Comments on
"Monitored Natural Attenuation Evaluation Report – Draft,
Brown & Bryant Superfund Site," Prepared by Eco & Associates, dated June 29, 2012

Comments prepared by
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On July 19, 2012 the US EPA forwarded the following report to us for our review as TAG Technical Advisors to CBA:

Eco & Associates, "Monitored Natural Attenuation Evaluation Report – Draft, Brown & Bryant Superfund Site," Prepared for US Army Corps of Engineers, Albuquerque, NM, Report of Eco & Associates, Orange, CA, June 29 (2012).

Presented below are excerpts and our comments on that draft, referred to herein as the "draft evaluation report."

The introduction to the draft evaluation report states on Page 1:
"1.0 Introduction
This report provides the evaluation of the Monitored Natural Attenuation (MNA) for the B-Zone groundwater at the former Brown & Bryant, Inc. (B&B) Superfund Site (hereafter, referred to as the "Site") located in the City of Arvin, Kern County, California (Figure 1 — Site Vicinity Map and Figure 2 — Site Map). MNA was selected as the remedy for the OU-2 B-zone groundwater at the Site, as described and documented in the ROD (EPA 2007)."

"This report was prepared in general conformance with the MNA Evaluation workplan prepared by Eco & Associates, Inc. (Eco, 2012). The report purposes and objectives are described below in Section 1.1."

We have commented on technical aspects of the workplan and discussions of it in:

Lee, G. F., and Jones-Lee, A., "Comments on Eco & Associates, 'Final Site-Specific Work Plan [Monitored Natural Attenuation] Brown & Bryant Superfund Site in Arvin, CA,' Contract No. W912PP-10-D-0014, Prepared for US Army Corps of Engineers, Albuquerque, NM, by Eco & Associates, Orange, CA, January 26, 2012," Comments submitted to CBA by G. Fred Lee & Associates, El Macero, CA, March 29(2012). http://www.gfredlee.com/CBA_BBSite/2012/Eco_MNA_WP_comments.pdf

as well as in the following report on a meeting held with the US EPA to discuss the workplan briefing document prepared by Eco & Associates:

Lee, G. F., and Jones-Lee, A., Email to B. Davila, US EPA Region 9, Re: May 1, 2012 meeting on MNA at B&B Superfund Site, email from G. Fred Lee & Associates, El Macero, CA, May 1 (2012). http://www.gfredlee.com/CBA_BBSite/2012/May1MeetingUSEPA.pdf

The Eco & Associates June 29, 2012 draft evaluation report also states on Page 1:

"*1.1 Report Purposes and Objectives*
A preliminary evaluation of MNA at the Site is performed based on the application of the USGS's Natural Attenuation Software (NAS) model using site-specific data and evaluation of the data for performing trend analysis. The MNA evaluation addresses whether natural attenuation is occurring at the Site based on the estimated rate of attenuation for each COC.

The main objective of the evaluation was to assess that the B-zone groundwater Cleanup Levels (CLs) can be reached and that the estimated timeframe to reach these CLs is reasonable."

Technical deficiencies in, and concerns attendant to, reliance on the modeling approach used and in the use of model output as prescribed have been discussed in several of our reports to CBA, including the reports cited above.

Section 2.0 of the draft evaluation report, which begins on Page 2, addresses "Site Conditions and Background." The information in that section is basically the same as that upon which we have commented in previous reports to CBA that are on the CBA website at http://www.gfredlee.com/CBA_BBSite/bbdoc.htm.

"Table 1: B-Zone Contamination of Concern and Cleanup Levels" on Page 4 of the draft evaluation report contains the same error in the listing of the chloroform cleanup level at 80 ug/L. As we have discussed in previous comments, the 80 ug/L level is the regulatory limit that the US EPA allows for chloroform in domestic waters that have been treated with chlorine for disinfection. That concentration is inappropriate for use as a cleanup level for chloroform-polluted groundwater.

The bulk of the draft evaluation report is devoted to discussing the approach used by Eco & Associates to evaluate the use of the NAS software for assessing the potential for MNA to provide cost- effective remediation of the pollution of B-zone groundwater. That discussion and analysis was based on highly limited data available; given the limitations of those data, the Eco & Associates approach to analysis of this issue appears to be appropriate.

