TRICHLOROFLUOROMETHANE (CCl_3F)

also known as Freon 11
Chemical Abstracts Service (CAS) Number: 75-69-4

General Information

Trichlorofluoromethane is a colorless, nearly odorless, volatile liquid or a gas above 75 degrees Fahrenheit. It can affect you when inhaled and may be absorbed through the skin. Acute (short-term) exposure to trichlorofluoromethane can irritate the skin and eyes and make you feel lightheaded and dizzy. Exposure to high levels can cause irregular heartbeat, which can be fatal. Chronic (long-term) exposure to trichlorofluoromethane can irritate the lungs causing coughing and/or shortness of breath. No information is available on the cancer risk of exposure to trichlorofluoromethane.

Sources

- Trichlorofluoromethane is no longer manufactured in the United States due to its ozone depleting characteristics.
- Trichlorofluoromethane was used as a refrigerant, solvent, chemical intermediate, and in making fire extinguishers.

Indiana Emissions

Trichlorofluoromethane emissions totals are not available from the National Emission Inventory (NEI) for the 2014 calendar year.

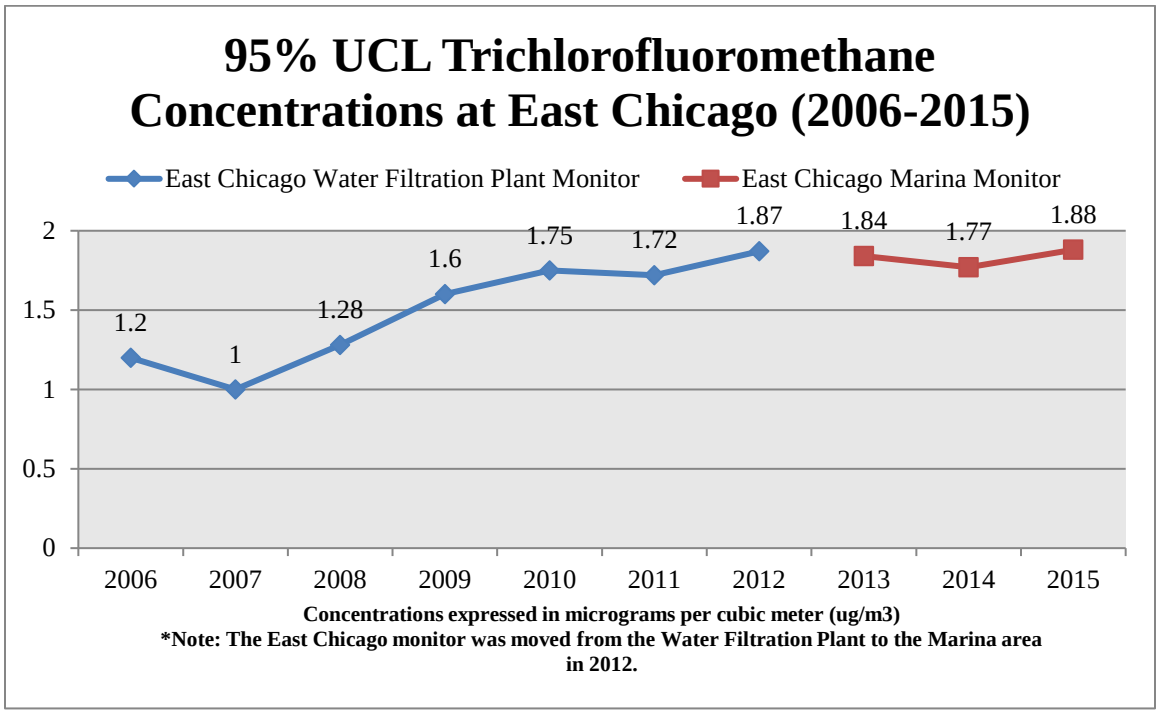
Measured Concentration Trends

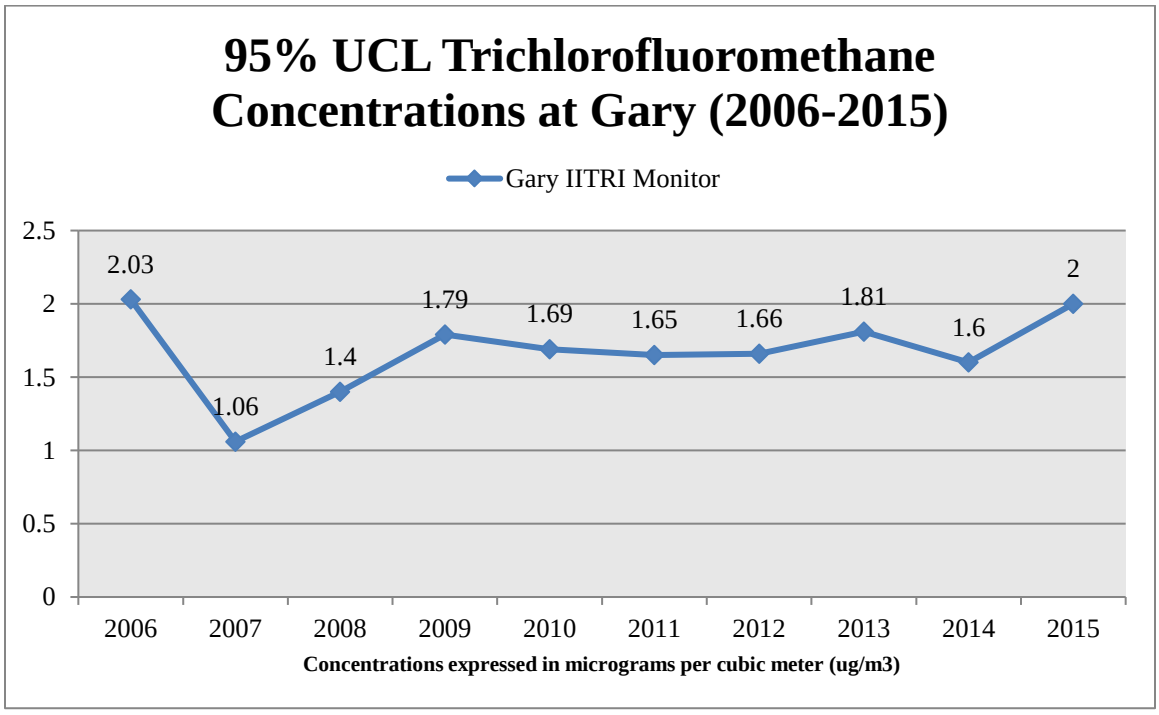
Ambient air monitoring data most accurately represents a limited area near the monitor location. All monitors for air toxics sample every sixth day. The monitoring locations by themselves are not sufficient to accurately characterize air toxic concentrations throughout the entire state, however, results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

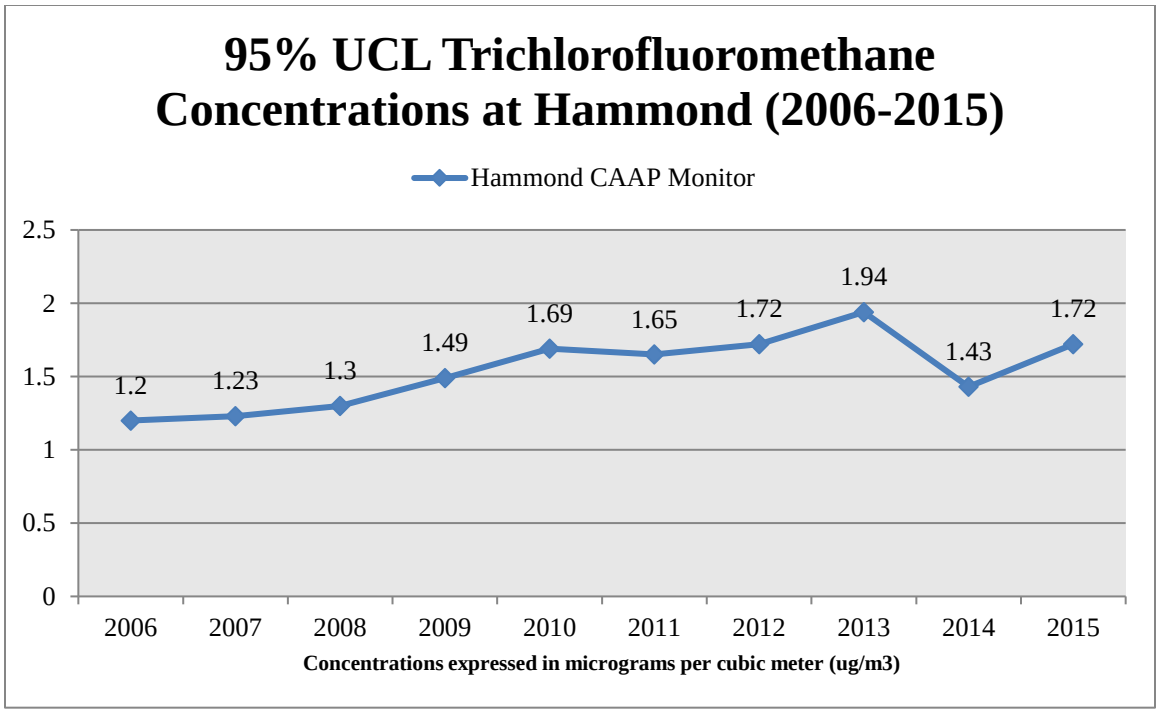
The ambient air monitoring results were analyzed using U.S. EPA recommended statistical methods. IDEM evaluated the data so that a 95% upper confidence limit of the mean (UCL) could be determined. A 95% UCL represents a value which one can be 95% confident that the true mean of the population is below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

