

ETHYLBENZENE (C₈H₁₀)

Chemical Abstracts Service (CAS) Number: 100-41-4

General Information

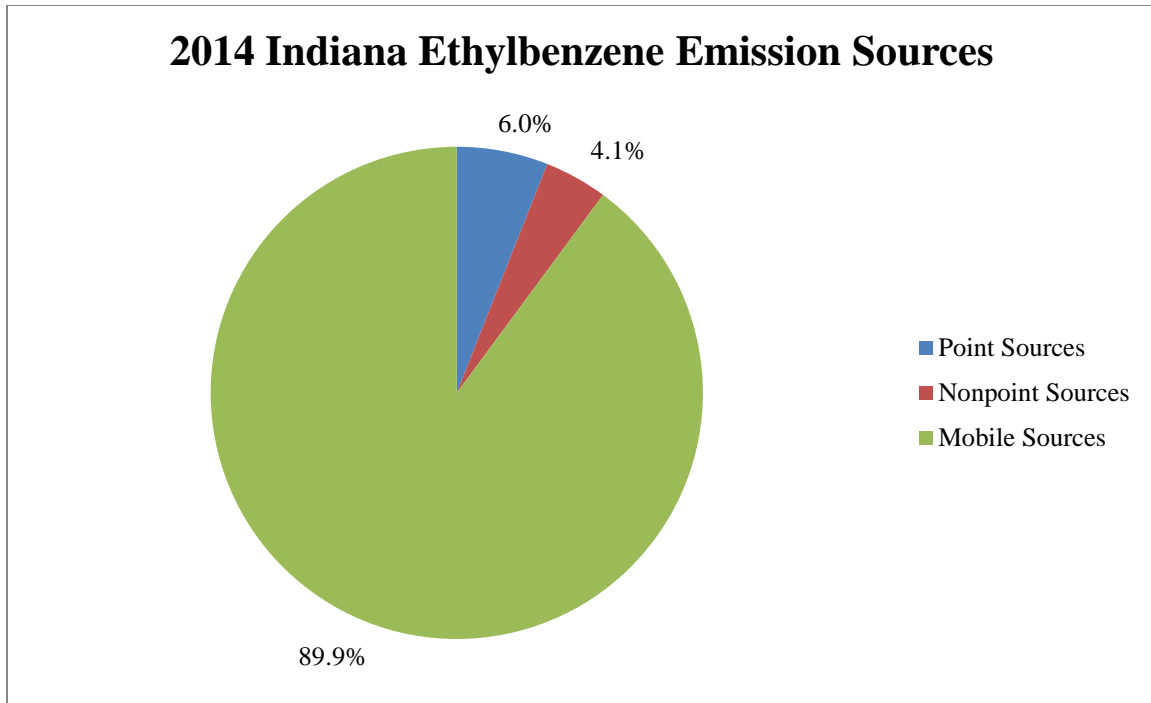
Ethylbenzene is a colorless liquid that smells like gasoline. Acute (short-term) exposure to ethylbenzene in humans results in respiratory effects, such as throat irritation and chest constriction, irritation of the eyes, and neurological effects such as dizziness. Chronic (long-term) exposure to ethylbenzene by inhalation in humans has shown conflicting results regarding its effects on the blood. Animal studies have reported effects on the blood, liver, and kidneys from chronic inhalation exposure to ethylbenzene. Limited information is available on cancer risk from human exposure to ethylbenzene. U.S. EPA has classified ethylbenzene as a Group D, not classifiable as to human carcinogenicity.

Sources

- Ethylbenzene is used primarily in the production of styrene. It is also used as a solvent, as a constituent of asphalt and naphtha, and in fuels.
- Occupational exposure to ethylbenzene occurs in factories that use ethylbenzene to produce other chemicals; for gas and oil workers; and for varnish workers, spray painters, and persons involved in gluing operations.
- Exposure to ethylbenzene occurs from the use of consumer products, gasoline, pesticides, solvents, carpet glues, varnishes, paints, and tobacco smoke.

