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Lynn M. Muench  
Senior Vice President - Regional Advocacy

April 9, 2010

Mr. James Holt  
Assistant Manager  
Pollution Control Section  
Memphis and Shelby County Health Department (MSCHD)  
814 Jefferson Avenue  
Memphis, TN 38105

RE: Memphis Barge Emissions Project  
draft Final Report

Dear Mr. Holt:

The American Waterways Operators (AWO) values our longstanding partnership with the Memphis and Shelby County Health Department (MSCHD) and thanks you for the opportunity to review and comment on the Memphis Barge Emissions Project draft Final Report. AWO Barge Emissions Working Group members, Starcrest Consulting Group, LLC and MSCHD convened for a project coordination meeting in Memphis in December 2007, thus beginning a productive dialogue that has been ongoing for more than two years. During the meeting, the group examined and discussed the methodologies MSCHD proposed to measure inadvertent tank barge emissions operating on McKellar Lake in Memphis. AWO followed that meeting with comments submitted in February 2008, and we appreciate that MSCHD continued to reach out to AWO when it formally began its study to quantify barge emissions in September 2009. This process has illustrated that both AWO and MSCHD have a mutual commitment to environmental stewardship. The AWO membership thanks you for involving the tank barge industry in this process and we look forward to working with you in the future.

Attached to this letter please find comments drafted by Starcrest after a thorough technical review of the report. Starcrest has extensive experience working with ports and the maritime sector on air quality issues. AWO encourages MSCHD to consider Starcrest's feedback and to address these comments, where possible, in the final published report. The comments have been reviewed by the AWO member experts that participate on the AWO Barge Emissions Working Group. The group concurs with Starcrest's assessment. The report is consistent with the issues and concerns raised at the December 2007 meeting and in AWO's February 2008 comments.

AWO's more than 300 member companies care deeply about the environment. We have worked closely with the Environmental Protection Agency and numerous state environmental agencies across the United States on a number of issues, including air emissions. The Texas Transportation Institute's (TTI) report, titled "A Modal Comparison of Domestic Freight Transportation Effects on the General Public," found that waterways transportation is the most environmentally friendly mode of commercial freight transportation. The TTI study highlights where we are now. In the future, we look forward to continuing to work with local, state and federal agencies including MSCHD to reduce inadvertent tank barge emissions.

Sincerely,

A handwritten signature in cursive script that reads "Lynn M. Muench". The signature is written in black ink and is positioned below the word "Sincerely,".

Lynn M. Muench

Attachment: Starcrest Comments on Memphis Barge Emissions Project (Shelby County)

It is our belief that the sampling methodology used in the Memphis Barge Emissions Project Final Report, Revision 0.0 (March 2010) is fatally flawed and will not provide information that could be incorporated into a State Implementation Plan or health risk assessment. The stated purpose of the study was “to study uncontrolled emissions of volatile organic compounds (VOC) and hazardous air pollutants (HAP) from tank barges and their impact on local community air quality.” As stated by Starcrest at the 2008 project coordination meeting with AWO in Memphis, and in subsequent comments submitted by AWO in February 2008, the use of OTM-10 method with a scanning OP-FITR and SUMMA canister samples to measure barge emissions did not indicate exactly which pollutants were coming from a barge-leak event and which pollutants were coming from the other sources in the area. This application of the OTM-10 method is definitely pushing the limits of the test method. The study proved inconclusive with respect to its purpose, and the comments made by AWO and Starcrest both at the Memphis meeting and in writing were validated.

Presented below are both general and specific comments on the draft Memphis Barge Emissions Project study approach as well as recommendation for a more accurate approach based on health risk assessment.

#### **PROBLEM STATEMENT**

The study’s stated: “The primary objective of this ‘community scale’ study was to determine the VOC and HAP emissions from tank barges carrying petrochemicals to assist in developing emission inventories for communities being exposed to emissions from tank barges. However, the data collected from the study can also be used to:

- ✓ characterize risk,
- ✓ support health effects assessments for urban populations near rivers with tank barge traffic,
- ✓ examine baseline concentrations for community exposure,
- ✓ improve air quality models from mobile source emissions, and
- ✓ delineate local scale HAP gradients.”