The draft evaluation report's "Conclusions," beginning on Page 18, state:
"*6.0 Conclusions*
MNA in the B-zone was evaluated by use of the NAS modeling software and by use of trend analysis. The attenuation of COCs in the B-zone has been assessed quantitatively and qualitatively. On a preliminary basis, the evaluation shows that all COCs appear to be naturally attenuating. Along flow direction B, the attenuation is expected to take another 30 years or more. There is less contamination along flow direction A and this will likely attenuate over the next 10 to 15 years.

The use of the NAS Software was to conduct the analysis and report the results for preliminary evaluation as to whether the model is suitable for use in MNA assessment of the B-zone. The results have provided time to remediation along the considered flow paths. Additional simulations may need to be completed for a more comprehensive evaluation on a well-by-well

basis. Additional analysis may also be necessary as the B-zone boundary conditions are better defined for COCs where there is greater than cleanup levels concentrations in the outermost well.

Based on the trend analysis results using Mann-Kendall and regression statistical analyses of the available data in the B-zone groundwater monitoring wells, the natural attenuation processes appear to be contributing to the degradation of COCs in B-zone aquifer. The concentrations of COCs in most of the groundwater monitoring wells show statistically significant negative trend for most of the contaminants of concern.

The following items need consideration because of this preliminary evaluation of MNA in the B-zone:

1. *Is the NAS software a suitable tool for use at the B&B site? If it is, the protocol for its further use requires definition and its comprehensive use described. If not, alternative approaches to quantitatively assessing MNA need to be explored and attempted. It is expected that this report will serve as a basis for this discussion as it is reviewed amongst the regulators and other parties to the project.*
2. *Since source control in the A-zone is essential, it is difficult to quantitatively assess B-zone MNA because added loading at the source is not known and not incorporated into the analysis. The timing for further MNA quantitative assessment should be evaluated in relationship to the effective implementation of source control in the A-zone."*

We find that these conclusions are appropriate in that the groundwater pollution that has been documented to have occurred at the B&B site does not appear to be migrating at a rapid rate to the Arvin municipal water supply wells. It also appears that the currently identified pollution of the B-zone groundwater is slowly and naturally attenuating. Under these conditions, the key to the rate of B-zone groundwater remediation by MNA will be the extent to which the release of pollutants from the A-zone to the B-zone is controlled.

In connection with our review of the Eco & Associates workplan for the MNA and our discussion of the May 1, 2012 meeting with the US EPA, DTSC, Corps of Engineers, and Eco & Associates (the Corps of Engineers contractor responsible for developing and implementing the MNA) (both reports are referenced above), we developed the following discussion of issues that needed to be considered in developing and implementing B-zone remediation using MNA:

Lee, G. F., and Jones-Lee, A., "Comments on Issues Discussed of US EPA/TAG May 1, 2012 Meeting on the US EPA CBA B&B Superfund Site Devoted to the Plan for Implementation of Monitored Natural Attenuation," Comments submitted to CBA by G. Fred Lee & Associates, El Macero, CA, May 14 (2012). http://www.gfredlee.com/CBA_BBSite/2012/Comments_May1_2012_Mtg.pdf

In reviewing the June 29, 2012 Eco & Associates draft MNA evaluation report we found that many of the issues that we raised in our comments on the proposed MNA workplan have still not been addressed by Eco & Associates. Presented below are excerpts from our May 14, 2012 briefing report comments that address some of those key issues that remain to be addressed.

"*Reliability of USGS NAS MNA Model*

Page 2 of the briefing document summarizes the potential use of the USGS NAS Model by Eco & Associates in evaluating the use of MNA at the at the B&B Superfund site. Eco & Associates mentioned that this model has been widely used in MNA evaluation at other sites. Dr. Lee asked for information on where this model had been found to be reliable for predicting the MNA at other sites. Eco & Associates staff stated that this model was based on the USGS MOD flow model that is widely used. Dr. Lee stated that wide spread use does not necessarily led to reliable results in predicting fate, transport and persistence of pollutant in groundwaters. Dr. Lee indicated that he has considerable expertise and experience in groundwater quality model evaluation through his previously serving as a member of the Journal Ground Water editorial board where he was responsible for reviewing papers on groundwater quality issues. Also Dr. Lee is currently a member of the Water and Environmental Modeling Forum steering committee. The CWEMF has as a primary focus review of the reliability of water transport and quality models including groundwater models for the Central Valley of California. Dr. Lee responded to a Eco & Associates staff statement about the widespread use of the USGS MOD flow model implying that it had been found to be a reliable model that the CWEMF has found that the this model has never been independently peer reviewed. This is an issue that is under review by CWEMF at this time. Information on CWEMF is available at http://cwemf.org/. Dr. Lee stated as he has stated in his comments on the Eco & Associates MNA report reference above that modeling cannot be reliably used to evaluate the effectiveness of the MNA approach for remediation of the B-zone groundwater at the B&B Superfund site because of the large number of modeling parameters such as those listed on page 3 Table 2 Description of Parameters and Data Sources for which there is inadequate site specific information for the B-zone groundwater and the complexity of this zones aquifer system. The effectiveness of MNA will have to be evaluated based on the actual decrease in the concentrations of COCs in the B-zone groundwater over time through trend analysis.