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 ethylbenzene totaled 1806.09 tons in the 2014 calendar year. Of this total, 89.9% was attributed to mobile sources, 6.0% was attributed to point sources, with the remaining 4.1% attributed to nonpoint 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

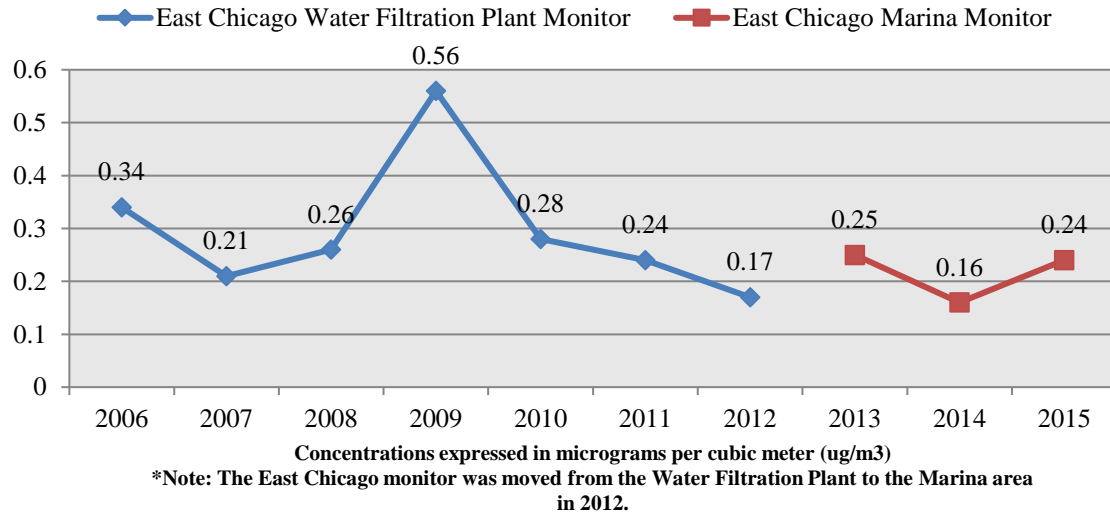
Ambient air monitoring data most accurately represents a limited area near the monitor location. All monitors for air toxics sample every sixth day. The monitoring locations by themselves are not sufficient to accurately characterize air toxic concentrations throughout the entire state, however, results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

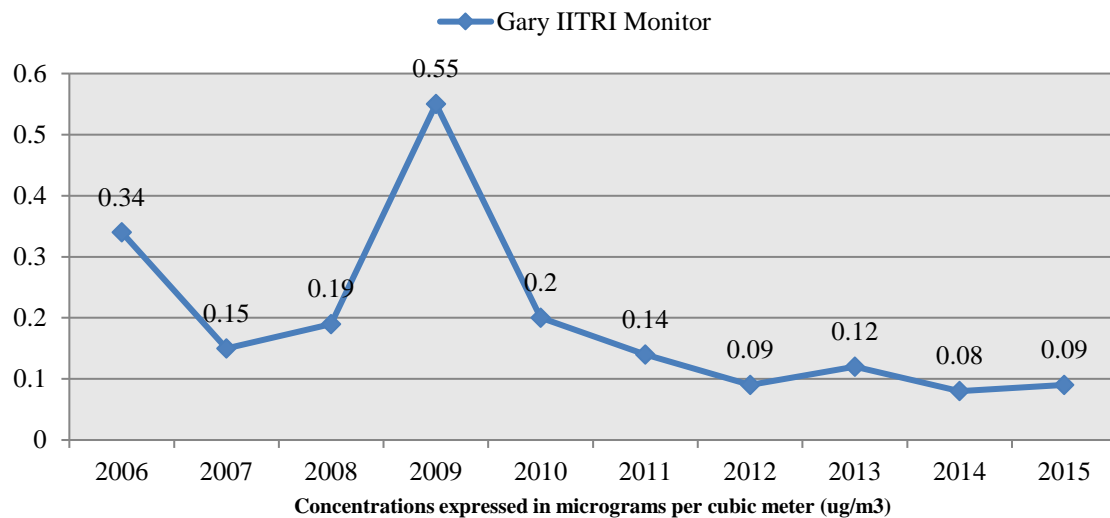
To learn more about the current monitoring locations, please visit IDEM's Air Toxics Monitor Siting webpage at: <http://www.in.gov/idem/toxic/2337.htm>

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 ethylbenzene for the monitors analyzed from 2006-2015 was 66.9%. Trend graphs for each of these monitors are provided below.

