

ACROLEIN (C₃H₄O)

Chemical Abstracts Service (CAS) Number: 107-02-8

General Information

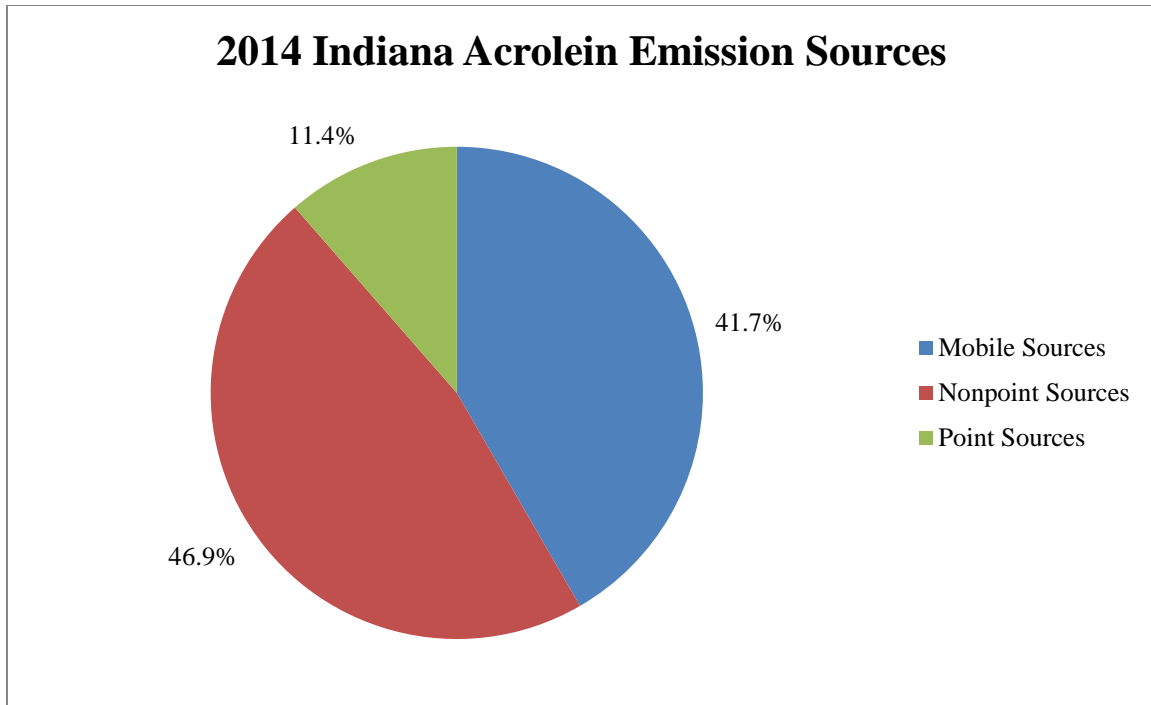
Acrolein is a clear or yellow liquid with a burned, sweet, pungent odor that most people may begin to smell at air concentrations around 600 ug/m³. Acrolein is primarily used as an intermediate in the synthesis of acrylic acid and as a biocide. It may be formed from the breakdown of certain pollutants in outdoor air or from the burning of organic matter including tobacco, or fuels such as gasoline or oil. Acute (short-term) inhalation exposure may result in upper respiratory tract irritation and congestion. No information is available on its reproductive, developmental, or carcinogenic effects in humans, and the existing animal cancer data are considered inadequate to make a determination that acrolein is carcinogenic to humans.

Sources

- Acrolein may be formed from the breakdown of certain pollutants found in outdoor air. Acrolein emissions occur from the burning of organic matter including tobacco, trees and shrubs, grasses, crops and trash, and from the burning of fuels such as wood, natural gas, gasoline, diesel and oil.
- Occupational exposure to acrolein could occur in industries that use acrolein to make other chemicals.
- Small amounts of acrolein may be found in some foods, such as fried foods, cooking oils, and roasted coffee.

