Testimony of Amy Mall,
NATURAL RESOURCES DEFENSE COUNCIL

ON
The applicability of federal requirements that protect public health and the environment to oil and gas development

Presented to the Committee on Oversight and Government Reform

United States House of Representatives

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Good morning Chairman Waxman, Ranking Member Davis, and members of the Committee. Thank you for the invitation to appear before you today to testify about the environmental and health impacts of oil and gas exploration and production. My name is Amy Mall, and I am a senior policy analyst with the Natural Resources Defense Council (NRDC). NRDC is a national non-profit organization of scientists, lawyers, and environmental policy specialists dedicated to protecting public health and the environment. Founded in 1970, NRDC has more than 1.2 million members and online activists nationwide.

Today NRDC is releasing a report entitled, "Drilling Down: Protecting Western Communities from the Health and Environmental Effects of Oil and Gas Production." This report discusses hazardous materials that can enter the environment during oil and gas exploration and production, the loopholes in federal laws that allow industry to legally release these contaminants into the human environment, and the technologies readily available to control pollution and minimize toxic waste in order to reduce any impacts to human health.

Summary
The oil and gas industry has expanded rapidly during the last decade in the United States, particularly in the Rocky Mountain region, and predictions call for that trend to continue. Oil and gas production is a dirty process; many of the steps involved can be sources of dangerous pollution that can have serious impacts on the region's air, water, and land—and on people's health. Despite the number of dangerous materials involved in oil and gas production—and the frequent proximity of these operations to residences and other community resources—the oil and gas industry enjoys numerous exemptions from provisions of federal laws intended to protect human health and the environment.

Decades of deal-making by the industry, Congress, and regulatory offices have resulted in exemptions for the oil and gas industry from protections in the Clean Water Act, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also known as the Superfund law), the Resource Conservation and Recovery Act, the Safe Drinking Water Act, and the Clean Air Act. In addition, the oil and gas industry is not covered by public right-to-know provisions under the Emergency Planning and Community Right-to-Know Act, meaning that companies can withhold information needed to make informed decisions about protecting the environment and human health.[1]

Many people who live near oil and gas operations experience symptoms resembling those that may be caused by the toxic substances found in oil and gas or the chemical additives used to produce them. Among the toxic chemicals that can be released during oil and gas operations are benzene, toluene, ethylbenzene, and xylene (known as the "BTEX" chemicals);[2] radioactive materials;[3] hydrogen sulfide;[4] arsenic;[5] and mercury.[6] The illnesses associated with these substances range from eye and skin irritation to respiratory problems, thyroid disorders, and even tumors. Their known health effects are described in the chart below.

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[1] Several of these loopholes were originally discussed in Doyle, J., "Crude Awakening - The Oil Mess in America: Wasting Energy, Jobs & The Environment," (Friends of the Earth 1994), see pp. 154-155.

[2] Williams, S.D., D.E. Ladd, and J.J. Farmer, "Fate and Transport of Petroleum Hydrocarbons in Soil and Ground Water at Big South Fork National River and Recreation Area, Tennessee and Kentucky, 2002-2003," U.S. Geological Survey, Scientific Investigations Report 2005-5104 (2006), p.7.

[3] Smith, K.P., "An Overview of Naturally Occurring Radioactive Materials (NORM) in the Petroleum Industry," Argonne National Laboratory, ANL/EAIS-7 (December 1992). For more information see Argonne National Laboratory's website on Naturally Occurring Radioactive Materials (NORM) at: http://www.ead.anl.gov/project/dsp_topicdetail.cfm?topicid=16.

[4] Illinois Department of Public Health, Fact Sheet, "Hydrogen Sulfide Gas," available at: http://www.idph.state.il.us/envhealth/factsheets/hydrogensulfide.htm.

[5] Puri, B. K. and K.J. Irgolic, "Determination of Arsenic in Crude Petroleum and Liquid Hydrocarbons, "*Environmental Geochemistry and Health*," 11 (3,4) 95-99 (December 1989).

[6] Wilhelm, S.M. et al, "Mercury in Crude Oil Processed in the United States," *Environmental Science & Technology*, 41(13) 4509-4514, 2007.

TOXIC CHEMICALS RELEASED DURING OIL & GAS OPERATIONS

Pollutant	Known Negative Health Effects
Arsenic	Chronic arsenic exposure can cause damage to blood vessels, a sensation of "pins and needles" in hands and feet, darkening and thickening of the skin, and skin redness. It is a known human carcinogen, and can cause cancer of skin, lungs, bladder, liver, kidney and prostate.[7]
Hydrogen Sulfide	Hydrogen sulfide has been linked to irritation of the eyes, nose, and throat, difficulty in breathing, headaches, dizziness, nausea, and vomiting. Low-level exposure might also lead to poor attention span, poor memory, and impaired motor function. Short-term exposure at high concentrations can lead to loss of consciousness and death.[8]
Mercury	Mercury can permanently damage the brain, kidneys, and developing fetus and may result in tremors, changes in vision or hearing, and memory problems. Even in low doses, mercury may affect an infant's development, delaying walking and talking, shortening attention span and causing learning disabilities.[9]
Polycyclic Aromatic Hydrocarbons	Several of the polycyclic aromatic hydrocarbons (PAHs) that can be found in crude oil have caused tumors in laboratory animals and are considered possible or probable human carcinogens. Studies of people have found that individuals exposed for long periods to mixtures that contain PAHs can also develop cancer. In addition, animal tests have found reproductive problems and birth defects.[10]

[7] National Library of Medicine, Hazardous Substances Data Bank (HSDB): http://toxnet.nlm.nih.gov; U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR), "ToxFAQs for Arsenic" (September 2005), available at: http://www.atsdr.cdc.gov/tfacts2.html. See also: U.S. Department of Energy, Office of Environmental Management, Risk Assessment Information System (RAIS), "Toxicity Summary for Arsenic," available at: http://rais.ornl.gov/tox/profiles/arsenic.shtml.

[8] HSDB: http://toxnet.nlm.nih.gov; ATSDR, "ToxFAQs for Hydrogen Sulfide" (July 2006), available at: http://www.atsdr.cdc.gov/tfacts114.html. See also: Hirsch, A.R., "Hydrogen sulfide exposure without loss of consciousness: chronic effect in four cases," *Toxicology and Industrial Health* 18, No. 2 (March 2002), pp. 51-61; Kilburn, K.H., "Effects of Hydrogen Sulfide on Neurobehavioral Function," *Southern Medical Journal* 96, No. 7 (July 2003), pp. 639-646; Legator, M.S. et al, "Health effects from chronic low-level exposure to hydrogen sulfide," *Archives of Environmental Health* 56, No. 2 (March- April 2001), pp. 123-131.

[9] HSDB: http://toxnet.nlm.nih.gov; ATSDR, "ToxFAQs for Mercury" (April 1999), available at: http://www.atsdr.cdc.gov/tfacts46.html. See also: RAIS, Toxicity Summary for Mercury, available at: http://rais.ornl.gov/tox/profiles/mercury_f_V1.shtml.

[10] HSDB: http://toxnet.nlm.nih.gov; ATSDR, "Public Health Statement for Polycyclic Aromatic Hydrocarbons (PAHs)" (August 1995), available at: http://www.atsdr.cdc.gov/toxprofiles/phs69.html.

Volatile Organic Compounds (VOCs)	
Acetone	Acetone can cause nose, throat, lung, and eye irritation; headaches; light-headedness; and confusion. In animals it has been linked to kidney, liver, and nerve damage, and increased birth defects.[11]
Benzene	Benzene is a known human carcinogen and causes leukemia.[12]
Ethylbenzene	Ethylbenzene can cause dizziness, throat and eye irritation, respiratory problems, fatigue and headaches. It has been linked to tumors and birth defects in animals, as well as to damage in the nervous system, livers and kidneys.[13]
Toluene	Toluene can cause fatigue, confusion, weakness, memory loss, nausea, hearing loss, central nervous system damage, and may cause kidney damage.[14] It is also known to cause birth defects and reproductive harm.[15]
Xylene	Xylene can cause headaches, dizziness, confusion, balance changes, irritation of the skin, eyes, nose, and throat, breathing difficulty, memory difficulties, stomach discomfort, and possibly changes in the liver and kidneys.[16]
Radioactive Substances	
Radium	Radium is a known human carcinogen, causing bone, liver, and breast cancer.[17]
Radon	Radon can cause an increased incidence of lung diseases such as emphysema, as well as lung cancer.[18]

[11] HSDB: http://toxnet.nlm.nih.gov; ATSDR, "ToxFAQs for Acetone" (September 1995), available at: http://www.atsdr.cdc.gov/tfacts21.html.

[12] HSDB: http://toxnet.nlm.nih.gov; ATSDR, "ToxFAQs for Benzene" (September 2005), available at: http://www.atsdr.cdc.gov/tfacts3.html. See also: RAIS, "Toxicity Summary for Benzene," available at: http://rais.ornl.gov/tox/profiles/benzene.shtml.

[13] HSDB: http://toxnet.nlm.nih.gov; ATSDR, "ToxFAQs for Ethylbenzene" (June 1999), available at: http://www.atsdr.cdc.gov/tfacts110.html; See also: U.S. Department of Labor, Occupational Safety and Health Administration Guidelines for Ethyl Benzene (April 1999), available at: http://www.osha.gov/SLTC/healthguidelines/ethylbenzene/index.html.

14 HSDB: http://toxnet.nlm.nih.gov; ATSDR, "ToxFAQs for Toluene" (February 2001), available at: http://www.atsdr.cdc.gov/tfacts56.html. See also: RAIS, "Toxicity Summary for Toluene," available at: http://rais.ornl.gov/tox/profiles/toluene_f_V1.shtml.

[15] State of California Environmental Protection Agency, "Chemicals known to the state to cause cancer or reproductive toxicity, (1 June 2007), available at: http://www.oehha.ca.gov/prop65/prop65_list/Newlist.html.

[16] HSDB: http://toxnet.nlm.nih.gov; ATSDR, "ToxFAQs for Xylene" (September 2005), available at: http://www.atsdr.cdc.gov/tfacts71.html. See also: RAIS, "Toxicity Summary for Xylene," available at: http://rais.ornl.gov/tox/profiles/xylene.shtml.

[17] HSDB: http://toxnet.nlm.nih.gov; ATSDR, "ToxFAQs for Radium" (July 1999), available at: http://www.atsdr.cdc.gov/tfacts144.html.

[18] HSDB: http://toxnet.nlm.nih.gov; ATSDR, "ToxFAQs for Radon" (July 1999), available at: http://www.atsdr.cdc.gov/tfacts145.html.

Why don't we hear even more stories about illnesses related to oil and gas operations? Oil and gas companies may claim there is a lack of data proving that industry pollution is a cause of illness. While more research needs to be conducted, important information is available. There are now more wells than ever before, and more of them near where people live. Chemical poisoning is notorious for resulting in nonspecific signs or symptoms that resemble other common diseases, immediate symptoms might be nonexistent or mild despite the risk of long-term severe health effects, and physicians may not recognize the connection between illness and the oil and gas operations.