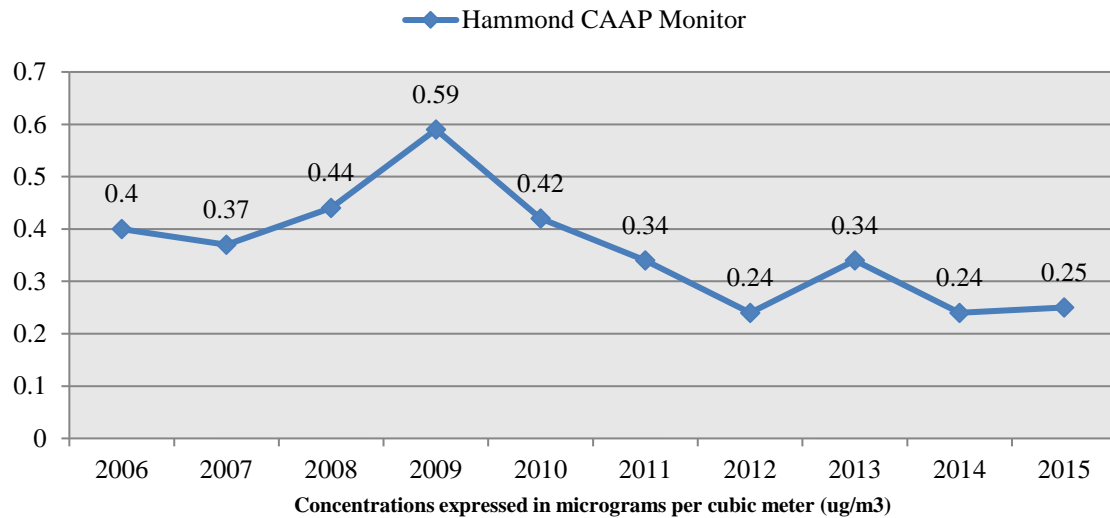
95% UCL Ethylbenzene Concentrations at East Chicago (2006-2015)



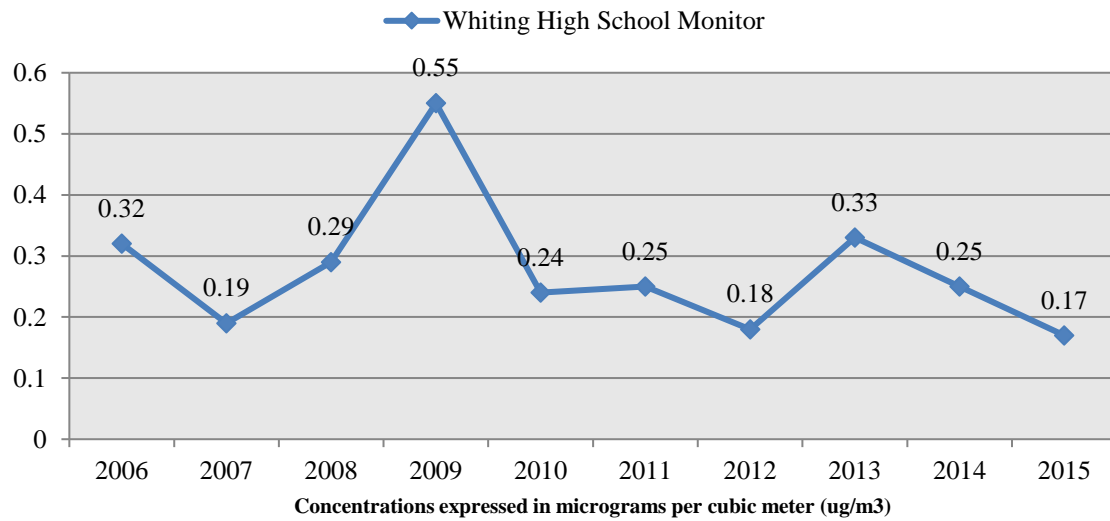
95% UCL Ethylbenzene Concentrations at Gary (2006-2015)



