Literature Review
of

Agency for Toxic Substances and Disease Registry (ATSDR) Assessments Related to the Oil and Gas Industry

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EXECUTIVE SUMMARY

A literature search of ATSDR documents with sources of contamination from oil and gas production/refinery/manufacturing was prepared. This search is limited by the search terms used. It may not be inclusive of all ATSDR documents that address this subject. Documents reviewed include Health Consults, Health Assessments, and Health Letters

The Agency for Toxic Substances and Disease Registry (ATSDR) is directed by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 to perform specific public health activities associated with actual or potential exposure to hazardous substances released into the environment. The agency's highest priority is protection of public health. Two major tools in accomplishing their priority are Health Assessments and Health Consultations.[1]

A summary of chemicals of concern, exposure pathways, conclusions and recommendations are provided.
A list of other ATSDR documents that were reviewed and excluded because they did not appear to be related are provided at the end of the document

Sites were selected based on their source and type of contaminant, route of exposure and completed pathway of exposure. Of the 29 sites reviewed, one site was an urgent public health hazard because of combustible gas produced during oil and gas exploration. Four sites were considered to be of public health concern based on environmental media collected. Of these four sites, two were refineries and the threat was due to site access. The remaining public health concern sites were a waste disposal site and a refinery with air being the pathway of concern.(See Summary Table in Attachments).

Review of these site assessments indicate the following:

1. Assessment of health risk is highly site-specific and is based on receptor populations , route of exposure, and completed pathways of exposure.
2. The mere presence of a chemical even when it has been released into the environment does not automatically translate into a health risk.
3. Many of the assessments were written in response to citizen concern of exposure to oil and gas chemicals being the cause of their chronic illness or disease, this was not evidenced in the reports reviewed.

BACKGROUND

A Health Assessment *characterizes the nature and extent of hazards and identifies communities where public health actions are needed.* **The Health Consultation** *is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material.*

Documents were reviewed for the following:

1. Source of contamination
2. Environmental media of concern
3. Human past, present, and current routes of exposure
4. Completed human exposure pathways
5. Chemicals of concern

ATSDR includes the following as elements of an exposure pathway

1. Source of contamination
2. Transport through environmental media
3. A point of exposure
4. Route of human exposure
5. Exposed population

ATSDR characterizes exposure pathways as follows:

Completed Exposure Pathway
If it is certain that people are exposed to contaminated media. Completed exposure pathways must include all five elements and indicate that human exposure to the contaminant has occurred, is occurring, or will occur.

Potential Exposure Pathway
Those in which at least one of the five elements is missing but could exist. Potential exposure pathways indicate that exposure to a contaminant could have occurred, could be occurring, or could occur in the future. Potential exposure pathways are those that have

1. Documented exposure, but there is insufficient information available to determine whether the environmental medium is contaminated or
2. No one is exposed to contaminated media

Eliminated Exposure Pathway
Is one in which at least one of the five elements is missing and will never be present. From a human health perspective, pathways can be eliminated from further consideration if ATSDR is able to show that

1. An environmental medium is not contaminated
2. No one is exposed to contaminated media

ATSDR characterizes impact to public health as follows:

Urgent Public Health Hazard	Site poses an urgent public health hazard as the result of short-term exposures to site-related contaminants
Public Health Hazard	Site poses a public health hazard as the result of long-term exposures to site-related contaminants.
Indeterminate Public Health Hazard	Information is missing for the site
No Apparent Public Health Hazard	Human exposure to site-related contaminants is occurring or has occurred in the past, but the exposure is below a level of health hazard.

SUMMARY OF DOCUMENTS REVIEWED

[2]A & F Materials Reclaiming Inc. – Health Consult

Site was an industrial waste sludge and spent oil reclamation facility. It is located within 100 feet of residents. Citizens had complaints about the facility due to odors and spills. Their investigation revealed operating permit violations, including un permitted waste discharge onto the soil and drainage pathways leading to a river. The waste materials handled at the facility consisted of sludges, oils, acids, and aqueous wastes.

Residents expressed concerns over possible adverse health effects and the high incidence of cancer deaths in the immediate area of the site. Interviews with local residents revealed complaints about symptoms which might be associated with acute respiratory disorders and emotional stress conditions being elevated within close proximity to the site during the years the facility operated or sat idle. However, no other unusual pattern of chronic or persistent disease, including cancer, emerged from two previous state studies as well as this health assessment.

*Concluded that the air sampling was limited but the site posed **No Apparent Health Threat**.*

[3]Amoco Oil Company – Sugar Creek Missouri – Health Assessment

Amoco conducted petroleum refinery from 1904 to 1982 on 500 acres on both sides of Sugar Creek. Crude oil was brought in by underground pipeline to produce gasoline, distillate fuels, jet fuels, residual fuels, asphalt, petroleum coke, liquefied petroleum gases, sulfur and polymers. In 1970 they began using above ground pipelines. Operational activities included land farming, sludge pits, sludge lagoons and sludge ponds. Investigations have found 11 on-site areas of benzene contamination in a 68-acre area, 13 on-site free product plumes on 73 acres and three off-site areas of contamination.

Citizens believe the incidences of various types of cancers, Alzheimer's, multiple sclerosis, and nervous disorders are directly related to contaminants migrating from the site. The Norledge area, adjacent to the southern boundary of the site, was described as an area at particular risk for off-site migration of contaminants. The Norledge area of Sugar Creek encompasses approximately 100 residences.

*Site was determined to pose **No Public Health Hazard**.*

[4]Amoco Oil Company – Sugar Creek Missouri - Surface Water and Sediment – Health Consult

Purpose of document was to evaluate the public health significance of surface water and sediment sampling data from areas on and near a former Amoco Oil Company petroleum refinery. Residents of the Norledge neighborhood of Sugar Creek, an area adjacent to the southern boundary of the site, are concerned that off-site migration of contaminants could be adversely affecting their health and environment. The Norledge area of Sugar Creek comprises approximately 130 residences. In July 1999, MDNR collected surface water and sediment data from areas within the surface water drainage routes from the former refinery site.

*Exposures were determined to present **No Apparent Public Health Hazard**.*

[5]Amoco Oil Company – Sugar Creek Missouri - Air Exposure – Health Consult

ATSDR received a request from Amoco to review indoor air sampling results from eight Amoco-owned homes in the Norledge area. An Amoco contractor conducted the air sampling event.
An investigation of chronic exposure to benzene and other contaminants in indoor air was conducted.

*Concluded that levels of chemicals detected at chronic exposures **would not be expected to produce adverse health.***

[6]Blanchard Lease Property – Health Consult Letter

ATSDR received a request to evaluate potential soil mercury exposures at the Blanchard Lease Property (BLP) site. The site is involved in oil and gas production operations.