In a 2004 program sponsored by the Centers for Disease Control and Prevention, two medical toxicologists from the National Center for Environmental Health discussed the challenges of recognizing illness stemming from chemical exposure, including:

- Chemicals do not always cause acute and obvious health effects. Immediate symptoms of chemical exposures might be nonexistent or mild despite the risk for long-term effects. Because of this lag time, it may be difficult for us to recognize the exposure source leading to the illness.
- Another obstacle that could lead to difficulty in recognition might be exposure to multiple chemical agents.
- Chemical poisoning is notorious for resulting in nonspecific signs or symptoms that resemble other common diseases.
- Physicians might be less familiar with recognition and treatment of illness related to chemical agents simply because illness from most chemicals is just not that common or at least not recognized as often as it occurs. [19]

In addition, some individuals choose not to share their stories, especially in communities with local economies dependent on the oil and gas industry. Others move away, sometimes with their homes purchased by energy companies and with signed agreements that prohibit them from telling their stories. And still others have given up on trying to call attention to this matter. One man recently stated at a public meeting, "...if few people are complaining about drilling these days, it's because they've given up after being ignored for so long."[20]

Despite readily available and often economical technological solutions capable of controlling hazardous pollution such as air emission controls and non-toxic or less toxic chemical alternatives, the industry as a whole has failed to take reasonable steps needed to protect families, communities, and the environment. NRDC therefore recommends that the federal government, in coordination with state and local governments:

- Close the legal loopholes granting oil and gas exemptions from laws designed to protect our air, water, and land, and human health;

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[19] Excerpted from: "Recognition of Illness Associated With Chemical Exposure," Centers for Disease Control and Prevention, Public Health Training Network Webcast. August 5, 2004, available at: http://www2.cdc.gov/phtn/webcast/chemical-exp/default.asp.

[20] Webb, Dennis, "Houpt: Gasfield residents will be heard," *The Aspen Times* (7 October 2007).

- Require industry to adopt affordable and available technological solutions for limiting pollution; and
- Evaluate health risks associated with oil and gas production and exploration, including independent testing of air, water, and land; conducting an assessment of the level of toxic exposure of families; identifying chemicals used; and tracking illnesses in workers and communities impacted by oil and gas facilities.

Background

The oil and gas industry is booming. In keeping with America's rising national demand for energy, domestic oil and natural gas production has expanded enormously in recent decades—and much of this growth is occurring in the Rocky Mountain region. According to the U.S. Energy Information Administration, between 1990 and 2005 the number of producing gas wells nationwide (spread across 32 states) increased from roughly 270,000 to 425,000.[21] The American Petroleum Institute (API) reported that 2006 was a record year for gas drilling, with more than 29,000 new wells drilled.[22] New Mexico, Colorado, Wyoming and Montana are among the states with the greatest growth. In addition to recent industry shifts favoring gas production, the number of producing oil wells also ranks in the hundreds of thousands. The year 2006 saw more oil wells completed—more than 15,000—than in any year since the 1980s.[23] Expectations that this buildup will continue unabated were confirmed by the API's recent report that oil and gas drilling hit a 21-year high in the first half of 2007.[24]

Colorado is already home to more than 30,000 active oil and gas wells. At the current rate of development, that number will double in less than six years.[25] State officials in Wyoming have approved more than 50,000 drilling permits since 2000, with more than 9,000 permits approved in 2006 alone.[26] The State of New Mexico approved nearly one-fifth more drilling permits in 2006 than were approved in 2005.[27] In Utah, state officials approved twice as many permits in 2006 as they did in 2004.[28]

Wells can be located near homes and communities, sometimes only hundreds of feet from a home, school, playground, or agricultural operation creating food products. The

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[21] Energy Information Administration, "Number of Producing Gas and Gas Condensate Wells," U.S. Department of Energy. (July 2007). According to the EIA: "Prior to 2001, the well counts for Federal Offshore Gulf of Mexico were included in the well counts for Alabama, Louisiana, and Texas." Available at: http://tonto.eia.doe.gov/dnav/ng/xls/ng_prod_wells_s1_a.xls#'1-Number of Gas and Gas Condensate Wells'!A1.

[22] "Industry sets record for drilling, well completions," *Land Letter*, 18 January 2007.

[23] Ibid.

[24] American Petroleum Institute, "U.S. drilling & completion half-year estimates at 21-year high" (1 August 2007), Available at: http://www.api.org/Newsroom/drilling-21year-high.cfm.

[25] Colorado Oil and Gas Conservation Commission, "Colorado Weekly & Monthly Oil & Gas Statistics" (8 August 2007). Available at: http://www.oil-gas.state.co.us/Library/Statistics/CoWkly&MnthlyO&GStats2007.pdf.

[26] Wyoming Oil and Gas Conservation Commission, "All APDs Approved." Available at: http://wogcc.state.wy.us/AllAppcount.cfm.

[27] New Mexico Oil Conservation Division, "APD's by County – 2005 and YTD 2006" (10 January 2007). Available at: http://www.emnrd.state.nm.us/ocd/documents/APDs_by_Co011007.xls.

[28] Utah Division of Oil, Gas, and Mining, "Applications for Permits to Drill (APD)-by year," State of Utah Department of Natural Resources (2007). Available at: http://www.ogm.utah.gov/oilgas/STATISTICS/permits/APDcount/apds_annual.htm.

McCoy Elementary School in Aztec, New Mexico, for example, is located less than 400 feet from two wells—and the playground is less than 150 feet from the wells. The Piedra Vista High School in Farmington, New Mexico is located approximately 500 feet from a well pad.

Unfortunately, these are not isolated occurrences. Many wells are in close proximity to places where people farm, work, and live. To illustrate how many people may live close to oil and gas wells, NRDC performed an analysis of the proximity of residential land parcels to oil and gas wells in Garfield County, Colorado and San Juan County, New Mexico.[29] In Garfield County, where there are 7,298 oil and gas wells,[30] NRDC found that 1,179 residential land parcels (8.5 percent of the total) were within 500 meters of at least one well and 276 residential land parcels were within 500 meters of at least five wells.[31]

In San Juan County, New Mexico, NRDC found even more residential land parcels near oil and gas wells (excluding portions of the Navajo and Ute Mountain nations). There are 28,207 residential land parcels in San Juan County and 18,711 oil and gas wells.[32] NRDC determined that most residential land parcels in San Juan County lie within 500 meters of at least one well: 20,048 residential land parcels are near at least one well; 14,540 are near at least two wells; and 3,065 are near at least five wells.[33]

Garfield and San Juan Counties illustrate the proximity of oil and gas wells to homes in the Rocky Mountain region. Many people do not own all of the rights to oil and gas underlying their land, and therefore cannot stop drilling from happening – even on their own property.[34] The increase in the overall number of wells being drilled could exacerbate the risk of health and environmental problems faced by the thousands of people living in communities with these sources of dangerous pollution. In addition, the impacts on workers and their families, to whom they may bring home toxic materials on their clothing or their shoes, are unknown.

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[29] For each county, Geographic Information Systems (GIS) data were obtained in the form of shapefiles, defining the boundaries and indicating the types of individual land parcels within the counties. Databases providing well locations were converted to GIS shapefiles, and buffer circles of 500 meters (1,640 feet) were created around each well. The GIS software was then used to calculate, for each residential land parcel, how many of these well buffer circles overlapped the area of the given residential land parcel. The land parcel shapefiles do not indicate how many people take up residence in a given parcel, and so an estimate of the population living in proximity to oil and gas wells was not performed with these data. Nor did we determine where in the land parcel a residential dwelling may be located.

[30] Colorado Oil and Gas Information System (COGIS) Database, available at: http://www.oil-gas.state.co.us/.

[31] Garfield County Assessor's Office, "Parcels: Property Boundaries and Surface Land Ownership, Garfield County Colorado," CD, 2007.

[32] GO-TECH, New Mexico Petroleum Recovery Research Center, available at: http://octane.nmt.edu/gotech/Petroleum_Data/allwells.aspx.

[33] San Juan County Assessor's Office, "San Juan County, New Mexico, Parcel Data CD," (12 July 2007).

[34] For more information on "split estate" circumstances, see: http://www.earthworksaction.org/SplitEstate.cfm.

Chemicals involved in oil and gas production can harm health

Toxic substances can enter the environment and pose a threat to human health at a number of points in the oil and gas production process. To start, oil and gas contain substances that are known to be very hazardous to human health, and exploration and production operations can release hazardous substances found naturally beneath the earth's surface into the environment.[35] These substances include: benzene, toluene, ethylbenzene, and xylene (known as the "BTEX" chemicals);[36] radioactive materials;[37] hydrogen sulfide;[38] arsenic;[39] mercury;[40] and more. Among the illnesses these substances can cause are cancer, damage to the central nervous system, dizziness, lung diseases and breathing difficulties, headaches, nausea, eye and nose irritation, and more.

Without proper safety measures, and compliance with and enforcement of such measures, toxic substances can be released into the environment from active wells, abandoned wells, and other facilities used in the oil and gas production process. Wells can directly vent toxic materials into the air. Oil spills or leaking wells can introduce contaminants into soils or water. Liquid and solid waste products are often dumped in open pits in the ground or even sprayed into the air. Toxic fluids can seep into the groundwater when these pits are not properly lined, and volatile toxic materials in the pits can evaporate into the air. In addition, stormwater can carry these toxic materials to other locations. Produced water—the fluid that is pumped out of the well and separated from oil and gas—is often nothing like water we drink and can contain oil, chemical additives used in the drilling and production processes, heavy metals, radioactive material, and volatile organic compounds like benzene and toluene. Billions of gallons of produced water are generated each year.[41]

Naturally occurring radioactive substances, which cause a host of adverse health effects, are among the numerous highly toxic substances that may be released during oil and gas exploration and production. According to the U.S. Environmental Protection Agency (EPA), the oil and gas industry is estimated to generate about 34 million gallons of

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[35] Oil and Gas Accountability Project, "Pathways and Sources of Contamination," available at: http://www.earthworksaction.org/contaminantpathways.cfm.

[36] Williams, S.D., D.E. Ladd, and J.J. Farmer, "Fate and Transport of Petroleum Hydrocarbons in Soil and Ground Water at Big South Fork National River and Recreation Area, Tennessee and Kentucky, 2002-2003," U.S. Geological Survey, Scientific Investigations Report 2005-5104 (2006), p.7.

[37] Smith, K.P., "An Overview of Naturally Occurring Radioactive Materials (NORM) in the Petroleum Industry," Argonne National Laboratory, ANL/EAIS-7 (December 1992). For more information see Argonne National Laboratory's website on Naturally Occurring Radioactive Materials (NORM) at: http://www.ead.anl.gov/project/dsp_topicdetail.cfm?topicid=16.

