U.S. Environmental Protection Agency (USEPA) Environmental Response Team
Trace Atmosphere Gas Analyzer (TAGA)
Post-Harvey Monitoring
Houston, Corpus Christi, and Beaumont Areas, TX

October 9, 2017
Background

Hurricane Harvey hit the Texas Coast as a Category 4 Hurricane on August 25, 2017, and subsequent stalling of the system over south Texas, caused unprecedented flooding in the Houston Region. As a result, several industrial facilities were damaged. To help protect and minimize damage to valuable monitoring equipment, the U.S. Environmental Protection Agency (USEPA), the Texas Commission on Environmental Quality (TCEQ), and other monitoring entities temporarily shut down several air monitoring stations from the greater Houston, Corpus Christi, and Beaumont areas ahead of the storm, as one of many preparations. After the storm passed, and conditions were safe, state and local authorities began work to get the systems up and running again as soon as possible. By August 28, 2017, TCEQ began efforts to assess sites for damage and bring monitors back online. In the interim, the USEPA dispatched its Environmental Response Team to conduct mobile monitoring in the Houston areas most affected by Hurricane Harvey.

USEPA Trace Atmosphere Gas Analyzer (TAGA)

The Trace Atmospheric Gas Analyzer (TAGA) is a self-contained mobile laboratory capable of real-time sampling of outdoor air emissions while in motion. The instrumentation refers both to the analytical instrument and the mobile laboratory built around it. The instrumentation aboard a TAGA mobile air monitoring bus (TAGA bus) includes:

1. A TAGA mass spectrometer/mass spectrometer (MS/MS), which provides real-time monitoring for many organic and inorganic compounds at the part-per-billion by volume (ppbv) levels or lower
2. An Agilent gas chromatograph/mass spectrometer (GC/MS), which analyzes volatile organic compounds at the ppbv level or lower in air samples collected in Tedlar® bags using a loop injection system
3. An Agilent Micro GC, which assays permanent gases at part-per-million by volume (ppmv) levels
4. A global positioning system (GPS), which supplies accurate, real-time positional data during mobile monitoring or stationary events
5. A GIS system, which maps and presents the TAGA’s position in real time.

This versatile mobile monitoring system offers a wide variety of services to assist groups within USEPA with cost-effectively conducting investigatory and enforcement activities. This mobile monitoring system collects instantaneous/grab samples which are not directly comparable to the TCEQ’s 1-hour, short-term ambient air monitoring comparison values (AMCVs), although the USEPA concluded that no levels of targeted air toxics were above the TCEQ’s AMCVs.
USEPA Mobile Monitoring in Houston and Southeast Texas

The USEPA conducted post-Hurricane Harvey air monitoring by deploying up to two TAGA buses throughout Houston and southeast Texas (see Table 1). Specifically, an area in the Manchester community near the Valero Houston Refinery, which had suffered significant damage from Hurricane Harvey, was a particular focus of sampling efforts.

Table 1. Areas and Dates of Post-Harvey TAGA Monitoring

<table>
<thead>
<tr>
<th>Area(s) Monitored</th>
<th>Date(s) of Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchester</td>
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</tr>
<tr>
<td>Deer Park</td>
<td>9/14/2017</td>
</tr>
<tr>
<td>Baytown</td>
<td>9/15/2017</td>
</tr>
<tr>
<td>Sweeny</td>
<td>9/17/2017</td>
</tr>
<tr>
<td>Texas City</td>
<td>9/17/2017</td>
</tr>
<tr>
<td>Beaumont/Port Arthur</td>
<td>9/18/2017</td>
</tr>
<tr>
<td>Victoria</td>
<td>9/18/2017</td>
</tr>
<tr>
<td>Point Comfort</td>
<td>9/18/2017</td>
</tr>
<tr>
<td>Corpus Christi</td>
<td>9/19/2017</td>
</tr>
</tbody>
</table>

The TAGA buses measured ambient, instantaneous concentrations (durations ranging from 1 to 2 minutes) of six air toxics (benzene; 1,1-dichloroethene; tetrachloroethene; toluene; trichloroethene; xylene) throughout Houston and southeast Texas (see Table 1). This duration of data are classified as grab samples. Grab samples (instantaneous samples) provide data that are used for source identification. The short nature of the sample, in conjunction with meteorological data, aids in the identification of potential sources of a contaminant plume. Grab samples are not sufficiently similar to the durations used to derive safe levels, such as AMCVs, for comparison.