*Concluded that there was **No Apparent Public Health Hazard** related to levels of mercury found in the soil and no potential or completed exposure pathways at the site due to restricted access to site and remediated areas.*

[7]Brio Refining, Inc. & Dixie Oil Processor, Inc. – Health Assessment

The site has approximately 23 unlined storage pits used during the period 1957 to 1982. From 1957 to 1969, the major industrial operations included regeneration of copper catalysts, recovery of petrochemicals from styrene tars and recovery of chemicals from vinyl chloride still bottoms and reclamation of petrochemicals from various chemical feedstock. Because of a lack of processing capacity, styrene tars were stored in large impoundments. The recovery plant was converted to a crude oil topping unit for jet fuel production in 1978. Different fuels were produced by distillation of crude oil. The former storage pits on the Brio site contain numerous chemicals and organic solvents. Among the chemicals that occurred most frequently and at the highest concentrations were chlorinated VOCs such as 1,2-dichloroethane, 1,1,2-trichloroethane, trans-1,2-dichloroethylene, and vinyl chloride. The shallow aquifers are heavily contaminated with SVOCs. Analyses of air and soil samples did not reveal significant contamination with site-related chemicals.

*Concluded that the site poses **No Significant Health Risk**. It is of **Potential Health Concern** because of the risk to human health resulting from possible exposure to hazardous substances at concentrations that may result in adverse health effects. Human exposure to VOCs, PAHs, and metals may occur by ingestion, dermal absorption, and inhalation.*

[8]Cady Road – Ohio – Health Consultation

A resident of Cady Road petitioned (ATSDR) to determine if exposure to possible contaminants in private well water and indoor air could adversely affect the health of area residents. The Cady Road community is made up of approximately 25 homes or 50 people that use private well water. Between 1954 and 1958, many of the current oil and gas wells were drilled about 3000 feet deep at varying elevations along Cady Road for oil and gas extraction from geologic reservoirs. Currently, there are approximately 8 oil and gas production wells and one former (plugged) saltwater injection well about 1/4 - 1/2 mile from the nearest private water well.
It has been determined by the Ohio Department of Natural Resources (ODNR) that natural oil and gas deposits may impact shallow groundwater due to the unique geology of the area. A fault line intersects Cady Road and has caused a major fracture in the shale underneath the aquifer used for drinking water by private well owners. This fracture could allow the migration of underlying oil and gas deposits to upper water-bearing zones. Some residents are concerned that past or present activities from nearby oil and gas extraction wells and a brine (saltwater) injection well in the area have affected their water quality.

Concluded the following

1. *Combustible gases, including methane, in the private well water present an **Urgent Public Health Hazard**. The levels of gases measured near two outdoor wellheads were at explosive levels. These levels could also build up in enclosed spaces, posing a fire and explosion hazard indoors.*
2. *Hydrogen sulfide in the private well water on Cady Road presents a **Public Health Hazard**. The levels measured in some homes on Cady Road could cause adverse health effects, especially in residents with a pre-existing condition such as asthma or other respiratory conditions.*
3. *The levels of sodium measured in the water may be harmful to residents with elevated blood pressure or to residents that require a sodium-restricted diet. The metals and inorganic ions levels measured in water are **Not of Health Concern.***
4. *Benzene and other VOCs in indoor air at the levels measured are **Not a Public Health Hazard**.*
5. *The gases and organic compounds measured in the drinking water are Not an Ingestion Hazard.*
6. *Residential exposure is through the use of the water for drinking, bathing, and other household uses.*

[9]East Mount Groundwater Wells - Houston – Health Consultation

This document was written to evaluate whether the barium and manganese in a citizens drinking water could be responsible for depression, obsessive-compulsive disorder (OCD), and seizures in family members who grew up drinking the water. Shallow groundwater in this area reportedly has been affected by brine from oil and gas development operations.

*Concluded that barium and manganese were **not detected at levels that would be likely to result in adverse health effects**. A review of the literature did not find any association between barium or manganese exposure and the development of depression, OCD, or seizures.*

[10]Former Del Roc Oil Refinery – Health Consult

The former oil refinery site has been redeveloped for residential homes. This document evaluated the public health implications of exposure to environmental contaminants. The refinery was in operation from 1955 through 1957 and processed crude oil. Citizens were concerned about the potential for adverse health effects from living on a former oil refinery. Community members were also concerned about a possible excess of cancer and birth defects.

*Concluded that direct contact with media at the former oil refinery poses **No Apparent Public Health Hazard** for residents living in this area.*

- The vapor intrusion pathway is an ***indeterminate public health*** hazard because of the estimated values of contaminants, the unknown attenuation factors, and the lack of soil gas data. The number of infants and fetuses with any birth defects was lower among residents of this area compared to Texas overall.
- The Texas Cancer Registry found the occurrence of *specific cancers* in the area to be *within expected ranges* based upon state cancer rates.
- The Texas Birth Defects Registry found no elevations in the occurrence of birth defects compared to Texas overall.

[11]Gulf Coast Vacuum Services – Abbeville Louisiana

The site is a 25.56-acre parcel of land which was used for the storage and formulation of mud for barium sulfate-based oil field drilling. Waste oils and diesel fuel reportedly spilled onto the surface soils at the site. Residents within a 3-mile radius of the site obtain drinking water from private wells, which also provide a water source for irrigation. There is no evidence of groundwater migration from the monitoring wells to the domestic water sources. Long-term groundwater monitoring at the site currently shows no evidence of such migration.

*The contaminants detected at the site pose **No Public Health Hazard.***

[12]Highway 71/72 Refinery, Louisiana – Health Assessment

Site is a former refinery that has been developed for residential and commercial use. A tar material has been found several feet underground during on-site construction. The tar material has been reported in residential areas, apartment complexes, and hotel parking lots. The tar material is high in PAHs and lead. Contaminants found in soil gas were found in indoor air samples. The groundwater is contaminated with PAHs and volatile organic compounds. The residents on site do not obtain their drinking water from the groundwater. The public water which is supplied from the Red River is a safe water supply.

*Concluded that the site **Is A Public Health Hazard.***

1) Lead in surface soil poses future potential pathway.
2) Benzene concentrations reported in indoor air (1990-1994) may pose a health threat if the short-term benzene measurements are representative of daily exposures.
3) Methane concentrations measured indoors and in soil gas may pose a potential explosion hazard.

[13]Holly Street Power Plant, Texas, Health Assessment

The site is a natural gas/oil-fired steam electric generating facility. Residents of the East Austin neighborhood surrounding the facility have expressed concern about potential adverse health effects associated with the plant. Air quality, noise, and chemical hazards were of concern. There have been numerous spills or upsets associated with the Holly Street Power Plant. An air dispersion model was used to predict potential air quality impacts from the facility. The model predicted that when natural gas was used as fuel, the predicted ambient air quality impacts are such that they would not pose a threat to public health.