Page 4 of the meeting briefing document presents Table 3 Value(s) Obtained for NAS Model that are to be used in the MNA modeling effort. It will be important that the range of the values found for the area groundwater needs to be evaluated/listed to understand the range of values that can impact the modeling results."

The Eco & Associates June 29, 2012 MNA draft evaluation report does not provide the requested information on previous use of the USGS NAS MNA Model where it has been independently documented to be reliable.

"*Adequate Groundwater Monitoring Well Array*
Eco & Associates staff stated that there are 23 groundwater monitoring wells in the B-zone groundwaters. With respect to using the existing groundwater monitoring wells to monitor MNA effectiveness, Dr. Lee asked whether there are a sufficient number of existing groundwater monitoring wells to adequately evaluate the effectiveness of MNA and to characterize the COC plumes. He indicated that based on his experience that there is need for additional monitoring wells to properly characterize these plumes. Contrary to the statement made in the Eco & Associate January 2012 MNA report there will be need for additional groundwater monitoring wells to better define the COC plumes in the B-zone groundwater. As the May 1 meeting Eco & Associates staff indicted that additional groundwater monitoring wells will be needed to properly evaluate the progress of the MNA approach. The Eco & Associates staff indicated that it has

already found that through the development of four additional monitoring wells the COC plumes had spread further than previously reported. Dr. Lee indicated that there is need to perform a critical evaluation of the current monitoring well array for its adequacy in defining the COC plumes and especially any changes in these plumes as a result of decreased input of pollutants form the A-zone. This evaluation will require that a special evaluation/report be developed on this issue and periodically updated as additional groundwater quality monitoring data is obtained.

The Eco & Associates June 29, 2012 MNA draft evaluation report does not provide a discussion of the adequacy of the existing groundwater monitoring well array to reliably define the persistence of pollutants in the B-zone as discussed in our comments on the Briefing document.

"*As discussed in our previous report referenced above it may be a number of years before there will be significant changes in the concentrations of COC in the B-zone groundwater because of the continued addition of pollutants from a A-zone. Because of the great uncertainty of the effectiveness of the removal COCs in the A-zone by the proposed larger diameter extraction wells that are scheduled to be install this summer it may be a number of years before the flux of COCs from the A-zone to the B-zone will be significantly decreased so as to impact the B-zone groundwater concentrations under the site.*"

The Eco & Associates June 29, 2012 draft evaluation report acknowledged that the key to effective implementation of the MNA for the B-zone is the control of pollutant input from the A-zone. At this time it is not possible to reliably define the duration of MNA for the B-zone since the potential effectiveness of A-zone pollutant migration to the B-zone is not predictable.

Based on the current information and with the current deficiencies in the information base, we support the watchful and judicial use of MNA for cost-effective control of B-zone groundwater pollution. The efficacy and sufficiency of this approach should be followed closely through appropriate monitoring of groundwater pollution, until acceptable concentrations are reached and sustained; greater attention, however, needs to be paid to reviewing, and keeping current, the list of COCs for presently unrecognized pollutants and pollutant transformation products. The efficacy of the MNA should also be re-evaluated every five or so years to assess the reliability of the initial approaches and conclusions concerning the threat to the Arvin municipal water supply wells posed by pollutants in the B-zone groundwater. If the assessment of this threat changes in the future to reveal a greater threat to water quality than is currently anticipated, more aggressive groundwater pollution remediation approaches, such as pump-and-treat methods, should be expeditiously implemented.