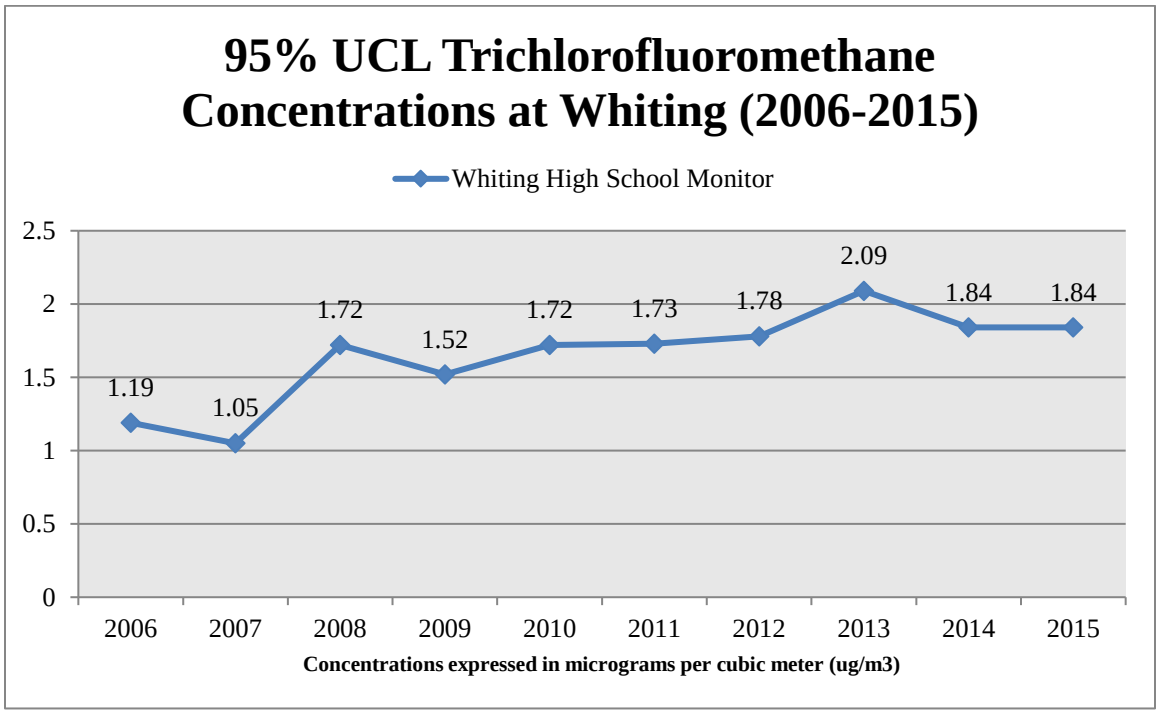
To learn more about the current monitoring locations, please visit IDEM's Air Toxics Monitor Siting webpage at: http://www.in.gov/idem/toxic/2337.htm