Indiana Emissions

IDEM collects HAP emissions information for the categories of point sources (large stationary sources like power plants and factories), nonpoint sources (aka area sources - smaller stationary sources like gas stations and dry cleaners), and mobile sources (vehicles, airplanes, marine vessels, etc.).* Estimated statewide emissions of acrolein totaled 359.19 tons in the 2014 calendar year. Of this total, 46.9% was attributed to nonpoint sources, 41.7% to mobile sources, and the remaining 11.4% to point sources.



* For additional examples of types of emission sources, please visit IDEM’s Hazardous Air Pollutants page at: <http://www.in.gov/idem/toxic/pages/hap/index.html>. For specific details on industrial sources of air toxics, please visit U.S. EPA’s Toxics Release Inventory (TRI) page at: <https://www.epa.gov/toxics-release-inventory-tri-program>.

Measured Concentration Trends

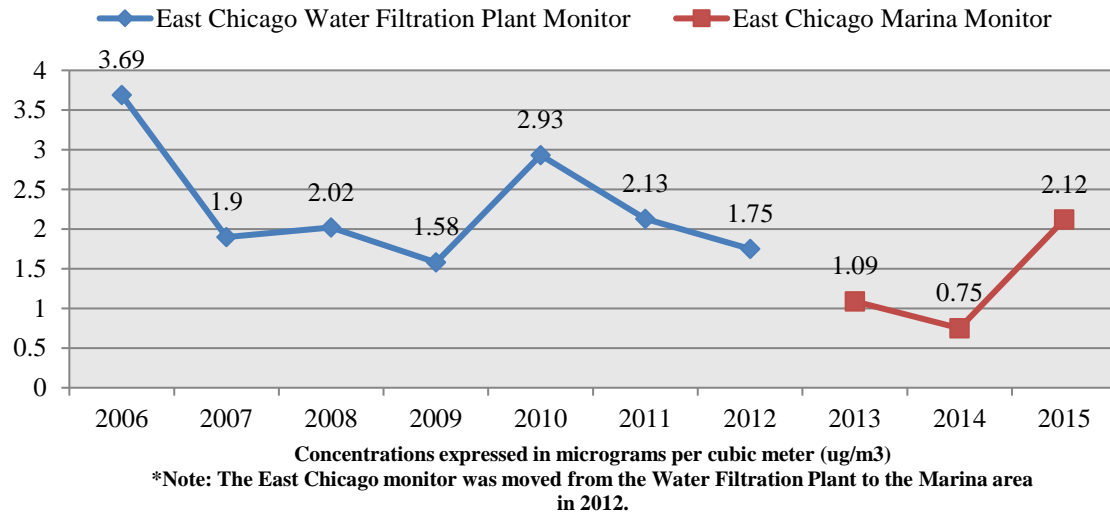
Ambient air monitoring data most accurately represents a limited area near the monitor location. All monitors for air toxics sample every sixth day. The monitoring locations by themselves are not sufficient to accurately characterize air toxic concentrations throughout the entire state, however, results from the monitors will provide exposure concentrations with a great deal of confidence at the monitoring locations.

The ambient air monitoring results were analyzed using U.S. EPA recommended statistical methods. IDEM evaluated the data so that a 95% upper confidence limit of the mean (UCL) could be determined. A 95% UCL represents a value which one can be 95% confident that the true mean of the population is below that value.