The study did not conclusively achieve any of its objectives due to critical design flaws in its approach, which we note above.

The approach of using a combination of FLIR infrared cameras, scanning OP-FITR, and SUMMA canisters “directly on the Mississippi River at the National Ornamental Metal Museum and at Tom Lee Park” (Executive Summary, pg. V) illustrates one of the study’s fatal flaws – overcoming the significant hurdle of determining background contributions to the SUMMA canister results. There is simply no way for the study as designed to successfully and conclusively separate barge emissions from background pollutants collected in the SUMMA canisters due to the uncontrolled conditions of the environment; the fact that the barges are moving; and, the distances between the SUMMA canister locations and the barges the study was trying to sample. These uncontrolled conditions cannot be conclusively isolated to determine what is actually coming out of the barge, which is the

stated purpose of the project. There are examples throughout the report that demonstrate the failure of overcoming this fatal flaw.

Another basic design flaw of the study was Memphis and Shelby County Health Department's decision to ignore the alternative of conducting mass balance analyses, a technique that works well for VOC liquids. This alternative method, which was suggested at the Memphis meeting, would have eliminated the study's uncontrolled conditions. Mass balance, which is obtained by subtracting the ending volume or weight of a tank barge's cargo from the beginning volume or weight, would have conclusively demonstrated how much cargo was lost during the tank barge's voyage. In addition, knowing the volume or weight lost during a transit can be easily converted into measurements of VOC and HAP fugitive emissions.

### **SPECIFIC COMMENTS**

#### ➤ **The SUMMA Canister Fatal Flaw**

From page 4, Section 3. Measurement Methods, quoting:

“During this study, three measurement methods were employed:

- an infrared camera was used to identify potential barge sources of emissions,
- emissions were characterized using open-path optical remote sensing techniques.
- canister samples were collected both in and out of the pollutant plume and in impacted communities in the vicinity of emission sources”

First, the infrared camera was not an actual emissions measuring method; it “was used to identify potential barge sources of emissions” and therefore should not be listed in this section. Leaving it in this section implies that it is a valid method for measuring plumes from tank barges, which is clearly not the case. Suggestion: change the section to Identification and Measurement Methods, and split out each piece of equipment used into the appropriate subsection.

The third bullet, “canister samples were collected both in and out of the pollutant plume,” is misleading because it overstates the level of accuracy of the SUMMA canisters and does not properly describe the actual conditions. The SUMMA canisters, as later described, were actually located a significant distance from the plumes, as opposed to being directly in the plume at or near the source of the emissions. The distances between the source and the sampling locations allowed for background pollutants from other sources to be combined with the “sampling plume.” Therefore, the sampling plume is not representative of the emissions plume from the barge. A good example of this is provided in Section 5.3, SUMMA Canister Results (pg. 40 & 41):

“Many of the SUMMA canister results were presented previously in Section 5.1.1, concurrent with the OTM-10 and FLIR Camera data from the same emission events. However, an additional event was detected from SUMMA canister samples collected at the National Ornamental Metal Museum on October 2 as several barges (8 fuel tankers, approximately 15 open coal and approximately 4 covered barges) traveled along the river upwind of the sample location. In fact, some of the highest VOC concentrations of the study were observed in these canister samples, including 160 ppbv tetrachloroethene. Unfortunately, FLIR camera video was not collected during this event, as the camera battery had just been changed, and there was insufficient time for the infrared camera to cool down to record video.”

The 160 ppb of tetrachloroethene, taken at the National Ornamental Metal Museum, is associated in the report with the “8 fuel tankers, approximately 15 open coal, and approximately 4 covered barges”; however, tetrachloroethene (also known as perchloroethylene or “perc”) is a colorless liquid widely used for the dry cleaning of fabrics, an excellent solvent for organic materials, nonflammable, and not found in significant concentrations in gasoline, kerosene, jet fuel or other refined fuel products.