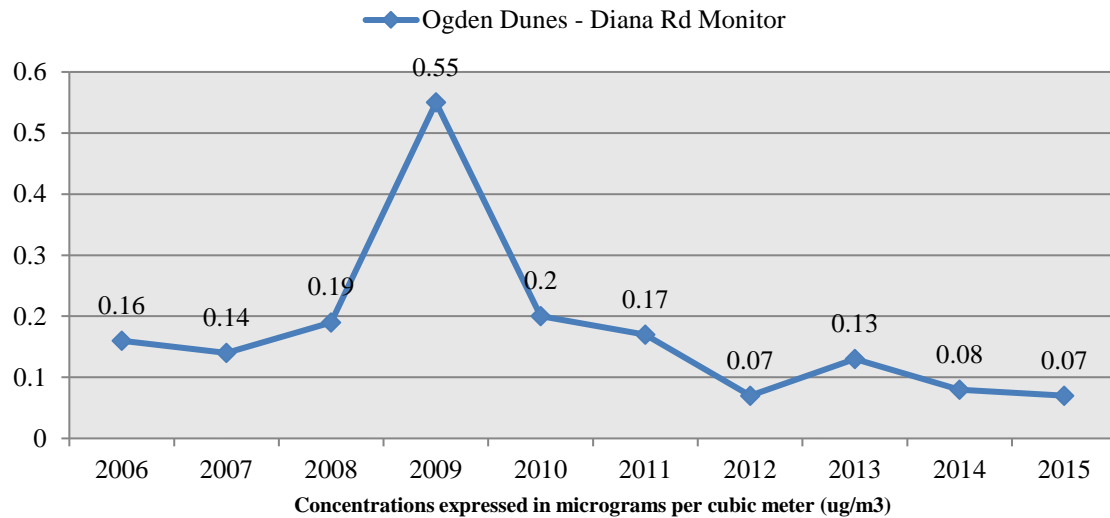
95% UCL Ethylbenzene Concentrations at Hammond (2006-2015)



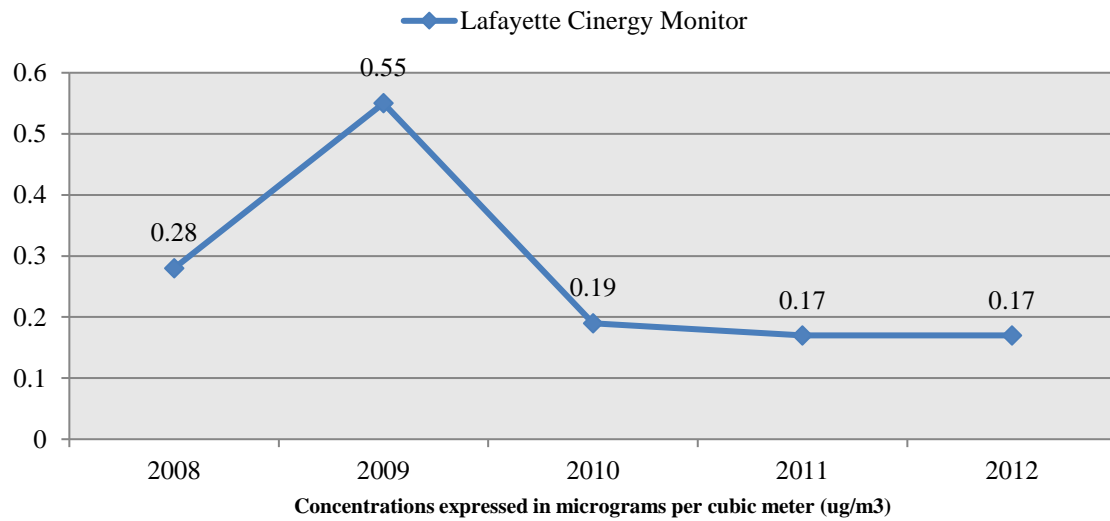
95% UCL Ethylbenzene Concentrations at Whiting (2006-2015)



