

	Ranson Landing Traffic Impact Study Lee's Summit, Missouri		Figure A-2
	May 2021	No Scale	SITE PLAN

Is it Safe to Live Near a Gas Station. (2009 April) Scientific American.

<https://www.scientificamerican.com/article/is-it-safe-to-live-near-gas-station/>

- Despite all the modern health and safety guidelines they must follow, gas stations can still pose significant hazards to neighbors, especially children. Some of the perils include ground-level ozone caused in part by gasoline fumes,
- Ozone pollution is caused by a mixture of volatile organic compounds, some of which are found in gasoline vapors
- nearly odorless hydrocarbon fumes, which contain harmful chemicals like benzene, can be released into the air.
- Higher ozone levels can lead to respiratory problems and asthma, while benzene is a known cancer-causing chemical, according to the National Institutes of Health (NIH).

Residential Proximity to Environmental Hazards and Adverse Health Outcomes. (2011 December).

PubMed Central (PMC)

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3222489/>

Risk of childhood cancer was examined in relation to residential proximity to other sources of contaminants, including industries reporting under the US Toxic Release Inventory, petrochemical plants, gas stations, repair garages, nuclear power plants, and landfill sites and hazardous waste sites. Increased risk of childhood leukemia was found with residential addresses near gas stations,^{44,60,63} repair garages,⁶⁰ and nuclear power plants.^{46,59} Children whose mothers lived near industries covered under the Toxic Release Inventory during pregnancy were more likely to have brain cancer, especially if the mother lived within 1 mile of a facility with carcinogen emissions.⁴²

- Harrison, 1999, United Kingdom (44)
- Childhood leukemia cases diagnosed between 1990 and 1994
- Gas stations and roads: Exposure defined as an address at the time of diagnosis ≤ 100 m from gas station
- From case-control study, ORs = 1.61 (95% CI = 0.90, 2.87) and 1.99 (95% CI = 0.73, 5.43) for living ≤ 100 m of a main road or gas station, respectively;

- Steffen, 2004 France (60)
- Acute leukemia in children aged 0–14
- Roadways, repair garages, and gas stations: History of exposure to hydrocarbons (residential proximity to roadways, car repair garage, gas station)
- Association between residential proximity to a gas station or repair garage during childhood and risk of childhood leukemia (OR = 4.0, 95% CI = 1.5, 10.3) was stronger for acute nonlymphocytic leukemia (OR = 7.7, 95% CI = 1.7, 34.3).

- Weng, 2009, Taiwan (63)
- Leukemia deaths in children aged <15 y, 1996–2006
- Gas stations: Gas station density in municipalities in which the residents lived at the time of death

- OR = 1.91 (95% CI = 1.29, 2.82) for leukemia (death) associated with living in municipalities with the highest gas station density; a significant trend was noted between increasing gas station density and risk of death from childhood leukemia.

Vent Pipe Emissions from Storage Tanks at Gas Stations: Implications for Setback Distances. (2020 Mar). PubMed Central (PMC). <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7059886/>

- Our findings support the need to revisit setback distances for gas stations, which are based on more than 2-decade old estimates of vent emissions.
- Our data support, however, that setback distances should be a continuous function of sales volume V_{sales} and also include the type of controls installed at the facility.

Ozone. American Lung Association. www.lung.org/clean-air/outdoors/what-makes-air-unhealthy/ozone

