HARPETH RIVER
WATERSHED ASSOCIATION

"Protecting the State Scenic Harpeth River and Clean Water in Tennessee Since 1999"

January 11, 2016

Justin Meredith
TDEC Division of Remediation
William Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue
14th Floor
Nashville, TN 37243

Via Electronic Mail

Re: proposed final Corrective Action Plan by Egyptian Lacquer Manufacturing Company

Dear Mr. Meredith:

The Harpeth River Watershed Association submits these comments on the proposed final Corrective Action Plan (FCAP) by Egyptian Lacquer Manufacturing Company for its groundwater contamination of solvents that was first discovered in early 2007. These comments include a technical review by Mark Quarles of Global Environmental. HRWA has been involved with the contamination issue since the *Tennessean* first began writing stories about the "cat pee" smell in downtown Franklin. HRWA has assisted in identifying the seeps in the Harpeth River, conducted dissolved oxygen studies in the main Harpeth in the vicinity, funded expert review of the first and second proposal Corrective Action Plans, and worked with the neighbors and nearby Battleground Academy elementary school to help provide information and encourage their involvement in various investigations. These comments on the final proposal CAP also include as attachments the comments and technical review of the second CAP in 2008 and initial CAP in 2007 so that TDEC has a complete set of material.

While obvious efforts have been made by ELMCO to clean up contaminated soil and groundwater on-site, these efforts have not been very successful and significant fundamental flaws still remain that result in ELMCO not meeting its obligations under the June 2007 Consent Agreement and Order. In addition, the proposal FCAP does not meet basic requirements of EPA's RCRA criteria for Corrective Action Plans (see Quarles comments for details and citations.)

As a result, the proposed FCAP needs to be rejected and effort put toward re-initiating treatment of the contaminated groundwater using biostimulation approaches that enhance natural degradation processes with bacteria. The USGS lab study funded by TDEC and

presented at the December public information session demonstrated that this approach would work. This was after a year of such treatment was funded by ELMCO and performed by AquAeTer from 2010-2011. The treatment effort by AquAeTer was the result of a lawsuit brought by neighbors against ELMCO. Data from AquAeter's reports to TDEC that can be found on the TDEC ELMCO web site indicate that treatment was working (September 2013 AquAeter report). Nonetheless ELCMO chose not to continue for a second year.

ELMCO from the beginning has shown strong reluctance to treat the contamination without state or private entities pushing it. The Final CAP has little mention of the biostimulation treatment performed by AquAeTer (page 25-26). The Final CAP mentions dye trace testing of groundwater flow and bench-scale treatability testing, but none of this is available on the TDEC web site. AquAeTer is not able to provide these reports because they were performed for ELMCO. TDEC needs to request these reports so they can be part of the discussion on how to design new treatment of the groundwater.

A key component of ELMCO's FCAP is Monitored Natural Attention (MNA) which is layman's terms means to "let mother nature takes its course." This can be an appropriate remediation, but only in certain conditions that are not met on this site. ELMCO proposed MNA in their first CAP that TDEC found deficient. The same reasons apply to this FCAP. EPA requirements for approving MNA requires a thorough investigation of the nature and extent of the contamination which continues to be a problem. The contamination plume and pathway(s) have not been well defined nor the extent and amount of contamination (see Quarles reports for details). Equally important, MNA is also not appropriate in complex geologic conditions (such as karst or limestone bedrock) which are the geological conditions in this area, when the contamination plume migrates off site. The continuing contamination of Liberty Creek with seeps of contaminated groundwater are proof of continuing migration of solvents.

MNA is appropriate if letting nature takes its course will be "protective of human health and the environment." HRWA's recent sampling of the main seep on December 11, 2015 found concentrations of toluene at 173 mg/L and 179 mg/L. (See Test America Lab Report Attachment 2). This is over 100 to nearly 200 times the Regulatory Level of Concern of 1 mg/L for Toluene. These recent concentrations are at the levels toluene has been in the main seep since 2008 and contradict ELMCO's main premise for the final CAP, that concentrations of solvents are diminishing and "will be naturally attenuated within a relatively few years to levels that pose no risk" (p. 88-89 of FCAP). The concentration of Toluene in the main seep were below 50 mg/L in early 2015 according to Table 1 of the FCAP for the first time, but this can be attributed to the seasonal movement of groundwater and continued migration of contamination. Also, the Oct. 5. 2015 sampling result of 0.140 mg/L toluene is likely an error and a sample of water from the creek instead of the seep. The concentration of toluene at the personnel crossing in the creek is also 0.176 mg/L. Triad had a similar sampling error noted for September 2012 and redid the sampling. HRWA's two samples in December can be considered that resampling to accurately sample the seep versus the creek which dilutes the groundwater.

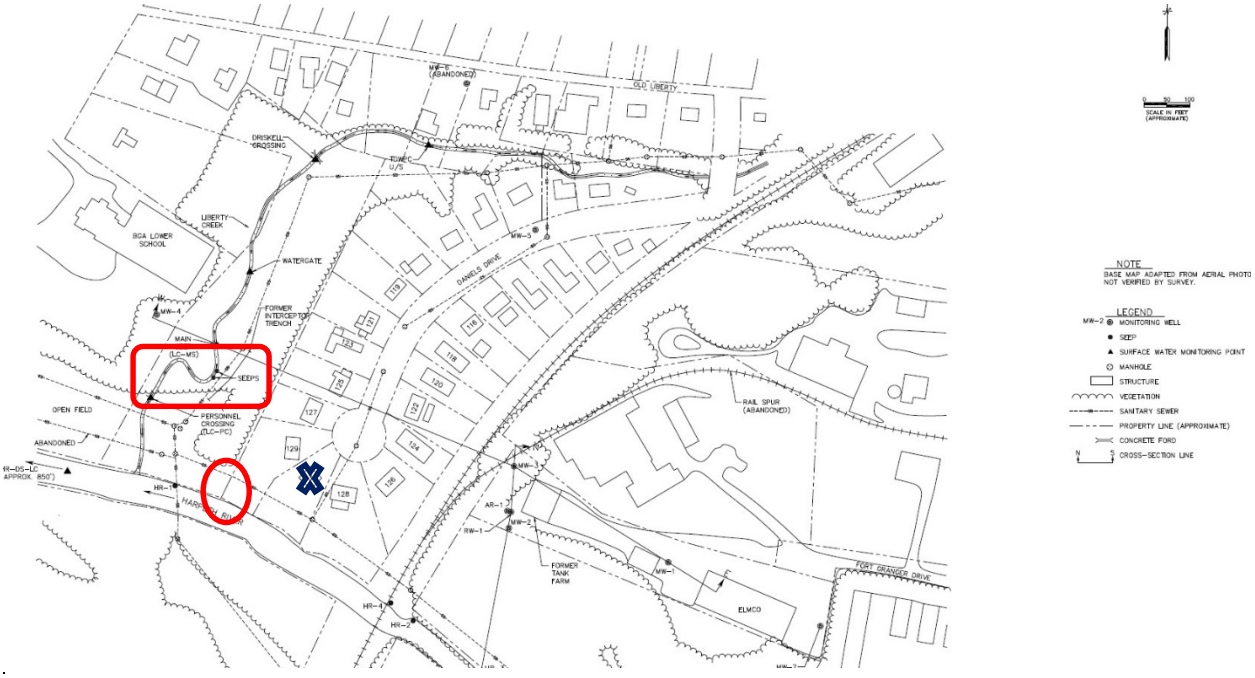
The FCAP characterizes the contamination as residual. This can not be supported by the data on the FCAP. In addition to HRWA's samples, the monitoring well data at ELMCO's site shows that toluene continues to be a 300-600 times Regulatory Levels of Concern. The September 2015 concentration was 598 mg/L! This is hardy residual contamination. The FCAP acknowledges that groundwater contamination still exists at ELMOC's site, yet proposed to do no treatment to remove or destroy it via biostimulation or other means, nor does the FCAP propose any treatment of the contamination off site and still flowing into Liberty Creek under people's homes. Nor does the FCAP propose any means to limit access for children to play in Liberty Creek which is easily accessible. The concentration reported at the main seep in December from HRWA sampling of 173 mg/L and 179 mg/L clearly indicate that the source/pathway to the main seep continue to pollute waters of the US and pose ecological risk the Liberty Creek and health risk to anyone who stirs up the contaminated areas in Liberty Creek.

In addition, EPA CAP guidelines to be "protective of human health and the environment" means concentrations need to be below EPA risk levels. This is not the case. Quarles' Technical report has a table comparing the concentrations in Liberty Creek that are higher than chronic and/or acute ecological screening values for surface water. The sampling in Liberty Creek at the "water gate" is upstream of the main seep and shows that there is another pathway for contamination to the creek than the main seep. Concentrations in the creek at that location are at or above the EPA 2015 chronic screening levels. The risk assessment work done in 2008 for this site is based on old EPA risk levels (see Quarles).

In addition, the risk to people in the Liberty Creek to inhale fumes of solvent is very real. When one goes to sample the main seeps, it is imperative to wear a respirator or else suffer from severe headaches after exposure to the fumes that tend to kick up when the contaminated area is disturbed. TDEC was concerned about this risk to children and required a risk assessment in 2012. Unfortunately, this study needs to be redone since it was based on ONE sample and did not simulate someone, likely a child, stirring up the contaminated areas of bacteria and leaf litter. Because of the risk of inhalation of fumes it is incredible that none of the CAPs have proposed to limit access to liberty Creek or warning signage. HRWA highly recommends this with details below.

HRWA conducted a site visit in early December. One purpose was to assess the likelihood of public exposure to the contamination in Liberty Creek. The creek flows through Driskill's property and much of that property has old fencing as seen in photo below. There are a few areas where the old wire fencing is bent and it would be easy for anyone to get over. Most importantly, the property is freely accessible off the end of Daniels' Drive through the city of Franklin's sewer easement. See the oval area in Figure 1 below. ELMCO needs to pay for appropriate fencing based on the requirements of the city of Franklin to limit access to the area from the city's sewer line right of way both from the Daniels Drive area and from the Franklin Road entrance. Also it would be valuable to review the access via BGA school which now has a new fence up for the playground.

Figure 1: Map from CAP of the immediate area:
Rectangle shows area of active seeps and bacterial build-up. Oval is area where there is no fencing along the city's sewer right of way between a private fence and the river. The X marks the Martin's former home, now removed with the flood buy-out. It is easy for people to access the creek via the end of the Daniels Drive cul-de-sac along the city's sewer right of way onto Driskill's property where Liberty Creek flows. While BGA school has a new fence around the playground so the children can no longer access the area, it is also possible to access this area from the city's right of way access off Franklin road (not shown on below).



At the pbulic hearing TDEC asked HRWA for suggestions for public signage. Below are some examples that would seem appropriate.

The Final CAP incorrectly separates the contamination in the groundwater from that on the ELMCO site and that in the ground off site under people's homes and moving in various pathways to Liberty Creek. EPA RCRA Final Corrective Action Plan guidelines (March 2000) make it clear that the source area refers to wherever contamination is found. ELCMO is trying to separate solvents on their property from those sources that that have moved off site. These areas of solvents off site are a source area as well per EPA CAP guidelines. ELMCO is obligated to clean-up its solvents regardless of their location. Since the CAP and prior efforts have not adequately defined the extent and amount of chemical

contamination there is no way ELCMO can support the statement that "contamination will naturally attenuate within a relatively few years."

The Final CAP and review by Quarles in 3 separate sets of comments demonstrate that ELMCO's clean up efforts have not been very successful for various reasons. For example, the BIOX injection treatment done in the early summer of 2007, while a form of in-situ biological treatment, was applied to soil instead of to the groundwater. The large volume of BIOX formulation injected likely moved contaminated groundwater off the ELMCO site. The dual-phase vacuum extraction while an appropriate approach in the source area around the tank farm was not able to perform well because some of the well used are located or constructed in a manner to be ineffective. This effort was for a year and started in July 2008 over 1.5 years after the contamination was identified.

The interceptor trenches has been fraught with problems as outlined in the proposed FCAP. As noted in the FCAP, the first set of efforts that began in the spring of 2007 was an open trench that allowed an unknown about of free product hazardous chemicals that flowed into the trench to volatilize into the air in the neighborhood. The trench was converted to a covered system in late 2008. There were long periods of almost a year when no activity was performed at the trench, then once it was repaired in late 2008 free-product once again was being removed. High water table from rain also prevented removal operations for months at a time. The trench removal operation was permanently closed at the end of 2011.

One of the primary purposes of the trenches was to hopefully stop the flow of chemicals in the groundwater from reaching Liberty Creek. The monitoring data (Table 2) for the main seep clearly indicate the trench did not affect the concentrations significantly which stayed over 100 times or more over Regulatory Level of Concern in groundwater for Toluene (1 mg/L) during over four plus years of the trench operations. Concentrations were even higher in 2007 and there were numerous underestimations of the concentration as noted in the table because sample concentrations exceeded the calibration range of the lab equipment. It appears that during much of ELMCO's attempted clean-up essentially the entire effort has been Monitored Natural Attention though it has never been approved nor appropriate for this site.

Equally important to reject this proposal FCAP is that that it offers no timeline for meeting clean up objectives nor defined what constituent concentrations would be acceptable – key EPA requirements for evaluating any corrective measure. Interestingly, in TDEC's 2008 response to comments # 6, TDEC quotes from Microbe Inotech Lab that it could take 9.8 months to clean up the toluene if there is no free-product. As the FCAP clearly states, free product, the actual solvent without any dilution in the groundwater, was prevalent. It has been nine years and there is clearly still significant solvent contamination on ELMCO's site, there is solvent contamination in pathways through the karsk to Liberty Creek, and people, especially children can easily be exposed to unsafe fumes when playing in Liberty Creek.

HRWA strongly urges TDEC to set up an expert committee comprised of the USGS, ELMCO, Triad, AquAeTer, HRWA, neighbors and others to review the data and design a

biostimulation or combination of treatments for the contamination. It has not worked to have ELMCO set the pace or provide the approaches. It may be nine years later and much as escaped into the environment, but data indicates that there is still significant levels still in the environment that must be addressed. TDEC should require that ELMCO complete a thorough investigation that will provide meaningful data that can be used to make informed remedial and risk-based decisions. The proposed FCAP is ELMCO's third attempt to create a correction action plan that is still based on a monitoring program that is incapable to determining the extent of contamination or a reasonable timeline for cleanup. Such an investigation can be employed quickly and cost-effectively with minimal disruption to ELMCO neighbors (see Quarles for details).

TDEC needs to reject the proposed final CAP to "monitor natural attention" and:

- Formulate of a committee of experts from the USGS, TDEC, HRWA, AquAeTer, and ELMCO to review and discuss the data and lessons learned from previous investigations and corrective actions.
- Require a thorough investigation to identify pollution migration pathways and pollutant mass to that reasonable corrective measures can be evaluated
- Maintain monitoring of all VOC constituents and not the proposal to narrow to just Toluene. (see Quarles for explanation that these high concentrations of toluene mask the lower concentrations of benzene, a known carcinogen, and other hazardous chemicals that need to be monitored).
- Increase groundwater and surface monitoring to quarterly and then to the frequency needed during treatment.
- New ecological and human health risk assessments that consider an expanded list of constituents of probable concern and more probable exposure pathways.
- Install fencing, warning signage and other options after conferring with the neighborhood and property owners around the impaired section of Liberty Creek.

Please do not hesitate to contact me for any materials and to discuss these comments.

Sincerely,

Dorene Bolze

Dorene Bolze
Executive Director
Harpeth River Watershed Association
615-479-0181
doriebolze@harpethriver.org

Attachments:

1. HRWA Field Report on Sampling of Seeps at Liberty Creek and Dissolved Oxygen
2. Lab Report from Test America for HRWA's sampling

3. Comments and Technical Review by Mark Quarles, Global Environmental LLC, on the proposal Final Corrective Action Plan, January 11, 2016.
4. HRWA comments on the 2007 first proposed CAP, October, 2007.
5. Comments and Technical Review by Mark Quarles, Global Environmental LLC, on the 2007 first proposed CAP.
6. AquAeTer comments on the 2007 first proposed CAP.
7. LEED Environmental comments on the 2007 first proposed CAP, Oct. 2007.
8. HRWA comments on the 2008 proposed revised CAP, August 2008.
9. Comments and Technical Review by Mark Quarles, Global Environmental LLC, on the 2008 proposed revised CAP, August 2008.

Cc:

Bob Martineau, TDEC Commissioner
Shari Megrehblian, Deputy Commissioner of TDEC
Steve Goins, TDEC Office of Remediation
Ahmet Bulbulkaya, TDEC Remediation
Andy Binford, TDEC Remediation Fellow
Steve Spurlin, EPA Office of Emergency Response
Mike Bradley, USGS TN office
Tom Byl, USGS TN office
Joe George, TN Public Health
City of Franklin Board of Mayor and Aldermen
Eric Stuckey, City of Franklin Administrator
State Senator Jack Johnson
State Senator Douglas Henry
State Representative Glen Casada
State Representative Charles Sargent
Dwight Hinch and Chris Scott, TriAD
Kerry Maddox, General Manager ELMCO

Attachment 1

HRWA Field Report from Sampling Liberty Creek Seeps and Dissolved Oxygen: Dec. 11, 2015

- HRWA Executive Director, Dorene Bolze, did a site recon visit on December 8, 2015, 10:30am to 11:45am. The site visit assessed the ease of access by the public to the creek, the status of any active seeps, and the condition of Liberty Creek.

- Active seeps found. Strong smell of toluene up near seeps and also when leaf litter near seeps with bacterial growth was gently disturbed with foot. This warranted contact with Test America and a return site visit to conduct sampling in accordance with EPA Method 8260B.

Conditions on Liberty Creek: December 11, 2015: 10:30am-12:45pm.

- Could smell chemicals in the air intermittently. The Seep is on river left at the mud/tree debris pile. Seep not flowing much at the orange flags on photo.
- I had to wear a respirator. It was too strong not to do so.
- White and gray matter in leaf litter and stream at tall/high river bank where large bacterial balls were present in early field visits in 2007-8.
- The mud/tree debris pile splits the creek into two channels. Orange colored and other gray/white mass bacteria is growing along river left creek bank. Also small amount of orange bacteria in the river right channel along the left side of the channel which is also the right side of the mud debris island. This indicates that chemicals are not just on the river left side of the creek.
- Small fish observed in the creek upstream of the debris pile and seeps.

Notes on sampling the seeps:

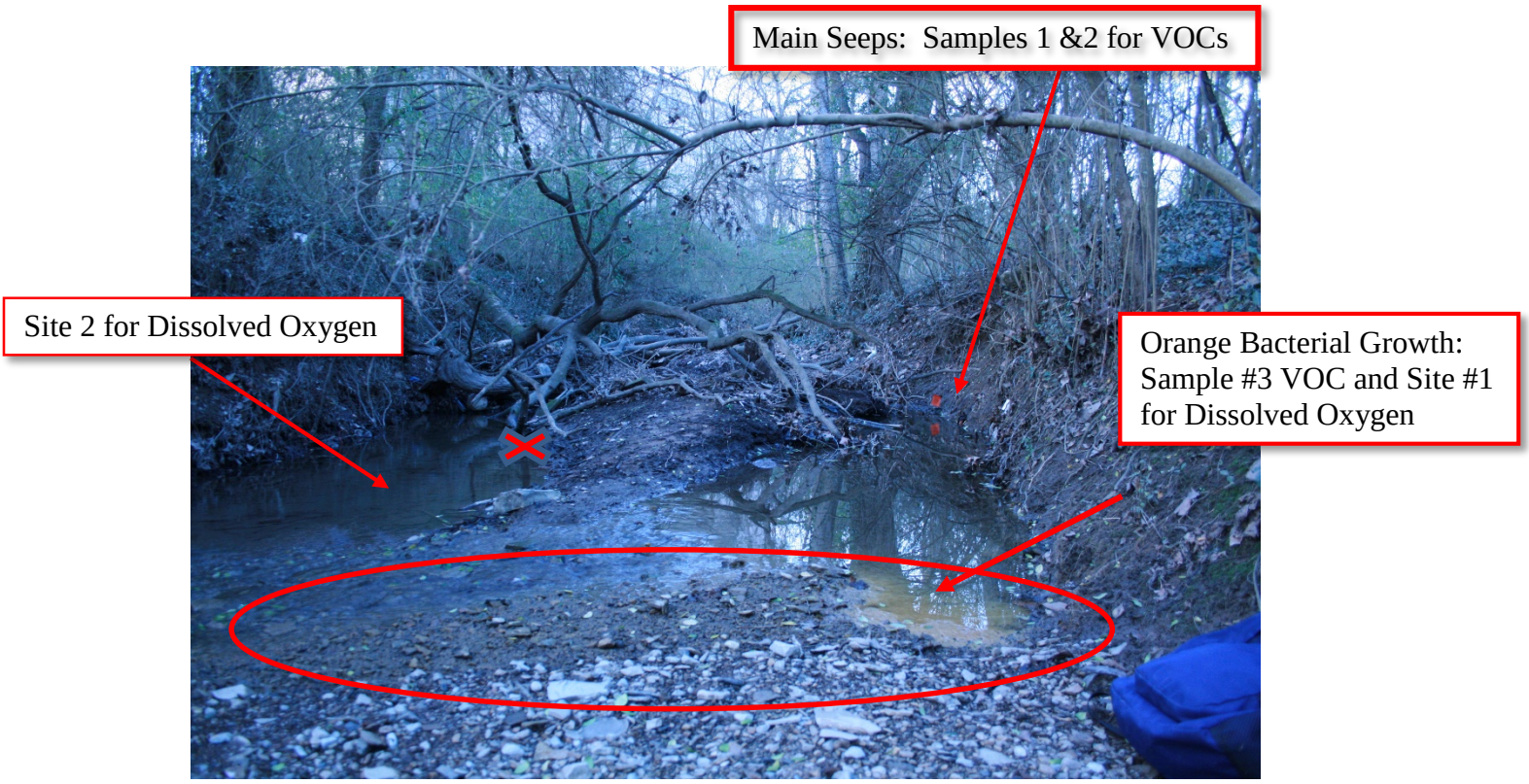
- A small little channel needed to be dug near the seep in order to place the sample tube so the seep water would flow into the tube. The tubes filled in approximately in 2 minutes.
- Can see groundwater seeping into the area from the side of the seep hole which is about 3 inches in diameter.
- Sample #3 location was chosen because of the large orange bacterial growth about 10 feet downstream of the main seep. Disturbance of the leaf litter, or gray colored or orange colored bacteria gave off strong fumes. In this area the VOC still are concentrated along this channel in the creek which is separated from the channel on the other side of the large debris island. Triad samples downstream at the personnel crossing after both stream channels merge.

Table 1: Sampling Liberty Creek main seep for Volatile Organic Compounds (VOC) (see photo below for locations?) (Test America Laboratory report is attached)

LOCATION for VOC Sampling in Seeps into Liberty Creek	**Concentration of Toluene**	**Sampling Time on 12/11/15**
#1: LC-MS-HRWA dirty: sample at main seep, muddy with silt from creek bank	173 mg/L	11:15am
#2: LC-MS-HRWA cleaner: sample at main seep in same location as sample #1.	179 mg/L	11:30 am
#3: LC-MS-atbac: sample 10 feet downstream on same bank as seep where large growth of bacteria found NOTE: sewage worms present. (Same location as Sample 1 for Dissolved Oxygen sampling.)	18.7 mg/L	11:45am

- All other VOC constituents were at Non-detect levels. This is not necessarily because other VOC are not present. As discussed in the CAP and in HRWA and Quarles' comments toluene can be so high that it masks other constituents that are typically found with toluene.
- HRWA provided the TRIAD monitoring data table to Test America that notes the Regulatory Level of Concern for each VOC. The chain of custody specifically requests testing down to the RCL for benzene (0.005 mg/L). HRWA sent an email to Test America for an explanation for why they could not test down to this level with these samples and were informed that the toluene concentrations are too high in the sample to enable testing for benzene.
- In an email from Test America staff in Nashville on December 15, 2015: "…they said to get the Benzene down to the 0.005 ppm regulatory limit, the Toluene would need to be below 5 ppm to avoid any carryover. It is way above that level at this point. If they run much lower dilutions right now, they risk carrying over to other samples, and if the dilution is too low, losing instrument functionality."
- As noted in AuqAeTer's final report of September 2013, benzene is a common by-product constituent in toluene and has been found at levels above RCL in the seeps and groundwater water wells. Since benzene is a known carcinogen, it is a significant concern that toluene concentrations remain this high and are likely indicative of benzene as well.

Photograph 1: Liberty Creek looking upstream at the main seep. The two creek channels are seen here and the muddy debris island. Orange bacteria and sheen were seen on the opposite side of the debris island from the main seeps (marked with X). The large oval indicates one of the areas of bacterial growth. A dense area is at Sample #3.



Note: photo taken Jan 6, 2016 because most photos taken during sampling date were lost.

Photograph 2: One of the two Active Main seeps:
(Samples #1 and #2 for VOCs collected here).

Note: The wording on the flag is not relevant.

Photograph 3: Orange colored bacteria at Sample #3 location noted above. Photo on left is close up (12-11-15), photo on right from 1-6-2016.

Table 2: Dissolved Oxygen: see photo below table for location of sampling sites. Site 1 is the sample Sample #3 for the VOC sampling.

- Used LaMotte Dissolved Oxygen Test Kit-Winkler Titration method.
- Creek Water temperature: 60 degrees Fahrenheit
- At Site 1: Two other samples were tested, but the titration method had trouble reading at such low levels. The samples were clear with no yellow after the reagents were added before the titration step which determines the concentration level. Adding starch made both samples pale purple and the color did not disappear after using all of reagent. Thus, only one reading was successful at Site 1.

LOCATION for Dissolved Oxygen Sampling in Liberty Creek	**Dissolved Oxygen**	**Sampling Time 12/11/15**
Site 1- at large orange bacteria growth in river left channel 3-5 feet downstream of main seep (Same as Sample #3 for VOC sampling)	0.8 mg/l	11:55am
Site 2- in river right channel opposite the seep across the debris/mud island	6.0 mg/l	12:10pm
Site 3- downstream of confluence of two channels around mud/debris island and upstream of first ripple	6.2 mg/l	12:25pm
Site 4- upstream side of personnel crossing before ripple	5.8 mg/l	12:50pm

Global Environmental, LLC
Environmental Consulting

January 11, 2016

ELMCO Public Comments
TDEC Division of Remediation
William Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue
14th Floor
Nashville, TN 37243
Justin.M.Meredith@tn.gov

RE: Technical Comments for the Proposed Final Corrective Action Plan (FCAP)
Egyptian Lacquer Manufacturing Company
Franklin, Tennessee

Dear Mr. Meredith:

Global Environmental, LLC submits these comments on behalf of the Harpeth River Watershed Association (HRWA) in response to the proposed Final Corrective Action Plan (FCAP) for the above-referenced facility.

Both Global Environmental and the HRWA have provided technical comments for investigative and corrective actions completed and / or proposed in 2007 and 2008 for the ELMCO site. While obvious efforts have been made by ELMCO to clean up contaminated soil and groundwater on-site, significant fundamental flaws still remain that result in ELMCO not meeting its obligations under the June 2007 Consent Agreement and Order. As a result, the proposed FCAP should be rejected.

Given the turn-over of Tennessee Division of Remediation staff responsible for over-seeing this site since contamination was first reported and the previous corrective action plans were developed by ELMCO, we are re-submitting previous technical comments that contain continued, relevant information that still applies to the recently proposed FCAP. High points of the previously submitted technical comments include:

- Groundwater Corrective Action Plan (August 28, 2007) – comments dated October 22, 2007 from Global Environmental regarding the initially proposed plan to use Monitored Natural Attenuation (MNA) for groundwater remediation. Those comments concluded that MNA for groundwater corrective action did not meet EPA requirements and that the investigation never property characterized the nature and extent of contamination. TDEC agreed that MNA was inappropriate and did not approve the proposed plan. Notable comments included:

- The presence of light non-aqueous phase liquid (LNAPL) free product and conduit groundwater flow negates the use of MNA, according to the EPA.
- The mass of on and off-site source contamination that remained in the subsurface had not been determined.
- The vertical and horizontal extent of LNAPL contamination had not been defined.
- Petroleum hydrocarbon contamination (perhaps from the previous Shell Oil site ownership) was also observed in on-site soil borings, yet the investigation and corrective action only addressed volatile organic compounds (VOCs).
- Although groundwater was commonly observed during boring and well drilling, wells were generally screened below that interval and much deeper into the underlying Hermitage Formation. In fact, only one well (RW-1) was even drilled into the Bigby Cannon bedrock "cutter" (a weathered joint) that was acknowledged as being the groundwater transport pathway. Also, one well (AR-1) was constructed to actual *prevent* monitoring of the uppermost groundwater - where LNAPL would most likely be present.
- Off-site investigations into the adjoining Daniels Drive residential neighborhood to locate LNAPL mass and groundwater flow pathways were not seriously considered because ELMCO's consultant concluded that the investigation would be "disruptive."
- ELMCO never demonstrated that the injection of BIOXX liquid into the source area even worked to destroy soil source area contaminants, and that treating dissolved-phase contamination was "technically infeasible" - without explaining why.

- Revised Comprehensive Corrective Action Plan (June 23, 2008) - comments dated August 22, 2008 from Global Environmental were submitted. Those comments concluded in general, that the proposed plan for groundwater corrective action still did not meet EPA requirements for defining the nature and extent of contamination and development of a corrective action plan. Notable comments included:
  - The nature and extent of solvent and petroleum contamination still had not yet been defined.
  - Triad concluded that the LNAPL plume "cannot be determined from existing data" and that an estimate of LNAPL mass "would be dependent on understanding the specific geometry of the conduits and fractures" and that "geometry is unknown." ELMCO made no attempt to understand that important information in order to evaluate corrective measures.
  - ELMCO relied upon a groundwater monitoring system of wells (and continues use the same system), despite ELMCO's consultant concluding that there is a "lack of free hydraulic connection" between the wells.
  - The groundwater monitoring system continued to miss the uppermost top of bedrock groundwater where LNAPL would most likely be present. As a result, the wells likely under-report the highest groundwater constituent concentrations.
  - Rather than installing groundwater wells where the highest contaminant concentrations would most likely be, ELMCO's consultant installed wells far away from the source area, deep into the Hermitage Formation, and away from the presumed contaminant pathways located beneath the residential area.
  - The proposed dual-phase extraction wells were not located in the specific areas that were most likely to contain LNAPL. As a result, the proposed dual-phase extraction process would not be expected to achieve substantial remedial success.
  - The proposed corrective action offered no timeline for meeting clean up objectives nor defined what constituent concentrations would be acceptable – key EPA requirements for evaluating any corrective measure.

In addition to reviewing the attached additional technical comments specific to the proposed FCAP, we trust that the Division of Remediation staff will complete a comprehensive review of all past HRWA

and Global Environmental technical comments. The major comments related to review of the most recently proposed FCAP are included below and the supporting technical basis for each is included in the attached Technical Comments:

- The source of contamination that is entering Liberty Creek still has not been defined or properly mitigated to allow consideration of a MNA approach - or any other "active" remedial approach.
- Staff with the United States Geological Survey (USGS) Nashville office concluded that an active system of bioremediation is a good remedial option to degrade volatile organic compounds in the local groundwater, yet the FCAP did not recommend or seemingly even seriously consider that approach.
- The proposed FCAP assumes that constituent concentrations on and off-ELMCO property are decreasing, when in fact there is evidence to suggest that they are not.
- The proposed groundwater monitoring system continues to rely on a system that is incapable of detecting the highest concentrations; constituents that are perhaps the most toxic at the lowest concentrations; or the concentrations that are migrating towards Liberty Creek and the Harpeth River. Remedial alternatives cannot possibly be considered until an adequate monitoring system is installed on and off-ELMCO property.
- The FCAP did not include meaningful, future remedial options other than MNA and was not based upon any detailed technical remedial alternatives analysis, other than providing information on previous attempts for corrective measures.
- The FCAP and the supporting investigative actions do not meet the Rules established by the Division of Remediation.
- The human and ecological risk assessments used to support the proposed MNA corrective measure are substantially flawed and should be rejected.
- Innovative investigative techniques that result in little disruption to the surrounding neighborhood and the ELMCO property could have been used – and can still be used - to determine contaminant preferential flow pathways and to accurately define the nature and extent of contamination.