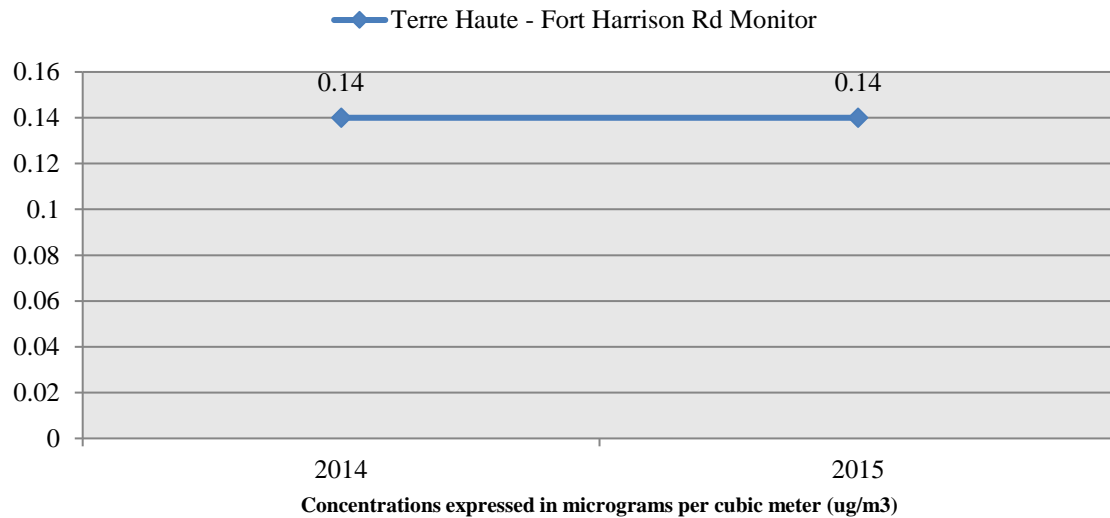
95% UCL Ethylbenzene Concentrations at Ogden Dunes (2006-2015)



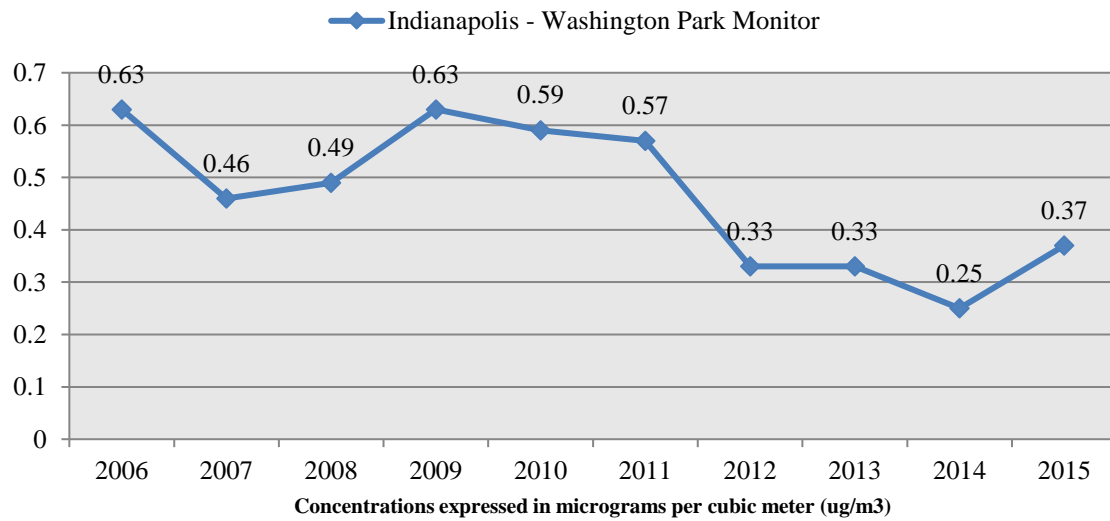
95% UCL Ethylbenzene Concentrations at Lafayette (2008-2012)