*Concluded that currently, the Holly Street Power Plant poses **No Apparent Public Health Hazard**.*

[14]Krouts Creek Site – West Virginia

Twenty-two thousand (22,000) gallons of Coal Tar Light Oil spilled from a railroad car.
The CTLO contained 68% benzene, 24% toluene, 7% xylene, and 1% other chemicals. The named chemicals in the "other" category were ethylbenzene, trimethylbenzene, styrene, and naphthalene.

*Exposure through vapor intrusion is **No Apparent Public Health Hazard.***

[15]Leffington Road Pipeline Spill Ohio

Crude oil was released into an intermittent stream and residual petroleum remains in stream sediments and soils underlying an adjacent wetlands area in 1989 from a pipeline spill. Consult focuses on sampling of residential wells conducted in 1997.

*Recommended that an alternate source of drinking water be used for one of the private wells due to elevated levels of metals and turbid water (suggested that they are coming from deteriorating well casing). Other wells were determined to **Not pose a Health Hazard** to residents.*

[16]Matheson Gas – Health Consult

This document reviews the historical and environmental data available to determine if a public health threat exists at the Matheson Gas Products, Inc. The site was an oil refinery from 1991 – 1946. While the property was an oil refinery, the refinery waste was deposited in at least one old quarry pit. An on-site pit, measuring about 125 feet by 30 feet with an unknown depth, contains viscous, petroleum, tar-like waste. The facility has had no compliance problems in the past but has a history of odor complaints from area residents. Local residents have complained of odors coming from the open surface of the tar pit and from an oil-like substance reportedly present in residential water supplies.

Currently, no hazardous waste is generated at Matheson Gas, but contaminants from the past refinery activities exist at the site. Past, current, and future completed exposure pathways are present for contaminated surface soil and sediment at several on-site points of exposure: the tar pit, quarry pond, and dry creek beds. The tar pit holds refinery waste that is still contained in the unit, but there are no controls to prevent a release. In the 1991 tar pit samples, chrysene measured 44 (mg/kg) and lead measured 318 mg/kg.

*Concluded that site is considered **A Public Health Hazard** due to the potential for human access to the contaminants on the site and its ponds.*

- *Air sampling using a PID showed no readings of airborne contaminants above background.*
- *Samples of unfiltered water from residential water supply of a home approximately 400 feet south of Matheson Gas found no contaminants of health concern.*

[17]Millbrook Condominiums – Conncecticut (Former MGP)

Historical use of site was for storage tanks, a manufactured gas plant, cleaning solvents, plating solutions containing heavy metals, and a former coal storage area. There is a potential that ash wastes generated from the manufactured gas plant were disposed throughout the site.

*Concluded that the site was **No Apparent Public Health Threat***

[18]Moberly Former Gas Manufacturing Plant

The Missouri Department of Natural Resources requested that an assessment be done to determine whether residents living next to, and workers at the site are being exposed to hazardous substances at levels that could result in adverse health effects. A previous assessment determined that there was the potential for coal tar contamination of the site's surface soils, subsurface soils, and groundwater because of spillage and general FMGP practices of burying tar and purifier wastes on site.

*Concluded that the site poses **No Apparent Public Health Hazard**.* This means that there is a completed pathway of exposure but, exposures are occurring or have occurred in the past but below a level of health concern.

[19]New Jersey Natural Gas Company/Longbranch Gas Contamination, New Jersey

The site operated from approximately 1870 through 1960 and involved the manufacture of water gas, carbureted water gas, and oil gases. Numerous structures, including retorts, gas holders, tar separators, storage tanks and repair shops were present on the property to support the coal-gas processes. A portion of the former MGP property was redeveloped in the 1950's by the Long Branch Housing Authority into an apartment complex. Citizens requested a review of cancer incidence.

Evaluation of on-site soil samples detected a variety of chemical contaminants above EPA residential soil cleanup criteria including benzene, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, phenanthrene, antimony, arsenic, cadmium, copper, lead, and zinc. Potential past and possibly current human pathways of exposure include dermal contact with contaminated soil, inhalation of vapors emanating from the contaminated soil, and ingestion of contaminated soil.

*Concluded that **overall cancer incidence not elevated** and the analysis provides little evidence that the rate of cancer in the study population has been affected by the potential exposure to MGP contamination.*

[20]Organic Chemicals Inc. - Health Assessment

The site is approximately 5 acres of the U.S. EPA-designated OCI Superfund site, which covers approximately 20 acres and includes several other privately-owned industrial properties.
The site was used by an oil and gas exploration firm as its headquarters. Site activities included petroleum refining, transport, and storage, solvent reclamation, and chemical manufacturing. The groundwater beneath and down gradient of the site contains VOCs and metals. There is no indication that residents in the nearby area have been significantly exposed to site-related contamination through private well use.

*Concluded that the site poses **A Public Health Hazard** under current conditions.*

- Past site workers could have been exposed to various chemicals during operations.
- Trespassers may have also been exposed to various chemicals when the site was in operation.
- Current Trespassers may be exposed to high levels of contaminants in surface soils via direct contact, incidental ingestion, and inhalation.
- Access to the former oil refinery operations area and former petroleum sludge lagoons area is possible.

[21]Pab Oil and Chemical Services – Louisiana

The site is 16.7 acres of abandoned oil field exploration and production waste-disposal facility which operated from late 1978 until early 1983. A citizen's complaint of a discharge from the site into an off-site drainage ditch led to site discovery.

*Concluded. that the site posed **No Apparent Public Health Hazard** because the estimated exposures to site contaminants to surrounding residents, trespassers, and visitors to the Pab Oil site are not at levels that exceed established health guidelines. Additionally, community-specific health-outcome data that was reviewed indicates that the site has had no adverse effect on human health.*

[22]Panola County Road 329 Bethany Texas

This site is located in a rural area and has a history of oil and gas production and exploration. There are 11 oil and gas wells located within a half-mile radius of seven residential properties and a church. Residents located approximately 1/8-mile northeast of an injection well were concerned about its impact on the quality of their drinking water. The injection well was permitted to inject brine between 1,080 and 1,110 feet below grade. Based on the permit, the groundwater is protected to 250 feet at this well.

*Site was determined to pose **An Indeterminate Public Health Hazard** due to lack of data and method detection limit above the health comparison value. It was also concluded that there is no apparent health hazard for VOCs, metals, and radionuclides detected above the method detection limit.*

[23]Petro Processors, Louisiana Health Assessment (Cancer Incidence Review)

The company operated two waste disposal facilities: the Brooklawn area and the Scenic Highway area. A variety of wastes generated by petrochemical processes were disposed of at both areas by the operators of the site, from 1964 to 1980. Both areas contain chlorinated aromatic hydrocarbons and chlorinated hydrocarbons.

