# Gas Drilling Contaminants and their Sources

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| **BTEX** | Benzene, toluene, ethylbenzene and xylenes | Benzene is a known carcinogen. Toluene may affect the reproductive and central nervous systems. Ethylbenzene and xylenes may have respiratory and neurological effects. | Venting of natural gas<br>Wastewater pits<br>Toxic wastewater<br>Dehydration |
| **$CH_4$** | Methane | The main concern is that this gas can explode. | Venting of natural gas<br>Dehydration |
| **Diesel fuel** | A complex mixture of hydrocarbons | Both fuel and exhaust contain carcinogenic substances like benzene and PAHs. | Gas "stimulation" fluids<br>Oil-based drilling muds<br>Engines heavy equip. |
| **PAHs** | Polycyclic Aromatic | Several agencies have classified some PAHs as probable or possible carcinogens. Animal studies show reproductive effects. | Diesel exhaust<br>Flaring<br>Wastewater pits |
| **$H_2S$** | Hydrogen sulfide | Aggravates respiratory conditions, and affects the neurological system and cardiovascular system. It can also cause central nervous system problems. | Venting and flaring of natural gas (if present in oil and gas formations)<br>Rises from soils |
| **Toxic metals** | Examples — arsenic, barium, cadmium, chromium, lead, mercury, selenium, zinc and others | There are different potential health consequences associated with each metal. Possible toxic effects include hair loss, kidney damage, skin problems, high blood pressure, increased cancer and risk of neurological damage, among others. | Drilling muds<br>Gas "stimulation" fluids<br>Wastewater pits<br>Toxic wastewater<br>Venting and flaring<br>Diesel exhaust |
| **NOx** | Nitrogen oxides | These react with VOCs to form ground-level ozone and smog, which can trigger respiratory problems other chemicals to form particulate pollution, which can damage lungs and cause respiratory illness, heart conditions and premature death common organic chemicals to form toxics that can cause genetic mutation | Compressor engines<br>Flaring<br>Diesel / natural gas drilling engine exhaust |
| **VOCs** | Volatile Organic Compounds include BTEX (above), formaldehyde and others | React with NOx to form ground-level ozone & smog, which can trigger respiratory problems. Can cause health problems, such as cancer | Venting & flaring of natural gas<br>Wastewater pits; Oily wastes; Diesel / natural gas; drilling engine exhaust; Compressors |
| **Particulate matter** | Small particles suspended in air | Can be inhaled & cause adverse health effects, like respiratory ailments, aggravation of asthma & allergies, painful breathing, shortness of breath, chronic bronchitis & premature death. May combine with other air pollutants & aggravate additional health problems. Some particulates, such as diesel exhaust, are carcinogenic. | Diesel exhaust<br>Waste pit dust<br>Venting and flaring |
| **$SO_2$** | Sulfur dioxide | Reacts with other chemicals to form particulate pollution, which can damage lungs and cause respiratory illness, heart conditions and premature death. | Diesel / natural gas; drilling engine exhaust; Flaring |

* based on Theo Colborn's original