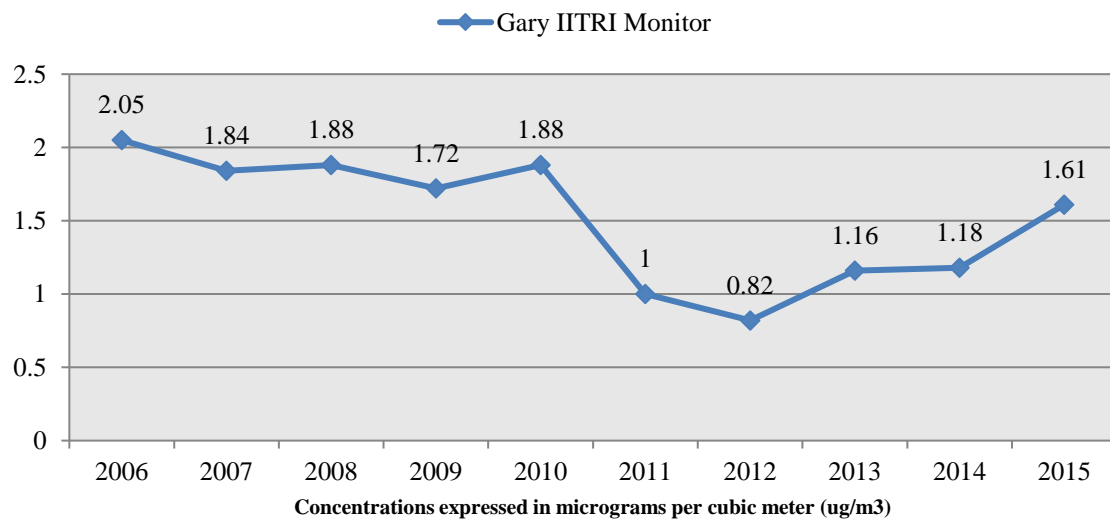
To learn more about the current monitoring locations, please visit IDEM’s Air Toxics Monitor Siting webpage at: <http://www.in.gov/idem/toxic/2337.htm>

Data analysis was performed for each monitor that operated for a significant portion of the analysis period. This analysis determined the detection rate, which is defined as the percentage of valid samples taken statewide that had a quantifiable concentration of the pollutant. The statewide detection rate of acrolein for the monitors analyzed from 2006-2015 was 93.1%. Trend graphs for each of these monitors are provided below.

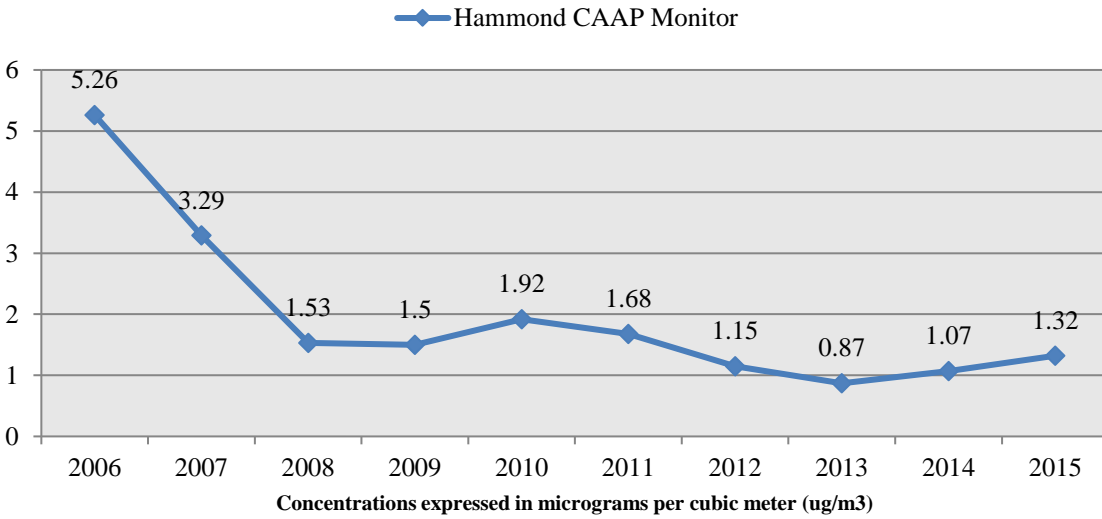
95% UCL Acrolein Concentrations at East Chicago (2006-2015)