Industrial workers and residents of the local communities which surround the PPI site have reported a variety of health concerns. On November 17 and 18, 1980, a health survey was conducted in the Alsen community, southeast of the PPI Site. A team consisting of one physician, one nurse and two public health investigators were in the community center collecting information from people who came voluntarily for a health interview. Approximately 140 people were interviewed; information was obtained for 107 households representing 367 residents or about 40% of the total population of Alsen. Some of the health complaints included burning eyes, frequent headaches, sinus problems, breathing difficulties, nausea and vomiting, skin rashes and dizziness. Exposures are through on-site soil and through off-site soil, sediments in Devils Swamp and Bayou Baton Rouge. Potential completed pathways are through off-site soil and private wells. Exposure to the volatile chlorinated hydrocarbons and aromatic chlorinated hydrocarbons (HCB, HCBD) at high concentrations may have caused acute health problems such as headaches and other nervous system effects (dizziness, weakness, vertigo, irritability, depression or confusion). The populations at highest risk for these effects are the workers on the site and workers in the neighboring industries 400 yards from the site.

*It was concluded that the site is **A Public Health Hazard** as a result of past, present and future exposure to chlorinated hydrocarbons, and aromatic chlorinated hydrocarbons (HCB, HCBD). The contaminants are present in all environmental media including soil, sediment, surface water, groundwater, air, and fish.*
*An evaluation of the health outcome data **did not demonstrate a significant difference in cancer and stillbirth rates** between the community of Alsen and East Baton Rouge Parish.*

[24]Plymouth Manufactured Gas Plant

Large quantities of complex mixtures of coal tar, sludges, oils, and other chemicals were byproducts of the production of coal gas. Coal tar and other waste products from the gasification plants were commonly disposed of on-site in unlined pits or, in some cases, injected underground through injection wells. Health consult was conducted to determine whether residents near the site were exposed to volatile organic compounds (VOCs) through inhalation of the indoor air of their homes at levels that would harm their health.

*It was concluded that **none of the chemicals** detected in indoor air of homes at this site **represent a human health threat.** It could not be determined if there were past threats to human health due to lack of sampling data.*

[25]Ripon Manufactured Gas Plant - Wisconsin

Wisconsin Department of Natural Resources requested that a review of the assessment data collected from the site be done to evaluate any health hazard associated with contamination in sediment and to identify where other areas of health concern may exists. Elevated concentrations of polycyclic aromatic hydrocarbons (PAHs) are present in sediment and deeper soils at the site.

*It was concluded that contaminants in sediment are **Not an Apparent Health Hazard** under current use patterns at the park and pond, but remediation is needed to address current ecological concerns and to avoid future human health concerns. PAHs exposure from **eating fish** from Mill Pond represents **No Public Health Hazard.***

[26]Shell Oil Pipeline Spill –Illinois – Health Consult

Corrosion of a 14-inch underground Shell pipeline resulted in the release of an estimated 120,000 gallons of gasoline. A pool of gasoline about 450 feet by 50 feet appeared among fields of corn and soybeans. Between 1994 and 2001, MTBE was discovered in several residential wells. The location of the wells where MTBE was detected shows that the contaminants are migrating away from the initial release point.

*Concluded that **No Apparent Public Health Hazard** exists from exposure to groundwater in the residential wells near the Shell Oil release at the time of the review.*

[27]Tri-Par Oil – Ohio – Health Consult

The document addresses citizen concern that the indoor air was impacted by chemical vapor intrusion in a church. Results from a monitoring well located in the driveway north of the church building show that dissolved contamination is present in groundwater close to the building. Benzene in this well is at 240 parts per billion. Cleanup at the site has included the removal of 1,300 tons of contaminated soil in the impacted area around former storage tanks and the removal of petroleum floating above the groundwater table. As much as 5 feet of petroleum was found on the water table in the source area on the site in 1999. Currently, that level has decreased to less than a foot. In addition to the petroleum contamination floating on the surface of the water table, some petroleum-related chemicals have dissolved into the groundwater and have moved with groundwater away from the site. This area is served by a municipal water supply, and the wells for that system are located outside the area of impact from this site contamination. Bedrock in this area is less than 10 feet from the surface. This bedrock is known to be fractured, and groundwater in this area moves through the fractures.

*Concluded that the site **does not pose a current public health threat** through inhalation.*

[28]Warren Recycling Landfill – Health Consult

This document addresses the impact of water off-gassing hydrogen sulfide into residential homes and if exposure may impact the health of residents. Additionally, the document evaluated metals and water quality. Citizens were concerned about exposure of children attending schools and residents living in close proximity to the facility. 15 oil and gas wells are in the general vicinity of the facility. Five of these wells are located either on or adjacent to the site.

Some long-time residents indicated that the odor in drinking water was present before the landfill was developed; others associated the odor in drinking water with landfill construction and with area oil and saltwater injection wells.

These wells pump an average of 200 to 400 barrels of oil and 9,000 to 11,000 million cubic feet of natural gas per day. Although a strong hydrogen sulfide odor was detected in the ambient air on-site no significant quantities of hydrogen sulfide were detected coming from vents associated with these oil and gas wells. There is no evidence that local oil and gas wells have impacted the local environment, including the bedrock aquifer system.

*Concluded that there was **No Apparent Public Health Threat** from groundwater. Area oil and gas wells do not appear to be significant contributors to ambient levels of hydrogen sulfide in ambient air.*

[29]Wisconsin Fuel and Light - Wisconsin

This former manufactured gas plant primarily has coal tar waste that remain in Manitowoc River sediments adjoining the site. Oily sheens have been reported in areas of the Manitowoc River near the site. Current environmental assessments indicate that the oil sheens are related to contaminated sediments remaining from the former MGP. The river bank in this area sees some recreational use, primarily fishing. This report addresses the question of health risk from exposure to these oil sheens and coal tar-contaminated sediments.

