TOWN OF ERIE AIR QUALITY ASSESSMENT

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NOAA 2011 Air Chemistry at the Boulder Atmospheric Observatory: Nitrogen, Aerosol Composition and Halogens on a Tall Tower (NACHTT)

- BAO tower air quality representative of Front Range region
- Light alkane VOCs higher at BAO than TX and CA
- “Propane and other light alkanes were not likely coming from an urban source.”
Present toxicological information for:
- Benzene
- Propane

Present ASTDR and EPA health risk guidelines

Discuss NOAA study results relative to the health risk guidelines
BENZENE

- **Natural sources**
  - Gas emissions – volcanoes, forest fires
  - Crude oil

- **Man-made sources**
  - Vehicle exhaust
  - Tobacco smoke
  - Industrial emissions
  - Limited household products
Acute Health Effects – high concentration, short duration
- Dizziness, rapid heart rate, headaches, CNS effects
  - 700 to 3,000 ppm
- Death – 10,000 to 20,000 ppm

Chronic health effects – low concentration, long duration
- Noncancerous
- Cancer causing (carcinogenic)
EPA HEALTH RISK GUIDELINES, NONCANCEROUS

- Integrated Risk Information System (IRIS)
  - Human health assessment program
  - Evaluates information on health effects from environmental exposures

- Inhalation Reference Concentration (RfC)
  - Exposure at or below which noncancerous adverse health effect is not likely to occur

The RfC is not a direct estimator of risk, but rather a reference point to gauge the potential for health effects.

At lifetime exposures increasingly greater than the reference exposure level, the potential for adverse health effects increases.
The Agency for Toxic Substances and Disease Registry (ASTDR)
- Mission – prevent harm to human health from exposure to hazardous substances

Minimal Risk Levels (MRLs)
- Estimate of daily exposure at or below which is unlikely to pose a measurable risk of harmful, noncancerous health effects

Different MRLs for specified time periods
- Acute
- Intermediate
- Chronic
# NONCANCEROUS MRLs AND RfC FOR BENZENE

## ASTDR Minimal Risk Level (MRL)

<table>
<thead>
<tr>
<th>Duration</th>
<th>ppm</th>
<th>ppb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute-duration inhalation exposure (14 days or less)</td>
<td>0.009</td>
<td>9</td>
</tr>
<tr>
<td>Intermediate-duration inhalation exposure (15 to 365 days)</td>
<td>0.006</td>
<td>6</td>
</tr>
<tr>
<td>Chronic-duration inhalation exposure (greater than 365 days)</td>
<td>0.003</td>
<td>3</td>
</tr>
</tbody>
</table>

## IRIS Inhalation Reference Concentration (RfC)

<table>
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<tbody>
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<td>0.009</td>
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</table>

*ppm, parts of benzene per million parts of air  
**ppb, parts of benzene per billion parts of air
Benzene is a confirmed human carcinogen
- Acute nonlymphocytic leukemia

Unit risks – used to estimate risk of cancer associated with exposure
- Expressed as risk levels
  - 1 in 10,000
  - 1 in 100,000
  - 1 in 1,000,000

A risk of 1 in a million... a likelihood that one person, out of one million equally exposed people would contract cancer if exposed continuously (24 hrs per day) to the specific concentration over 70 years.
## BENZENE – CARCINOGEN RISK LEVELS

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Air Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 in 10,000</td>
<td>4 to 14 ppb (0.004 to 0.014 ppm)</td>
</tr>
<tr>
<td>1 in 100,000</td>
<td>0.4 to 1.4 ppb (0.0004 to 0.0014 ppm)</td>
</tr>
<tr>
<td>1 in 1,000,000</td>
<td>0.04 to 0.14 ppb (0.00004 to 0.00014 ppm)</td>
</tr>
</tbody>
</table>
NOAA NACHTT STUDY

- Limitations
  - Air chemistry study
  - Not a human health study

- Contaminant concentrations not measured in Erie
  - Unknown if reported concentrations Erie residents’ inhalation exposures
Comparison of NACHTT Benzene Average Mixing Ratio Concentration* to Noncancerous Health Risk Estimates

- ASTDR MRL Acute
- ASTDR MRL Intermediate
- ASTDR MRL Chronic
- IRIS RfC
- NACHTT

Parts per Billion, ppb

- ASTDR MRL Acute: 9
- ASTDR MRL Intermediate: 6
- ASTDR MRL Chronic: 3
- IRIS RfC: 9
- NACHTT: 1
Risk of Erie residents experiencing an adverse health effect over an entire lifetime exposure to the NOAA reported benzene concentration is low.
Comparison of NACHTT Benzene Average Mixing Ratio Concentration* to EPA's Lifetime Cancer Risk Estimates

EPA 1 in 10,000
EPA 1 in 100,000
EPA 1 in 1,000,000
NACHTT

Parts per Billion, ppb
If Erie residents were to continuously breathe air containing the NOAA reported benzene concentration over an entire lifetime, the risk of cancer would be on the order of 1 in 100,000.

EPA states that the results of risk estimates should not be used as a measure of whether risks are acceptable.

Rather, they should be used to focus or target more refined measurement or assessment.
Natural sources
- Natural gas
- Crude oil

Man-made sources
- Fuel-fired equipment (gasoline, diesel, gas, oil)
- Vehicle exhaust
- Numerous household products
  - Heaters
  - Grills
  - Furnaces
  - Propellant
Acute Health Effects – high concentration, short duration
- Simple asphyxiant
- CNS effects

Chronic health effects – low concentration, long duration
- None observed below 1000 ppm
EXPOSURE GUIDELINES

- Integrated Risk Information System (IRIS)
  - No information

- ASTDR
  - No information

- Occupational health exposure limits
  - 1000 ppm

- NOAA reported propane concentration
  - 0.115 ppm (115 ppb)
Comparison of NACHTT Toluene and Xylene Average Mixing Ratio Concentration to Noncancerous Health Risk Estimates

- Toluene ASTDR MRL Acute
- Toluene ASTDR MRL Chronic
- Toluene NACHTT
- Xylene ASTDR MRL Acute
- Xylene ASTDR MRL Intermediate
- Xylene ASTDR MRL Chronic
- Xylene IRIS RfC
- Xylene NACHTT

Parts per billion, ppb