



Arkema Facility Post-Harvey Sampling Crosby, TX

October 9, 2017

Background

Landfall of Hurricane Harvey on August 25, 2017, and subsequent stalling of the system over south Texas, caused unprecedented flooding in the Houston Region, including a small town located northeast of the Greater Houston area, Crosby, TX. The Arkema Inc. organic peroxide facility is located in Crosby, TX. Flooding at the Arkema facility caused loss of power and ultimate failure of refrigeration needed for organic peroxide stabilization. Without refrigeration, organic peroxides degrade and spontaneously combust, creating a fire hazard. While the facility operators maintained monitoring of the internal temperature of some of the nine organic peroxide containers, due to the conditions at the site, it was not possible to prevent the critical temperature from being reached. In a coordinated effort between State, Federal, and local agencies, the Interagency Modeling and Atmospheric Assessment Center (IMAAC) modeled potential release scenarios at the facility, based on the possible rupture of the sulfur dioxide (SO₂) tank and the possible effects of an organic peroxide fire. Based on that assessment, a 1.5 mile evacuation zone radius was established, which also included potential hazards from release of other substances on-site. Throughout the incident, contractors hired by Arkema and the United States Environmental Protection Agency (USEPA) conducted emergency response air monitoring for Lower Explosive Limit, oxygen, SO₂, hydrogen sulfide, carbon monoxide, and total volatile organic compounds (VOCs) at strategic locations around the 1.5 mile perimeter. No concerning levels were detected. On August 31, 2017, the organic peroxide storage containers began catching fire, and by September 3, 2017, in an effort to destroy the material, the emergency responders initiated a controlled burn of the remaining containers. Once the fire had burned out completely, there was a lack of odors, and no chemicals of concern (COCs) were detected using hand-held monitoring equipment, the all-clear was agreed upon by all agencies and emergency responders (State, Federal, and local).

A joint investigation into the incident and Arkema's response was conducted by the Texas Commission on Environmental Quality (TCEQ), the USEPA and the Harris County Pollution Control Services Department. Over several weeks, Arkema provided information about the facility, the impacts from the hurricane and trailer fires, and monitoring conducted in the area during and after the incident. The TCEQ received copies of the information provided by Arkema to the USEPA and the Harris County Pollution Control Services Department and reviewed the available sampling data below.

Arkema's Incident Response and Sampling

Arkema conducted a series of on- and off-site investigations to assess the total impacts from Hurricane Harvey on the Arkema facility. Supplemented by data collected from the USEPA, Arkema collected samples from various media (i.e. air, solid ash, storm water) in and around the facility. Arkema hired Environmental Resources Management (ERM) to prepare a Sampling and Analysis Plan (Attachment 1) in order to assess the impacts from the hurricane and the trailer fires that occurred at the property. According to ERM's Sampling and Analysis Plan,

following an investigation by Arkema, if representative COCs of concern are found above the applicable Texas Risk Reduction Program (TRRP) Protective Concentration Levels (PCLs), Arkema will develop a site clean-up plan.

Arkema conducted daily community air monitoring during and after the fire events from September 1, 2017, through September 8, 2017. Initial air sampling was conducted by Bureau Veritas North America, Inc. (BVNA) on September 1, 2017. BVNA placed 1-liter evacuated canister (Minican™) samplers around the 1.5 mile evacuation zone perimeter in order to collect air over a 4-hour period. Ambient air samples collected during and immediately following the event were submitted to AB Labs, an AIHA-accredited laboratory for analysis using EPA Method TO-15 (Attachment 2). Nearly all of the COCs were not detected, and the few that were detected were well below the TCEQ's short-term air monitoring comparison values (AMCVs).

The Center for Toxicology and Environmental Health, LLC (CTEH) conducted air monitoring during the event prepared daily summary reports evaluating the real-time air monitoring that was conducted (Attachment 3). Real-time air monitoring was conducted for benzene, cumene, and total VOCs using handheld RAE Systems and Gastec instruments. Combustion byproducts potentially associated with fire smoke, such as particulate matter with diameter of 2.5 micrometers or less in size (PM_{2.5}), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂) were also assessed. Monitoring data from the surrounding community indicated that nearly all of the COCs were not detected with the exception of PM_{2.5}. Arkema asserts that PM_{2.5} is a component typically found in the Houston air and would be expected to increase following a fire.

CTEH collected ash samples from within and around the designated 1.5 mile evacuation zone radius (Attachment 4). The sampling map provided by CTEH shows twelve sampling locations, while the laboratory report available at this time shows the analytical sampling results for only seven of those locations. Most of the tested constituents were not detected, while those that were detected in ash were well below their respective TRRP PCLs for residential surface soil (i.e., residential ^{Tot}Soil_{Comb} PCLs). These residential surface soil PCLs are designed to be protective of daily, long-term simultaneous exposure of adults and children considering multiple routes (e.g., incidental ingestion of soil, dermal exposure, inhalation of vapor/particulate emanating from soil, ingestion of homegrown produce) and are very conservative comparison values for ash samples.

There is no surface water body in the area, however CTEH collected storm water runoff from drainage and containment trenches in and around the Arkema facility (Attachment 5). The sampling map provided by CTEH shows 41 sampling locations, while the laboratory report available at this time shows the analytical sampling results for only 13 of those locations. Most of the tested COCs were not detected, and with the exception of one sample described below, the rest were detected well below their respective TRRP PCLs for residential groundwater (i.e., residential ^{GW}GW_{Ing} PCLs). These residential groundwater PCLs are calculated to be health-protective for the long-term ingestion of groundwater by residents (adults and children) as

drinking water and thus are very conservative comparison values for onsite storm water samples. The one sample that did exceed the residential groundwater PCL for vinyl chloride was sample CTRX0906W015 from a drainage ditch north of Tower Road and Production Point. This sampling point is located in the center of the Arkema facility, and the storm water sample result was 3 ug/L, while the residential ^{GW}GW_{ing} PCL for vinyl chloride in drinking water is 2 ug/L. However, all vinyl chloride storm water results were well below the human health contact recreation PCL (11.3 ug/L), which considers long-term exposure and is also a very conservative comparison value given the results being evaluated.

Arkema also contracted CTEH to sample private drinking water wells at the request of local residents. CTEH collected drinking water samples from within and around the designated 1.5 mile evacuation zone radius (Attachment 6). The sampling map provided by CTEH shows 22 sampling locations, while the laboratory report available at this time shows the full analytical sampling results for only 21 of those locations. Most of the tested COCs in these samples were not detected, with the exception of total coliform and lead. Eleven samples contained detectable levels of total coliform, which are bacteria present in the environment as well as in fecal matter and are very common after flooding events. Three of the samples had lead levels above the residential ^{GW}GW_{ing} PCL (15 ug/L). However lead is ubiquitous in the environment, may arise from plumbing fixtures, and would not be a COC that would be expected to originate from the Arkema facility. Arkema stated that the analytical results were provided to the residents who requested the sampling.

Attachment 1

Sampling and Analysis Plan

Attachment 2

AB Labs Analytical Sampling Reports

Attachment 3

CTEH Community Air Monitoring Reports

Attachment 4

CTEH Solid Bulk/Ash Sampling Locations and Results

Attachment 5

CTEH Storm Water Drainage/Trench Sampling Locations and Results

Attachment 6

CTEH Drinking Water Sampling Locations and Results