*It was concluded that the sheen on the Manitowoc River near the former MGP is **a health hazard** for anyone who comes in contact with the coal tars.*

SITE	BACKGROUND/ISSUE Conclusions/Recommendations	CHEMICALS OF CONCERN	EXPOSURE PATHWAY
A & F Materials Reclaiming Inc. – Health Consult	• Site was an industrial waste sludge and spent oil reclamation facility. • It is located within 100 feet of residents. Citizens had complaints about the facility due to odors and spills. • Residents expressed concerns over possible adverse health effects and the high incidence of cancer deaths in the immediate area of the site. • Groundwater monitoring wells sampled and analyzed in 1991 indicated that benzene was the only contaminant detected (0.0018 ppm) slightly above the comparison value. • There are no water supply wells (public or private) known within three miles hydraulically down-gradient of the site. Conclusion: No unusual pattern of chronic or persistent disease, including cancer, emerged from two previous state studies as well as this health assessment. Site poses *No Apparent Public Health Threat.*	*Air* **Benzene** 3.4 ug/m3 **PAH**- levels not likely to cause adverse health effects **TCE –** 13.5 ug/m3 *Waste Lagoon Sludge* No chemical detected above its health comparison value. Benzene evaluated further because of its carcinogenicity.	*Air* Eliminated during remediation *Groundwater* Future impact on public and private wells unlikely
Amoco Oil Company (Sugar Creek) Public Health Assessment	• Former Petroleum Refinery • Incidences of cancer, Alzheimer's, Multiple Sclerosis • 100 Residents • Sampled Indoor air Conclusion: *No Adverse Health Effects* would be expected from chronic exposure to the levels of contaminants found in indoor air or surface soil. Groundwater is not a completed pathway of exposure.	**Benzene** GW= ND - 18,800 ug/l Test Holes = 2,560 ug/L Air = 62 ug/m3 **1,4, Diclorobenzene** Air = 3,400 ug/m3	*Air* Completed – Inhalation *Subsurface Soil* Potential – dermal contact
Amoco Oil Company (Sugar Creek) Health Consultation Surface Water and Sediment	• See above for background • Sampled surface water and sediment Conclusion: Intermittent exposures to on-site surface water and sediment would not be expected to result in adverse health effects for workers and trespassers. *No Apparent Public Health Hazard*	Metals, SVOCs, VOCs	*Onsite Surface Soil/Sediment* Potential -Incidental Ingestion Potential - Dermal Contact
Amoco Oil Company (Sugar Creek) - Review of Air Quality Data – Health Consult	• See above for background • Response to odor concerns • Assessed chronic exposure to indoor air contaminants • Three days of 24 hr samples (summa canisters) Conclusion: *No Apparent Public Health Hazard* for future or current chronic exposure.	**Benzene** Air= 70 ug/m3 **1,2, Dichloroethane** Not stated	*Indoor Air* Completed - Inhalation

SITE	BACKGROUND/ISSUE Conclusions/Recommendations	CHEMICALS OF CONCERN	EXPOSURE PATHWAY
Blanchard Lease Property site – Letter Health Consult	• The site is involved in oil and gas production operations • Sampling confirmed the presence of mercury in the soil • Source is natural gas meters which may have used mercury manometers to meter the flow of natural gas through flowline Conclusion: *No Apparent Public Health Hazard* related to mercury in soils from remediated areas.	**Mercury** <100 mg/kg	*On-Site Soil* No completed potential or completed exposure pathways. Due to restricted access
Bio Refining, Inc. & Dixie Oil Processor, Inc. – Texas Health Assessment	• Unlined storage pits • Aquifer contaminated with SVOCs • Nearest municipal well (1,200 ft deep) over 1 mile away not impacted • Sediment runoff through Mud Gulley • Air sampling did not reveal significant levels of site related contaminants Conclusion: 1. The site poses *No Significant Health Risk* if contaminated groundwater is not used for human consumption and the site conditions and migration pathways remain unchanged 2. This site is of potential health concern because of the risk to human health resulting from possible exposure to hazardous substances at concentrations that may result in adverse health.	**SVOCs, VOCs,** *Sediment Runoff* • PAHS 27.1 mg/kg • Carcinogenic PAHS • 24.7 mg/kg *Surface Water* • 1,1,2-TCA (35.5 ug/l) • 1,2-DCA (26.1 ug/l)	*On-Site Air* Completed - Inhalation *Sediments* Potential – Incidental Ingestion Dermal Contact Mud Gulley *Cattle* Bioaccumulation
Cady Road Ohio, Health Consultation	• Private well water was reported to be cloudy and to "fizz" • Indoor & outdoor ambient air testing at 9 homes • 8 oil and gas production wells and one former (plugged) saltwater injection well about 1/4 - 1/2 mile from the nearest private water well • Demonstrations of flammability include: i. Flame created when kitchen faucet turned on ii. Burning candle flashed a flame in bathroom during normal water use iii. There are two wells which "blow off their well caps" and at least one fire in a pump house Conclusion: The site poses an *Urgent Public Health Hazard* due to the following: • Levels of combustible gases found in homes • Levels of hydrogen sulfide in private well water	Well Water -Sodium 330,000 ppb Air -Methane 1.1 ppm -Sulfides 28 ppm -Benzene 5.6 ppm	*Physical Hazard* i. Explosion/Fire *Private well Water* - Ingestion Completed - Inhalation Completed

SITE	BACKGROUND/ISSUE Conclusions/Recommendations	CHEMICALS OF CONCERN	EXPOSURE PATHWAY
	Levels of sodium measured in well water		
East Mount – Texas – Health Consult	• Private wells impacted by oil & gas production • Determine if contamination is responsible for health problems Conclusion: Levels of barium and magnesium detected should pose *No Apparent Public Health Hazard*. Literature shows no association with barium and magnesium and citizens health concerns.	Barium Magnesium	*Private Well Water* Ingestion completed
Former Del Roc Refinery - Health Consult	• Former Oil Refinery Site was redeveloped for residential property • Residents were concerned about birth defects, and cancer incidence Conclusion: Direct contact with site media poses no apparent public health concern. Vapor intrusion into homes is an *Indeterminate Health Concern* due to lack of data.	Dichloromethane Iron PAHs Note calculated risk eliminated them as chemicals of concern	*Air – Vapor Intrusion* -Inhalation – potential
Gulf Coast Vacuum Services – Abbeville Louisiana – Health Consultation	• Storage and formulation of mud for barium sulfate-based oil field drilling • Post Hurricane Katrina & Rita evaluation for impact to groundwater • Private wells source of drinking water Conclusion: There is no evidence of groundwater migration from the monitoring wells to the domestic water sources.	141 contaminants, including a range of metals and organic contaminants. Primarily metals detected	None Completed *Private Well Water* Potential ingestion
Highway 71/72, Louisiana - Health Assessment	• PAHs and VOCs have been identified in the groundwater under the site areas of soil • lead contamination on site that would pose a health threat to young children • benzene levels reported in the indoor air, that if representative of long-term exposures, would pose an unacceptable cancer risk for long-term residents. BTEX 196 ppm • methane levels measured under buildings on site may pose a future physical hazard 719,753 ppm Conclusion: Classified as A *Public Health Hazard*	*PAHS, VOCs, methane* *Benzene* *Lead* – note testing results were below 10 ug/dl	*Soil Gas* Completed Inhalation *Air* Completed inhalation *On-Site Soil* Potential – Incidental Ingestion, Dermal Contact *Physical Hazard* Methane gas under buildings