TDEC should require that ELMCO complete a thorough investigation that will provide meaningful data that can be used to make informed remedial and risk-based decisions. The proposed FCAP is ELMCO's third attempt to create a correction action plan that is still based on a monitoring program that is incapable to determining the extent of contamination or a reasonable timeline for cleanup. Such an investigation can be employed quickly and cost-effectively with minimal disruption to ELMCO neighbors. TDEC should require:

- Formation of a committee of experts from the USGS, TDEC, HRWA, AquAeTer, and ELMCO to review and discuss the data and lessons learned from previous investigations and corrective actions.
- A thorough investigation to identify pollution migration pathways and pollutant mass so that reasonable corrective measures can be evaluated.
- Completion of new ecological and human health risk assessments that consider an expanded list of constituents of probable concern and probable exposure pathways.
- Install institutional controls (e.g. fencing) around the impaired section of Liberty Creek and provide signage to warn the public of potential hazards.

We appreciate your consideration of these technical comments and look forward to meeting with you and other experts that have been involved in this ongoing contamination to devise investigative and treatment strategies.

Should you have any questions or comments, please contact me at 615-646-0969 or markquarles@comcast.net.

Sincerely,

Mark A. Quarles, P.G.

Attachment: Technical Comments for Proposed FCAP

Technical Comments for Proposed Final Corrective Action Plan

The source of contamination that is entering Liberty Creek still has not been defined or properly mitigated to allow consideration of a passive Monitored Natural Attenuation (MNA) approach - or any other "active" remedial approach.

1. Although Triad recognized the need to calculate light, non-aqueous phase liquid (LNAPL) mass and to determine where "pockets" of that contamination exists in soil, bedrock, and groundwater, no such off-site investigation has ever been attempted.
2. The time of remedial completion for the proposed MNA approach cannot be estimated unless and until accurate contaminant mass is calculated based on real data.
3. EPA guidance for RCRA and Superfund corrective actions and TDEC rules for corrective actions require that several corrective actions be considered and evaluated before a final corrective measure can be selected. EPA and TDEC rules both require an analysis of all reasonably possible corrective measures that are evaluated side-by-side for such performance characteristics: performance, reliability and control of exposures; time required to begin and meet standards; cost of the remedy; and the ability of the proposed measure to reduce or eliminate, to the maximum extent practicable, further releases of constituents.
4. Triad concluded in the FCAP that soil beneath the old tank farm on ELMCO property is no longer the primary source of the main contamination that is entering Liberty Creek, yet ELMCO has not yet completed any meaningful investigation to locate light, non-aqueous phase liquid (LNAPL), dissolved phase groundwater, or soil contamination off ELMCO's property.
5. Triad concluded in the FCAP that "isolated pockets of free-product solvent" are the principal source of contamination entering Liberty Creek, and that those pockets exist off the ELMCO property beneath the Daniels Drive residential area.
6. The continued presence of constituents in the upstream Watergate sampling location and its location away from the former solvent recovery trench indicate that more than one significant groundwater flow pathway exists and that the interceptor trench may have been under-sized.
7. Triad cannot conclude within a reasonably accurate timeframe how long contamination will continue to flow from the ELMCO property and into Liberty Creek or the Harpeth River because the extent and mass of the contamination has never been determined. Triad's conclusion that contamination will be "naturally attenuated within a relatively few years" is not based upon meaningful science and offers no timeline of when human and ecological performance standards will be met.

Staff with the United States Geological Survey (USGS) Nashville office concluded that an active system of aerobic bioremediation is a good remedial option to degrade volatile organic compounds in the local groundwater [1], yet the FCAP did not recommend or seemingly seriously consider that approach.

8. USGS representatives at the December 15, 2015 public information meeting for the proposed FCAP presented a poster that illustrated that under proper design and implementation protocol, contaminants in the groundwater from ELMCO operations can be actively remediated.
9. The USGS concluded that enhanced aerobic biodegradation with oxygen-releasing peroxide or Vitamin B supplements enhances the existing, very slow anaerobic biodegradation that is

[1] Oral Communication with Mike Bradley and Thomas Byl, USGS, Public Information Meeting, Franklin, Tennessee, December 15, 2015.

occurring. The anaerobic conditions are most likely due to the existing contaminant load on the groundwater.

10. The USGS concluded that monitoring wells intercept portions of the aquifer with poor hydraulic conductivity and little, if any, dissolved oxygen is added to the groundwater due to rainfall. As a result, additional oxygen is needed to promote accelerated biodegradation.
11. Bioremediation of the on-site groundwater is possible and much faster with the addition of hydrogen peroxide to chemically oxidize the groundwater. Ironically, solid peroxide was a component of the BIOX injectate that Triad used as a soil remediation strategy – a strategy that was not successful for soil remediation, according to Triad. The results of the USGS study suggest that hydrogen peroxide injection into the *groundwater* at the site – not the soil - is a reasonably good remedial strategy to consider.

The proposed FCAP assumes that constituent concentrations on and off-ELMCO property are decreasing, when in fact there is evidence to suggest that they are not.

12. The proposed FCAP concluded that groundwater constituent concentrations in the tank farm source area are decreasing at such a rate that the risks to human health and ecological receptors are acceptable. This conclusion assumes that the groundwater monitoring system is capable of detecting the highest concentrations – which it is not.
13. The proposed FCAP also concluded that the groundwater constituent concentrations that discharge as seeps into Liberty Creek are decreasing at such a rate that the risks to human health and ecological receptors are acceptable. This assumption relies on Triad sampling data that is no longer being collected quarterly to show seasonal variability (now semi-annual).
14. Samples collected by HRWA staff at the Main Seep at Liberty Creek by HRWA on December 11, 2015 demonstrates that Triad's most recent results grossly under-report the actual groundwater contamination. Two samples collected of the Main Seep prior to entering Liberty Creek resulted in 173 and 179 mg/L toluene. As a comparison, the most recent two quarters reported by Triad in the FCAP (January and March 2015) were 34.70 and 23.60 mg/L respectively. The HRWA-collected results are comparable to the concentrations reported by Triad in 2008. As a result, there is ample evidence that constituent concentrations are not declining, as concluded by Triad.
15. Given the on-site well placement outside of the main contaminant pathway and the fact that there are no hydraulically downgradient wells off-site between the ELMCO site and Liberty Creek seeps, there is adequate reason to believe that substantial contamination has simply moved laterally towards Daniels Drive and / or is present on the ELMCO property in such a manner that is not detectable by the groundwater monitoring system.
16. The Solvent Constituent Distribution and Potentiometric Map (Figures 9 and 10 in the FCAP) prepared by Triad fails to consider that the main contaminant plume may have simply migrated westward between the on-site source area and Liberty Creek.
17. Triad's use of high pressure air and water injections in the on-site tank farm area during early investigations could reasonably be expected to have pushed LNAPL and dissolved-phase contaminants into deeper portions of the bedrock and laterally from the on-site source area. Triad used high-pressure air rotary drilling methods to drill all groundwater monitoring wells. Further, Triad's drilling of well RW-1 resulted in the loss of 600 gallons of potable water into the formation. Also, Triad injected 3,249 gallons of high-pressure BIOX treatment liquids into the soil in the source area. Lastly, dye tracing would have also injected undetermined amounts of water. Any or all of those high-pressure injections could have pushed contamination from its origin.
18. Off-site soil borings advanced in January 2009 near Daniels Drive – borings that were installed for a vapor intrusion breathing hazard study and not to define soil or groundwater conditions per

se – demonstrated that significant off-site migration of contamination had in fact already occurred. Triad concluded in the proposed FCAP that "the presence of solvent-impacted soil in the cutter encountered at the deepest of these borings demonstrated that the cutter, or a set of multiple, interconnected cutters, was providing a pathway for solvent migration under Daniels Drive along a zone extending from the soil source area at EMLCO to the seeps along Liberty Creek."

19. One soil boring (BP-8) advanced at Daniels Drive exhibited solvent contamination for the last 5 feet of the boring, and the saturated soil conditions of that zone were indicative of groundwater. Triad concluded that the boring was located within a preferential bedrock cutter flow pathway. Although collecting a groundwater sample was possible with Geoprobe technology that Triad used, Triad apparently chose to not collect such a sample. The soil sample however, exhibited substantial contamination: Acetone 85.2 mg/kg; Benzene 0.00713 mg/kg; and Toluene 282 mg/kg, as examples.

The proposed groundwater monitoring system continues to rely on a system that is incapable of detecting the highest concentrations; constituents that are perhaps the most toxic at the lowest concentrations; or the concentrations that are migrating towards Liberty Creek and the Harpeth River. Remedial alternatives cannot possibly be considered until an adequate monitoring system is installed on and off-ELMCO property.

20. Other than one well (RW-1), the groundwater monitoring system is incapable of detecting LNAPL and the highest concentrations of dissolved-phase constituents due to the depth of the screened intervals into the Hermitage Limestone formation (a shaley-limestone) and the wells not being located within weathered Bigby Cannon bedrock joint / cutters.
21. Although the Geoprobe investigation in the on-site source area demonstrated widespread groundwater that was present in the soil at the top of bedrock and within depressions of the Bigby Cannon limestone bedrock surface, Triad instead installed a groundwater monitoring system that included wells that are screened in the deeper shaley Hermitage Formation. Saturated soil and groundwater was found in 10 of the 20 direct-push Geoprobe soil borings (See August 28, 2007 CAP, Attachment 5, Geoprobe Boring Logs). As such, a top-of-bedrock and soil interface groundwater monitoring system was possible and should have been installed.
22. Triad has concluded that the groundwater monitoring wells that are primarily screened in the deeper, shaley Hermitage Formation produce little groundwater, yet dye tracing from the tank farm source area demonstrated rapid (600 feet per day) groundwater velocities. As such, the monitoring system is missing the transmissive, highly conductive groundwater flow pathways.
23. Past samples for groundwater, surface water, and soil have been unable to accurately report benzene, as an example, because the high dilution factors used by the laboratory. The high dilution factors were due to the significant concentrations of other constituents (e.g. toluene and acetone). A "non-detect" or "less than" value reported by Triad can be misleading and can understate actual human and ecological risks, when the dilution factors raise minimum detection limits higher than harmful regulatory standards.
24. Other analytical methods were available that would have accurately reported concentrations of all constituents. For example, soil sampling data reported by Triad during the January 2009 Geoprobe investigation at Daniels Drive [2] used a different extraction method (Method 5035), that enabled detection limits "lower than those typically obtained on samples from the source area, where the 5035 extraction has not been used." According to Triad, the method used for samples in the on-site EMLCO area "may have prevented" constituent identification because of high

[2] Report of Bedrock Surface Data – Daniels Drive Area, ELMCO Solvent Release Response Interim Action, letter to Ashley Holt, TDEC, from Chris Scott, P.G., Triad, July 27, 2009.

concentrations of acetone and toluene. Triad attributed their selection of the enhanced, lower detection limit methods for the single Daniels Drive sample to the "different data quality objectives for the two areas." Had the more enhanced method with lower detection limits been used, other constituents – such as the human carcinogen benzene – would have likely been more defined.

25. Triad's conclusion that the contaminant plume has "decreased significantly" since the first year of the investigation ignores the fact that 1.) The highest concentrations may have simply migrated beyond the source area wells and towards the Daniels Drive residential area, and 2.) The well screens for wells other than RW-1 are submerged below what is expected to be the highest concentrations and outside of the migration pathways.
26. Triad's request to eliminate some wells from the future monitoring program (MW-4 and MW-5) should be rejected, given that the nature and extent of the contamination still have not yet been defined.
27. Triad's request to only test seep and surface water samples for toluene should be rejected because numerous other constituents have been detected in the water.

The FCAP did not include meaningful, future remedial options other than MNA and was not based upon any detailed technical remedial alternatives analysis, other than providing information on previous attempts for corrective measures.

28. Triad argument that additional active remedial actions would be "technically difficult", "costly", "disruptive", and would be "fraught with difficulty and expense" does not meet core EPA requirements for corrective action consideration. The EPA requires that a final remedy achieve all three (3) performance standards: [3]
    1. Protect human health and the environment.
    2. Achieves media cleanup objectives and includes media cleanup levels (chemical concentrations), points of compliance, and remediation time frames (time to implement the remedy and achieve cleanup levels at the point of compliance).
    3. Remediate the sources of releases so as to eliminate or reduce further releases. "Sources" includes both the location of the original release and also where significant mass of contaminants may have migrated *away from* the original source area.
29. Triad's recommendation that MNA be selected as the "final" corrective action seems to be based on what remediation techniques that have been employed in the field but were not successful – rather than implementing techniques that laboratory-scale studies demonstrated would work.
30. Triad injected 3,249 gallons of the BIOX liquid treatment reagent into the soil in the source area - not into the groundwater. Although it was implemented to chemically oxidize the soil contaminants (with solid peroxide) and to stimulate biodegradation (with dissolved nutrients) in soil, Triad concluded that the effort "was not successful in achieving significant reductions in source-area contaminant concentrations." One would not expect solid chemical oxidant to be transported in the soil beyond the immediate vicinity of the well, or that such a strategy would even be a viable soil remediation measure. The USGS demonstrated that the strategy should work for ELMCO-specific *groundwater*.
31. Aquaeter's bio-stimulation activities – which were performed as a result of a Federal lawsuit against ELMCO by neighboring property owners - reportedly reduced constituent concentrations in source area wells; however, ELMCO chose to terminate that remedial action after only one year of operation.
32. Dual-phase vacuum extraction efforts apparently had some success removing soil vapors and contaminated groundwater - but attempts to extract LNAPL from wells AR-1, RW-1, and MW-3

[3] Final Remedy Selection for Results-Based RCRA Corrective Action, Fact Sheet #3, EPA, March 2000.

led Triad to conclude that the LNAPL was not present in those areas. Given the well construction specifics, no such conclusion should have been made. If the intention is to remove large volumes of contaminated groundwater, LNAPL, and soil vapor, such extraction wells need to be properly constructed like well RW-1 across the soil / bedrock interface and in deeper-lying bedrock areas.

33. Triad concluded in the FCAP that the dual-phase extraction remedial program inaccurately calculated the mass of contaminants that were actually removed, and that the "actual mass removal cannot be accurately calculated."
34. The FCAP considered no new active corrective measures to eliminate or reduce further releases of contaminants to the groundwater and surface water that were based upon lessons learned from past remedial attempts.
35. The proposed FCAP provided no time estimate for contaminant concentrations to achieve cleanup levels anywhere - on or off the ELMCO site.
36. Dye traces performed by Triad or Aquaeter demonstrated rapid groundwater flow where dye was injected into limestone migration pathways. Finding those pathways and using those locations to inject bio-stimulants presents an opportunity to achieve widespread treatability – yet the approach for bio-stimulation was based primarily on slow drip system into wells or high pressure injection into clayey soils above the bedrock migration pathway. A more logical approach would have been to locate the highly transmissive groundwater flow pathways, perform dual-phase extraction of those zones, and to inject treatment chemicals into those transmissive groundwater zones.

The FCAP and the supporting investigative actions do not meet the Rules established by the Division of Remediation.

37. According to Steve Goins [4], Director of the Division of Remediation, rules that establish the investigative and corrective action performance standards for releases of hazardous constituents to the environment are listed in Chapter 0400-15-01, Hazardous Substances Remedial Action.
38. The nature and extent of the contamination – as required by the Rules - has not been fully determined in order to meet the investigative data objectives or to design a corrective action. As a result, ELMCO is unable to provide a reasonably accurate estimate of the time needed to meet soil, groundwater, and surface water criteria – as required by the Rules.
39. The proposed FCAP is not stamped by a registered Professional Engineer (P.E.) in the State of Tennessee, as required in the Rules. In fact, the only licensed professional that is certifying the FCAP is a Professional Geologist (P.G.), and that certification specifically excludes (on the report certification page) any responsibility for the accuracy and conclusions associated with the solvent capture trench at Liberty Creek, the dual-phase vacuum extraction remedial activities, the air monitoring for human exposure, and the human and ecological risk assessments.

The human and ecological risk assessments used to support the proposed MNA corrective measure are substantially flawed and should be rejected.

40. Triad concluded in the FCAP that Liberty Creek is a "poor-quality urban stream", as an apparent justification to allow ELMCO contaminants to flow into the creek for the foreseeable future. Triad offered no explanation of why Liberty Creek is considered to be "poor quality", other than describing contamination that is entering the creek from ELMCO and the toxic effects of that waste on the creek.

[4] Telephone conversation and email correspondence, Steve Goins, Division of Remediation, with Mark Quarles, January 6, 2016.

41. Triad concluded in their evaluation of 2008 and 2012 data that "elevated levels" of ELMCO solvents exist in approximately 600 feet of Liberty Creek prior to entering the Harpeth River; low dissolved oxygen levels create eutrophic conditions; and acute and chronic toxicities for acetone and / or toluene were present.
42. The Human Health Risk Assessment (HHRA) and the Ecological Risk Assessment (ERA) performed by Secaps to support the MNA corrective action used outdated regulatory standards and poor quality analytical data in its evaluation of risks. As such, neither assessment can be relied upon to determine relative levels of harm. Secaps used water quality criteria from 2006 to support the ecological risk assessment in the proposed FCAP (2015). The risk assessments should have instead used the most current EPA Region 4 standards (2015) [5] to determine risks. The ecological benchmarks used by Secaps were much greater than what current EPA standards allow. See examples below:

Ecological Risk Assessment	**Secaps Risk Assessment**		**EPA Region 4 2015**		**LC-MS**	**LC-PC**	**LC Watergate**
Constituent	Chronic (mg/L)	Acute (mg/L)	Chronic (mg/L)	Acute (mg/L)	March 2015	March 2015	March 2015
1, 2, 4-Trimethylbenzene	0.017	0.31	0.015	0.140	***<0.05***	<0.005	<0.002
1, 3, 5-Trimethylbenzene	0.045	0.81	0.026	0.230	***<0.05***	<0.005	<0.002
Acetone	1.7	30	1.7	15	<1.25	<0.125	<0.05
Benzene	0.053	0.53	0.160	0.700	<0.05	<0.005	<0.002
Ethylbenzene	0.453	4.53	0.061	0.550	<0.05	<0.005	<0.002
Toluene	0.175	1.75	0.062	0.560	***23.60***	***0.566***	***0.233***
Xylenes	0.041	0.73	0.027	0.240	***<0.25***	<0.0150	<0.01

43. When the most recently reported data (March 2015) that was included in the FCAP are compared to the appropriate EPA Region 4 (2015) ecological standards, both chronic and acute ecological exposures continue for toluene and are exceeded in the Personnel Crossing (LC-PC) and Main Seep (LC-MS) locations for Liberty Creek.
44. The most recent March 2015 sample results also illustrate that the analytical method detection limits are too high to determine risks for relevant constituents, due to the extremely high concentrations of other contaminants and the Triad-selected laboratory using variable dilution factors (resulting in high "<" values; see table above as an example). Note that the report limits are sometimes higher than the protective standard itself.
45. A summary of the highest detection limits and reported values for the January through May 2008 reporting period used by Secaps, compared to combined human risk (Maximum Contaminant Levels (MCLs) and Regional Screening Levels (RSLs)) and ecological standards, is included as follows:

[5] Region 4 Ecological Risk Assessment Supplemental Guidance Interim Draft, EPA Region 4, Originally published November 1995, EPA 2015.

Ecological and Human Risk Assessments	EPA MCLs or RSLs		EPA Region 4 2015 (ecological)		LC-MS	LC-PC
Constituent	MCL (mg/L)	RSL[6] (mg/L)	Chronic (mg/L)	Acute (mg/L)	Jan-May 2008	Jan-May 2008
1, 2, 4-Trimethylbenzene	-	0.015	0.015	0.140	***<0.25***	***<0.05***
1, 3, 5-Trimethylbenzene	-	0.12	0.026	0.230	***<0.25***	***<0.05***
Acetone	-	14	1.7	15	***120***	***8.8***
Benzene	0.005	0.0045	0.160	0.700	***<0.25***	***<0.05***
Ethylbenzene	0.7	0.0015	0.061	0.550	***<0.25***	***0.0019***
Toluene	1.0	1.1	0.062	0.560	***100***	***8.1***
Xylenes	10	0.19	0.027	0.240	***<1.5***	0.01

46. Secaps excluded all constituents that were "non-detected" from consideration in the risk assessments. The data for non-detected concentrations does not mean that the constituents are not present in harmful amounts – just that the methods used by Triad and the laboratory were incapable of reporting its presence for that sample. The variability of the detection limits varied over time, even though high concentrations of toluene and acetone, for example, remained high. As such, there seems to be no consistent explanation for the high detection limits.
47. The human health risk assessment to determine the risk to a child playing in Liberty Creek was flawed and perhaps understated the risks. The assessment collected only one breathing zone air sample that was stationary on a ladder in the creek. [7] Volatile organic compound vapors are the highest when the water is agitated, like what would occur when a child is walking or playing in the creek. The results of that sample would therefore not be indicative of a child playing in the creek.

Innovative investigative techniques that result in little disruption to the surrounding neighborhood and the ELMCO property could have been used – and can still be used - to determine the nature and extent of contamination.

48. Triad investigations determined early in 2007 and 2008 that contaminated groundwater flowed along bedrock joints and bedding planes. Rather than placing groundwater monitoring wells precisely along those pathways, wells were randomly placed. Triad should have instead placed monitoring wells in areas where Geoprobe and other drilling showed bedrock depressions and saturated groundwater conditions. That data can however, still be used to install new wells on-site to accurately determine groundwater constituent concentrations of the uppermost portion of the aquifer where contamination is most likely to be present.
49. Innovative investigative techniques could also be used off-site in the Daniels Drive residential area to determine the nature and extent of contamination – in a manner that would be minimally disruptive to the community. Such techniques should be used to accurately define the nature and extent of contamination, to determine contaminant mass loadings to the groundwater, and to optimally locate monitoring wells. These industry-standard technologies are commonly used for cost-effective, minimally invasive investigations for volatile organic compounds:
    - Surface geophysics to locate contaminant migration pathways in soil, bedrock surface depressions, and voids within the bedrock.

[6] EPA Regional Screening Level (RSL) Summary Table (TR= 1E-6, HQ=1) June 2015 (revised).

[7] Ahmet Bulbulkaya, conversation, TDEC Division of Remediation, Public Meeting, Franklin, Tennessee, December 15, 2015.

- Passive soil gas surveys to identify migration pathways and areas with the highest contamination.
- Direct-push Geoprobe (or equivalent) samplers using low impact, mobile vehicles (e.g. a recreational 4-wheeler) to collect soil, soil gas, and groundwater samples with minimal surface disturbance.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-93822-1
TestAmerica Sample Delivery Group: Liberty Creek
Client Project/Site: Harpeth River Watershed

For:
Harpeth River Watershed
215 Jamestown Park #101
Brentwood, Tennessee 37027

Attn: Dorie Bolze

Heather Baker

Authorized for release by:
12/15/2015 11:18:23 AM

Heather Baker, Project Manager I
(615)301-5043
heather.baker@testamericainc.com

Table of Contents

Sample Summary

Client: Harpeth River Watershed
Project/Site: Harpeth River Watershed

TestAmerica Job ID: 490-93822-1
SDG: Liberty Creek

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-93822-1	#1 LC-MS-HRWA dirty	Water	12/11/15 11:15	12/11/15 16:25
490-93822-2	#2 LC-MS-HRWA cleaner	Water	12/11/15 11:30	12/11/15 16:25
490-93822-3	#3 LC-MS-at bac	Water	12/11/15 11:45	12/11/15 16:25

Job ID: 490-93822-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-93822-1

Comments
No additional comments.

Receipt
The samples were received on 12/11/2015 4:25 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 18.7º C.

Except
The following samples were received with headspace in the sample vials: #1 LC-MS-HRWA dirty (490-93822-1), #2 LC-MS-HRWA cleaner (490-93822-2), and #3 LC-MS-at bac (490-93822-3).

GC/MS VOA
Method(s) 8260B: The laboratory control sample (LCS) for batch analytical batch 490-305914 recovered outside control limits for the following analyte: Dichlorodifluoromethane. This analyte was biased high in the LCS and was not detected in the associated samples; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOA Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample ID: #1 LC-MS-HRWA dirty

Date Collected: 12/11/15 11:15
Date Received: 12/11/15 16:25

Lab Sample ID: 490-93822-1

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		1000		ug/L			12/12/15 19:32	1000
1,1,1-Trichloroethane	ND		1000		ug/L			12/12/15 19:32	1000
1,1,2,2-Tetrachloroethane	ND		1000		ug/L			12/12/15 19:32	1000
1,1,2-Trichloroethane	ND		1000		ug/L			12/12/15 19:32	1000
1,1-Dichloroethane	ND		1000		ug/L			12/12/15 19:32	1000
1,1-Dichloroethene	ND		1000		ug/L			12/12/15 19:32	1000
1,1-Dichloropropene	ND		1000		ug/L			12/12/15 19:32	1000
1,2,3-Trichlorobenzene	ND		1000		ug/L			12/12/15 19:32	1000
1,2,3-Trichloropropane	ND		1000		ug/L			12/12/15 19:32	1000
1,2,4-Trichlorobenzene	ND		1000		ug/L			12/12/15 19:32	1000
1,2,4-Trimethylbenzene	ND		1000		ug/L			12/12/15 19:32	1000
1,2-Dibromo-3-Chloropropane	ND		10000		ug/L			12/12/15 19:32	1000
1,2-Dibromoethane (EDB)	ND		1000		ug/L			12/12/15 19:32	1000
1,2-Dichlorobenzene	ND		1000		ug/L			12/12/15 19:32	1000
1,2-Dichloroethane	ND		1000		ug/L			12/12/15 19:32	1000
1,2-Dichloropropane	ND		1000		ug/L			12/12/15 19:32	1000
1,3,5-Trimethylbenzene	ND		1000		ug/L			12/12/15 19:32	1000
1,3-Dichlorobenzene	ND		1000		ug/L			12/12/15 19:32	1000
1,3-Dichloropropane	ND		1000		ug/L			12/12/15 19:32	1000
1,4-Dichlorobenzene	ND		1000		ug/L			12/12/15 19:32	1000
2,2-Dichloropropane	ND		1000		ug/L			12/12/15 19:32	1000
2-Butanone (MEK)	ND		50000		ug/L			12/12/15 19:32	1000
2-Chlorotoluene	ND		1000		ug/L			12/12/15 19:32	1000
2-Hexanone	ND		10000		ug/L			12/12/15 19:32	1000
4-Chlorotoluene	ND		1000		ug/L			12/12/15 19:32	1000
4-Methyl-2-pentanone (MIBK)	ND		10000		ug/L			12/12/15 19:32	1000
Acetone	ND		25000		ug/L			12/12/15 19:32	1000
Benzene	ND		1000		ug/L			12/12/15 19:32	1000
Bromobenzene	ND		1000		ug/L			12/12/15 19:32	1000
Bromochloromethane	ND		1000		ug/L			12/12/15 19:32	1000
Bromodichloromethane	ND		1000		ug/L			12/12/15 19:32	1000
Bromoform	ND		1000		ug/L			12/12/15 19:32	1000
Bromomethane	ND		1000		ug/L			12/12/15 19:32	1000
Carbon disulfide	ND		1000		ug/L			12/12/15 19:32	1000
Carbon tetrachloride	ND		1000		ug/L			12/12/15 19:32	1000
Chlorobenzene	ND		1000		ug/L			12/12/15 19:32	1000
Chlorodibromomethane	ND		1000		ug/L			12/12/15 19:32	1000
Chloroethane	ND		1000		ug/L			12/12/15 19:32	1000
Chloroform	ND		1000		ug/L			12/12/15 19:32	1000
Chloromethane	ND		1000		ug/L			12/12/15 19:32	1000
cis-1,2-Dichloroethene	ND		1000		ug/L			12/12/15 19:32	1000
cis-1,3-Dichloropropene	ND		1000		ug/L			12/12/15 19:32	1000
Dibromomethane	ND		1000		ug/L			12/12/15 19:32	1000
Dichlorodifluoromethane	ND	*	1000		ug/L			12/12/15 19:32	1000
Ethylbenzene	ND		1000		ug/L			12/12/15 19:32	1000
Hexachlorobutadiene	ND		2000		ug/L			12/12/15 19:32	1000
Isopropylbenzene	ND		1000		ug/L			12/12/15 19:32	1000
Methyl tert-butyl ether	ND		1000		ug/L			12/12/15 19:32	1000
Methylene Chloride	ND		5000		ug/L			12/12/15 19:32	1000

Client Sample ID: #1 LC-MS-HRWA dirty

Date Collected: 12/11/15 11:15
Date Received: 12/11/15 16:25

Lab Sample ID: 490-93822-1

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	ND		5000		ug/L			12/12/15 19:32	1000
n-Butylbenzene	ND		1000		ug/L			12/12/15 19:32	1000
N-Propylbenzene	ND		1000		ug/L			12/12/15 19:32	1000
p-Isopropyltoluene	ND		1000		ug/L			12/12/15 19:32	1000
sec-Butylbenzene	ND		1000		ug/L			12/12/15 19:32	1000
Styrene	ND		1000		ug/L			12/12/15 19:32	1000
tert-Butylbenzene	ND		1000		ug/L			12/12/15 19:32	1000
Tetrachloroethene	ND		1000		ug/L			12/12/15 19:32	1000
Toluene	**173000**		1000		ug/L			12/12/15 19:32	1000
trans-1,2-Dichloroethene	ND		1000		ug/L			12/12/15 19:32	1000
trans-1,3-Dichloropropene	ND		1000		ug/L			12/12/15 19:32	1000
Trichloroethene	ND		1000		ug/L			12/12/15 19:32	1000
Trichlorofluoromethane	ND		1000		ug/L			12/12/15 19:32	1000
Vinyl chloride	ND		1000		ug/L			12/12/15 19:32	1000
Xylenes, Total	ND		3000		ug/L			12/12/15 19:32	1000

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*95*		*70 - 130*		*12/12/15 19:32*	*1000*
4-Bromofluorobenzene (Surr)	*107*		*70 - 130*		*12/12/15 19:32*	*1000*
Dibromofluoromethane (Surr)	*95*		*70 - 130*		*12/12/15 19:32*	*1000*
Toluene-d8 (Surr)	*101*		*70 - 130*		*12/12/15 19:32*	*1000*