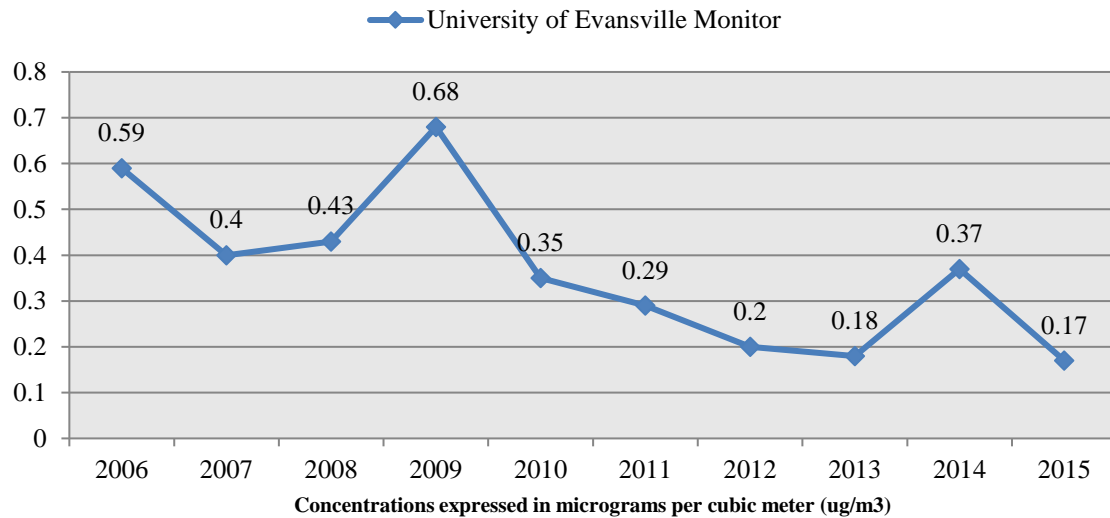
95% UCL Ethylbenzene Concentrations at Terre Haute (2014-2015)



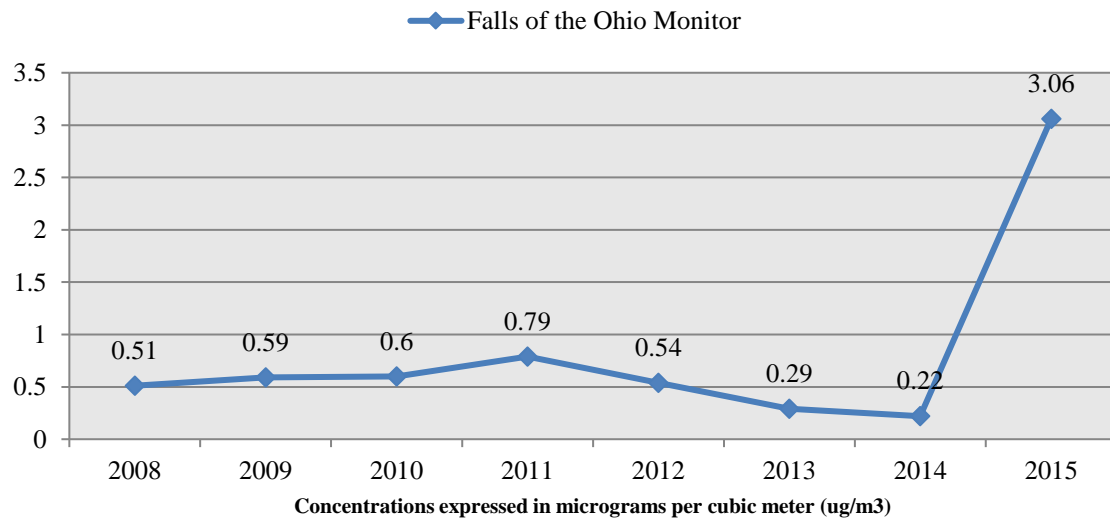
95% UCL Ethylbenzene Concentrations at Indianapolis (2006-2015)