SITE	BACKGROUND/ISSUE Conclusions/Recommendations	CHEMICALS OF CONCERN	EXPOSURE PATHWAY
Holly Street Power Plant – Texas – Health Assessment	• Modeling data suggest that mixed fuel burning with fuel oil containing 0.227% to 0.3% sulfur by weight could result in sulfur dioxide levels high enough to aggravate pre-existing respiratory conditions (i.e., asthma) in sensitive individuals • Total petroleum hydrocarbons (TPH) in groundwater are generally reported below MDLs; however, the detection limits varied from 200 µg/L up to 800 µg/L Conclusion: 1. It is *unlikely* that air pollution from the plant would *Pose A Health Threat.* 2. The information reviewed does not indicate that people are currently being exposed to levels of contamination that would be expected to cause adverse health effects.	Fuel Oil Ferrous Sulfate PCB Transformer Oil	*Air* completed *Groundwater* Not complete
Krouts Creek Site - West Virginia - Health Consultation	• Twenty-two thousand gallons of Coal Tar Light Oil spilled from a railroad car • 150 homes potentially impacted, about 500 people in a 2-mile radius of the spill were evacuated Conclusion: • *No Apparent Public Health Hazard* through vapor intrusion • All calculations of excess cancer risk indicated a low to very low excess cancer risk • Data limitations and uncertainties exist. Therefore, conservative assumptions made	Benzene	*Vapor Intrusion* Completed Inhalation
Leffington Road Pipeline Spill Ohio	• Natural gas pipeline spill • 6 residential properties on private wells were assessed Conclusion: Metals in one well possibly due to deterioration of well casing. Other wells did not have chemicals at concentration exceeding US EPA drinking water standards.	Metals, VOCs, SVOCs, TPH – non detect in past 10 times of sampling	*Private Well Water* Potential – ingestion

SITE	BACKGROUND/ISSUE Conclusions/Recommendations	CHEMICALS OF CONCERN	EXPOSURE PATHWAY
Matheson Gas – Health Consultation - Illinois	• Site was oil refinery from 1911- 1946 • On-site quarry pond drowning hazard, site is not fenced • Data needed to characterize on-site soil and migration to groundwater • Present and future potential exposures may result if contaminants from the surface soil are blown into the air or migrate to the groundwater where the private wells draw water • Source of increased pollutant levels might be a recent migration from past refinery activity sites, the corroded scrap cylinders buried 20 to 30 years ago, or an unknown activity at the site or in the vicinity Conclusion: The site is a *Public Health Hazard* due to potential exposure to on-site contaminants and drowning hazard due to pond. Workers exposed over many years to benzo(a)pyrene, chrysene, and arsenic might increase the risk of getting cancer over their lifetime.	Benzo(a) pyrene Chrysene Lead Arsenic Former Creek Bed Samples Lead increased from 4 to 20 times background level 1991-1995 BAP increased from Non detect to above background 1991-1995	*Private Well Water* Present/Future Potential – ingestion *Air* Present/Future - inhalation
Millbrook Condominiums- Connecticut	These historic sources include above ground fuel oil storage tanks, a manufactured gas plant, cleaning solvents, plating solutions containing heavy metals, and a former coal storage area. There is a potential that ash wastes generated from the manufactured gas plant were disposed throughout the site. Conclusion: *No Apparent Public Health Threat.*	PAHs VOCs	*Air* Potential - inhalation
Moberly Former Gas Manufacturing Plant- Missouri	• Residents and worker exposure is a concern • Contamination of surface soil, subsurface soil, and groundwater from previous site activities Conclusion *No Apparent Public Health Hazard.*	PAHs Metals Benzene Toluene Xylenes	*Surface Soil/Subsurface Soil/Groundwater* Potential - Dermal Inhalation, and incidental ingestion
New Jersey Natural Gas Company Long branch Gas Contamination, New Jersey	Cancer incidence was evaluated for the city of Long branch Conclusion: This analysis of cancer incidence in the City of Long Branch and CT 8056 provides little evidence that the rate of cancer in the study population has been affected by the potential exposure to MGP contamination.	PAHS, Benzene	*Soil* Potential - past and possibly current dermal contact and incidental ingestion Soil Gas inhalation,

SITE	BACKGROUND/ISSUE Conclusions/Recommendations	CHEMICALS OF CONCERN	EXPOSURE PATHWAY
Organic Chemicals Inc. - Health Assessment	• Petroleum refining, transport, and storage on the site • Groundwater, soil, and air are contaminated with site-related chemicals • Flora and fauna in nearby wetlands were endangered • There are no indications that humans may have had significant exposure to site-related contaminants. Primary concern are trespassers. Conclusion: The site poses a *Public Health Hazard* under current conditions.	Soil, Groundwater, Air, Surface Water, Private Wells VOCs SVOCs PCBs Metals	*Groundwater and Soil* Potential - Incidental Ingestion Potential - Dermal Contact *Air* Completed - Inhalation
PAB Oil and Chemical Services – Health Assessment	• NPL site • Operated a disposal facility on the site for oil field exploration and production wastes from late 1978 until early 1983 • Citizens concerned about cancer, private wells, discolored and metallic tasting water, contamination of Chicot Aquifer and Vermilion River (fish and wildlife) • In 1993, EPA collected off-site groundwater samples from 10 residential wells in the vicinity of the site • EPA conducted air sampling (in the breathing zone) during a site inspection in 1987. Eleven sampling locations were selected around the waste pits and the storage tank areas on the basis of the prevailing wind direction at the time of the sampling. Based on sample results obtained by EPA, it was concluded that no contaminants attributable to the site were detected. Conclusion: The site poses *No Apparent Public Health Hazard*. No cancers associated with oil and gas production were elevated.	Found in on-site media and off-site drainage ditch Heavy Metals PAHs 5.7 ppm soil Benzene .003 ppm GW TPH Arsenic and manganese were detected in some of the residential wells surrounding the site at levels that exceeded health guidelines	*On-Site Soil* Incidental Ingestion and Dermal Contact *Surface Water/Sediments* Dermal contact, incidental ingestion *Groundwater* Future Potential
Panola County Road 329 – Texas Health Consultation	• History of oil and gas production • Concerns about injection wells impacting private wells • The method detection limit are above the health comparison value, therefore, risk is indetermined Conclusions: 1. *Indeterminant Public Health Hazard* due to lack of data. No apparent health hazard for VOCs, metals, radionuclides detected above the method detection limit.	VOC, SVOC, Metals Pesticides/PCBS, Radionuclides No SVOC was detected above the MDL	*Private Well Water* Potential – Ingestion