Client Sample ID: #2 LC-MS-HRWA cleaner

Date Collected: 12/11/15 11:30
Date Received: 12/11/15 16:25

Lab Sample ID: 490-93822-2

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		1000		ug/L			12/12/15 19:05	1000
1,1,1-Trichloroethane	ND		1000		ug/L			12/12/15 19:05	1000
1,1,2,2-Tetrachloroethane	ND		1000		ug/L			12/12/15 19:05	1000
1,1,2-Trichloroethane	ND		1000		ug/L			12/12/15 19:05	1000
1,1-Dichloroethane	ND		1000		ug/L			12/12/15 19:05	1000
1,1-Dichloroethene	ND		1000		ug/L			12/12/15 19:05	1000
1,1-Dichloropropene	ND		1000		ug/L			12/12/15 19:05	1000
1,2,3-Trichlorobenzene	ND		1000		ug/L			12/12/15 19:05	1000
1,2,3-Trichloropropane	ND		1000		ug/L			12/12/15 19:05	1000
1,2,4-Trichlorobenzene	ND		1000		ug/L			12/12/15 19:05	1000
1,2,4-Trimethylbenzene	ND		1000		ug/L			12/12/15 19:05	1000
1,2-Dibromo-3-Chloropropane	ND		10000		ug/L			12/12/15 19:05	1000
1,2-Dibromoethane (EDB)	ND		1000		ug/L			12/12/15 19:05	1000
1,2-Dichlorobenzene	ND		1000		ug/L			12/12/15 19:05	1000
1,2-Dichloroethane	ND		1000		ug/L			12/12/15 19:05	1000
1,2-Dichloropropane	ND		1000		ug/L			12/12/15 19:05	1000
1,3,5-Trimethylbenzene	ND		1000		ug/L			12/12/15 19:05	1000
1,3-Dichlorobenzene	ND		1000		ug/L			12/12/15 19:05	1000
1,3-Dichloropropane	ND		1000		ug/L			12/12/15 19:05	1000
1,4-Dichlorobenzene	ND		1000		ug/L			12/12/15 19:05	1000
2,2-Dichloropropane	ND		1000		ug/L			12/12/15 19:05	1000
2-Butanone (MEK)	ND		50000		ug/L			12/12/15 19:05	1000
2-Chlorotoluene	ND		1000		ug/L			12/12/15 19:05	1000
2-Hexanone	ND		10000		ug/L			12/12/15 19:05	1000
4-Chlorotoluene	ND		1000		ug/L			12/12/15 19:05	1000
4-Methyl-2-pentanone (MIBK)	ND		10000		ug/L			12/12/15 19:05	1000
Acetone	ND		25000		ug/L			12/12/15 19:05	1000
Benzene	ND		1000		ug/L			12/12/15 19:05	1000
Bromobenzene	ND		1000		ug/L			12/12/15 19:05	1000
Bromochloromethane	ND		1000		ug/L			12/12/15 19:05	1000
Bromodichloromethane	ND		1000		ug/L			12/12/15 19:05	1000
Bromoform	ND		1000		ug/L			12/12/15 19:05	1000
Bromomethane	ND		1000		ug/L			12/12/15 19:05	1000
Carbon disulfide	ND		1000		ug/L			12/12/15 19:05	1000
Carbon tetrachloride	ND		1000		ug/L			12/12/15 19:05	1000
Chlorobenzene	ND		1000		ug/L			12/12/15 19:05	1000
Chlorodibromomethane	ND		1000		ug/L			12/12/15 19:05	1000
Chloroethane	ND		1000		ug/L			12/12/15 19:05	1000
Chloroform	ND		1000		ug/L			12/12/15 19:05	1000
Chloromethane	ND		1000		ug/L			12/12/15 19:05	1000
cis-1,2-Dichloroethene	ND		1000		ug/L			12/12/15 19:05	1000
cis-1,3-Dichloropropene	ND		1000		ug/L			12/12/15 19:05	1000
Dibromomethane	ND		1000		ug/L			12/12/15 19:05	1000
Dichlorodifluoromethane	ND	*	1000		ug/L			12/12/15 19:05	1000
Ethylbenzene	ND		1000		ug/L			12/12/15 19:05	1000
Hexachlorobutadiene	ND		2000		ug/L			12/12/15 19:05	1000
Isopropylbenzene	ND		1000		ug/L			12/12/15 19:05	1000
Methyl tert-butyl ether	ND		1000		ug/L			12/12/15 19:05	1000
Methylene Chloride	ND		5000		ug/L			12/12/15 19:05	1000

Client: Harpeth River Watershed
Project/Site: Harpeth River Watershed

TestAmerica Job ID: 490-93822-1
SDG: Liberty Creek

Client Sample ID: #2 LC-MS-HRWA cleaner
Date Collected: 12/11/15 11:30
Date Received: 12/11/15 16:25

Lab Sample ID: 490-93822-2
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	ND		5000		ug/L			12/12/15 19:05	1000
n-Butylbenzene	ND		1000		ug/L			12/12/15 19:05	1000
N-Propylbenzene	ND		1000		ug/L			12/12/15 19:05	1000
p-Isopropyltoluene	ND		1000		ug/L			12/12/15 19:05	1000
sec-Butylbenzene	ND		1000		ug/L			12/12/15 19:05	1000
Styrene	ND		1000		ug/L			12/12/15 19:05	1000
tert-Butylbenzene	ND		1000		ug/L			12/12/15 19:05	1000
Tetrachloroethene	ND		1000		ug/L			12/12/15 19:05	1000
Toluene	**179000**		1000		ug/L			12/12/15 19:05	1000
trans-1,2-Dichloroethene	ND		1000		ug/L			12/12/15 19:05	1000
trans-1,3-Dichloropropene	ND		1000		ug/L			12/12/15 19:05	1000
Trichloroethene	ND		1000		ug/L			12/12/15 19:05	1000
Trichlorofluoromethane	ND		1000		ug/L			12/12/15 19:05	1000
Vinyl chloride	ND		1000		ug/L			12/12/15 19:05	1000
Xylenes, Total	ND		3000		ug/L			12/12/15 19:05	1000

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*94*		*70 - 130*		*12/12/15 19:05*	*1000*
4-Bromofluorobenzene (Surr)	*105*		*70 - 130*		*12/12/15 19:05*	*1000*
Dibromofluoromethane (Surr)	*97*		*70 - 130*		*12/12/15 19:05*	*1000*
Toluene-d8 (Surr)	*100*		*70 - 130*		*12/12/15 19:05*	*1000*

Client Sample ID: #3 LC-MS-at bac

Date Collected: 12/11/15 11:45
Date Received: 12/11/15 16:25

Lab Sample ID: 490-93822-3

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		100		ug/L			12/12/15 18:38	100
1,1,1-Trichloroethane	ND		100		ug/L			12/12/15 18:38	100
1,1,2,2-Tetrachloroethane	ND		100		ug/L			12/12/15 18:38	100
1,1,2-Trichloroethane	ND		100		ug/L			12/12/15 18:38	100
1,1-Dichloroethane	ND		100		ug/L			12/12/15 18:38	100
1,1-Dichloroethene	ND		100		ug/L			12/12/15 18:38	100
1,1-Dichloropropene	ND		100		ug/L			12/12/15 18:38	100
1,2,3-Trichlorobenzene	ND		100		ug/L			12/12/15 18:38	100
1,2,3-Trichloropropane	ND		100		ug/L			12/12/15 18:38	100
1,2,4-Trichlorobenzene	ND		100		ug/L			12/12/15 18:38	100
1,2,4-Trimethylbenzene	ND		100		ug/L			12/12/15 18:38	100
1,2-Dibromo-3-Chloropropane	ND		1000		ug/L			12/12/15 18:38	100
1,2-Dibromoethane (EDB)	ND		100		ug/L			12/12/15 18:38	100
1,2-Dichlorobenzene	ND		100		ug/L			12/12/15 18:38	100
1,2-Dichloroethane	ND		100		ug/L			12/12/15 18:38	100
1,2-Dichloropropane	ND		100		ug/L			12/12/15 18:38	100
1,3,5-Trimethylbenzene	ND		100		ug/L			12/12/15 18:38	100
1,3-Dichlorobenzene	ND		100		ug/L			12/12/15 18:38	100
1,3-Dichloropropane	ND		100		ug/L			12/12/15 18:38	100
1,4-Dichlorobenzene	ND		100		ug/L			12/12/15 18:38	100
2,2-Dichloropropane	ND		100		ug/L			12/12/15 18:38	100
2-Butanone (MEK)	ND		5000		ug/L			12/12/15 18:38	100
2-Chlorotoluene	ND		100		ug/L			12/12/15 18:38	100
2-Hexanone	ND		1000		ug/L			12/12/15 18:38	100
4-Chlorotoluene	ND		100		ug/L			12/12/15 18:38	100
4-Methyl-2-pentanone (MIBK)	ND		1000		ug/L			12/12/15 18:38	100
Acetone	ND		2500		ug/L			12/12/15 18:38	100
Benzene	ND		100		ug/L			12/12/15 18:38	100
Bromobenzene	ND		100		ug/L			12/12/15 18:38	100
Bromochloromethane	ND		100		ug/L			12/12/15 18:38	100
Bromodichloromethane	ND		100		ug/L			12/12/15 18:38	100
Bromoform	ND		100		ug/L			12/12/15 18:38	100
Bromomethane	ND		100		ug/L			12/12/15 18:38	100
Carbon disulfide	ND		100		ug/L			12/12/15 18:38	100
Carbon tetrachloride	ND		100		ug/L			12/12/15 18:38	100
Chlorobenzene	ND		100		ug/L			12/12/15 18:38	100
Chlorodibromomethane	ND		100		ug/L			12/12/15 18:38	100
Chloroethane	ND		100		ug/L			12/12/15 18:38	100
Chloroform	ND		100		ug/L			12/12/15 18:38	100
Chloromethane	ND		100		ug/L			12/12/15 18:38	100
cis-1,2-Dichloroethene	ND		100		ug/L			12/12/15 18:38	100
cis-1,3-Dichloropropene	ND		100		ug/L			12/12/15 18:38	100
Dibromomethane	ND		100		ug/L			12/12/15 18:38	100
Dichlorodifluoromethane	ND	*	100		ug/L			12/12/15 18:38	100
Ethylbenzene	ND		100		ug/L			12/12/15 18:38	100
Hexachlorobutadiene	ND		200		ug/L			12/12/15 18:38	100
Isopropylbenzene	ND		100		ug/L			12/12/15 18:38	100
Methyl tert-butyl ether	ND		100		ug/L			12/12/15 18:38	100
Methylene Chloride	ND		500		ug/L			12/12/15 18:38	100

Client Sample ID: #3 LC-MS-at bac

Date Collected: 12/11/15 11:45
Date Received: 12/11/15 16:25

Lab Sample ID: 490-93822-3

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	ND		500		ug/L			12/12/15 18:38	100
n-Butylbenzene	ND		100		ug/L			12/12/15 18:38	100
N-Propylbenzene	ND		100		ug/L			12/12/15 18:38	100
p-Isopropyltoluene	ND		100		ug/L			12/12/15 18:38	100
sec-Butylbenzene	ND		100		ug/L			12/12/15 18:38	100
Styrene	ND		100		ug/L			12/12/15 18:38	100
tert-Butylbenzene	ND		100		ug/L			12/12/15 18:38	100
Tetrachloroethene	ND		100		ug/L			12/12/15 18:38	100
Toluene	**18700**		100		ug/L			12/12/15 18:38	100
trans-1,2-Dichloroethene	ND		100		ug/L			12/12/15 18:38	100
trans-1,3-Dichloropropene	ND		100		ug/L			12/12/15 18:38	100
Trichloroethene	ND		100		ug/L			12/12/15 18:38	100
Trichlorofluoromethane	ND		100		ug/L			12/12/15 18:38	100
Vinyl chloride	ND		100		ug/L			12/12/15 18:38	100
Xylenes, Total	ND		300		ug/L			12/12/15 18:38	100

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*96*		*70 - 130*		*12/12/15 18:38*	*100*
4-Bromofluorobenzene (Surr)	*104*		*70 - 130*		*12/12/15 18:38*	*100*
Dibromofluoromethane (Surr)	*95*		*70 - 130*		*12/12/15 18:38*	*100*
Toluene-d8 (Surr)	*99*		*70 - 130*		*12/12/15 18:38*	*100*

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 490-305914/7
Matrix: Water
Analysis Batch: 305914

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		1.00		ug/L			12/12/15 17:17	1
1,1,1-Trichloroethane	ND		1.00		ug/L			12/12/15 17:17	1
1,1,2,2-Tetrachloroethane	ND		1.00		ug/L			12/12/15 17:17	1
1,1,2-Trichloroethane	ND		1.00		ug/L			12/12/15 17:17	1
1,1-Dichloroethane	ND		1.00		ug/L			12/12/15 17:17	1
1,1-Dichloroethene	ND		1.00		ug/L			12/12/15 17:17	1
1,1-Dichloropropene	ND		1.00		ug/L			12/12/15 17:17	1
1,2,3-Trichlorobenzene	ND		1.00		ug/L			12/12/15 17:17	1
1,2,3-Trichloropropane	ND		1.00		ug/L			12/12/15 17:17	1
1,2,4-Trichlorobenzene	ND		1.00		ug/L			12/12/15 17:17	1
1,2,4-Trimethylbenzene	ND		1.00		ug/L			12/12/15 17:17	1
1,2-Dibromo-3-Chloropropane	ND		10.0		ug/L			12/12/15 17:17	1
1,2-Dibromoethane (EDB)	ND		1.00		ug/L			12/12/15 17:17	1
1,2-Dichlorobenzene	ND		1.00		ug/L			12/12/15 17:17	1
1,2-Dichloroethane	ND		1.00		ug/L			12/12/15 17:17	1
1,2-Dichloropropane	ND		1.00		ug/L			12/12/15 17:17	1
1,3,5-Trimethylbenzene	ND		1.00		ug/L			12/12/15 17:17	1
1,3-Dichlorobenzene	ND		1.00		ug/L			12/12/15 17:17	1
1,3-Dichloropropane	ND		1.00		ug/L			12/12/15 17:17	1
1,4-Dichlorobenzene	ND		1.00		ug/L			12/12/15 17:17	1
2,2-Dichloropropane	ND		1.00		ug/L			12/12/15 17:17	1
2-Butanone (MEK)	ND		50.0		ug/L			12/12/15 17:17	1
2-Chlorotoluene	ND		1.00		ug/L			12/12/15 17:17	1
2-Hexanone	ND		10.0		ug/L			12/12/15 17:17	1
4-Chlorotoluene	ND		1.00		ug/L			12/12/15 17:17	1
4-Methyl-2-pentanone (MIBK)	ND		10.0		ug/L			12/12/15 17:17	1
Acetone	ND		25.0		ug/L			12/12/15 17:17	1
Benzene	ND		1.00		ug/L			12/12/15 17:17	1
Bromobenzene	ND		1.00		ug/L			12/12/15 17:17	1
Bromochloromethane	ND		1.00		ug/L			12/12/15 17:17	1
Bromodichloromethane	ND		1.00		ug/L			12/12/15 17:17	1
Bromoform	ND		1.00		ug/L			12/12/15 17:17	1
Bromomethane	ND		1.00		ug/L			12/12/15 17:17	1
Carbon disulfide	ND		1.00		ug/L			12/12/15 17:17	1
Carbon tetrachloride	ND		1.00		ug/L			12/12/15 17:17	1
Chlorobenzene	ND		1.00		ug/L			12/12/15 17:17	1
Chlorodibromomethane	ND		1.00		ug/L			12/12/15 17:17	1
Chloroethane	ND		1.00		ug/L			12/12/15 17:17	1
Chloroform	ND		1.00		ug/L			12/12/15 17:17	1
Chloromethane	ND		1.00		ug/L			12/12/15 17:17	1
cis-1,2-Dichloroethene	ND		1.00		ug/L			12/12/15 17:17	1
cis-1,3-Dichloropropene	ND		1.00		ug/L			12/12/15 17:17	1
Dibromomethane	ND		1.00		ug/L			12/12/15 17:17	1
Dichlorodifluoromethane	ND		1.00		ug/L			12/12/15 17:17	1
Ethylbenzene	ND		1.00		ug/L			12/12/15 17:17	1
Hexachlorobutadiene	ND		2.00		ug/L			12/12/15 17:17	1
Isopropylbenzene	ND		1.00		ug/L			12/12/15 17:17	1
Methyl tert-butyl ether	ND		1.00		ug/L			12/12/15 17:17	1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 490-305914/7
Matrix: Water
Analysis Batch: 305914

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Methylene Chloride	ND		5.00		ug/L			12/12/15 17:17	1
Naphthalene	ND		5.00		ug/L			12/12/15 17:17	1
n-Butylbenzene	ND		1.00		ug/L			12/12/15 17:17	1
N-Propylbenzene	ND		1.00		ug/L			12/12/15 17:17	1
p-Isopropyltoluene	ND		1.00		ug/L			12/12/15 17:17	1
sec-Butylbenzene	ND		1.00		ug/L			12/12/15 17:17	1
Styrene	ND		1.00		ug/L			12/12/15 17:17	1
tert-Butylbenzene	ND		1.00		ug/L			12/12/15 17:17	1
Tetrachloroethene	ND		1.00		ug/L			12/12/15 17:17	1
Toluene	ND		1.00		ug/L			12/12/15 17:17	1
trans-1,2-Dichloroethene	ND		1.00		ug/L			12/12/15 17:17	1
trans-1,3-Dichloropropene	ND		1.00		ug/L			12/12/15 17:17	1
Trichloroethene	ND		1.00		ug/L			12/12/15 17:17	1
Trichlorofluoromethane	ND		1.00		ug/L			12/12/15 17:17	1
Vinyl chloride	ND		1.00		ug/L			12/12/15 17:17	1
Xylenes, Total	ND		3.00		ug/L			12/12/15 17:17	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*99*		*70 - 130*		*12/12/15 17:17*	*1*
4-Bromofluorobenzene (Surr)	*107*		*70 - 130*		*12/12/15 17:17*	*1*
Dibromofluoromethane (Surr)	*95*		*70 - 130*		*12/12/15 17:17*	*1*
Toluene-d8 (Surr)	*97*		*70 - 130*		*12/12/15 17:17*	*1*

Lab Sample ID: LCS 490-305914/3
Matrix: Water
Analysis Batch: 305914

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1,2-Tetrachloroethane	20.0	18.69		ug/L		93	74 - 135
1,1,1-Trichloroethane	20.0	19.73		ug/L		99	78 - 135
1,1,2,2-Tetrachloroethane	20.0	22.05		ug/L		110	69 - 131
1,1,2-Trichloroethane	20.0	21.05		ug/L		105	80 - 124
1,1-Dichloroethane	20.0	19.42		ug/L		97	78 - 125
1,1-Dichloroethene	20.0	18.79		ug/L		94	79 - 124
1,1-Dichloropropene	20.0	19.63		ug/L		98	80 - 122
1,2,3-Trichlorobenzene	20.0	19.80		ug/L		99	62 - 133
1,2,3-Trichloropropane	20.0	21.24		ug/L		106	70 - 131
1,2,4-Trichlorobenzene	20.0	15.51		ug/L		78	63 - 133
1,2,4-Trimethylbenzene	20.0	21.96		ug/L		110	77 - 126
1,2-Dibromo-3-Chloropropane	20.0	18.00		ug/L		90	54 - 125
1,2-Dibromoethane (EDB)	20.0	20.75		ug/L		104	80 - 129
1,2-Dichlorobenzene	20.0	20.50		ug/L		102	80 - 121
1,2-Dichloroethane	20.0	19.02		ug/L		95	77 - 121
1,2-Dichloropropane	20.0	21.32		ug/L		107	75 - 120
1,3,5-Trimethylbenzene	20.0	22.37		ug/L		112	77 - 127
1,3-Dichlorobenzene	20.0	21.00		ug/L		105	80 - 122
1,3-Dichloropropane	20.0	20.49		ug/L		102	80 - 125
1,4-Dichlorobenzene	20.0	19.98		ug/L		100	80 - 120

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 490-305914/3
Matrix: Water
Analysis Batch: 305914

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
2,2-Dichloropropane	20.0	18.79		ug/L		94	43 - 161
2-Butanone (MEK)	100	107.1		ug/L		107	62 - 133
2-Chlorotoluene	20.0	20.98		ug/L		105	75 - 126
2-Hexanone	100	100.1		ug/L		100	60 - 142
4-Chlorotoluene	20.0	22.90		ug/L		114	75 - 130
4-Methyl-2-pentanone (MIBK)	100	95.09		ug/L		95	60 - 137
Acetone	100	105.7		ug/L		106	54 - 145
Benzene	20.0	20.64		ug/L		103	80 - 121
Bromobenzene	20.0	20.72		ug/L		104	68 - 130
Bromochloromethane	20.0	16.45		ug/L		82	78 - 129
Bromodichloromethane	20.0	19.79		ug/L		99	75 - 129
Bromoform	20.0	18.96		ug/L		95	46 - 145
Bromomethane	20.0	20.95		ug/L		105	41 - 150
Carbon disulfide	20.0	18.17		ug/L		91	77 - 126
Carbon tetrachloride	20.0	18.30		ug/L		92	64 - 147
Chlorobenzene	20.0	20.43		ug/L		102	80 - 120
Chlorodibromomethane	20.0	20.79		ug/L		104	69 - 133
Chloroethane	20.0	21.14		ug/L		106	72 - 120
Chloroform	20.0	19.60		ug/L		98	73 - 129
Chloromethane	20.0	27.13		ug/L		136	12 - 150
cis-1,2-Dichloroethene	20.0	20.26		ug/L		101	76 - 125
cis-1,3-Dichloropropene	20.0	18.75		ug/L		94	74 - 140
Dibromomethane	20.0	21.11		ug/L		106	71 - 125
Dichlorodifluoromethane	20.0	28.26	*	ug/L		141	37 - 127
Ethylbenzene	20.0	21.08		ug/L		105	80 - 130
Hexachlorobutadiene	20.0	18.74		ug/L		94	49 - 146
Isopropylbenzene	20.0	20.67		ug/L		103	80 - 141
Methyl tert-butyl ether	20.0	19.71		ug/L		99	72 - 133
Methylene Chloride	20.0	19.84		ug/L		99	79 - 123
Naphthalene	20.0	18.43		ug/L		92	62 - 138
n-Butylbenzene	20.0	19.37		ug/L		97	68 - 132
N-Propylbenzene	20.0	21.72		ug/L		109	75 - 129
p-Isopropyltoluene	20.0	21.23		ug/L		106	75 - 128
sec-Butylbenzene	20.0	21.89		ug/L		109	76 - 128
Styrene	20.0	21.76		ug/L		109	80 - 127
tert-Butylbenzene	20.0	21.44		ug/L		107	76 - 126
Tetrachloroethene	20.0	19.30		ug/L		97	80 - 126
Toluene	20.0	20.20		ug/L		101	80 - 126
trans-1,2-Dichloroethene	20.0	19.65		ug/L		98	79 - 126
trans-1,3-Dichloropropene	20.0	21.40		ug/L		107	63 - 134
Trichloroethene	20.0	17.90		ug/L		89	80 - 123
Trichlorofluoromethane	20.0	19.57		ug/L		98	65 - 124
Vinyl chloride	20.0	22.02		ug/L		110	68 - 120
Xylenes, Total	40.0	40.90		ug/L		102	80 - 132

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*94*		*70 - 130*
4-Bromofluorobenzene (Surr)	*105*		*70 - 130*

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 490-305914/3
Matrix: Water
Analysis Batch: 305914

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Surrogate	LCS %Recovery	LCS Qualifier	Limits
Dibromofluoromethane (Surr)	*92*		*70 - 130*
Toluene-d8 (Surr)	*98*		*70 - 130*

Lab Sample ID: LCSD 490-305914/4
Matrix: Water
Analysis Batch: 305914

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,1,1,2-Tetrachloroethane			20.0	19.05		ug/L		95	74 - 135	2	16
1,1,1-Trichloroethane			20.0	20.10		ug/L		101	78 - 135	2	17
1,1,2,2-Tetrachloroethane			20.0	22.40		ug/L		112	69 - 131	2	20
1,1,2-Trichloroethane			20.0	21.97		ug/L		110	80 - 124	4	15
1,1-Dichloroethane			20.0	19.61		ug/L		98	78 - 125	1	17
1,1-Dichloroethene			20.0	18.42		ug/L		92	79 - 124	2	17
1,1-Dichloropropene			20.0	20.50		ug/L		103	80 - 122	4	17
1,2,3-Trichlorobenzene			20.0	20.97		ug/L		105	62 - 133	6	25
1,2,3-Trichloropropane			20.0	21.73		ug/L		109	70 - 131	2	19
1,2,4-Trichlorobenzene			20.0	16.51		ug/L		83	63 - 133	6	19
1,2,4-Trimethylbenzene			20.0	22.19		ug/L		111	77 - 126	1	16
1,2-Dibromo-3-Chloropropane			20.0	18.86		ug/L		94	54 - 125	5	24
1,2-Dibromoethane (EDB)			20.0	21.83		ug/L		109	80 - 129	5	15
1,2-Dichlorobenzene			20.0	21.16		ug/L		106	80 - 121	3	15
1,2-Dichloroethane			20.0	20.61		ug/L		103	77 - 121	8	17
1,2-Dichloropropane			20.0	19.56		ug/L		98	75 - 120	9	17
1,3,5-Trimethylbenzene			20.0	22.40		ug/L		112	77 - 127	0	17
1,3-Dichlorobenzene			20.0	21.33		ug/L		107	80 - 122	2	15
1,3-Dichloropropane			20.0	21.03		ug/L		105	80 - 125	3	14
1,4-Dichlorobenzene			20.0	20.39		ug/L		102	80 - 120	2	15
2,2-Dichloropropane			20.0	19.37		ug/L		97	43 - 161	3	18
2-Butanone (MEK)			100	114.0		ug/L		114	62 - 133	6	19
2-Chlorotoluene			20.0	21.18		ug/L		106	75 - 126	1	17
2-Hexanone			100	107.3		ug/L		107	60 - 142	7	15
4-Chlorotoluene			20.0	22.77		ug/L		114	75 - 130	1	18
4-Methyl-2-pentanone (MIBK)			100	98.36		ug/L		98	60 - 137	3	17
Acetone			100	118.0		ug/L		118	54 - 145	11	21
Benzene			20.0	21.45		ug/L		107	80 - 121	4	17
Bromobenzene			20.0	21.48		ug/L		107	68 - 130	4	20
Bromochloromethane			20.0	16.85		ug/L		84	78 - 129	2	17
Bromodichloromethane			20.0	21.24		ug/L		106	75 - 129	7	18
Bromoform			20.0	19.27		ug/L		96	46 - 145	2	16
Bromomethane			20.0	20.13		ug/L		101	41 - 150	4	50
Carbon disulfide			20.0	18.31		ug/L		92	77 - 126	1	21
Carbon tetrachloride			20.0	18.65		ug/L		93	64 - 147	2	19
Chlorobenzene			20.0	20.52		ug/L		103	80 - 120	0	14
Chlorodibromomethane			20.0	21.64		ug/L		108	69 - 133	4	15
Chloroethane			20.0	18.97		ug/L		95	72 - 120	11	20
Chloroform			20.0	20.52		ug/L		103	73 - 129	5	18
Chloromethane			20.0	23.43		ug/L		117	12 - 150	15	31

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCSD 490-305914/4
Matrix: Water
Analysis Batch: 305914

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
cis-1,2-Dichloroethene			20.0	21.22		ug/L		106	76 - 125	5	17
cis-1,3-Dichloropropene			20.0	19.11		ug/L		96	74 - 140	2	15
Dibromomethane			20.0	21.34		ug/L		107	71 - 125	1	16
Dichlorodifluoromethane			20.0	25.18		ug/L		126	37 - 127	12	18
Ethylbenzene			20.0	20.90		ug/L		105	80 - 130	1	15
Hexachlorobutadiene			20.0	19.05		ug/L		95	49 - 146	2	23
Isopropylbenzene			20.0	20.70		ug/L		103	80 - 141	0	16
Methyl tert-butyl ether			20.0	20.90		ug/L		105	72 - 133	6	16
Methylene Chloride			20.0	21.00		ug/L		105	79 - 123	6	17
Naphthalene			20.0	19.92		ug/L		100	62 - 138	8	26
n-Butylbenzene			20.0	19.66		ug/L		98	68 - 132	1	18
N-Propylbenzene			20.0	21.66		ug/L		108	75 - 129	0	17
p-Isopropyltoluene			20.0	21.25		ug/L		106	75 - 128	0	16
sec-Butylbenzene			20.0	21.72		ug/L		109	76 - 128	1	16
Styrene			20.0	21.51		ug/L		108	80 - 127	1	24
tert-Butylbenzene			20.0	21.60		ug/L		108	76 - 126	1	16
Tetrachloroethene			20.0	19.38		ug/L		97	80 - 126	0	16
Toluene			20.0	20.49		ug/L		102	80 - 126	1	15
trans-1,2-Dichloroethene			20.0	20.20		ug/L		101	79 - 126	3	16
trans-1,3-Dichloropropene			20.0	22.19		ug/L		111	63 - 134	4	14
Trichloroethene			20.0	17.76		ug/L		89	80 - 123	1	17
Trichlorofluoromethane			20.0	17.15		ug/L		86	65 - 124	13	18
Vinyl chloride			20.0	19.47		ug/L		97	68 - 120	12	17
Xylenes, Total			40.0	40.15		ug/L		100	80 - 132	2	15

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*97*		*70 - 130*
4-Bromofluorobenzene (Surr)	*106*		*70 - 130*
Dibromofluoromethane (Surr)	*94*		*70 - 130*
Toluene-d8 (Surr)	*95*		*70 - 130*

Lab Sample ID: 490-93778-B-6 MS
Matrix: Water
Analysis Batch: 305914

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1,2-Tetrachloroethane	ND		50.0	46.71		ug/L		93	73 - 141
1,1,1-Trichloroethane	ND		50.0	49.41		ug/L		99	76 - 149
1,1,2,2-Tetrachloroethane	ND		50.0	51.70		ug/L		103	56 - 143
1,1,2-Trichloroethane	ND		50.0	51.45		ug/L		103	74 - 134
1,1-Dichloroethane	ND		50.0	46.62		ug/L		93	71 - 139
1,1-Dichloroethene	ND		50.0	44.35		ug/L		89	70 - 142
1,1-Dichloropropene	ND		50.0	47.79		ug/L		96	76 - 139
1,2,3-Trichlorobenzene	ND		50.0	44.65		ug/L		89	55 - 138
1,2,3-Trichloropropane	ND		50.0	49.12		ug/L		98	53 - 144
1,2,4-Trichlorobenzene	ND		50.0	36.91		ug/L		74	60 - 136
1,2,4-Trimethylbenzene	ND		50.0	54.10		ug/L		108	69 - 136
1,2-Dibromo-3-Chloropropane	ND		50.0	39.58		ug/L		79	52 - 126

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 490-93778-B-6 MS
Matrix: Water
Analysis Batch: 305914

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,2-Dibromoethane (EDB)	ND		50.0	49.00		ug/L		98	75 - 137
1,2-Dichlorobenzene	ND		50.0	51.12		ug/L		102	79 - 128
1,2-Dichloroethane	ND		50.0	45.95		ug/L		92	64 - 136
1,2-Dichloropropane	ND		50.0	43.80		ug/L		88	67 - 131
1,3,5-Trimethylbenzene	ND		50.0	55.07		ug/L		110	69 - 139
1,3-Dichlorobenzene	ND		50.0	51.25		ug/L		102	77 - 131
1,3-Dichloropropane	ND		50.0	49.15		ug/L		98	72 - 134
1,4-Dichlorobenzene	ND		50.0	48.01		ug/L		96	78 - 126
2,2-Dichloropropane	ND		50.0	42.71		ug/L		85	37 - 175
2-Butanone (MEK)	ND		250	229.5		ug/L		92	50 - 138
2-Chlorotoluene	ND		50.0	53.51		ug/L		107	67 - 138
2-Hexanone	ND		250	240.0		ug/L		96	50 - 150
4-Chlorotoluene	ND		50.0	55.20		ug/L		110	69 - 138
4-Methyl-2-pentanone (MIBK)	ND		250	219.0		ug/L		88	50 - 147
Acetone	ND		250	227.2		ug/L		91	45 - 141
Benzene	ND		50.0	49.36		ug/L		99	75 - 133
Bromobenzene	ND		50.0	51.44		ug/L		103	60 - 138
Bromochloromethane	ND		50.0	39.32		ug/L		79	67 - 139
Bromodichloromethane	ND		50.0	51.62		ug/L		103	70 - 140
Bromoform	ND		50.0	47.73		ug/L		95	42 - 147
Bromomethane	ND		50.0	50.10		ug/L		100	16 - 163
Carbon disulfide	ND		50.0	37.03		ug/L		74	48 - 152
Carbon tetrachloride	ND		50.0	45.67		ug/L		91	62 - 164
Chlorobenzene	ND		50.0	48.28		ug/L		97	80 - 129
Chlorodibromomethane	ND		50.0	52.61		ug/L		105	66 - 140
Chloroethane	ND		50.0	47.88		ug/L		96	58 - 137
Chloroform	ND		50.0	48.15		ug/L		96	66 - 138
Chloromethane	ND		50.0	60.55		ug/L		121	10 - 169
cis-1,2-Dichloroethene	ND		50.0	46.66		ug/L		93	68 - 138
cis-1,3-Dichloropropene	ND		50.0	44.62		ug/L		89	71 - 141
Dibromomethane	ND		50.0	48.44		ug/L		97	58 - 140
Dichlorodifluoromethane	ND	*	50.0	52.07		ug/L		104	40 - 127
Ethylbenzene	ND		50.0	51.59		ug/L		103	79 - 139
Hexachlorobutadiene	ND		50.0	45.60		ug/L		91	45 - 155
Isopropylbenzene	ND		50.0	52.77		ug/L		106	80 - 153
Methyl tert-butyl ether	ND		50.0	44.15		ug/L		88	66 - 141
Methylene Chloride	ND		50.0	44.77		ug/L		90	64 - 139
Naphthalene	ND		50.0	41.72		ug/L		83	55 - 140
n-Butylbenzene	ND		50.0	49.67		ug/L		99	66 - 141
N-Propylbenzene	ND		50.0	54.58		ug/L		109	69 - 142
p-Isopropyltoluene	ND		50.0	54.36		ug/L		109	71 - 137
sec-Butylbenzene	ND		50.0	55.62		ug/L		111	73 - 138
Styrene	ND		50.0	53.35		ug/L		107	61 - 148
tert-Butylbenzene	ND		50.0	55.21		ug/L		110	70 - 138
Tetrachloroethene	1.57		50.0	47.06		ug/L		91	72 - 145
Toluene	ND		50.0	50.37		ug/L		101	75 - 136
trans-1,2-Dichloroethene	ND		50.0	44.31		ug/L		89	66 - 143
trans-1,3-Dichloropropene	ND		50.0	52.76		ug/L		106	59 - 135