Additionally, the report states “The first auxiliary site was at the National Ornamental Metal Museum, located at 374 Metal Museum Drive, Memphis, TN. The museum is located on a bluff overlooking the river with a good view of barge traffic up and down the river.” (pg. 17) The study attributes the SUMMA canister findings of 160 ppb of tetrachloroethene (which is a chemical not generally found in the cargoes the study is targeting) to the passing barges. However, a number of other factors are present that most likely interfered with the canister findings: the barges are located below the bluff on the river, the sampling location is adjacent to Interstate 55, which is elevated over the river, and there are residential/commercial/industrial facilities including liquid bulk barge loading facilities around the sampling location. Furthermore, the study does not mention wind measurements and direction for this sample nor use the FLIR camera to identify if a plume from the barges was present.

There is also no evidence in the report, for any of the events, that the canisters were actually sampling in a FLIR-identified barge plume, only that “Alion leased a FLIR GasFindIR infrared camera for this study to locate petrochemical (VOC) emissions on passing barges (such as the ones shown in Figure 3-1 and on the cover of this report) and to track the movement of the petroleum plumes onshore. This information was used to inform both the Open-Path Fourier Transform Infrared (OP-FTIR) operator and the canister collector of an incident to be monitored.” (pg. 4) Further, “a sampling event often involved a time-integrated sample incorporating the entire passing of the barge as well as one or more grab samples when it was believed that the densest part of the plume was present. The timing of this was estimated based on barge position, wind speed, wind direction, and the presence of odor from the tug exhaust.” (pg. 11) This approach to determining when a canister is in the densest part of the plume prompts several questions, including:

- ✓ What equipment was used to measure wind speed and direction and where were these measurements taken?
- ✓ How was density of the plume determined?
- ✓ Can the FLIR camera see a plume from a barge beyond the barge itself and as the plume crosses the river's shoreline?
- ✓ How does one calibrate and consistently time the opening of a SUMMA can to barge position (as it moves up or down the river), wind speed, wind direction and odor of tug exhaust?

It would seem to be highly challenging to logistically position SUMMA canisters along the river's edge, downwind and at the proper elevation, and to open the cans at the right time and for the appropriate duration as the plume passes from a moving barge. This would be even more difficult to do while simultaneously having another group positioned upwind in a column of air that is representative of the background conditions of the time of the downwind sampling location, based solely on FLIR camera observations and guidance of the camera's operator in real time. Was there only one team/group deploying canisters?

In summary, the fatal flaw with the SUMMA canister method deployed in the study is that pollutants captured in the cans cannot be conclusively attributed to specific sources. SUMMA canisters are not designed for source attribution evaluations; they are designed to capture whatever is near the valve when opened rather than collect a sample from a specific distant source.

➤ **Meteorological Data Gaps**

The report states, "Additionally, a reasonableness check was performed in the field on the measured wind direction data. While data collection was occurring, the field team leader compared the wind direction measured with the heads to the forecasted wind direction for that particular day." (pg. 43) Additional information is needed to better understand the relationship between the meteorological station sampling locations, the reasonableness check and the actual location of the barge traffic. For example:

- ✓ How far in advance were the forecasted wind directions checked prior to doing the reasonableness check?
- ✓ Were the forecasted winds for the day realized or did the wind shift at all during the day?
- ✓ Was an actual weather report for the day reviewed to compare the forecasted report to the conditions monitored at the site?
- ✓ What location was the weather forecasted for (airport, school, building, area, etc.), how far was that from the meteorological station, what is the difference in elevation and are there any geographical structures (bluff, dike, hill, etc.) located between the forecasted location, the sampling location and the station site?

- ✓ What was the source of the wind forecast?

Local geographical conditions and time of day could have contributed to wind conditions where the barges were transiting which were different from where the meteorological stations were located. Ideally, the meteorological station would be located adjacent to the source of the fugitive emission to determine the micro conditions around the plume's origin.

➤ **Emissions Factor Calculations**

Some of the OTM-10 measurements have been used to estimate emissions factors for alkane mixtures from passing tank barges (subsection 5.21.2, pg. 34). While the calculations appear valid, the extremely small sample size (two measurements) and the variability between the results obtained for the two calculations (0.111 and 6.73 kg alkane per kilometer traveled) points out the need for a considerably larger set of measurements to support any reasonable conclusions. The limited duration study described in the draft report does not provide an adequate number of measurements.