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



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



The analysis of monitoring data from 2006 to 2015 indicates that concentrations of ethylbenzene have generally declined or remained relatively constant throughout the state. The exception to this is the significant spike in concentrations at the Clarksville monitor in 2015. The calculated concentration in 2015 was heavily influenced by a single high reading of 40.23 taken on 11/20/2015. This reading appears to be a single outlier and no consistent pattern of exceptionally high readings was observed. The high reading of 40.23 was still well below the Reference

Concentration of 1000.00. 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 ethylbenzene 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 ethylbenzene do not present a risk for non-cancer health effects.

Table 1. Ethylbenzene 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	0.28	1000.00	0.0003
East Chicago Marina	2013-2015	0.21	1000.00	0.0002
Gary IITRI	2006-2015	0.20	1000.00	0.0002
Hammond CAAP	2006-2015	0.33	1000.00	0.0003
Whiting High School	2006-2015	0.26	1000.00	0.0003
Ogden Dunes – Diana Rd	2006-2015	0.18	1000.00	0.0002
Lafayette Cinergy	2008-2012	0.27	1000.00	0.0003
Terre Haute – Fort Harrison Rd	2014-2015	0.14	1000.00	0.0001
Indianapolis – Washington Park	2006-2015	0.41	1000.00	0.0004

University of Evansville	2006-2015	0.31	1000.00	0.0003
Clarksville – Falls of the Ohio	2008-2015	0.73	1000.00	0.0007

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

Cancer Risk

IDEM uses U.S. EPA methods and toxicological information from reliable sources when calculating potential cancer risk estimates. Potential lifetime cancer risk estimates are obtained by multiplying ambient air concentrations by cancer slope factors. The resulting calculations give a number that is expressed using the term “lifetime cancer cases per number of people.” U.S. EPA uses a range between one in a million and one hundred in a million (1 to 100) when evaluating whether the estimated risk is at a level where action should be taken. Generally, U.S. EPA considers lifetime cancer risk estimates over one hundred in a million to be at levels where action or more investigation is required. Lifetime cancer risks that fall between the one in a million and 100 in a million range generate decisions and actions taking into account the assumptions used to determine the estimate. Lifetime cancer risk estimates below one in a million are usually considered not to require further action.

Ethylbenzene has not been classified as a known human carcinogen by U.S. EPA. However, IDEM does consider peer reviewed data from other sources when they are available. A benchmark for assessing additional lifetime cancer risk for ethylbenzene is available from the California Environmental Protection Agency, so this was used to estimate the risk in the table below. The estimated risk of contracting cancer from ethylbenzene is less than one in a million at monitors across the state with the exception of Indianapolis and Clarksville.

Table 2. Ethylbenzene Additional Lifetime Cancer Risk (concentrations expressed in micrograms per cubic meter)

Monitor	Years	Average Concentration	Cancer Risk (in one million)*
East Chicago Water Filtration Plant	2006-2012	0.28	0.70
East Chicago Marina	2013-2015	0.21	0.53
Gary IITRI	2006-2015	0.20	0.50
Hammond CAAP	2006-2015	0.33	0.83
Whiting High School	2006-2015	0.26	0.65
Ogden Dunes – Diana Rd	2006-2015	0.18	0.45
Lafayette Cinergy	2008-2012	0.27	0.68
Terre Haute – Fort Harrison Rd	2014-2015	0.14	0.35
Indianapolis – Washington Park	2006-2015	0.41	1.03
University of Evansville	2006-2015	0.31	0.78
Clarksville – Falls of the Ohio	2008-2015	0.73	1.83

* Additional Cancer Risk Factor Source: The California Environmental Protection Agency.