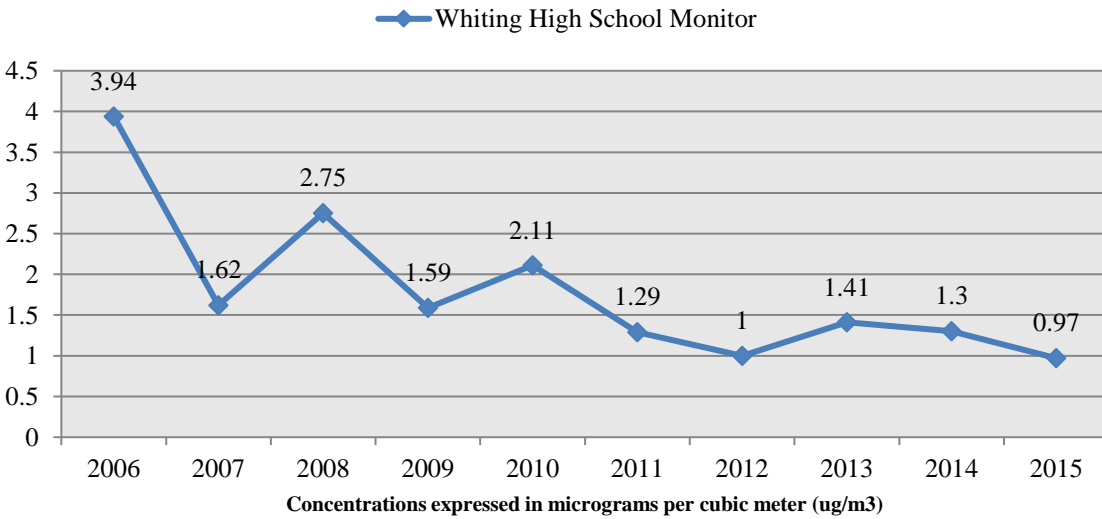
95% UCL Acrolein Concentrations at Gary (2006-2015)



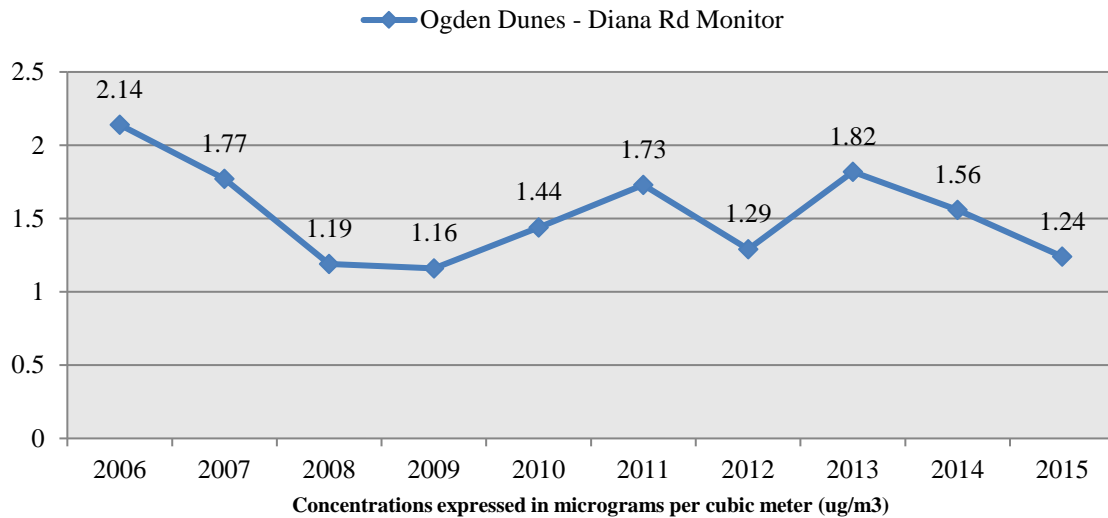
95% UCL Acrolein Concentrations at Hammond (2006-2015)