[38] Illinois Department of Public Health, Fact Sheet, "Hydrogen Sulfide Gas." Available at: http://www.idph.state.il.us/envhealth/factsheets/hydrogensulfide.htm.

[39] Puri, B. K. and K.J. Irgolic, "Determination of Arsenic in Crude Petroleum and Liquid Hydrocarbons, "*Environmental Geochemistry and Health*," 11 (3,4) 95-99 (December 1989).

[40] Wilhelm, S.M. et al, "Mercury in Crude Oil Processed in the United States," *Environmental Science & Technology*, 41(13) 4509-4514, 2007.

[41] Veil, J.A. et al, "A White Paper Describing Produced Water from Production of Crude Oil, Natural Gas, and Coal Bed Methane," Argonne National Laboratory (January 2004). See also: EPA (October 2000), p.45. Available at: http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/oilgas.pdf.

radium-contaminated waste each year.[42] The levels of radioactivity can exceed those permitted to be discharged by nuclear power plants.[43]

The Emergency Planning and Community Right-to-Know Act was enacted in 1986 to establish a process for informing people of chemical hazards in their communities. Companies are required to report the locations and quantities of certain chemicals stored, released, or transferred.[44] Some of this information is made available to the public in an annual Toxics Release Inventory (TRI). Congress originally specified which industries were required to report to the TRI, but gave the EPA the authority to add or delete industries. The EPA was also given discretion to require reporting from any facility, based on criteria including the toxicity of the chemicals involved, proximity to other facilities that release a toxic chemical or to population centers, and the history of releases at the facility. While petroleum bulk stations, terminals, refining and related industries are required to report to the TRI, oil and gas exploration and production are not.[45]

According to the Oil and Gas Accountability Project, oil and gas companies generally assert that the composition of the chemical products they use is confidential and legally protected information. The industry has claimed that sufficient chemical ingredient information is provided in so-called Tier II reports (required by the Emergency Planning and Community Right-to-Know-Act) and Material Safety Data Sheets (MSDS) required by the Occupational Safety and Health Administration. Tier II reports, however, apply only to large volumes of stored chemicals and often list only one chemical (even if a product contains multiple ingredients) or are too general to identify specific chemicals. MSDS reports may state that the mixture of chemicals being stored or used is proprietary or may include an incomplete list of the chemicals in the product.[46]

Oil and gas drilling, production, and processing utilize hundreds of chemical additives, many of them toxic to human and animal health. The independent non-profit organization TEDX (The Endocrine Disruption Exchange) has analyzed publicly available documents citing the products and individual chemicals used in oil and natural

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[42] U.S. Environmental Protection Agency, "Oil and Gas Production Wastes." Available at: http://www.epa.gov/radiation/tenorm/oilandgas.html.

[43] U.S. Occupational Safety and Health Administration, "Health Hazard Information Bulletin: Potential Health Hazards Associated with Handling Pipe used in Oil and Gas Production" (26 January 1989). Available at: http://www.osha.gov/dts/hib/hib_data/hib19890126.html.

[44] There are some limitations on what information is available to the public through the TRI. For example, companies are required to report only a limited number of substances. In addition, reporting is only required for hazardous wastes that are discarded, not chemicals actually used in a business. There are also thresholds for reporting – if a facility does not release above the threshold, they do not need to report the release of hazardous chemicals. The Bush Administration raised this threshold in 2006, so that there will be less reporting of dangerous chemicals released into the environment. For more information about the TRI see: Right-to-Know Network, "About TRI Data," at: http://data.rtknet.org/tri/genhelp.php; and Scorecard, "The U.S. Toxic Release Inventory," at: http://www.scorecard.org/general/tri/tri_gen.html.

[45] U.S. EPA, "Standard Industrial Classification (SIC) Codes in TRI Reporting." Available at: http://www.epa.gov/tri/report/siccode.htm#original_industries.

[46] Oil and Gas Accountability Project, Letter to Colorado Department of Public Health and Environment and Colorado Oil and Gas Conservation Commission, 14 June 2006.

gas development and delivery. TEDX has researched the scientific literature on these substances and has documented the negative health effects associated with them.

The TEDX analysis of products used in oil and gas operations in four western states revealed more than 350 products containing hundreds of chemicals; more than 90 percent of these products contain chemicals with one or more adverse health effects. The health effects vary in type and severity, but the four most common effects experienced on immediate exposure are: skin, eye and sensory organ toxicity; respiratory problems; neurotoxicity; and gastrointestinal and liver damage. These substances may also cause health effects without immediate symptoms that progress slowly and are more difficult to diagnose in the short term, such as cardiovascular and reproductive disorders, or certain cancers. Because product ingredients are often listed as proprietary or are unspecified, TEDX makes no claim that its data are complete.[47]

In order to monitor for contamination and protect human health, it is essential to know exactly which chemicals are being used in individual oil and gas operations, along with their quantities and how they are combined.[48] Toxic chemicals may be used in many different combinations in various ways throughout the oil and gas production process, e.g., to facilitate drilling, inhibit corrosion, limit mineral scaling, eliminate bacteria, or fracture underground rock formations.

More research is needed on the impacts of oil and gas exploration and production on the health of nearby communities. A recent study reported a higher prevalence of rheumatic diseases, lupus, neurological symptoms, respiratory symptoms and cardiovascular problems in a New Mexico community built on top of a former oilfield with some nearby active wells when compared to a community with no known similar exposures.[49] Other studies have found increased cancer risks associated with living near oil or gas fields.[50] There have been additional studies on the occupational hazards from working in the industry, but it is shocking that an industrial activity present in 32 states—with more than

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[47] The Endocrine Disruption Exchange, "Analysis of Chemicals Used in Natural Gas Development and Delivery: Four Western United States," (March 2007). Available at: http://www.endocrinedisruption.com/. For more information on pollution outputs from oil and gas, see: U.S. Environmental Protection Agency, Office of Compliance, "Profile of the Oil and Gas Extraction Industry" (October, 2000), p. 73. Available at: http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/oilgas.pdf.

[48] Cottle, M.K.W. and T.L. Guidotti, "Process Chemicals in the Oil and Gas Industry: Potential Occupational Hazards," *Toxicology and Industrial Health* 6, No. 1 (1990), pp. 41-56. See also: Oil and Gas Accountability Project, Letter to Colorado Department of Public Health and Environment and Colorado Oil and Gas Conservation Commission (14 June 2006).

[49] Dahlgren, J. et al, "Cluster of systemic lupus erythematosus (SLE) associated with and oil field waste site: a cross sectional study," *Environmental Health* 6, No. 8 (22 February 2007). Available at: http://www.ehjournal.net/content/6/1/8.

[50] Hurtig, A.K. and M. San Sebastián, "Geographical differences in cancer incidence in the Amazon basin of Ecuador in relation to residence near oil fields," *International Journal of Epidemiology* 31 (2002), pp. 1021-1027; Argo, J., "Unhealthy effects of upstream oil and gas flaring: A report prepared for Save Our Seas and Shores (SOSS) for presentation before the Public Review Commission into effects of potential oil and gas exploration, drilling activities within licences 2364, 2365, 2368," IntrAmericas Centre for Environment and Health (18 January 2002).

half a million locations that could be emitting toxic materials to workers and nearby residents—has seen no comprehensive scientific monitoring or exposure assessment.

The amount of information available to the public about the substances contained in chemical additives used in specific oil and gas exploration and production is currently very limited. Companies should be required to provide information to the public regarding chemicals used in these activities that may pose a risk to the health of local communities.

Activities at oil and gas facilities can pollute our water

The oil and gas industry has exemptions from two major laws established to protect the nation's water—the Clean Water Act and the Safe Drinking Water Act. The Clean Water Act is our bedrock law that protects American rivers, streams, lakes, wetlands, and other waterways from pollution. These surface waters are often the source of drinking water for people and livestock. The Safe Drinking Water Act was enacted to protect public drinking water supplies as well as their sources.

Safe Drinking Water Act

"Hydraulic fracturing" is a method frequently used to increase a well's production of oil and gas. Hydraulic fracturing fluids, which often contain toxic chemicals, are injected underground into wells at high pressures to crack open an underground formation and allow oil and/or gas to flow more freely. More than 90 percent of oil and gas wells in the U.S. undergo fracturing, according to the Interstate Oil and Gas Compact Commission,[51] and these wells can be fractured more than once during their lifetime. While a portion of the injected fluids are transferred to aboveground disposal pits, some of them may remain underground.[52]

"Underground injection" is a method by which wastes and other fluids are injected into rock formations. The EPA classifies injection wells roughly in accordance with the type of fluid to be put into the ground. Oil and gas production wells are referred to as Class II wells. A 1989 investigation by the General Accounting Office into the effectiveness of safeguards in preventing contamination from injection wells found 23 cases of drinking water contaminated by the underground injection of oil and gas waste.[53]

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[51] Carrillo, Victor, "Testimony Submitted to the House Committee on Energy and Commerce" (10 February 2005). Available at: http://www.rrc.state.tx.us/commissioners/carrillo/press/energytestimony.html.

[52] Stahl, R.M. and P.E. Clark, "Fluid Loss During the Fracturing of Coalbed Methane Wells," The 1991 Coalbed Methane Symposium Proceedings, 269, 269 (The University of Alabama 1991), appearing at R6-565; and Palmer, I.D. et al, "Comparison between Gel-Fracture and Water-Fracture Stimulations in the Black Warrior Basin," The 1991 Coalbed Methane Symposium Proceedings, 233, 237, appearing at R6-564, as discussed in Legal Environmental Assistance Foundation v. United States Environmental Protection Agency (EPA), 118 F3d 1467 (11th Cir. 1997).

[53] U.S. General Accounting Office, "Drinking Water: Safeguards Are Not Preventing Contamination From Injected Oil and Gas Wastes," Washington, D.C., GAO/RCED-89-97 (July 1989).

The Safe Drinking Water Act (SDWA) was enacted to protect public drinking water supplies as well as their sources. SDWA authorizes health-based standards for drinking water to protect against both naturally-occurring and man-made contaminants.[54] SDWA's Underground Injection Control (UIC) program protects current and future underground sources of drinking water by regulating the injection of industrial, municipal, and other fluids into groundwater, including the siting, construction, operation, maintenance, monitoring, testing, and closing of underground injection sites. According to the EPA, there are more than 400,000 underground injection wells across the country used by agribusiness and the chemical and petroleum industries.[55] The oil and gas industry, however, is exempt from crucial provisions of the Safe Drinking Water Act intended to protect drinking water.

