performing the calculations. The EPA states that a decrease in contaminant concentration of at least one order of magnitude is necessary in order to reliably calculate a half-life (rate law). Only eight of the 21 calculations meet this requirement.

Recommendation: The Army should not use any half-lives that do not satisfy the EPA's requirement.

Response: *The calculated half-lives that were previously used were based on preliminary data available at the time. As part of MNA evaluation, estimation of natural attenuation rates will be performed in accordance with EPA's requirements using the Guidance Document Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater (USEPA, 1998).*

Question/Comment: Estimating hydraulic conductivity. The Army used slug tests to estimate hydraulic conductivity. However, estimates of hydraulic conductivity based on slug test data are subject to large errors. Slug test data are often affected by a 'skin effect' that is caused by incomplete development. This results in estimates of hydraulic conductivity that are too low. Because calculated groundwater flow rates are directly proportional to the hydraulic conductivity, any groundwater flow rates based on the slug test data will probably be low.

Recommendation: The Army should not rely on data from slug tests to estimate hydraulic conductivity. The Army should use a more reliable method, such as pumping tests.

Response: *Limitations to slug test data are acknowledged. Provided water table conditions are amenable for a pump test, limited aquifer pump testing may be performed during RD to validate/refine previous hydraulic conductivity estimates (and, thereby, groundwater flow rates).*

Question/Comment: Metals. High concentrations of metals are present in groundwater (e.g., arsenic, cadmium, thallium), but the proposed cleanup plan does not directly address metals. Instead, the Army states: *Monitoring will be performed to track metals concentrations for future potential treatment or elimination as COCs.* This statement does not specify how, or when, the Army would decide to implement cleanup methods designed for metals.

Recommendation: The Army should develop explicit and quantifiable criteria to address the cleanup of metals.

Response: *Many metals are believed to be present due to turbidity or well-corrosion and not due to CERCLA releases. It is also possible that some exceedances are associated with presence of VOCs in groundwater. No explicit treatment is directed at reducing metals because of the small percentage of hazard associated with them (2.5% of non-carcinogenic hazard). Metals will be monitored during the remedy implementation. While metals may potentially increase in concentrations during ISB implementation, they typically attenuate without additional treatment. The RD will discuss specific criteria to address metals' cleanup.*