SITE	BACKGROUND/ISSUE Conclusions/Recommendations	CHEMICALS OF CONCERN	EXPOSURE PATHWAY
Petro Processors of Louisiana Health Assessment	• Waste disposal facilities for petrochemical processes • Soil, sediment, surface water contaminated with chlorinated aromatic hydrocarbons and chlorinated hydrocarbons • Cancer Incidence Review conducted Conclusions: Site poses A *Public Health Hazard* No significant difference in cancer incidence in comparable community.	Soil 1,1,2 TCA – 75,000 ppm Vinyl Chloride – 570 ppm Chloroform – 5.16 ppm Air Carbon Tetrachl. – 103 ppm Chloroform 5.16 ppm Hexachlorobutadiene .029 ppm Hexachlorobenzene <.001 ppm	*Air* Inhalation *Private Well Water* Future potential *Soil/Sediment/Surface Water* Dermal Contact
Plymouth Manufactured Gas Plant. – Pennsylvania – Health Consultation	• Coal tar and other waste products present at site • Unlined pits • Injection wells • Subsurface coal tar contamination • Collected indoor air samples of residents 8 hr summa canisters Conclusion: The site represents *No Apparent Health Hazard* for humans. An indeterminate health hazard for past exposures to VOCs because historical data is lacking. Future exposure are unlikely to increase.	Benzene 1.3 ppb Propene 93 ppb	*Air* Completed Inhalation
Ripon Manufactured Gas Plant - Wisconsin	• DNR wanted a review of environmental assessment data Conclusion: • Current use of site poses *No Public Health Threat* under current use patterns at the park and • PAHs exposure from eating fish from Mill Pond represents no public health hazard. • Remediation is needed to address current ecological concerns and to avoid future human health concerns.	PAHs	*Sediments* Potential Dermal contact *Fish* Incidental ingestion – PAH bioaccumulation
Shell Oil Company - Illinois	• Corrosion of a 14-inch underground pipeline release of an estimated 120,000 gallons of gasoline • Residents would be exposed by breathing some MTBE vapors released during showering or other indoor water uses Conclusion: • *No Apparent Public Health Hazard* exists from exposure to groundwater in the residential wells near the Shell Oil release site at this time.	MTBE	*Air* Inhalation

SITE	BACKGROUND/ISSUE Conclusions/Recommendations	CHEMICALS OF CONCERN	EXPOSURE PATHWAY
Tri-Par Oil - Wisconsin Health Consult	• Monitoring well at driveway of church shows Benzene at 240 ppb • Citizens concerned about vapor intrusion Conclusion: Site *does not pose a current Public Health Hazard*	Petroleum distillates, Benzene	*Air Vapor Intrusion* Potential – Inhalation
Warren Recycling Landfill – Ohio Health Consultation	• None of the private wells pose a health threat to the residents using them for drinking water • 15 oil and gas wells are in the general vicinity of the site. Five of these wells are located either on or adjacent to the site. • Although a strong hydrogen sulfide odor was detected in the ambient air on-site, no significant quantities of hydrogen sulfide were detected coming from vents associated with these oil and gas wells Conclusion: 1. Based on current data, groundwater in this area is "*No Apparent Health Hazard*" 2. Currently, there is no evidence that local oil and gas wells have impacted the local environment, including the bedrock aquifer system. 3. Private wells may present a brief and intermittent exposure, although this could cause short-term health effects such as headaches or respiratory effects.	Ground Water Na – 510,000 ppb Lead – 25 ppb Manganese Sulfates Air Hydrogen Sulfide 1-8 ppm	*Air* Completed - Inhalation *Groundwater* Completed - Ingestion
Wisconsin Fuel & Light (Former Gas Manufacture Plant) - Wisconsin – Health Consultation	• MGP wastes, primarily coal tars, remain in Manitowoc River sediments adjoining the site • The river bank in this area sees some recreational use, primarily fishing Conclusion: The sheen *is a Health Hazard* for anyone who comes in contact with the coal tars.	PAH	*Sediment/Surface Water* Dermal Contact

SITE SUMMARY TABLE

TYPE OF SITE	SITE NAME	CONCERN	CONCLUSION
Reclamation	A&F Materials Reclaiming Inc.	Cancer Incidence	No Apparent Public Health Threat
Refinery	Amoco Oil Company	Cancer and Other Disease Off-site migration of chemicals Indoor Air	No Public Health Hazard No Apparent Public Health Hazard No Adverse Effects Expected
Oil & Gas Production	Blanchard Lease Property	Mercury in Soil	No Apparent Public Health Hazard
Refinery	Bio Refining & Dixie Oil Processor	Unlined Storage Pits	No Significant Health Risk
Oil & Gas Wells	Cady Road	Impact to Shallow Aquifer Quality	Air not Public Health Hazard Combustible Gas Urgent Public Health Haz H2S Public Health Hazard Private Wells not a Health Concern
Oil & Gas Wells	East Mount Groundwater Wells	Barium & Magnesium in Drinking Water related to Depression, Seizures, Obsessive Compulsive Disorder	Not detected at levels that would be likely to cause adverse health effects
Former Refiner	Former Del Roc Oil Refinery	Site redeveloped to Residential Exposure to contaminants Cancer Incidence	Vapor Intrusion is an Indeterminate Public Health Hazard Cancers within expected range No elevations of Birth defects in area
Mid-storage and Formulation	Gulf Coast Vacuum Services	Impact to Private Wells	No Public Health Hazard
Former Refinery	Highway 71/72	Redeveloped to Residential Groundwater is Contaminated	Site is a Public Health Hazard • On-site surface soil (lead) • Indoor air • Methane gas explosion hazard
Power Plant	Holly Street Power Plant	Air Quality, Noise, Chemical Hazards	Currently Poses No Apparent Public Health Hazard
Coal Tar Spill	Kreuts Creek	Vapor Intrusion	No Apparent Public Health Hazard
Pipeline Spill	Leffingtom Road Pipeline Spill	Impact to Private Wells	No Public Health Hazards *Note: Elevated levels of metals in some wells due to deteriorating well casing suggested alternate water source*
Refinery	Matheson Gas	Odor Complaints Private Wells	Public Health Hazard due to site access Private Wells no Public Health Hazard
Manufactured Gas Plant	Millbrook Condominiums	On-site contamination	No Apparent Public Health Hazard