Hydraulic fracturing is a suspect in impaired or polluted drinking water in Alabama, Colorado, New Mexico, Virginia, West Virginia and Wyoming, where residents have reported changes in water quality or quantity following fracturing operations of gas wells.[56] In 1997, the U.S. Court of Appeals for the 11th Circuit ordered the EPA to regulate hydraulic fracturing under the SDWA after a hydraulic fracturing operation resulted in the contamination of a residential water well.[57] In 2004, however, the EPA issued a study on hydraulic fracturing which concluded that fracturing "poses little or no threat" to drinking water. This study was declared "scientifically unsound" by an EPA whistleblower.[58]

Commenting on the EPA study, the Montana Bureau of Mines and Geology stated:

> The study does not consider the fate of fracture-fluid residuals after decommission of the wells. When hydrostatic pressures recover sufficiently, the residuals will become mobilized in the Powder River Basin's fresh-water regimen that we have already demonstrated to be an active flow system. Twenty or fifty years from now these aquifers will be far more important than they are today, and to have left them contaminated with residuals from hydrofracturing would only be seen as a stupid and costly mistake. It can only be concluded that hydrofracturing in the Powder River Basin must be done only with fresh water, or not at all....[59]

An analysis by the Oil and Gas Accountability Project (OGAP) found that critical information was removed from the study, including a table with estimates for nine chemicals (including benzene, naphthalene, and ethylene glycol) that exceeded water

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[54] These health-based standards, however, are limited in application by economical and technical feasibility for a public water supply system.

[55] EPA, "What is the UIC Program" (February 2006). Available at: http://www.epa.gov/safewater/uic/whatis.html.

[56] Natural Resources Defense Council, "Hydraulic Fracturing of Coalbed Methane Wells: A Threat to Drinking Water" (January 2002). Available at: www.earthworksaction.org/pubs/200201_NRDC_HydrFrac_CBM.pdf.

[57] Legal Environmental Assistance Foundation v. United States Environmental Protection Agency (EPA), 118 F3d 1467 (11th Cir. 1997). This decision, however, was overridden by the Energy Policy Act of 2005.

[58] Letter from Weston Wilson to Senators Allard and Campbell and Representative DeGette (8 October 2004), available at: http://www.latimes.com/media/acrobat/2004-10/14647025.pdf.

[59] See letter from Wayne Van Voast, Montana Bureau of Mines and Geology, 16 October 2002, as discussed in Oil and Gas Accountability Project (April 2005), p. 31.

quality standards and the fact that hydraulic fracturing operations may involve the use of radioactive tracers.[60] According to OGAP, the final report admitted that: (1) many chemicals in hydraulic fracturing fluids are linked to human health effects; (2) in some cases, hydraulic fracturing fluids are injected directly into underground sources of drinking water; and (3) it is possible for hydraulic fracturing fluids, even if they are not injected into these sources of drinking water, to move into adjacent formations.

The EPA Inspector General found that mishandling of this study warranted an investigation. This investigation was put on hold, however, after Congress created a new loophole for industry in the Energy Policy Act of 2005 by exempting hydraulic fracturing by the oil and gas industry from the UIC program.[61]

In addition to the exemption for hydraulic fracturing, there is another aspect of the Safe Drinking Water Act that puts families with private water wells at risk. Because the SDWA protects drinking water by regulating water systems that serve 25 or more individuals or have at least 15 service connections, people who obtain their domestic water from private wells that supply water for less than 25 individuals are not protected by the law's provisions that require monitoring of drinking water quality or treatment of discovered contaminants.[62] While this exclusion of wells that serve less than 25 individuals is not limited to the oil and gas industry, that industry is positioned to greatly affect many private water wells and benefit from this provision. Rural Americans need protection from the risk of contamination of their water supply caused by industrial underground injection of materials that could release toxic substances.

In 1990, the last year the national census asked families about their water source, 30 percent of households in Montana, 20 percent of households in Wyoming, 15 percent of households in New Mexico and eight percent of households in Colorado obtained drinking water from private wells.[63]

Other SDWA exemptions for oil and gas production

- The Safe Drinking Water Act allows fines of up to $10,000 per day for certain violations of the law—unless the violation involves underground injection of fluids related to oil or gas production, in which case the maximum fine is only $5,000 per day.[64]

- The Underground Injection Control program classifies different types of wells. Class I wells are for injection of waste, including hazardous waste as defined in RCRA, and the materials must be injected deep into the ground beneath the

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[60] For an extensive analysis of the EPA report, see Oil and Gas Accountability Project (OGAP), "Our Drinking Water at Risk: What the EPA and the Oil and Gas Industry Don't Want Us to Know about Hydraulic Fracturing," (April 2005). Available at: http://www.earthworksaction.org/hydfracking.cfm.

[61] Energy Policy Act of 2005, §322.

[62] 42USC§300h(d)(2)

[63] Stone, A.W., "Ground Water for Household Water Supply in Rural America: Private Wells or Public Systems?" American Ground Water Trust (September 1998).

[64] 42USC§300h-2(c). In both cases the total maximum fine is $125,000.

lowest underground source of drinking water. Class I wells are strictly regulated and even banned in some places. Because many toxic materials associated with oil and gas operations are exempt from the hazardous materials section of RCRA, they do not have to be injected into Class I wells. Instead, they can be injected into Class II wells, which have different standards than Class I wells.[65]

- The EPA may not prescribe requirements which interfere with or impede underground injection related to certain oil or gas operations – "unless such requirements are essential to assure that underground sources of drinking water will not be endangered by such injection." This establishes a higher hurdle for regulating the oil and gas industry that does not apply to other industries.[66]

According to the Oil and Gas Accountability Project, studies show that alternatives to toxic hydraulic fracturing fluids exist that are effective, economical, and less hazardous. Industry has developed non-toxic fluids for offshore oil and gas operations, such as Schlumberger's GreenSlurry, which the company claims is "earth-friendly."[67] In addition, water can be an alternative. At a 2001 EPA expert panel meeting, it was stated that hydraulic fracturing can be performed using water without additives.[68] Two studies conducted in the field by Amoco Production Company found that gas wells fractured with water produced more gas and cost considerably less to fracture than wells fractured with a gel comprised of chemicals. Another study by the Gas Research Institute, Phillips Petroleum Company, Amax Oil and Gas, and Resource Enterprise also found that hydraulic fracturing using water was more effective than fracturing with a gel.[69]

Stormwater Pollution

Stormwater pollution from oil and gas operations causes real problems. Nevertheless, oil and gas companies have been excused from taking simple steps to prevent harm. The Clean Water Act is our bedrock law that protects American rivers, streams, lakes, wetlands, and other waterways from pollution. These waters are often the source of drinking water for people and livestock. The oil and gas industry, however, is exempt from several crucial provisions of the Clean Water Act and is thereby allowed to pollute our waters. Compliance with the law is not onerous and is required for almost every other American industry.

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[65] 42USC§300h-4. For more information on the difference between Class I and Class II wells, see the EPA's "What is the UIC Program" (February 2006), available at: http://www.epa.gov/safewater/uic/whatis.html.

[66] 42USC§300h(b) and 42USC§300h-1(c).

[67] http://www.slb.com/content/services/stimulation/fracturing/greenslurry.asp.

[68] See U.S. Environmental Protection Agency, "Summary of 10/31/01 Expert Panel Meeting on the Hydraulic Fracturing Study" (15 November 2001), p.6, as discussed in OGAP (April 2005), p. 55. Available at: http://www.earthworksaction.org/pubs/DrinkingWaterAtRisk.pdf.

[69] Logan, T.L., "Preliminary results of cooperative research efforts with Phillips Petroleum Company and Amax Oil and Gas Inc., San Juan Basin," Quarterly Review of Methane from Coal Seams Technology, 11(3&4):39-49 (April 1994), as discussed in Oil and Gas Accountability Project (April 2005), p. 56. Available at: http://www.earthworksaction.org/pubs/DrinkingWaterAtRisk.pdf. More information on non-toxic alternatives is available in Chapter 6 of OGAP's April, 2005 report.

During a rain or snowstorm, flowing water causes excessive soil erosion and picks up pollutants along the way—including toxic materials and sediment. Congress amended the Clean Water Act in 1987 to require a stormwater permit for large-scale ground disturbing and other activities that can increase runoff and the risk of water pollution. To obtain a permit, a company or municipality must have a Storm Water Pollution Prevention Plan outlining precautions the company will take to reduce the discharge of pollutants and impacts to receiving waters, and to eliminate illegal discharges.[70]

Unfortunately, the oil and gas industry now enjoys significant exemptions from the Clean Water Act's stormwater permit requirements. Since 1987, oil and gas "operations" have not needed a stormwater permit as long as their stormwater discharges were uncontaminated.[71] In the Energy Policy Act of 2005, Congress expanded this exemption to include the construction of new well pads and the accompanying new roads and pipelines.[72]

The EPA has interpreted this new 2005 exemption as allowing unlimited discharges of sediment into the nation's streams, even where those discharges contribute to a violation of state water quality standards.[73] Oil and gas companies have been excused from putting controls in place to address the erosion and sedimentation of waters even though mounting evidence—including the EPA's own analysis—shows that such sedimentation causes numerous problems for the fish, wildlife, and people that depend on clean water.

Sediment—even without toxic substances attached to it—causes water pollution. Sediment increases water treatment costs for cities and towns responsible for delivering drinking water to their residents. Municipalities across the Rocky Mountain region are becoming increasingly concerned about the impact of oil and gas development on their water supplies.[74] The EPA has reported that "siltation is the largest cause of impaired water quality in rivers."[75] According to the U.S. Government Accountability Office, sediment "clouds water, decreases photosynthetic activity; reduces the viability of aquatic plants and animals; and, ultimately, destroys organisms and their habitat."[76]

According to the EPA, "erosion rates from construction sites are much greater than from almost any other land use."[77] A 2005 modeling study of the Parachute Creek watershed

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[70] For more information, see Washington State Department of Ecology, "How is Stormwater Regulated?" (December 2006), available at: http://www.ecy.wa.gov/programs/wq/stormwater/municipal/how_regulated.html.

[71] 33USC§1342(l)(2).

[72] Energy Policy Act of 2005, §323.

[73] 71 Fed. Reg. 33628 (June 12, 2006).

[74] "City Takes Stand to Protect Watershed," *Raton Range* (22 August 2007).

[75] 64 Fed. Reg. 68722, 68724 (8 December 1999).

[76] U.S. Government Accountability Office, "Storm Water Pollution: Information Needed on the Implications of Permitting Oil and Gas Construction Activities," GAO-05-240 (February 2005), p.1.