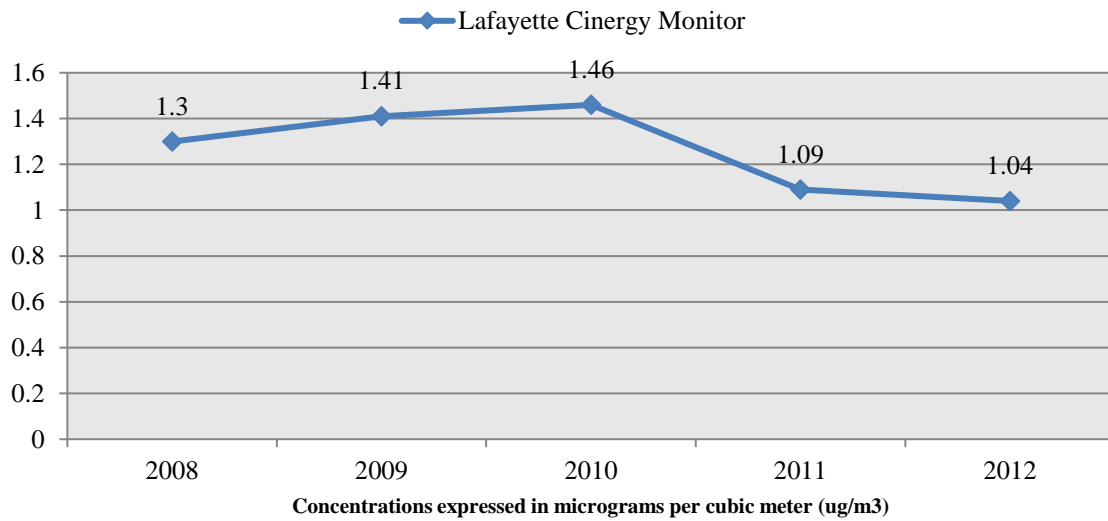
95% UCL Acrolein Concentrations at Whiting (2006-2015)



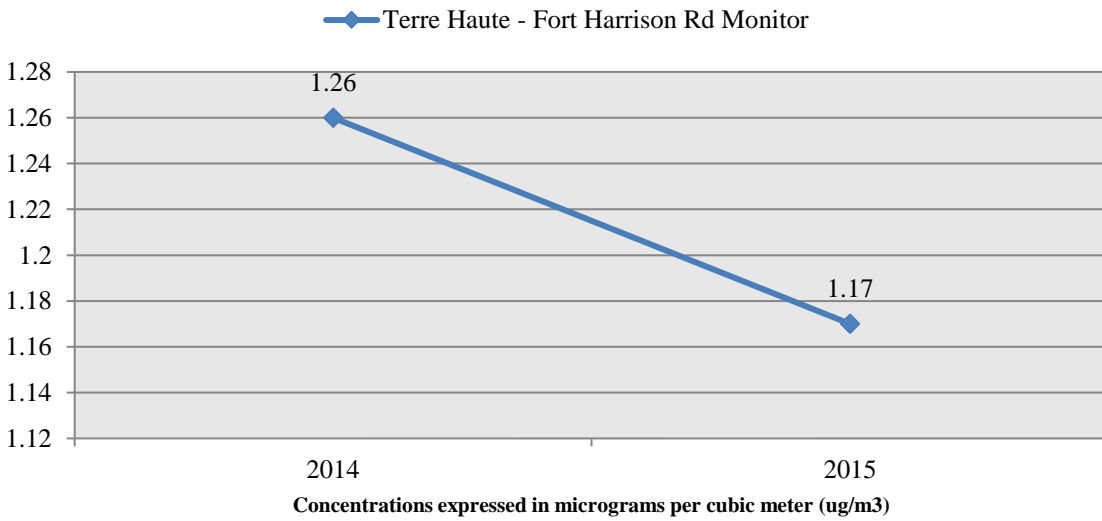
95% UCL Acrolein Concentrations at Ogden Dunes (2006-2015)