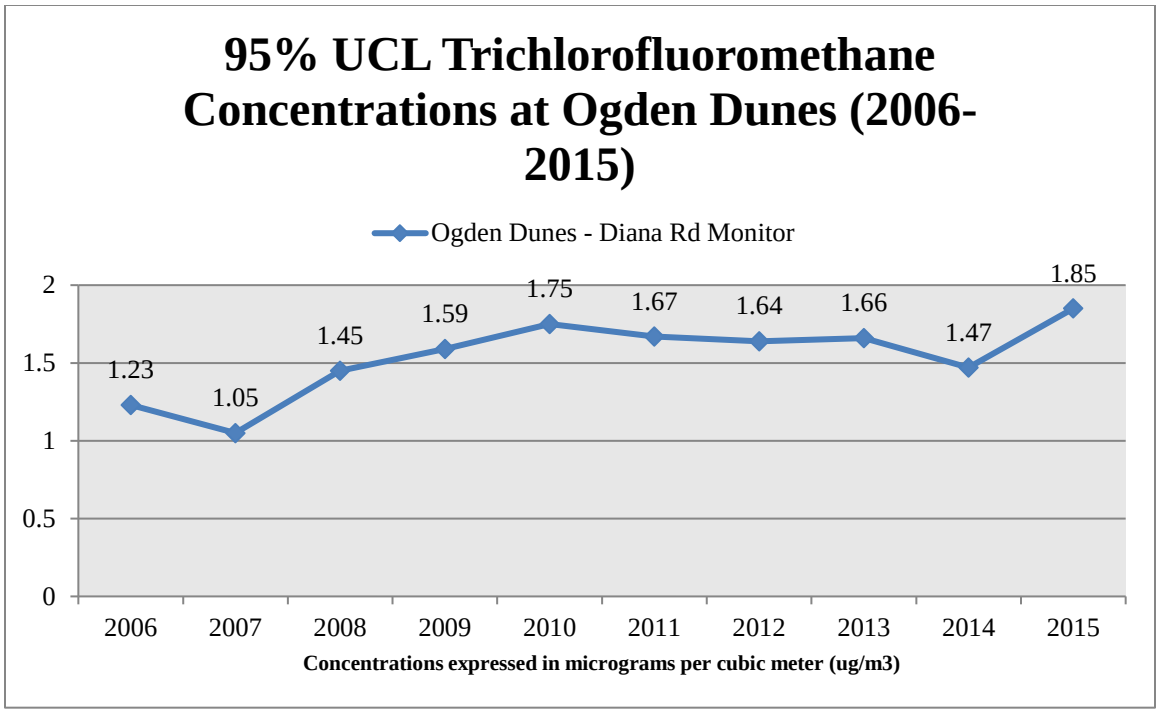
Data analysis was performed for each monitor that operated for a significant portion of the analysis period. This analysis determined the detection rate, which is defined as the percentage of valid samples taken statewide that had a quantifiable concentration of the pollutant. The statewide detection rate of trichlorofluoromethane for the monitors analyzed from 2006-2015 was 99.8%. Trend graphs for each of these monitors are provided below.