[77] 64 Fed. Reg. at 68729.

in western Colorado estimated that oil and gas construction in a 15,000 acre area would almost double sediment into a creek that runs into the Colorado River.[78]

The City of Grand Junction, Colorado, has identified sedimentation due to surface runoff from areas disturbed by oil and gas activities as one of the main threats to its water supply.[79] According to Grand Junction officials, "sediment loading from gas well sites during storm events . . . has the potential to damage the infrastructure (reservoirs, canals, ditches and conveyance lines) used in Grand Junction's water supply."[80]

The Colorado River Water Conservation District has stated that "[t]he lower Colorado River within Colorado already exceeds water quality standards for selenium and is being monitored for sediment exceedances. A decrease in water quality could impair the beneficial use of water downstream of oil and gas development by requiring increased treatment by municipalities and possibly interfering with agricultural uses."[81]

Because of water pollution problems from oil and gas activities, the Colorado Water Quality Control Commission stepped in and required permits despite the federal exemption. Even with these permit requirements, problems are still occurring. In May, 2007, the Colorado Oil and Gas Conservation Commission cited one company with nine wells that had insufficient stormwater runoff protections. At each of these nine wells, runoff from melting snow had overflowed a pit and flooded the well pad. Oil was seen in pits that were flooded. At one of these wells, runoff flowed into a creek. At another, there were sacks of chemicals in the pit that overflowed and puddles of condensate and chemical residue were observed on the well pad.[82]

Developing a storm water pollution prevention plan is not complicated. It relies in large part on general permits and known approaches that have been available and utilized for years, such as installing vegetative ground cover, berms, temporary fabric barriers known as silt fences, or turnouts (ditches extended into a vegetated area to disperse and filter stormwater runoff). Information on these approaches is widely and easily available from state and federal agencies and other public sources including the International Stormwater Best Management Practices Database.[83]

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[78] "Parachute Creek Sediment Yield Study," Science Applications International Corporation (November, 2005).
[79] Statement of City of Grand Junction before the Colorado Water Quality Control Commission (5 December 2005), at 9.
[80] Ibid, at 7.
[81] Letter from Peter Fleming, General Counsel, Colorado River Water Conservation District to Stephen Johnson, EPA Administrator (17 February 2006).
[82] "Driller leaves mess behind: Nervous neighbors seek answers from oil, gas commission," *Rocky Mountain News*, 19 July 2007.
[83] "International Stormwater Best Management Practice (BMP) Database." Available at: http://www.bmpdatabase.org/

Additional Clean Water Act exemption for oil and gas production
The Clean Water Act definition of "pollutant" excludes materials injected into an oil or gas well to facilitate production, such as hydraulic fracturing fluid, or produced water re-injected into a well for disposal if approved by a state and that state determines that such injection or disposal will not result in the degradation of ground or surface water resources.[84]

The Oil Pollution Act, enacted in 1990 as an amendment to the Clean Water Act, is intended to respond to substantial threats of an oil spill into American waters, and to fund any necessary clean-up. The law applies to 'navigable waters,' which the Clean Water Act defines as "the waters of the United States, including the territorial seas." The use of this broad term by Congress previously led the Courts and administrative agencies to protect the various surface waters that make up our aquatic system, including ponds, streams, and wetlands. Two recent Supreme Court decisions, however, as well as ambiguous 'guidance' from the Bush Administration, have created significant uncertainty about the degree to which many water bodies remain protected today and have suggested that some link to an actually navigable water body is needed to trigger Clean Water Act protections. Many of the waters affected by oil and gas drilling in the West do not contain water all year and thus may enjoy less protection under the Clean Water Act. While this is not a loophole in the statute, it is potentially a major rollback of a much-needed statutory protection from the toxic substances associated with oil and gas production. Congress should clearly define the protected waters of the United States and delete the term "navigable" from the law.[85]

Toxic substnces associated with oil and gas can pollute our land
According to a survey conducted by the American Petroleum Institute, the total estimated volume of waste (including drilling waste, produced water, and other wastes) generated by oil and gas exploration and production operations was 18 billion barrels in 1995, the most recent year for which data are available.[86] Most of this waste is produced water and exempt from the Resource Conservation and Recovery Act (RCRA), the principal federal law designed to ensure safe management of hazardous waste and prevent new toxic waste sites. In addition to its significant exemption under RCRA, the oil and gas industry enjoys a major exemption under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the law known for creating the Superfund program.

While RCRA covers the management of a hazardous material from cradle to grave in order to avoid risks to human health and the environment, CERCLA provides a framework for clean-up of toxic materials that were never given a proper burial. In addition to its remedial aspect, the threat of CERCLA liability encourages strict

[84] 33USC§1362(6)(B).
[85] 33USC§2701-2761.
[86] American Petroleum Institute (API), "Overview of Exploration and Production Waste Volumes and Waste Management Practices in the United States," prepared for API by ICF Consulting (May 2000), p. 1. Available at: http://www.api.org/aboutoilgas/sectors/explore/waste-management.cfm.

compliance with RCRA's cradle to grave regulation of hazardous substances. The exemptions given to the oil and gas industry in RCRA and CERCLA limit the effectiveness of both laws in protecting communities from toxic materials.

RCRA

The oil and gas industry employs several methods for discarding its waste. Sometimes waste is buried in the ground or injected underground. Another common method is to dump it into open air pits, sometimes called evaporation pits, and allow any volatile organic compounds to evaporate into the air. In addition to potentially contaminating the air, this method may still leave waste in the pits that needs to be treated and/or disposed of.[87]

In 1995, over 90 percent of produced water was injected underground and most drilling wastes were disposed of on-site through evaporation or burial.[88] Waste may also be piled on the ground in a method called "land farming," which is intended to allow the soil—and sometimes added bacteria—to digest the pollutants through a technique called bioremediation. According to the Argonne National Laboratory: "Land farming is the controlled and repeated application of wastes to the soil surface, using microorganisms in the soil to naturally biodegrade hydrocarbon constituents, dilute and attenuate metals, and transform and assimilate waste constituents."[89]

Enacted in 1976 and significantly amended in 1980, RCRA sets standards for management of hazardous waste throughout its life cycle from cradle to grave—including generation, transportation, treatment, storage, and disposal—in order to prevent harm to human health and the environment. These standards are a powerful incentive for a company to minimize waste and pollution through methods such as changing the industrial process and using substitute materials that are not hazardous.

When Congress wrote RCRA, it gave the EPA the authority to determine whether the law should cover hazardous wastes associated with oil and gas exploration, development, or production.[90] The EPA sampled drilling fluids and produced water at field sites and found pollutants at levels that exceeded 100 times the agency's standards, including benzene, lead, arsenic and uranium. The agency found 62 documented cases where waste from oil or natural gas operations had endangered human health. The EPA also found

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[87] More information on various techniques used to treat and/or dispose of waste can be found at: "Oil and Gas Waste Disposal," available at: http://www.earthworksaction.org/oilgaswastedisposal.cfm and Argonne National Laboratory: http://web.ead.anl.gov/dwm/techdesc/index.cfm. For more details on the hazards to human health and the environment associated with disposal pits, see Oil and Gas Accountability Project, "Pit Pollution" (May 2004), at: http://www.earthworksaction.org/pubs/PitReport.pdf. Additional documentation of contamination across the country can be found in Doyle, J., "Crude Awakening - The Oil Mess in America: Wasting Energy, Jobs & The Environment," (Friends of the Earth 1994).

[88] API (May 2000), p. 2.

[89] Argonne National Laboratory, "Fact Sheet: Land Application, Drilling Waste Management Information System," available at: http://web.ead.anl.gov/dwm/techdesc/land/index.cfm.

[90] 42USC6921(b)(2).

that, while there were some federal and state regulations in place to control hazardous oil and gas wastes, there were gaps in some places as well as inadequate enforcement.[91]

EPA staff recommended that some hazardous oil and gas wastes be regulated, but were overruled by senior agency officials in 1988 when the EPA exempted wastes uniquely associated with oil and gas exploration and production from RCRA's hazardous waste provisions. At the time, the assistant to the EPA's then-Director of Hazardous Site Control told a reporter, "This is the first time that in the history of environmental regulation of hazardous wastes that the EPA has exempted a powerful industry from regulation for solely political reasons, despite a scientific determination of the hazardousness of the waste."[92] The majority of exploration and production wastes are covered by this exemption,[93] and the list of exempt wastes includes drilling fluids, produced water, hydrocarbons, hydraulic fracturing fluids, sludge from disposal pits, drilling muds, and sediment from the bottom of tanks.[94]

Disposal pits, evaporation ponds, misting systems, and land farms are sometimes adjacent to or within residential communities, and guidelines vary in each state. The federal statutory guidelines of RCRA are critical to ensure that, when methods such as these are used for waste management, treatment or disposal, they are employed in ways that are safe for the environment.

During May and June of 2007, the New Mexico Oil Conservation Division collected fluid and soil samples from 21 drilling/reserve pits, two production pits, and two closed-loop tanks. Testing found various hazardous substances including arsenic, lead, benzene, mercury, acetone, toluene, ethylbenzene, xylenes, and others at some of these locations.[95] In 2003, New Mexico state officials identified over 6,700 instances of pit-caused contamination since the mid-1980s, with over 550 resulting in groundwater contamination.[96]

Congress should close the RCRA loophole for hazardous wastes associated with oil and gas exploration, development, and production. This would provide a powerful incentive for companies to minimize waste, use non-toxic alternatives, recycle and reuse toxic

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[91] "Regulatory Determination for Oil and Gas and Geothermal Exploration, Development and Production Wastes," 53 Federal Register 25446 (6 July 1988). Ironically, the EPA stated that it would work to improve the Clean Water Act and Safe Drinking Water Act to fill some of these gaps in environmental protection. Since then, the Clean Water Act and Safe Drinking Water Act have actually been weakened by the creation of even more exemptions for the oil and gas industry.

[92] Dixon, J., "EPA Said To Bow To Political Pressure In Oil Wastes Ruling," *Associated Press*, 19 July 1988.

[93] Puder, M.G. and J. A. Veil, "Offsite Commercial Disposal of Oil and Gas Exploration and Production Waste: Availability, Options and Costs," Argonne National Laboratory, ANL/EVS/R-06/5 (August 2006), p. 74.

[94] U.S. Environmental Protection Agency, "Exemption of Oil and Gas Exploration and Production Wastes from Federal Hazardous Waste Regulations," p. 10.

[95] New Mexico Oil Conservation Division, "Analytical Results of OCD's Pit Sampling Program" (2007). Available at: http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental.

[96] Anderson, R.C., New Mexico Oil Conservation Division, Letter to Jennifer Goldman, Oil and Gas Accountability Project (23 October 2003).

substances where possible, and treat waste so that it is no longer toxic. When toxic waste remains, its disposal should minimize risk to the environment and human health. Protection of soil, water, and air is needed, as well as disclosure of hazardous materials and sampling and monitoring of the waste. The oil and gas exploration and production industry should not be allowed to follow a different standard than other industries.

Industry can comply with RCRA's hazardous waste provisions thanks to available technologies that minimize hazardous waste and, in some cases, are profitable for industry to adopt. For example, oil and gas companies have economical and effective alternatives available to open pits that would allow them to comply with requirements to control hazardous waste.