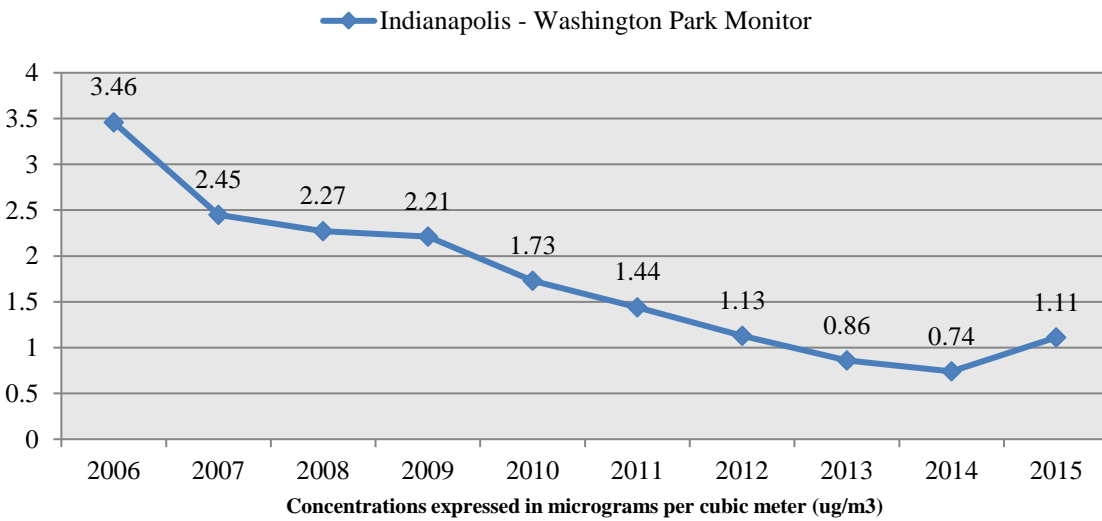
95% UCL Acrolein Concentrations at Lafayette (2008-2012)



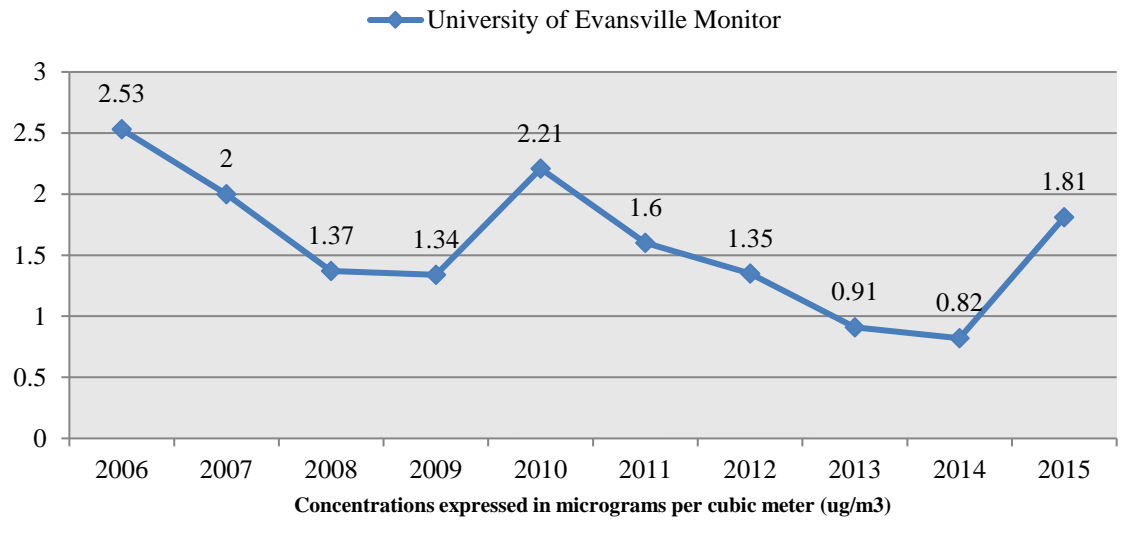
95% UCL Acrolein Concentrations at Terre Haute (2014-2015)