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 490-93778-B-6 MS
Matrix: Water
Analysis Batch: 305914

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Trichloroethene	ND		50.0	41.91		ug/L		84	73 - 144
Trichlorofluoromethane	ND		50.0	45.60		ug/L		91	58 - 139
Vinyl chloride	ND		50.0	46.80		ug/L		94	56 - 129
Xylenes, Total	ND		100	100.0		ug/L		100	74 - 141

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*94*		*70 - 130*
4-Bromofluorobenzene (Surr)	*106*		*70 - 130*
Dibromofluoromethane (Surr)	*93*		*70 - 130*
Toluene-d8 (Surr)	*99*		*70 - 130*

Lab Sample ID: 490-93778-C-6 MSD
Matrix: Water
Analysis Batch: 305914

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,1,1,2-Tetrachloroethane	ND		50.0	46.40		ug/L		93	73 - 141	1	16
1,1,1-Trichloroethane	ND		50.0	49.76		ug/L		100	76 - 149	1	17
1,1,2,2-Tetrachloroethane	ND		50.0	50.92		ug/L		102	56 - 143	2	20
1,1,2-Trichloroethane	ND		50.0	49.62		ug/L		99	74 - 134	4	15
1,1-Dichloroethane	ND		50.0	47.55		ug/L		95	71 - 139	2	17
1,1-Dichloroethene	ND		50.0	42.83		ug/L		86	70 - 142	4	17
1,1-Dichloropropene	ND		50.0	48.46		ug/L		97	76 - 139	1	17
1,2,3-Trichlorobenzene	ND		50.0	50.93		ug/L		102	55 - 138	13	25
1,2,3-Trichloropropane	ND		50.0	49.30		ug/L		99	53 - 144	0	19
1,2,4-Trichlorobenzene	ND		50.0	41.75		ug/L		84	60 - 136	12	19
1,2,4-Trimethylbenzene	ND		50.0	54.58		ug/L		109	69 - 136	1	16
1,2-Dibromo-3-Chloropropane	ND		50.0	42.34		ug/L		85	52 - 126	7	24
1,2-Dibromoethane (EDB)	ND		50.0	47.90		ug/L		96	75 - 137	2	15
1,2-Dichlorobenzene	ND		50.0	51.58		ug/L		103	79 - 128	1	15
1,2-Dichloroethane	ND		50.0	45.78		ug/L		92	64 - 136	0	17
1,2-Dichloropropane	ND		50.0	44.85		ug/L		90	67 - 131	2	17
1,3,5-Trimethylbenzene	ND		50.0	55.45		ug/L		111	69 - 139	1	17
1,3-Dichlorobenzene	ND		50.0	51.55		ug/L		103	77 - 131	1	15
1,3-Dichloropropane	ND		50.0	47.10		ug/L		94	72 - 134	4	14
1,4-Dichlorobenzene	ND		50.0	49.75		ug/L		100	78 - 126	4	15
2,2-Dichloropropane	ND		50.0	43.37		ug/L		87	37 - 175	2	18
2-Butanone (MEK)	ND		250	236.2		ug/L		94	50 - 138	3	19
2-Chlorotoluene	ND		50.0	53.29		ug/L		107	67 - 138	0	17
2-Hexanone	ND		250	225.5		ug/L		90	50 - 150	6	15
4-Chlorotoluene	ND		50.0	54.80		ug/L		110	69 - 138	1	18
4-Methyl-2-pentanone (MIBK)	ND		250	218.3		ug/L		87	50 - 147	0	17
Acetone	ND		250	241.7		ug/L		97	45 - 141	6	21
Benzene	ND		50.0	49.42		ug/L		99	75 - 133	0	17
Bromobenzene	ND		50.0	51.55		ug/L		103	60 - 138	0	20
Bromochloromethane	ND		50.0	39.62		ug/L		79	67 - 139	1	17
Bromodichloromethane	ND		50.0	50.61		ug/L		101	70 - 140	2	18
Bromoform	ND		50.0	47.79		ug/L		96	42 - 147	0	16

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 490-93778-C-6 MSD
Matrix: Water
Analysis Batch: 305914

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Bromomethane	ND		50.0	55.60		ug/L		111	16 - 163	10	50
Carbon disulfide	ND		50.0	37.67		ug/L		75	48 - 152	2	21
Carbon tetrachloride	ND		50.0	45.84		ug/L		92	62 - 164	0	19
Chlorobenzene	ND		50.0	48.16		ug/L		96	80 - 129	0	14
Chlorodibromomethane	ND		50.0	51.95		ug/L		104	66 - 140	1	15
Chloroethane	ND		50.0	47.10		ug/L		94	58 - 137	2	20
Chloroform	ND		50.0	49.19		ug/L		98	66 - 138	2	18
Chloromethane	ND		50.0	61.42		ug/L		123	10 - 169	1	31
cis-1,2-Dichloroethene	ND		50.0	48.02		ug/L		96	68 - 138	3	17
cis-1,3-Dichloropropene	ND		50.0	44.46		ug/L		89	71 - 141	0	15
Dibromomethane	ND		50.0	48.03		ug/L		96	58 - 140	1	16
Dichlorodifluoromethane	ND	*	50.0	53.61		ug/L		107	40 - 127	3	18
Ethylbenzene	ND		50.0	51.60		ug/L		103	79 - 139	0	15
Hexachlorobutadiene	ND		50.0	51.72		ug/L		103	45 - 155	13	23
Isopropylbenzene	ND		50.0	52.44		ug/L		105	80 - 153	1	16
Methyl tert-butyl ether	ND		50.0	45.59		ug/L		91	66 - 141	3	16
Methylene Chloride	ND		50.0	46.01		ug/L		92	64 - 139	3	17
Naphthalene	ND		50.0	50.28		ug/L		101	55 - 140	19	26
n-Butylbenzene	ND		50.0	50.47		ug/L		101	66 - 141	2	18
N-Propylbenzene	ND		50.0	54.39		ug/L		109	69 - 142	0	17
p-Isopropyltoluene	ND		50.0	54.96		ug/L		110	71 - 137	1	16
sec-Butylbenzene	ND		50.0	55.46		ug/L		111	73 - 138	0	16
Styrene	ND		50.0	53.07		ug/L		106	61 - 148	1	24
tert-Butylbenzene	ND		50.0	54.96		ug/L		110	70 - 138	0	16
Tetrachloroethene	1.57		50.0	46.43		ug/L		90	72 - 145	1	16
Toluene	ND		50.0	50.15		ug/L		100	75 - 136	0	15
trans-1,2-Dichloroethene	ND		50.0	44.49		ug/L		89	66 - 143	0	16
trans-1,3-Dichloropropene	ND		50.0	53.23		ug/L		106	59 - 135	1	14
Trichloroethene	ND		50.0	42.56		ug/L		85	73 - 144	2	17
Trichlorofluoromethane	ND		50.0	48.40		ug/L		97	58 - 139	6	18
Vinyl chloride	ND		50.0	47.69		ug/L		95	56 - 129	2	17
Xylenes, Total	ND		100	101.8		ug/L		102	74 - 141	2	15

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*95*		*70 - 130*
4-Bromofluorobenzene (Surr)	*108*		*70 - 130*
Dibromofluoromethane (Surr)	*95*		*70 - 130*
Toluene-d8 (Surr)	*97*		*70 - 130*

QC Association Summary

Client: Harpeth River Watershed
Project/Site: Harpeth River Watershed

TestAmerica Job ID: 490-93822-1
SDG: Liberty Creek

GC/MS VOA

Analysis Batch: 305914

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-93778-B-6 MS	Matrix Spike	Total/NA	Water	8260B	
490-93778-C-6 MSD	Matrix Spike Duplicate	Total/NA	Water	8260B	
490-93822-1	#1 LC-MS-HRWA dirty	Total/NA	Water	8260B	
490-93822-2	#2 LC-MS-HRWA cleaner	Total/NA	Water	8260B	
490-93822-3	#3 LC-MS-at bac	Total/NA	Water	8260B	
LCS 490-305914/3	Lab Control Sample	Total/NA	Water	8260B	
LCSD 490-305914/4	Lab Control Sample Dup	Total/NA	Water	8260B	
MB 490-305914/7	Method Blank	Total/NA	Water	8260B	

Lab Chronicle

Client: Harpeth River Watershed
Project/Site: Harpeth River Watershed

TestAmerica Job ID: 490-93822-1
SDG: Liberty Creek

Client Sample ID: #1 LC-MS-HRWA dirty

Lab Sample ID: 490-93822-1
Matrix: Water
Date Collected: 12/11/15 11:15
Date Received: 12/11/15 16:25

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1000	5 mL	5 mL	305914	12/12/15 19:32	RP	TAL NSH

Client Sample ID: #2 LC-MS-HRWA cleaner

Lab Sample ID: 490-93822-2
Matrix: Water
Date Collected: 12/11/15 11:30
Date Received: 12/11/15 16:25

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1000	5 mL	5 mL	305914	12/12/15 19:05	RP	TAL NSH

Client Sample ID: #3 LC-MS-at bac

Lab Sample ID: 490-93822-3
Matrix: Water
Date Collected: 12/11/15 11:45
Date Received: 12/11/15 16:25

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		100	5 mL	5 mL	305914	12/12/15 18:38	RP	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: Harpeth River Watershed
Project/Site: Harpeth River Watershed

TestAmerica Job ID: 490-93822-1
SDG: Liberty Creek

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL NSH

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Certification Summary

Client: Harpeth River Watershed
Project/Site: Harpeth River Watershed

TestAmerica Job ID: 490-93822-1
SDG: Liberty Creek

Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15 *
Alaska (UST)	State Program	10	UST-087	07-24-16
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15 *
Florida	NELAP	4	E87358	06-30-16
Georgia	State Program	4	N/A	06-30-16
Illinois	NELAP	5	200010	12-09-16
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	01-31-16
Kentucky (UST)	State Program	4	19	06-30-16
Kentucky (WW)	State Program	4	90038	12-31-15 *
Louisiana	NELAP	6	30613	06-30-16
Maine	State Program	1	TN00032	11-03-17
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-16
Minnesota	NELAP	5	047-999-345	12-31-16
Mississippi	State Program	4	N/A	06-30-16
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-16
New Hampshire	NELAP	1	2963	10-09-16
New Jersey	NELAP	2	TN965	06-30-16
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15 *
North Dakota	State Program	8	R-146	06-30-16
Ohio VAP	State Program	5	CL0033	07-10-17
Oklahoma	State Program	6	9412	08-31-16
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-16
Rhode Island	State Program	1	LAO00268	12-30-15 *
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (Do Not Use - DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-16
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-16
Virginia	NELAP	3	460152	06-14-16
Washington	State Program	10	C789	07-19-16
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-16
Wyoming (UST)	A2LA	8	453.07	12-31-15 *

* Certification renewal pending - certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

490-93822 Chain of Custody

COOLER RECEIPT FORM

Cooler Received/Opened On 12-1-15 @ 1625

1. Tracking # N/A (last 4 digits, FedEx)

Courier: Client IR Gun ID 18290455

2. Temperature of rep. sample or temp blank when opened: 18.7 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: (1) Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) mbm

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) mbm

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) mbm

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) mbm

I certify that I attached a label with the unique LIMS number to each container (intial) mbm

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

#13b) All of the voa's for all of the samples. mbm

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAm THE LEADER IN ENVIRON

Loc: 490
93822

12/15/2015

Client Information	Sampler: Dorie Bolze	Lab PM: Baker, Heather	Carrier Tracking No(s):	COC No: 490-46583-15696.1
Client Contact: Dorie Bolze	Phone: 615 479-0861	E-Mail: heather.baker@testamericainc.com		Page: Page 1 of 1
Company: Harpeth River Watershed				Job #:
Address: 215 Jamestown Park #101	Due Date Requested: 1 day turnaround			
City: Brentwood	TAT Requested (days):			
State, Zip: TN, 37027				
Phone:	PO #: Pre-Payment by CC Required			
Email: doriebolze@harpethriver.org	WO #:			
Project Name: Harpeth River Watershed	Project #: 49009985			
Site: Liberty Creek	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2SO3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - ph 4-5
L - EDA	Z - other (specify)

Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8260B - Standard 8260 List	Total Number of containers	Special Instructions/Note:
			Preservation Code:				A		
#1 LC-MS-HRWA dirty	12/1/15	11:45 am	G	Water			X		See attached notes about setting detection at level of regulatory level of concern especially for ~~toluene~~ toluene & benzene
#2 LC-MS-HRWA cleaner	12/1/15	11:30 am	G	Water			X		
#3 LC-MS-atbac	12/1/15	11:45 am	G	Water			X		
				Water					
				Water					
				Water					
				Water					

Possible Hazard Identification
☐ Non-Hazard ☑ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
1	Donell A Fuller	12/11/15 18:25:00			12-11-15 @ 1625	TAN
2	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
3	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks: 18.7c

Detection Limits need to be below these Regulatory levels of concern: See next page *
Toluene: 1mg/l
Benzene: 0.005 mg/l

Loc: 490
93822

12/15/2015

Table 2: Summary of Analytical Results Continued
Liberty Creek and Harpeth River Seeps
Results in mg/L

	Sampling Location LC-MS (Main Seep) Cont'd												
Date	Acetone	Toluene	Benzene	cis-1,2-Dichloro-ethene	Ethyl-benzene	Methyl Ethyl Ketone (MEK)	Methyl Isobutyl Ketone (MIBK)	n-Propyl-benzene	Tetra-chloro-ethene (PCE)	1,2,4-Trimethyl-benzene	1,2,3-Trimethyl-benzene	1,3,5-Trimethyl-benzene	Xylenes
6/3/09 [8]	<25.00	**185.0**	**0.00503**	<0.0010	**0.0724**	**0.121**	<0.010	**0.00242**	<0.0010	**0.0160**	NR	**0.00516**	<1.5
8/10/09 [9]	**9.170**	**149.0**	**0.00256**	<0.0010	**0.0574**	**0.110**	**0.0264**	**0.00221**	<0.0010	**0.0146**	NR	**0.00487**	**0.191**
10/22/09	<100.0 [RL1]	**108.0**	**0.00354**	<0.0010	**0.0472**	**0.0703**	**0.0286**	**0.00165**	<0.0010	**0.0120**	NR	**0.00393**	**0.159**
12/7/09 [10]	**15.500**	**169.0**	**0.00431**	<0.0010	**0.0645**	**0.0703**	<0.005	**0.00194**	<0.0010	**0.0144**	NR	**0.00462**	**0.256**
2/26/10 [11]	**4.510**	**137.0**	**0.00312**	<0.0010	**0.0695**	**0.0926**	<0.010	<0.0010	<0.0010	**0.0138**	NR	**0.00448**	**0.277**
4/16/10 [12]	**1.44** [E]	**150.0**	**0.00374**	<0.0010	**0.0944**	<0.050	<0.010	**0.00228**	<0.0010	**0.0157**	NR	**0.00510**	**0.369**
6/18/10 [13]	**0.220**	**131.0**	**0.00321**	<0.0010	**0.0706**	<0.050	<0.010	**0.00207**	<0.0010	**0.0148**	NR	**0.00456**	**0.269**
7/27/10 [14]	**0.0929**	**82.4**	**0.00194**	<0.0005	**0.0267**	<0.025	<0.0050	**0.00104**	<0.0005	**0.00751**	NR	**0.00234**	**0.0806**
10/15/10 [RL1]	<25.00	**196.0**	<0.500	<0.500	<0.500	<25.00	<5.00	<0.500	<0.500	<0.500	NR	<0.500	<1.500
12/21/10 [RL1]	<25.00	**78.40**	<0.500	<0.500	<0.500	<25.00	<5.00	<0.500	<0.500	<0.500	NR	<0.500	<1.500
3/22/11 [RL1]	<25.00	**88.90**	<0.500	<0.500	<0.500	<25.00	<5.00	<0.500	<0.500	<0.500	NR	<0.500	<1.500
06/09/11 [15]	<0.050	**236.0**	**0.00474**	<0.0010	**0.0964**	<0.050	<0.010	**0.00302**	<0.0010	**0.0207**	NR	**0.00641**	**0.311**
9/13/11 [RL1]	<12.5	**128.0**	<0.250	<0.250	<0.250	<12.5	<2.50	<0.250	<0.250	<0.250	NR	<0.250	<0.750
12/13/11 [RL1]	<12.5	**134.0**	<0.250	<0.250	**0.0765** [16]	<12.5	<2.50	<0.250	<0.250	<0.250	NR	<0.250	**0.236** [16]
3/22/12 [17]	<0.050	**142.0**	**0.00252**	<0.0005	**0.0938**	<0.050	<0.010	**0.00340**	<0.0010	**0.0215**	NR	**0.00634**	**0.292**
7/17/12 [RL1]	<2.50	**90.0**	<0.050	<0.050	**0.0663**	<2.50	<0.500	<0.050	<0.050	<0.050	NR	<0.050	**0.169**
10/5/12 [RL1]	<2.50	**72.7** [18]	<0.050	<0.050	**0.0708**	<2.50	<0.500	<0.050	<0.050	<0.050	NR	<0.050	**0.176**
12/13/12	<0.050	**62.20**	**0.00116**	<0.0010	**0.0489**	<0.050	<0.010	**0.00134**	<0.0010	**0.00842**	NR	**0.00264**	**0.154**
3/27/13 [RL1]	<2.50	**96.20**	<0.050	<0.050	**0.0561**	<2.50	<0.500	<0.050	<0.050	<0.050	NR	<0.050	**0.188**
9/18/13 [RL1]	<2.50	**114.00**	<0.500	<0.500	<0.500	<25.00	<2.500	<0.500	<0.500	<0.500	NR	<0.500	<1.000
3/21/14 [RL1]	<1.250	**157.00**	<0.050	<0.050	**0.0676**	<2.50	<0.500	<0.050	<0.050	<0.050	NR	<0.050	**0.177**
10/23/14	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1/16/15 [RL1]	<1.250	**34.70**	<0.050	<0.050	<0.050	<2.50	<0.500	<0.050	<0.050	<0.050	NR	<0.050	<0.250
3/25/15 [RL1]	<1.250	**23.60**	<0.050	<0.050	<0.050	<2.50	<0.500	<0.050	<0.050	<0.050	NR	<0.050	<0.250

Bold text indicates a detected parameter

Notes:

NR - Not Reported

NS - Not Sampled. Location had insufficient water to allow sample collection.

[8] Sample also contained isopropylbenzene at 0.00116 mg/L

[9] Sample also contained isopropylbenzene at 0.00116 mg/L

[10] Sample also contained isopropylbenzene at 0.00108 mg/L

[11] Sample also contained isopropylbenzene at 0.00191 and chloroform at 0.00108 mg/L

[12] Sample also contained isopropylbenzene at 0.00133 and chloroform at 0.00145 mg/L

[13] Sample also contained isopropylbenzene at 0.00190 mg/L

[14] Sample also contained isopropylbenzene at 0.000575 mg/L

[15] Sample also contained isopropylbenzene at 0.00191 mg/L

[16] Constituent detected in a re-analysis of the sample outside the required holding time. Result not verified.

[17] Sample also contained isopropylbenzene at 0.00196 mg/L

[18] This result is from resampling. A sample collected on September 6, 2012, contained toluene at a concentration of 0.0912 mg/L.

Laboratory qualifiers:

[E] Estimated result. Sample concentration exceeds the calibration range.

[RL1] Reporting limit raised due to sample matrix effects

Constituent	Regulatory Level of Concern	MW-1 [3]														
Volatiles		4/18/2007 [4]	9/19/2007 [4]	2/21/2008	3/12/2008	6/3/2008	9/9/2008	12/17/2008	3/24/2009	6/9/2009	9/2/2009	12/9/2009	3/24/2010	6/16/2010	9/21/2010	12/21/2010
Acetone	14 [2]	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	NS	<0.050	NS
Benzene	0.005 [1]	<0.0010	<0.0010	**0.0086**	**0.0040**	**0.011**	**0.0109**	**0.00450**	**0.00360**	**0.00753**	**0.00443**	**0.00386**	**0.00392**	NS	**0.00545**	NS
Carbon Disulfide	0.81 [2]	NR	NR	NR	NR	NR	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	NS	<0.0010	NS
Di-isopropyl ether	0.150 [2]	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	NR	NR	NR	NR	NR	NR	NR	NS	NR	NS
1,4-Dichlorobenzene	0.075 [1]	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	NS	<0.0010	NS
Ethylbenzene	0.7 [1]	<0.0010	<0.0010	**0.0038**	**0.0030**	**0.010**	**0.0150**	**0.00475**	**0.00403**	**0.00572**	**0.00413**	**0.00343**	**0.00378**	NS	**0.00381**	NS
Isopropylbenzene(cumene)	0.45 [2]	<0.0010	<0.0010	**0.0047**	<0.0010	**0.0025**	**0.00329**	<0.0010	**0.0010**	**0.00123**	**0.00115**	<0.0010	**0.00108**	NS	**0.00144**	NS
Methyl Ethyl Ketone (MEK)	5.6 [2]	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	NS	<0.050	NS
4-Methyl-2-pentanone (MIBK)	1.2 [2]	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	NS	<0.010	NS
n-propylbenzene	0.66 [2]	<0.0010	<0.0010	**0.0038**	<0.0010	**0.0013**	**0.00192**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	NS	**0.00103**	NS
Toluene	1 [1]	<0.0050	<0.0050	<0.0050	<0.0050	**0.0064**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	NS	<0.0010	NS
Xylenes	10 [1]	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	**0.00343**	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	NS	<0.0030	NS
1,2,3-Trimethylbenzene	0.010 [2]	<0.0010	<0.0010	**0.0012**	<0.0010	**0.0024**	NR	NR	NR	NR	NR	NR	NR	NS	NR	NS
1,2,4-Trimethylbenzene	0.015 [2]	<0.0010	<0.0010	**0.0050**	<0.0010	**0.0033**	**0.00361**	**0.00114**	**0.00106**	**0.00136**	**0.00130**	<0.0010	**0.00120**	NS	<0.0010	NS
1,3,5-Trimethylbenzene	0.120 [2]	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	NS	<0.0010	NS
Semi-volatiles																
1-Methylnaphthalene	0.0011 [2]	NA	**0.00018**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NS
2-Methylnaphthalene	0.036 [2]	NA	**0.00019**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NS

Notes:
NP - Not Promulgated NA - Not Analyzed NR - Not Reported NS - Not Sampled
Bold - Detected at concentration above laboratory detection limit
Shade - Detected at concentration above regulatory level of concern
[1] Tennessee General Use Groundwater Criteria (Rule 0400-40-03-.08(2))
[2] USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites (RSLs), January 2015 (for tap water)
[3] All sampling by low-flow methods using bladder pump except as noted. Dedicated bladder pump installed December 2008.
[4] Samples collected by bailer.

Login Sample Receipt Checklist

Client: Harpeth River Watershed

Job Number: 490-93822-1
SDG Number: Liberty Creek

Login Number: 93822
List Number: 1
Creator: McBride, Mike

List Source: TestAmerica Nashville

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	Received same day of collection; chilling process has begun.
Cooler Temperature is recorded.	True	18.7
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	False	Headspace larger than 1/4".
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

HARPETH RIVER
WATERSHED ASSOCIATION

October 23, 2007

Ms. Ashley Holt
State Remediation Section
Tennessee Division of Solid Waste Management
5th Floor, L&C Tower
401 Church Street
Nashville, TN 37243

By Electronic Mail and First Class Mail

RE: Comments on Egyptian Lacquer Manufacturing Company's (ELMCO) Corrective Action Plan

Dear Ms. Holt,

The Harpeth River Watershed Association's mission is to protect and restore the ecological integrity of the Harpeth. Our organization has hundreds of members throughout the Harpeth River watershed, including the area that has been contaminated by ELMCO. It is our intention through submission of these comments to provide TDEC with information to help with the determination of whether or not to accept ELMCO's proposed Corrective Action Plan (CAP) submitted on August 28th 2007. The fundamental aspects of the CAP is to address the dissolved phase of chemicals in contaminated groundwater in the vicinity of ELMCO by using Monitored Natural Attenuation (MNA) or in layman's terms, to let nature take its course.

As part of this comment letter are four attachments: our June-July 2007 Dissolved Oxygen study in the downtown Franklin area of the Harpeth river, and three separate comments letters to us from different consulting firms with expertise in hazardous waste contamination and remediation. Based on this analyses and data, the proposed CAP is woefully inadequate because it does not meet EPA guidelines for appropriate use of MNA and does not meet the requirements of TDEC's Consent Order and Agreement. If this proposed CAP were accepted, this would allow for ongoing violations of the Tennessee Water Quality Control Act, such as water quality standard violations for dissolved oxygen and violations for unpermitted discharges; the federal Clean Water Act; and various sections of the Resource Control and Recovery Act (RCRA) (see Aquaeter p. 2, Leed p. 6).

The CAP was due to TDEC in June of 2007, however ELMCO was given an extension in order to have time to carry out the requirements of the Order. Though the

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CAP was not submitted until August 28th, the most basic requirements of the Order were not fulfilled including "adequately defining the vertical and horizontal extent of the contaminant plume" and "a description of current contamination conditions and the risks they pose." By not having fulfilled these basic requirements, ELMCO is subject to fines imposed for non-compliance with the Order. Also, we would recommend modifications to the Consent Order to establish specific timelines and numeric standards for the clean-up process such that both ELMCO and the public would have clear expectations of when the remediation process should be completed and what the final results are expected to be (Quarles p. 2).

Foremost among the basic requirements of the existing Order was that the contamination plume was to be defined in extent and nature. This has not been accomplished as no work has been completed to define the plume beyond the ELMCO facility site. Even on the ELMCO site, further investigation around the manufacturing building site away from the above-ground tank farm was not conducted even though data indicate that there is potential groundwater contamination in this area of the site which would more likely explain pathways to the seeps into the main Harpeth versus the ones in Liberty Creek (see Quarles p. 9, #13). The Contamination plume definition was not only required in the Order, it was also promised in a letter from Chuck Head, TDEC's Senior Director of Land Resources to HRWA in May 2007.

EPA has specific guidelines for the use of Monitored Natural Attenuation as a remediation approach, but this proposed CAP does not meet any of them. All three attached comments address this to some extent, but Quarles (pp. 4-6) is the most extensive. One key requirement is that the contamination plume be defined which has not been done here. MNA is also not appropriate in complex geologic conditions (such as karst or limestone bedrock) which we have here, when the contamination plume migrates off site, and only if the approach will be "protective of human health and the environment." The fact that the contaminated plume migrates off site, under people's homes through the fissures in the karst bedrock into Liberty Creek and the Harpeth River automatically signals that MNA would not be appropriate here. Additionally, approving MNA would violate Tennessee Water Quality Control Act and RCRA regulations by allowing an unpermitted discharge of hazardous waste into waters of the state that causes water quality standard violations.

Other alternatives to MNA are available and have not been proven to be technically impracticable or too costly from the minimal work provided in the CAP. In fact, a number of different options that would substantially remediate this site are outlined by Aquaeter (pp. 3-6) that would allow the contamination to be treated before the hazardous waste reaches the Harpeth and in many instances, before they flow under people's homes that live down gradient from some of the underground pools of contaminated groundwater. According to Aquaeter, a number of biologically based remediation approaches would work on the site, and some could have been implemented already for less than what has been spent to date. We specifically asked Aquaeter to provide this after Bill Penny, legal counsel for ELMCO, asked us what we would suggest

at the end of a meeting with Triad, himself and HRWA that you attended as an observer on September 10.

ELMCO has not done enough investigative work to rule out detrimental impacts from long term exposure to these contaminants for the people who live and work in the area, both residents of Daniels Drive and students at Battle Ground Academy primarily because the plume has not been characterized. If the contamination continues to be present under these homes and if it has migrated under Liberty Creek to Battle Ground Academy, ELMCO has no assurances that this will also not affect property values, which are obviously of concern to property owners. (Aquaeter p. 2 #3) From a quality of life standpoint the residents in the vicinity of the seeps still have to deal with the strong odors that come from the seeps which flow with ELMCO's chemical releases ten months after the problem was brought to TDEC's attention. In a January meeting with stakeholders from the City of Franklin, HRWA, Battle Ground Academy and several TDEC divisions, Deputy Commissioner Paul Sloan said that TDEC would make certain that the contamination would be cleaned up in a timely manner. This has yet to happen.

All three expert comments attached refute the claim that there are no detrimental effects to long term exposure for fish and wildlife has not been substantiated given that only one acute toxicity test has been performed and given that dissolved oxygen levels are below standards in the river because of the chemical seeps. HRWA completed a dissolved oxygen study in June and July of 2007 of the five river miles between the city of Franklin's water withdrawal point for its drinking water plant to the city's sewage treatment plant discharge point. In between are the chemical seeps from ELMCO (see map in study). The study found that dissolved oxygen levels immediately downstream of the Harpeth seep 2 and just downstream of Liberty Creek never reached state standards of 5 mg/l at anytime. This field data indicates that the chemicals are a significant contributing factor to low dissolved oxygen levels and violations of the TWCQA. This impact on water quality was also verified in a phone conversation with Joey Holland of TDEC Water Pollution Control. Liberty Creek itself is virtually dead at this point from the build up of bacteria and sediment toxicity conditions and has been for a number of months. This situation does not allow either body of water to meet its state designated use for fish and wildlife. With a quick visit to Liberty Creek or Harpeth River one can easily still see and smell the hazardous chemicals illegally entering waters of the State.

Virtually no improvement in the condition of the river or Liberty Creek has occurred after the emergency response that TDEC initiated in February. The September lab results provided monthly by TDEC's Water Pollution Control Division indicate that the levels of acetone and toluene in both the Harpeth and Liberty Creek are very close to what they were in January. The open trench dug to capture and remove the floating toluene moving toward Liberty Creek is not capturing all of the free product since there are still active seeps in the creek down gradient of the trench. The open trenches are also contributing air pollution as the chemicals volatize, according to the CAP and Triad at the public hearing.

This unpermitted continued release of hazardous waste into the Harpeth and Liberty Creek is in direct violation of the anti-degradation rules under the CWA and TNWQCA. The Harpeth River is listed on the 303(d) list as impaired and not meeting state standards for nutrient enrichment and low dissolved oxygen. The EPA prepared the TMDL, approved in 2004, for the Harpeth for nutrient enrichment/low dissolved oxygen which called for significant reduction in pollution loads that cause or contribute to low oxygen levels. As shown by HRWA's summer Dissolved Oxygen study, the chemical releases are contributing to low dissolved oxygen levels. Under the anti-degradation statement (1200-4-3-.06) no new or increased discharges are allowed if the receiving stream is not meeting water quality standards. Thus, the proposed MNA that would allow chemicals to continue to enter waters of the state for an undefined period of time violate the TWQCA and cannot be approved and could not be permitted under the TNWCQA. The EPA TMDL calls for significant reductions in pollutant loads both from nonpoint sources and from the NPDES permitted sources (the sewage treatment plants). Approving MNA would also not meet the TMDL and would essentially put an increased burden on the permitted downstream sewage treatment plants to meet tighter limits than the TMDL already recommends to ensure that the Harpeth meets water quality standards.