According to the Oil and Gas Accountability Project, one option called a closed-loop drilling fluid system which uses storage tanks and other equipment instead of pits is used by many companies, and comparisons have found these systems to be cost-effective and even profitable.[97] An industry study found that these systems "dramatically lower"[98] the volume of waste, and they also maximize the ability to reuse and recycle drilling fluids. Any waste that is created can easily be transported to an appropriate facility instead of dumped in an open pit. While initial costs may be higher, closed-loop drilling systems create savings in the long run. There is no need to construct a pit, drilling waste is virtually eliminated, water use can be reduced by as much as 80 percent, truck traffic -- which can often involve 50 truck trips each day on one road, seven days a week -- is reduced by as much as 75 percent, and tanks can be reused.

Comparisons have found closed-loop drilling can result in a cost savings of up to $180,000 per pit.[99]

CERCLA

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) was enacted in 1980 and amended in 1986. The reach of CERCLA is not limited to materials defined as waste under RCRA. Rather, it kicks in when there is a release—or a substantial threat of a release—of a substance hazardous to the environment. When the responsible parties cannot be identified or do not have the finances to pay for cleanup, CERCLA provides for Superfund to cover the costs.

The money for Superfund used to come from taxes on the oil and gas industry, as well as other industries that were the major sources of hazardous substance pollution. This tax was part of a political compromise where, in return for the oil and gas industry paying into the fund, the substances petroleum and natural gas were exempted from CERCLA.[100]

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[97] Oil and Gas Accountability Project, "Alternatives to Pits." Available at: http://www.earthworksaction.org/alternativestopits.cfm.

[98] Rogers, D., G. Fout and W.A. Piper, "New Innovative Process Allows Drilling Without Pits in New Mexico," 13th Annual International Petroleum Environmental Conference, (17-20 October 2006), page 5. Available at: http://ipec.utulsa.edu/Conf2006/Papers/Piper_5.pdf.

[99] Ibid.. pages 9-10. For more information, see: Rogers, D, et al, "Closed-loop drilling system: A viable alternative to reserve waste pits," *World Oil Magazine*, Vol. 227 No. 12 (December 2006).

[100] 42 U.S.C. §9601(14).

Although the Superfund tax expired in 1995, oil and gas have remained exempt from CERCLA's critical provisions for cleaning up hazardous sites. Clearly, the oil and gas industry got the better part of the deal.

The exemption for oil and gas created an umbrella of exemption for many substances toxic to human health, such as benzene, toluene, and xylenes, polycyclic aromatic hydrocarbons, arsenic, and mercury, when they occur naturally in oil or gas. CERCLA requires the EPA to compile a National Priorities List of sites, known as Superfund sites, where there is a known or threatened release of hazardous substances, in order to prioritize investigation and clean-up. The law also requires federal agencies to compile a priority list of toxic substances that are most commonly found at these contaminated sites nationwide and which are determined to pose the most significant potential threat to human health due to their known or suspected toxicity and potential for human exposure at these sites.[101] The latest list of toxic substances, from 2005, contains 275 different substances. When these substances naturally occur in oil and gas, however, CERCLA has been interpreted to exempt these substances from regulation.[102]

In order to ensure that contaminated sites are made safe as soon as feasible, CERCLA generally authorizes the government to clean the sites and pursue payment from potentially responsible parties. Private parties who incur costs to clean up hazardous substance spills and other sites governed by CERLCA can also, in many circumstances, pursue payment for clean up directly from the responsible parties. This avenue is not available for sites contaminated with oil and natural gas.

Given the growth in oil and gas drilling, the likelihood of oil or gas being released into the environment and threatening human health will also increase if there is no incentive, in the form of potential CERCLA liability, for industry to take preventive measures. If oil and natural gas were covered under CERCLA, companies could be held responsible for cleaning up oil or gas where it is being released into the environment and poses a threat to human health. The EPA could add sites contaminated by oil or gas to the National Priorities List and use federal funds, if any are available, to clean up the site while pursuing reimbursement from the primary responsible party. The threat of a CERCLA enforcement or cost-recovery action would provide a strong incentive to industry to not only clean up hazardous waste released in the past, but to change polluting practices. Regulators and people who are affected by oilfield pollution would have a powerful tool with which to pursue the polluter to pay for cleanup.

Closing the CERCLA oil and gas loophole need not require new technology or equipment for industry. There are economical measures to avoid leaks or uncontrolled disposal of oil and gas. Perhaps the most simple is regularly scheduled preventive maintenance on equipment, pumps, valves and engines.

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[101] More information on the priority list of toxic substances is available at: http://www.atsdr.cdc.gov/cercla/.

[102] McKay D.L., "RCRA's Oil field wastes exemption and CERCLA's petroleum exclusion: are they justified?" *Journal of Energy, Natural Resources, & Environmental Law*, 1995.

The Railroad Commission of Texas Oil and Gas Division reports that numerous companies have implemented preventive maintenance programs and found them to be "quite successful" at minimizing the occurrence of leaks and releases of materials into the environment. According to the Commission, preventive maintenance programs "have resulted in more efficient operations, reduced regulatory compliance concerns, reduced waste management costs, and reduced soil and/or ground water cleanup costs."

Other techniques recommended by the Commission to reduce leaks and spills include: remote monitoring of leaks; leak-proof storage containers; proper containment devices like drip pans; plating that reduces wear on valve stems and pipe threads; methods to avoid pipe corrosion; and impermeable wellhead sumps during drilling preparation. This last item collects crude oil leakage associated with workover operations, and in 2001 was reported to be available for $800.[103]

Unchecked emissions from oil and gas facilities can pollute our air

According to the State of Colorado, oil and gas production facilities can release more than 50 toxic air pollutants from a variety of sources, including "venting, dehydration, gas processing, compression, leaks from equipment (fugitive emissions), open pit waste ponds, and land application of volatile wastes."[104] There may be more than 26 individual sources of toxic air pollution associated with the production of oil and gas.[105]

Of the dangerous air emissions emitted from oil and gas production operations, chemicals referred to as volatile organic compounds (VOCs) are the largest group and typically evaporate easily into the air. They are primarily found in oil and gas itself, but are also a byproduct of fuel combustion to operate pumps and engines and are found in chemical additives used in oil and gas production. Benzene, toluene, ethylbenzene, xylene, hexane, acrolein, acetaldehyde, and formaldehyde are common VOCs released during oil and gas production.[106] VOCs pose health threats ranging from short-term illness to cancer or death. Other harmful VOCs that may be released include methanol,[107] triethylene glycol,[108] and a multitude of chemicals used in hydraulic fracturing.[109]

VOCs react with sunlight to form ground level ozone, or smog, which is known to be extremely hazardous to human health. Ozone can cause problems such as chest pain,

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[103] Railroad Commission of Texas, Oil and Gas Division (RCT), "Waste Minimization in the Oil Field" (July 2001). Available at: http://www.rrc.state.tx.us/divisions/og/key-programs/manual/wastemin.pdf.
[104] Colorado Department of Public Health and Environment (CDPHE), Air Pollution Control Division, "Hazardous Air Pollutants from oil and gas exploration and production" (October 2006). Available at: http://www.cdphe.state.co.us/ap/uat/atoilgas.pdf
[105] Russell, J. and A. Pollack, "Oil and Gas Emission Inventories for the Western States." Final Report Prepared for the Western Governors' Association by ENVIRON (27 December 2005). Available at: http://www.wrapair.org/forums/ssjf/documents/eictts/OilGas/WRAP_Oil&Gas_Final_Report.122805.pdf.
[106] CDPHE (October 2006).
[107] CDPHE, "Produced Water Evaporation Ponds, Emissions Estimates and Control Requirements" (31 May 2007).
[108] U.S. Environmental Protection Agency, Office of Compliance, "Profile of the Oil and Gas Extraction Industry" (October, 2000), p. 73. Available at: http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/oilgas.pdf.
[109] CDPHE (October 2006).

coughing, and throat irritation, and can worsen bronchitis, emphysema, and asthma. Recent studies have even linked ozone to premature mortality.[110] Several Rocky Mountain counties with oil and gas production are already violating federal standards for ozone or are at risk of doing so.

A 2005 Western Governors' Association report found that oil and gas production operations released more than 430,000 tons of VOCs in Colorado, New Mexico, Utah, Wyoming and Montana in 2002. It projected that oil and gas operations in these states will release more than 965,000 tons of VOCs annually by 2018, more than doubling in fifteen years.[111] This would equal the average amount of VOCs released annually from approximately 50,000 gas stations,[112] or the VOC pollution released by more than 25 million passenger cars each driven 12,500 miles.[113] More recent estimates by the same researchers indicate that the increase in VOC pollution between now and 2018 is likely to be substantially higher.[114]

The high level of VOC emissions means that oil and gas operations are one of the largest sources of harmful air pollution in the Rocky Mountain region. In Colorado, oil and gas operations are the largest source of the VOCs formaldehyde, benzene, acetaldehyde, acrolein, hexane, toluene, and xylenes among stationary sources in the state.[115] In Garfield County, Colorado, where oil and gas drilling has increased by 132 percent since 2004,[116] sampling and testing conducted by the county near oil and gas operations within its boundaries has detected fifteen VOCs at high levels.[117] Oil and gas operations release more VOCs than cars, trucks, and all other sources combined in Garfield County; 77 percent of all human-caused VOC emissions countywide and 95 percent of stationary VOC emissions countywide result from gas industry facilities.[118]

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[110] See generally: http://www.cleanairstandards.org/wp-content/uploads/2007/07/7-7-07-ozone-kills-fact-sheet.pdf.

[111] Russell and Pollack, "Oil and Gas Emission Inventories for the Western States," available at: http://www.wrapair.org/forums/ssjf/documents/eictts/OilGas/WRAP_Oil&Gas_Final_Report.122805.pdf.

[112] For gasoline service stations using stage II vapor recovery controls. See EPA Clearinghouse for Inventories and Emissions Factors, "Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources" (January 1995), available at: http://www.epa.gov/ttn/chief/ap42/ch05/final/c05s02.pdf.

[113] According to the EPA, a standard vehicle releases 77.1 pounds of VOCs annually, assuming an average annual throughput of one million gallons of gasoline at a rate of 3.1 lbs of VOCs/1,000 gallons of throughput. See EPA Consumer Information, "Average Annual Emissions and Fuel Consumption for Passenger Cars and Light Trucks" (April 2000). Available at: www.epa.gov/otaq/consumer/f00013.htm.

[114] Pollack, A., J. Russell, et al, "Ozone Precursors Emission Inventory for San Juan and Rio Arriba Counties, New Mexico," Final Report Prepared for New Mexico Environment Department (2006).

[115] Colorado Department of Health and Environment, Air Pollution Control Division. "Emission Inventory Data" (2004). Available at: http://emaps.dphe.state.co.us/APInv.

[116] Colorado Oil and Gas Conservation Commission, "Staff Report" (10 March 2007). Available at: http://oil-gas.state.co.us/Staff_Reports/2007/May%202007%20SR.pdf.

