Health Consultation

Ambient Air Evaluation of Polychlorinated Biphenyls and Dioxins
Calcasieu Parish, Louisiana

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
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Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

HEALTH CONSULTATION

Ambient Air Evaluation of Polychlorinated Biphenyls and Dioxins
Calcasieu Parish, Louisiana

Prepared By:

U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry (ATSDR)
Division of Community Health Investigations

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List of Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
Cal/EPA	California Environmental Protection Agency
CPAMS	Calcasieu Parish Air Monitoring Study
EPA	U.S. Environmental Protection Agency
fg	femtogram
IUR	inhalation unit risk
kg	kilogram
LOAEL	lowest-observed-adverse-effect-level
m	meter
m^3	cubic meter
µg	microgram
mph	miles per hour
NAS	National Academy of Sciences
NDAMN	National Dioxin Air Monitoring Network
ng	nanogram
NOAEL	no-observed-adverse-effect-level
NR	no value reported
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-*p*-dioxin
PCDF	polychlorinated dibenzofuran
pg	picogram
QA	quality assurance
QC	quality control
REL	reference exposure level
s	second
SAB	Science Advisory Board
TCDD	tetrachlorodibenzo-*p*-dioxin
TEF	toxicity equivalency factors
TEQ	toxicity equivalents
TR	target risk
TRI	Toxics Release Inventory
WHO	World Health Organization

1.0 Executive Summary

INTRODUCTION

Over the years, there have been community concerns in Calcasieu Parish, Louisiana, about releases of chemicals to the environment, including the air. Of particular concern to area residents are coplanar polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (PCDDs), and polychlorinated dibenzofurans (PCDFs). In this document, PCDDs and PCDFs are referred to as dioxins.

The Calcasieu Parish Air Monitoring Study (CPAMS) was conducted to assess the outdoor air quality of Calcasieu Parish, including PCB and dioxin levels. The CPAMS was a voluntary cooperative effort among the U.S. Environmental Protection Agency (EPA), Lake Area Industry Alliance, and Louisiana Department of Environmental Quality. In 1997, EPA Region VI and a community group requested ATSDR evaluate PCB and dioxin exposures in Calcasieu Parish, Louisiana. Calcasieu Parish is highly industrialized, with agricultural and residential areas co-mingled throughout the industrial area. ATSDR responded to EPA's original request through a series of public health evaluations. This health consultation evaluates available PCB and dioxin data from ambient (outdoor) air monitors in Calcasieu Parish.

OVERALL CONCLUSIONS

ATSDR concludes that breathing the low levels of PCBs and dioxins found in outdoor air in 2001 in Calcasieu Parish would not be expected to harm people's health.

ATSDR cannot conclude whether breathing PCBs and dioxins in outdoor air during other timeframes could harm people's health.

BASIS FOR DECISION

Based on a review of PCB and dioxin air monitoring data collected during the CPAMS from five locations in Calcasieu Parish (four industrial corridor locations and one reference location), ATSDR found that long-term exposure (greater than one year) to

- PCB and dioxin levels detected in outdoor air in 2001 were below non-cancer health-based guidelines and unlikely to result in harmful non-cancer health effects in exposed Calcasieu Parish residents.
- PCB and dioxin levels detected in outdoor air in 2001 were below health-based guidelines for cancer and not likely to result in cancer in exposed Calcasieu Parish residents.

Only the CPAMS PCB and dioxin air data exist for Calcasieu Parish. Because historical and current levels of PCBs and dioxins in Calcasieu Parish air are not available, the extent to which they may have varied from the 2001 data evaluated in this health consultation is unknown. ATSDR, therefore, cannot determine whether outdoor air could have harmed or could be harming people's health during these other timeframes.

NEXT STEPS	As a protective action, ATSDR recommends that facilities releasing dioxins into Calcasieu Parish air reduce or eliminate those releases wherever possible.
FOR MORE INFORMATION	You can call ATSDR at 1-800-CDC-INFO and ask for information on the Calcasieu Parish/Mossville site.

2.0 Statement of Issues

Over the years, there have been community concerns in Calcasieu Parish, Louisiana, about releases of chemicals to the environment, including the air. Of particular concern to area residents are coplanar polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (PCDDs), and polychlorinated dibenzofurans (PCDFs). In this document, PCDDs and PCDFs are referred to as dioxins.

In 1997, the U.S. Environmental Protection Agency (EPA) Region VI and a community group requested the Agency for Toxic Substances and Disease Registry (ATSDR) evaluate PCB and dioxin exposures in Calcasieu Parish, Louisiana. ATSDR responded to this original request through a series of public health evaluations [ATSDR 1998b, ATSDR 1999, ATSDR 2005b, ATSDR 2005c, ATSDR 2006, ATSDR 2007]. Appendix C provides background information about these evaluations. This health consultation evaluates ambient (outdoor) air monitoring data for PCBs and dioxins collected in 2001 from five locations in Calcasieu Parish. ATSDR focuses this review on four distinct areas:

1. Evaluating available wind rose data to determine annual and seasonal wind patterns throughout the parish.
2. Reviewing information in EPA's Toxics Release Inventory (TRI) database to provide general observations about reported dioxin air emissions in the Calcasieu Parish area.
3. Evaluating available PCB and dioxin air data from 2001 from four industrial corridor locations and one reference location in the Calcasieu Parish area to determine the potential for harmful health effects from breathing the outdoor air.
4. Comparing Calcasieu Parish air data to U.S background air data to determine whether the parish's PCB and dioxin air levels are elevated compared to national levels.

Of note, in addition to this health consultation, there are three additional reports being released at the same time for this site [ATSDR 2013a, ATSDR 2013b, ATSDR 2013c]. Community leaders had expressed a desire to receive agency reports together, and ATSDR agreed to this request if there were no public health issues and concerns identified during the data evaluation process. ATSDR delayed the release of its analysis of the air PCB and dioxin data so that all reports could be released in Calcasieu Parish at one time.

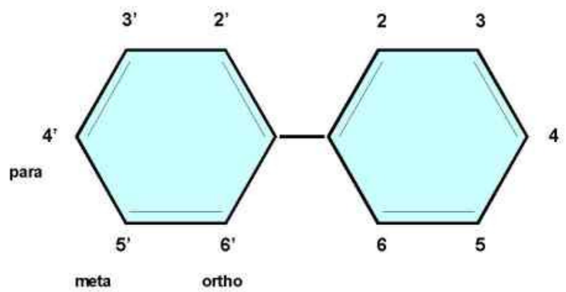
3.0 Background Information on PCBs and Dioxins

In this document, the term "dioxins" refers to PCDDs/PCDFs and the term "dioxin-like compounds" refers to the combination of coplanar PCBs and PCDDs/PCDFs.

3.1 Structure of PCBs and Dioxins

PCBs are a class of chlorinated organic compounds, one in which 2–10 chlorine atoms are attached to the molecule. Each of the 209 PCB congeners has a different number and arrangement of chlorines. There are three positions where chlorine can attach to the molecule, which are the meta-, para- and ortho-positions (see Exhibit 1.) If there are no ortho-substituted chlorines, the PCB can take a flat (coplanar) structure, which is similar to PCDDs/PCDFs. These coplanar PCBs are considered to share the established toxicities of the most toxic dioxin congener, which is 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD).

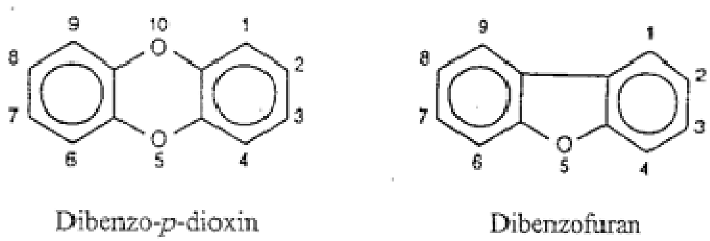
Exhibit 1. Structure of Polychlorinated Biphenyls (PCBs)



Source: EPA 2010c.

PCDDs and PCDFs are two related classes of chlorinated organic compounds with similar structures [ATSDR 1998a]. There are 8 different positions on a PCDD molecule and 10 on a PCDF molecule, which can be occupied by a chlorine atom (see Exhibit 2.) This makes possible the existence of 75 individual variations or "congeners" of PCDDs and 135 of PCDFs. The only difference between these various congeners is the specific number and location of the chlorine atoms. Congeners that share the same number of chlorine atoms, but at different locations, are called isomers. Groups of isomers that contain 1, 2, 3, 4, 5, 6, 7, or 8 chlorine atoms are called *mono*-, *di*-, *tri*-, *tetra*-, *penta*-, *hexa*-, *hepta*-, and *octa*-chlorinated dioxins/furans, respectively [ATSDR 1998a].

Exhibit 2. Core Structures of Dioxins and Furans



Source: ATSDR 2003.

The relative toxicity of various PCDDs/PCDFs is influenced by the number and position of the chlorine atoms in the molecule. As stated previously, the most toxic dioxin congener is 2,3,7,8-TCDD. More highly chlorinated (i.e., *penta*- through *octa*-) PCDDs/PCDFs that also have chlorine atoms at the (lateral) 2, 3, 7 and 8 positions (among others) are considered to share the established toxicities of 2,3,7,8-TCDD [ATSDR 1998a].

Due to the complex naming conventions used to describe congeners, this report uses an abbreviated nomenclature. Table 1, Appendix B, displays a key for determining the full name of each congener.

3.2 Sources of PCBs and Dioxins

PCBs were commercially manufactured in the United States in large quantities from 1929 until production was banned in 1977. PCBs were produced in relatively large quantities for use in commercial products such as dielectrics, hydraulic fluids, plastics, and paints. Although PCBs are no longer commercially produced in the United States, they continue to be released to the environment through past use and disposal of these products [ATSDR 1998a, ATSDR 2000, EPA 2006].

PCDDs/PCDFs are not produced intentionally, except in small amounts for research purposes. They are formed in combustion processes. This includes commercial or municipal waste incineration, burning fuels (like wood, coal or oil), burning household trash, and forest fires [ATSDR 1998a].

Small amounts of dioxins are created during chlorine bleaching of pulp and paper, certain types of chemical manufacturing and processing, and other industrial processes. Cigarette smoke contains small amounts of dioxins [IWG 2010]. Automobile exhaust from cars running on leaded gasoline and to a much lesser extent from cars running on unleaded gasoline can contain PCDDs [ATSDR 1998a].

Over the past few decades, EPA has looked for ways to reduce and control dioxins in the environment in the United States. Through expanded monitoring and research collaboration with the Food and Drug Administration, the Food Safety and Inspection Service, and the Centers for Disease Control and Prevention, EPA is also making progress in characterizing additional sources of exposure [IWG 2010].

For 1987, 1995, and 2000, EPA conducted an inventory of environmental releases of dioxins in the United States by estimating annual releases to land, air, and water for each source category [EPA 2006]. As reported by EPA, the leading sources of dioxin air emissions to the environment were municipal waste combustors in 1987 and 1995 [EPA 2006]. Between reference years 1987 and 2000, there was approximately a 90% reduction in the dioxin releases from all known sources combined [EPA 2006]. The overall reduction in releases of dioxin-like compounds is attributed to the control of air emissions of these compounds from municipal waste combustors, medical waste incinerators, and cement kilns burning hazardous waste and of wastewater discharges of the compounds into surface waters from pulp and paper mills using chlorine. These reductions were achieved through a combination of regulatory activities, improved emission controls, voluntary actions on the part of industry, and the closing of a number of facilities. In 2000, burning of domestic refuse in backyard burn barrels emerged as the largest source of dioxin emissions.

3.3 Toxicity Equivalency Factors (TEFs) and Toxicity Equivalents (TEQs)

The most toxic form and the most extensively studied congener is 2,3,7,8- TCDD. Specific PCB and dioxin congeners have varying strengths or potencies that contribute to harmful health effects. Scientists use toxicity equivalency factors (TEFs) that compare the relative toxicity of individual PCB and dioxin congeners to that of 2,3,7,8-TCDD. This comparison is based on the assumption that 2,3,7,8-TCDD and similar congeners act through the same mechanism of action. Because each congener is weighted by its expected degree of toxicity relative to 2,3,7,8-TCDD, a chemical that has the potential to have the same health effects as 2,3,7,8-TCDD, such as

1,2,3,7,8-PeCDD, is given the same weight. A chemical considered less toxic or less likely to act like 2,3,7,8-TCDD is given less weight.

In the TEF approach, the concentration of each PCB and dioxin congener is multiplied by its respective TEF, thereby expressing each individual concentration in terms of its "toxicity equivalents" (TEQ). The individual PCB congener TEQ values are added together to yield a total PCB TEQ value. Likewise, the individual PCDD/PCDF congener TEQ values are added together to yield a total PCDD/PCDF TEQ value. The sum of the total PCB TEQ and total PCDD/PCDF TEQ values yields the overall total dioxin-like compound TEQ value for the mixture.

In the early 1990s, the World Health Organization (WHO) organized a meeting with a group of experts to agree on standard TEFs for PCB and dioxin congeners. Since then, the WHO International Program on Chemical Safety workgroup holds expert meetings to update the TEFs with results from the most recent studies. In this health consultation, ATSDR reports data calculations using both the TEFs from 1998, which are designated TEF_{98}, and the TEFs from 2005, which are designated as TEF_{05} [WHO 2006]. See Table 1, Appendix B, for the 1998 and 2005 TEF values.

The TEF_{98} values are used in Section 6.4 because the published reports on background remote, rural, suburban, and urban dioxin air levels were calculated with these TEF_{98} values. ATSDR can compare the reported background levels in the published reports to the levels detected in Calcasieu Parish. However, for its health evaluation, ATSDR used the most recent (TEF_{05}) values in Section 6.3.

3.4 PCB and Dioxin Levels in the Environment

Before 1977, PCBs entered the air, water, and soil during their manufacture and use in the United States. Once in the environment, PCBs do not readily break down and therefore may remain for very long periods of time. However, PCB levels have generally decreased since PCB production stopped in 1977 [ATSDR 2000].

People are exposed to PCBs primarily from contaminated food and breathing contaminated air. The major dietary sources of PCBs are fish (especially sportfish that were caught in contaminated lakes or rivers), meat, and dairy products. Between 1978 and 1991, the estimated daily intake of PCBs in adults from dietary sources declined from about 1.9 nanograms (a nanogram is a billionth part of a gram) to less than 0.7 nanograms [ATSDR 2000].

PCB atmospheric concentrations have been detected in all areas of the world due to the high amount of past usage and their great persistence. In general, atmospheric levels of PCBs appear to be decreasing over time with higher levels of PCBs being detected in urban sites compared to rural locations. For example, the atmospheric concentrations of PCBs measured in urban and rural Baltimore locations in June of 1996 were 0.38–3.36 nanograms per cubic meter (ng/m^3) and 0.02–0.34 ng/m^3, respectively [Offenberg and Baker 1999]. Monitoring studies indicate that concentrations of PCBs in the air tend to be dominated by lower chlorinated, more volatile congeners [ATSDR 2000].

Over the last 20 years, dioxin levels in the United States have been declining because of reductions in dioxin source emissions. However, dioxins break down very slowly so some dioxins from past releases are still in the environment today. Because of natural processes, there will always be dioxin in the environment [IWG 2010].

Because dioxins are found everywhere in the environment, most people are exposed to very small background levels of dioxins when they breath air, consume food or milk, or have skin contact with materials contaminated with dioxins. A background exposure level of approximately 3–6 picograms TEQ per kilogram per day (pg TEQ/kg/day) has been estimated for the general population [ATSDR 1998a].

For the general population, more than 95% of the daily intake of dioxins comes from food [IWG 2010], primarily meat, dairy products, and fish. Inhalation of ambient air is not a major pathway of exposure; it accounts for less than 2% of the total daily intake of dioxins [Schaum et al. 1994]. See Table 2, Appendix B, for estimated daily intake levels of dioxins in air, food, soil and water for the general U.S. population.

Dioxins are present in rural outdoor air at concentrations near the testing equipment detection limits. Dioxin levels may be slightly higher in winter because of the burning of wood and other fuels for home heating. In general, the background air levels of dioxins in urban areas are higher than in rural areas. The air around people who are smoking cigarettes may have dioxins at levels above background. Although breathing contaminated air is usually minor for most people, exposure may be greater in areas near dioxin sources [ATSDR 1998a].

4.0 Background on Calcasieu Parish

Calcasieu Parish is located in southwest Louisiana. Calcasieu Parish and the surrounding area are highly industrialized. Petroleum refineries and major chemical manufacturing plants have been in operation for decades. Agricultural and residential areas are co-mingled throughout the industrial area.

4.1 Toxics Release Inventory (TRI) Summary for Calcasieu Parish

In 1997, ATSDR was asked to evaluate blood samples provided by residents; the agency found the blood serum dioxin levels were elevated [ATSDR 1998b]. Since then, the Calcasieu community has continued to express concerns about dioxin air releases from facilities in the area. EPA's Toxics Release Inventory (TRI) provides estimates of the annual air emissions of "dioxin and dioxin-like compounds," as well as many other chemicals (see http://www.epa.gov/triexplorer/). As described by EPA in its TRI database, the term "dioxin and dioxin-like compounds" refers to 17 PCDD/PCDF congeners. The term does not include coplanar PCBs. ATSDR notes TRI reports emissions for the general category of "PCBs", but TRI does not provide emission data specific to the coplanar PCB congeners.

According to the TRI database, nine industries in the Calcasieu area released PCDD/PCDF congeners into the air in 2001 (see Figure 1, Appendix A). ATSDR reviewed the 2000–2009 TRI data to gain a general overview of potential PCDD/PCDF air releases of regulated facilities in the Calcasieu Parish area. No PCB air emissions data were reported for the years 2000–2009. TRI data contain several limitations including:

- Only certain industries are required to disclose releases for specific hazardous chemicals.
- Information in the TRI database does not represent measured concentrations or a direct measure of exposure; it represents industry-reported emission estimates. The accuracy of these estimates of emissions is not known.

- TRI data do not include mobile sources, like automobiles, trucks, buses, and motorcycles.

Despite these limitations, ATSDR was able to make some observations about TRI reported PCDD/PCDF air emissions in 2001, which corresponds to the year CPAMS air data were available, and for the years 2000–2009 (see Section 6.2).

4.2 Demographics for Calcasieu Parish

Because the PCB and dioxin air data for Calcasieu Parish were collected in 2001, in this section the agency provides demographic statistics from the 2000 Census of Population and Housing [Bureau of the Census 2001]. According to the 2000 census, approximately 183,600 people live in the cities and unincorporated areas of Calcasieu Parish. Lake Charles is the largest city in the Parish with a population of approximately 71,800. Sulphur and Westlake are considerably smaller with populations of approximately 20,500 and 4,600, respectively. The unincorporated portion has a population of approximately 61,700, or one-third of the Calcasieu population. Overall, 10% of the population consists of children aged 6 years or younger and 12% of the population consists of adults aged 65 years older. There is some variation in the elderly population with 15% in Lake Charles and 8% in the unincorporated areas [Bureau of the Census 2001].

To gather additional demographic statistics, ATSDR drew a general boundary around the industrial corridor using the locations of the TRI reported dioxin emitters (see Figure 2, Appendix A). According to the 2000 Census of Population and Housing, 49,308 persons 21,813 households lived within this boundary. Of these, 82% were white and 15% black. The demographic statistics indicated 4,692 children were aged 6 years of age or younger and 6,900 adults were 65 years of age or older [Bureau of the Census 2001]. Figure 2, Appendix A, provides additional demographic statistics within the ATSDR-defined industrial corridor boundary.

5.0 Calcasieu Parish Air Monitoring Study

The Calcasieu Parish Air Monitoring Study (CPAMS) assessed the Parish's ambient air quality. The CPAMS was a voluntary cooperative effort among the EPA, Lake Area Industry Alliance, and the Louisiana Department of Environmental Quality. PCB and dioxin air monitoring efforts conducted during 2001 were included in this study [EPA 2002].

5.1 Air Monitoring Methods

The CPAMS used well-established methods to collect and analyze air samples. Specifically, PCBs and dioxins were measured using EPA Method TO-9A. This method uses a high volume air sampler equipped with a quartz-fiber filter and a polyurethane foam adsorbent [EPA 1999]. Analytical procedures were based on high resolution gas chromatography-high resolution mass spectrometry for analysis of the samples. The CPAMS air samples were analyzed for seven coplanar PCBs and 17 PCDDs/PCDFs.

5.2 Air Monitoring Locations

The CPAMS network was comprised of five monitoring locations in Calcasieu Parish. EPA Region 6 conducted air dispersion modeling to select four of these locations in the areas of greatest community impact from the surrounding industrial corridor. These four industrial corridor locations are Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake (see Figure 1,

Appendix A.) The fifth location was established as a reference location in Vinton, over 10 miles west of the industrial corridor. Because the CPAMS network refers to the Vinton location as a “reference location,” ATSDR in this health consultation also refers to Vinton as a “reference location;” however, ATSDR notes that the Vinton location is impacted by regional dioxin air emissions. In general, one sample was collected at each location during six sampling periods.

5.3 Air Sampling Schedule

Because of technical restrictions in measuring low PCB and dioxin levels in the air, a sample was collected from each location over a thirty-day period every other month from January 2001 through December 2001. This produced six sampling periods in 2001:

Sampling Period 1.	January 15 to February 10
Sampling Period 2.	March 15 to April 11
Sampling Period 3.	May 16 to June 12
Sampling Period 4.	July 24 to August 14
Sampling Period 5.	September 11 to October 8
Sampling Period 6.	November 7 to December 4

Air samples were not collected at the Mossville location during the first two sampling periods because site access agreements were not yet secured. Therefore, an additional sampling period was added at the Mossville location from March 19 to April 15, 2002. Wind speed and direction were collected at the Bayou D’Inde and Mossville locations during the sampling periods.

5.4 Data Quality

The analyses, conclusions, and recommendations in this health consultation are valid only if the sampling and analytical data are complete and reliable. The CPAMS conducted sampling in accordance with a quality assurance project plan [EPA 2002]. The laboratory followed quality assurance/quality control (QA/QC) and data reporting measures. A rotating field duplicate was established at a different location during each sampling period to measure the accuracy of the field sampling techniques. In addition, several trips were made to audit the network and the report indicated the sampling was proceeding very well with only a few exceptions [Lockheed Martin 2001]. ATSDR considers most of the PCB and dioxin data adequate for public health evaluation purposes with the following noted exceptions:

- In sampling period 1, the rotating field sampler at the Westlake location experienced motor failure.
- In sampling period 2, the sample at the Vinton location was lost prior to analysis as a result of laboratory error.
- In sampling period 3, the sample at the Lighthouse Lane location was analyzed for coplanar PCBs, but the PCDD/PCDF data were lost as a result of laboratory error.
- In sampling period 5, the Lighthouse Lane sampler experienced a motor failure and a run-time counter failure.

- In sampling period 6, both the stationary and rotating duplicate samplers at the Vinton location experienced motor failures.

ATSDR did not consider data for the samples noted from these instances in this document.

5.5 Air Sampling Results

Tables 3–7, Appendix B, summarize the PCB and PCDD/PCDF air concentration results for the Vinton, Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake locations, respectively. For each sampling location, the results of the PCB and PCDD/PCDF TEQ_{05} calculations are contained in Tables 8–12, Appendix B.

For each monitoring location, mean PCB TEQ_{05} values were calculated by adding up the total PCB TEQ_{05} values for each sampling period and then dividing by the number of sampling periods. Likewise, mean PCDD/PCDF TEQ_{05} values were calculated by adding up the total PCDD/PCDF TEQ_{05} values for each sampling period and then dividing by the number of sampling periods. The overall mean dioxin-like compound TEQ_{05} values are also provided in Tables 8–12, Appendix B.

For each monitoring location, Table 13, Appendix B, contains a summary of all the TEQ calculations including the mean PCB TEQ_{98} and TEQ_{05} levels, the mean PCDD/PCDF TEQ_{98} and TEQ_{05} levels, and the overall mean dioxin-like compound TEQ_{98} and TEQ_{05} levels. Of note, TEQ data calculation results presented in the Appendix B tables show results rounded to four decimal places. For ease of reading this report, the TEQ values provided in the main text are rounded to two decimal places.

As seen in Table 13, the mean coplanar PCB levels for the industrial corridor locations ranged from 1.32 femtograms per cubic meter (fg/m^3) TEQ_{98} (Westlake) to 2.01 fg/m^3 TEQ_{98} (Mossville), with an overall mean for the industrial corridor of 1.68 fg/m^3 TEQ_{98}. The mean coplanar PCB level for the reference location (Vinton) was 0.74 fg/m^3 TEQ_{98}. The mean PCDD/PCDF levels for the industrial corridor locations ranged from 9.53 fg/m^3 TEQ_{98} (Lighthouse Lane) to 28.01 fg/m^3 TEQ_{98} (Mossville), with an overall mean for the industrial corridor of 16.66 fg/m^3 TEQ_{98}. The mean PCDD/PCDF level for the reference location (Vinton) was 7.42 fg/m^3 TEQ_{98}. Figure 3, Appendix A, is a graphical representation of the mean TEQ_{98} levels for Calcasieu Parish.