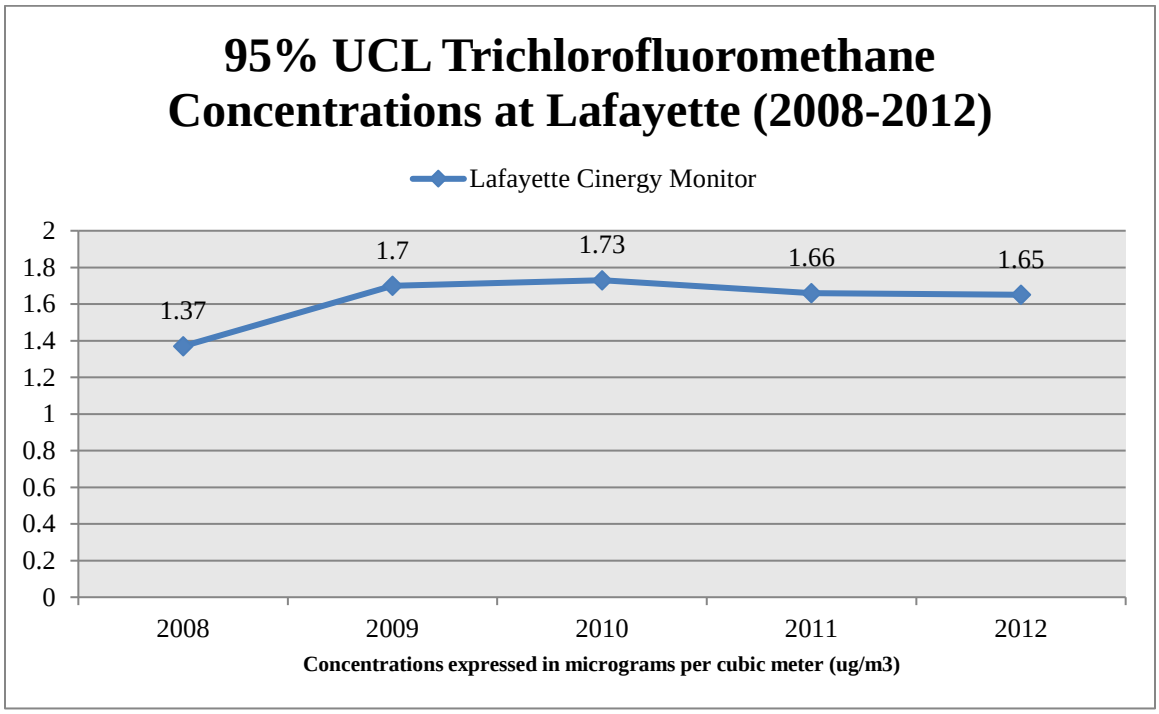


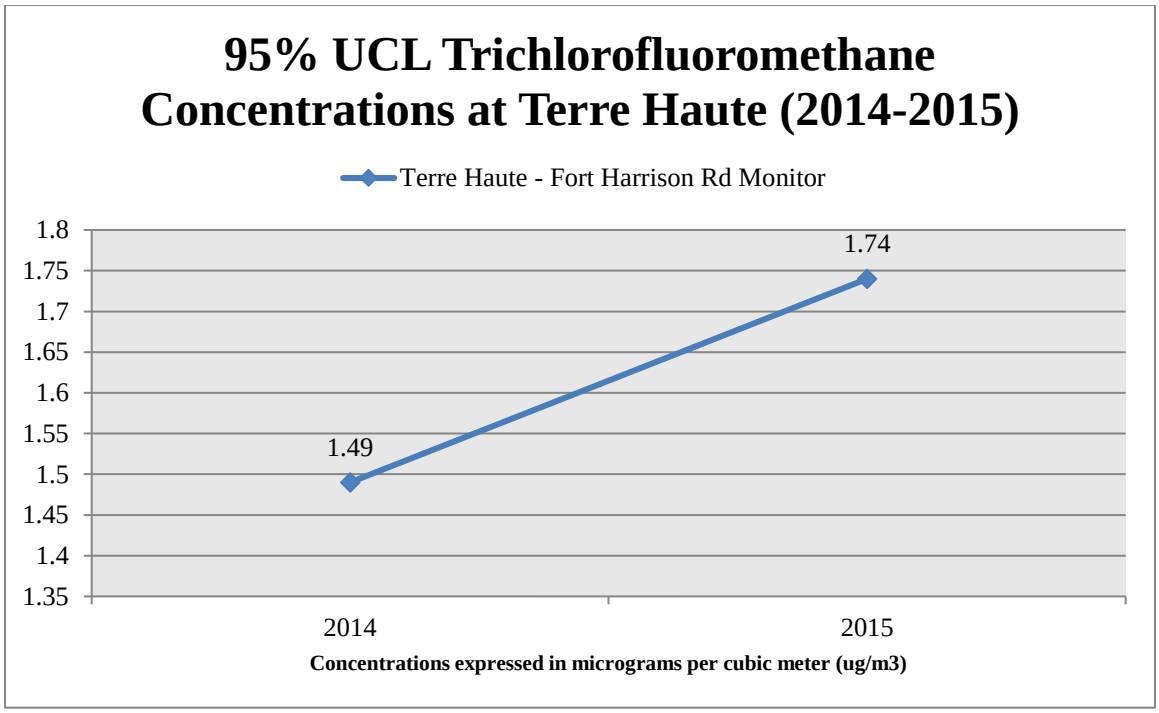


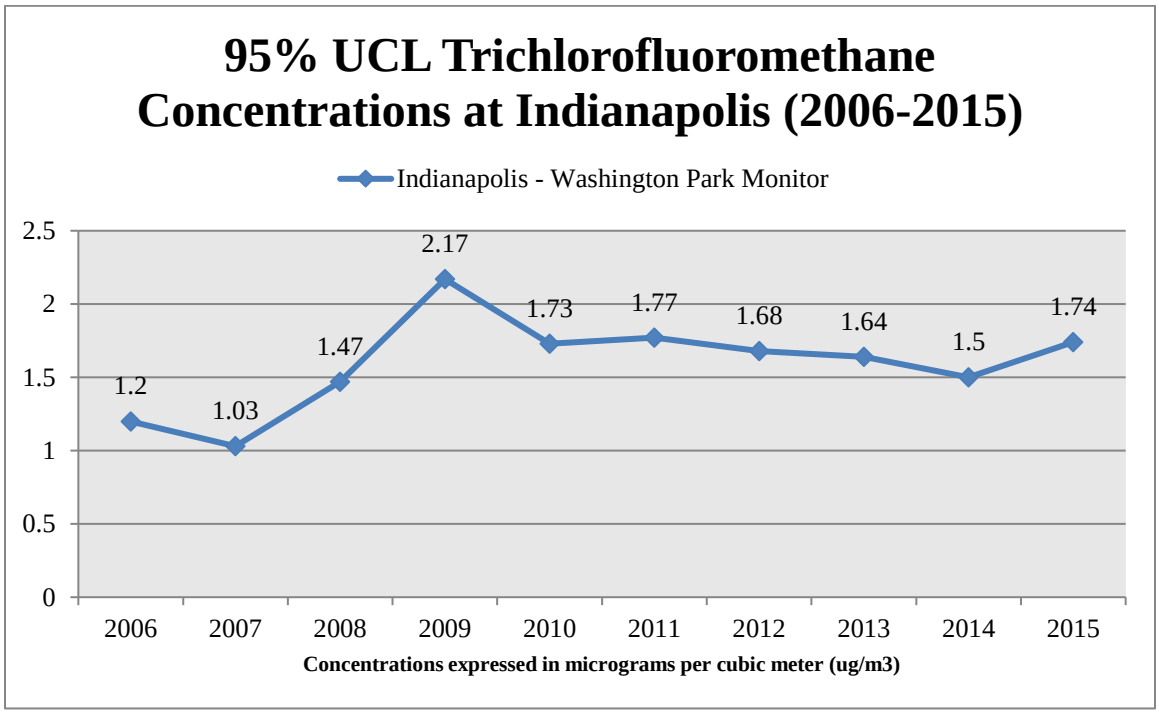

95% UCL Trichlorofluoromethane Concentrations at Hammond (2006-2015)
Hammond CAAP Monitor
2.5
2
1.5
1
0.5
0
1.2
1.23
1.3
1.49
1.69
1.65
1.72
1.94
1.43
1.72
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Concentrations expressed in micrograms per cubic meter (ug/m3)