[117] "Status of Garfield County's Air Quality Monitoring Program," Power point presentation (6 April 2006), available at: http://www.garfield-county.com/docs/air_quality_study__4.6.06.ppt; and Frey, D., "Something in the air?" *Mountain Business Journal* (3-9 May 2006).

[118] McKibbin, M., "Air concerns rise with gas drilling," *The Daily Sentinel*, 22 October 2006.

In addition to VOCs, other toxic substances may be released into the air during oil and gas production, such as hydrochloric acid and hydrogen sulfide. Although oil and gas wells, condensate tanks, compressor stations, and waste sites have collectively become one of the largest sources of toxic air pollution in the Rocky Mountain region, they are largely unregulated under the Clean Air Act's program to control hazardous air pollutants.

First passed in 1970, and significantly amended in 1977 and again in 1990, the Clean Air Act limits emissions of nearly 190 toxic air pollutants known to be hazardous to human health by causing cancer, birth defects, reproductive problems, or other serious illnesses. Oil and gas production operations release many of these pollutants, such as benzene, toluene, and xylene. The Clean Air Act established two programs to control these pollutants: one for major sources of the pollutants and a second for smaller sources.

The program to control major sources of hazardous pollutants established limits called the National Emission Standards for Hazardous Air Pollutants ("NESHAPs").[119] To meet these standards, a company must install the maximum level of emission control of hazardous pollutants that is technically achievable by the cleanest facilities in an industry sector. Small sources of toxic air pollution that are under common control and are grouped together to perform similar functions in close proximity to each other are required to be added together and considered as one source of emissions. If the aggregate emissions of these small sources meet the thresholds for major sources, then they must comply with NESHAPs. This "aggregation requirement" is intended to protect the public from smaller sources that might seem individually harmless but cumulatively account for the release of large volumes of toxic substances into the air.

The Clean Air Act completely exempts oil and gas exploration and production activities from this aggregation requirement.[120] Even if wells, compressor stations, condensate tanks and disposal pits are adjacent to each other and owned by the same company, they do not have to comply with NESHAPs. For example, in Garfield County, Colorado, more than 30 tons of benzene are released into the air from 460 oil and gas wells.[121] This is nearly 20 times more benzene than is released by a giant industrial oil refinery in Denver, Colorado,[122] yet none of the toxic emissions from these oil and gas wells are subject to NESHAPs.

The Clean Air Act established a separate NESHAPs program to regulate individual small sources of toxic emissions. This program also has a substantial loophole for the oil and gas industry: oil and gas wells and their associated equipment are not on the list of small hazardous air pollutant sources and are therefore exempt from this provision.[123] While the EPA can regulate individual small oil and gas facilities like wells and pits if they are

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[119] NSHAPs apply to any source that emits or has the potential to emit ten tons or more of any single hazardous air pollutant, or 25 tons or more of any combination of hazardous air pollutants.
[120] 42USC§7412(n)(4)(A).
[121] CDPHE, "Emission Inventory Data" (2004).
[122] Ibid.
[123] 42USC§7412(n)(4)(B).

within a metropolitan area with a population greater than one million people, the Denver metropolitan area is the only place in the Rocky Mountain region that meets this condition, and the vast majority of small oil and gas operations in the region are outside this area. Oil and gas operations in the Rocky Mountain region, therefore, are virtually exempt from the provisions of the Clean Air Act intended to protect Americans from small sources of hazardous air pollutants.[124]

The effects are especially evident in the case of condensate storage tanks, which are typically associated with many natural gas wells.[125] In Colorado alone, there are more than 5,500 condensate storage tanks, some of which can release in excess of 100 tons of VOCs annually—including benzene and other hazardous air pollutants.[126] No condensate tanks at oil and gas wells in the state of Colorado are currently regulated under the hazardous air pollutant protections of the Clean Air Act.

Hydrogen Sulfide

Hydrogen sulfide released during oil and gas production has been associated with irritation to the eyes, nose, or throat, difficulty in breathing for asthmatics, nausea, vomiting, and headaches. Some studies suggest that even low exposure may be linked to poor attention span, poor memory, and impaired poor motor function Hydrogen sulfide can cause loss of consciousness and even death in extreme cases.[127] Estimates indicate that 15 to 25 percent of all natural gas wells in the United States may contain hydrogen sulfide.[128] It can be released by wellheads, pumps, piping, separation devices, storage tanks, and flaring. According to the EPA, "the potential for routine H_2S [hydrogen sulfide] emissions [at oil and gas wells] is significant."[129]

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[124] "Revision of December 2000 Regulatory Finding on the Emissions of Hazardous Air Pollutants From Electric Utility Steam Generating Units and the Removal of Coal- and Oil-Fired Electric Utility Steam Generating Units From the Section 112(c) List; Final Rule, " Federal Register 79:59 (29 March 2005). Available at: http://earth1.epa.gov/ttn/atw/utility/fr29mr05.pdf.

[125] Condensate is defined as liquid petroleum extracted with natural gas that condenses upon separation. See "National Emission Standards for Hazardous Air Pollutants: Oil and Natural Gas Production and Natural Gas Transmission and Storage; Final Rule," Federal Register 64:116 (17 June 1999), p. 32629. Available at: http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=1999_register&docid=fr17jn99-24.pdf.

[126] CDPHE, "Emission Inventory Data." 2004.

[127] National Library of Medicine, Hazardous Substances Data Bank (HSDB): http://toxnet.nlm.nih.gov; U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR), "ToxFAQs for Hydrogen Sulfide" (July 2006), available at: http://www.atsdr.cdc.gov/tfacts114.html. See also: Hirsch, A.R., "Hydrogen sulfide exposure without loss of consciousness: chronic effect in four cases," *Toxicology and Industrial Health* 18, No. 2 (March 2002), pp. 51-61; Kilburn, K.H., "Effects of Hydrogen Sulfide on Neurobehavioral Function," *Southern Medical Journal* 96, No. 7 (July 2003), pp. 639-646; Legator, M.S. et al, "Health effects from chronic low-level exposure to hydrogen sulfide," *Archives of Environmental Health* 56, No. 2 (March- April 2001), pp. 123-131.

[128] Dalrymple, D.A., Skinner, F.D. and Meserole, N.P., "Investigation of U.S. Natural Gas Reserve Demographics and Gas Treatment Processes," Gas Research Institute, Topical Report GRI-91/0019 (1991), pp. 3-1 to 3-13; Hugman, R.H., Springer, P.S. and Vidas, E.H., "Chemical Composition of Discovered and Undiscovered Natural Gas in the United States: 1993 update," Gas Research Institute, Topical Report GRI-93/0456 (1993), pp. 1-3.

[129] U.S. Environmental Protection Agency, Office of Compliance, "Profile of the Oil and Gas Extraction Industry" (October, 2000), p. 73. Available at:

The oil and gas industry has options for controlling hydrogen sulfide emissions. In May, 2007, Kerr-McGee Corporation agreed to install scrubbing systems on its facilities in eastern Utah to remove hydrogen sulfide.[130]

The Clean Air Act entirely exempts hydrogen sulfide from regulation as a hazardous air pollutant. Hydrogen sulfide was on the original list of hazardous air pollutants in the Clean Air Act, but was subsequently removed by Congress.[131] In 1997, the *Houston Chronicle* published a series of articles on the harms caused by hydrogen sulfide across the country.[132] One article quoted three former EPA officials explaining the removal of hydrogen sulfide from the list of hazardous air pollutants. One official described it as "a political deal" in which "[c]ompanies in Texas were very successful in removing [hydrogen sulfide] from the list because of its presence in the extraction of oil." Another official "couldn't believe they did that," and thought "it was a poor scientifically based decision, extremely poor," since "[w]e all know it is extremely deadly." "It's clearly known, from industrial exposures, that it's a very toxic gas," said another.[133]

Not only are pollution control methods widely available, they can yield a payback for industry, offsetting the capital, operation, and maintenance costs of installing controls -- sometimes significantly. As one study reported, "Each volume of gas not vented or leaked to the atmosphere is a volume of gas sold."[134] According to the EPA, paybacks to industry from some pollution control techniques can come within less than one year.[135] Depending on the technology and the facility, industry's return on investment can be as high as 1,321 percent.[136]

The oil and gas industry has many options available to control its toxic air emissions, and actually stands to benefit from readily available, cost-effective technologies. For example, a recent report in the *Journal of Petroleum Technology* discussed 25 cost-effective ways to reduce methane emissions, VOC emissions, and hazardous air pollutants at small to mid-size oil and gas operations.[137] The EPA's Natural Gas STAR Program has identified more than 89 different control options available to industry that

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http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/oilgas.pdf.

[130] U.S. v. Kerr-McGee Corp., Consent Decree (2007). Available at: http://www.epa.gov/compliance/resources/decrees/civil/caa/kerr-mcgee-cd.pdf.

[131] U.S. General Accounting Office,"Clean Air Act: EPA Should Improve the Management of Its Air Toxics Program: Report to Congressional Requesters" (June 2006). Available at: http://www.gao.gov/new.items/d06669.pdf.

[132] See Morris, J., "Brimstone Battles: A Houston Chronicle Special Report," *The Houston Chronicle.* Available at: http://www.chron.com/content/chronicle/nation/h2s/index.html.

[133] Morris, J., "Lost opportunity; EPA had its chance to regulate hydrogen sulfide," *The Houston Chronicle*, 9 November 1997.

[134] Fernandez, R. et al, "Cost-effective methane emissions reductions for small and midsize natural gas producers," *Journal of Petroleum Technology*, (June 2005). Available at: http://www.epa.gov/gasstar/pdf/CaseStudy.pdf.

[135] EPA, "Natural Gas STAR Program: Recommended Technologies and Practices," Available at: http://www.epa.gov/gasstar/techprac.htm.

[136] Fernandez et al (2005).

[137] Ibid.

involve the recovery of methane and the reduction of air pollution.[138] These options range from basic inspection and preventive maintenance to equipment upgrades, heightened monitoring, and even process changes.

A production engineering manager for Williams Production Company recently stated, "We realized we can make money with this instead of letting the gas escape to the air." Williams has estimated that it has recovered up to $10.00 for each dollar it invested in new equipment to drill and then separate gas from hydraulic fracturing fluids and sands.[139]

Solutions to oil and gas pollution problems are available and often economical

Based on widely available information sources, there are numerous methods to reduce and prevent toxic pollution—and in many cases they are profitable. To best protect human health and decrease environmental contamination, oil and gas exploration and production operations should start by utilizing the internationally accepted waste management hierarchy that is based on the concepts of reduce, reuse, and recycle.

The top priority for reducing pollution from oil and gas operations should be an effort to minimize the use of toxic substances through changes in technology or substituting non-toxic alternatives. Any toxic substances that must be used should be recycled or reused to the greatest extent possible, including products such as drilling fluids, produced water, and lube oil.