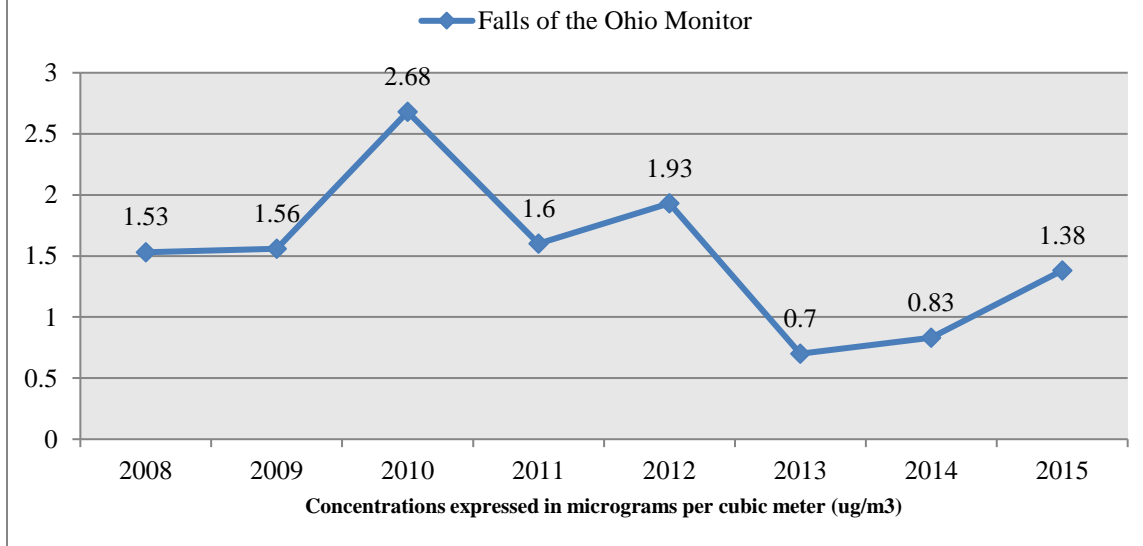
95% UCL Acrolein Concentrations at Indianapolis (2006-2015)



95% UCL Acrolein Concentrations at Evansville (2006-2015)



95% UCL Acrolein Concentrations at Clarksville (2008-2015)



Acrolein was added to the ToxWatch program in July 2006. The analysis of monitoring data from 2006 to 2015 indicates that concentrations of acrolein have generally declined since the initial readings in 2006. Concentrations initially appeared to be increasing in 2007, but an investigation by IDEM's laboratory found calibration errors that caused concentrations to be reported higher than the true concentration during the period of March-April. As a result of this investigation, acrolein data for all monitoring locations in March and April 2007 have been

invalidated and removed from the ToxWatch analysis. A spike in acrolein concentrations can be noted in 2010 for Northwest and Southern Indiana monitors before measured concentrations started to decline again.

Hazard Quotient

IDEM evaluates chronic (lifetime) non-cancer hazard assuming a threshold for each pollutant at which a health effect can be observed. That is, it assumes safe exposure to the pollutant up to a certain level before it is possible to experience a health effect from breathing the pollutant. IDEM uses health protective assumptions by taking into account people who might be more sensitive to the pollutants. The hazard quotient is a ratio that divides the measured concentration of a pollutant by the reference concentration (RfC). A hazard quotient under 1.0 is commonly recognized to be below the health-protective level. Hazard quotients over 1.0 indicate that further investigation may be necessary and does not necessarily mean that health effects are expected. Given the many health-protective assumptions used in the evaluation, most non-cancer hazards over 1.0 are still unlikely to be associated with observable adverse health effects.

The average concentration of acrolein was evaluated for each air pollutant monitor over the span of this study. The results for each monitor are displayed in the table below.

Table 1. Acrolein Hazard Quotients (concentrations expressed in micrograms per cubic meter)

Monitor	Years	Average Concentration	Reference Concentration (RfC)*	Hazard Quotient
East Chicago Water Filtration Plant	2006-2012	2.03	0.02	101.5
East Chicago Marina	2013-2015	1.17	0.02	58.5
Gary IITRI	2006-2015	1.35	0.02	67.5
Hammond CAAP	2006-2015	1.58	0.02	79.0
Whiting High School	2006-2015	1.55	0.02	77.5
Ogden Dunes – Diana Rd	2006-2015	1.37	0.02	68.5
Lafayette Cinergy	2008-2012	1.16	0.02	58.0
Terre Haute – Fort Harrison Rd	2014-2015	1.18	0.02	59.0
Indianapolis – Washington Park	2006-2015	1.45	0.02	72.5
University of Evansville	2006-2015	1.36	0.02	68.0
Clarksville – Falls of the Ohio	2008-2015	1.46	0.02	73.0

* Reference Concentration Source: Integrated Risk Information Service (IRIS)

Cancer Risk

The potential carcinogenicity of acrolein cannot be determined because existing data are inadequate for an assessment of human carcinogenic potential for the inhalation route of exposure.