Table 13, Appendix B, shows the mean coplanar PCB levels for the industrial corridor locations ranged from 1.14 fg/m^3 TEQ_{05} (Westlake) to 1.79 fg/m^3 TEQ_{05} (Mossville), with an overall mean coplanar PCB for the industrial corridor of 1.47 fg/m^3 TEQ_{05}. The mean coplanar PCB level for the reference location (Vinton) was 0.65 fg/m^3 TEQ_{05}. The mean PCDD/PCDF levels for the industrial corridor locations ranged from 8.81 fg/m^3 TEQ_{05} (Lighthouse Lane) to 25.66 fg/m^3 TEQ_{05} (Mossville), with an overall mean for the industrial corridor of 15.53 fg/m^3 TEQ_{05}. The mean PCDD/PCDF level for the reference location (Vinton) was 7.03 fg/m^3 TEQ_{05} (see Table 13, Appendix B, and Figure 4, Appendix A).

Figures 5–8, Appendix A, show the PCB and PCDD/PCDF concentration and TEQ_{05} profiles for Calcasieu Parish. These profiles show the predominant congener(s) for each industrial corridor location, as well as the reference location and industrial corridor overall. Specifically, the concentration profiles show the percent of the total concentration of each individual congener at each location. Concentration profiles were calculated using mean values for each location (found in Tables 3–7, Appendix B); that is, they were calculated by dividing individual congener mean concentrations by the sum of the mean congener concentrations at each location and then multiplying by 100. TEQ_{05} profiles show the percent of the total TEQ_{05} of each individual congener. TEQ_{05} profiles were calculated using mean values for each location (found in Tables 8–12, Appendix B); that is, they were calculated by dividing individual congener mean $TEQs_{05}$ by the sum of the mean congener $TEQs_{05}$ at each location and then multiplying by 100. Based on these profiles, ATSDR made the following observations:

- Figure 5, Appendix A, shows that the predominant coplanar PCB concentration for all locations was PCB-118 (about 65% of the total concentrations), followed by PCB-105 (about 25% of the total concentrations). The coplanar PCB concentration profiles for industrial corridor locations were similar to the profile for the reference location (Vinton).
- Figure 6, Appendix A, shows the predominant PCDD/PCDF concentration for all locations was for OCDD, which accounted for about 60–65% of the total concentrations. The PCDD/PCDF concentration profiles for industrial corridor locations were similar to the profile for the reference location (Vinton).
- Figure 7, Appendix A, shows the predominant coplanar PCB TEQ_{05} for all locations was for PCB-126, which accounted for about 90% of the total coplanar PCB TEQ_{05} levels. The coplanar PCB TEQ_{05} profiles for the industrial corridor locations were similar to the profile for the reference location (Vinton).
- Figure 8, Appendix A, shows that no PCDD/PCDF TEQ_{05} at any location accounted for greater than 30% of the total PCDD/PCDF TEQ_{05} levels. The 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD TEQ_{05} profiles at the reference location (Vinton) were higher than the other four industrial corridor locations.

As stated previously, PCB and dioxin congeners are believed to have varying strengths or potencies that contribute to harmful health effects. Therefore, coplanar PCB TEQ_{05} and PCDD/PCDF TEQ_{05} levels are used to evaluate potential harmful health effects, not coplanar PCB and PCDD/PCDF concentrations. The following text describes the TEQ_{05} data results specific for each location used in this public health evaluation.

5.5.1 Vinton

The Vinton location's total coplanar PCB levels ranged from 0.36 fg/m^3 TEQ_{05} (sampling period 1) to 1.05 fg/m^3 TEQ_{05} (sampling period 4) (see Table 8, Appendix B). The total PCDD/PCDF levels ranged from 2.53 fg/m^3 TEQ_{05} (sampling period 5) to 9.12 fg/m^3 TEQ_{05} (sampling period 4). Sampling period 4 had the maximum total dioxin-like compound level of 10.17 fg/m^3 TEQ_{05}. For this reference location, the overall mean dioxin-like compound level was 7.68 fg/m^3 TEQ_{05}.

5.5.2 Bayou D'Inde

The Bayou D'Inde location's total coplanar PCB levels ranged from 0.91 fg/m^3 TEQ_{05} (sampling period 2) to 2.10 fg/m^3 TEQ_{05} (sampling period 4) (see Table 9, Appendix B). The total PCDD/PCDF levels ranged from 3.83 fg/m^3 TEQ_{05} (sampling period 3) to 44.91 fg/m^3 TEQ_{05} (sampling period 6). Sampling period 6 had the maximum total dioxin-like compound level of

46.27 fg/m^3 TEQ_{05}. For the Bayou D'Inde location, the overall mean dioxin-like compound level was 13.64 fg/m^3 TEQ_{05}.

5.5.3 Lighthouse Lane

The Lighthouse Lane location's total coplanar PCB levels ranged from 0.69 fg/m^3 TEQ_{05} (sampling period 1) to 2.35 fg/m^3 TEQ_{05} (sampling period 4) (see Table 10, Appendix B). The total PCDD/PCDF levels ranged from 3.41 fg/m^3 TEQ_{05} (sampling period 4) to 16.19 fg/m^3 TEQ_{05} (sampling period 6). Sampling period 6 had the maximum total dioxin-like compound level of 17.12 fg/m^3 TEQ_{05}. For the Lighthouse Lane location, the overall mean dioxin-like compound level was 10.33 fg/m^3 TEQ_{05}.

5.5.4 Mossville

The Mossville location's total coplanar PCB levels ranged from 1.13 fg/m^3 TEQ_{05} (sampling period 5) to 2.53 fg/m^3 TEQ_{05} (sampling period 6) (see Table 11, Appendix B). The total PCDD/PCDF levels ranged from 5.80 fg/m^3 TEQ_{05} (sampling period 3) to 83.72 fg/m^3 TEQ_{05} (sampling period 6). Sampling period 6 had the maximum total dioxin-like compound level of 86.25 fg/m^3 TEQ_{05}. For the Mossville location, the overall mean dioxin-like compound level was 27.45 fg/m^3 TEQ_{05}.

5.5.5 Westlake

The Westlake location's the total coplanar PCB levels ranged from 0.86 fg/m^3 TEQ_{05} (sampling period 1) to 1.94 fg/m^3 TEQ_{05} (sampling period 4) (see Table 12, Appendix B). The total PCDD/PCDF levels ranged from 5.34 fg/m^3 TEQ_{05} (sampling period 3) to 29.23 fg/m^3 TEQ_{05} (sampling period 6). Sampling period 6 had the maximum total dioxin-like compound level of 30.30 fg/m^3 TEQ_{05}. For the Westlake location, the overall mean dioxin-like compound level was 16.57 fg/m^3 TEQ_{05}.

6.0 Discussion

This section evaluates the PCB and dioxin air monitoring data collected in 2001 from five locations in Calcasieu Parish. First, wind direction and speed data are reviewed to determine whether any annual and seasonal patterns exist. Second, TRI data for facilities in Calcasieu Parish are evaluated for general trends of reported dioxin air emissions. Third, available PCB and dioxin data are evaluated to determine the potential for harmful health effects in Calcasieu Parish residents. Finally, PCBs and dioxins in Calcasieu's air (Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake) are compared to U.S background levels and the reference location (Vinton).

6.1 Wind Rose Data Evaluation

ATSDR examined wind rose data (local wind direction and speed) [URS Corporation 2002, WebMET 2003]. A wind rose is a way of showing average wind direction and speed, both of which impact outdoor air PCB and dioxin exposures. ATSDR examined these data for any possible annual and seasonal patterns.

6.1.1 Annual Patterns

2001 wind direction and speed data for the Bayou D'Inde and Mossville locations are displayed in Figure 9, Appendix A. ATSDR made these general observations:

- The average wind speeds at the two locations in 2001 were similar: 3.2 meters per second (m/s) (or about 7.2 miles per hour (mph)) at Bayou D'Inde and 3.0 m/s (or 6.7 mph) at Mossville.
- For both locations, winds were least likely to come from the west direction.
- Predominant wind directions at the Bayou D'Inde location were from the south and north-northeast.
- Predominant wind directions at the Mossville location were from the southeast and north-northeast.

Overall, the wind roses for Bayou D'Inde and Mossville were similar even though they are several miles apart. Therefore, these wind patterns are likely similar to the annual patterns at the other CPAMS monitoring locations in the industrial corridor.

ATSDR then examined how well the 2001 Bayou D'Inde and Mossville wind roses compared with the 2001 Lake Charles Municipal Airport wind rose. The airport is several miles southeast of the industrial corridor. Then, ATSDR compared how well 2001 wind patterns compared with historical wind patterns in Calcasieu Parish. To complete this analysis, ATSDR first gathered and compiled available Lake Charles Municipal Airport wind rose data for 2001 and for the years 1987 through 1991 [URS Corporation 2002, WebMET 2003]. Figure 10, Appendix A, shows the airport wind rose data averaged for the five-year period of 1987–1991. Figure 11, Appendix A, shows the wind roses averaged for each year for the airport. ATSDR made these general observations:

- The average wind speed at the Lake Charles Municipal Airport for 2001 was 3.03 m/s, and predominant wind directions were from the south and northeast.
- The wind speed at the Lake Charles Municipal Airport averaged for the five-year period 1987–1991 was 3.9 m/s, and predominant wind directions were from the south and northeast.
- The average wind speed was 3.57 m/s in 1987, 3.97 m/s in 1988, 4.17 m/s in 1989, 4.00 m/s in 1990, and 3.79 m/s in 1991.
- Predominant wind directions in 1987, 1988, and 1989 were from the south and northeast.
- Predominant wind directions in 1990 were from the south and southeast and in 1991 from the northeast.
- All the wind roses in Figures 10 and 11, Appendix A, indicated winds were least likely to come from the west direction.

Overall, comparing the 2001 Lake Charles Municipal Airport to Bayou D'Inde and Mossville wind roses demonstrate similar 2001 patterns. The slight differences were most likely attributable to small geographical differences between the locations. The 2001 wind roses for the airport, Bayou D'Inde, and Mossville compared to the 1987–1991 wind roses for airport also show similar patterns, which indicates annual wind directions remained fairly consistent over the years.

6.1.2 Seasonal Variations

Although analysis of annual patterns is important to gain perspective about a region's general wind speed and direction, seasonal variations can also exist.

During the CPAMS, air samples collected during six sampling periods represent conditions across the seasons. To note any potential seasonal variations, wind rose data from the Mossville area for the year 2001 during the same six sampling periods used in the CPAMS were evaluated. Figure 12, Appendix A, presents the wind roses for each sampling period. The following text briefly describes these 2001 data:

- *Sampling Period 1. January 15–February 10:* During the winter season, the predominant wind direction was from the north about 16% of the time. Overall, the wind speed was moderate with an average of 3.0 m/s.
- *Sampling Period 2. March 15–April 11:* As the season changed from winter to spring, so did the wind direction and speed. During this sampling period, the predominant wind direction was from south-southeast about 25% of the time and the average wind speed was 3.5 m/s.
- *Sampling Period 3. May 16–June 12:* The wind direction and speed remained fairly constant during the spring season. For sampling period 3, the predominant wind direction was from the south about 25% of the time. Overall, the average wind speed of 3.6 m/s during this period was similar to that of sampling period 2.
- *Sampling Period 4. July 24–August 14:* During the summer season, the predominant wind direction was from the south about 14% of the time. In addition, the average wind speed dropped to 2.4 m/s, which was less than the averages from other sampling periods.
- *Sampling Period 5. September 11–October 8:* As the season changed from summer to fall, so did the wind direction. The predominant wind direction was from the north-northeast almost 30% of the time. Also, wind direction was from the north almost 25% of the time. The average wind speed was 2.7 m/s during the fall.
- *Sampling Period 6. November 7–December 4:* As the season changed from fall to winter, patterns changed again. In this period, winds were from the north-northeast, east, and southeast about 12% of the time each. Overall, the wind speed during sampling period 6 was moderate with an average of 3.0 m/s.

Based on the wind roses for each sampling period, both wind direction and speed vary across the seasons.

Next, total concentration levels (PCBs and PCDF/PCDDs combined) for each sampling period were evaluated to determine whether any seasonal variations are evident. Figure 13, Appendix A, presents seasonal variations for each sampling period as a function of total concentration. Of note, no data were available for the reference location (Vinton) for comparison purposes during sampling period 6. Both the stationary and rotating duplicate samplers at the Vinton location experienced motor failures during this period. Based on Figure 13, Appendix A, the following observations are made:

- Three of the four industrial corridor locations (Bayou D'Inde, Mossville and Westlake) showed higher dioxin-like compound concentrations in sampling period 6 (November/December) than during any other sampling season.
- During sampling period 6 (November/December), the dioxin-like compound concentrations at Mossville and Bayou D'Inde were about two times greater than they were during any other sampling season. The wind rose at the Mossville location indicated the community was downwind of the industrial corridor part of the time (i.e., winds were from the north-northeast, east, and southeast about 12% of the time each.)
- One industrial corridor location (Lighthouse Lane) and the reference location (Vinton) showed maximum dioxin-like compound concentrations in sampling period 4 (July/August). Although the maximum dioxin-like compound concentration at Lighthouse Lane was during sampling period 4, this location showed similar dioxin-like compound concentrations across sampling periods 2, 5, and 6.

These data suggest that seasonal variations are one of multiple factors influencing outdoor PCB and PCDD/PCDF air levels in Calcasieu Parish. Seasonal variations alone cannot account for fluctuations in outdoor dioxin-like compound air concentrations.

6.1.3 Wind Rose Data Evaluation Limitations

Wind rose data has limitations. For example, other meteorological conditions may have also influenced PCB and dioxin outdoor air concentrations in 2001, including temperature and precipitation.

6.2 TRI Review

EPA TRI data provide general observations about reported PCDD/PCDF air emissions in the Calcasieu Parish area. As mentioned previously, coplanar PCBs are not included in the TRI database as part of "dioxin-like compounds." Also, no PCB air emissions were reported for the years 2000–2009. TRI does not provide emission data specific to coplanar PCB congeners. Based on the 2001 data:

- Calcasieu Parish was ranked 105th of 792 counties in the nation in total reported PCDD/PCDF air releases [EPA 2011a].
- The majority (90%) of the total reported PCDD/PCDF air emissions releases in Calcasieu Parish were from four facilities. As shown in Table 14, Appendix B, these four facilities were PPG Industries (about 40% of the total reported PCDD/PCDF air emissions for the Parish), Citgo Petroleum (about 24%), Georgia Gulf (about 14%), and Entergy Services (about 12%) [EPA 2011b].
- PPG Industries in Calcasieu Parish ranked 279th of 1,254 facilities in the U.S. for total PCDD/PCDF air emissions (see Table 14, Appendix B) [EPA 2011c].

Dioxin levels in the U.S. environment have been declining for the last 30 years due to reductions in man-made sources [IWG 2010]. The TRI database reports PCDD/PCDF air emissions starting in the year 2000, and reporting year 2009 contained the most recent TRI data available when this report was written. TRI information for PCDD/PCDF air emissions for the available years (2000–2009) for Calcasieu Parish, the state of Louisiana, and the U.S. was reviewed for any notable trends. Based on Figures 14, 15, and 16, Appendix A, the following observations were made:

- Calcasieu Parish total onsite PCDD/PCDF air emissions showed less than a 5% drop from 2000 to 2009. The years 2006–2007 and 2007–2008 showed the sharpest drop in levels, and 2008–2009 showed the sharpest rise in levels.
- The state of Louisiana total PCDD/PCDF air emissions showed about a 51% drop from 2000 to 2009, with the sharpest drop between 2003 and 2004.
- The U.S. total PCDD/PCDF air emissions showed about a 70% drop from 2000 to 2009, with the sharpest overall drop from 2000–2004.

Overall, while the state of Louisiana and U.S. showed marked decreases in reported PCDD/PCDF air emissions from 2000 to 2009, the TRI data for Calcasieu Parish indicated PCDD/PCDF air emissions in 2000 are similar to 2009 (about 3.5 grams.) As stated previously, the overall reduction in releases of dioxin-like compounds in the United States is attributed to the control of air emissions of these compounds from municipal waste combustors, medical waste incinerators, and cement kilns burning hazardous waste. These are not the types of facilities located in Calcasieu Parish.

6.2.1 TRI Review Limitations

TRI emission data have several limitations. As mentioned in Section 4.1, these data do not represent measured concentrations; rather, they represent industry-reported estimates of dioxin emissions. The accuracy of these estimates of emissions is not known. In addition, smaller stationary sources are not captured in the TRI database. For dioxin air releases, large stationary sources might have less of an impact on outdoor dioxin air levels than the smaller stationary sources, which include burning fuels (like wood, coal or oil) and burning household trash at residences.

Second, many of the facilities have been in operation for decades but TRI data for PCDD/PCDF air emissions were not available until 2000. Over the years, there has been increased awareness of the potential health impacts of chemicals released to the environment. Concurrently, chemical releases into the environment have been greatly reduced through environmental regulation and advances in air emissions control technology. Between 1987 and 2000, there was approximately a 90% reduction in the dioxin releases from all known sources combined in the United States [EPA 2006]. Therefore, a public health evaluation of historical exposures cannot be made—primarily because PCDD/PCDF levels in the past (prior to 2000) may have been vastly different from the data evaluated in this health consultation.

6.3 Public Health Effects Evaluation

Calcasieu Parish residents are concerned about inhaling PCBs and dioxins in the ambient air. In this section, ATSDR addresses the question of whether exposure to the PCB and dioxin levels detected in ambient air during the CPAMS is likely to result in harmful health effects.

Mean dioxin-like compound TEQ_{05} results for each sampling location were compared to screening level guidelines. Screening level guidelines are estimates of daily human exposure to a chemical that are not likely to result in adverse health effects over a specified duration of exposure. Screening level guidelines represent conservative levels of safety—they are not thresholds of toxicity. Although concentrations at or below a health-based guideline may reasonably be considered safe, concentrations above these guidelines will not necessarily be harmful. To ensure that they will protect even the most sensitive populations (such as children or the elderly), these guidelines are intentionally designed to be much lower, usually by two or three orders of magnitude[1], than the corresponding no-observed-adverse-effect-levels (NOAELs) or lowest-observed-adverse-effect-levels (LOAELs) on which they were based. When a screening level guideline is exceeded, ATSDR evaluates site-specific exposure scenarios to determine the possibility of harmful health effects.

No ATSDR screening levels currently exist for inhalation exposures to dioxin-like compounds in air. Therefore, the 2,3,7,8-TCDD California EPA (Cal/EPA) chronic inhalation reference exposure level (REL) of 40,000 fg/m^3 was used as a non-cancer screening value [Cal/EPA 2005a, EPA 2010b]. The 2,3,7,8-TCDD EPA carcinogenic target risk (TR)[2] for inhalation of 64 fg/m^3 and the Cal/EPA inhalation unit risk[3] (IUR) of 38 $(\mu g/m^3)^{-1}$ were used as screening values for cancer health effects [Cal/EPA 2005b, EPA 2010b]. Of note, both the non-cancer and cancer screening levels are for chronic exposures (one year or longer.)

6.3.1 Non-cancer Health Effects

Exposure to dioxin-like compounds are associated with harmful non-cancer health effects. 2,3,7,8-TCDD, which is the most extensively studied dioxin congener, has been shown to cause a variety of harmful effects in animals. Exposure to 2,3,7,8-TCDD can cause weight loss, liver damage, immune system suppression, reproductive damage, and birth defects. Although less is known about the ability of other dioxin congeners to cause harmful health effects, it appears that all dioxins with chlorine in the 2, 3, 7, and 8 positions have similar effects to 2,3,7,8-TCDD but the effects occur at higher doses [ATSDR 1998a].

2,3,7,8-TCDD has also been associated with harmful health effects in people, primarily those with exposures based on occupational or accidental releases. The most noted health effect in people exposed to large amounts of 2,3,7,8-TCDD is chloracne. Chloracne is a severe skin disease with acne-like lesions that occur mainly on the face and upper body. Other skin effects noted in people exposed to high doses of 2,3,7,8-TCDD include skin rashes, discoloration, and

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[1] "Order of magnitude" refers to an estimate of size or magnitude expressed as a power of ten. An increase of one order of magnitude is the same as multiplying a quantity by 10, an increase of two orders of magnitude equals multiplication by 100, an increase of three orders of magnitude is equivalent of multiplying by 1000, and so on. Likewise, a decrease of one order of magnitude is the same as multiplying a quantity by 0.1 (or dividing by 10), a decrease of two orders of magnitude is the equivalent of multiplying by 0.01 (or dividing by 100), and so on.

[2] EPA provides carcinogenic target risk screening levels for inhalation that correspond to a 10^{-6} risk level for carcinogens.

[3] The inhalation unit risk is the upper-bound excess lifetime cancer risk estimated to result from continuous exposure to a chemical at a concentration 1 $\mu g/m^3$ in air.

excessive body hair. Changes in blood and urine that may indicate liver damage are seen in people. Exposures to dioxin have been associated with other health endpoints including a variety of birth defects, reproductive outcomes, and diabetes [ATSDR 1998a].

Because the data available for chronic toxic effects in humans have a number of limitations, the Cal/EPA chronic inhalation REL is based on the Kociba et al. (1978) study of Sprague-Dawley rats with continuous dietary exposure starting at seven weeks of age for 2 years [Cal/EPA 2005a]. The critical effects from the study included increased mortality, decreased weight gain, and changes in the liver, lymphoid tissue, lung and vascular tissues.

To determine the likelihood of Calcasieu residents experiencing these adverse non-cancer health effects, ATSDR compared the mean dioxin-like compound TEQ_{05} levels for each sampling location to the available non-cancer dioxin health-based guideline, which is the Cal/EPA chronic inhalation REL of 40,000 fg/m^3. The mean dioxin-like compound level at the reference location (Vinton) was 7.68 fg/m^3 TEQ_{05} (see Table 13, Appendix B). The industrial corridor locations ranged from 10.33 fg/m^3 TEQ_{05} at the Lighthouse Lane location to 27.45 fg/m^3 TEQ_{05} at the Mossville location. The overall mean for the industrial corridor was 17.00 fg/m^3 TEQ_{05}. These mean dioxin-like compound TEQ_{05} levels are about three orders of magnitude below the Cal/EPA chronic inhalation REL of 40,000 fg/m^3. In general, doses below a health-based guideline are below levels of health concern.

Based on the available data, chronic PCB and dioxin air exposures are unlikely to result in harmful non-cancer health effects in exposed Calcasieu Parish residents, which includes both children and adults.

6.3.2 Cancer Health Effects

2,3,7,8-TCDD is a potent carcinogen in various animal species. Target organs include the liver, thyroid, lung, skin, and soft tissues [EPA 2003].

Several epidemiologic studies have also examined dioxin exposures and cancer incidence. However, conclusions about the human carcinogenicity of dioxin have varied because of differences in opinion regarding the weight-of-evidence. Overall, the EPA, National Toxicology Program, and International Agency for Research on Cancer list 2,3,7,8-TCDD as a known human carcinogen [EPA 2003, IARC 1997, NTP 2005]. Although the weight-of-evidence appears stronger for 2,3,7,8-TCDD as compared to assessments of dioxin TEQs, EPA characterizes the complex mixtures of dioxin to which people are exposed as a likely human carcinogen [EPA 2004].

Because the data available for chronic toxic effects in humans have a number of limitations, Cal/EPA based its IUR for 2,3,7,8-TCDD on an NTP (1982) study [Cal/EPA 2005b]. This study was an oncogenicity bioassay of 2,3,7,8-TCDD in male and female Osborne-Mendel rats and carcinogenicity bioassay with 2,3,7,8-TCDD in male and female B6C3F1 hybrid strain mice by gavage for two years. The most sensitive species, sex, and site for the induction of cancer by 2,3,7,8-TCDD was the male mouse with hepatocellular adenomas or carcinomas (liver tumors). Of note, EPA derived its 2,3,7,8-TCDD carcinogenic TR from equations combining exposure assumptions with the 2,3,7,8-TCDD Cal/EPA IUR. For further information on the specific equations and exposure parameters used by EPA, visit http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm.

To determine the likelihood of Calcasieu residents experiencing cancer, the mean dioxin-like compound TEQ_{05} levels for each sampling location were compared to the available cancer health-based guidelines, one of which is the EPA carcinogenic TR of 64 fg/m^3. As stated previously, the mean dioxin-like compound level for the reference location was 7.68 fg/m^3 TEQ_{05} and the overall mean for the industrial corridor was 17.00 fg/m^3 TEQ_{05}. The maximum mean dioxin-like compound level of 27.45 fg/m^3 TEQ_{05} was found at the Mossville location (see Table 13, Appendix B). These TEQ_{05} levels are below the EPA TR for cancer effects of 64 fg/m^3. Levels below a health-based guideline are not expected to be of health concern.