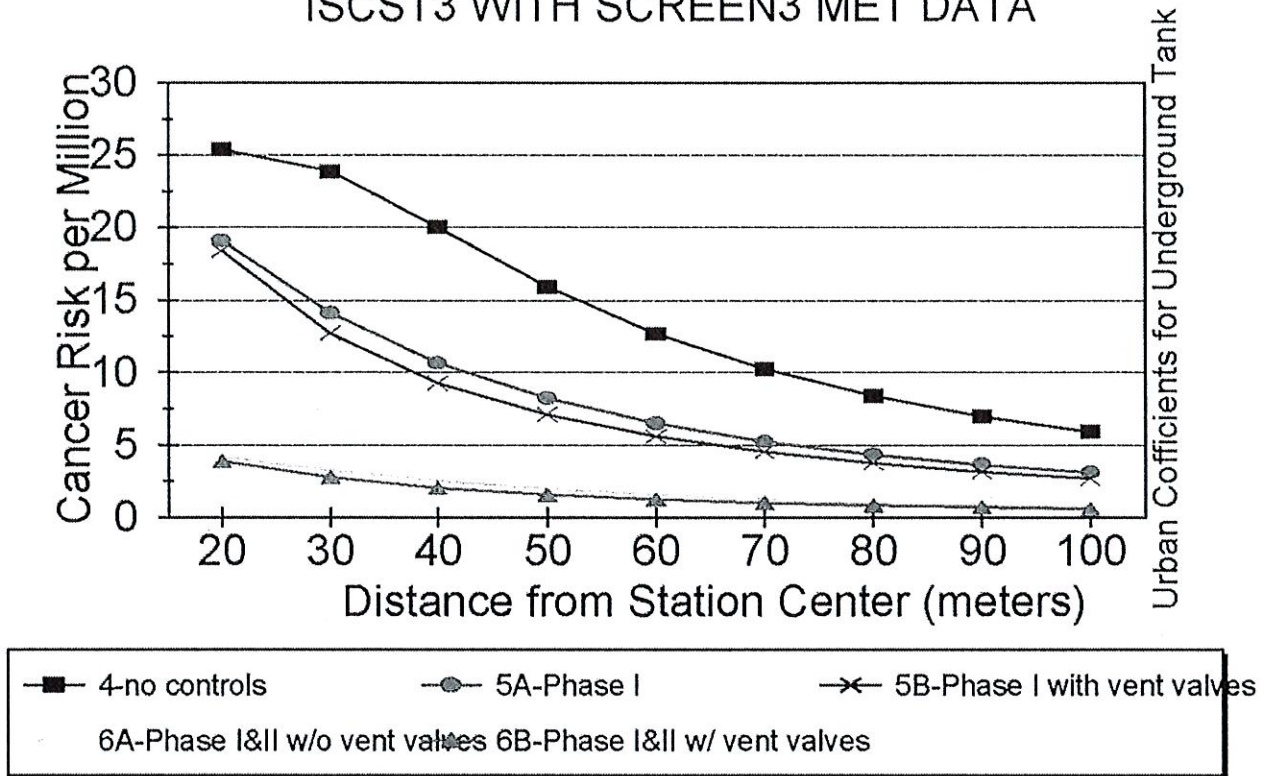
- The essential raw ingredients for ozone are nitrogen oxides (NO_x) and volatile organic compounds (VOCs). They are produced primarily when fossil fuels like gasoline, oil or coal are burned or when some chemicals, like solvents, evaporate. NO_x is emitted from power plants, motor vehicles and other sources of high-heat combustion. VOCs are emitted from motor vehicles, chemical plants, refineries, factories, gas stations, paint and other sources.²
- Who is at risk from Breathing Ozone?
 - children and teens;³
 - anyone 65 and older;⁴
 - people with existing lung diseases, such as asthma and chronic obstructive pulmonary disease (also known as COPD, which includes emphysema and chronic bronchitis⁵; and
 - people who work or exercise outdoors.⁶
- EPA Conclude Ozone Pollution Poses Serious Health Threats
 - Causes respiratory harm (e.g., worsened asthma, worsened COPD)
 - Likely to cause early death (both short-term and long-term exposure)
 - Likely to cause cardiovascular harm (e.g., heart attacks, strokes, heart disease, congestive heart failure)
 - May cause harm to the central nervous system
 - May cause reproductive and developmental harm
- U.S. Environmental Protection Agency, *Integrated Science Assessment for Ozone and Related Photochemical Oxidants*, 2013. EPA/600/R-10/076F.

Harmful Outcome of Occupational Exposure to Petrol. (2018 Nov). PubMed Central (PMC). <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6238353/>

- According to the US Agency for Toxic Substances and Disease Registry, there are typically more than 150 chemicals in petrol, including small amounts of benzene, toluene, xylene, ethyl benzene, and trace amounts of some contaminants, such as lead.
- Conclusions: Long-term exposure to petrol fumes has deleterious effect on white blood cells. A significant reduction in the number of total and differential lymphocyte seems to be attributed to the toxic effect of petrol ingredients.

The following graph is from the California Air Resources Board *Gasoline Service Station Industrywide Risk Assessment Guidelines*.

Cancer Risk - 1,000,000 gal/yr thruput ISCST3 WITH SCREEN3 MET DATA



Zoning Examples

Following are examples from around the U.S. of various safeguards with regard to the public health effects of air pollutants released from new gas stations:

- Santa Rosa County, FL:** Following is the text of the Santa Rosa County law which requires a minimum 500-foot separation between new gas station storage tanks and residentially-zoned properties: "In no case shall hazardous or potentially hazardous materials be stored or located in residential zones or within five hundred (500) feet of any residential zone, except for those materials used as fuel by emergency generators for communications towers as provided for in Section 7.01.15 or for public and private utilities. In which case, no hazardous or potentially hazardous materials may be stored within two hundred (200) feet of any residential structure." This law appears in the Santa Rosa Land Development Code (LDC) at 7.01.14.D.3.c.