This letter does not capture all of the excellent analysis, recommendations, and points noted by the expert consultants: Mark Quarles of Globally Green Consulting; John Michael Corn and Michael Corn of AquAeTer; and Jeff Leed of Leed Environmental. Both Quarles and Leed's comments focus on issues with the proposed CAP and bring to bear dozens of points that render the CAP inadequate and unacceptable. Quarles has a specific section on the EPA's MNA guidelines. Aquaeter's comments provide a variety of remedial alternatives that could be considered and are workable for this site. Both Leed and Aquaeter comment on regulatory violations with the proposing and approving Monitored Natural Attenuation for this hazardous chemical release site. Both Aquaeter and Quarles note a concern that approving this proposed CAP to use MNA would not meet core EPA requirements for implementing state agencies as well.

Our experts have all noted the severity of this chemical pollution problem that has been ongoing since it was identified in January by the City of Franklin staff. This is not an inactive hazardous substance site as defined in the Order. ELMCO is currently conducting business manufacturing with these solvents and there is ongoing release of regulated hazardous wastes to the waters of the state from the contaminated groundwater plume in violation of federal and state water pollution and hazardous waste management statutes and regulations. While Triad did not provide an estimate of the quantity of contaminated groundwater, Aquaeter worked from the CAP information and estimated 10,000 to 30,000 gallons of RCRA hazardous wastes in the plume. Also, based on the CAP information, Aquaeter notes that ELMCO is likely emitting enough volatiles from the above-ground storage tanks into the air to need an Air Permit under the Clean Air Act. This would corroborate reports of smelling chemicals off and on for the past decade or so that was stated by residents during the public hearing.

Even though right now ELMCO is regulated as a small quantity generator of hazardous wastes as Chuck Head explained in his letter to HRWA May 17, it is not

unreasonable based on the amount of hazardous chemicals released into the environment by ELMCO to consider treating it as a full quantity generator. According to Chuck Head's letter, this would mean the company would need a Part B permit under RCRA and would be obligated to follow the RCRA Correction Action rules. HRWA requested in our May letter to TDEC that the clean-up by ELMCO would be conducted as an "equivalent of a full RCRA facility assessment and RCRA facility investigation." In Chuck Head's response, TDEC indicated that it was approaching ELMCO in this fashion. However, as noted in Leed's comments, ELMCO's proposed CAP simply bypasses many of the important components of the RCRA corrective action plan and corrective measures study process. Thus, this is not an "RCRA equivalent" proposal.

Essentially, the proposed CAP to use Monitored Natural Attenuation puts the burden of the pollution of hazardous chemical releases into the environment from ELMCO onto other permitted entities such as the city of Franklin and the two other downstream sewage treatment plants, the neighboring residential area, the public who enjoy the Harpeth and walk along the right-of-ways, and the environment in general. None of these entities caused this pollution problem, ELMCO did. In summary, to ensure that there is a timely removal of the pollution we recommend the following based on the expertise provided to us. Many of these points are components of a RCRA equivalent facility assessment and investigation, and RCRA corrective measures study and implementation.

1. That this proposed groundwater Corrective Active Plan be rejected
2. The Order be amended to include goals and metrics for clean-up, quarterly progress reports, penalties and deadlines
3. Notice of violation and penalties for not meeting the Order with this proposed groundwater CAP
4. Redesign the interceptor trench to capture all of the free product and install air pollution controls (either by closing the trench or with a capture system for emissions)
5. Conduct a thorough on-site investigation to see if additional sources exist and determine the localized groundwater (30 days to design and implement; and 15 days to report)
6. Expand the soil/groundwater investigation off-site to characterize the contamination plume (30 days; 15 days)
7. Conduct a meaningful seasonal air migration pathway analysis
8. Conduct ambient air monitoring with appropriate EPA methods to test down to the NOAEL concentrations
9. Consider effects of all the chemicals cumulatively, rather than each singularly
10. Prepare a new CAP after conducting what is still needed as suggested above for comprehensive assessment and investigation (45 days after investigations done)
11. Prepare a new CAP with complete feasibility study of remediation options, costs, and with each cost projected back to present value for the lifetime of the remediation (suggest 20 years).

If you have any questions regarding our submission, please do not hesitate to call me, Pam Davee, or any of the experts whose comments we have provided. We look forward to your response to our comments and final decision regarding the proposed CAP and having ELMCO move quickly to develop and implement a remediation plan that substantially meets RCRA requirement. It is imperative that there is a timely removal of the hazardous chemicals from the area which will result in reducing the risk to public health, reducing the risk to private property damage, improving the water quality and aquatic habitat in Liberty Creek and the Harpeth, and increasing the enjoyment of the Harpeth River in this area of downtown Franklin.

Sincerely,

Dorene Bolze
Executive Director

Attachments:

1) Globally Green Consulting Comment Letter to Ashley Holt and Technical Comments by Mark Quarles, P.G.
2) AquAeTer Comment Letter to Dorie Bolze on Egyptian Lacquer Manufacturing Company's Corrective Action Plan by John Michael Corn, P.E. and Michael Corn, P.E.
3) Leed Environmental, Inc. Comment letter to Dorie Bolze by Jeff Leed. President
4) Harpeth River Watershed Association Dissolved Oxygen Study June and July 2007

cc: Paul Sloan, Deputy Commissioner of TDEC
Joe Sanders, TDEC General Counsel
Mike Apple, Director Solid and Hazardous Waste Management
Chuck Head, Senior Director, Land Programs
David Draughon, Senior Director for Water Resources
Paul Davis, Director Water Pollution Control
Joey Holland, Director of Nashville TDEC EAC Office and staff
Bonnie Bashor and staff at TN Department of Health
Susan Minor, Andy Graham, and Lawrence Sullivan, Battleground Academy
City of Franklin Board of Mayor and Aldermen and senior city staff
James Giattina, EPA Region IV, Director Water Management Division
Kumar Narindor, EPA Region IV, Chief RCRA and OPA Enforcement
Hector Danois, EPA Region IV, Coordinator RCRA Enforcement and Compliance Branch
State Senator Douglas Henry
State Senator Jack Johnson
State Representative Glen Casada
State Representative Charles Sergeant

Marc Driskill, Property Owner of Liberty Creek
Residents of Daniels Drive Neighborhood adjacent to ELMCO
Bill Penny, ELMCO legal counsel, Stites and Harbison
Dwight Hinch and Chris Scott, TriAD
Kerry Maddox, General Manager Egyptian Lacquer Manufacturing Company

Globally Green Consulting
Environmental Consulting

October 22, 2007

Ms. Ashley Holt
State Remediation Section
Tennessee Division of Solid Waste Management
5th Floor, L&C Tower
401 Church Street
Nashville, Tennessee 37243

RE: Egyptian Lacquer Manufacturing Company
Ground Water Corrective Action Plan and Consent Agreement and Order

Dear Ashley:

Attached are written technical comments submitted on behalf of the Harpeth River Watershed Association (HRWA) regarding the proposed Ground Water Corrective Action Plan (CAP) and the associated Consent Agreement and Order. We trust that our comments will receive careful and diligent consideration. Specifically, our comments address the inadequacies associated with the following: the environmental investigative activities that became the basis for technical decisions in the CAP; the CAP itself; and the Consent Agreement and Order that is the regulatory mechanism for the CAP and the supportive investigations.

There is adequate technical support to justify complete rejection of the CAP by TDEC because of the inadequate scope and scale of the investigative activities, the lack of adherence to industry and EPA standards for conducting investigations for the purpose of making remedial decisions, the lack of a thorough corrective action measures evaluation of high potential alternatives, and the lack of adherence to EPA criteria for selecting monitored natural attenuation (MNA) as a remedial action.

Selection of MNA by ELMCO does not even meet the general EPA handout requirements provided by TDEC to attendees at the October 10, 2007 public hearing. As examples, the handout stated that MNA works best where the source of the pollution has been removed. This is not the case for the proposed corrective action because Triad has admitted that there is free product in the bedrock that will be a source of free and dissolved-phase contamination for likely years to come. Further, the extent to which free product exists beyond the ELMCO property line has not been defined. Secondly, the flier explained that regular monitoring is needed “to make sure that pollution doesn’t leave the site”. Obviously, this is occurring on a 24-hour-a-day basis for the foreseeable future.

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Although not specifically a part of the CAP, we believe that the regulatory mechanism that requires such, the Consent Order and Agreement, should be modified because of the following inadequacies relative to the investigative and remedial activities required:

1. The Order failed to include specific criteria for soil, groundwater, or air remediation levels to define clean-up objectives that are protective of human health and the ecological environment. Without those criteria, there is no pre-established expectation of what degree of clean-up and environmental protection for area restoration is required. These criteria should be included in a new, modified Order.
2. The Order continually refers to the ELMCO site as an "inactive" hazardous substance site. The site is an active manufacturing facility with an ongoing release of regulated hazardous wastes to the waters of the State in violation of the Clean Water Act and the Tennessee Water Quality Control Act.
3. The Order specifically assigned responsibility of a release of toluene and acetone to ELMCO, and the Order specifically described the investigative actions to mitigate and investigate. However, the Order did not assign responsibility for the numerous other industrial chemicals that have been detected that are known to be used as raw materials by ELMCO. The Order should be modified to include all chemicals that are observed in soil and groundwater and into the waters of the State where there is a reasonable potential for ELMCO to be the responsible party.
4. ELMCO agreed in the March 1, 2007 meeting with TDEC to initiate investigative activities to "delineate" the extent of contamination. To-date, the extent of the contamination has not been defined off-property in a residential area or on-site and therefore, a remedy cannot be selected.
5. According to the Order, a *Phase II Groundwater Assessment Plan* was due to TDEC in June 2007 to "define the horizontal and vertical extent of the contamination plume". To-date, the nature and extent of the contaminant plume of neither the soil nor groundwater have been determined. As a result, ELMCO is out of compliance, and a penalty is warranted.
6. The Order included no penalties (financial or otherwise) for non-compliance. EPA guidance on this matter states "a critical component in the development of facility-specific incentives is the inclusion of penalty provisions in enforcement documents, and collection of penalties when the facility fails to comply with the permit or order". Further, the EPA concluded "penalty provisions in consent orders should contain stipulated penalty provisions, including provisions for interest on any unpaid stipulated penalty balance". The Order should be amended to define the penalties for non-compliance relative to the required clean-up criteria.

I am concerned that if TDEC were to approve ELMCO's proposed CAP, doing so would be approving a corrective action approach and supporting environmental investigation that do not meet core EPA requirements, as listed in the attached written

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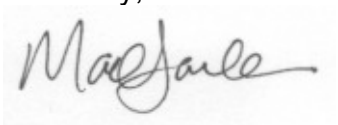
comments. Not meeting EPA requirements thereby means TDEC would not be meeting its responsibilities as a state agency authorized by EPA to implement RCRA and the Clean Water Act. I sincerely hope that TDEC can meet all of these requirements and keep the responsibilities of the clean up of ELMCO's toxic releases within TDEC's jurisdiction.

We look forward to receiving your written, detailed responses to our comments.

Sincerely,



Mark Quarles, P.G.

Attachment: Technical Comments

cc: Pam Davie, HRWA
Dorie Bolze, HRWA

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The *Groundwater Corrective Action Plan for the Solvent Release at the Egyptian Lacquer Manufacturing Company in Franklin, Tennessee* (hereinafter referred to the "groundwater CAP") does not meet US EPA requirements[1] [2] for monitored natural attenuation (MNA) for selection as a remedial action.

1. The use of monitored natural attenuation (MNA) as a component for remedial action does not meet EPA's criteria. According to EPA guidance, use of MNA as a remedy should only be used when the selected remedy will "meet the site remediation objectives within a timeframe that is reasonable when compared to that offered by other methods". The proposed remedy offers no factual time of completion for natural attenuation to meet remedial objectives, nor did the CAP compare the timeframes associated with all remedial options considered.
2. The ELMCO site does not qualify for MNA given the direct and quick connection to Liberty Creek and the Harpeth River. The EPA expects that MNA "will only be appropriate for sites that have a low potential for contaminant migration", which is clearly not the case here.
3. Liberty Creek and springs into the Harpeth River are critical base flow components to the Harpeth River flow. The EPA concluded "groundwater should be returned to their beneficial uses as soon as practical". EPA defines a "beneficial use" as groundwater that discharges to surface waters and becomes a critical base flow component of the receiving streams. As a result, both Liberty Creek and the Harpeth River should be returned to their highest quality conditions as soon as practical.
4. EPA concluded that MNA "will be an appropriate remediation method only where its use will be protective of human health and the environment and it will be capable of achieving site-specific remediation objectives within a time frame that is reasonable compared to other alternatives". Clearly, the proposed remedy is not protective of human health or the environment, and no timeframe for remediation was given in the CAP.
5. EPA concluded that "MNA should not be viewed as a direct or presumptive outcome of a technically impracticability determination". The selection of MNA by ELMCO is essentially a presumptive remedy without first completing a detailed argument for technical impracticability (TI), as defined by the EPA. ELMCO has not demonstrated that the most appropriate cleanup levels cannot be practicably attained using all available, reasonably applicable technologies.
6. ELMCO has not completed the technical arguments necessary to demonstrate that a TI argument is warranted. To make such a

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demonstration, ELMCO should have included, at a minimum according to EPA criteria, a discussion of the applicable or relevant and appropriate requirements (ARARs); a detailed conceptual model; data to support exactly why the TI is requested; a demonstration that the contaminant source(s) have been identified; an analysis of ongoing remedial actions; predictive analyses of the timeframes to attain the required clean-up levels; a demonstration that no other remedial technology could reliably, logically, or feasibly attain the clean-up levels within a reasonable timeframe; and an estimate of all costs of all proposed remedy options. No such information was provided by ELMCO and therefore, it is presumed that selection of the MNA was a presumptive remedy without basis.

7. EPA concluded "decisions to employ MNA as a remedy or remedy component should be thoroughly and adequately supported with site-specific characterization data and analysis". Site characterization to support MNA "warrant a quantitative understanding of source mass; groundwater flow (including preferential pathways); contaminant phase distribution and partitioning between soil, groundwater, and soil gas; rates of biological and non-biological transformation; and an understanding of how all of these factors are likely to vary with time". Further, investigative activities should result in an understanding of aquifer hydraulics, recharge and discharge areas and volume, an evaluation of nutrients and electron donors and acceptors in the groundwater, the anticipated rate of attenuation, and specific analyses to measure microbial populations in the subsurface. A detailed conceptual model is supposed to detail all of these critical components as the foundation for MNA, yet the conceptual geologic model in the CAP did not include these components.
8. EPA recognizes that LNAPL in free or residual phase "represents a significant mass of contamination that will serve as a long-term dissolved-phase source". The CAP allows for an undetermined mass of light non-aqueous phase liquid (LNAPL) to remain in the ground untreated, creating a long-term detrimental impact to the waters of the State and daily violations of the Tennessee Water Quality Control Act and the Clean Water Act.
9. EPA has determined that site characterization should include collecting data to define (in three special dimensions over time) the nature and distribution of contaminants of concern and contaminant sources, as well as potential impacts on receptors. The proposed remedy does virtually nothing to mitigate the impacts to fish and aquatic life, to wildlife that depend on surface waters for survival, or to human receptors.
10. The EPA concluded "MNA will generally not be appropriate where site complexities preclude adequate monitoring" and that complex geologic conditions (e.g. karst) are a good example when MNA should <u>not</u> be used

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because of the inability to adequately accomplish performance monitoring. Triad Environmental Consultants (Triad) has argued that the site groundwater cannot be reasonably monitored with groundwater wells, and that the karst geologic conditions result in the inability to adequately monitor the site. As a result, Triad concluded that MNA is not a reasonable remedial option yet recommended it anyway.

11. EPA concluded that MNA "should not be used where such an approach would result in either plume migration or impacts to environmental resources". The proposed remedy does virtually nothing to further prevent plume migration from the currently effected areas.
12. EPA concluded that when clean-up objectives cannot be met within a reasonable timeframe, "a remedial alternative that more likely would meet these expectations should be selected". The clean-up objectives have never been defined by TDEC nor has ELMCO ever been able to define the length of time for MNA to achieve EPA or TDEC water quality standards. As a result, MNA should not have been selected.

Specific comments relative to the CAP and its technical attachments and appendices are as follows:

1. Triad explained in the CAP (Section 3.1) that TDEC, not Triad, had determined that "no further investigations for contaminant releases at the Site are needed". As a result, ELMCO has, through its consultant Triad, placed the responsibility of not conducting more investigative activities on TDEC, even thought the requirements for investigative activities detailed in the Order have not been met. ELMCO has the responsibility, by law, to adequately and completely define the extent of the contamination and meet all remedial objectives.
2. TDEC committed in the May 17, 2007 letter from Mr. Chuck Head to Ms. Dorie Bolze of the HRWA that the environmental investigation will begin "at the point of the release and will move from there until the extent of contamination in the soil and groundwater is determined". To-date, this has not been demonstrated by ELMCO because the nature and extent of contamination has not been determined beyond the ELMCO property, other than multiple discharge points into the waters of the State located hundreds of feet away.
3. The soil and groundwater investigation performed by Triad does not meet the minimum requirements of EPA for determining the horizontal and vertical extent of contamination of any constituent. The EPA defines[3] such extent as "the horizontal and vertical area within which the concentrations of hazardous

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constituents in the environmental media being investigated are above detection limits or background concentrations indicative of the region".

4. The groundwater CAP determined that the "volume of the release cannot be determined" for a variety of reasons that relate to historical inventory inadequacy, the unknown length of time of the release, and an unknown leakage rate. Triad claimed in the groundwater CAP that the mass of the contaminants in the soil and groundwater is not known. If ELMCO had completed the TDEC-required delineation to define the vertical and horizontal extent of the contamination, the mass of remaining contaminants for purposes of corrective actions could have been determined. No soil or groundwater investigation has been completed off-property and therefore, the mass of polluted media is still unknown. As a result, ELMCO is unable comply with a basic component necessary to make reasonable conclusions on remedial cleanup. This is necessary in order to estimate the length of time for remedial actions to eventually result in the groundwater and surface water meeting all EPA and TDEC closure standards that are protective of human health and the environment.
5. The proposed remedy does not meet TDEC's Groundwater Classification Rule to allow contaminants to remain in the subsurface in excess of Tennessee water quality standards. ELMCO has not completed the application requirements for applying for a Site-Specific Impaired standard.
6. Triad stated in the October 10, 2007 public hearing that VOC concentrations in Liberty Creek are reducing, yet actual TDEC-provided analytical reports show that they are in fact increasing.
7. Triad concluded in the groundwater CAP that the dissolved phase component of the plume "poses no significant risk to ecological receptors in the Liberty Creek or the Harpeth River" – even though 20 percent acute toxicity was noted in one test. Further, the water quality has been shown to be highly variable (e.g. compare acetone results for Liberty Creek on September 12 and 13, 2007), so one test on one day does not indicate conclusive acute toxicity over the long-term. In addition to acute toxicity test mortality, dissolved oxygen studies performed by the HRWA indicated that that dissolved phase and LNAPL contaminants cause significant drops in dissolved oxygen concentrations below the 5.0 mg/l minimum requirement to sustain fish and aquatic life, as established by the Tennessee Water Quality Control Act. Therefore, there is no further basis for the Triad conclusion of no significant risk.
8. The Consent Agreement and Order requires that ELMCO submit "all data that is obtained during the implementation of the CAPs". The CAP included the results of the *Phase I and Phase II Groundwater Investigations* results in Appendix 2. A review of the laboratory analytical reports included in

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Attachment 4 of that report suggests that groundwater samples were collected for the Extractable Petroleum Hydrocarbons (EPH) test, yet no data were presented for the results. Further, the analytical reports indicate that Triad requested chromatograms be provided so the actual range of hydrocarbons could be determined beyond what was reported in US EPA Method 8260, to give an indication of other organic compounds that might be present. No such chromatograms were provided in the report and therefore should be provided for adequate public review and comment to this CAP. Only through complete and thorough review of the all site data can informed decisions be made, and such information should have been included in the CAP for the public to provide comment.

9. The *Summary of Phase I and II Groundwater Investigations* (Appendix 2 in the CAP) report provided laboratory analyses, and the associated laboratory analytical reports indicated that the laboratory results were outside the acceptable levels of precision and accuracy and therefore, the reported data values are suspect and cannot be relied upon for accurate trend comparisons or for making remedial measure decisions.
10. ELMCO was required to submit two (2) soil corrective action plans (CAPs) for source area soils at the facility and also for the remediation waste soil pile located at the interceptor trench. The source area CAP was due in June 2007 and has apparently been implemented; however, there has been no demonstration that the remediation even worked. The only way to surely understand if the remediation worked is to advance more soil borings in the exact areas known to be contaminated and to compare the results. Groundwater monitoring will not accomplish this objective.
11. Triad explained during the October 10, 2007 public hearing that the amount of BIOX solution added to the tank farm subsurface soil was based upon the estimated pollutant mass beneath the immediate area of the tank farm. Further, Triad stated in a September 13, 2007 meeting with HRWA, Globally Green Consulting, and Stites and Harbison staff that no BIOX solution was injected within the bedrock (weathered or competent) or at the top of bedrock and therefore, the solution was injected well above the saturated zone. As such, not enough solution was applied to promote accelerated natural attenuation to the wider-spread area between the contaminated tank farm area and the receiving surface waters.
12. The CAP stated that the source of the “solvent” release was “eliminated as of February and March 2007” when two (2) supply lines for acetone and toluene were found to be leaking at two (2) piping elbows. The presence of other volatile organic compounds (VOCs) (e.g. methyl ethyl ketone, MIBK, isopropyl alcohol, 1,2,4-trimethybenzene, etc.) in the soil, groundwater, and surface

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water are not explained by releases from two (2) virgin toluene and acetone tank lines.

13. The Phase II Environmental Site Assessment (ESA) performed by August Mack in October 2006 indicated that there are other possible sources of contamination of VOCs and semi-volatile organic compounds (SVOCs). For example, there is ample indication that some VOC and SVOC constituents (e.g. ethylbenzene, 1,2,4-trimethylbenzene, naphthalene, etc.) are associated with possible releases from three (3) underground storage tanks on-site that contained gasoline, diesel fuel, and heating oil that were never properly closed. Further, the Phase II ESA actually indicated that the highest acetone concentrations on-site were located near the manufacturing building – not at the aboveground tank farm. Triad advanced no soil borings near the manufacturing building.
14. The May 17, 2007 letter from Chuck Head concluded "naphthalene is a key indicator of the presence of diesel fuel and No. 2 heating oil". Per the August Mack Phase II ESA, diesel fuel and heating oil tanks existed at the ELMCO facility several hundred feet away from the "solvent" tank farm. Naphthalene was found at 2,300 parts per million (*Data Report of Soil Investigation Results*, April 11, 2007) in a soil sample (8.5 feet deep) collected at the tank farm with no explanation as to the source of that contaminant. Therefore, the source of naphthalene in the soil on-site has not been defined. Further, investigative sampling did not include any US EPA Method 8270 analyses for SVOC parameters.
15. Boring logs of air rotary borings that were included in the *Phase I and Phase II Groundwater Investigation* report indicated that petroleum hydrocarbon odors (that were distinctly differentiated from solvent odors) were present during drilling. There is no explanation of what the source(s) of those odors might be. When Triad was questioned in a September 13, 2007 meeting at the Stites and Harbison office, Triad responded by saying that those odors were "natural" in middle Tennessee. There is no basis whatsoever to support the naturally occurring petroleum odor claim, especially given the historic uses of petroleum hydrocarbons on-site by ELMCO and the previous owner, Shell Oil (as a bulk oil storage terminal).
16. The groundwater CAP concluded that the shallowest groundwater occurs at the top of bedrock. A review of the Geoprobe boring logs for the 20 borings that were advanced around the tank farm indicated that saturated groundwater conditions were present at the top of bedrock in 9 of 20 (45%) soil borings, yet only one groundwater well was properly installed to screen this interval.
17. Of the four (4) wells installed on-site, only one (1) well (RW-1) is screened to bracket top-of-bedrock groundwater. Further, only RW-1 was installed within

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the zone of highest concentrations; within the zone of highest hydraulic conductivity; and within the lowest bedrock elevations indicative of “cutters” or linear depressions in the bedrock. The top of the well screens (meaning that the actual screened intervals extend much deeper) for the remaining wells are at least 36 feet (MW-1), 27 feet (MW-2), and 17 feet (MW-3) below the top of bedrock and outside the zone of “cutters”, as defined by Triad during their Geoprobe drilling investigation. It is likely that the wells are monitoring different water-bearing zones than RW-1. As a result, a monitoring system capable of monitoring the zones of highest contamination and all migration pathways does not exist, and a system should be created.

18. Drilling operations for the only groundwater recovery well that was installed (RW-1) likely caused light non-aqueous phase liquid (LNAPL) observed at boring AR-1 to migrate further to the west towards Daniels Drive and Liberty Creek due to Triad’s use of 600 gallons of drilling water. Subsequent groundwater monitoring of the well that has apparently not indicated the presence of LNAPL is not surprising given the hydraulic head that would have been present with the addition of 600 gallons of water. There is no downgradient well capable of monitoring LNAPL in this area or off-property and therefore the extent of LNAPL is not defined.
19. Open borehole groundwater well AR-1 is likely incapable of recovering LNAPL or monitoring the groundwater from the zone of the highest contamination because of the steel surface casing that was set by Triad approximately five (5) feet into weathered and competent bedrock “to prevent cross-contamination of groundwater with solvent found at the top of bedrock”. The well can therefore not possibly provide an indication of the highest groundwater concentrations that exist.
20. Groundwater assessment activities used an air rotary drilling rig to advance borings. As indicated in AR-4 and AR-5 in the Phase I / II Groundwater Report, air rotary drilling missed discrete, shallow water bearing zones during drilling on June 11–12, 2007 when no water was detected during drilling, yet 15 feet of standing water from undetermined intervals was present in the boreholes one to two days later. Further, the depths of the borings exceeded the depths of the nearby Harpeth River by 25 feet.
21. As of the September 13, 2007 meeting at Stites and Harbison office, each well had only been sampled one (1) time and at no time, have all wells been sampled on the same day. Triad cannot possibly understand the groundwater characteristics enough to responsibly propose any remedy, much less a MNA remedy, with just one (1) groundwater sampling event and not having sampled all wells on the same day.
22. Triad proposed in the CAP that seeps be sampled monthly, yet groundwater monitoring wells MW-2, MW-3, and RW-1 would be sampled semi-annually,

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and MW-1 would be sampled annually. There has yet to be a sampling event where all groundwater wells and seeps are sampled on the same day. All valid sampling points should be sampled monthly to provide consistent information on the rate and direction of flow and chemical quality. Secondly, additional groundwater monitoring wells should be required so that each water-bearing zone has at least three (3) wells (at least 2 downgradient and one upgradient) so that an accurate potentiometric surface diagram can be produced for each water-bearing zone, as required by EPA rules and guidance for groundwater investigations. Further, groundwater wells should be installed off-property. Currently, the existing groundwater well configuration does not meet minimum EPA requirements for quantity or location for environmental investigations of this nature.

23. Triad concluded that there is a "lack of free hydraulic connection" between wells MW-1, MW-2, MW-3, AR-1, and RW-1 and as a result, Triad argued that no potentiometric surface diagram could be developed for submittal in the CAP. Minimum EPA and industry-acceptable protocol requires at a minimum, three (3) wells to be installed in a triangular pattern within the same water-bearing zone to determine the direction of groundwater flow. This is especially critical when, as is the case at ELMCO, there are possibly more contaminated zones, there are preferential joint-controlled pathways, the groundwater represents significant hazards, the geologic conditions represent multiple exposure pathways, sensitive groundwater discharge pathways exists, and the contamination is located so close to a residential area.
24. Triad presented a groundwater potentiometric surface diagram at the October 10, 2007 public hearing and explained that all five well points (MW-1, MW-2, MW-3, AR-1, and RW-1) were used to develop the diagram. That diagram is invalid because the well points likely monitor different water-bearing zones and also Triad's admittance in the CAP that there was no hydraulic connection between the wells.
25. Seep sampling at Liberty Creek has indicated the presence of dissolved-phase acetone, toluene, and multiple other VOCs that are used as raw materials by ELMCO, in addition to the presence of free-phase toluene. The occurrence of MIBK in the Harpeth River samples and none being detected in Liberty Creek; the occurrence of isopropyl alcohol in some (not all) Harpeth River seep samples and no Liberty Creek samples; and the predominance of acetone being detected in the Harpeth River all indicate that there are source areas other than the solvent tank farm. The Phase II ESA and the disparity between constituents from various seep samples all indicate other, undefined sources of VOC constituents. As a result, the nature and extent of the contamination has not been defined consistent with the Order.

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26. Triad concluded in the groundwater CAP that a “large-scale, disruptive investigations along the presumed pathway” would be required to determine the migration pathways of LNAPL and dissolved phase contaminants from the ELMCO facility. Neither the Order (nor EPA regulations) require that the investigation be limited to “small-scale” investigations and therefore, this Triad argument has no merit whatsoever as a reason to not delineate the horizontal and vertical extent of the contamination. ELMCO is required to complete whatever investigations are necessary to meet the characterization requirements consistent with TDEC and EPA rules and guidance.
27. Triad concluded in the groundwater CAP that “it is clear from evidence gathered during the drilling of MW-3 (located closest to the residential subdivision) that there is a vapor-phase component to the plume” and that those vapors appear to be related to the groundwater contamination, which is determined by bedrock “cutters” and fractures. To-date, these bedrock conditions have not been determined beyond the ELMCO property line and therefore, the seasonal risk from vapor hazards has yet to be defined or properly mitigated. Incidentally, MW-3 does not seem to be located within a bedrock “cutter”, yet hazardous vapors were present and most recently, Triad stated at the October 10, 2007 public hearing that LNAPL was present. As a result, high levels of vapors and LNAPL are present in varying bedrock conditions.
28. The Triad conceptual geologic model (Figures 2 and 3) presented in the groundwater CAP indicated that the underlying bedrock bedding planes are flat, although the CAP reported “limestones in the vicinity of the Site dip slightly to the southwest”. Triad has not collected any area bedrock-specific field information to determine the bedrock dip. From the explanation given of the regional southwesterly dip and the flow direction (to the west) of the sanitary sewer along the Harpeth River, there is no actual data to support Triad’s belief that the tank farm is the source of contamination at seeps HS-2 and HS-3 along the Harpeth River. Triad should be required to determine the actual bedrock dip and pipe / trench grade to provide proof of their claim.
29. For the aboveground solvent tank farm to be the source of the contamination observed at seep HS-3 on the Harpeth River, the groundwater would have to flow presumably up-dip and upgradient, against the direction of bedrock slope and contrary to the preferred migration pathway along the “cutter”, as concluded by Triad. The Triad investigative activities have not yet reasonably and competently explained how this is possible.
30. Triad based their determination that “there is no significant risk to human health posed by the consumption of contaminated groundwater” on the fact that the groundwater is not used as a source of drinking water. First, there is no stated basis for what Triad determines to be a “significant” risk and what

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criteria were used for comparison. Secondly, although the groundwater is not used for human consumption, it is used regularly for wildlife consumption and by fish and aquatic life. Further, the localized groundwater (at the point of the LNAPL discharge and downgradient) has been demonstrated to be the only base flow component to Liberty Creek during the driest times of the year. Liberty Creek provides base flow to the Harpeth River. Both the Clean Water Act and the Tennessee Water Quality Control Act assign numeric criteria for designated uses of all waters of the State, including those for wildlife and aquatic uses. The Triad report apparently did not consider these criteria in their assessment. The only criteria mentioned by Triad in the groundwater CAP were EPA Region IX Preliminary Remediation Goals (PRGs), and PRGs specifically exclude any impacts to groundwater and ecological concerns. As a result, use of PRGs in determining final corrective action objectives is invalid.