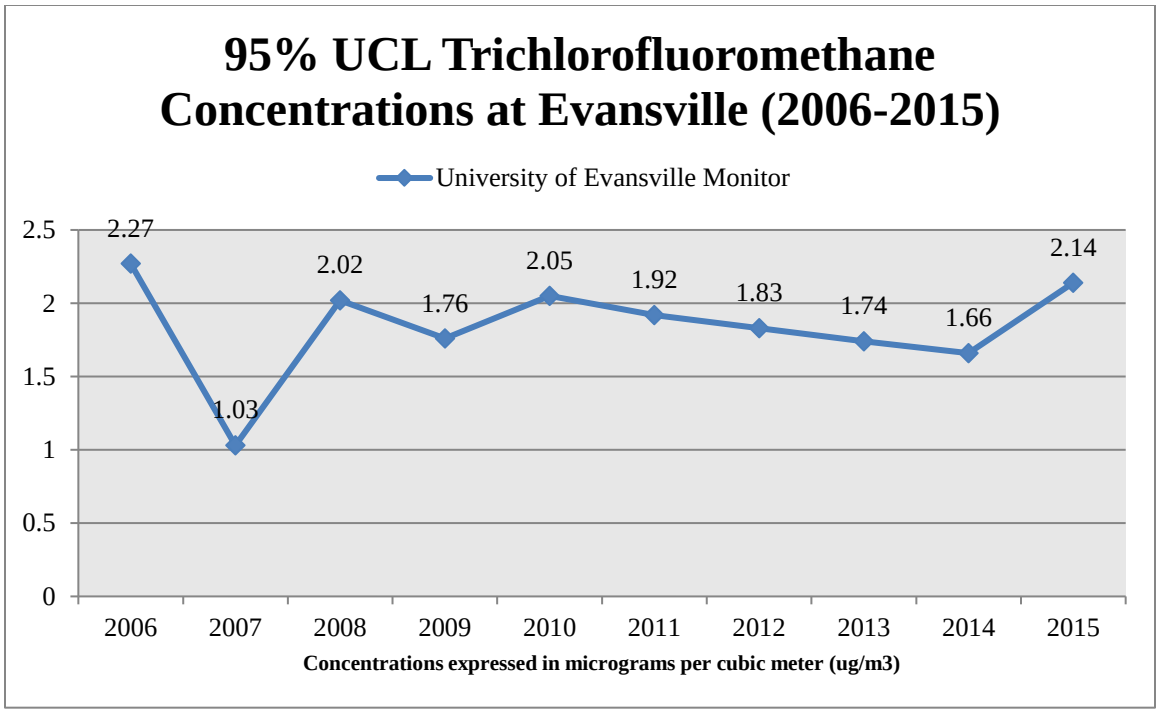

95% UCL Trichlorofluoromethane Concentrations at Whiting (2006-2015)
Whiting High School Monitor
2.5
2
1.5
1
0.5
0
1.19
1.05
1.72
1.52
1.72
1.73
1.78
2.09
1.84
1.84
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Concentrations expressed in micrograms per cubic meter (ug/m3)