In the case of waste products that cannot reasonably be recycled or reused, the remaining waste should be treated to the greatest extent possible to reduce the risk to the environment and human health. Although disposal is the least preferred option for dealing with toxic materials—due to the likelihood of residual pollutants causing future environmental or health risks—when there is remaining waste, it should be disposed of safely.

Many methods to reduce or recycle toxic materials have been documented to produce significant cost savings after initial up-front costs. Some even help the industry to recover more of their product and increase revenue. A company in Alaska reusing drilling fluid reduced its costs from $7 million to $3.25 million.[140] Devon Energy spent $15,000 to capture methane emissions from a new well, instead of venting those emissions into the air, and sold the methane captured for $35,000. A Devon Energy official said, "It's a win-win for everybody." BP tested an air emissions control unit that cost $1.4 million but in two years led to income of more than $1.6 million.[141] Another

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[138] See EPA, Natural Gas STAR Program, "Recommended Technologies and Practices." Available at: http://www.epa.gov/gasstar/techprac.htm.

[139] McKibbin, Mike, "Gas producer: Emissions cut by about 90 percent," *The Daily Sentinel* (12 September 2007).

[140] U.S. Environmental Protection Agency (EPA), Office of Compliance, "Profile of the Oil and Gas Extraction Industry" (October, 2000), p. 73. Available at: http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/oilgas.pdf.

[141] Bleizeffer, Dustin, "Capturing Greenhouse Gas Pays Big," *Casper Star-Tribune*, (31 August 2005)

company experienced annual savings of $272,000 and paid off initial capital costs in less than four years after starting to reclaim crude oil from sludge.[142]

Devon Energy spent $15,000 to capture methane emissions from a new well, instead of venting those emissions into the air, and sold the methane captured for $35,000. A Devon Energy official said, "It's a win-win for everybody."

In instances when pollution prevention technology does not pay for itself, the industry can afford to comply with our laws. For the second quarter of 2007, 22 major energy companies reported overall net income of $30.7 billion,[143] and net income was $5.5 billion for 38 independent energy companies.[144] Since 1990, the oil and gas industry has ranked in the top 20 industries for total campaign giving to federal candidates and political parties.[145] Surely it also has enough money to protect human health and our environment.

Public sources provide information on hundreds of ways reported to utilize the waste management hierarchy and minimize the potential for toxic substances to be released into the environment. Some of the approaches recommended by these sources include:

- planning and design of site construction and equipment to minimize waste, such as minimizing the number of wells;
- using less toxic product alternatives, such as low-toxicity glycols, lead-free and biodegradable pipe dope, chrome-free lignosulfonates, or non-toxic solvents;
- modifying equipment, such as adding lubricating oil purification units or vapor recovery systems in condensate tanks;
- modifying processes, such as implementing downhole separation of produced water, reclaiming water, or increasing efficiency of drilling fluid use; and
- implementing preventive maintenance, alarms, and monitoring.

Information on the universe of approaches and technologies for reducing pollution is publicly available and easily accessible. Some examples include:

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[142] EPA (October, 2000), p. 77.
[143] U.S. Energy Information Administration, "Financial News for Major Energy Companies" (Second Quarter 2007). Available at: http://www.eia.doe.gov/emeu/perfpro/news_m/index.html.
[144] U.S. Energy Information Administration, "Financial News for Independent Energy Companies" (Second Quarter 2007). Available at: http://www.eia.doe.gov/emeu/perfpro/news_i/index.html.
[145] Center for Responsive Politics, "Oil and Gas: Long-term Contribution Trends," Available at: http://www.opensecrets.org/industries/indus.aps?Ind=E01.

- A 2000 EPA report on oil and gas extraction discusses dozens of pollution prevention opportunities that companies have used to "improve efficiency and increase profits while at the same time minimizing environmental impacts."[146]

- The website of the U.S. Export-Import Bank encourages several ways to reduce environmental contamination such as minimizing hazardous air pollutants to the extent possible, using closed loop systems, minimizing or avoiding toxic additives to drilling fluids, using the least toxic alternative chemicals, actively monitoring hydrogen sulfide wherever it may accumulate, and more.[147]

- "Waste Minimization in the Oilfield," published by the Oil and Gas Division of the Railroad Commission of Texas in 2001, offers more than 100 ways for companies to minimize wastes, including those currently exempt from RCRA.[148]

- The Illinois Environmental Protection Agency website lists close to 100 best management practices for oil exploration and extraction to reduce and prevent pollution.[149]

- Argonne National Laboratory offers an on-line Drilling Waste Management Technology Identification Module to help companies identify drilling waste management strategies for a given well location and circumstances. The module uses a hierarchy based on level of impact to encourage waste management options with the lowest environmental impacts.[150]

- Research is ongoing; the Integrated Petroleum Environmental Consortium is a joint effort of four research universities established to develop cost-effective technologies and tools to comply with environmental regulations in the industry.[151] For more than ten years it has held an annual conference where research papers on new methods to solve environmental problems are presented.

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[146] EPA (October, 2000), pp. 65-79.
[147] Export-Import Bank of the United States, "Environmental Guidelines: Oil & Gas Development" (29 August 2007). Available at: http://www.exim.gov/products/policies/environment/envtbl5.cfm.
[148] RCT (July 2001).
[149] Illinois EPA, Office of Pollution Prevention, "Best Management Practices for Oil Exploration and Extraction." Available at: http://www.epa.state.il.us/p2/fact-sheets/bmp-oil-exploration.html. For additional information on solutions, see Oil and Gas Accountability Project., "Resources on 'Best' or Alternative Technologies and Practices," in *Oil and Gas at Your Door?* (2005), pp: V-3 and V-4.
[150] See Argonne National Laboratory, "Drilling Waste Management Technology Identification Module," available at: http://web.ead.anl.gov/dwm/tim/index.cfm.
[151] Consortium members are the University of Tulsa, the University of Oklahoma, Oklahoma State University, and the University of Arkansas. See the Integrated Petroleum Environmental Consortium website, available at: http://ipec.utulsa.edu.

Conclusion and recommendations

Oil and gas operations that can emit hazardous substances into the environment are booming in the Rocky Mountain region, many of them closer and closer to where people live and where children go to school in western communities. Although this report focuses on oil and gas operations in the Rocky Mountain region, statutory exemptions allow toxic releases into the environment from oil and gas operations throughout the country, as well as offshore.

The network of interrelated exemptions from environmental regulation given to oil and gas companies is a 'regulatory void' unique to the industry.[152] And while some state laws regulate the hazards of oil and gas operations, these laws vary widely. The health of Americans should not be harmed—or even put at risk—by toxic contamination that can be readily and economically controlled; modernizing the regulation of oil and gas exploration and production is long past due.

At a minimum, oil and gas exploration and production should be subject to the same environmental measures with which other industries must comply to adequately protect human health and the environment. Technologies are readily and often economically available to reduce environmental contamination and to protect the health of communities across the nation. The free pass to pollute given to the oil and gas industry is a privilege that is unjustifiable when weighed against the potential harm that will come from continued unchecked pollution by oil and gas companies. The time for Congress to step into the void is long overdue.

Recommendations

Close the loopholes for the oil and gas industry

Close all the loopholes in federal environmental laws that allow oil and gas exploration and production to pollute our environment and jeopardize the health of communities.

- **Ensure the Public's Right-to-Know**
    1. Require oil and gas exploration and production companies to report to the Toxic Release Inventory to provide information to the public regarding chemicals that may pose a risk to the health of local communities.

- **Protect Underground Sources of Drinking Water**
    1. Subject all hydraulic fracturing by the oil and gas industry to the Underground Injection Control program of the Safe Drinking Water Act;
    2. Increase daily fines for violations by the oil and gas industry to equal those for other industries;
    3. Require that the underground injection of materials associated with the oil and gas industry that meet RCRA's definition of hazardous waste meet the standards of Class I injection.

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[152] Cox, J. R., "Revisiting RCRA's Oilfield Waste Exemption as to Certain Hazardous Oilfield Exploration and Production Wastes," *Villanova Environmental Law Journal* 14 (2003).

- **Protect American Waters**
    1. Delete the term "navigable" from the Clean Water Act;
    2. Require stormwater permits for all oil and gas industry activities;
    3. Apply the Clean Water Act definition of "pollutant" to all materials used in oil and gas operations.

- **Protect the Air**
    1. Require aggregation of the emissions of oil and gas exploration and production activities under the National Emission Standards for Hazardous Air Pollutants;
    2. Include oil and gas wells and their associated equipment on the list of small hazardous air pollutant sources wherever they are located;
    3. Add hydrogen sulfide to the list of hazardous air pollutants.

- **Protect the Land**
    1. Include all toxic wastes associated with oil and gas exploration and production under RCRA's cradle to grave hazardous waste provisions;
    2. Include oil and gas under the Superfund law—CERCLA.

Monitoring and Health Assessment

While the science on the hazards and toxicity of many of these substances is long established, the exposure from living near oil or gas operations must be further studied, as outlined below. The lack of such studies, however, should not dissuade Congress from taking immediate legislative action as discussed above.[153]

- **Ensure extensive independent environmental monitoring** of air, water, and soil that could be affected by oil and gas exploration and production sites. Monitoring includes recording observations of existing conditions and collecting various data and samples of air, water, soil and more to measure changes in the environment and contamination.

- **Assess the toxic exposures of families living near oil and gas exploration and production sites.** An exposure assessment attempts to determine who is being exposed to a particular substance or chemical, how the exposure occurs (through breathing air, drinking water, skin contact or any other routes), how much exposure is occurring, and the frequency and duration of exposure. The results of an exposure assessment are often considered in coordination with a hazard assessment of the chemical. Exposure assessments based on monitoring data are important to provide real-world data for risk assessment.[154]

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[153] The precautionary principle calls for precautionary measures when an activity raises threats of harm to human health or the environment, even if some causal relationships are not conclusively established.

[154] EPA, "What is An Exposure Assessment?" Available at: http://www.epa.gov/opptintr/exposure/pubs/exposurep.htm.

- **Identify the toxic effects of the typical chemical mixtures found at oil and gas sites.** In order to fully analyze all risks, federal agencies, independent researchers, and the public must have comprehensive information on the chemicals used by industry. This information is combined with the results of monitoring and exposure assessment to help develop a full profile of the risks to human health.

- **Utilize the best available methods to monitor and track health outcomes in communities and in workers exposed to oil and gas exploration and production activities** in comparison with similar but unexposed groups. Tracking the rates of medical problems along with information on geography, lifestyle, occupation, and other indicators will provide essential information pertaining to whether chemical contamination may be contributing to illness in workers and nearby residents and to monitoring the overall health impact of living near oil and gas activities.

- **Conduct health impact assessments for oil and gas activities on public land.** Under the National Environmental Policy Act (NEPA), an Environmental Impact Statement (EIS) is required for federal projects likely to have significant environmental effects. Environmental Impact Statements analyzing the impacts of oil and gas exploration and production on federal lands should include a comprehensive assessment of potential human health impacts.