Using quantitative cancer risk assessment methodology, inhalation cancer risk estimates are expressed as follows:

Cancer Risk = (exposure concentration) × (inhalation unit risk)

Cancer risk estimates are a probability; that is, the proportion of a population that may be affected by a carcinogen during a lifetime of exposure (24 hours/day, 365 days/year, for life). For example, an estimated cancer risk of 2×10^{-6} represents potentially two excess cancer cases in a population of one million over a lifetime of continuous exposure.

For this health consultation, the highest mean dioxin-like compound TEQ_{05} level, which was at the Mossville location, and the overall mean for the industrial corridor were multiplied by the Cal/EPA IUR. The Mossville cancer risk estimate was 1×10^{-6} and the industrial corridor cancer risk estimate was 6×10^{-7}. These cancer risk estimates, which are equal to and less than 1×10^{-6}, suggest minimal risk for the Calcasieu Parish population because the cancer risk estimates were very low.

ATSDR finds that PCB and dioxin air exposures are not likely to result in a cancerous adverse human health effect.

6.3.3 Public Health Evaluation Limitations

This public health evaluation has several limitations. PCB and dioxin air samples were collected over a 30-day period every other month because of technical restrictions in measuring low levels in the air, so acute exposures (short-term exposures to maximum concentrations) could not be evaluated. However, even if all the dioxin detected over a 30-day period were released over a 24-hour period, dioxin air levels would still be orders of magnitude less than a concentration that would be expected to cause acute or chronic non-cancer health effects.

Second, the health-based guidance values used to evaluate the likelihood of non-cancer and cancer adverse health effects were not based on epidemiologic (i.e., human) studies. In most instances, a study based on human data holds the greatest weight in describing relationships between a chemical exposure and a human health effect. However, in the case of dioxin-like compounds, the available case studies have a limited ability to establish cause and effect relationships or threshold doses. For example, chloracne is the most widely recognized effect, yet there are very few human data to determine definitively the threshold level required to produce chloracne [EPA 2003]. In contrast, animal studies evaluating 2,3,7,8-TCDD exposure are controlled experiments (i.e., route, duration, and levels). Well-conducted animal studies can span the 2,3,7,8-TCDD LOAEL and NOAEL to demonstrate the dose-response relationship. Therefore, the health-based guidelines for 2,3,7,8-TCDD were derived from animal studies.

A third limitation is that the health-based guidance values used to evaluate the likelihood of adverse health effects were not based on the inhalation route of exposure. In the case of 2,3,7,8-TCDD, human studies regarding health effects by specific routes of exposure (e.g., inhalation, oral, dermal) are not available and most animal studies related to exposure specifically examine the oral route of exposure. Although the lack of inhalation exposure studies is a serious limitation, the animal studies used to derive the health-based guidance values used in this health consultation do have strengths as well. For example, even though the Cal/EPA chronic inhalation REL is based on dietary exposure, its strengths include continuous exposure for the length of the study, dose ranges spanning the apparent NOAEL, sizable numbers of animals (50 per treatment group per sex), testing of both sexes, examination of all organ systems for microscopic anatomical changes, and demonstration of a dose-response relationship [Cal/EPA 2005a].

Fourth, the available Calcasieu Parish PCB and dioxin air data used in the evaluation were limited in scope. Specifically, the CPAMS was conducted over the course of only one year. In addition, the CPAMS was conducted at only five locations in the parish, yet the parish encompasses over 1,000 square miles. For the purpose of this health consultation, however, ATSDR assumed that PCB and dioxin data collected from these five locations were representative of PCB and dioxin air levels for the entire parish.

Overall, there are recognized uncertainties in ATSDR's public health evaluation. However, providing a framework that puts site-specific exposures and the potential for harm into perspective is one of the primary goals of this health evaluation process [ATSDR 2005a]. Therefore, despite the previously mentioned limitations, ATSDR finds that PCB and dioxin air exposures are unlikely to result in harmful non-cancer or cancer health effects in exposed Calcasieu Parish residents. Even so, because of these same limitations and because EPA is currently reevaluating dioxin risk, ATSDR recommends protective actions to make sure the public remains safe, such as reducing or eliminating releases of dioxin into Calcasieu Parish air wherever possible.

6.4 Calcasieu Parish and U.S. Background Air Data Review

ATSDR compared Calcasieu Parish air data to U.S. background data to determine whether the parish's PCB and dioxin air levels are elevated compared to national levels. The parish comprises both cities and unincorporated areas. Land use is a mixture of agricultural, residential, and industrial areas. As such, one would expect the Calcasieu Parish PCB and dioxin data to span the full range of background levels reported for areas geographically distributed throughout the United States.

6.4.1 U.S. Background Data

EPA established a National Dioxin Air Monitoring Network (NDAMN) to assess ambient air levels of dioxins. Cleverly et al. have reported on the results of air monitoring that occurred in 1999, 2000, 2001, and 2002 at remote, rural, and suburban locations in United States [Cleverly et al. 2002, Cleverly et al. 2004, Cleverly et al. 2007]. Sampling sites were located in 34 areas geographically distributed throughout the United States to obtain background levels.

The year 1999 measurement at the U.S. remote locations indicated an annual mean PCDD/PCDF level of 1.41 fg/m^3 TEQ_{98}. For the years 2000, 2001, and 2002, the annual mean PCDD/PCDF levels were 0.99, 0.7, and 1.07 fg/m^3 TEQ_{98}, respectively. For these four years, the U.S. remote locations' annual mean coplanar PCB levels ranged from 0.16 to 0.32 fg/m^3 TEQ_{98} [Cleverly et al. 2007]. The overall remote mean PCDD/PCDF and PCB levels for 1999–2002 were 1.04 and 0.22 fg/m^3 TEQ_{98}, respectively.

For the years 1999, 2000, 2001, and 2002, the U.S. rural locations' annual mean PCDD/PCDF levels were 10.43, 11.39, 10.40, and 10.47 fg/m^3 TEQ_{98}, respectively. For these four years, the U.S. rural locations' annual mean coplanar PCB levels ranged from 0.59 to 0.7 fg/m^3 TEQ_{98} [Cleverly et al. 2007]. The overall rural mean PCDD/PCDF and PCB levels for 1999–2002 were 10.67 and 0.65 fg/m^3 TEQ_{98}, respectively.

For both U.S. remote and rural locations, the predominant PCDD/PCDF concentration profile was OCDD followed by 1,2,3,4,6,7,8-HpCDD. With regard to the coplanar PCB concentration profile, PCB-118 was the predominant congener. For these locations, the predominant PCDD/PCDF TEQ_{98} profile was the congener 1,2,3,7,8-PeCDD. PCB-126 was the predominant congener for the coplanar PCB TEQ_{98} profile.

In addition to the U.S. rural and remote monitoring effort, during the year 2000, two stations were located in the suburban areas of Washington DC and San Francisco, CA. These suburban locations served as an indicator of PCB and dioxin levels in more populated areas. The two suburban sites had a mean PCDD/PCDF level of 15.5 fg/m^3 TEQ_{98} and a mean coplanar PCB level of 2.0 fg/m^3 TEQ_{98} [Cleverly et al. 2002].

At 106 urban sites, the annual mean PCDD/PCDF levels ranged from 30 to 200 fg/m^3 TEQ_{98}, with an overall mean PCDD/PCDF of 120 fg/m^3 TEQ_{98} [EPA 2003]. The PCDD/PCDF TEQ_{98} levels at these U.S. urban sites tended to be one order of magnitude greater than what was measured at U.S. rural sites. However, the annual mean coplanar PCB levels at 53 urban sites had an overall mean of 0.9 fg/m^3 TEQ_{98}, which is similar to rural levels.

6.4.2 Comparison of Calcasieu Parish TEQ_{98} Levels to U.S. Background TEQ_{98} Levels

For comparison purposes, ATSDR used the available U.S. PCB and dioxin data describing remote and rural areas [Cleverly et al. 2007], suburban areas [Cleverly et al. 2002], and urban areas [EPA 2003]. The Calcasieu Parish TEQ_{98} values (Table 13, Appendix B) are used in this section because the published reports on background remote, rural, suburban, and urban PCB and dioxin air levels were calculated with TEF_{98} values. Figure 17, Appendix A, graphically displays the overall mean dioxin-like compound TEQ_{98} levels for Calcasieu Parish and U.S. remote, rural, suburban, and urban locations. Based on these data, ATSDR made the following observations regarding dioxin-like compound TEF_{98} levels:

- The mean level of 8.17 fg/m^3 TEQ_{98} at the Calcasieu Parish reference location (Vinton) was greater than the mean U.S. remote level (1.26 fg/m^3 TEQ_{98}) but less than mean U.S. rural (11.32 fg/m^3 TEQ_{98}), suburban (17.5 fg/m^3 TEQ_{98}), and urban (120.9 fg/m^3 TEQ_{98}) levels.
- The mean level of 18.34 fg/m^3 TEQ_{98} for the Calcasieu Parish industrial corridor was greater than mean U.S. remote (1.26 fg/m^3 TEQ_{98}) and rural (11.32 fg/m^3 TEQ_{98}) levels, similar to mean U.S. suburban levels (17.5 fg/m^3 TEQ_{98}), and less than mean U.S. urban levels (120.9 fg/m^3 TEQ_{98}).
- The mean level of 30.02 fg/m^3 TEQ_{98} at one Calcasieu Parish industrial location (Mossville) exceeded mean U.S. remote (1.26 fg/m^3 TEQ_{98}), rural (11.32 fg/m^3 TEQ_{98}),

and suburban (17.5 fg/m^3 TEQ_{98}) levels, but was less than mean U.S. urban levels (120.9 fg/m^3 TEQ_{98}).

Of note, the four industrial corridor monitoring locations were selected based on computer modeling that predicted the areas of greatest community impact from the surrounding industrial corridor. However, the dioxin-like compound TEQ_{98} levels detected at these four locations were distinctly lower than the levels detected in U.S. urban industrialized areas (Gibbs et al. 2003).

Overall, the 2001 Calcasieu Parish mean dioxin-like compound TEQ_{98} level for the industrial corridor (18.34 fg/m^3 TEQ_{98}) was similar to U.S. suburban levels and an order of magnitude lower than what would be expected for an urban area.

6.4.3 Comparison of Calcasieu Parish Air Concentration Profiles to U.S. Background Profiles

PCB and PCDD/PCDF concentration profiles were evaluated to determine similarities between Calcasieu Parish and U.S. rural and remote areas in 2001. Because the CPAMS was conducted in 2001, ATSDR used the available U.S. background data from 2001, which were the data reported for U.S. remote and rural locations [Cleverly et al. 2007]. The following were found:

- Similar to the U.S. rural profile, the predominant coplanar PCB congener for the reference location and industrial corridor was PCB-118, which was about 65% of the total concentration. Although PCB-118 was the predominant coplanar PCB congener for the U.S. remote locations too, the remote location was closer to 85% of the total concentration (see Figure 18, Appendix A.)
- For the U.S. rural profile, the reference location and the industrial corridor, PCB-118 was followed by PCB-105, which was about 25% of the total mean concentrations. In U.S. rural locations PCB-156 followed PCB-118 (see Figure 18, Appendix A.)
- Similar to both the U.S. remote and rural profiles, the predominant PCDD/PCDF congener in ambient air for both the reference location and the industrial corridor was OCDD (over 60% of the total mean concentrations) followed by 1,2,3,4,6,7,8-HpCDD (see Figure 19, Appendix A.)

Overall, the PCB and PCDD/PCDF concentration profiles for Calcasieu Parish and the U.S. remote and rural areas appear similar.

6.4.4 Comparison of Calcasieu Parish TEQ_{98} Profiles to U.S. Background TEQ_{98} Profiles

PCB and PCDD/PCDF TEQ_{98} profiles were compared to determine whether there are any similarities between Calcasieu Parish and U.S. background areas. Using available 2001 U.S. background data, the following observations were made:

- Similar to both the U.S. remote and rural profiles, the predominant PCB TEQ_{98} congener in ambient air for both the reference location and industrial corridor was PCB-126 followed by PCB-118 (see Figure 20, Appendix A.)
- Similar to the U.S. rural profile, the predominant PCDD/PCDF TEQ_{98} congener in ambient air for the Calcasieu Parish reference location was 1,2,3,7,8-PeCDD followed by 2,3,4,7,8-PeCDF (see Figure 21, Appendix A.)

- For the Calcasieu Parish industrial corridor and the U.S. remote TEQ_{98} profiles, the congeners 1,2,3,7,8-PeCDD and 2,3,4,7,8-PeCDF showed equally predominant profiles (about 18-19% of the total TEQ_{98}) (see Figure 21, Appendix A.)

Overall, the Calcasieu Parish reference location, Calcasieu Parish industrial corridor, U.S. remote, and U.S. rural areas showed the most similarity in PCB TEQ_{98} profiles.

7.0 Conclusions

Breathing PCBs and dioxins found in outdoor air in 2001 in Calcasieu Parish would not be expected to harm people's health. PCB and dioxin levels detected in outdoor air in 2001 were below levels of health concern. Specifically, the following were found:

- Chronic exposure to PCB and dioxin levels detected in outdoor air in 2001 were below non-cancer health-based guidelines and unlikely to result in harmful non-cancer health effects in exposed Calcasieu Parish residents.
- Chronic exposure to PCB and dioxin levels detected in outdoor air in 2001 were below health-based guidelines for cancer and not likely to result in a cancerous adverse impact to human health.

ATSDR cannot conclude whether breathing PCBs and dioxins in outdoor air during other timeframes could have harmed people's health. Because historical and current levels of PCBs and dioxins in Calcasieu Parish air are not available, the extent to which they may have varied from the 2001 data evaluated in this health consultation is unknown.

Additionally, the following observations were made based on a review of the available information:

- The TRI data for Calcasieu Parish indicated PCDD/PCDF air emissions from the year 2000 are similar to 2009 levels.
- Based on TRI data for 2000 and 2009, the State of Louisiana and U.S. showed decreases of 51% and 70%, respectively, in reported PCDD/PCDF air emissions. The overall reduction in PCDD/PCDF releases is likely attributed to the control of air emissions of these compounds from municipal waste combustors, medical waste incinerators, and cement kilns burning hazardous waste.
- In 2001, four industries in Calcasieu Parish accounted for 90% of the total TRI reported PCDD/PCDF air emissions, earning the parish the rank of 105^{th} of 792 counties in the nation in total reported PCDD/PCDF air releases.
- A review of 2001 wind roses and historical wind roses (1987–1991) indicates annual wind directions in Calcasieu Parish have remained fairly consistent over the years.
- Both wind direction and speed vary across the seasons, and seasonal variations alone may not account for fluctuations in outdoor PCB and dioxin air concentrations.
- The mean dioxin-like compound TEQ_{98} level for the Calcasieu Parish industrial corridor was similar to U.S. suburban levels and 10 times lower than those seen in other U.S. urban areas.

8.0 Recommendations

- Facilities that release dioxins into Calcasieu Parish air should reduce or eliminate those releases wherever possible as a public health-protective action.

9.0 Public Health Action Plan

The purpose of the public health action plan is to ensure that this evaluation not only identifies potential and ongoing public health hazards, but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Appendix C contains a summary of ATSDR's past and ongoing activities.

EPA is currently reevaluating dioxin risk[4] and ATSDR supports continued efforts to identify and reduce exposure to dioxin in the environment. Specific to Calcasieu Parish, ATSDR has released this health consultation for public comment. Our recommendation to reduce or eliminate dioxin releases to the air was provided to state regulatory officials.

10.0 Public Comments

From July 9, 2013, through September 9, 2013, ATSDR released this health consultation for public review and comment. Appendix D contains both the written comments received during the public comment period and ATSDR's responses to those comments.

[4] In response to key comments and recommendations made by the National Academy of Sciences (NAS) on the 2003 draft dioxin reassessment, in 2010 EPA released a draft dioxin reanalysis report [EPA 2010a]. Then, the EPA Science Advisory Board (SAB), a public advisory committee providing extramural scientific information and advice to the Administrator and other EPA officials, was requested to provide an external peer review of the draft dioxin reanalysis report [EPA 2011h]. The SAB review was released in August 2011.

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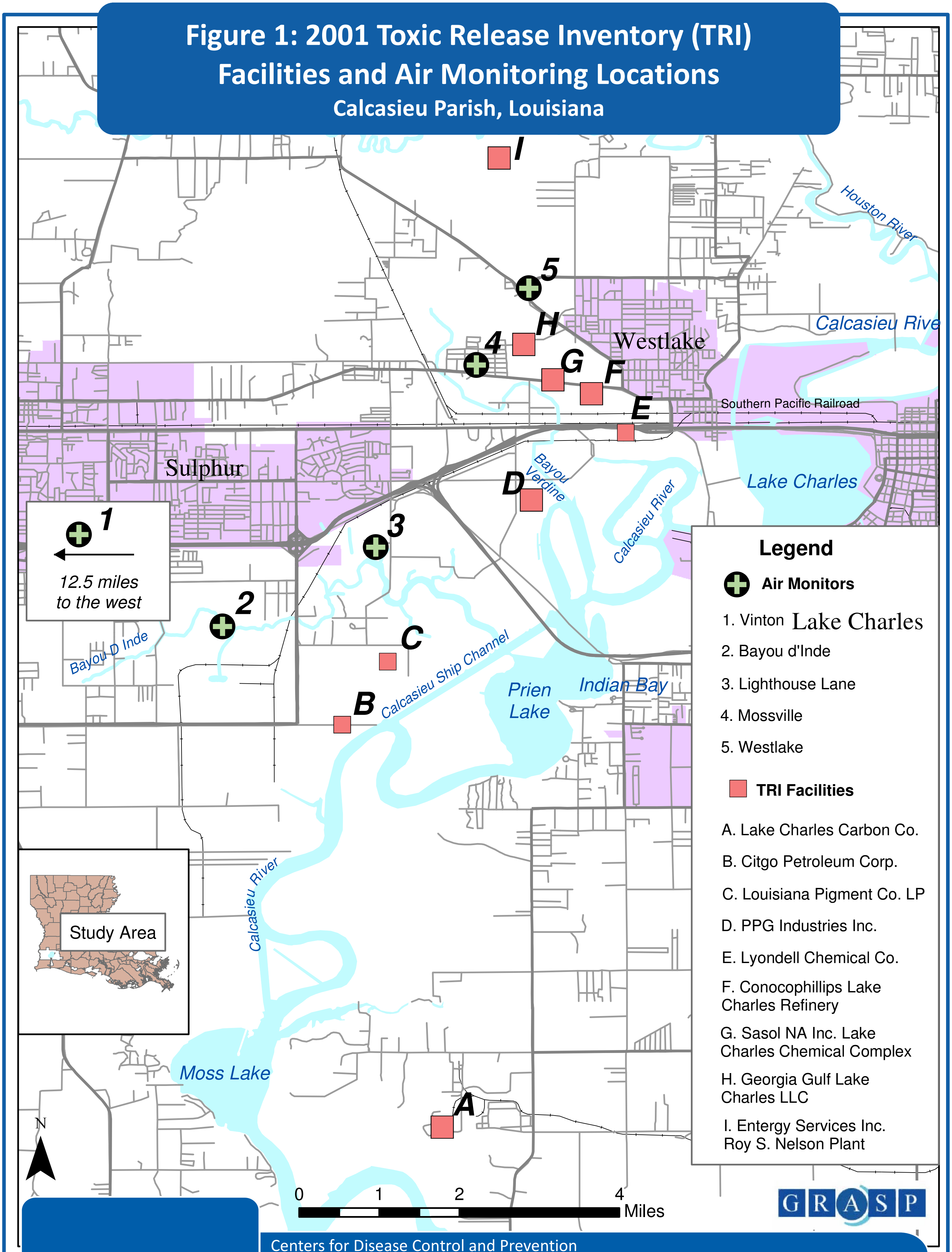
Appendix A: Figures

Figure 1: 2001 Toxic Release Inventory (TRI) Facilities and Air Monitoring Locations
Calcasieu Parish, Louisiana

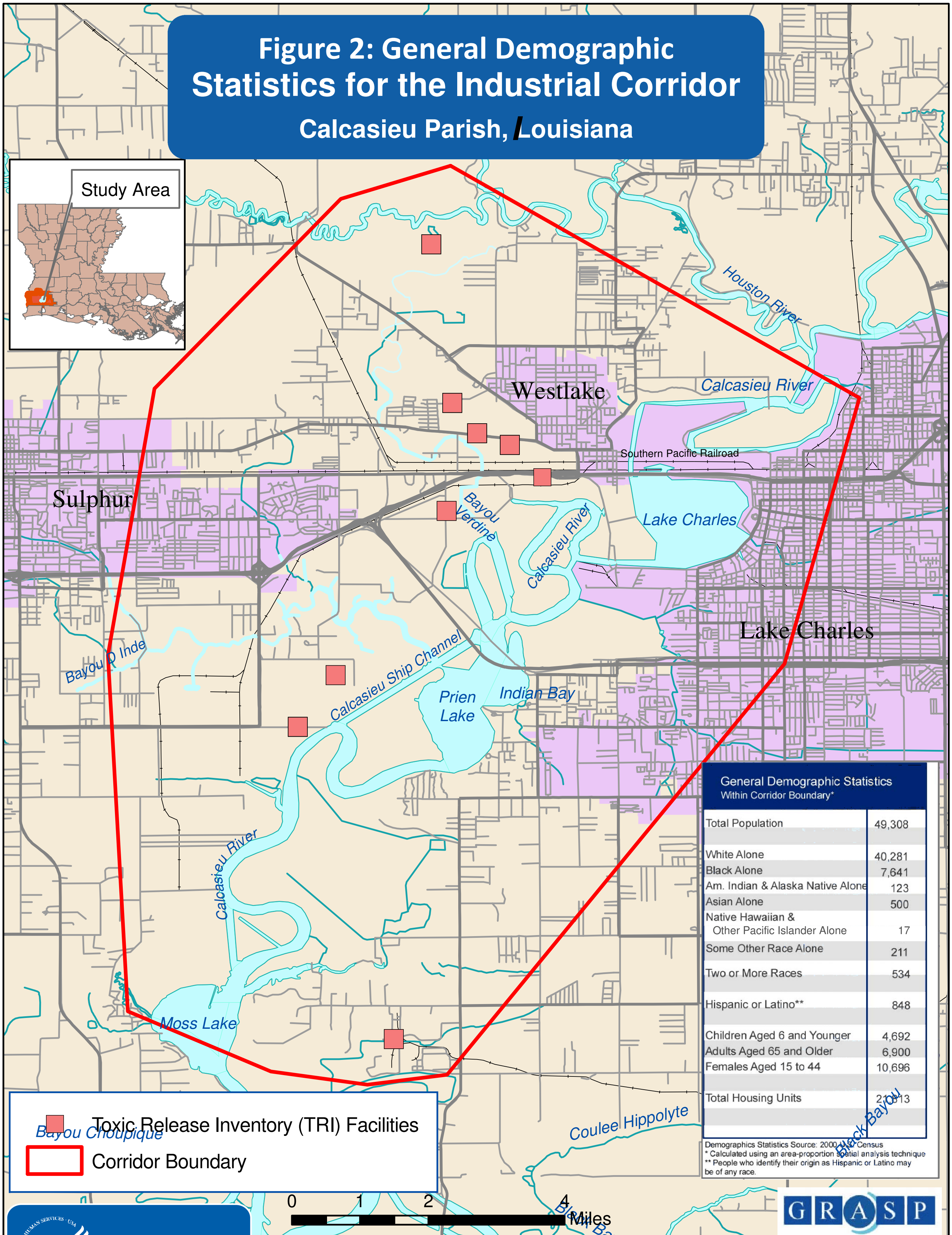


Centers for Disease Control and Prevention
Agency for Toxic Substances and Disease Registry