TYPE OF SITE	SITE NAME	CONCERN	CONCLUSION
Manufactured Gas Plant	Moberly Former Gas Manufac. Plant	Impact to Residents Impact to Workers	No Apparent Public Health Hazard
Natural Gas Comp.	New Jersey Natural Gas company	Site contamination Air Quality Cancer Incidence	Overall Cancer Incidence not elevated
Oil & Gas Wells	Organic Chemicals Inc.	Impact to Private Wells	Public Health Hazard due to site access
Oil & Gas Wells	Pab Oil and Chemical Services	Impact on Human Health Impact to Private Wells	No Apparent Public Health Hazard
Oil & Gas Production	Panola County Road 329	Impact to Private Wells	Indeterminate Health Hazard due to method detection limit (MDL) Note: No Apparent Health Hazard for chemicals detected above MDL.
Waste Disposal Facility	Petro Processors	Cancer Incidence Health Survey Conducted	Public Health Hazard No significant difference in cancer incidence and still birth rates
Manufactured Gas Plant	Plymouth Manufactured Gas Plant	Unlined Pits Indoor Air	No Human Health Threat
Manufactured Gas Plant	Ripon Manufactured Gas Plant	Impact to Human Health	No Apparent Public Health Hazard
Pipeline Spill	Shell Oil Pipeline Spill	Private Wells	No apparent Public Health Hazard
Oil Company	Tri-Par Oil	Vapor Intrusion	No Current Public Health Threat
Recycling Landfill	Warren Recycling Landfill	Private Wells and H2S	No Apparent Public Health Hazard
Manufactured Gas Plant	Wisconsin Fuel and Light	Oily Sheen in surface water and Impact to health	Public Health Hazard

EXCLUDED DOCUMENTS

Ashland Petroleum – Kentucky – Air pollution
Atlanta Gas Light Company – Georgia – Manufacture gas plant
Atlanta Gas Light Company - Georgia – Health Assessment 1998 – Manufactured gas plant (citizens)
AMPM Gas Station - California –Service station
Bay Street Study Area - Rhode Island – Goal gasification waste material
Bountiful Utah – PCE plume, waste oil trucks
Bridgeport Homes/31 st Gas Distribution Center - Illinois – Gas distribution center
Buchanan Bulk Oil – Ma and Pa Store Iowa – Gas Station with underground storage tanks
Chevron Refinery – Ohio- Soil Vapor Intrusion - Contaminated aquifer
Chillum Per Site – Maryland – Gas Station
Contamination of Sump - Iowa – Unknown source of oil contamination
Coopers Poynt Elementary School – New Jersey – Fuel oil spill
Difeo Oil and Propane Derry - New Hampshire – PCE from dry cleaners
Du Quon Gas Plant – Illinois – Health Consultation – Gas manufacturing plant
Former Delroc Oil Refinery, Texas – Oil refinery not production
Globe Building Brownfield – Michigan – Underground storage tanks gas and fuel oil
Home Heating oil Release – Puyallup Washington – Above ground residential storage tank release
Landfill Gas Recovery – Michigan – Landfill gas in sewer lines
Laugh and Learn Daycare – Ohio – Underground storage tanks removed contaminated soil
Lenz Oil Services – Illinios – Public Health Assessment – Waste oil and asphalt supply (benzene)
Le Mars Coal Gas Site Iowa – Health Consultation 1998 - Air monitoring during remediation - benzene concern – GW contaminated BAP concerned that black tar substance came through assumed cracks in water pipes
Mill Street Plant - Michigan - Steel Mill Plant
Marion Brag Dump – Indiana – Dumpsite not oil and gas
Messer Street Manufactured Gas Plant – New Hampshire – Health Assessment (2002) – Coal tar issues\
Neenan former manufactured gas plant residential indoor air investigation – Wisconin – Gas plant
Newton Community Air Quality Study – Georgia – Good example of air study
North Sanitary Landfill – Ohio - Landfill Gas
Old Total Gas Station – Michigan –Waste Oil - UST lead (benzene, ethylbenzene)
Recchia Property - Rhode Island – Unpermitted landfill
Rock Avenue 21 Dump – Methane dumpsite
Santa Cruz Harbor - California – Dredging and H2S gas
Saufley Field Landfill – Florida – Landfill
Sawyer Ludwig Park –Ohio – Contaminated sediments
Schofield Barracks – Honolulu- Health Assessment - TCE
Skyline Drive Dump – Tennessee – Dump
Sunoco Service Center – Pennsylvania – Service Station
UGI Columbia Gas Plant –Pennsylvania – Gas manufacturing plant
Wisconsin Fuel and Light – Health Consult 2005 - Coal tar in sediment samples - Former manufactured gas plant

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3. Amoco Oil Company – Sugar Creek Missouri. 1999 - Petitioned Public Health Assessment
4. Amoco Oil Company, Sugar Creek, Surface Water and Sediment - 2000 - Health Consultation
5. Amoco Oil Company, Sugar Creek, Air Addendum – 2000 - Health Consultation
6. Blanchard Lease Property Site – 2008 Letter Health Consultation
7. Brio Refining, Inc & Dixie Oil Processor, Inc. – Texas – 1988 - Health Assessment
8. Cady Road Ohio - 2003 - Health Consultation
9. East Mount Groundwater Wells – Texas – 1998 - Health Consultation
10. Former Del Roc Oil Refinery – Texas - 2007 Health Consultation
11. Gulf Coast Vacuum Service - Abbeville Louisiana - 2006 - Health Consultation
12. Highway 71/72 Refinery – Louisiana – 2000 - Public Health Assessment
13. Holly Street Power Plant – Texas - Health Assessment
14. Krouts Creek Site – West Virginia – Health Consultation
15. Leffington Road Pipeline Spill Ohio - 1998 - Health Consultation
16. Matheson Gas – Health Consultation - 1998 – Illinois – Health Consultation
17. Millbrook Condominiums – Connecticut - Health Consultation
18. Moberly Former Gas Manufacturing Plant – 2002 Missouri - Health Consultation
19. New Jersey Natural Gas Company/Longbranch Natural Gas - New Jersey – Health Consultation
20. Organic Chemicals Inc. – 1998 - Health Assessment
21. Pab Oil and Chemical Services – 2005 - Health Assessment
22. Panola County Road 329 - Bethany Texas – 2007 - Health Consultation
23. Petro Processors of Louisiana - 1996 - Health Assessment
24. Plymouth Manufactured Gas Plant - Plymouth, - 2004 - Health Consultation
25. Ripon Manufactured Gas Plant –Wisconsin – 2004 - Health Consultation
26. Shell Oil Pipeline Spill – Illiniois – Health Consultation
27. Tri-Par Oil – Ohio – Health Consultation
28. Warren Recycling Landfill – Ohio - 2003 - Health Consultation
29. Wisconsin Fuel and Light - Wisconsin – 2005- Health Consultation