31. Triad concluded that "there is minimal risk to human health posed by contact with or inhalation of vapors from the free product component of the groundwater plume as it surfaces in the channel of Liberty Creek", even though Triad concluded that vapor-phase migration of contaminated groundwater is occurring and the migration pathways exists to residential areas. Triad concluded that there is minimal risk without having multiple samples from homes during multiple seasons of high and low groundwater flow, high and low atmospheric pressures, or high and low ambient air temperatures. Further, this conclusion seems to in part, be based upon short-term worker exposure measurements made with a photo-ionization detector (PID). PID measurements are a crude screening mechanism that measures random carbon atoms in the air, not actual VOC or SVOC constituents. As a result, Triad cannot possibly understand the health and safety risks to residential occupants in the Daniels Drive area.
32. The Consent Agreement and Order required that ELMCO include a detailed evaluation of the air migration pathway in the CAP. The CAP included no summary or factual data to support Triad's conclusion that there is "minimal risk" to human health and safety via the inhalation pathway.
33. Ensafe apparently was hired by Triad to evaluate the risks of vapor intrusion. The *Proposed Air Monitoring Near Liberty Creek* letter (June 8, 2007) to TDEC proposed to compare monitoring results to criteria established for short-term emergency response workers and workers in an industrial setting working 8-hour days. There is no indication that the plan or its criteria meet the minimum levels by EPA in the *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (EPA 530-D-02-004, November 2002). Further, there is no support in the CAP that comparing air sampling results to healthy, industrial worker 8-hour standards

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is in any way directly applicable to defining risks in a residential setting for children, adult, and elderly residents on either an acute or long-term basis. Further, the inhalation hazard risk determination did not consider the effects of exposures of multiple, cumulative constituents - just individual constituents.

34. The groundwater CAP included no discussion of the results of any vapor monitoring in homes and offered no conclusions relative to specific risk levels that are present. The Order specifically required that the air migration pathway be studied and appropriate mitigations be implemented, if necessary.
35. Triad concluded in the groundwater CAP that pump and treat groundwater treatment is “not typically effective” in karst environments without having any site-specific data to support this claim. In fact, Triad installed RW-1 for the sole purpose of recovering LNAPL from the release area. That is why the well was labeled a “recovery well” by Triad. Surely at the time of the installation of RW-1, Triad believed that pump and treat or groundwater recovery was a viable option. There is no indication that properly located wells in the zones of lower-lying bedrock and large joints / fractures (called “cutters” by Triad) would not be a viable remedial alternative. In fact, loss of 600 gallons of drilling water during the installation of RW-1 indicates a zone of extremely high hydraulic conductivity that would likely be suitable for groundwater recovery in the zone of the highest observed soil and groundwater concentrations.
36. Triad concluded in the groundwater CAP that the pump and treat groundwater remedial alternative represents “high costs”, yet no cost estimate was provided as a relative comparison to other remedial options. Therefore, using “high cost” as an excuse not to implement the pump and treat has no basis.
37. Triad concluded in the groundwater CAP that groundwater stripping for toluene removal would require a “large-scale treatment facility”; would be “disruptive” to the area; and would be “cost-prohibitive”. No details were given to support any of these claims. Triad argued that groundwater stripping will generate large quantities of used carbon, requiring disposal as a hazardous waste. This excuse for not using air stripping as a remedial alternative has no basis as a reason to not conduct active remedial actions.
38. Triad argued against contaminated groundwater removal because the City of Franklin cannot accept acetone-bearing water to the wastewater treatment plant. This is not a viable excuse to exclude removal as a remedial alternative. Triad and ELMCO have the expertise to manifest and dispose of contaminated remediation wastes to numerous licensed treatment facilities.

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39. The groundwater CAP completed by Triad only considered groundwater pump and treat and air stripping as viable ex-situ remedial options. There are multiple other viable *in-situ* and *ex-situ* options never considered by Triad.
40. Triad argued against in-situ groundwater treatment because it is "technically infeasible and cost prohibitive" because of the plume size, the required number of injection points, and the inability to control treatment chemicals in the subsurface. Triad provided no support for the technical infeasible argument nor did the CAP include any cost estimates for comparative analyses.
41. Triad described natural attenuation as being a suitable remedial alternative "where the groundwater contamination poses no significant risk to human health or the environment, the source area has been removed or neutralized, and other remediation technologies are either inapplicable or cost-prohibitive". First, ELMCO has not yet determined the nature and extent of contamination and therefore, cannot possibly conclude that there are no significant risks. Second, ELMCO has made no demonstration that remediation of the tank farm-area soils where severe contamination existed even worked. Therefore, there is no basis for their claim that the source has been mitigated. In fact, in the September 13, 2007 meeting between Triad, TDEC, HRWA, Stites and Harbison, and Globally Green Consulting personnel, Triad admitted that they have no proof that the remediation using BIOX chemicals even worked. Lastly, when asked in the September meeting what biological, physical, chemical, or other indicators exist to prove that natural attenuation is actually occurring or has the potential to occur at this site, Triad responded by saying that they had no specific site information to support this claim.
42. A BIOX manufacturer representative (Mr. John Kiest) who was familiar with the ELMCO site was contacted on October 3, 2007. Mr. Kiest stated that the BIOX solution could actually initially kill microbes that are necessary for bio-degradation. There has been no demonstration that microbial populations capable of degrading multiple dissolved-phase constituents existed prior to or after the injection of BIOX.
43. There is no basis to support that natural attenuation or BIOX additives will remediate LNAPL in the saturated zone to meet Tennessee Water Quality criteria.
44. The groundwater CAP includes a "risk evaluation" of the acetone and toluene relative to human health and ecological factors. Other than brief conclusions of "no significant risk" or "minimal risks", the risk assessment did not include any basis for those conclusions. The assessment did not evaluate or conclude what actual concentrations of specific chemicals pose a risk to human health through all migration pathways. Secondly, the assessment did not specifically include what concentrations constitute risk to the receiving

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streams relative to ecological health and their designated uses in the Tennessee Water Quality Control Act. Lastly, the risk assessment did not consider the cumulative effects of multiple constituents.

45. The only "active" remedial alternative chosen by Triad in the CAP is physical interception of LNAPL in a trench located 800 feet from the ELMCO facility. That trench was constructed as an interim measure required by TDEC in an attempt to capture LNAPL. The interceptor trench for LNAPL recovery will only be partially effective during periods of low groundwater flow, as was experienced during the summer of 2007 when Liberty Creek was mostly dry. When the creek is dry and when the groundwater elevation is lower than the bottom of the interceptor trench, the trench will do nothing to mitigate or recover LNAPL. In fact, LNAPL was still flowing into Liberty Creek on October 10, 2007 even though the trench was fully operational.
46. The CAP described groundwater influent points to the interceptor trench at four (4) locations. Three (3) were located along the eastern (ELMCO side) of Liberty Creek while one (at 102 feet along the trench transect) enters from the west, as indicated on Figure 5 of the CAP. This indicates that LNAPL likely migrates beyond / under the interceptor trench during dry periods of the year. Given the dry conditions of Liberty Creek during much of the summer of 2007, it is likely that neither Liberty Creek nor the interceptor trench is a downgradient discharge barrier during all seasonal groundwater flow conditions. Unmonitored and unmitigated LNAPL is therefore likely flowing beyond the interceptor trench towards Franklin Road during the driest periods of the year.
47. The CAP reported that the time required to collect LNAPL "cannot, at this time, be estimated". Further, the time required for "clean-up" of the dissolved phase contamination cannot be estimated. These conclusions are due to the fact that the extent of the LNAPL has not yet been defined, as required in the Order. TDEC should require that the extent, rate of migration, and all migration pathways be defined as required in the Order.
48. Triad argued in the CAP that use of remedial technologies to remediate the dissolved-phase groundwater plume is "technically infeasible", without completing the required technical analyses to fully demonstrate that remediation of dissolved-phase constituents would in fact meet EPA's criteria for a technical impracticability (TI) argument.
49. Unmitigated dissolved-phase and LNAPL migration beneath residential properties on Daniels Drive can result in property damage of the individual residences. TDEC has the responsibility to ensure that this property damage is minimized, and the best way to minimize this damage is to conduct a complete investigation to define the nature and extent of the contamination and to remediate the contaminants.

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[1] Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (OSWER Directive Number 9200.4-17P).
[2] Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, OSWER Directive 9234.2-25, September 1993.
[3] Extent of Contamination and Scope of Investigations in the HSWA Program, Corrective Action Standing Team, RCRA Branch, 1996.

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October 19, 2007

Dorene Bolze
Harpeth River Watershed Association
P.O. Box 1127
1164 Columbia Avenue
Franklin, TN 37065

RE: Comments on Egyptian Lacquer Manufacturing Company's Corrective Action Plan

Dear Ms. Bolze:

AquAeTer attended the public hearing concerning the corrective action plan (CAP) for Egyptian Lacquer Manufacturing Company (ELMCO) on October 10, 2007. We have a few comments that we believe should be addressed before the Tennessee Department of Environment and Conservation (TDEC) accepts the CAP. There are several fundamental issues that have not been addressed by the CAP and by the information presented at the Public Hearing. There are also several key regulatory issues that seem to be totally ignored by this CAP and its validity, if accepted by TDEC, violate federal and state laws dealing with Resource Conservation and Recovery Act (RCRA), the Clean Water Act, and both state and federal guidance on preparing a CAP and accepting a Monitored Natural Attenuation as a remedy for this site. The continued degradation of the Harpeth River also jeopardizes the ability of three wastewater treatment facilities that use the Harpeth River for assimilative capacity. It is also clear that citizen lawsuits will result if no further work is required on this site by TDEC. From our perspective of having worked on many similar sites, this is one of the most contaminated sites and one that is having a negative impact on the environment.

SPECIFIC POINTS

1. The United States Environmental Protection Agency's guidance for Monitored Natural Attenuation requires the following:
   a. Source removal;
   b. Determination of plume extent;
   c. Determination of aquifer characteristics including hydraulic conductivities, storage coefficients, and travel time to receptors (in this case, Daniel Drive residents, Liberty Creek, BGA Lower Campus, and the Harpeth River ;
   d. Definition of impact of contaminants not removed;
   e. Time required for natural attenuation to assimilate or remove the contaminants; and

f. The costs of other remedial options to demonstrate that Monitored Natural Attenuation is the preferred alternative.

2. Given the time required for karst hydrogeologic systems to naturally wash contaminants out of the numerous storage locations in the fractured rock, it is anticipated that this contaminant source without further remediation will continue to degrade the Harpeth River for at least the next 20 years.
3. Based on TriAD's analysis that the karst is several feet below Liberty Creek, the BGA Lower Campus site is most likely impacted by the plume during summer months when Liberty Creek dries up and groundwater elevations are below the bed of Liberty Creek. This has an impact on the property values of this campus if for some reason BGA decides to move this campus in the future.
4. There are still RCRA listed hazardous wastes, waste acetone is designated U002 (Commercial chemical products that become waste) and waste toluene is designated as U220, being discharged through point source locations on Liberty Creek and the Harpeth River for which there is no National Pollutant Discharge Elimination System (NPDES) Permit(s). These products are designated as wastes because they have contaminated the soil, groundwater, and U.S. navigable waterways. This is in direct violation of 40 CFR 122 and 125 (NPDES), 40 CFR 261 (hazardous waste listings), and 40 CFR 446 (effluent guidelines limits for paint formulating point source category) which prohibits discharge of wastewaters generated from paint formulating point source categories from discharge to surface streams or to a Publically Owned Treatment Works (POTW). This could also be construed to be in violation with the oil spill pollution and prevention regulations, 40 CFR 112;
5. These point source discharges have been and continue to cause further degradation of the water quality of the Harpeth River, an impaired stream, in direct violation of 40 CFR 131.12 antidegradation and the Rules of the TDEC, Chapter 1200-4-3-.06;
6. The solvents entering the Harpeth River through Liberty Creek and from point source locations on the Harpeth River itself are causing a significant degradation of the water quality of the Harpeth River in violation of 40 CFR 131;
7. The facility is currently in violation of the Federal Clean Water Act, sections 301, 302, 303, 304, 307, and 402. The State and the facility are open to citizen suits under Section 505 of the Clean Water Act.
8. This degradation causes an impairment to the dissolved oxygen resources of the Harpeth River upstream from the City of Franklin POTW effluent discharge to the Harpeth. Under 40 CFR 131.12 and under the TMDL 40 CFR 130.7, the Franklin POTW cannot discharge to an impaired stream that is not meeting water quality standards, in this case, the DO standard, if the NPDES discharge causes further degradation of the stream downstream from this discharge. The Franklin POTW has been documented to cause further impairment of the Harpeth River DO water quality standard downstream from the POTW effluent discharge. Under both Federal and state law, Franklin's ability to discharge to the Harpeth River during several months of the year is in jeopardy.
9. There are two other NPDES dischargers on the Harpeth River, Lynwood Utilities and Cartwright Creek Utilities that also have been violating the Clean Water Act due to the Harpeth River not meeting water quality standards upstream from these

discharges and further impairment of the River DO resources is documented downstream from these discharges.

10. There are alternatives that potentially could be used to substantially remediate this site that could be implemented for less than what has been spent on the investigations to date and these are required to be investigated before any Monitored Natural Attenuation is allowed.
11. Finally, leaving this site unremediated with free product and a documented past and continued degradation of the environment receiving this contamination for some undetermined indefinite time period, the Harpeth River, sets a precedent that TDEC should seriously ponder for its legal and regulatory impact on future remediation activities in the state.

Product Loss

TriAD stated that no estimate had been made nor could be made about the volume of product released. The following provides an engineering estimate of the range of product loss, based upon the following assumptions:

- The pipes began leaking within 1 and 10 years following installation in 1978;
- The leakage rate was 1 milliliter per minute; and
- There were 10 tanks.

This gives a range of 26,000 to 38,000 gallons of product released. The flow rate of 1 mL/min is considered very conservative, given the extent of corrosion to the piping and the amount of head (pressure) exerted on the pipe above the known leaks. Other potential leaking sections of the pipe have not been fully addressed. If pipe elbows at the tank farm were not wrapped, then there is no reason to believe that the pipe elbows at the building were wrapped either. Additionally, this does not take into account the increased rate of release when the pipe was under pressure while the pump was running. Given the extent of the plume frontage along Liberty Creek and the Harpeth River, if we assume that 1 to 4 gallons (1 mL/min from 10 tanks is 3.8 gallons of RCRA hazardous wastes seeping into the ground each day for the last 20 years) of RCRA hazardous wastes have been released daily for the last 20 years, then about 7,300 to 29,200 gallons of hazardous wastes have been discharged to the Harpeth River over the last 2 decades. Since free toluene and groundwater containing acetone is still seeping into the Harpeth River, it is assumed that there is still a significant inventory of product in the plume area, most likely on the order of 10,000 to 30,000 gallons of RCRA hazardous wastes.

Remedial Alternatives

Unsaturated Zone. The unsaturated zone is the soil that is above the water table. TriAD identified an area around the tank farm that was contaminated. They then utilized a product, Bioxx, to treat the contamination in the unsaturated zone. There has been no follow-up sampling to confirm its effectiveness. This should be determined immediately.

An alternative to the method already employed that is much cheaper and is very effective for volatile organics is the installation of a soil vapor extraction (SVE) system. This system basically provides a vent to allow the volatile organic compounds (VOCs) to volatilize from the

soil to a collection point where the volatile organics can be removed through a catalytic oxidation unit or through carbon canisters. An SVE system may be active or passive. A passive system does not utilize any mechanical equipment to increase the suction pressure on the wells. An active system does utilize a pump or other mechanical means to increase the suction on the well, thus potentially drawing more VOCs from the soil.

PROS of a SVE System:

- Can be relatively cheap to install, depending upon site characteristics;
- A passive system can be very cheap to maintain and operate, although it would be more difficult to utilize controls to capture air emissions;
- An active system can potentially can help to remove free product from ground water, if the well is screened through the soil/water interface by reducing the vapor pressure in the well, thus allowing more volatilization of the VOCs; and
- An active system should be routed through a control device to minimize the emissions to the atmosphere.
- Neither type of SVE system requires the zone to be saturated in order for it to work. (Biological systems require at least some degree of saturation in the soil in order to grow. Chemical systems only work so long as the chemicals remain in the unsaturated zone. Once they have passed through the zone, they can no longer be expected to treat the unsaturated zone.)

CONS of a SVE System:

- Soil type plays a large role in determining the number of wells required.
- A passive system requires more wells, since the area of influence around each well is solely dependent upon atmospheric pressure, which increases the installation costs.

Saturated Zone. First and foremost, any free product should be removed from the groundwater. It is by far the easiest and cheapest way to treat contamination. Doing nothing is not a method of treatment and so cannot be compared to remedial alternatives. Any recovered product can be sent to the onsite distillation units for recovery or can be sent to a recycle center for uses such as a fuel.

As for the dissolved phase, there are two ways to go about treating the saturated zone, either by removing and treating (ex situ) or by treating in place (in situ). We would recommend in situ treatment.

One of the reasons TriAD gave for not being able to perform ex situ treatment is that they could not discharge the water to the City of Franklin's Publicly Owned Treatment Works (POTW), which legally, Franklin cannot accept this waste for treatment as specified in 40 CFR 446. ELMCO could potentially treat this water and re-inject the clean water to provide a clean groundwater to move the contamination towards the collection wells. This would have to be permitted by TDEC, but it has been done at numerous sites across the country.

If ex-situ treatment is used, after the groundwater is removed it must be treated. The following alternatives, which may or may not be done on-site, could be used:

- Distillation – This method basically relies on heating the recovered groundwater to separate the volatile constituents from the water. This treatment technology would be costly to operate and may not work to separate all of the acetone from the water;
- Air sparging – This method may work to remove soluble toluene and some of the acetone, but again would not likely remove all of the acetone. Emissions would also need to be captured and put through a control device;
- Chemical oxidation (peroxide) – This method should theoretically be able to achieve treatment of both toluene and acetone. A bench-scale test or a pilot-scale test would show the efficiency of this method and provide an estimation for the costs. This method is patented and costs for use may be prohibitive;
- Adsorption onto carbon or other media – This method should theoretically be able to treat both acetone and toluene. This method could be easily tested to determine the efficiency of the carbon. Alternatively, carbon could be used as a polishing step of another treatment method, thus reducing the amount of carbon needed; and
- Biological treatment – This method is suited to treat both toluene and acetone if set up properly. It can be a cost effective method for dealing with the contaminated groundwater, but the water would have to be reinjected or evaporated (no discharge alternative).

Of these alternatives, a biological treatment system would probably be the most effective. The system would probably need an equalization tank, a reactor tank, and other peripheral equipment. If free-product is not being removed separately, an oil/water separator would need to be in-line before the biological treatment. This method is most likely costly due to equipment and operational expenditures.

In Situ Treatment. In situ treatment means that treatment takes place in the ground. This is accomplished by making conditions favorable to micro-organisms that can consume these contaminants. The treatment system should employ a treatment curtain at a designated location to treat the contaminants that are migrating. On-site, it usually involves injection wells that are installed to allow injection of the treatment just upgradient of the contaminant plume and within the plume itself. This allows the treatment to fully encompass the affected area. Biological treatment walls could be placed next to the creek and the River to affect treatment of the groundwater entering the River. The existing trench along Liberty Creek would provide a very effective injection point; however, we would not recommend leaving this trench open (regardless of its future use) since this trench is evidently resulting in a direct air exposure pathway to the neighbors along Daniel Drive.

A few of the in-situ bioremediation alternatives include:

- Bio-stimulation. These injections are made to stimulate the growth of micro-organisms present in the soil and groundwater to breakdown the contamination. Acetone and toluene are two of the most readily degradable volatile organic constituents to biologically treat. In fact, toluene is used in some methods as the biostimulant in groundwater remediation projects. The contaminants contained in the ELMCO plume can be used as a food source by the micro-organisms. The

injection usually includes an oxygen source, a minor amount of food source to ensure a healthy population, and nutrients depending on the characteristics of the soil. One advantage of the use of bacteria is that the bacteria will follow the food, meaning that an effective treatment curtain will continue to work downgradient from the injection site. Both acetone and toluene are rapidly degraded using in-situ techniques.

- One alternative that has merit would be to use the unchlorinated effluent from the Franklin POTW as a continuous injection fluid with the addition of nutrients and an oxygen source, such as, peroxide, at low levels to bring the groundwater DO up to around 8 to 10 mg/L. The bacteria require about 1 mg/L to aerobically decay the food source (Eckenfelder 2007) (Oxidation occurs around 100 to 200 mg/L O_2). A vacuum truck per week of treated effluent for about 1 year would more than likely go a long way in reducing the contaminated plume. Laboratory treatability tests could easily confirm this technique. Obviously, TDEC would have to hold harmless the City of Franklin for the use of this valuable bacterial seed material. We have demonstrated that acclimated treated effluent is an effective biostimulant in a groundwater, even to complex ringed constituents, such as, benzo(a)pyrene (half-life of about 30 days).
- AquAeTer has developed a patented bio-stimulation process for the treatment of contaminated groundwater. The AquAeTer method has been used in Tennessee and several other states. The injection is typically measured in a few mL per day rather that the thousands of gallons used by TriAD on the unsaturated zone with unknown effects.
- Other companies also offer bio-stimulation methods, but these typically involve truckloads of chemicals on a routine basis. These would have to be costed individually to determine their economic validity.
- Chemical oxidation. These injections usually include a peroxide, such as hydrogen peroxide (chemical grade), and a reagent, such as Fenton's reagent, to activate the peroxide. This is a patented process as well. The effectiveness of this injection is entirely limited to the area in which the chemical and its reagent spread. It may or may not follow the food source, depending upon the groundwater transport. With effective injection well points, this method can be effective in destroying the majority of the contaminants, but may not be able to get into every crack and crevice within the bedrock. Again this may not be economically viable and would include with dealing with another hazardous material (hydrogen peroxide at concentrations greater than 8% by weight are considered hazardous).

Any of the above methods could work on the site. Each method has advantages and disadvantages, and the costs associated with doing them can also range in price. Some methods are not very costly at all, while others, such as distillation, could be extremely costly. There are, however, relatively low cost methods, when compared with the costs already expended, to effectively reduce the contamination in the groundwater plume area. Having participated in toxic tort trials, TDEC and ELMCO could certainly expect the costs of a toxic tort lawsuit(s) to be about $1,000,000 per week. Although we doubt that ELMCO has this type of resource, the State of Tennessee does. It appears that some further treatment would save all parties concerned a great deal of time, money and grief in the long run.

TDEC should carefully weigh a decision to allow Monitored Natural Attenuation of this site. We see no merit in TDEC accepting this remedy when the downside will potentially cost the state a substantial amount of investment in defending its position before both the USEPA and private citizens. Given that numerous federal and state laws are being violated, it appears that granting of this CAP will probably lead to far greater costs than taking further remediation steps, such as, in situ treatment with one of the more economical but highly effective in-situ techniques.

Air Emissions

Although not related to the CAP, the lack of an Air Permit if needed would represent another violation of federal and state laws. TriAD, the consultant working for ELMCO, mentioned that the tanks were vented to the atmosphere. Since all of the volatile constituents contained in the tank potentially would have significant loss rates from the tanks and when used in the process, it would seem that this facility would need an air permit. We have reviewed the EPA's records of air permits for the Franklin area. ELMCO does not seem to have an air permit. ELMCO should file for an air permit in order to be in compliance with the state and federal Clean Air Act Amendments of 1990. An emission estimate will need to be made to determine if the facility meets the definition of a Major Source (greater than 10 tons per year of a single Hazardous Air Pollutant (HAP) or greater than 25 tons per year of total HAPs), a Minor Source, or a Synthetic Minor Source.

We would like to note that all numbers given in this document are hypothetical estimates based on similar sites that we have studied. TriAD is in the best position to make these estimates since they have spent about $750,000 to collect the data that can be used to make engineering estimates of the required information to support Monitored Natural Attenuation. If you should have questions or comments concerning these comments, please contact Mike Corn or myself at (615) 373-8532 or by e-mail at jmcorn@aquaeter.com or mcorn@aquaeter.com.

Sincerely,
AquAeTer, Inc.

John Michael Corn, P.E.
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Michael R. Corn, P.E.
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cc: Pam Davee
Shari Meghreblian

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October 19, 2007

By Electronic Mail and First Class Mail

Ms. Doreen Bolze
Executive Director
Harpeth River Watershed Association
1164 Columbia Avenue
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Franklin, TN 37065

Re: Egyptian Lacquer – Groundwater Corrective Action Plan

Dear Ms. Bolze:

Thank you for sending the information to Leed Environmental, Inc. related to the subsurface release of solvents from the Egyptian Lacquer Manufacturing Company (ELMCO) facility in Franklin, Tennessee. At your request, I have reviewed the documents and am providing my comments and questions for your use.

My comments and questions on the Groundwater Corrective Action Plan which Triad Environmental Consultants (Triad) issued to the Tennessee Department of Environment and Conservation (Tennessee DEC) on August 28, 2007 on ELMCO's behalf are as follows:

1. Investigations for Contaminant Releases

Page 6 of the Groundwater Corrective Action Plan indicates that it is ELMCO's and Triad's understanding that Tennessee DEC has concluded, based on investigations conducted to date, that no further investigations for contaminant releases at the property are necessary. If the Tennessee DEC has concluded that further investigations of contaminant releases are not required, that definitive conclusion is premature at this time. Furthermore, there is no need to make that definitive conclusion at this time. If the Tennessee DEC believes that further investigations of potential releases are not required at this time, the potential for further investigations at a later date should not be ruled out as a possibility if future work at the property indicates that further investigations are required.

2. Elimination of Release Mechanism

- Page 6 of the Groundwater Corrective Action Plan indicates that ELMCO removed about 50 feet of each underground solvent pipeline from the ground near the end of the tank farm. Page 2 of the Groundwater Corrective Action Plan indicates that the tank farm is located about 350 feet west of the building. Why is it not necessary

to remove the other 300 feet of underground pipeline between the tank farm and the building. Although the other 300 feet of underground pipe may not have leaked, wouldn't it be a prudent, preventative measure to remove all potential solvent sources to the subsurface?

- How is solvent currently conveyed from the tank farm to the building? Are double-walled aboveground pipes being used? Are the pipes being inspected frequently?

- Page 2 of the Groundwater Corrective Action Plan indicates that the 12 solvent-containing tanks in the tank farm are situated on a concrete pad and are surrounded by "low, concrete block secondary containment walls." What is the current condition of the concrete pad? Since the facility was constructed in 1978, what were the historical conditions of the concrete pad? Why is the secondary containment structure "low?" Is the structure sufficient to contain tank leaks and/or ruptures? If a tank would leak near the middle or the top of the tank, is the height of the containment structure sufficient to prevent the solvent from spraying or flowing out above the top of the containment structure and onto the adjacent ground surface?

- Can the public be assured that Tennessee DEC will prevent ELMCO from using underground pipelines to convey solvent from the tank farm to the building?

3. Volume of Release

- Page 7 of the Groundwater Corrective Action Plan indicates that ELMCO's solvent inventory controls were "inadequate," "problematic," and "inaccurate." Are these types of procedures satisfactory to Tennessee DEC? Are they sufficient to comply with ELMCO's air permits? If inventory controls are not required by Tennessee DEC's regulations, wouldn't a requirement in the Consent Agreement and Order be appropriate?

- Page 7 of the Groundwater Corrective Action Plan indicates that "the time of the [solvent] release is unknown" and "all that can be established is that the pipe elbows at the tank farm end were corroded and leaking when they were inspected in March 2007." This statement is incorrect. Based on the information included on page 6 of the report, it would be correct to state that a phase II investigation was performed at the site in November 2006 and significant VOC concentrations were detected in the area west of the tank farm.

4. Preliminary Remediation Goals

Page 9 of the Groundwater Corrective Action Plan indicates that the preliminary remedial goals (PRGs) for acetone in tap water are 5.5 mg/l (there is no maximum contaminant level, MCL) and the toluene PRG is 0.72 mg/l for tap water (the MCL is 1.0 mg/l). Since the seeps discharge to Liberty Creek and the Harpeth River, why is there no mention of concentrations protective of aquatic life?

5. Soil Investigation

Page 14 of the Groundwater Corrective Action Plan indicates that a column of contaminated soil was detected during the soil investigation in the area of the solvent release. The document also indicates that the solvent, upon completing its migration through the soil column, spread out along the top of rock following the top of rock contours. Figures 2 and 3 are deceptive in that they show the approximate zone of contaminated soil but not the movement of contamination in groundwater, fractures, etc. away from the contaminated soil.

6. Soil Remediation

Pages 14-15 of the Groundwater Corrective Action Plan describe the injection of a liquid reagent to treat contaminated soil. Further, the report indicates that a report of this remedial action was submitted to Tennessee DEC in June 2007. Due to the relationship between the solvent release into the soil and the subsequent effect on groundwater, it would be appropriate to present a summary of the results of the soil remediation in the Groundwater Corrective Action Plan, the status of the soil remediation work, whether soil remediation is ongoing, whether PRGs for soil have been achieved, etc.

7. Seep Monitoring

Pages 11-13 of the Groundwater Corrective Action Plan describe changes in seep behavior over time and as a function of drought conditions. Further, the Groundwater Corrective Action Plan describes other contaminants in addition to toluene and acetone (including benzene, 1,1,2-trichloroethane, naphthalene, and 1,2,4-trimethyl benzene) that have been detected in the seeps at various times. In general, the sources of the other contaminants have not been identified, and an investigation of the potential extent of these contaminants is not included in the plan. Why?

8. Groundwater Investigations

The results of phase I and phase II groundwater investigations at the ELMCO facility are described on pages 15-17 of the Groundwater Corrective Action Plan. In general, it does not appear that the extent of potential groundwater contamination has been defined. Specifically, page 16 indicates that groundwater elevations measured to date do not allow a potentiometric map to be prepared. Further, it appears that all of the wells are impacted to some extent by solvent constituents. Yet there is no plan for additional wells, no plan for sampling additional wells, no plan for additional delineation of groundwater impacts. Why?

9. Fractures

The site conceptual model on pages 17-18 of the Groundwater Corrective Action Plan indicates that solvents have migrated along subsurface fractures. Have the fractures been sufficiently defined to be certain that solvents haven't migrated to additional areas? Indeed, the Groundwater Corrective Action Plan indicates on page 18 that the "exact migration pathways of the free-product and dissolved-phase components of the plume cannot be established with certainty."

10. Risk Evaluation – Vapors

Page 20 of the Groundwater Corrective Action Plan indicates that there is a minimal risk to human health by contact with, or inhalation of vapors from, the free-product component of the groundwater plume as it surfaces in the channel of Liberty Creek. The report also indicates that the area of the creek valley where high concentrations of solvent could occur is on private property not generally accessible to the public. Does this imply that exposure to high solvent concentrations is acceptable on private property?

11. Risk Evaluation – Ecological Risk

Page 21 of the Groundwater Corrective Action Plan indicates that the groundwater plume poses no significant risk to ecological receptors in the Liberty Creek or the Harpeth River. This conclusion is incorrect in light of the Harpeth River Watershed Association's (HRWA) determination that the dissolved oxygen concentrations in the Harpeth River are impacted as a result of the seeps.

12. Toxicity Studies

Page 21 of the Groundwater Corrective Action Plan indicates that the groundwater plume poses no risk to ecological receptors based on acute toxicity studies. Have chronic studies been performed? Why not?

13. Monitoring of Seeps

Page 28 of the Groundwater Corrective Action Plan indicates that seeps and river sampling will be performed on a monthly basis and that the three downgradient monitoring wells will be monitored semi-annually. A site-specific sampling and analysis plan should be prepared for stakeholder review and comment.

14. Planned Corrective Action

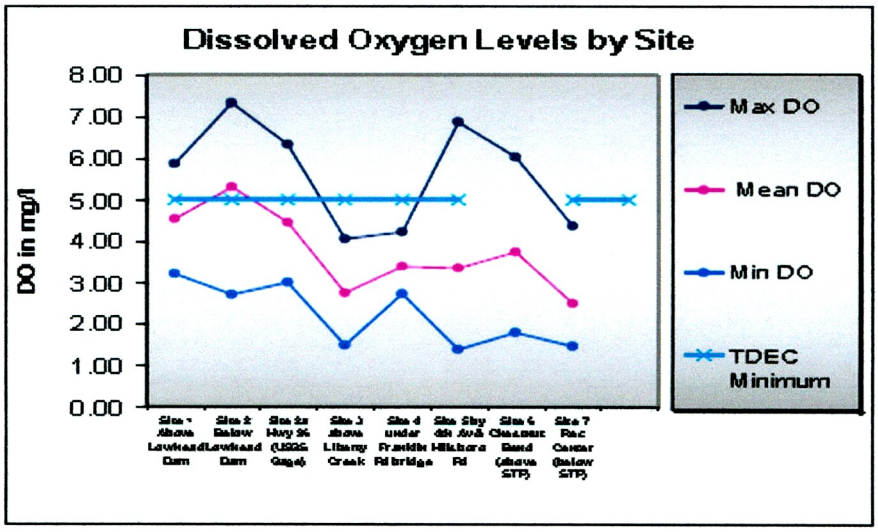
The proposed groundwater remedy for the site is described beginning on page 24 of the Groundwater Corrective Action Plan. The proposed remedy involves the use of an interception/ recovery trench (already constructed and in operation) to address the free-product component of the plume prior to entry into Liberty Creek. There is no treatment remedy (other than natural attenuation) proposed in the Groundwater Corrective Action Plan to address dissolved contaminants in groundwater prior to discharge into Liberty Creek and the Harpeth River. The Groundwater Corrective Action Plan indicates on page 27 that, over time, the dissolved phase component of the plume will be diluted or removed from the groundwater by natural flow to Liberty Creek and the Harpeth River and by natural, physical, chemical, and biological degradation. Comments related to the lack of an active treatment remedy for the solvents are addressed in subsequent portions of this letter.