Geospatial Research, Analysis & Services Program

Figure 2: General Demographic Statistics for the Industrial Corridor

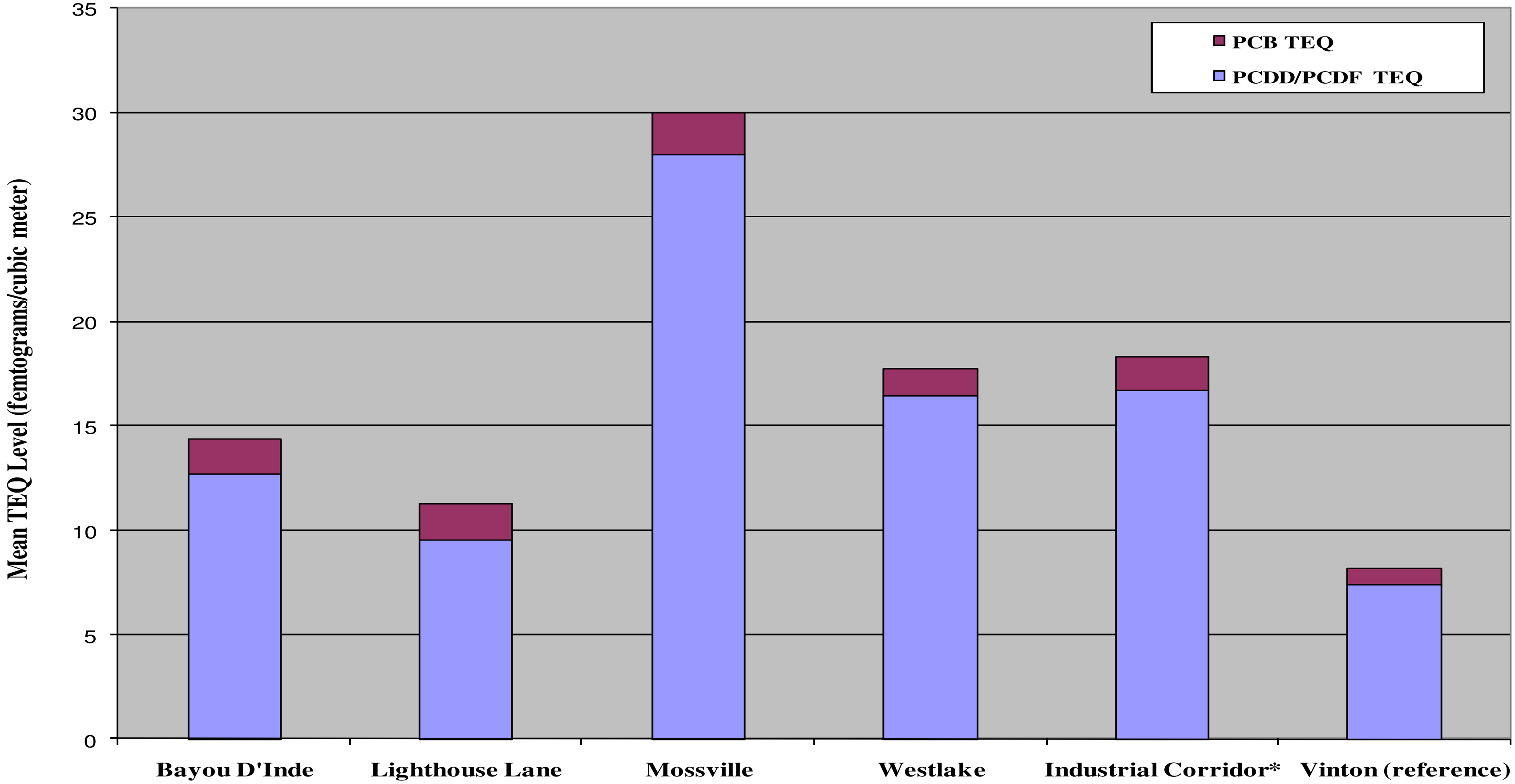
Calcasieu Parish, Louisiana



General Demographic Statistics Within Corridor Boundary*	
Total Population	49,308
White Alone	40,281
Black Alone	7,641
Am. Indian & Alaska Native Alone	123
Asian Alone	500
Native Hawaiian & Other Pacific Islander Alone	17
Some Other Race Alone	211
Two or More Races	534
Hispanic or Latino**	848
Children Aged 6 and Younger	4,692
Adults Aged 65 and Older	6,900
Females Aged 15 to 44	10,696
Total Housing Units	21,813

Demographics Statistics Source: 2000 U.S. Census
* Calculated using an area-proportion spatial analysis technique
** People who identify their origin as Hispanic or Latino may be of any race.

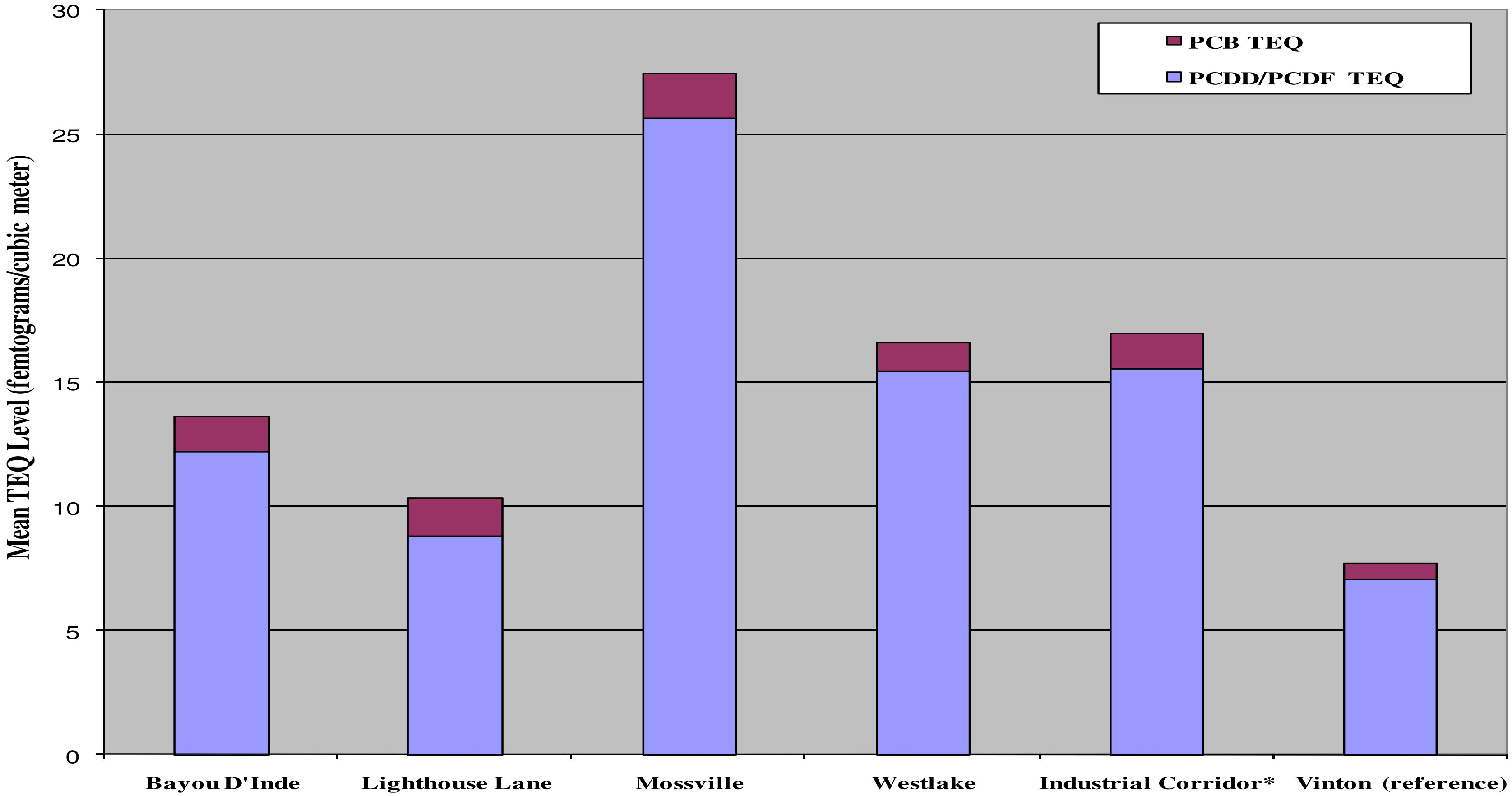
Figure 3. 2001 Mean Toxicity Equivalents (TEQ_{98}) Levels for Calcasieu Parish, Louisiana



Source: Mean TEQ_{98} levels gathered from Table 13, Appendix B.

* The industrial corridor refers to the overall mean of four locations in Calcasieu Parish, which are Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake.
Mean TEQ Level = (sum of the total TEQ values for each sampling period) / number of sampling periods
TEQ_{98} toxicity equivalents calculated from toxicity equivalence factors published by the World Health Organization in 1998
PCB polychlorinated biphenyl
PCDD polychlorinated dibenzo-*p*-dioxin
PCDF polychlorinated dibenzofuran

Figure 4. 2001 Mean Toxicity Equivalents (TEQ_{05}) Levels for Calcasieu Parish, Louisiana



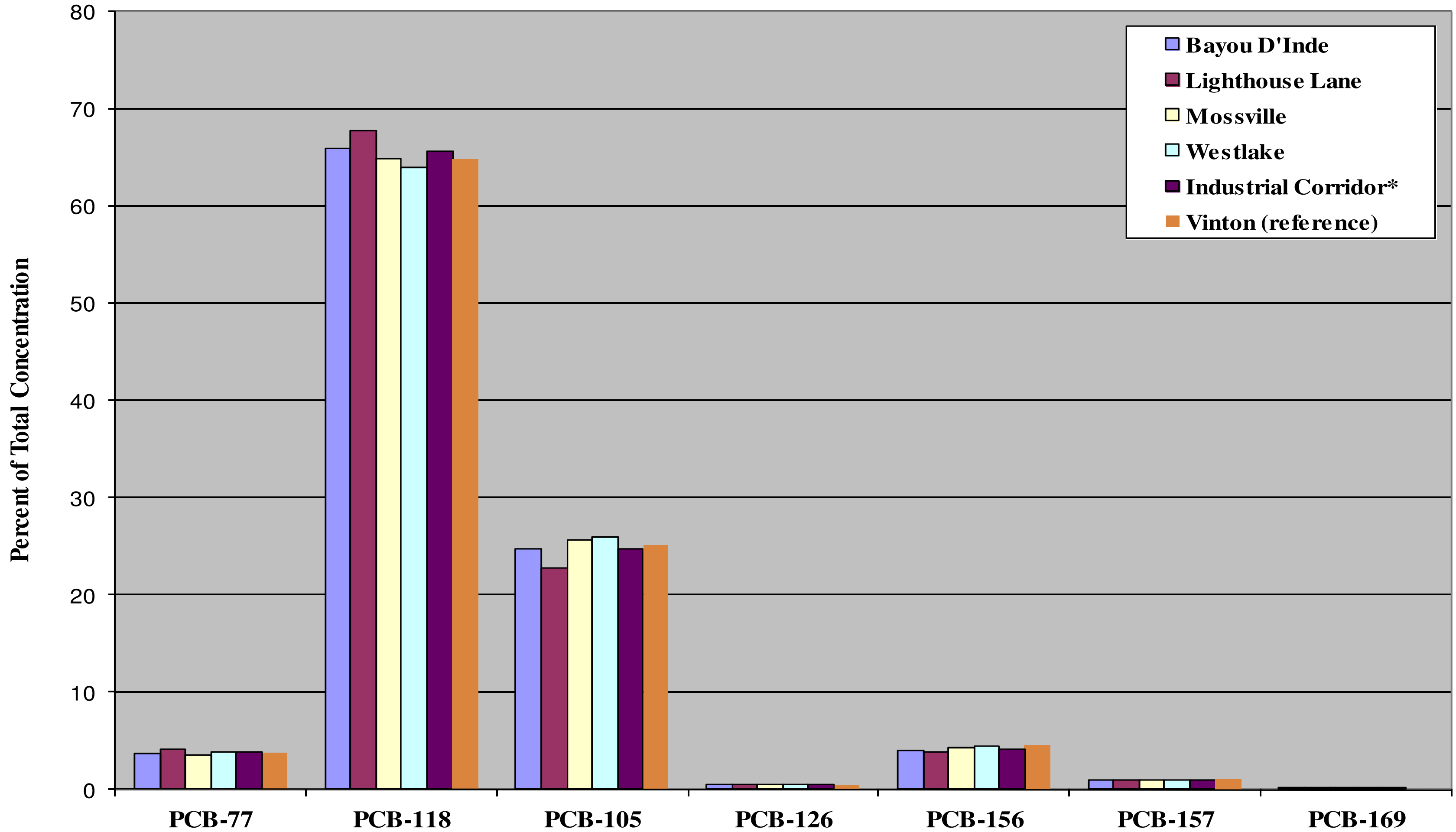
Source: Mean TEQ_{05} levels gathered from Table 13, Appendix B.

*	The industrial corridor refers to the overall mean of four locations in Calcasieu Parish, which are Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake.

Mean TEQ Level = (sum of total TEQ values for each sampling period) / number of sampling periods

TEQ_{05}	toxicity equivalents calculated from toxicity equivalence factors published by the World Health Organization in 2005
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-*p*-dioxin
PCDF	polychlorinated dibenzofuran

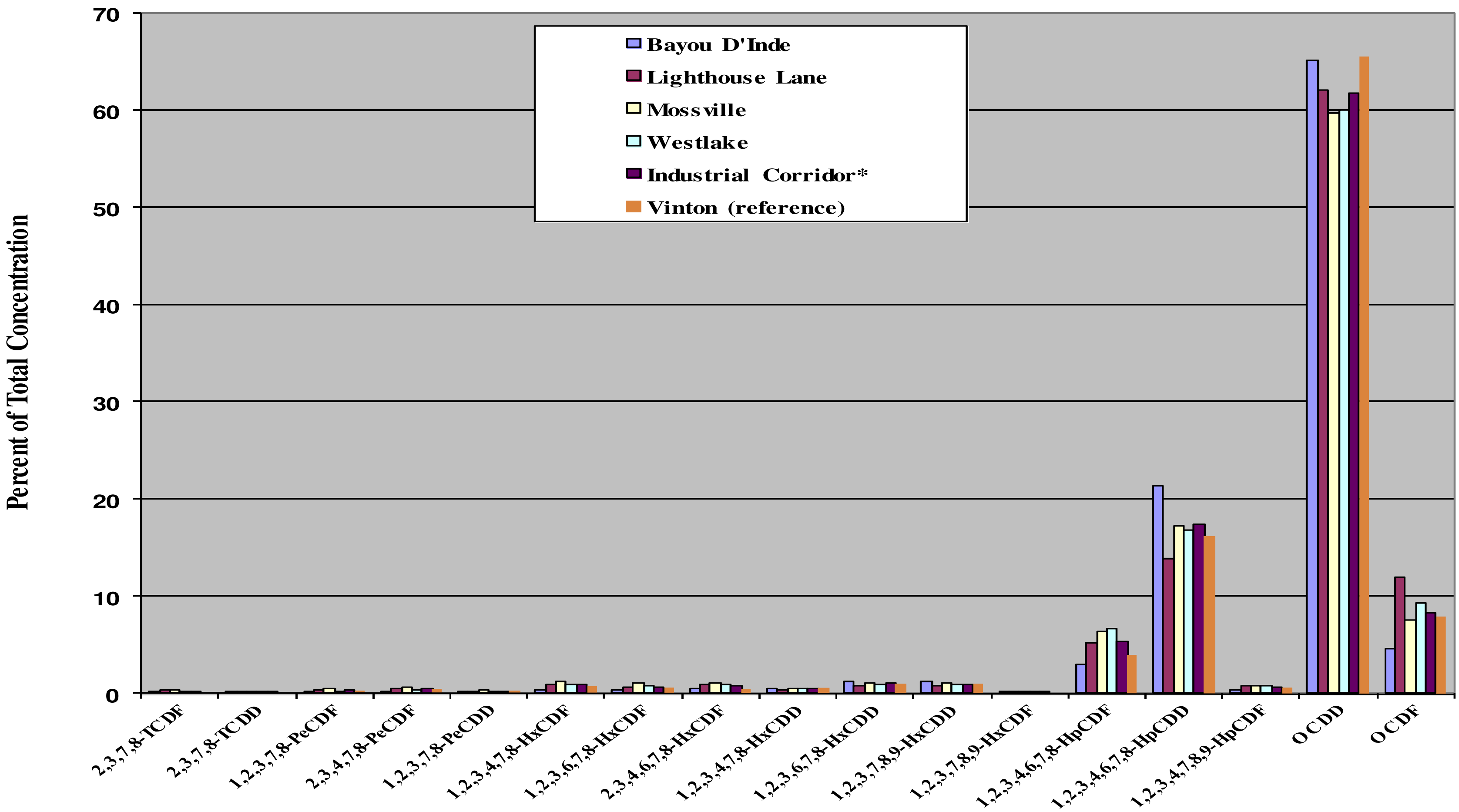
Figure 5. 2001 Coplanar PCB Concentration Profiles for Calcasieu Parish, Louisiana



Source: PCB concentration profile data gathered from Tables 3–7, Appendix B.

* The industrial corridor refers to overall concentration profile of four locations in Calcasieu Parish, which are Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake.
Percent of total concentration = (mean congener concentration / sum of mean congener concentrations) * 100
PCB polychlorinated biphenyl

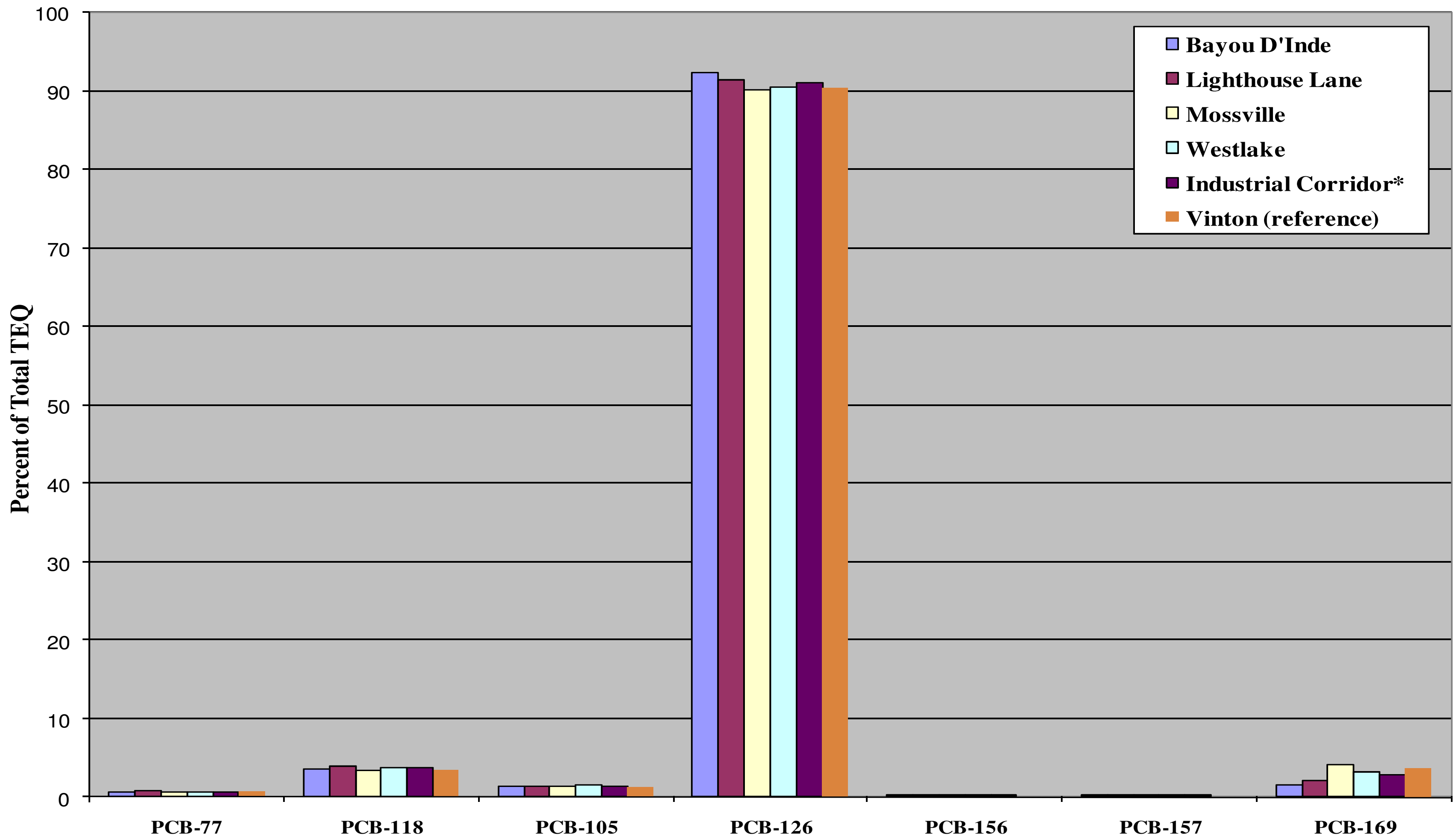
Figure 6. 2001 PCDD/PCDF Concentration Profiles for Calcasieu Parish, Louisiana



Source: PCDD/PCDF concentration profile data gathered from Tables 3–7, Appendix B.
Nomenclature Key for Congeners: See Table 1, Appendix B

* The industrial corridor refers to the overall concentration profile of four locations in Calcasieu Parish, which are Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake.
Percent of total concentration = (mean congener concentration / sum of mean congener concentrations) * 100
PCDD polychlorinated dibenzo-*p*-dioxin
PCDF polychlorinated dibenzofuran

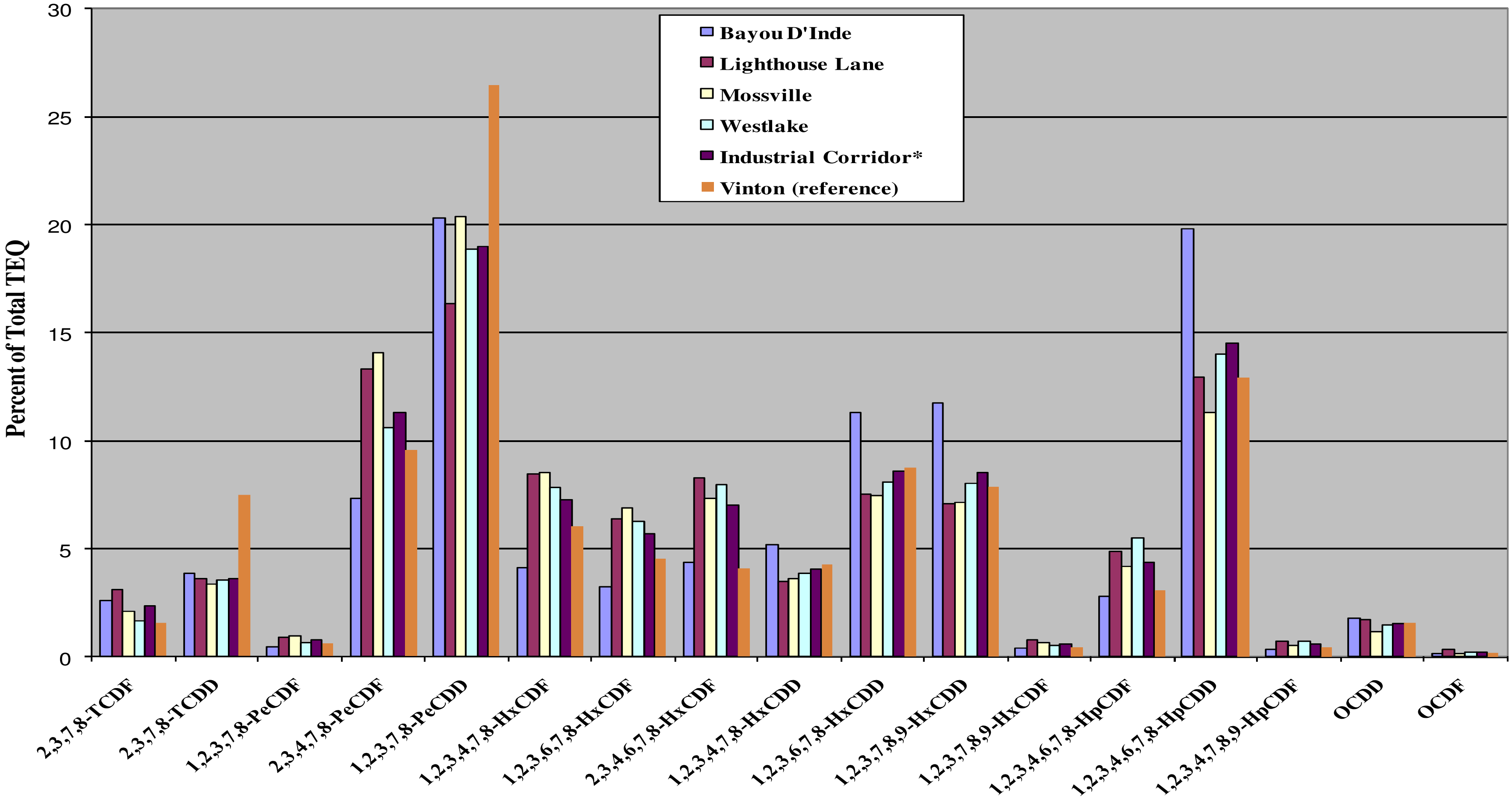
Figure 7. 2001 Coplanar PCB Toxicity Equivalents (TEQ_{05}) Profiles for Calcasieu Parish, Louisiana



Source: PCB TEQ_{05} profile data gathered from Tables 8–12, Appendix B.