For six days the TAGA mobile air monitoring bus collected thousands of ambient air samples in and around the Manchester community area. Following analysis of these samples, the USEPA concluded “no levels of targeted toxic chemicals were detected above the Texas TCEQ AMCV short-term screening levels” and “that the probable source of benzene and volatile organic compound readings in the Manchester community in Houston was the roof failure and spill from a light crude storage tank at the Valero Houston Refinery during Hurricane Harvey.” The TCEQ reviewed the TAGA data provided by the USEPA for any levels of potential concern. Maximum concentrations (Table 2) and associated mapped locations can be found in the Attachments. The TCEQ’s short-term AMCV’s are provided for information purposes only in order to provide some context to the monitored levels. All of the TAGA measured
concentrations were below levels of concern and would not be expected to cause health, odor, or welfare effects. The USEPA and TCEQ will continue their investigations into the incident at the Valero Houston Refinery.

Additional sampling was conducted in other Houston communities and areas along southeast Texas (see Table 1). Maximum concentrations (Table 3) and associated mapped locations can be found in the Attachments. The TCEQ’s short-term AMCV’s are provided for information purposes only in order to provide some context to the monitored levels. All of the TAGA measured concentrations were below levels of concern and would not be expected to cause health, odor, or welfare effects.
# Attachments

Table 2. Maximum concentrations measured in the Manchester area TAGA study

<table>
<thead>
<tr>
<th>Date</th>
<th>Substance</th>
<th>Maximum Instantaneous Concentration (ppbv)</th>
<th>TCEQ 1-Hour Short-Term AMCV (ppbv)*</th>
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</thead>
<tbody>
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<td>1,1-Dichloroethene</td>
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<td>Tetrachloroethene</td>
<td>6.66</td>
<td>1,000</td>
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<td>Toluene</td>
<td>27.40</td>
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<td>Trichloroethene</td>
<td>5.60</td>
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<td></td>
<td>Xylene</td>
<td>30.40</td>
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<td>15.98</td>
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<td>1,1-Dichloroethene</td>
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<td></td>
<td>Xylene</td>
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*Short-term, 1-hour AMCVs are provided for informational purposes in order to provide some context to the monitored levels. Instantaneous samples should not be directly compared to 1-hour AMCVs.
Table 3. Maximum concentrations measured in the Houston and southeast Texas TAGA study

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Substance</th>
<th>Maximum Instantaneous Concentration (ppbv)</th>
<th>TCEQ 1-Hour Short-Term AMCV (ppbv)*</th>
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<td>Benzene</td>
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**Page 7**

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Substance</th>
<th>Maximum Instantaneous Concentration (ppbv)</th>
<th>TCEQ 1-Hour Short-Term AMCV (ppbv)*</th>
</tr>
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*Short-term, 1-hour AMCVs are provided for informational purposes in order to provide some context to the monitored levels. Instantaneous samples should not be directly compared to 1-hour AMCVs.
Manchester Monitoring Study – Sept. 5-7;9-12, 2017
EPA TAGA Data for Houston & Valero
TOLUENE Max 20170905

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For more information concerning this map, contact the Information Resource Division at (512) 239-4803.
EPA TAGA Data for Houston & Valero
TRICHLOROETHENE Max 20170906

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EPA TAGA Data for Houston & Valero
TETRACHLOROETHENE Max 20170907

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The map is not to scale.
EPA TAGA Data for Houston & Valero
XYLENE Max 20170910
EPA TAGA Data for Houston & Valero
BENZENE Max 20170912

This map was generated by the Information Resources Division of the Texas Commission on Environmental Quality. This product is for informational purposes only and has been prepared for or to be used for legal, engineering, surveying purposes. It does not represent or guarantee the accuracy or completeness of the information shown. For more information, contact the Information Resources Division at (512) 239-4600.
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EPA TAGA Data for Houston & Valero
DICHLOROETHENE Max 20170912

The event is located in Harris County. The circle (green) in the left inset map represents the approximate location of the event. The inset map on the right represents the location of Harris County for the study set in Texas.
Port Arthur Monitoring Study 1 – Sept. 18, 2017
Point Comfort Monitoring Study – Sept. 18, 2017
EPA DATA for Corpus Christi, Texas
TETRACHLOROETHENE 20170919

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