15. Tennessee DEC's May 17, 2007 Letter to HRWA

- In the May 17, 2007 letter from Mr. Chuck Head, Tennessee DEC's Senior Director, Land Programs, Bureau of Environment, the HRWA, the Tennessee DEC (or the "Department") indicated on page 6 of the letter that:

> "The Department does not believe that the levels of toluene or acetone currently discharged into Liberty Creek and the Harpeth River will have a measurable impact on the dissolved oxygen levels in either stream this summer. Since the source of the release has been eliminated, the contaminant levels have decreased and should continue to do so."

The HRWA's Dissolved Oxygen Study June – July 2007 includes the following graph summarizing the results of the study:



Since the seeps of acetone into the river have been documented to cause a decrease in the dissolved oxygen levels which have in turn caused an impact to the aquatic organisms in the river, how can a "no treatment" remedy for the acetone seeps into the Harpeth River which will continue to affect aquatic life be justified? Has Tennessee DEC considered all potential remedial options (i.e., air striping, air sparging, etc.) to address the acetone? Has the groundwater been sufficiently characterized to make these determinations at this time? Since some VOCs, such as acetone, with high solubilities in water are more difficult to treat, have treatability studies been performed to evaluate potential treatment scenarios?

- Tennessee DEC's May 17, 2007 letter to the HRWA also indicates the following:

> "Tennessee DEC has worked with its own contractor and ELMCO to minimize the migration of solvents into both streams. . . Migration of toluene at Liberty Creek has been substantially reduced and vapors in the area have been mostly eliminated. Dissolved acetone continues to migrate into the Harpeth River and Liberty Creek (at reduced levels). After discussions with the Division of Water Pollution Control, including the review of sample

> results from both streams, the levels of acetone and toluene in the streams are below concentrations that are harmful to fish and aquatic life. We believe the toxicity testing completed by the Department was appropriate for this situation and provided the information we needed to make important water quality decisions."

If the fish in the river near the seeps can't breathe due to insufficient oxygen (as indicated in the HRWA's report) and the depressed oxygen levels in the river are a result of the seeps, how can the Department claim that the conditions in the stream are not harmful to fish and aquatic life?

- Tennessee DEC's May 17, 2007 letter also indicates the following:

> "ELMCO is subject to investigating and resolving the environmental problems caused by the release of solvent at their facility. The release of a commercial chemical product that becomes a hazardous waste upon entering the environment is governed under Rule 1200-1-11-.06(1)(b)2.vii(I). Specifically, ELMCO had an accidental release of a solvent into the environment and is required to investigate and resolve the resulting environmental problem."
>
> "The Department is requiring ELMCO to follow EPA RCRA guidance for the remediation of hazardous waste as described in the EPA document "Management of Remediation Waste Under RCRA" dated October 14, 1998. Specifically, the release of commercial chemical solvents (acetone and toluene) into soil, groundwater and surface water generates a listed hazardous waste when the contaminated media is removed."

If the release of acetone into the subsurface environment constitutes the release of a hazardous waste and the removal of contaminated groundwater also constitutes the removal of a hazardous waste, then the discharge of acetone through the seeps into the river also constitutes the release of a hazardous waste. If the acetone seeps are not addressed, under what authority is ELMCO allowed to discharge listed hazardous waste into the environment? Aren't Tennessee DEC's regulations intended to prohibit the discharge of hazardous waste into the environment? Wouldn't the seeps be classified as a listed hazardous waste? How will the discharge be listed or delisted?

- Tennessee DEC's May 17, 2007 letter to HRWA also indicates the following:

> "Initial indications are that the subsurface characteristics of the site will allow successful treatment of soil and groundwater in place. Preliminary discussions have been conducted between ELMCO and Tennessee DEC about the type and scope of the remedial action. The remedial action design will be proposed to Tennessee DEC once the areal and vertical extent of contamination has been defined, the subsurface geology determined, and contaminant treatment strategy developed. The contaminant treatment methodology used is important to us because we need to understand the effectiveness of the technology, we do not want to

transfer contamination from one media to another (i.e. air stripping is commonly used to remove solvents from groundwater but this action may cause odor problems in the neighborhood). We need to have an accurate estimate of the time to complete remediation and we need to have an accurate estimate of costs to complete the work."

Several comments and questions:

- o ELMCO's Groundwater Corrective Action Plan indicates that the areal and vertical extent of groundwater contamination is not known. Therefore, how can Tennessee DEC select a final groundwater remedy at this time?
- o ELMCO has provided no estimate of the time to complete the remediation nor any estimate of the costs. How can Tennessee DEC select a final remedy without this information?
- o If Tennessee DEC's "initial indications" were that the solvents could be successfully treated in place, why would Tennessee DEC select a "no treatment" remedy for acetone?

- Tennessee DEC's May 17, 2007 letter to HRWA also indicates the following:

"The cleanup criteria for soil and groundwater will be established taking into account the relative risk of the contaminants to public health and the environment, including the impact on fish and aquatic life in Liberty Creek and the Harpeth River."

How will the documented effect of the acetone seeps on dissolved oxygen concentrations in the Harpeth River and subsequent impacts be addressed?

In addition to my specific comments on the Groundwater Corrective Action Plan provided above, I am also providing the following additional comments on several other communications that are pertinent to the corrective action process at the ELMCO facility:

1. RCRA Corrective Action

The May 17, 2007 letter from the Tennessee DEC to the HRWA indicates that "ELMCO is a small quantity generator of hazardous waste in Tennessee as defined in Tennessee Rule 1200-1-11-.03(2)(a) and is required to follow the requirements for hazardous waste generators defined in Tennessee Rule 1200-1-11-.03." Tennessee DEC's letter also indicates that the release of commercial chemical solvents (acetone and toluene) at the ELMCO facility constitutes the discharge of hazardous waste into the environment and that ELMCO is responsible for taking corrective action to address the unauthorized discharge.

In the HRWA's May 1, 2007 letter, the HRWA requested that the Tennessee DEC require ELMCO to conduct "the equivalent of a full RCRA facility assessment and RCRA facility investigation." Although ELMCO is a hazardous waste generator and was not required to obtain a permit for the treatment, storage, or disposal of hazardous waste, the release of commercial chemical products from the ELMCO facility constitutes the unauthorized disposal of listed hazardous wastes. Thus, it seems appropriate (as

Tennessee DEC has indicated it would do) that Tennessee DEC should require ELMCO to perform the "equivalent of" a RCRA facility assessment and RCRA facility investigation to allow all stakeholders to understand the full scope of the environmental problem and all potentially feasible remedial alternatives.

As the Tennessee DEC knows, the process of implementing RCRA corrective action involves the following four steps, in order of implementation:

- RCRA facility assessment;
- RCRA facility investigation;
- Corrective measures study; and
- Corrective measures implementation.

Due to the severity of the problem at ELMCO, Tennessee DEC should strongly mandate that ELMCO address the situation at its facility in a manner that is equivalent to the RCRA corrective action process.

2. RCRA Facility Investigation

A RCRA facility investigation is step #2 of the RCRA corrective action process and is detailed investigation to determine the nature, extent, and rate of migration of contaminant releases; to determine the contamination source(s); and to provide sufficient data to choose appropriate response actions. The results of phase I and phase II groundwater investigations at the ELMCO facility are described on pages 15 – 17 of the Groundwater Corrective Action Plan. In general, the Groundwater Corrective Action Plan indicates that the extent of potential groundwater contamination has not been defined. Specifically, page 16 of the Groundwater Corrective Action Plan indicates the groundwater elevations measured to date do not allow a potentiometric map to be prepared. Further, it appears that all of the wells are impacted to some extent by solvent constituents. Yet, there is no plan for additional wells, no plan for sampling additional wells, and no plan to delineate the full extent of groundwater impacts. Clearly, the groundwater investigation performed at ELMCO does not achieve the requirements of a RCRA facility investigation, or equivalent study, needed to fully define the nature and extent of groundwater contamination.

3. Corrective Measures Study and Implementation

After a comprehensive RCRA facility investigation is performed, the RCRA corrective action process requires that a corrective measures study be performed to identify and evaluate potential remedial alternatives. Remedies that are evaluated and compared in the corrective measures study must address the following elements:

- An evaluation of performance reliability, ease of implementation, and potential impacts of one or more potential remedies;
- As assessment of the effectiveness of potential remedies in achieving adequate control of sources and cleanup of the hazardous waste and hazardous waste constituents released from solid waste management units;
- An assessment of the time required to begin and complete the remedy;
- An assessment of the costs of remedy implementation; and

- An assessment of institutional requirements (e.g., state or local permit requirements) which may substantially affect implementation of the remedy.

During the remedy evaluation phase of the corrective measures study, potential remedies are screened to determine if they meet four threshold criteria:

- They must be protective of human health and the environment;
- They must attain applicable media cleanup standards;
- They must control the source(s) of releases so as to reduce or eliminate further releases of hazardous wastes and hazardous constituents that may pose a threat to human health and the environment; and
- They must comply with applicable standards for waste management.

Remedies that meet the four threshold criteria are then evaluated using the following five balancing criteria to identify the remedy that provides the best relative combination of attributes:

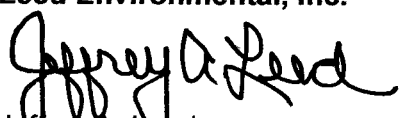
- Long-term reliability and effectiveness;
- Degree of reduction of toxicity, mobility, or volume of wastes;
- Short-term effectiveness;
- Implementability; and
- Cost.

The ELMCO Groundwater Corrective Action Plan simply bypasses many of the important components of the RCRA corrective action and corrective measures study process. Because the required information has not been prepared and presented, it is impossible for the Tennessee DEC, the HRWA, the public, and other stakeholders to make an informed decision about the proposed remedy at this time. The Tennessee DEC should require ELMCO to prepare and provide a complete, comprehensive corrective measures study. Only then can an informed decision be made regarding the best means to correct the environmental problem at the property and surrounding areas.

Thank you for the opportunity to provide these comments. Please let me know if you have questions or need additional information or clarification.

Very truly yours,

Leed Environmental, Inc.



Jeffrey A. Leed
President

HARPETH RIVER
WATERSHED ASSOCIATION

August 22, 2008

Ms. Ashley Holt
State Remediation Section
Tennessee Division of Solid Waste Management
5th Floor, L&C Tower
401 Church Street
Nashville, TN 37243

By Electronic Mail

RE: Comments on Egyptian Lacquer Manufacturing Company's (ELMCO) Second Proposed Corrective Action Plan

Dear Ms. Holt,

The Harpeth River Watershed Association's mission is to protect and restore the ecological integrity of the Harpeth. Our organization has hundreds of members throughout the Harpeth River watershed, including the area that has been contaminated by ELMCO. It is our intention through submission of these comments to provide TDEC with information to help with the determination of whether or not to accept ELMCO's second attempt at a Corrective Action Plan (CAP) submitted on June 24th 2008. In addition to these comments we respectfully submit those of Mr. Mark Quarles of Globally Green Consulting in the attached document. This technical review and commentary addresses inadequacies of the investigative activities that became the basis for technical decisions for the proposed CAP, the proposed CAP itself, and the Consent Order and Agreement.

The first proposed Corrective Action Plan which was submitted on August 21, 2007 and found deficient by TDEC on November 20, 2007 had so many shortcomings that were to have been addressed in this second attempt and were not. This leads us to ask our first question, "Why was the June 1, 2007 Consent Order ignored the first time and what are the penalties for this second instance of disregard for TDEC's authority?" We are 14 months past the Order and there is still no serious or approved plan for clean up. This company is clearly in violation of the State's Order and is continuing to pollute the Harpeth River and Liberty Creek with hazardous and carcinogenic chemicals every single day.

At issue, primarily, is the undeniable fact that ELMCO has yet to determine the nature and extent of the contamination of the environment with hazardous chemicals that they have caused through the illegal release of chemicals that they allowed to leave their property. Until there is a complete and thorough delineation of the contamination off site an effective plan cannot be proposed to TDEC or be in compliance with TDEC's own Consent Agreement and Order dated June 1, 2007. By default and unspoken in the second proposed CAP, if there is no plan to clean up ELMCO-contaminated property off site, then there *is* a plan to leave the contamination in place. This is essentially proposing monitored natural attenuation, (MNA) which is not acceptable per EPA guidelines as we covered in our first set of comments dated October 23, 2007. One key requirement for MNA is that the contamination plume be defined which has not been done here. MNA is also not appropriate in complex geologic conditions (such as karst or limestone bedrock) which we have here, when the contamination plume migrates off site, and only if the approach will be "protective of human health and the environment."

The fact that the contaminated plume migrates off site, under people's homes through the fissures in the karst bedrock into Liberty Creek and the Harpeth River, automatically signals that MNA would not be appropriate here. The location of the off site wells further demonstrates that there is not a serious plan for delineation of contamination because they are being sited where little or no contamination is likely to be found. Rather, wells need to be sited where contamination will likely be found and removed such as on individuals' property beyond the Driskill property or public property such as Fort Granger. The attorney for ELMCO stated in the *Tennessean* on August 19, 2008 when he was describing the two newest wells they have drilled, "We don't expect to find anything at those locations." This demonstrates the continued avoidance of finding and cleaning up ELMCO's contamination. As a part of the CAP, TDEC should require a dye study to be performed to determine the destinations of the ELMCO contaminants to help define the nature and extent of contamination.

The second crucial issue that has yet to be addressed in the second proposed Corrective Action Plan is that the tank farm is *not* the only source of contamination from ELMCO. This was not addressed in the first plan and further proof of the existence of contamination beyond the tank farm come to light since the first deficient plan was rejected. Other sources can no longer be ignored in the CAP. None of the soil borings before or after the BIOX treatment at the tank farm demonstrated any evidence of the presence of several of the VOCs that are used as raw materials by ELMCO that continue to be detected in the seeps in Liberty Creek and the Harpeth or in the well drilled on Daniels Drive. If the contamination was *only* from the tank farm why was there no benzene, n-propylbenzene, 1,2,3 trimethylbenzene, 1,3,5-trimethylbenzene, cis 1-2 dichloroethene, or methylene chloride at the farm and why do they continue to be detected in the creek and river and why were they found in the 2006 Phase II Environmental Assessment near the ELMCO building? We insist that the CAP include a complete investigation of *all* hazardous chemicals from *all* potential sources on the ELMCO property especially near and under the building, the drum storage area, and the underground storage tank area as was indicated in the Phase II Environmental study completed in 2006 by August Mack.

Additionally, a year and a half after ELMCO has taken responsibility for the off site contamination, they are still contaminating waters of the state every day and they have no

deadline by which they must stop. They have not provided any timeline to TDEC for which they will be accountable if they do not meet their clean up goals. In fact, they have not set any clean up goals such as federal standards that will be met when they complete their clean up or benchmarks on the way to their final goals during the clean up. This does not meet the requirements of a Corrective Action Plan and therefore it cannot be accepted. Also, we would recommend modifications to the Consent Order and Agreement to establish specific timelines and numeric standards for the clean-up process such that both ELMCO and the public would have clear expectations of when the remediation process should be completed and what the final results are expected to be. Additionally we recommend, as we did in our comments to the first proposed corrective action plan that the order be modified to adhere to the specific requirements of a RCRA equivalent facility assessment and investigation, and RCRA corrective measures study and implementation.

As the second proposed plan stands now it does not adequately monitor the river or provide notice to the public of hazardous waste contamination. The public uses the Harpeth River in downtown Franklin for recreation including swimming, wading, and fishing and swimming for pets. Until ELMCO controls the seeps to levels below Maximum Contaminant Levels (MCLs), TDEC should require ELMCO to post signs warning the public of the hazardous chemical discharges. These chemicals are unhealthy and are sometimes flowing at levels hundreds of times MCL's. No studies have been done demonstrating that exposure or direct contact with multiple, hazardous and carcinogenic chemicals *cumulatively* are safe such as those that are entering the River at seep 2. Therefore, signage warning the public it might not be safe should be posted.

The July seep sample for the Harpeth Seep 2, which is a public fishing location had benzene twice the MCL and toluene three hundred times the MCL plus acetone at one hundred and forty times the PRG *as well as* ethylbenzene, MEK, MIBK, n-Propyl-benzene, 1,2, 4-Trimethyl-benzene, 1,2,5-Trimethyl-benzene, xylenes and trace amounts of 2-hexanone, isopropylbenzene, and methylene chloride. These lab results are based on findings from a split sample which ultimately determined that the laboratory that ELMCO/TriAd has been using is inaccurate and will no longer be used, which brings into question *all* of the lab results reported by TriAd to date. The above results were from the state's lab which has better reproducibility, sensitivity, and accuracy and lower detection limits than the lab that was used.

Also, with respect to the last Seep Monitoring Report dated August 13, 2008 submitted by TriAd to TDEC, on page 4, Mr. Hinch indicated that ELMCO performed the August sampling event during the first full week of the month and, "will report to TDEC immediately if results indicate any significant increases." We certainly hope that this does not mean that the report to the public will only occur if there are increases in seep concentrations and only if those increases are "significant", which was not defined in the letter. This is not acceptable. All data gathered is public information. We would like for the monthly seep reporting to continue with the added mass concentration calculations posted to the TDEC web site.

These chemicals have continued to flow continuously into the Harpeth directly from Harpeth Seep 2 since at least their detection in January 2007 and almost continuously from Harpeth Seep 1 which is a few hundred yards downstream. The CAP gives the impression that

the contamination is becoming less and this conclusion simply cannot be drawn for the Harpeth or Liberty Creek. As a matter of fact the concentrations are actually increasing if you look at the latest seep report in the context of the mass loadings. As Mark Quarles explains in great detail in his comments (p.14-15) with the mass loading discharges that have been calculated starting with TDEC's records in 2007, there is no reduction, but cyclic increases and decreases depending on ground water flow. This is consistent with EPA standards for measuring contamination in groundwater. Trend conclusions cannot be drawn based solely on concentrations in ground or surface water.

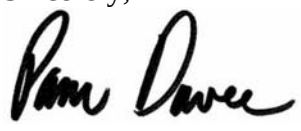
Harpeth seep 2 adds to the contamination of Harpeth seep 1 which is downstream from seep 2 and upstream from Liberty Creek. Harpeth seep 1 is not monitored and the downstream confluence of Liberty Creek which also adds its contaminant load to these two seeps is not monitored. The only sampling/monitoring done is a few *miles* downstream where the contamination is extremely diluted at the Franklin wastewater treatment plant so no conclusions about health and safety or contaminant levels can be drawn because the most contaminated area is not being monitored for ecological receptors or for humans. For long term effective monitoring of impacts of contamination on the river, monitoring should be set up monthly at the Franklin Road Bridge as well as at Harpeth Seep1.

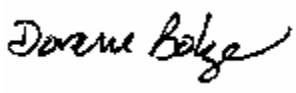
In addition to not addressing the deficiency of defining the nature and extent of the contamination which was listed as one of the nine deficiencies in the November 20, 2007 Notice of Deficiency, ELMCO also still has not laid out a timeframe for cleanup, done a thorough feasibility study of remedial alternatives, or provided any contingency plans should its recommended course of action fail. For instance, the proposed remedy of using EcoVac systems did not include the requisite criteria of explaining; 1) long term reliability and effectiveness, 2) ability to reduce the toxicity, mobility or volume of the contamination, 3) short-term effectiveness, 4) implementability, or 5) cost. This was the proposed remedy and they did not include this information in the second proposed CAP.

These are what HRWA finds to be the most important issues that have been inadequately addressed by the second proposed ELMCO Corrective Action Plan. Once again, we have many other more technical issues in the attached document prepared by Mark Quarles of Globally Green Consulting. If you have any questions please contact Pam Davee or Dorie Bolze at 615-790-9767 or Mr. Quarles at 352-0471.

Thank you for your time and consideration.

Sincerely,





Pam Davee
Development Director and Policy Specialist

Dorie Bolze
Executive Director

cc: Jimmy Palmer, Regional Administrator, Region IV, US EPA
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Chuck Head, Senior Director, Land Programs TDEC
Joey Holland, TDEC
Ryan Durst, Chief of Staff, US Representative Marsha Blackburn
State Senator Jack Johnson
State Senator Douglas Henry
State Representative Glen Casada
State Representative Charles Sergeant
Marc Driskill, Property Owner of Liberty Creek
Residents of Daniels Drive Neighborhood adjacent to ELMCO
Bill Penny, ELMCO legal counsel, Stites and Harbison
Dwight Hinch and Chris Scott, TriAD
Kerry Maddox, General Manager ELMCO

Globally Green Consulting
Environmental Consulting

August 22, 2008

Ms. Ashley Holt
State Remediation Section
Tennessee Division of Solid Waste Management
5th Floor, L&C Tower
401 Church Street
Nashville, Tennessee 37243

RE: Egyptian Lacquer Manufacturing Company, Franklin, Tennessee
Comments to the Revised Comprehensive Corrective Action Plan

Dear Ashley:

Attached are written technical comments submitted on behalf of the Harpeth River Watershed Association (HRWA) regarding the *Revised Comprehensive Corrective Action Plan Addressing the Solvent Release from the Egyptian Lacquer Manufacturing Company* (CAP) and the associated Consent Agreement and Order. We trust that our comments will receive careful and diligent consideration. We also trust that unlike the previously submitted Globally Green Consulting comments submitted in October 2007 in response to the August 2007 CAP, TDEC will respond to each of these technical comments as Mr. Jerry Ingram of TDEC stated would be done during the August 7, 2008 Public Hearing.

Specifically, our comments address the inadequacies associated with the environmental investigative activities that became the basis for technical decisions in this revised CAP; the CAP itself; and the Consent Agreement and Order that is the regulatory mechanism for the CAP. There is adequate technical support to justify, yet again, complete rejection of the CAP by TDEC because of:

- The inadequate scope and scale of the investigative activities,
- ELMCO's consultant's admittance that the nature and extent of toluene and acetone contamination are still not defined,
- The lack of source identification, much less delineation of the nature and extent, of numerous other volatile organic compounds found in the surface water and groundwater,
- The lack of adherence to industry and U.S. EPA standards for conducting investigations for the purpose of making remedial decisions, and
- The lack of a thorough corrective action evaluation of meaningful, high potential remedial alternatives.

Although not specifically a part of the CAP, we believe that the regulatory mechanism that requires such, the Consent Order and Agreement, should be modified because of the following inadequacies relative to the investigative and remedial activities required**:**

Nashville, Tennessee 37209

1. The Order failed to include specific criteria for soil, groundwater, or air remediation levels to define clean-up objectives that are protective of human health and the ecological environment. Without those criteria, there is no pre-established expectation of what degree of clean-up and environmental protection for area restoration is required. These criteria should be included in a new, modified Order.
2. The Order continually refers to the ELMCO site as an "inactive" hazardous substance site. The site is an active manufacturing facility with an ongoing release of regulated hazardous wastes to the waters of the State in violation of the Clean Water Act, the Tennessee Water Quality Control Act, the Tennessee Solid and Hazardous Waste Management Rules and Regulations, and the Resource Conservation and Recovery Act (RCRA).
3. The Order specifically only assigned responsibility of a release of toluene and acetone to ELMCO. The Order did not assign responsibility for the numerous other industrial chemicals that have been detected in soil and water. The Order should be modified to include all chemicals that are observed in soil and groundwater and those being discharged into the Waters of the State where there is a reasonable potential for ELMCO to be the responsible party.
4. The Order included no penalties (financial or otherwise) for non-compliance. U.S. EPA guidance on this matter states "*a critical component in the development of facility-specific incentives is the inclusion of penalty provisions in enforcement documents, and collection of penalties when the facility fails to comply with the permit or order*". Further, the EPA concluded "*penalty provisions in consent orders should contain stipulated penalty provisions, including provisions for interest on any unpaid stipulated penalty balance*". The Order should be amended to define the penalties for non-compliance relative to the required clean-up criteria.

ELMCO should incur financial penalties because of non-compliance with both the Order and the Notice of Deficiency that was written for the August 2007 CAP that was completely rejected almost one year ago. ELMCO has violated the trust of the people of Tennessee, the requirements of the Order, many of the terms in the Notice of Deficiency, and U.S. EPA and TDEC law according to the following:

1. ELMCO agreed in the March 1, 2007 meeting with TDEC to initiate investigative activities to "delineate" the extent of contamination. To-date, the extent of the contamination has not been defined in a residential area nor has it even been defined on-site.
2. According to the Order, a *Phase II Groundwater Assessment Plan* was due to TDEC in June 2007 to "*define the horizontal and vertical extent of the contamination plume*". To-date, the nature and extent of the contaminant plume of neither the soil nor groundwater has been determined, as admitted numerous times by ELMCO's consultant Triad Environmental Consultants, Inc. (Triad).
3. ELMCO has continually defied the requirements of TDEC and U.S EPA by storing and treating listed hazardous wastes without a permit - clear violations of law.

TDEC committed over a year ago in the May 17, 2007 letter from Mr. Chuck Head to Ms. Dorie Bolze of the HRWA that the environmental investigation will begin "*at the point of the*

release and will move from there until the extent of contamination in the soil and groundwater is determined". To-date, this has not been demonstrated by ELMCO because the nature and extent of contamination has not been determined on or off-property over a year after such was required - without penalty from TDEC.

Unmitigated dissolved-phase and free product occurrence and migration beneath residential properties on Daniels Drive can result in property damage of individual residences and can harm human health and the environment. TDEC has the responsibility to ensure that this harm and damage is minimized and citizen property rights are protected. The best way to accomplish this objective is to complete a thorough, timely investigation to define the nature and extent of the contamination and to remediate the contaminants.

We look forward to receiving your written, detailed responses to all the attached comments.

Sincerely,

Mark Quarles, P.G.

Attachment: Technical Comments

cc: Pam Davie, HRWA
Dorie Bolze, HRW

Corrective Action Plan Technical Comments

1. Environmental investigations Protocol Adherence

- Triad's claim that "significant reductions" have occurred in seep concentrations at both Liberty Creek and the Harpeth River should be rejected. A review of TDEC water sampling results from January 18, 2007 through June 14, 2008 and calculating mass discharges in pounds per day into Liberty Creek indicate that contaminated groundwater concentrations and mass loadings are cyclic, with the highest mass loadings occurring in January 2007, April 2007, September 2007, and again in March 2008. The mass loadings are the highest during the end of winter / beginning of spring and the end of the summer.
- Triad's claim that seep concentrations have significantly reduced should also be rejected because their August 13, 2008 seep sampling report for a July 1, 2008 seep sampling event determined that the concentrations in Main Seep at Liberty Creek were "*significantly higher than those measured in recent monitoring events*". Therefore, instead of improving as the CAP claims, the concentrations for acetone and toluene have actually increased according to Triad.
- Laboratory analytical results of samples split between Environmental Science Corporation (ESC, Triad's lab of choice for over a year), Test America, and TDEC's lab, indicate that ESC consistently under-reported concentrations when compared to the other labs. Therefore, both the accuracy and reliability of all historical monitoring data reported by ESC is questionable and should be rejected for making risk-based and final remedial conclusions.
- Triad's claim that Liberty Creek is "*acting to block any significant contamination flow further to the west*" should be rejected because of the concentrations reported in MW-4.
- Air rotary drilling likely missed discrete water bearing zones of the highest contamination during well drilling activities. Groundwater assessment activities used an air rotary rig to advance borings. As indicated in AR-4 and AR-5 in the Phase I / II Groundwater Report, on June 11–12, 2007, no water was detected during drilling, yet 15 feet of standing water from unknown intervals was present in the boreholes one to two days later. Further, the depths of the borings sometimes exceeded the depths of the nearby Harpeth River by 25 feet.
- Triad's well drilling methods for well RW-1 likely caused free product observed at boring AR-1 to migrate further to the west towards Daniels Drive and Liberty Creek due to Triad's use of 600 gallons of drilling water. Subsequent groundwater monitoring of the well that has apparently not indicated the presence of light non-aqueous phase liquid (LNAPL) is not surprising given the hydraulic head that would have been present with the addition of 600 gallons of water. There is no

downgradient well capable of monitoring LNAPL in this area or off-property and therefore, the extent of LNAPL has not been defined.

- Triad's use of potentiometric diagrams that combine water elevations from all wells should be rejected. Triad concluded in August 2007 that there is a "*lack of free hydraulic connection*" between wells MW-1, MW-2, MW-3, AR-1, and RW-1 - yet Triad uses the data to support all risk assessment and corrective action conclusions. Triad has been constructing potentiometric surface diagrams from these well in addition to MW-4 and MW-5 – even though they previously admitted that the wells monitored different water-bearing zones. The potentiometric surface diagrams provided by Triad therefore do not represent true groundwater flow directions.
- The monitoring system installed by Triad is incapable of monitoring the zone of highest concentrations, and additional wells should be installed. Triad concluded that groundwater is "*limited to a thin zone at the top of rock, predominantly in bedrock depressions or cutters*", yet only one (1) of the five (5) wells (RW-1) installed by Triad even monitors the top-of-rock groundwater. One source area well (AR-1) is even double-cased to actually <u>prevent</u> shallow top-of-rock groundwater from even entering the well. The monitoring system on-site is therefore not capable of monitoring the highest concentrations.
- Additional groundwater monitoring wells should be required so that each water-bearing zone has at least three (3) wells (at least 2 downgradient and one upgradient) so that an accurate potentiometric surface diagram can be produced for each water-bearing zone, as required by U.S. EPA rules and guidance for groundwater investigations.
- Triad's claim that the groundwater concentrations in AR-1 are improving - therefore implying that conditions are getting better – should be rejected. This conclusion has no merit because Triad admitted in the July 2007 letter to TDEC that a "*steel isolation casing (for AR-1) was set … to prevent cross contamination of groundwater with solvent found at the top of bedrock*". In fact, Triad set more than one casing in the well to isolate upper groundwater with deeper zones. Triad further concluded "*the lack of free product indicates that either the steel casing or the groundwater closed off the migration pathway for the free product, and the product found in the well was isolated from its source*". Groundwater monitoring results from AR-1 cannot possibly be used in making arguments that the groundwater quality is improving because the well was constructed to keep contaminants <u>out</u> of the well.
- Triad's claim that groundwater concentrations in MW-2 have declined in an effort to support their conclusion that contamination is improving should be rejected. A review of the groundwater data for MW-2 does indicate lower concentrations of acetone; however the water level was five (5) feet higher than the screened interval of the well. When one considers the water level (June 3, 2008 event was 618.07 feet mean sea level) and the screen elevation (613.7 to 583.7 to feet mean sea level), the drop in acetone concentration may be because the water level was five (5) feet higher than the screen. The highest concentrations of emulsified acetone in groundwater and free product acetone would be expected to occur along the upper-most groundwater

fringe. The June 2008 results for MW-2 cannot therefore be used for making definitive trend determinations.