* The industrial corridor refers to the overall TEQ profile of four locations in Calcasieu Parish, which are Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake.
Percent of total TEQ = (mean congener TEQ / sum of mean congener TEQs) * 100
PCB polychlorinated biphenyl
TEQ_{05} toxicity equivalents calculated from toxicity equivalence factors published by the World Health Organization in 2005

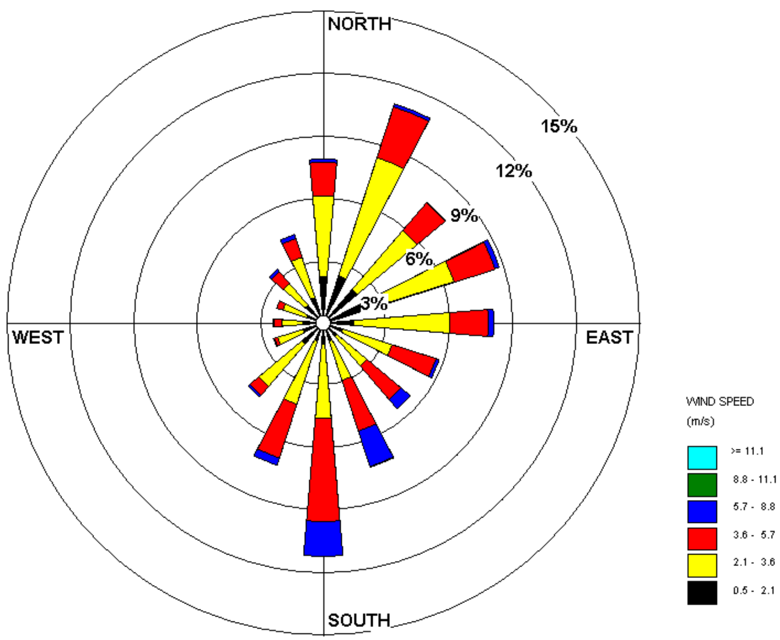
Figure 8. 2001 PCDD/PCDF Toxicity Equivalents (TEQ_{05}) Profiles for Calcasieu Parish, Louisiana



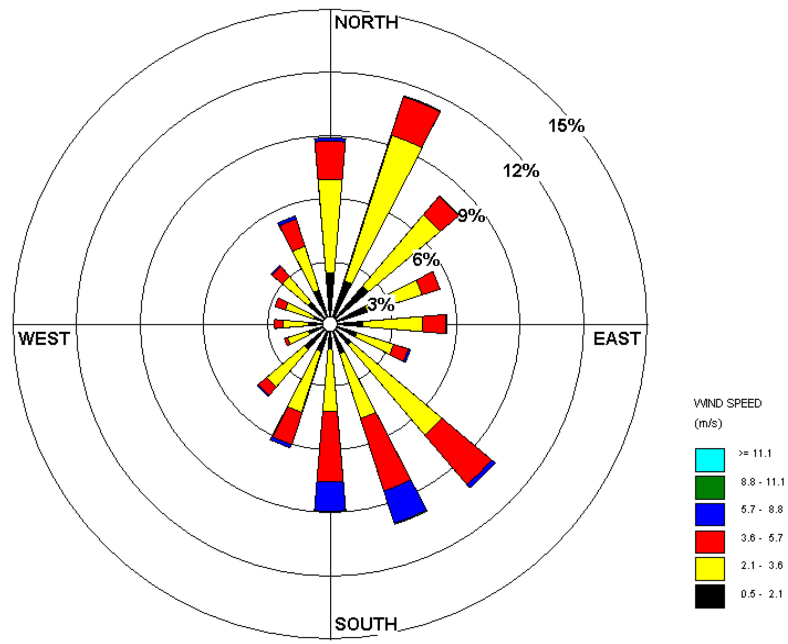
Source: PCDD/PCDF TEQ_{05} profile data gathered from Tables 8–12, Appendix B.
Nomenclature Key for Congeners: See Table 1, Appendix B.

* The industrial corridor refers to the overall TEQ profile of four locations in Calcasieu Parish, which are Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake.
Percent of total TEQ = (mean congener TEQ / sum of mean congener TEQs) * 100
PCDD polychlorinated dibenzo-*p*-dioxin
PCDF polychlorinated dibenzofuran
TEQ_{05} toxicity equivalents calculated from toxicity equivalence factors published by the World Health Organization in 2005

Figure 9. 2001 Wind Rose* Data for Bayou D'Inde and Mossville, Calcasieu Parish, Louisiana



Bayou D'Inde Air Monitor: Wind Rose
Calcasieu Parish, Louisiana
2001

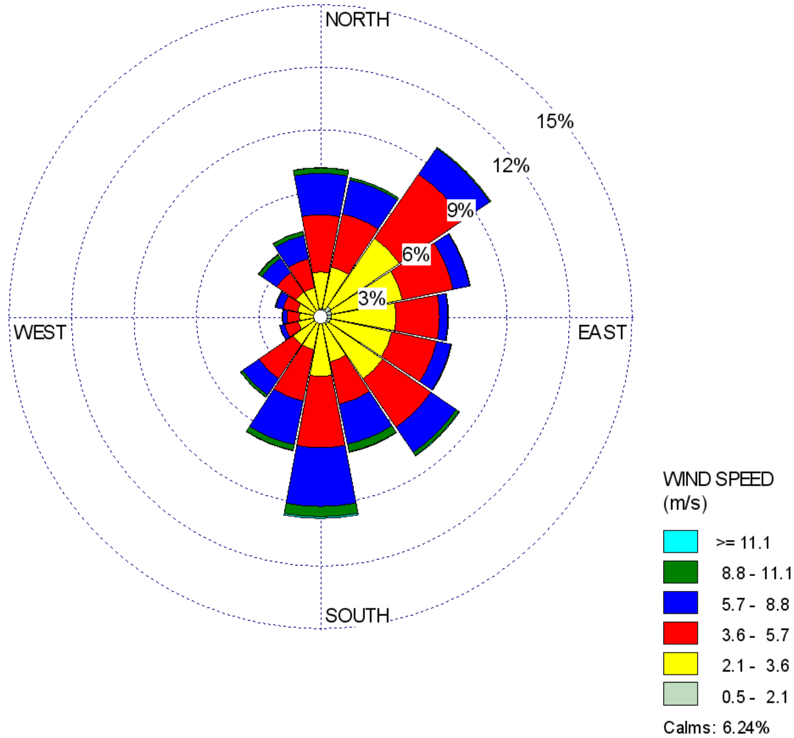


Mossville Air Monitor: Wind Rose
Calcasieu Parish, Louisiana
2001

Source: URS Corporation. 2002. LAIA ambient air quality and meteorological monitoring annual report. CD accessed for file names 19PRPD01.ASC and 28PRPD01.ASC. Prepared by URS Corporation: Austin, Texas.

* A wind rose is a way of showing average wind direction and speed. These pictures gives a summary of how often wind comes from a direction towards the weather station (wind from), as well as the wind speed during that time. The weather station is at the center of a wind rose, so an arrow to the east of the center indicates wind from the east. The arrows are labeled with a percent, which indicates the percent of time the wind was coming from that direction at that speed. Relative wind speeds are shown by the color of the arrow.

Figure 10. Wind Rose* Data (averaged for years 1987–1991) for Lake Charles Regional Airport, Lake Charles, Louisiana

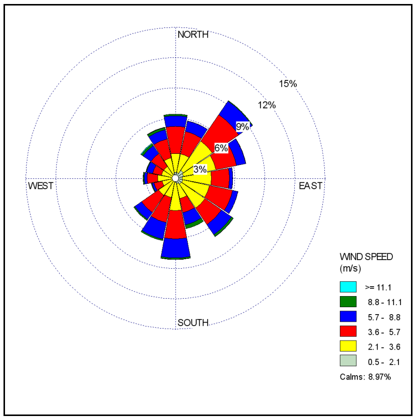


Lake Charles Regional Airport: Wind Rose
Lake Charles, Louisiana
1987–1991

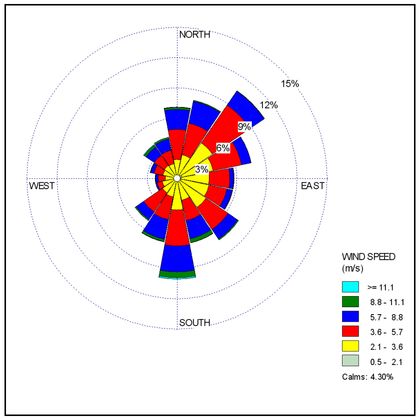
Source: WebMET. 2003. The meteorological resource center. Meteorological data accessed for the Lake Charles Regional Airport in March 2003. URL: www.webmet.com

* A wind rose is a way of showing average wind direction and speed. These pictures gives a summary of how often wind comes from a direction towards the weather station (wind from), as well as the wind speed during that time. The weather station is at the center of a wind rose, so an arrow to the east of the center indicates wind from the east. The arrows are labeled with a percent, which indicates the percent of time the wind was coming from that direction at that speed. Relative wind speeds are shown by the color of the arrow.

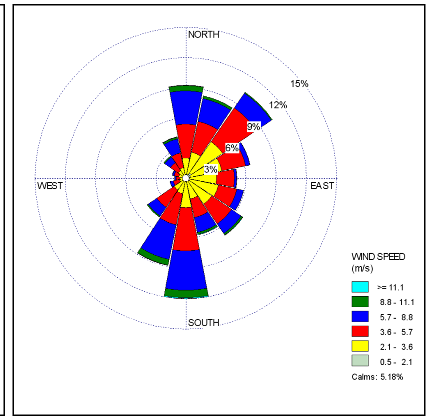
Figure 11. 1987–1991 and 2001 Wind Rose* Data for Lake Charles Regional Airport, Lake Charles, Louisiana



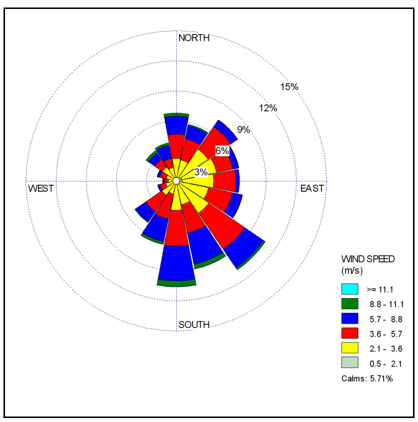
1987 Wind Rose



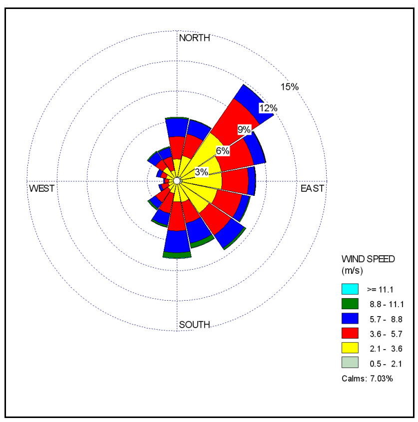
1988 Wind Rose



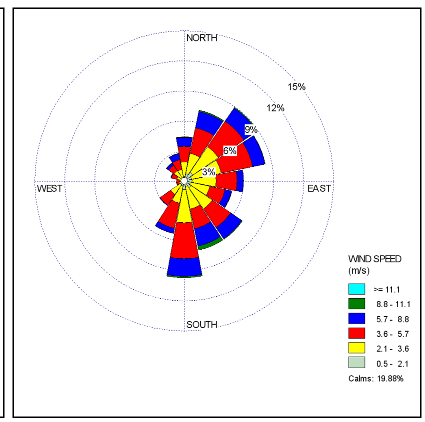
1989 Wind Rose



1990 Wind Rose



1991 Wind Rose

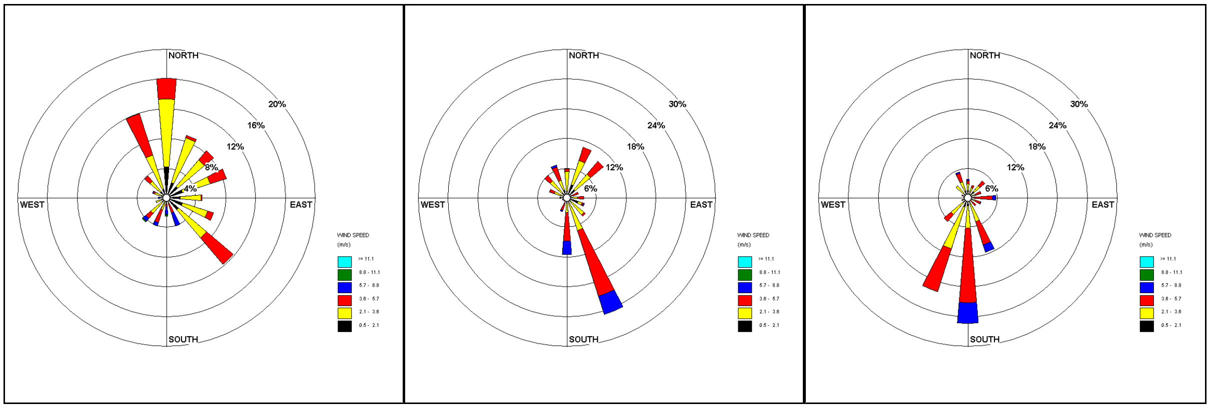


2001 Wind Rose

Source: WebMET. 2003. The meteorological resource center. Meteorological data accessed for the Lake Charles Regional Airport in March 2003. URL: www.webmet.com

* A wind rose is a way of showing average wind direction and speed. These pictures gives a summary of how often wind comes from a direction towards the weather station (wind from), as well as the wind speed during that time. The weather station is at the center of a wind rose, so an arrow to the east of the center indicates wind from the east. The arrows are labeled with a percent, which indicates the percent of time the wind was coming from that direction at that speed. Relative wind speeds are shown by the color of the arrow.

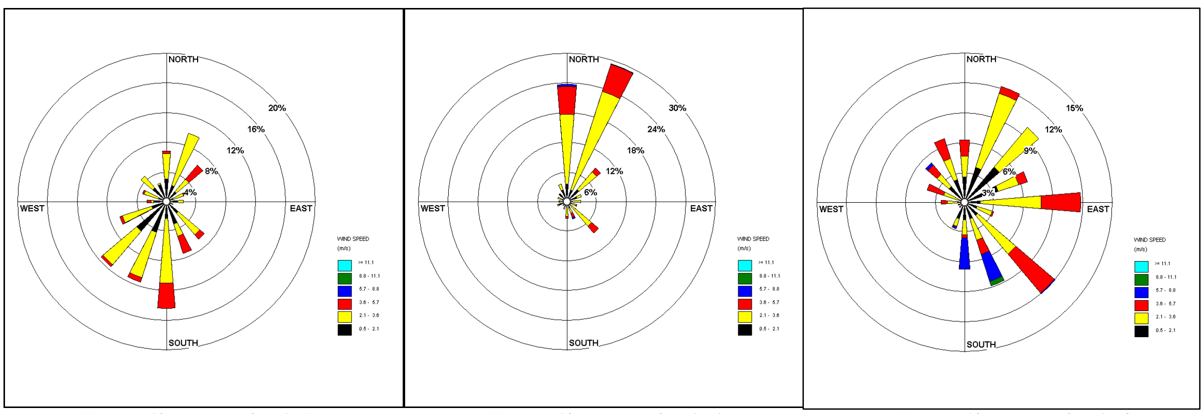
Figure 12. Seasonal Wind Rose* Data for 2001 at the Mossville Location, Calcasieu Parish, Louisiana



Sampling Period 1
January 15 – February 10

Sampling Period 2
March 15 – April 11

Sampling Period 3
May 16 – June 12



Sampling Period 4
July 24 – August 14

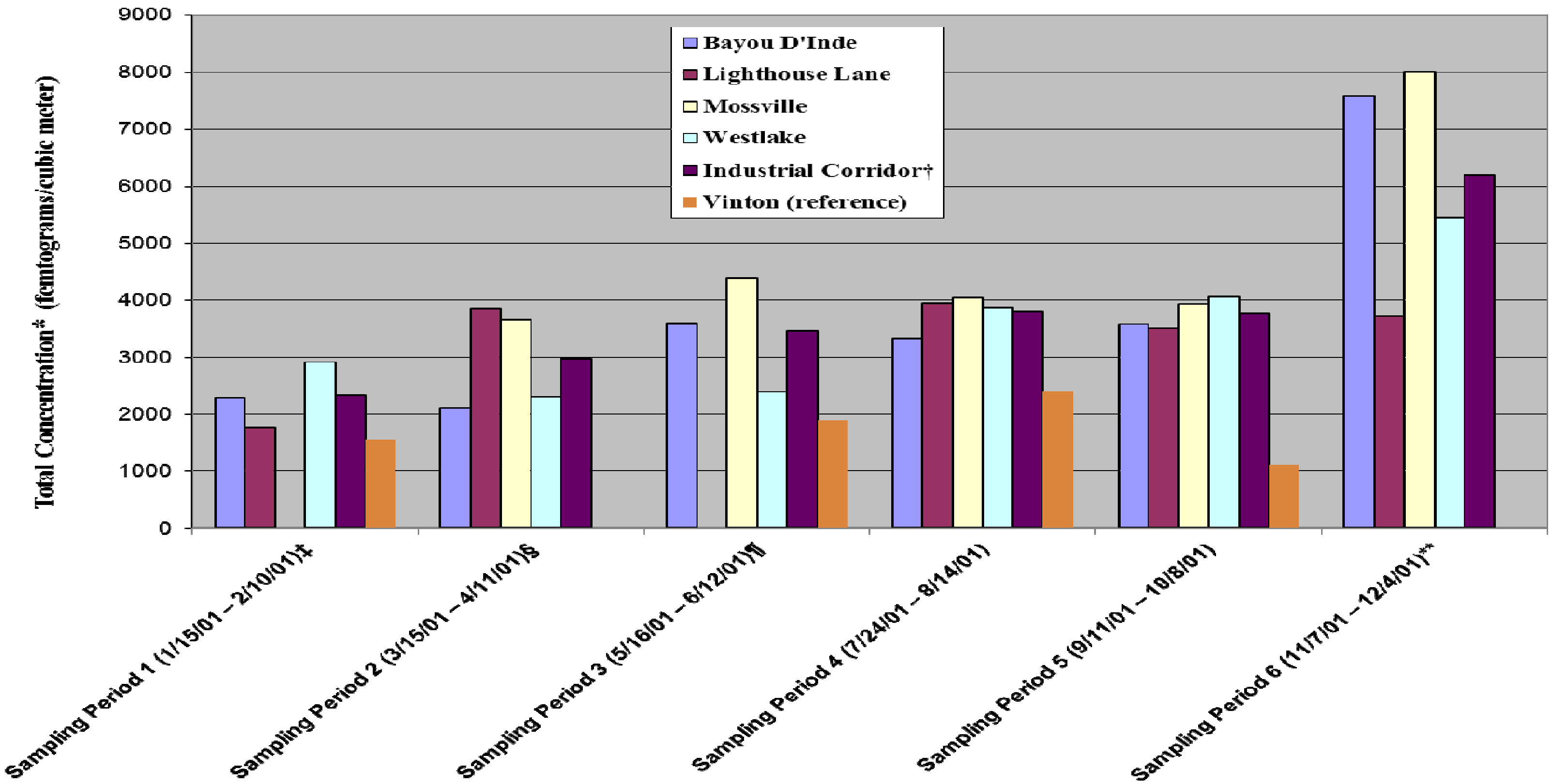
Sampling Period 5
September 11 – October 8

Sampling Period 6
November 7 – December 4

Source: URS Corporation. 2002. LAIA ambient air quality and meteorological monitoring annual report. CD accessed for file name 19PRPD01.ASC. Prepared by URS Corporation: Austin, Texas.

* A wind rose is a way of showing average wind direction and speed. These pictures gives a summary of how often wind comes from a direction towards the weather station (wind from), as well as the wind speed during that time. The weather station is at the center of a wind rose, so an arrow to the east of the center indicates wind from the east. The arrows are labeled with a percent, which indicates the percent of time the wind was coming from that direction at that speed. Relative wind speeds are shown by the color of the arrow.

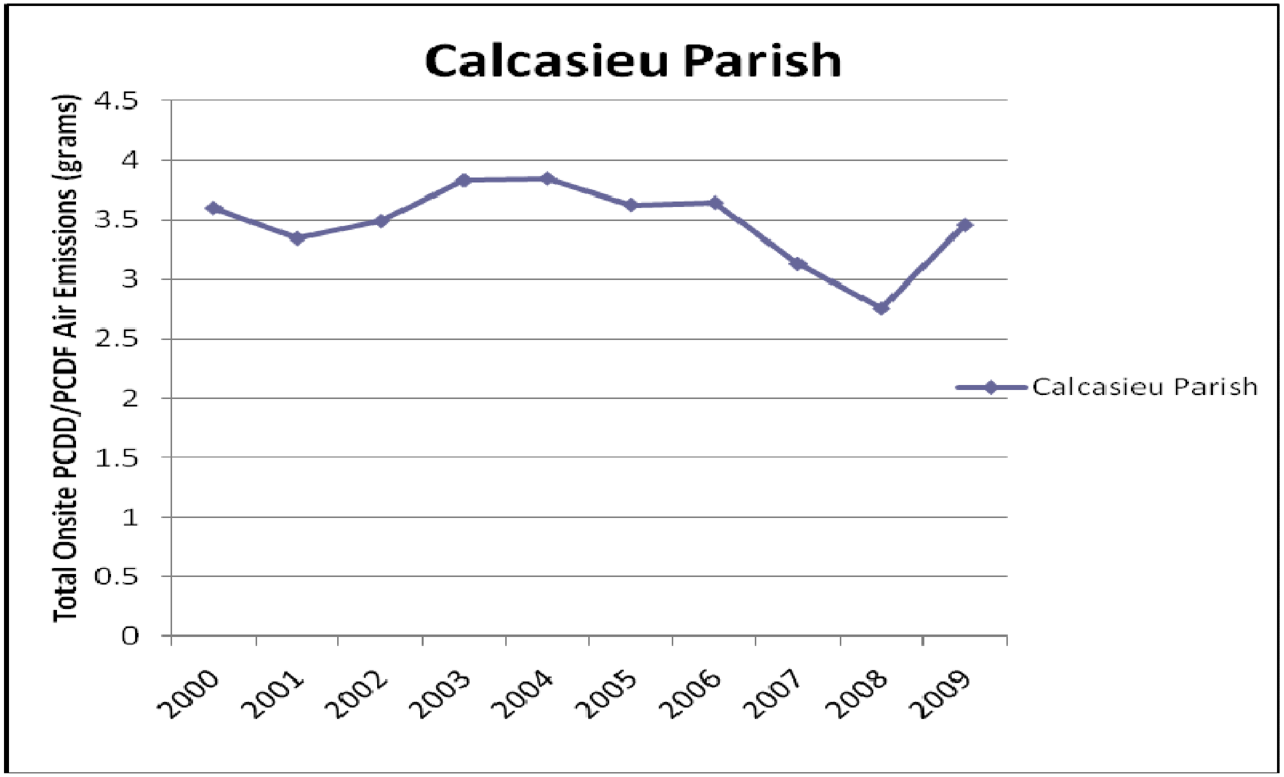
Figure 13. 2001 Seasonal Variations of Dioxin-like Compound Concentrations for Calcasieu Parish, Louisiana



Source: Concentration data gathered from Tables 3–7, Appendix B.

*	Total concentration = total polychlorinated biphenyls concentration + total polychlorinated dibenzo-p-dioxins concentration + total polychlorinated dibenzofurans concentration
†	The industrial corridor refers to four locations in Calcasieu Parish, which are Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake.
‡	A sample was not collected at the Mossville location during the first sampling period because site access agreements were not yet secured.
§	The sample at the Vinton location was lost prior to analysis during this sampling period. The dates for this sampling period at the Mossville location are from March 19 to April 15, 2002.
¶	The sample at the Lighthouse Lane location was lost as a result of laboratory error during this sampling period.
**	Two samples at the Vinton location were lost because both the stationary and rotating duplicate samplers experienced motor failure during this sampling period.