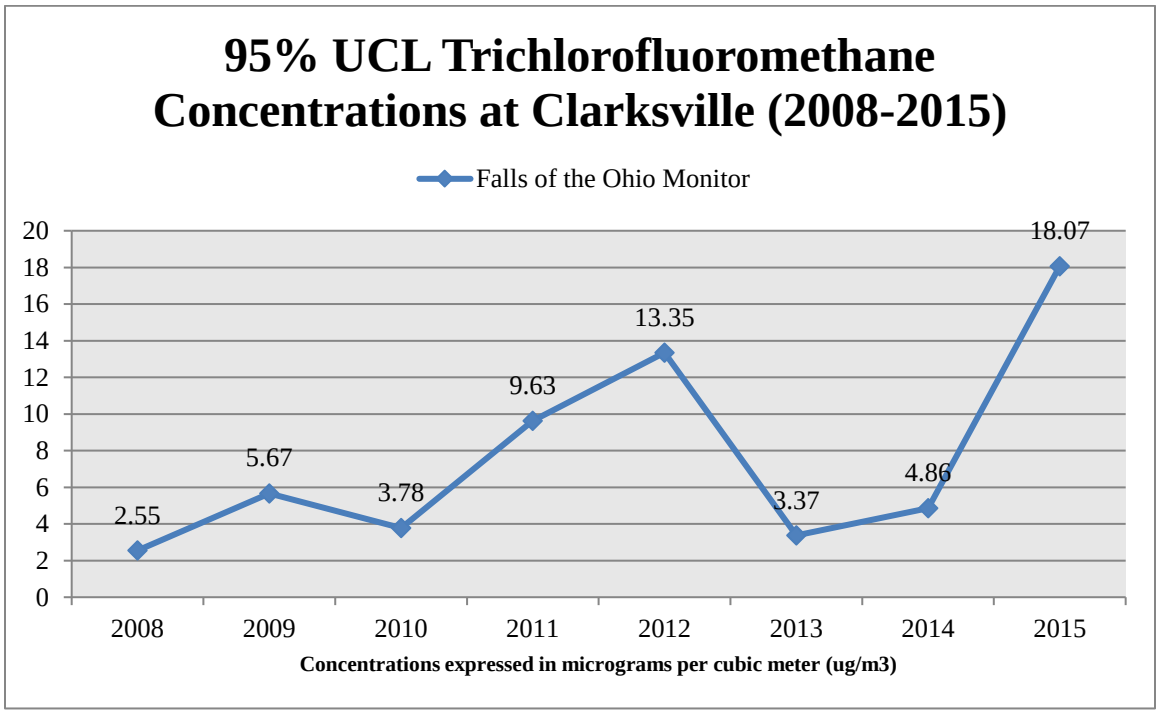

95% UCL Trichlorofluoromethane Concentrations at Ogden Dunes (2006-2015)
Ogden Dunes - Diana Rd Monitor
2
1.5
1
0.5
0
1.23
1.05
1.45
1.59
1.75
1.67
1.64
1.66
1.47
1.85
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Concentrations expressed in micrograms per cubic meter (ug/m3)


95% UCL Trichlorofluoromethane Concentrations at Lafayette (2008-2012)
Lafayette Cinergy Monitor
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1.37
1.7
1.73
1.66
1.65
2008
2009
2010
2011
2012
Concentrations expressed in micrograms per cubic meter (ug/m3)


95% UCL Trichlorofluoromethane Concentrations at Terre Haute (2014-2015)
Terre Haute - Fort Harrison Rd Monitor
1.8
1.75
1.7
1.65
1.6
1.55
1.5
1.45
1.4
1.35
1.49
1.74
2014
2015
Concentrations expressed in micrograms per cubic meter (ug/m3)


95% UCL Trichlorofluoromethane Concentrations at Indianapolis (2006-2015)
Indianapolis - Washington Park Monitor
2.5
2
1.5
1
0.5
0
1.2
1.03
1.47
2.17
1.73
1.77
1.68
1.64
1.5
1.74
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Concentrations expressed in micrograms per cubic meter (ug/m3)





The analysis of monitoring data from 2006 to 2015 indicates that concentrations of trichlorofluoromethane have remained relatively stable throughout the state. The monitor in Clarksville registered higher readings with a higher level of variance then other monitors around the state. The elevated concentrations noted at this monitor in 2011, 2012, and 2015 resulted from specific periods of the year when consistently high readings were observed. These include a period from July-October in 2011, July-September in 2012, and March-August in 2015.

Following each of these periods, concentrations declined to what would be considered more normal levels for this monitor. The single highest reading of 33.44 on 7/23/2015 was still well below the Reference Concentration of 700.00. More information about the reference concentration can be found in the hazard quotient section below.

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 trichlorofluoromethane was evaluated for each air pollutant monitor over the span of this study. The results for each monitor are displayed in the table below. The calculated hazard quotient is well below 1.0 at all monitors, which indicates that the measured concentrations of trichlorofluoromethane do not present a risk for non-cancer health effects.

Table 1. Trichlorofluoromethane 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	1.45	700.00	0.0021
East Chicago Marina	2013-2015	1.75	700.00	0.0025
Gary IITRI	2006-2015	1.59	700.00	0.0023
Hammond CAAP	2006-2015	1.49	700.00	0.0021
Whiting High School	2006-2015	1.58	700.00	0.0023
Ogden Dunes – Diana Rd	2006-2015	1.49	700.00	0.0021
Lafayette Cinergy	2008-2012	1.57	700.00	0.0022
Terre Haute – Fort Harrison Rd	2014-2015	1.60	700.00	0.0023
Indianapolis – Washington Park	2006-2015	1.54	700.00	0.0022
University of Evansville	2006-2015	1.75	700.00	0.0025
Clarksville – Falls of	2008-2015	7.16	700.00	0.0102

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* Reference Concentration Source: Health Effects Assessment Summary Table (HEAST)

Cancer Risk

There is no evidence at this time of increased cancer risk from exposure to trichlorofluoromethane.