- Triad's use of an assumed 20 percent effective porosity for the bedrock should be rejected, and actual wide spread porosities should be determined. The value used by Triad may not be representative of conduit flow that Triad admits exist when they concluded that the void space size where groundwater exists "*is unknown*". Triad never attempted to gather this information. Therefore, contaminant mass could be grossly underestimated.
- Triad's use of an estimated porosity (1 percent) for Daniels Drive area mass calculations should also be rejected. Triad used assumed values from a textbook without any basis to support the on-site porosity – rather than obtaining and using actual site-specific porosities.
- Triad should be required to collect Daniels Drive-specific to support their conclusion that it is "unlikely" that Daniels Drive residents have been affected by volatile organic compound contamination due to the thickness of soils beneath the homes. Triad, nor anyone else, cannot possibly make such a determination without actually drilling in the area to know the depth to the bedrock, the location and orientation of bedrock joints, the depth and location of free product in the groundwater, the depth and location of free product contaminated soil beneath Daniels Drive, and the seasonal high groundwater relative to crawl spaces and basements.
- Triad's work regarding vapor intrusion and air monitoring should be rejected. The CAP and the associated risk assessment did not properly assess the vapor intrusion risk relative to U.S. EPA's vapor intrusion guidance. As such, there is still no basis to conclude that the residents on Daniels Drive are not at risk. At a minimum, current vapor intrusion work has not used appropriate sampling and analyses procedures, the location and depth to the most contaminated areas off-site have never been established, not all exposure pathways have been considered, and the cumulative effects of multiple VOCs have not been considered.
- Triad's claim that that the bedrock is "tight" in an effort to downplay the potential domestic use of groundwater in the area should be rejected. Triad conversely concluded that the groundwater hydraulic conductivity might be 1,000 feet per day. The potential certainly exists that the public could use the groundwater for domestic use if a well is placed in the correct location.
- Triad installed AR-1 and RW-1 as "recovery wells" yet the sheer design and construction keep them from being able to be used as such.
- Triad's determinations for bedrock groundwater flow velocities should be rejected because the Bower and Rice method used to calculate flow is not appropriate for use in fractured, conduit flow bedrock. The method is only suitable for use in porous media. A tracer test should have been performed instead and should now be required.
- ELMCO's apparent working with the City of Franklin to restrict installation of water wells in the area because ELMCO's inability to adequately clean up their contamination denies citizens the right to use a Water of the State.

2. Nature and Extent of Contamination

- The CAP should be rejected because Triad admits numerous times in the CAP that the nature and extent of contamination have not even remotely been defined - contrary to the terms of the Order. A CAP cannot possibly be approved without first determining such. Triad admitted in the CAP that the nature and extent of contamination have not been defined in their following written statements:
    - The current size of the free product plume "*cannot be determined from existing data*".
    - The contamination in the former tank farm area soils was "*fairly well defined*". After over a year of investigations, there should be complete delineation according to terms of the Order.
    - The extent of the dissolved-phase plume "*has not been completely defined to the east or the north*".
    - The "*nature and extent of contamination in the excavated and unexcavated soils has as yet not been defined*".
    - The exact migration pathways of free product "*cannot be established with certainty*".
    - There are "*data gaps*" and that additional investigative activities "*may require a change in these planned corrective actions*".
    - Determining whether free product remained "*in the pipeline*" between the source area and the seeps was critical, yet no investigation to-date has included anything to determine this critical factor.
    - An estimation of the free product to calculate contaminant mass "*would be dependent on understanding the specific geometry of the conduits and fractures*", and that "*geometry is unknown*".
    - Not until sampling is performed of the excavated and unexcavated soils at Liberty Creek that "*any necessary corrective actions would then be designed and implemented*".
    - That other "*release mechanisms … cannot be ruled out with certainty*". Ironically, they have never looked for those other release mechanism even though the Order and the November 20, 2007 Notice of Deficiency required that the contamination be delineated.
- A detailed investigation should be required of ELMCO from the ELMCO property towards Liberty Creek or the Harpeth River so that the true migration pathways and risks to human health and the environment are defined. Horizontal well placement off-site seemed to have focused away from the expected areas of highest contamination in the Daniels Drive - instead focusing on where the contamination is less likely to be.
- Triad concluded that *"disruptive investigations*" would be required to assess the contaminants in the Daniels Drive area as an excuse why delineation consistent with the Order has not yet been completed. The Order does not specify that the investigations must not be disruptive. In fact, there has never been any proposed activities off-site whatsoever in the Daniels Drive area for the public or TDEC to

decide what is “disruptive”. The public should be allowed to comment on what activities are proposed by ELMCO on their property to determine what is “disruptive”.

- The proposed two (2) new wells serve no purpose in defining additional sources of contamination and serve no purpose in defining the contamination where the contamination is likely the highest – all necessities for designing a CAP.
- Triad’s claim that the absence of free product in MW-3 during the March was a result of the absorbent boom placement in the well should be rejected – at least until they prove that the product did not migrate downgradient. It is equally or perhaps more likely that the free product flowed downgradient from the well towards Daniels Drive residential properties towards an area that is not upgradient of the recovery trench.
- According to the potentiometric surface diagram included in the CAP, there is possibly no downgradient monitoring well between MW-3 and Liberty Creek. Also, the potentiometric surface diagram infers that free product observed in MW-3 will eventually discharge north of the interceptor trench.
- Monitoring wells that screen unknown water-bearing zone intervals should not be used for making potentiometric surface diagrams or for determining concentration determinations relative to risk. Triad was unable to determine the depths of water-bearing zones when wells MW-1, RW-1, MW-3, and MW-5 (4 of the 6 wells) were installed. Monitoring wells screened across multiple intervals can dilute any discrete contamination zones and therefore, the groundwater data should not be used for conclusive trend determinations.
- It is also possible that the wells are cross contaminating otherwise uncontaminated water bearing zones because the wells screen such a wide swath of bedrock.
- Triad installed wells deep into the bedrock, and well placement did not focus on monitoring the upper-most water-bearing zone in low-lying areas of the irregular surface of the bedrock. Additional wells specifically targeting those lowest-lying bedrock areas on and off-site should be installed. Of the 29 Geoprobe borings that were advanced in the aboveground tank farm area, Triad reported groundwater (and / or free product) at the top of bedrock in 10 borings. When a bedrock contour diagram is developed and integrated with boring observations of groundwater, soil sampling results, and free product observations**,** the borings in the lowest depressions were the most heavily contaminated – yet only one (1) well capable of monitoring conditions (or recovering free product) in this zone has ever been installed.
- Of the four (4) wells installed on-site, only one (1) well (RW-1) is screened to bracket top-of-bedrock groundwater. Further, only RW-1 was installed within the zone of highest concentrations; within the zone of highest hydraulic conductivity; and within the lowest bedrock elevations indicative of “cutters” or linear depressions in the bedrock. The top of the well screens (meaning that the actual screened intervals extend much deeper) for the remaining wells are at least 36 feet (MW-1), 27 feet (MW-2), and 17 feet (MW-3) below the top of bedrock and outside the zone of “cutters”, as defined by Triad during their Geoprobe drilling investigation. It is likely that the wells are monitoring different water-bearing zones than RW-1. As a result,

the monitoring system capable of monitoring the zones of highest contamination and the main migration pathways does not exist. A system should be created.

- Some wells are screened below the elevation of the Harpeth River and Liberty Creek, even though visual observations along the Harpeth River bluff indicated groundwater discharges from the Hermitage formation above the river water level.
- Triad should be required to provide actual subsurface data to support their estimation of the "*inferred trend*" of the cutter that is believed to extend from ELMCO to Liberty Creek. Even after over a year of investigations, Triad has still not determined whether or not the cutter actually exists, much less its size and location.
- Triad should be required to perform a fracture-trace analysis in addition to actual off-site subsurface investigations to determine the actual locations and orientation of the main bedrock joint migration pathway(s) given the importance on their assumptions on groundwater flow, contaminant migration, contaminant mass determinations, and human health risk.
- The potentiometric surface diagram is likely skewed in the former tank farm area because of the thousands of gallons of liquids that were pumped into the subsurface and never removed. The process injected 3,249 gallons of liquid at and above the water table in the tank farm area. Plus, another 600 gallons of water were used when drilling RW-1. As a result, the true potentiometric surface is likely still unknown.
- The data provided by Environmental Science Corporation cannot be used to make downward concentration trend determinations or to confirm / deny the presence of constituents. Triad's choice of laboratory consistently used laboratory method detection limits that were too high, and the laboratory consistently under-reported concentrations when compared to split samples sent to the TDEC lab and to Test America.
- Unless MW-4 screens the same interval and joint that is the migration pathway of the main seeps in Liberty Creek, the data from MW-4 cannot be used to make such a definitive conclusion on the worst-case groundwater concentrations on the west side of Liberty Creek. Triad concluded in the CAP that free product toluene flows into Liberty Creek along a discrete two (2)-foot section in the creek bank. Visual observations in the area indicate that the free product discharges from the soil <u>above</u> the top of the bedrock. MW-4 is screened from eight (8) to 18 feet <u>below</u> the top of bedrock.
- To understand the variability of seep concentrations, Triad should be required to calculate contaminant mass entering both Liberty Creek and the Harpeth River and to determine what effect increased base flow, stormwater, or seasonal variations in both the creek and the Harpeth River have in terms of constituent concentrations.
- Triad should be required to correlate trench operational success to a drop in Liberty Creek concentrations and contaminant mass. Until such time, no conclusions can be made about contaminant reductions relative to the overall net drop in contaminant loading to the Waters of the State.
- Smearing of soils and free product would not be limited to the area along Liberty Creek but also the 800-foot area from the trench to the ELMCO facility beneath Daniels Drive. There is no reason whatsoever to believe that smearing has not

occurred along the top of bedrock from ELMCO to Liberty Creek or the Harpeth River. Triad explained that "*smearing"* of free product has occurred wherever free product has come into contact with soils. If the nature and extent have not been defined at Liberty Creek, in addition to the area beneath Daniels Drive, it is impossible to propose a site remedy. Such nature and extent of the entire smear zone is required by the Order and necessary for selection of a remedy.

- Triad should be required to complete a detailed spring inventory in the downgradient direction to identify all seeps and springs along the Harpeth River. The survey should be performed during wet and dry periods of the year.
- TDEC should impose financial penalties on ELMCO because the current pace of investigations has still not defined the extent of contamination almost 15 months after the Order was written. The investigations completed to-date have been a haphazard attempt to look where contamination is not likely and to make broad statements of lack of risk with minimal science to back up their claims. Only through financial penalty, can we expect that a more serious, competent investigation and clean-up plan be developed.

3. Source Area Identification

- The entire Triad investigation has virtually focused solely on the tank farm located 100s of feet from the manufacturing building and that their soil samples have yet to explain the presence of eleven (11) VOCs detected in the groundwater.
- Triad found evidence that petroleum hydrocarbon contamination exists on-site, yet the investigations completed to-date have done nothing to identify the source(s) or to define the nature and extent. The Order should be revised to require such. Boring logs of air rotary borings that were included in the *Phase I and Phase II Groundwater Investigation* report indicated that petroleum hydrocarbon odors (that were distinctly differentiated from solvent odors) were present during drilling. Triad concluded that the source of the odors were petroliforous bedrock. There is no basis whatsoever to support the naturally occurring petroleum odor claim, especially given the historic uses of petroleum hydrocarbons on-site by ELMCO and the previous owner, Shell Oil (as a bulk oil storage terminal). While it is remotely possible that the shallow bedrock might be petroliferous, Triad has not demonstrated that to be true. It is more or at least equally likely that the constituents are related to inappropriate management of on-site petroleum fuels and ink wastes, according to Mr. Mike Hoyal of the Tennessee Division of Geology. Further, the U.S. EPA reports that both constituents are common in soil and groundwater at Superfund hazardous waste sites, and the ASTDR reports that they are common in resin formulations and dyes. Therefore, there is more reason to believe that the compounds are due to inappropriate waste disposal operations at the site
- ELMCO should be required to identify all sources of all contaminants present in the groundwater and surface water. To-date, <u>none</u> of the 40 total laboratory samples of the most contaminated soil intervals selected by Triad from <u>295 intervals</u> contained these VOCs that have been detected in groundwater on and off-site: benzene; di-

isopropylether; isopropyl alcohol; n-propylbenzene; 1,2,3 trimethylbenzene; 1,3,5 trimethylbenzene; cis-1,2 dichloroethene; tetrachloroethene; methylene chloride; 1 methylnaphthalene; or 2 methylnaphthalene. As a result, the source areas for these contaminants have not yet been defined, nor has the nature and extent of the contamination.

- The only benzene reported in any soil sample was from the former drum storage area and underground storage tank area near the building, as reported in October 2006 Phase II Environmental Site Assessment (ESA). This indicates a possible benzene source area.
- Seep sampling indicates that other unidentified sources of VOCs exist. Seep samples collected at Liberty Creek have indicated the presence of dissolved-phase acetone, toluene, and multiple other VOCs that are used as raw materials by ELMCO, in addition to the presence of free-phase toluene. The occurrence of MIBK in the Harpeth River samples and none being detected in Liberty Creek; the occurrence of isopropyl alcohol in some (not all) Harpeth River seep samples and not in Liberty Creek samples; and the predominance of acetone being detected in the Harpeth River all indicate that there are source areas other than the solvent tank farm.
- Neither the CAP nor the Order is complete because numerous constituents are not specifically mentioned or considered in the Order, the contaminant mass calculations, or in the risk assessment. Other volatile organic compounds not specifically mentioned in the Order or the CAP include benzene, di-isopropyl ether, ethylbenzene, isopropylbenzene, isopropyl alcohol, methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK), methylene chloride, n-propylbenzene, 1,2,3-trimethylbenzene, 1,2,4-trimethylbenzene, 1,3-5-trimethylbenzene, xylenes, cis-1,2-dichloroethene, tetrachloroethene, methylene chloride, naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene, among others.
- Triad's claim that the extent of the free product plume is limited to the east-west orientation of a bedrock joint located beneath the old piping elbow should be rejected. Significant amounts of free product have also been observed in MW-3, which is located approximately 100 feet to the north of the reported release point and outside the 15 foot swath designated by Triad as the free product migration area.
- The CAP does not include an evaluation of corrective action measures for all source areas of contamination and therefore the CAP should be rejected until such activities are completed. The Order required ELMCO to prepare and submit corrective action plans to address "source area" soils. The US. EPA[1] defines source area to include "*both the location of the original release as well as locations where significant mass of contaminants may have migrated*". Triad has acknowledged that LNAPL likely exists off-site yet no investigation has even been performed to define the nature and extent downgradient from the ELMCO property. As a result, the CAP is incomplete and therefore cannot possibly be approved.

[1] Fact Sheet #3, Final Remedy Selection for Results-Based RCRA Corrective Action, U.S. EPA, March 2000.

- Soils contaminated with free-phase compounds will continue to contaminate groundwater for the foreseeable future, yet the locations of these smear areas off-site have never been determined. Triad explained that "smearing" of free product has occurred wherever free product has come into contact with soils. This smearing would not be limited to the area along Liberty Creek but also the 800-foot area from the trench to the ELMCO facility beneath Daniels Drive.
- The CAP allows for an undetermined mass of LNAPL to remain in the ground untreated, creating a long-term detrimental impact to the waters of the State and daily violations of the Tennessee Water Quality Control Act and the Clean Water Act. the U.S. EPA recognizes that LNAPL in free or residual phase "*represents a significant mass of contamination that will serve as a long-term dissolved-phase source*".
- Triad's claim that benzene is the "*only human carcinogen that been consistently detected in water samples from the site*" should be rejected. Tetrachloroethene and methylene chloride are both carcinogens and have also been reported on-site. Further, tetrachloroethene and cis,1-2dichloroethene (also found on-site) can both degrade to vinyl chloride, which is a known carcinogen at an even lower concentration.
- Triad concluded that source area soils in the tank farm area "*appear to be capable of continuing to release solvent constituents to the underlying groundwater*".
- Triad should be required to submit the results of Extractable Petroleum Hydrocarbons (EPH) tests and chromatograph analyses for public review. Such tests were performed, yet no data has ever been presented for public review. The Consent Agreement and Order requires that ELMCO submit "*all data that is obtained during the implementation of the CAPs*".
- Without recovering all free product and heavily contaminated dissolved phase groundwater on and off-site, the contamination into Liberty Creek and the Harpeth River will continue into the foreseeable future.
- The source of naphthalene in on-site soil has not yet been identified. Mr. Chuck Head of TDEC concluded over a year ago in a May 17, 2007 letter regarding this site that "*naphthalene (detected in on-site soil) is a key indicator of the presence of diesel fuel and No. 2 heating oil*". An 8,500 underground storage tank existed on-site for almost 20 years.
- Documentation of proper closure of the heating oil tank and a change-of-service for the gasoline tank should be made available for public review as part of this CAP. Although the CAP reported that the on-site heating oil tank was closed in 1997 and results were sent to TDEC, there is no record of such closure in the Division of Underground Storage Tank files at either the Nashville Field Office or the Central Office. Further, there is no documentation that the gasoline storage tank was investigated prior to being converted to a "process cooling water tank".
- Triad should be required to expand the subsurface soil boring investigation to the area surrounding and within the manufacturing building. Triad concluded that groundwater constituent concentrations continue to increase at MW-1 (nearest the

manufacturing building and drum storage area) with no plausible explanation as to the source of the contamination.

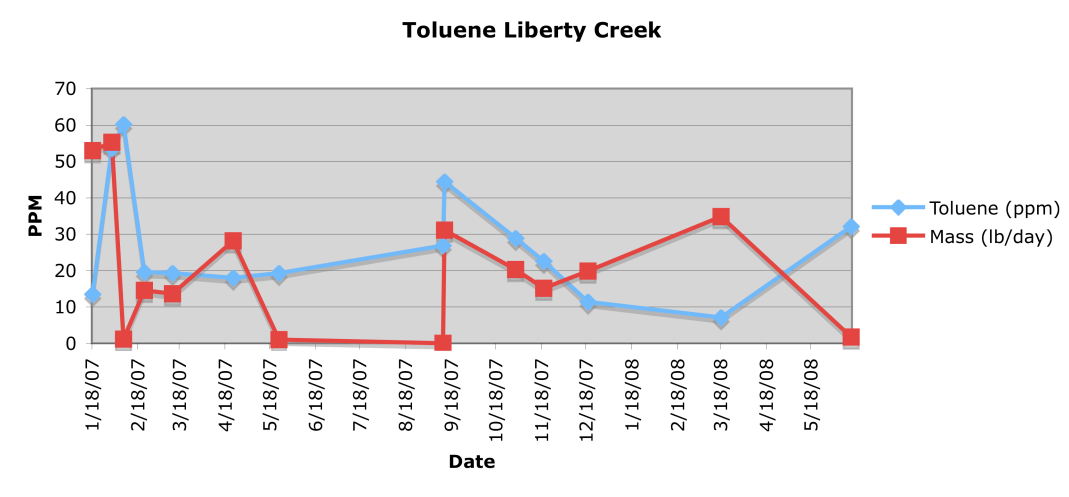
- ELMCO should be required to sample soil and groundwater for semi-volatile organic compounds (SVOCs) that are indicative of diesel fuel and heating oil contaminants.
- The two (2) additional wells proposed by Triad do nothing to define the additional sources of contamination; serve no purpose in defining contamination where the risks to the public are the highest; serve no purpose in defining the contamination where the contamination is likely the highest; and do nothing to define the sources of all volative organic compounds whose source(s) have yet to be defined.
- Contaminated soils on and off-site will continue to contaminate groundwater and surface water, based upon Triad's conclusion that corrective measures for source area soils are needed "*to reduce the potential for solvent constituents to migrate from the soils into the underlying groundwater*". The contaminated source area soils are not limited to the site, and the CAP does nothing to address any off-site contamination beneath Daniels Drive.

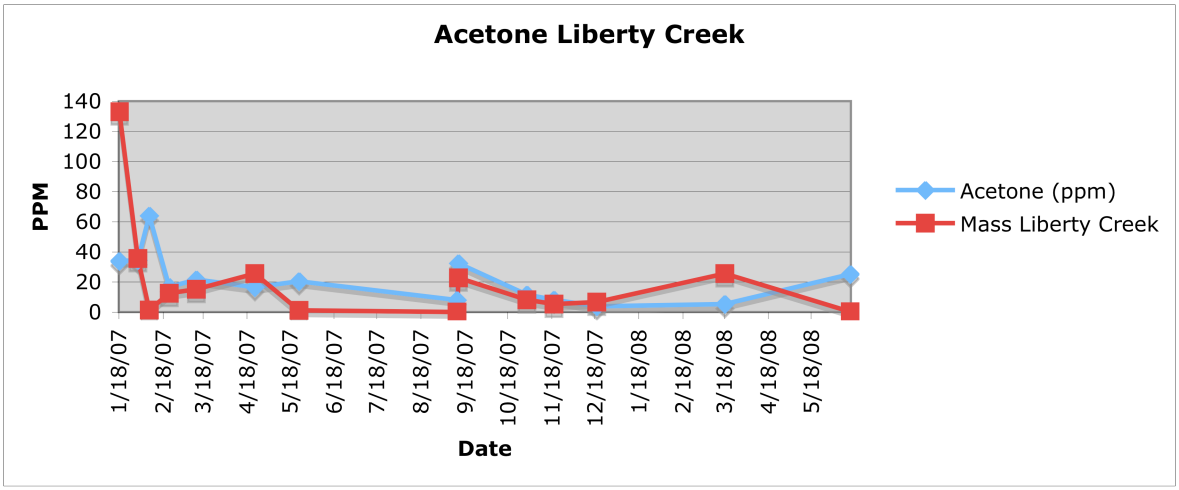
4. Corrective Action Plan Remedy

- The CAP should be rejected because ELMCO still has not completed a comprehensive investigation to support corrective actions, has provided a thorough remedial cost estimate or a technical feasibility evaluation, or a timeframe evaluation for all reasonable alternatives, as required in a U.S. EPA approved RCRA Corrective Measures Study or CAP.
- Triad's plan to realign of Liberty Creek so that oxygenation can occur for heavily volatile organic compound contaminated water should be rejected. This "treatment" process will result in volatile organic compound evaporation into the air – thereby increasing the inhalation hazard. This pathway and its expected vapor concentrations were never considered in the risk assessment.
- The CAP should be rejected because Triad's conclusion that no other more effective means of managing migrating free product exists other than the recovery trench. Triad has never even considered any other alternatives for off-site free product recovery, as required by a corrective action alternatives analysis.
- The proposed dual-phase vacuum extraction remedy at the aboveground tank farm should be rejected as a comprehensive corrective action because the CAP never considered any remedial alternatives for the off-site source area between ELMCO and the trench, nor did it include other unidentified source areas on the ELMCO property.
- The dual-phase extraction treatment should be rejected until such time extraction wells are properly located to provide maximum recovery benefit. The proposed extraction wells are not properly located in the areas most likely to contain free product. Specifically, none of the four (4) proposed multi-phase extraction well locations (GP-25, 26, 27, and 28) had groundwater at the top of bedrock; only one was in a topographic low elevation of the irregular shaped bedrock and therefore within the highest zone of hydraulic conductivity; none were in the downgradient

direction of the contaminant migration; and none were near MW-3 which has recently contained free product.

- Triad's conclusion that "*presumed that any remedial action taken to address the toluene and acetone would also remediate these associated VOCs*" should be rejected. The source area(s) for numerous VOC constituents (other than acetone and toluene) have never been identified because there has never been an attempt to do so. Further, dual-phase extraction in the former aboveground tank farm will do nothing to remove other contaminants because most of the VOCs have never been found in the soil in this area. As such, the CAP is incapable of removing or treating all volatile organic compounds that are found in the groundwater and surface water.
- The CAP should be rejected because it relies on calculations that incorrectly and inadequately account for contaminant mass. Bedrock porosities were not based upon site-specific or even regional specific limestone. Adequate time and resources have been available for over a year to determine actual site-specific porosities, yet no attempt has ever made by Triad to do so. The 20 percent effective porosity estimate used by Triad is not representative of conduit flow in solution-enlarged joints and fractures. Further, there has been no attempt to include the contaminant mass associated with numerous constituents other than acetone and toluene. Therefore, the contaminant mass calculations by Triad cannot possibly be expected to be accurate or even a reasonable estimate for corrective action purposes.
- Any claim by Triad that seep concentrations in Liberty Creek and the Harpeth River are improving should be rejected. A review of TDEC water sampling results from January 18, 2007 through June 14, 2008 and calculating mass discharges in pounds per day into Liberty Creek (see attached graphs) indicated that contaminated groundwater concentrations and mass loadings are cyclic, with the highest mass loadings occurring in January 2007, April 2007, September 2007, and again in March 2008. The mass loadings are the highest during the end of winter / beginning of spring and the end of the summer. Only through a thorough understanding of the connection to rainfall and groundwater elevations can Triad attempt to understand the occurrence and movement of free product into the trench.





- The CAP and the associated risk assessment should be rejected because both assumed that contaminant seep concentrations were decreasing - when in fact they have proven to be increasing based upon the most recent July 1, 2008 seep sampling event.
- The CAP should be rejected because the contaminant mass calculations and the risk assessment assumed an average dissolved phase concentration from well AR-1 - which is double-cased to exclude heavily contaminated groundwater from even entering the well. Therefore, calculations along the joint pathway grossly underestimate the mass. Further, the calculations assumed groundwater concentrations from a February 2008 sampling event, and those concentrations do not represent the highest concentrations observed from that well.
- The CAP should be rejected because TDEC has never determined what constituent concentrations in the soil are protective of human health and the environment. Triad argued in the CAP that they could not determine the volume of soil that would require treatment for corrective action purposes – a critical requirement of CAP completion and alternatives analyses. Therefore, the CAP alternatives analyses were incomplete.
- Triad concluded remedial efforts at the former aboveground tank farm would reduce contaminant concentrations in Liberty Creek; however, there was no estimated time frame for when that benefit might be achieved. An estimate based upon scientific fact should be provided.
- The CAP should be rejected because it offers no meaningful timeline for when clean-up objectives for soil, groundwater, and surface water will be met. Therefore, the CAP does not meet the U.S. EPA's minimum standard for a Corrective Measures Study. The U.S. EPA requires that when clean-up objectives cannot be met within a reasonable timeframe, "*a remedial alternative that more likely would meet these expectations should be selected*". Neither the clean-up objectives nor the length of time for any of the proposed remedies to achieve U.S. EPA or TDEC standards have ever been determined.

- Triad's conclusion in the CAP that a complete on-site treatment would be "*quite expensive*" and that dual-phase vacuum extraction cost were "*much more reasonable*" does not meet the minimum RCRA intentions for remedial cost evaluations. Further, the selected dual-phase extraction remedy cost did not consider off-site source area soils, did not consider continued, full-scale operation of the dual-phase system, and did not project how many years into the future the system will operate.
- Triad's plan to recovery free product from the ELMCO site to Liberty Creek should be rejected for any purpose other than removing free product nearest the trench. This pumping will only affect any free product in the near vicinity of the trench and will do little, if anything, to remove free product observed 800 away at the ELMCO property, beneath Daniels Drive, or from the likely 800-foot long smear zone. Triad's plan to ignores the historical cyclic nature of the highest concentrations, the unknown extent of free product beneath Daniels Drive, and the occurrence of smear zones. The work will do little, if anything, as a critical "*determination as to whether or not substantial free product solvent might still be present*", as determined by Triad.
- The CAP and the associated risk assessment should be rejected because neither properly assessed the vapor intrusion risk relative to U.S. EPA's vapor intrusion guidance. There is no indication that the plan or its methods meet the minimum levels by U.S. EPA in the *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (EPA 530-D-02-004, November 2002). As such, there is still no basis to conclude that the residents on Daniels Drive are not at risk. At a minimum, current vapor intrusion work has not used appropriate sampling and analyses procedures; the location and depth to the most contaminated areas off-site have never been established; not all exposure pathways have been considered; and the cumulative effects of multiple chemical exposures have not been considered. Further, Triad has concluded that there is minimal risk without having multiple samples from homes during multiple seasons of high and low groundwater flow, high and low atmospheric pressures, or high and low ambient air temperatures. The CAP cannot possibly be approved because not all risks have been defined.
- The CAP should be rejected because Triad has still not adequately evaluated vapor phase contaminant migration pathways by their own admission in August 2007 when the first CAP was submitted. Triad concluded in the first CAP that "*it is clear from evidence gathered during the drilling of MW-3 (*located closest to the residential subdivision*) that there is a vapor-phase component to the plume*" and that those vapors appear to be related to the groundwater contamination, which is determined by bedrock "*cutters*" and fractures. To-date, these bedrock conditions have not been determined beyond the ELMCO property line and therefore, the seasonal risk from vapor hazards has yet to be defined or properly mitigated.
- The biodegradation study performed by Triad suggests that either (or both) free product or the BIOX treatment solution that was injected was toxic to naturally occurring degrader bacteria. Therefore, there should be no direct or indirect reliance on biodegradation as a remedial action in areas where free product is likely to exist.

- Triad's recommendation to place BOS 200 in the recovery trench to treat contaminated water before it reaches Liberty Creek should be rejected because the method has only be used once in the U.S. without even knowing if the process worked. At best, one could this type of application to be experimental. According to Mr. Scott Noland of Remediation Products, Inc., the owner of the BOS 200 process, a critical determination for trench design and success with BOS 200 is to understand the dissolved and free-phase contaminant mass and how they fluctuate with time – factors that Triad have yet to understand. Further, Mr. Noland explained that the effluent from the trench would be expected to be extremely low in dissolved oxygen and very high in nutrients – all water quality degradation issues.
- The CAP should be rejected because there is no site-specific information to provide dimensions for the assumed main migration pathway along the illustrated "cutter" or bedrock joint. Triad has yet to complete any investigation whatsoever along the assumed joint pathway to even prove its existence, much less rely on any calculations or assumptions using the assumed 800 feet long, 15 to 100 feet wide, and 5 feet deep dimensions.
- Biodegradation calculations made by Microbe Inotech Laboratories (MiL) are flawed and are not representative of the real conditions. Any reliance on this information either directly or indirectly to support remedial decisions should be rejected. First, the calculations assumed that no free product exists, yet there is ample evidence to the contrary. Second, the calculations were made based upon contaminant mass calculations provided by Triad that were not based upon any real data for the largest acreage (off-site) that is contaminated. Lastly, they assumed concentrations that do not represent the highest dissolved-phase concentrations. Therefore, any use of the estimated clean-up times calculated by MiL is not supported by scientific fact.
- Any direct or indirect implication from Triad that biological remedial processes can be used to mitigate contamination should be rejected. The biodegradation study determined that degrader bacteria exist; however, the results indicate that no degrader bacteria exist in the zone of highest contamination where free product has been observed. Free product can be toxic to naturally occurring strains of degrader bacteria, as seemingly proven by the actual microbial sampling results.
- The microbial study completed by MiL concluded that augmentation of groundwater with nutrients was not necessary to initiate bioremediation, contrary to Triad's recommendation and conclusion that resulted in the injection of over 3,000 gallons of primarily nutrient-rich BIOX liquid into the subsurface.
- The groundwater and surface water monitoring program for the site and all springs should include sampling parameters indicative of the nutrients and other constituents that were injected in the BIOX solution. Groundwater with high concentrations of nutrients can create and exasperate existing eutrophic conditions in the Harpeth River and Liberty Creek.
- Secaps conclusion that contamination entering the Harpeth River "*poses no significant risk to aquatic organisms*" should be rejected because actual samples obtained from the Harpeth River indicated low dissolved oxygen concentrations at the seeps. Only through the dilution effects of upstream flows (when they exist), do

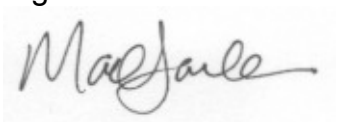
the dissolved oxygen concentrations improve to the point of supporting fish and aquatic life.

- ELMCO should incur a financial penalty because the Notice of Deficiency issued to Triad for the first CAP specifically required a comparative timeline for remediation, yet no remedial timeline was provided for each alternative.

5. Hazardous Waste Storage and Treatment

- ELMCO should incur a financial penalty for violating conditions of the Order that required remediation wastes be properly managed by June 30, 2007. Over a year later, those wastes remain on-site in violation of the Order and U.S. EPA rules. The wastes are a listed hazardous waste, and storage is not permitted by the U.S. EPA or by TDEC law for more than 90 days without a RCRA Part B permit.
- ELMCO should incur a financial penalty because listed hazardous remediation wastes have been treated on-site without first obtaining a U.S EPA or TDEC permit to do so – a violation of U.S. EPA rules and in direct violation of the requirements of the Order. The penalty should be retroactive to the day wastes were first placed because Triad referred to the pile as an "*active remediation effort*" and a "*biopile*"- meaning that ELMCO has already begun illegally treating a listed hazardous waste.
- TDEC should reject Triad's plan for "*reconfiguring the soils into a vegetated stockpile … where additional treatment by that method might be effective*" because that is an illegal activity that requires a permit.

Signed:



Mark Quarles, P.G.