Figure 14. Toxics Release Inventory (TRI) Reported Total Onsite PCDD/PCDF Air Emissions* for Calcasieu Parish

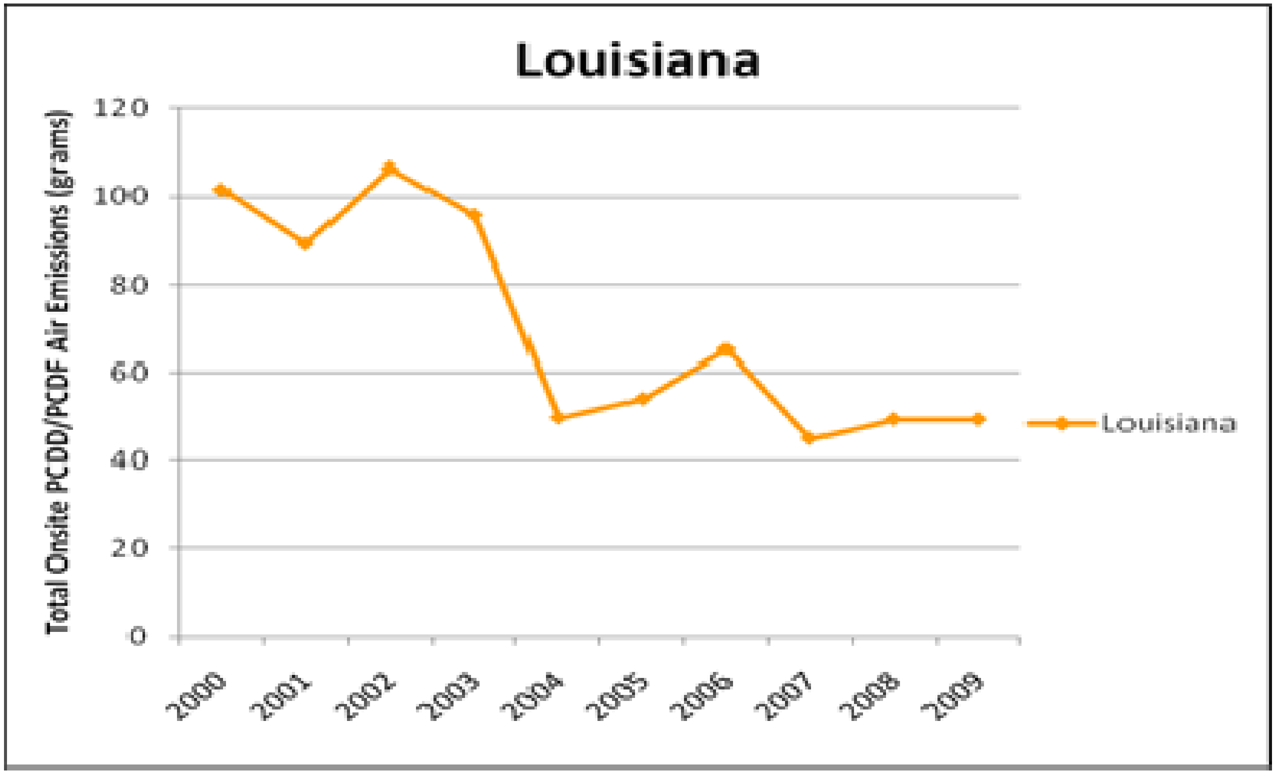


Sources: US Environmental Protection Agency. 2011e. Toxics Release Inventory (TRI) Explorer. TRI on-site and off-site reported disposed of or otherwise released (in grams), trend report for facilities in all industries, dioxin and dioxin-like compounds, Calcasieu Parish, Louisiana, 2000-2009. Data Source: 2009 Data Update as of February 2010. Data downloaded from www.epa.gov/tri on July 26, 2011.

* Total on-site air emissions includes both fugitive air emissions and point source air emissions. Fugitive air emissions are all releases to air that are not released through a confined air stream. Fugitive emissions include equipment leaks, evaporative losses from surface impoundments and spills, and releases from building ventilation systems. Point source air emissions occur through confined air streams such as stacks, vents, ducts, or pipes.

PCDD polychlorinated dibenzo-*p*-dioxin
PCDF polychlorinated dibenzofuran

Figure 15. Toxics Release Inventory (TRI) Reported Total Onsite PCDD/PCDF Air Emissions* for the State of Louisiana

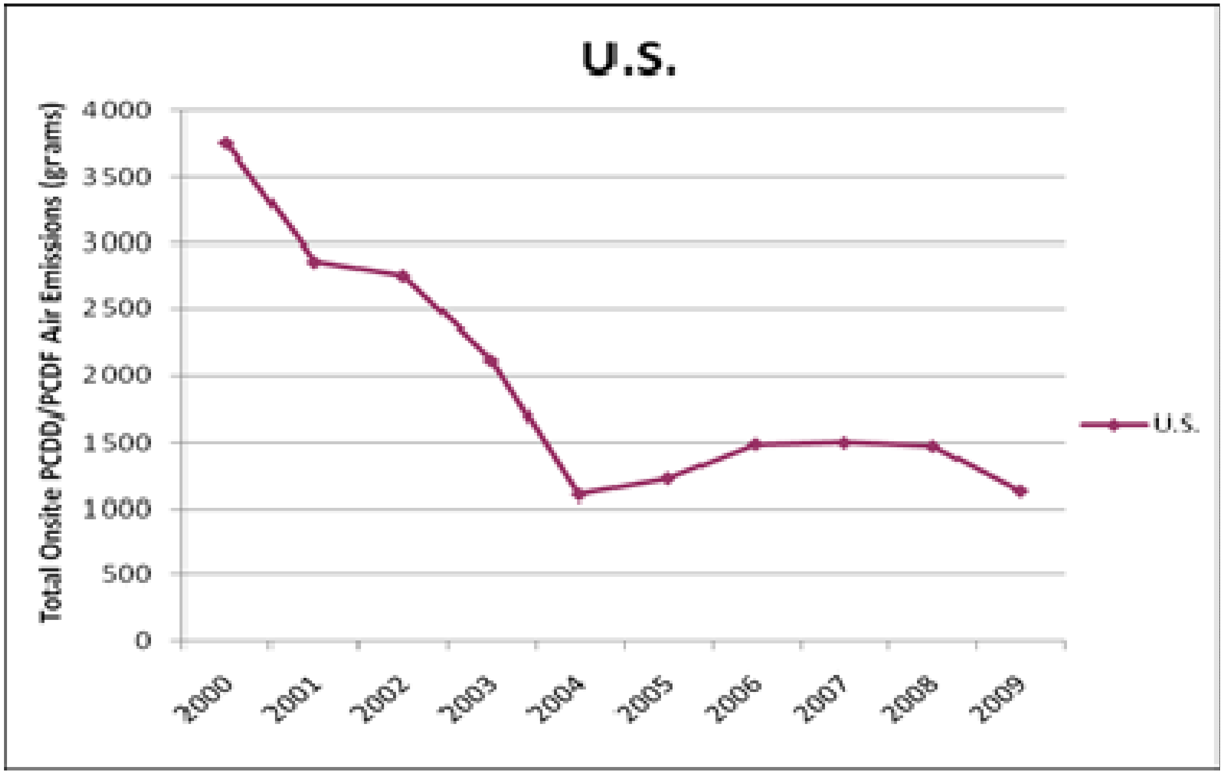


Sources: US Environmental Protection Agency. 2011g. Toxic Release Inventory (TRI) Explorer. TRI on-site and off-site reported disposed of or otherwise released (in grams), trend report for facilities in all industries, dioxin and dioxin-like compounds, Louisiana, 2000-2009. Data Source: 2009 Data Update as of February 2010. Data downloaded from www.epa.gov/tri on July 26, 2011.

* Total on-site air emissions includes both fugitive air emissions and point source air emissions. Fugitive air emissions are all releases to air that are not released through a confined air stream. Fugitive emissions include equipment leaks, evaporative losses from surface impoundments and spills, and releases from building ventilation systems. Point source air emissions occur through confined air streams such as stacks, vents, ducts, or pipes.

PCDD polychlorinated dibenzo-*p*-dioxin
PCDF polychlorinated dibenzofuran

Figure 16. Toxics Release Inventory (TRI) Reported Total Onsite PCDD/PCDF Air Emissions* for the U.S.

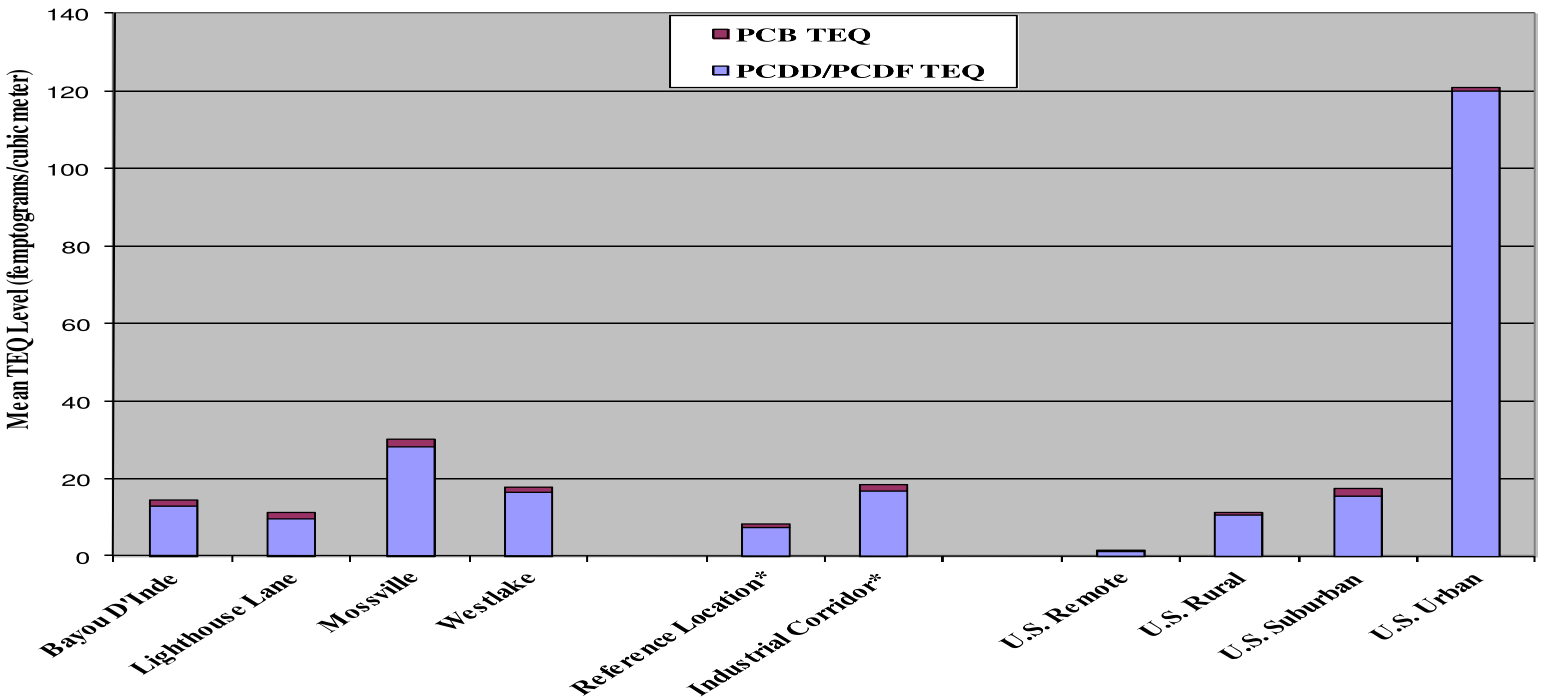


Sources: US Environmental Protection Agency. 2011f. Toxics Release Inventory (TRI) Explorer. TRI on-site and off-site reported disposed of or otherwise released (in grams), trend report for facilities in all industries, dioxin and dioxin-like compounds, US, 2000-2009. Data Source: 2009 Data Update as of February 2010. Data downloaded from www.epa.gov/tri on July 26, 2011.

* Total on-site air emissions includes both fugitive air emissions and point source air emissions. Fugitive air emissions are all releases to air that are not released through a confined air stream. Fugitive emissions include equipment leaks, evaporative losses from surface impoundments and spills, and releases from building ventilation systems. Point source air emissions occur through confined air streams such as stacks, vents, ducts, or pipes.

PCDD polychlorinated dibenzo-*p*-dioxin
PCDF polychlorinated dibenzofuran

Figure 17. Mean TEQ_{98} Levels for Calcasieu Parish, Louisiana and U.S. Remote, Rural, Suburban, and Urban Locations

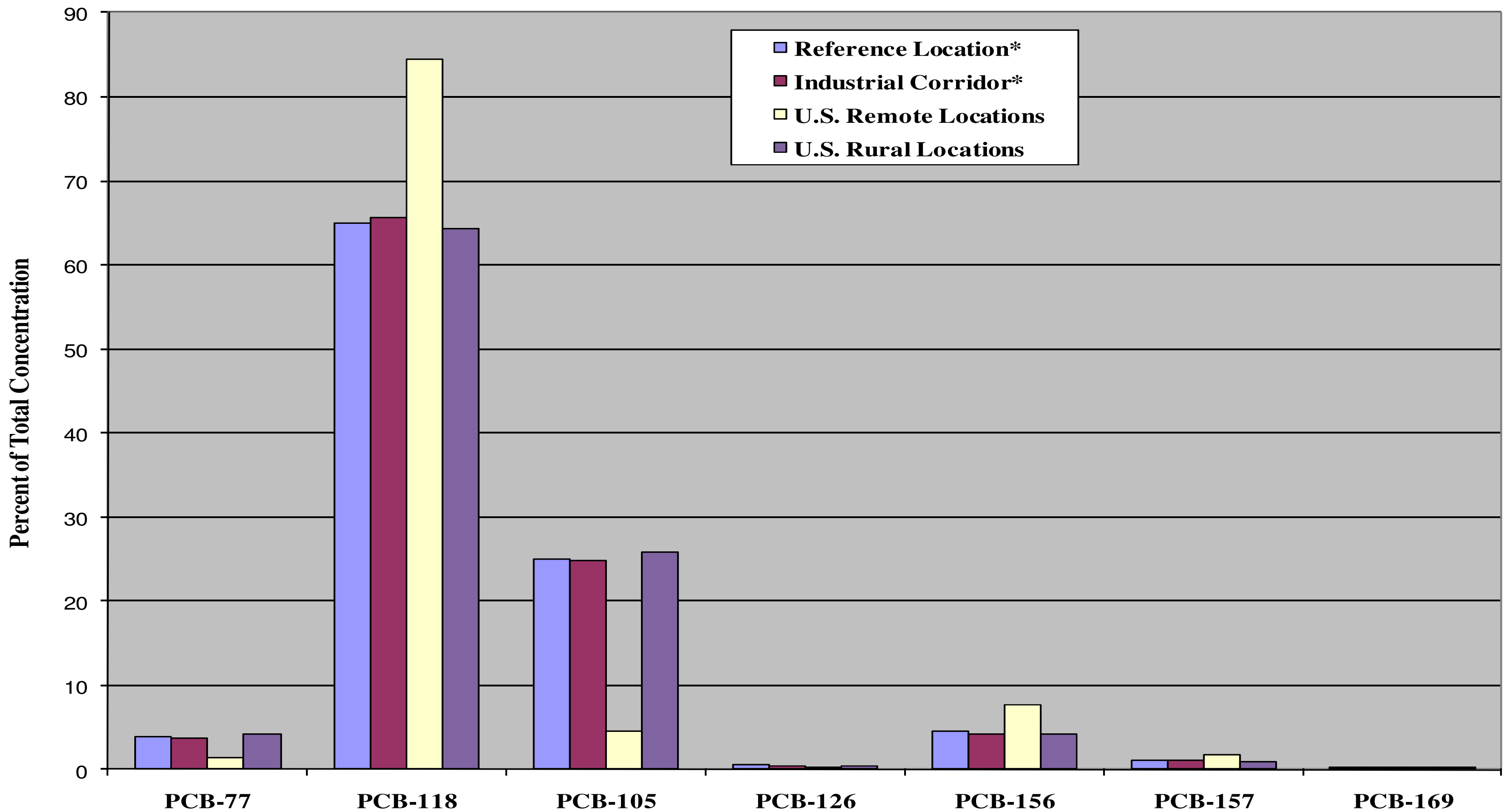


Sources: (1) Calcasieu Parish Area: TEQ_{98} levels gathered from Table 13, Appendix B.
(2) U.S. Remote and Rural Locations: Cleverly D, Ferrario J, Byrne C, Riggs K, Joseph D, Hartford P. 2007. A general indication of the contemporary background levels of PCDDs, PCDFs, and coplanar PCBs in the ambient air over rural and remote areas of the United States. Environ. Sci. Technol. 41: 1537-1544.
(3) U.S. Suburban Location: Cleverly D, Winters D, Ferrario J, Riggs K, Hartford P, Joseph D, Wisbith T, Dupuy A, Byrne C. 2002. The National Dioxin Air Monitoring Network (Ndamn): measurements of Cdds, Cdfs, and coplanar PCBs at 18 rural, 8 national parks, and 2 suburban areas of the United States: results for the year 2000. Organohalogen Compounds 56:437-450.
(4) U.S. Urban Location: US Environmental Protection Agency. 2003. Exposure and human health reassessment of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and related compounds, National Academy Sciences (NAS) review draft. EPA Office of Research and Development. EPA/600/P-00/001Cb. Available online at http://www.epa.gov/ncea/pdfs/dioxin/nas-review/

* The *reference location* refers to the Vinton location in Calcasieu Parish and the *industrial corridor* refers to the overall mean of four locations in Calcasieu Parish (i.e., Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake.)

PCB polychlorinated biphenyl
PCDD polychlorinated dibenzo-*p*-dioxin
PCDF polychlorinated dibenzofuran
TEQ_{98} toxicity equivalents calculated from toxicity equivalence factors published by the World Health Organization in 1998

Figure 18. 2001 Coplanar PCB Concentration Profiles for Calcasieu Parish, Louisiana and U.S. Remote and Rural Locations



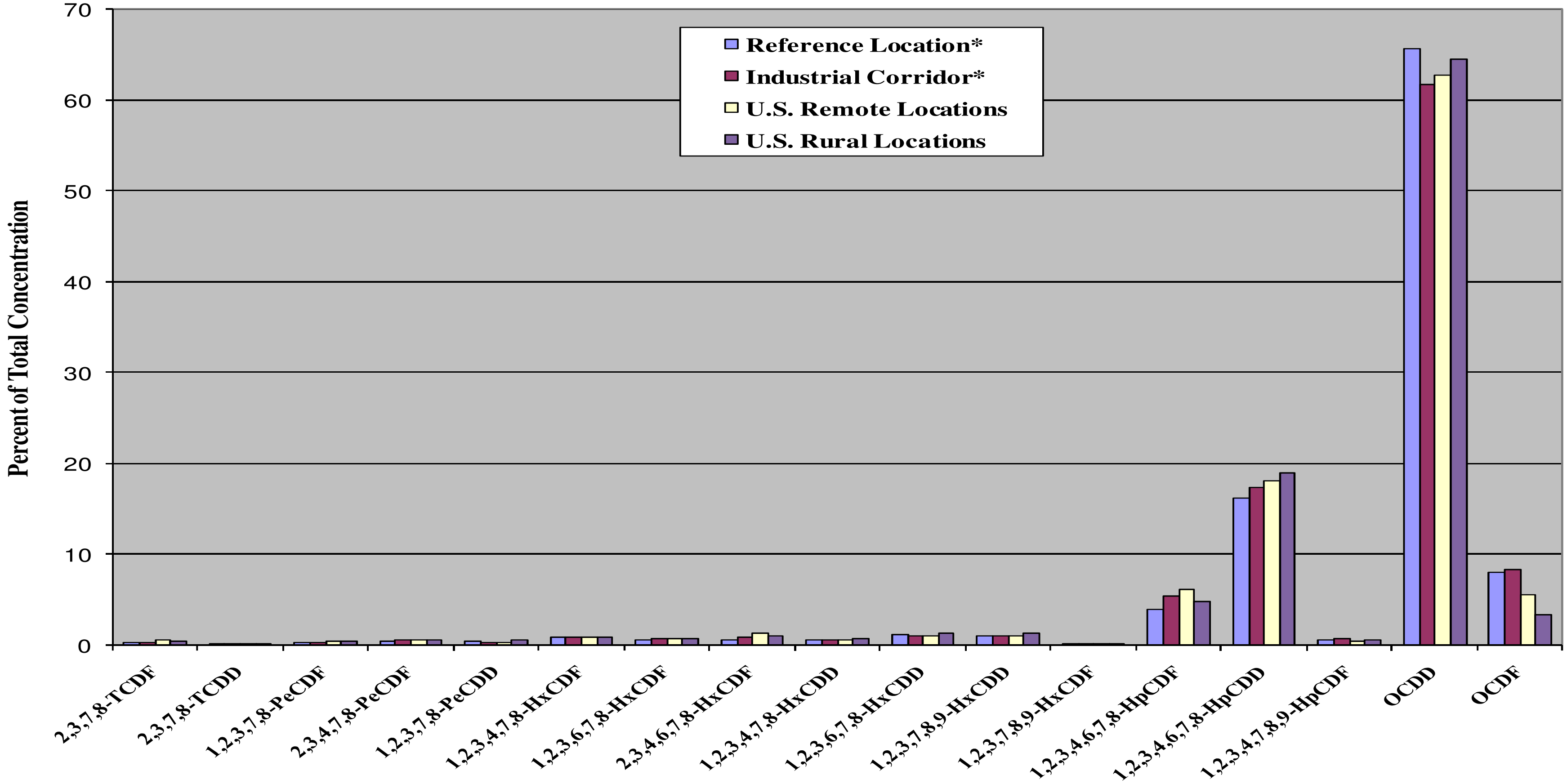
Sources: (1) Calcasieu Parish: concentration profile data gathered from Tables 3–7, Appendix B.
(2) U.S. Remote and Rural Locations: Cleverly D, Ferrario J, Byrne C, Riggs K, Joseph D, Hartford P. 2007. A general indication of the contemporary background levels of PCDDs, PCDFs, and coplanar PCBs in the ambient air over rural and remote areas of the United States. Environ. Sci. Technol. 41: 1537-1544.

* The *reference location* refers to the Vinton location in Calcasieu Parish and the *industrial corridor* refers to the overall concentration profile of four locations in Calcasieu Parish (i.e., Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake.)

Percent of total concentration = (mean congener concentration / sum of mean congener concentrations) * 100

PCB polychlorinated biphenyl

Figure 19. 2001 PCDD/PCDF Concentration Profiles for Calcasieu Parish, Louisiana, and U.S. Remote and Rural Locations



Sources: (1) Calcasieu Parish: concentration profile data gathered from Tables 3–7, Appendix B.
(2) U.S. Remote and Rural Location: Cleverly D, Ferrario J, Byrne C, Riggs K, Joseph D, Hartford P. 2007. A general indication of the contemporary background levels of PCDDs, PCDFs, and coplanar PCBs in the ambient air over rural and remote areas of the United States. Environ. Sci. Technol. 41: 1537-1544.

Nomenclature Key for Congeners: See Table 1, Appendix B.

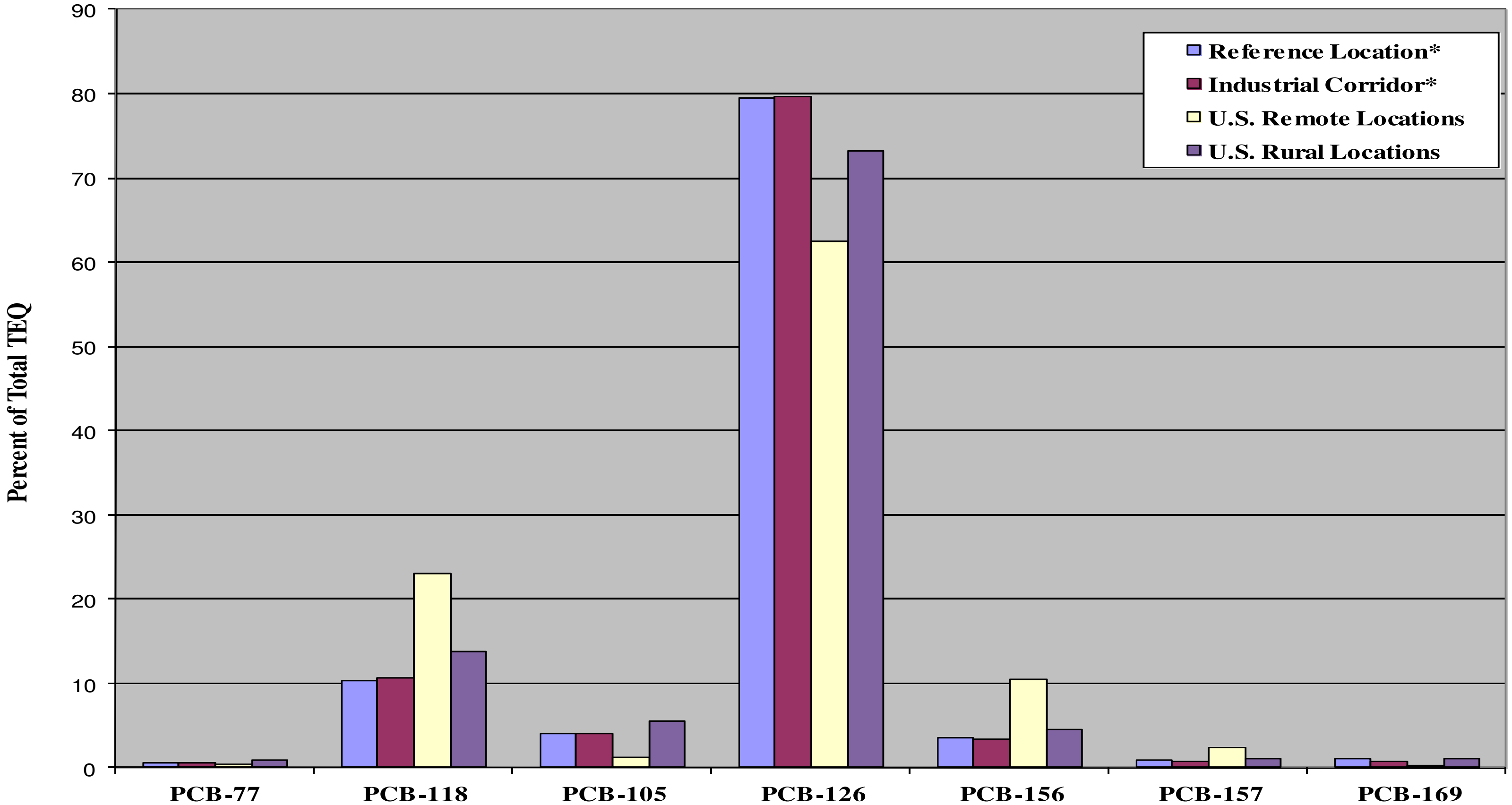
* The reference location refers to the Vinton location in Calcasieu Parish and the industrial corridor refers to the overall concentration profile of four locations in Calcasieu Parish (i.e., Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake.)

Percent of total concentration = (mean congener concentration / sum of mean congener concentrations) * 100

PCDD polychlorinated dibenzo-p-dioxin

PCDF polychlorinated dibenzofuran

Figure 20. 2001 Coplanar PCB TEQ_{98} Profiles for Calcasieu Parish, Louisiana and U.S. Remote and Rural Locations



Sources: (1) Calcasieu Parish: TEQ98 profiles calculated from concentration data provided in Tables 3–7, Appendix B, using the formula TEQ98 Level = congener concentration x congener TEF98 (from Table 1, Appendix B)
(2) U.S. Remote and Rural Locations: Cleverly D, Ferrario J, Byrne C, Riggs K, Joseph D, Hartford P. 2007. A general indication of the contemporary background levels of PCDDs, PCDFs, and coplanar PCBs in the ambient air over rural and remote areas of the United States. Environ. Sci. Technol. 41: 1537-1544.

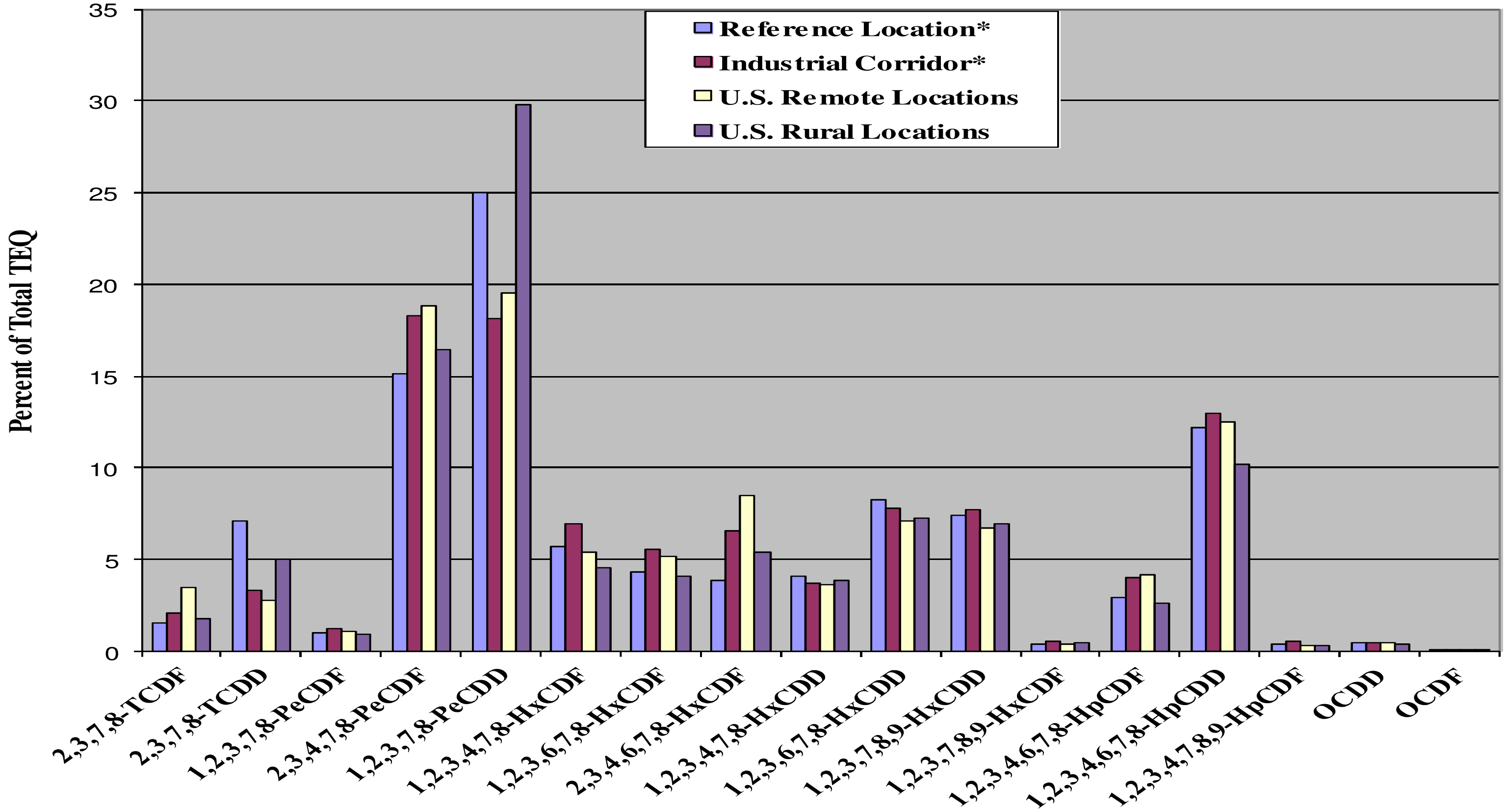
* The reference location refers to the Vinton location in Calcasieu Parish and the industrial corridor refers to the overall TEQ profile of four locations in Calcasieu Parish (i.e., Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake.)

Percent of total TEQ = (mean congener TEQ / sum of mean congener TEQs) * 100

PCB polychlorinated biphenyl

TEQ_{98} toxicity equivalents calculated from toxicity equivalence factors published by the World Health Organization in 1998

Figure 21. 2001 PCDD/PCDF TEQ_{98} Profiles for Calcasieu Parish, Louisiana and U.S. Remote and Rural Locations



Sources: (1) Calcasieu Parish: TEQ98 profiles calculated from concentration data provided in Tables 3–7, Appendix B, using the formula TEQ98 Level = congener concentration x congener TEF98 (from Table 1, Appendix B)

(2) U.S. Remote and Rural Locations: Cleverly D, Ferrario J, Byrne C, Riggs K, Joseph D, Hartford P. 2007. A general indication of the contemporary background levels of PCDDs, PCDFs, and coplanar PCBs in the ambient air over rural and remote areas of the United States. Environ. Sci. Technol. 41: 1537-1544.

Nomenclature Key for Congeners: See Table 1, Appendix B.

* The reference location refers to the Vinton location in Calcasieu Parish and the industrial corridor refers to the overall TEQ profile of four locations in Calcasieu Parish (i.e., Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake.)

Percent of total TEQ = (mean congener TEQ / sum of mean congener TEQs) * 100

PCDD polychlorinated dibenzo-p-dioxin

PCDF polychlorinated dibenzofuran

TEQ_{98} toxicity equivalents calculated from toxicity equivalence factors published by the World Health Organization in 1998

Appendix B: Tables

Table 1. Nomenclature Key for PCB and PCDD/PCDF Congeners, and 1998 and 2005 World Health Organization Toxic Equivalency Factors (TEFs)

PCB and PCDD/PCDF Congener	Abbreviation	TEF_{98}	TEF_{05}
polychlorinated biphenyl 77	PCB-77	0.0001	0.0001
polychlorinated biphenyl 118	PCB-118	0.0001	**0.00003***
polychlorinated biphenyl 105	PCB-105	0.0001	**0.00003**
polychlorinated biphenyl 126	PCB-126	0.1	0.1
polychlorinated biphenyl 156	PCB-156	0.0005	**0.00003**
polychlorinated biphenyl 157	PCB-157	0.0005	**0.00003**
polychlorinated biphenyl 169	PCB-169	0.01	**0.03**
2,3,7,8-tetrachlorodibenzofuran	2,3,7,8-TCDF	0.1	0.1
2,3,7,8-tetrachlorodibenzo-*p*-dioxin	2,3,7,8-TCDD	1	1
1,2,3,7,8-pentachlorodibenzofuran	1,2,3,7,8-PeCDF	0.05	**0.03**
2,3,4,7,8-pentachlorodibenzofuran	2,3,4,7,8-PeCDF	0.5	**0.3**
1,2,3,7,8-pentachlorodibenzo-*p*-dioxin	1,2,3,7,8-PeCDD	1	1
1,2,3,4,7,8-hexachlorodibenzofuran	1,2,3,4,7,8-HxCDF	0.1	0.1
1,2,3,6,7,8-hexachlorodibenzofuran	1,2,3,6,7,8-HxCDF	0.1	0.1
2,3,4,6,7,8-hexachlorodibenzofuran	2,3,4,6,7,8-HxCDF	0.1	0.1
1,2,3,4,7,8-hexachlorodibenzo-*p*-dioxin	1,2,3,4,7,8-HxCDD	0.1	0.1
1,2,3,6,7,8-hexachlorodibenzo-*p*-dioxin	1,2,3,6,7,8-HxCDD	0.1	0.1
1,2,3,7,8,9-hexachlorodibenzo-*p*-dioxin	1,2,3,7,8,9-HxCDD	0.1	0.1
1,2,3,7,8,9-hexachlorodibenzofuran	1,2,3,7,8,9-HxCDF	0.1	0.1
1,2,3,4,6,7,8-heptachlorodibenzofuran	1,2,3,4,6,7,8-HpCDF	0.01	0.01
1,2,3,4,6,7,8-heptachlorodibenzo-*p*-dioxin	1,2,3,4,6,7,8-HpCDD	0.01	0.01
1,2,3,4,7,8,9-heptachlorodibenzofuran	1,2,3,4,7,8,9-HpCDF	0.01	0.01
octachlorodibenzo-*p*-dioxin	OCDD	0.0001	**0.0003**
octachlorodibenzofuran	OCDF	0.0001	**0.0003**

Source: World Health Organization. 2006. Project for the re-evaluation of human and mammalian toxic equivalency factors (TEFs) of dioxins and dioxin-like compounds. Geneva: WHO International Programme on Chemical Safety. URL: http://www.who.int/ipcs/assessment/tef_update/en/print.html

* Numbers in bold indicate a change in TEF value

PCB polychlorinated biphenyl
PCDD polychlorinated dibenzo-p-dioxin
PCDF polychlorinated dibenzofuran
TEF_{98} toxicity equivalence factors published by the World Health Organization in 1998
TEF_{05} toxicity equivalence factors published by the World Health Organization in 2005

Table 2. Estimated Daily Background Exposure to Dioxins* in the General U.S. Population

Source	Daily Intake (fg TEQ/day)	Percentage of Total Daily Intake
Air	2,200	1.8
Food	116,000	97
Soil	800	0.7
Water	8	0.01
Total Exposure	120,000	100

Source: Schaum J, Cleverly D, Lorber M, et al. 1994. Updated analysis of U.S. sources of dioxin-like compounds and background exposure levels. Organohalogen Compounds 20:178-184. Cited in: Agency for Toxic Substances and Disease Registry. 1998. Toxicological profile for chlorinated dibenzo-*p*-dioxins. Atlanta: US Department of Health and Human Services.

* "Dioxins" refers to polychlorinated dibenzo-*p*-dioxins (PCDFs) and polychlorinated dibenzofurans (PCDFs).

fg femtograms
TEQ toxicity equivalents

Table 3. 2001 PCB and PCDD/PCDF Air Sampling Results for Vinton, Calcasieu Parish, Louisiana (page 1 of 3)

Congener	Sampling Period 1 (1/15/01 – 2/10/01)		Sampling Period 3 (5/16/01 – 6/12/01)		Sampling Period 4 (7/24/01 – 8/14/01)		Sampling Period 5 (9/11/01 – 10/8/01)		Mean Sampling Result*	
	Congener Concentration (fg/m^3)	Concentration Profile† (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Mean Congener Concentration (fg/m^3)	Mean Concentration Profile (percent)
PCB-77	36.9	4.95	51.19	3.20	54.21	3.60	38.24	4.32	45.14	3.81
PCB-118	483	64.73	1110	69.32	892.77	59.28	589.88	66.68	768.91	64.91
PCB-105	172	23.05	362.08	22.61	437.66	29.06	216.48	24.47	297.06	25.08
PCB-126	3.19	0.43	7.07	0.44	9.71	0.64	3.66	0.41	5.91	0.50
PCB-156	41.6	5.58	55.84	3.49	88.88	5.90	29.01	3.28	53.83	4.54
PCB-157	8.9	1.19	13.87	0.87	21.71	1.44	6.97	0.79	12.86	1.09
PCB-169	0.53	0.07	1.11	0.07	1.12	0.07	0.46	0.05	0.81	0.07
Totals for Coplanar PCBs	***746.12***	***100***	***1601.16***	***100***	***1506.06***	***100***	***884.7***	***100***	***1184.51***	***100***
2,3,7,8-TCDF	1.32	0.16	1.2	0.43	1.39	0.15	0.59	0.26	1.13	0.20
2,3,7,8-TCDD	0.34	0.04	0.89	0.32	0.68	0.07	0.19	0.08	0.53	0.09
1,2,3,7,8-PeCDF	2	0.24	1.81	0.64	1.59	0.18	0.55	0.24	1.49	0.27
2,3,4,7,8-PeCDF	2.33	0.28	3.2	1.14	2.4	0.26	1.05	0.45	2.25	0.40
1,2,3,7,8-PeCDD	1.36	0.17	3.09	1.10	2.41	0.27	0.58	0.25	1.86	0.33
1,2,3,4,7,8-HxCDF	7.17	0.87	4.15	1.48	4.35	0.48	1.36	0.59	4.26	0.76
1,2,3,6,7,8-HxCDF	4.78	0.58	3.45	1.23	3.44	0.38	1.08	0.47	3.19	0.57
2,3,4,6,7,8-HxCDF	4.33	0.53	2.56	0.91	3.14	0.35	1.42	0.62	2.86	0.51
1,2,3,4,7,8-HxCDD	3.65	0.44	3.35	1.19	4.2	0.46	0.92	0.40	3.03	0.54
1,2,3,6,7,8-HxCDD	7.26	0.88	6.49	2.31	8.86	0.98	2.01	0.87	6.16	1.10

Table 3. 2001 PCB and PCDD/PCDF Air Sampling Results for Vinton, Calcasieu Parish, Louisiana (page 2 of 3)

Congener	Sampling Period 1 (1/15/01 – 2/10/01)		Sampling Period 3 (5/16/01 – 6/12/01)		Sampling Period 4 (7/24/01 – 8/14/01)		Sampling Period 5 (9/11/01 – 10/8/01)		Mean Sampling Result*	
	Congener Concentration (fg/m3)	Concentration Profile† (percent)	Congener Concentration (fg/m3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Mean Congener Concentration (fg/m^3)	Mean Concentration Profile (percent)
1,2,3,7,8,9-HxCDD	6.5	0.79	5.71	2.03	7.9	0.87	1.95	0.84	5.52	0.98
1,2,3,7,8,9-HxCDF	0.76	0.09	0.2	0.07	0.29	0.03	NR	0	0.31	0.06
1,2,3,4,6,7,8-HpCDF	46.9	5.70	13.27	4.72	20.11	2.21	7.22	3.13	21.86	3.90
1,2,3,4,6,7,8-HpCDD	110	13.38	69.24	24.61	146.81	16.17	36.7	15.90	90.69	16.18
1,2,3,4,7,8,9-HpCDF	7.59	0.92	1.08	0.38	2.32	0.26	0.74	0.32	2.93	0.52
OCDD	482	58.62	151.96	54.02	670.05	73.79	168.14	72.85	368.04	65.65
OCDF	134	16.30	9.65	3.43	28.08	3.09	6.29	2.73	44.51	7.94
Totals for PCDDs/PCDFs	***822.29***	***100***	***281.3***	***100***	***908.02***	***100***	***230.79***	***100***	***560.62***	***100***

Sources: (1) US Environmental Protection Agency. 2002. Calcasieu Parish air monitoring study, 2001 annual report. Prepared by URS Corporation: Austin, Texas and US Environmental Protection Agency, Region 6: Dallas, Texas.
(2) US Environmental Protection Agency. 2011d. June 17th electronic mail containing data attachments from Jennifer Gibbs, Environmental Scientist, USEPA Region 6, to Danielle Langmann, Environmental Health Scientist, ATSDR. Attachments: CALCASIEUAIR2003[1].pdf; CPASPjanuarydata.xls; CPASPmarchdata.xls; CPASPmaydata.xls; CPASPjulydata.xls; CPASPseptemberdata.xls; CPASPnovemberdata.xls; CPASPmossvillextradata.xls. Dallas, TX.

* Mean Sampling Result = (sum of the values for each sampling period) / number of sampling periods. Of note, the sampling results from sampling periods 2 and 6 were not included in this table. In sampling period 2, the Vinton sample was lost prior to analysis and in sampling period 6, the Vinton sampler experienced motor failure.
† Concentration Profile = (congener concentration / sum of congener concentrations) x 100

fg/m^3 femtograms per cubic meter
NR no value reported

Congener Nomenclature Key:

HpCDD	heptachlorodibenzo-*p*-dioxin	PCDD	polychlorinated dibenzo-*p*-dioxin
HpCDF	heptachlorodibenzofuran	PCDF	polychlorinated dibenzofuran
HxCDD	hexachlorodibenzo-*p*-dioxin	PeCDD	pentachlorodibenzo-*p*-dioxin
HxCDF	hexachlorodibenzofuran	PeCDF	pentachlorodibenzofuran

Table 3. 2001 PCB and PCDD/PCDF Air Sampling Results for Vinton, Calcasieu Parish, Louisiana (page 3 of 3)

Congener Nomenclature Key (continued):

OCDD	octachlorodibenzo-*p*-dioxin	TCDD	tetrachlorodibenzo-*p*-dioxin
OCDF	octachlorodibenzofuran	TCDF	tetrachlorodibenzofuran
PCB	polychlorinated biphenyl		

Table 4. 2001 PCB and PCDD/PCDF Air Sampling Results for Bayou D'Inde, Calcasieu Parish, Louisiana (page 1 of 3)

Congener	Sampling Period 1 (1/15/01–2/10/01)		Sampling Period 2* (3/15/01–4/11/01)		Sampling Period 3 (5/16/01–6/12/01)		Sampling Period 4 (7/24/01–8/14/01)		Sampling Period 5 (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result†	
	Congener Concentration (fg/m^3)	Concentration Profile‡ (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Mean Congener Concentration (fg/m^3)	Mean Concentration Profile (percent)
PCB-77	69.2	4.00	72.38	4.22	133.89	3.91	118.61	3.72	89.3	2.87	96.55	3.79	96.65	3.69
PCB-118	1190	68.86	1193.50	69.57	2310	67.42	1894.7	59.41	2132.78	68.45	1656.39	65.10	1729.56	66.01
PCB-105	381	22.05	365.36	21.30	805.73	23.52	958.58	30.05	730.26	23.44	662.47	26.03	650.57	24.83
PCB-126	9.49	0.55	8.37	0.49	15.93	0.46	19.71	0.62	12.92	0.41	12.49	0.49	13.15	0.50
PCB-156	62.4	3.61	60.57	3.53	128.31	3.74	158.28	4.96	120.14	3.86	94.25	3.70	103.99	3.97
PCB-157	15.25	0.88	14.78	0.86	31.86	0.93	38.76	1.22	29.69	0.95	21.32	0.84	25.28	0.96
PCB-169	0.84	0.05	0.61	0.04	0.7	0.02	0.8	0.03	0.61	0.02	1.08	0.04	0.77	0.03
Totals for Coplanar PCBs	***1728.18***	***100***	***1715.57***	***100***	***3426.42***	***100***	***3189.44***	***100***	***3115.7***	***100***	***2544.55***	***100***	***2619.97***	***100***
2,3,7,8-TCDF	2.29	0.41	1.34	0.34	1.86	1.06	9.76	6.86	1.75	0.37	2.16	0.04	3.19	0.28
2,3,7,8-TCDD	0.34	0.06	0.25	0.06	0.42	0.24	0.79	0.56	0.33	0.07	0.73	0.01	0.48	0.04
1,2,3,7,8-PeCDF	3.3	0.59	1.26	0.32	1	0.57	2.8	1.97	1.19	0.25	2.31	0.05	1.98	0.17
2,3,4,7,8-PeCDF	4.82	0.86	2.04	0.52	1.6	0.91	3.14	2.21	1.76	0.37	4.66	0.09	3.00	0.27

Table 4. 2001 PCB and PCDD/PCDF Air Sampling Results for Bayou D'Inde, Calcasieu Parish, Louisiana (page 2 of 3)

Congener	Sampling Period 1 (1/15/01–2/10/01)		Sampling Period 2* (3/15/01–4/11/01)		Sampling Period 3 (5/16/01–6/12/01)		Sampling Period 4 (7/24/01–8/14/01)		Sampling Period 5 (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result†	
	Congener Concentration (fg/m^3)	Concentration Profile‡ (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Mean Congener Concentration (fg/m^3)	Mean Concentration Profile (percent)
1,2,3,7,8-PeCDD	1.72	0.31	1.09	0.28	0.94	0.54	0.77	0.54	1.15	0.24	9.24	0.18	2.48	0.22
1,2,3,4,7,8-HxCDF	10.5	1.87	2.97	0.76	1.75	1.00	2.16	1.52	2.86	0.61	9.81	0.19	5.01	0.44
1,2,3,6,7,8-HxCDF	7.45	1.32	2.69	0.69	1.55	0.89	1.89	1.33	2.23	0.47	7.88	0.16	3.95	0.35
2,3,4,6,7,8-HxCDF	8.35	1.48	4.25	1.08	1.62	0.93	2.03	1.43	2.82	0.60	13.29	0.26	5.39	0.48
1,2,3,4,7,8-HxCDD	2.77	0.49	1.83	0.47	1.12	0.64	0.74	0.52	1.7	0.36	29.8	0.59	6.33	0.56
1,2,3,6,7,8-HxCDD	5.43	0.96	3.89	0.99	1.85	1.06	1.53	1.08	4	0.85	66.44	1.32	13.86	1.23
1,2,3,7,8,9-HxCDD	4.94	0.88	5.03	1.28	5.3	3.03	1.24	0.87	3.44	0.73	66.25	1.32	14.37	1.27
1,2,3,7,8,9-HxCDF	1.42	0.25	0.25	0.06	NR	0.00	0.1	0.07	NR	0.00	1.23	0.02	0.50	0.04
1,2,3,4,6,7,8-HpCDF	59.2	10.52	25.99	6.63	8.41	4.80	10.36	7.29	18.13	3.84	81.79	1.62	33.98	3.01
1,2,3,4,6,7,8-HpCDD	83.6	14.85	65.37	16.67	33.39	19.07	19.58	13.77	70.92	15.02	1178.5	23.40	241.89	21.41
1,2,3,4,7,8,9-HpCDF	8.88	1.58	2.80	0.71	NR	0.00	0.65	0.46	2.32	0.49	11.58	0.23	4.37	0.39
OCDD	268	47.62	246.95	62.96	109.18	62.34	75.49	53.09	308.55	65.35	3416.24	67.84	737.40	65.26
OCDF	89.8	15.96	24.23	6.18	5.14	2.93	9.15	6.44	48.98	10.37	133.81	2.66	51.85	4.59
Totals for PCDDs/PCDFs	***562.81***	***100***	***392.23***	***100***	***175.13***	***100***	***142.18***	***100***	***472.13***	***100***	***5035.72***	***100***	***1130.03***	***100***

Table 4. 2001 PCB and PCDD/PCDF Air Sampling Results for Bayou D'Inde, Calcasieu Parish, Louisiana (page 3 of 3)

Sources: (1) US Environmental Protection Agency. 2002. Calcasieu Parish air monitoring study, 2001 annual report. Prepared by URS Corporation: Austin, Texas and US Environmental Protection Agency, Region 6: Dallas, Texas.
(2) US Environmental Protection Agency. 2011d. June 17th electronic mail containing data attachments from Jennifer Gibbs, Environmental Scientist, USEPA Region 6, to Danielle Langmann, Environmental Health Scientist, ATSDR. Attachments: CALCASIEUAIR2003[1].pdf; CPASPjanuarydata.xls; CPASPmarchdata.xls; CPASPmaydata.xls; CPASPjulydata.xls; CPASPseptemberdata.xls; CPASPnovemberdata.xls; CPASPmossvillextradata.xls. Dallas, TX.

* The rotating field sampler was stationed at Bayou D'Inde during sampling period 2. The results reported for sampling period 2 are the average of the Bayou D'Inde sampler and the rotating sampler.
† Mean Sampling Result = (sum of the values for each sampling period) / number of sampling periods
‡ Concentration Profile = (congener concentration / sum of congener concentrations) x 100

fg/m^3 femtograms per cubic meter
NR no value reported

Congener Nomenclature Key:

HpCDD	heptachlorodibenzo-*p*-dioxin	PCDD	polychlorinated dibenzo-*p*-dioxin
HpCDF	heptachlorodibenzofuran	PCDF	polychlorinated dibenzofuran
HxCDD	hexachlorodibenzo-*p*-dioxin	PeCDD	pentachlorodibenzo-*p*-dioxin
HxCDF	hexachlorodibenzofuran	PeCDF	pentachlorodibenzofuran
OCDD	octachlorodibenzo-*p*-dioxin	TCDD	tetrachlorodibenzo-*p*-dioxin
OCDF	octachlorodibenzofuran	TCDF	tetrachlorodibenzofuran
PCB	polychlorinated biphenyl		

Table 5. 2001 PCB and PCDD/PCDF Air Sampling Results for Lighthouse Lane, Calcasieu Parish, Louisiana (page 1 of 3)

Congener	Sampling Period 1 (1/15/01–2/10/01)		Sampling Period 2 (3/15/01–4/11/01)		Sampling Period 3 (5/16/01–6/12/01)		Sampling Period 4 (7/24/01–8/14/01)		Sampling Period 5* (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result	
	Congener Concentration (fg/m^3)	Concentration Profile‡ (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Mean Congener Concentration (fg/m^3)	Mean Concentration Profile (percent)
PCB-77	61.8	4.77	144.56	4.41	199.52	3.94	150.89	4.13	96.14	3.67	77.91	4.17	121.80	4.11
PCB-118	865	66.71	2324	70.93	3530	69.68	2288.65	62.71	1750.78	66.82	1287.59	68.91	2007.67	67.76
PCB-105	290	22.37	667.66	20.38	1104.1	21.79	938.86	25.73	635.21	24.24	408.65	21.87	674.08	22.75
PCB-126	6.16	0.48	15.74	0.48	20.48	0.40	21.95	0.60	10.45	0.40	8.29	0.44	13.85	0.47
PCB-156	58.9	4.54	98.29	3.00	168.33	3.32	199.31	5.46	101.88	3.89	69.13	3.70	115.97	3.91
PCB-157	13.7	1.06	25.24	0.77	42.43	0.84	48.64	1.33	24.77	0.95	15.8	0.85	28.43	0.96
PCB-169	1.08	0.08	1.14	0.03	0.99	0.02	1.15	0.03	0.93	0.04	1.13	0.06	1.07	0.04
Totals for Coplanar PCBs	***1296.64***	***100***	***3276.63***	***100***	***5065.85***	***100***	***3649.45***	***100***	***2620.16***	***100***	***1868.5***	***100***	***2962.87***	***100***
2,3,7,8-TCDF	2.58	0.54	4.48	0.79	--	--	1.84	0.60	2.44	0.27	2.41	0.13	2.75	0.34
2,3,7,8-TCDD	0.28	0.06	0.51	0.09	--	--	0.27	0.09	0.28	0.03	0.26	0.01	0.32	0.04
1,2,3,7,8-PeCDF	3.5	0.73	3.71	0.66	--	--	1.37	0.44	1.95	0.22	2.82	0.15	2.67	0.33
2,3,4,7,8-PeCDF	3.94	0.83	5.87	1.04	--	--	1.66	0.54	2.42	0.27	5.68	0.31	3.91	0.48

Table 5. 2001 PCB and PCDD/PCDF Air Sampling Results for Lighthouse Lane, Calcasieu Parish, Louisiana (page 2 of 3)

Congener	Sampling Period 1 (1/15/01–2/10/01)		Sampling Period 2 (3/15/01–4/11/01)		Sampling Period 3 (5/16/01–6/12/01)		Sampling Period 4 (7/24/01–8/14/01)		Sampling Period 5* (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result[†]	
	Congener Concentration (fg/m^3)	Concentration Profile[‡] (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Mean Congener Concentration (fg/m^3)	Mean Concentration Profile (percent)
1,2,3,7,8-PeCDD	1.59	0.33	1.62	0.29	--	--	0.58	0.19	1.11	0.12	2.31	0.12	1.44	0.18
1,2,3,4,7,8-HxCDF	8.27	1.73	5.7	1.01	--	--	3.39	1.10	8.05	0.90	11.99	0.65	7.48	0.91
1,2,3,6,7,8-HxCDF	5.24	1.10	5.22	0.92	--	--	2.46	0.80	5.66	0.64	9.51	0.51	5.62	0.69
2,3,4,6,7,8-HxCDF	5.6	1.17	7.35	1.30	--	--	2.86	0.93	5.63	0.63	14.99	0.81	7.29	0.89
1,2,3,4,7,8-HxCDD	2.8	0.59	2.61	0.46	--	--	0.8	0.26	2.47	0.28	6.72	0.36	3.08	0.38
1,2,3,6,7,8-HxCDD	5.94	1.24	5.3	0.94	--	--	1.72	0.56	5.22	0.59	14.85	0.80	6.61	0.81
1,2,3,7,8,9-HxCDD	5.42	1.14	4.7	0.83	--	--	1.31	0.42	4.06	0.46	15.75	0.85	6.25	0.76
1,2,3,7,8,9-HxCDF	0.63	0.13	0.85	0.15	--	--	0.17	0.06	0.35	0.04	1.42	0.08	0.68	0.08
1,2,3,4,6,7,8-HpCDF	37.4	7.84	26.86	4.75	--	--	21.25	6.89	60.22	6.77	70.71	3.82	43.29	5.29
1,2,3,4,6,7,8-HpCDD	84.8	17.77	88.47	15.65	--	--	25.21	8.18	88.81	9.98	283.49	15.30	114.16	13.94
1,2,3,4,7,8,9-HpCDF	5.41	1.13	3.66	0.65	--	--	2.55	0.83	9.53	1.07	10.9	0.59	6.41	0.78
OCDD	258	54.05	373.43	66.05	--	--	206.1	66.85	401.67	45.13	1305.56	70.47	508.95	62.16
OCDF	45.9	9.62	25.03	4.43	--	--	34.74	11.27	290.2	32.60	93.32	5.04	97.84	11.95
Totals for PCDDs/PCDFs	***477.3***	***100***	***565.37***	***100***	--	--	***308.28***	***100***	***890.07***	***100***	***1852.69***	***100***	***818.75***	***100***

Table 5. 2001 PCB and PCDD/PCDF Air Sampling Results for Lighthouse Lane, Calcasieu Parish, Louisiana (page 3 of 3)

Sources: (1) US Environmental Protection Agency. 2002. Calcasieu Parish air monitoring study, 2001 annual report. Prepared by URS Corporation: Austin, Texas and US Environmental Protection Agency, Region 6: Dallas, Texas.
(2) US Environmental Protection Agency. 2011d. June 17th electronic mail containing data attachments from Jennifer Gibbs, Environmental Scientist, USEPA Region 6, to Danielle Langmann, Environmental Health Scientist, ATSDR. Attachments: CALCASIEUAIR2003[1].pdf; CPASPjanuarydata.xls; CPASPmarchdata.xls; CPASPmaydata.xls; CPASPjulydata.xls; CPASPseptemberdata.xls; CPASPnovemberdata.xls; CPASPmossvillextradata.xls. Dallas, TX.

* Sampling results provided from the rotating field monitor that was stationed at Lighthouse Lane during sampling period 5.
† Mean Sampling Result = (sum of the values for each sampling period) / number of sampling periods
‡ Concentration Profile = (congener concentration / sum of congener concentrations) x 100

fg/m^3 femtograms per cubic meter
-- data lost as a result of laboratory error

Congener Nomenclature Key:

HpCDD	heptachlorodibenzo-*p*-dioxin	PCDD	polychlorinated dibenzo-*p*-dioxin
HpCDF	heptachlorodibenzofuran	PCDF	polychlorinated dibenzofuran
HxCDD	hexachlorodibenzo-*p*-dioxin	PeCDD	pentachlorodibenzo-*p*-dioxin
HxCDF	hexachlorodibenzofuran	PeCDF	pentachlorodibenzofuran
OCDD	octachlorodibenzo-*p*-dioxin	TCDD	tetrachlorodibenzo-*p*-dioxin
OCDF	octachlorodibenzofuran	TCDF	tetrachlorodibenzofuran
PCB	polychlorinated biphenyl		

Table 6. 2001 PCB and PCDD/PCDF Air Sampling Results for Mossville, Calcasieu Parish, Louisiana (page 1 of 3)

Congener	Sampling Period 2 (3/19/02–4/15/02)		Sampling Period 3* (5/16/01–6/12/01)		Sampling Period 4* (7/24/01–8/14/01)		Sampling Period 5 (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result†	
	Congener Concentration (fg/m^3)	Concentration Profile‡ (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Mean Congener Concentration (fg/m^3)	Mean Concentration Profile (percent)
PCB-77	115.12	4.65	142.02	3.41	115.34	3.12	92.45	3.14	91.63	3.94	111.31	3.57
PCB-118	1563.97	63.19	2840.00	68.20	2235.32	60.50	1967.91	66.79	1512.59	65.06	2023.96	64.85
PCB-105	609.45	24.62	974.25	23.40	1097.67	29.71	747.09	25.36	574.51	24.71	800.59	25.65
PCB-126	15.00	0.61	15.92	0.38	17.11	0.46	10.14	0.34	22.45	0.97	16.12	0.52
PCB-156	138.09	5.58	153.69	3.69	186.19	5.04	103.11	3.50	93	4.00	134.81	4.32
PCB-157	31.25	1.26	36.99	0.89	42.11	1.14	24.9	0.85	23.5	1.01	31.75	1.02
PCB-169	2.21	0.09	1.13	0.03	1.07	0.03	0.77	0.03	7.07	0.30	2.45	0.08
Totals for Coplanar PCBs	***2475.09***	***100***	***4164.00***	***100***	***3694.81***	***100***	***2946.37***	***100***	***2324.75***	***100***	***3120.99***	***100***
2,3,7,8-TCDF	7.34	0.62	2.62	1.24	2.35	0.68	2.12	0.21	13.01	0.23	5.49	0.33
2,3,7,8-TCDD	0.52	0.04	0.48	0.23	0.75	0.22	0.73	0.07	1.84	0.03	0.86	0.05
1,2,3,7,8-PeCDF	9.27	0.79	2.44	1.15	2.20	0.63	2.03	0.21	26.15	0.46	8.42	0.50
2,3,4,7,8-PeCDF	7.92	0.67	2.76	1.30	3.04	0.87	3.17	0.32	43.27	0.76	12.03	0.71
1,2,3,7,8-PeCDD	2.34	0.20	1.87	0.88	1.67	0.48	3.64	0.37	16.67	0.29	5.24	0.31

Table 6. 2001 PCB and PCDD/PCDF Air Sampling Results for Mossville, Calcasieu Parish, Louisiana (page 2 of 3)

Congener	Sampling Period 2 (3/19/02–4/15/02)		Sampling Period 3* (5/16/01–6/12/01)		Sampling Period 4* (7/24/01–8/14/01)		Sampling Period 5 (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result†	
	Congener Concentration (fg/m^3)	Concentration Profile‡ (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Mean Congener Concentration (fg/m^3)	Mean Concentration Profile (percent)
1,2,3,4,7,8-HxCDF	32.33	2.74	5.10	2.41	6.00	1.72	4.56	0.46	61.55	1.08	21.91	1.30
1,2,3,6,7,8-HxCDF	22.83	1.94	3.62	1.71	4.71	1.35	4.05	0.41	53.19	0.94	17.68	1.05
2,3,4,6,7,8-HxCDF	16.18	1.37	2.64	1.25	4.96	1.42	5.17	0.52	65.49	1.15	18.89	1.12
1,2,3,4,7,8-HxCDD	3.22	0.27	1.36	0.64	1.92	0.55	5.84	0.59	33.97	0.60	9.26	0.55
1,2,3,6,7,8-HxCDD	5.96	0.51	2.60	1.23	3.85	1.11	14.13	1.43	69.46	1.22	19.20	1.14
1,2,3,7,8,9-HxCDD	5.31	0.45	2.19	1.03	3.19	0.92	12.2	1.23	68.78	1.21	18.33	1.09
1,2,3,7,8,9-HxCDF	2.66	0.23	0.12	0.06	0.39	0.11	0.16	0.02	4.88	0.09	1.64	0.10
1,2,3,4,6,7,8-HpCDF	230.65	19.57	19.01	8.97	37.14	10.67	28.58	2.89	221.94	3.90	107.46	6.39
1,2,3,4,6,7,8-HpCDD	82.23	6.98	26.59	12.55	46.79	13.44	224.26	22.70	1072.87	18.87	290.55	17.27
1,2,3,4,7,8,9-HpCDF	29.13	2.47	2.36	1.11	4.20	1.21	2.92	0.30	29.38	0.52	13.60	0.81
OCDD	337.93	28.68	113.30	53.46	174.25	50.06	638.74	64.65	3765.2	66.21	1005.88	59.78
OCDF	382.62	32.47	22.89	10.80	50.67	14.56	35.7	3.61	139.34	2.45	126.24	7.50
Totals for PCDDs/PCDFs	***1178.44***	***100***	***211.95***	***100***	***348.08***	***100***	***988.00***	***100***	***5686.99***	***100***	***1682.68***	***100***

Table 6. 2001 PCB and PCDD/PCDF Air Sampling Results for Mossville, Calcasieu Parish, Louisiana (page 3 of 3)

Sources: (1) US Environmental Protection Agency. 2002. Calcasieu Parish air monitoring study, 2001 annual report. Prepared by URS Corporation: Austin, Texas and US Environmental Protection Agency, Region 6: Dallas, Texas.
(2) US Environmental Protection Agency. 2011d. June 17th electronic mail containing data attachments from Jennifer Gibbs, Environmental Scientist, USEPA Region 6, to Danielle Langmann, Environmental Health Scientist, ATSDR. Attachments: CALCASIEUAIR2003[1].pdf; CPASPjanuarydata.xls; CPASPmarchdata.xls; CPASPmaydata.xls; CPASPjulydata.xls; CPASPseptemberdata.xls; CPASPnovemberdata.xls; CPASPmossvillextradata.xls. Dallas, TX.

* The rotating field sampler was stationed at Mossville during sampling periods 2 and 3. The results reported for sampling periods 2 and 3 are the average of the Mossville sampler and the rotating sampler.

† Mean Sampling Result = (sum of the values for each sampling period) / number of sampling periods. Of note, no samples were collected at the Mossville location during the first two sampling periods as site access agreements were not yet secured. The additional sample collected from March 19 to April 15, 2002, was included.

‡ Concentration Profile = (congener concentration / sum of congener concentrations) x 100

fg/m^3 femtograms per cubic meter

Congener Nomenclature Key:

HpCDD	heptachlorodibenzo-*p*-dioxin	PCDD	polychlorinated dibenzo-*p*-dioxin
HpCDF	heptachlorodibenzofuran	PCDF	polychlorinated dibenzofuran
HxCDD	hexachlorodibenzo-*p*-dioxin	PeCDD	pentachlorodibenzo-*p*-dioxin
HxCDF	hexachlorodibenzofuran	PeCDF	pentachlorodibenzofuran
OCDD	octachlorodibenzo-*p*-dioxin	TCDD	tetrachlorodibenzo-*p*-dioxin
OCDF	octachlorodibenzofuran	TCDF	tetrachlorodibenzofuran
PCB	polychlorinated biphenyl		

Table 7. 2001 PCB and PCDD/PCDF Air Sampling Results for Westlake, Calcasieu Parish, Louisiana (page 1 of 3)

Congener	Sampling Period 1 (1/15/01–2/10/01)		Sampling Period 2 (3/15/01–4/11/01)		Sampling Period 3 (5/16/01–6/12/01)		Sampling Period 4 (7/24/01–8/14/01)		Sampling Period 5 (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result*	
	Congener Concentration (fg/m^3)	Concentration Profile† (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Mean Congener Concentration (fg/m^3)	Mean Concentration Profile (percent)
PCB-77	57	3.04	75.39	4.15	81.48	3.69	99.63	4.46	97.61	3.55	93.83	3.92	84.16	3.80
PCB-118	1260	67.13	1219	67.14	1480	67.07	1164.17	52.08	1794.2	65.29	1585.06	66.25	1417.07	64.05
PCB-105	449	23.92	425.55	23.44	534.83	24.24	727.9	32.56	729.57	26.55	588.48	24.60	575.89	26.03
PCB-126	7.67	0.41	8.21	0.45	8.54	0.39	17.89	0.80	10.21	0.37	9.54	0.40	10.34	0.47
PCB-156	83	4.42	70.13	3.86	81.54	3.70	181.2	8.11	93.85	3.41	92.48	3.87	100.37	4.54
PCB-157	19.3	1.03	16.72	0.92	19.38	0.88	41.91	1.87	22.01	0.80	21.85	0.91	23.53	1.06
PCB-169	1.11	0.06	0.74	0.04	0.74	0.03	2.69	0.12	0.78	0.03	1.3	0.05	1.23	0.06
Totals for Coplanar PCBs	***1877.08***	***100***	***1815.74***	***100***	***2206.51***	***100***	***2235.39***	***100***	***2748.23***	***100***	***2392.54***	***100***	***2212.59***	***100***
2,3,7,8-TCDF	2.43	0.23	2.28	0.47	1.79	0.99	3.22	0.20	1.9	0.15	3.98	0.13	2.60	0.20
2,3,7,8-TCDD	0.5	0.05	0.31	0.06	0.34	0.19	0.87	0.05	0.73	0.06	0.55	0.02	0.55	0.04
1,2,3,7,8-PeCDF	2.93	0.28	1.85	0.38	1.73	0.96	5.92	0.36	2.44	0.19	5.24	0.17	3.35	0.26
2,3,4,7,8-PeCDF	4.62	0.44	2.63	0.55	2.15	1.19	10.24	0.63	4.25	0.32	8.84	0.29	5.46	0.43

Table 7. 2001 PCB and PCDD/PCDF Air Sampling Results for Westlake, Calcasieu Parish, Louisiana (page 2 of 3)

Congener	Sampling Period 1 (1/15/01–2/10/01)		Sampling Period 2 (3/15/01–4/11/01)		Sampling Period 3 (5/16/01–6/12/01)		Sampling Period 4 (7/24/01–8/14/01)		Sampling Period 5 (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result*	
	Congener Concentration (fg/m^3)	Concentration Profile† (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Congener Concentration (fg/m^3)	Concentration Profile (percent)	Mean Congener Concentration (fg/m^3)	Mean Concentration Profile (percent)
1,2,3,7,8-PeCDD	3.54	0.34	1.42	0.30	1.35	0.75	1.96	0.12	3.82	0.29	5.4	0.18	2.92	0.23
1,2,3,4,7,8-HxCDF	6.65	0.64	3.9	0.81	3.44	1.90	36.06	2.21	6.56	0.50	16.02	0.52	12.11	0.94
1,2,3,6,7,8-HxCDF	5.22	0.50	3.22	0.67	2.42	1.34	27.52	1.69	5.73	0.44	13.7	0.45	9.64	0.75
2,3,4,6,7,8-HxCDF	7.28	0.70	3.76	0.78	7.87	4.35	31.34	1.92	7.46	0.57	16.06	0.53	12.30	0.96
1,2,3,4,7,8-HxCDD	5.86	0.56	2.12	0.44	1.06	0.59	3.99	0.24	7.23	0.55	15.83	0.52	6.02	0.47
1,2,3,6,7,8-HxCDD	11.8	1.13	4.23	0.88	2.05	1.13	8.29	0.51	16.79	1.28	31.66	1.04	12.47	0.97
1,2,3,7,8,9-HxCDD	10.9	1.05	4.59	0.95	6.54	3.62	5.51	0.34	15.01	1.15	31.81	1.04	12.39	0.97
1,2,3,7,8,9-HxCDF	0.87	0.08	0.54	0.11	NR	0.00	2.14	0.13	0.31	0.02	1.09	0.04	0.83	0.06
1,2,3,4,6,7,8-HpCDF	38.3	3.68	20.01	4.16	11.12	6.15	324.69	19.92	39.84	3.05	75.82	2.48	84.96	6.62
1,2,3,4,6,7,8-HpCDD	190	18.24	77.11	16.03	28.31	15.65	124.77	7.66	286.2	21.88	591.26	19.34	216.28	16.86
1,2,3,4,7,8,9-HpCDF	5.26	0.50	2.58	0.54	1.36	0.75	41.6	2.55	4.07	0.31	11.9	0.39	11.13	0.87
OCDD	690	66.23	325.31	67.62	99.47	54.99	508.02	31.17	849.52	64.95	2151.27	70.38	770.60	60.06
OCDF	55.6	5.34	25.22	5.24	9.9	5.47	493.53	30.28	56.2	4.30	76.37	2.50	119.47	9.31
Totals for PCDDs/PCDFs	***1041.76***	***100***	***481.08***	***100***	***180.9***	***100***	***1629.67***	***100***	***1308.06***	***100***	***3056.8***	***100***	***1283.08***	***100***

Table 7. 2001 PCB and PCDD/PCDF Air Sampling Results for Westlake, Calcasieu Parish, Louisiana (page 3 of 3)

Sources: (1) US Environmental Protection Agency. 2002. Calcasieu Parish air monitoring study, 2001 annual report. Prepared by URS Corporation: Austin, Texas and US Environmental Protection Agency, Region 6: Dallas, Texas.
(2) US Environmental Protection Agency. 2011d. June 17th electronic mail containing data attachments from Jennifer Gibbs, Environmental Scientist, USEPA Region 6, to Danielle Langmann, Environmental Health Scientist, ATSDR. Attachments: CALCASIEUAIR2003[1].pdf; CPASPjanuarydata.xls; CPASPmarchdata.xls; CPASPmaydata.xls; CPASPjulydata.xls; CPASPseptemberdata.xls; CPASPnovemberdata.xls; CPASPmossvillextradata.xls. Dallas, TX.

* Mean Sampling Result = (sum of the values for each sampling period) / number of sampling periods
† Concentration Profile = (congener concentration / sum of congener concentrations) x 100

fg/m^3 femtograms per cubic meter
NR no value reported

Congener Nomenclature Key:

HpCDD	heptachlorodibenzo-*p*-dioxin	PCDD	polychlorinated dibenzo-*p*-dioxin
HpCDF	heptachlorodibenzofuran	PCDF	polychlorinated dibenzofuran
HxCDD	hexachlorodibenzo-*p*-dioxin	PeCDD	pentachlorodibenzo-*p*-dioxin
HxCDF	hexachlorodibenzofuran	PeCDF	pentachlorodibenzofuran
OCDD	octachlorodibenzo-*p*-dioxin	TCDD	tetrachlorodibenzo-*p*-dioxin
OCDF	octachlorodibenzofuran	TCDF	tetrachlorodibenzofuran
PCB	polychlorinated biphenyl		

Table 8. 2001 Toxicity Equivalents (TEQ_{05}) Levels for Vinton, Calcasieu Parish, Louisiana (page 1 of 2)

Congener	Sampling Period 1 (1/15/01 – 2/10/01)		Sampling Period 3 (5/16/01 – 6/12/01)		Sampling Period 4 (7/24/01 – 8/14/01)		Sampling Period 5 (9/11/01 – 10/8/01)		Mean Sampling Result*	
	TEQ_{05} Level† (fg/m^3)	TEQ_{05} Profile‡ (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	Mean TEQ_{05} Level (fg/m^3)	Mean TEQ_{05} Profile (percent)
PCB-77	0.0037	1.03	0.0051	0.65	0.0054	0.51	0.0038	0.94	0.0045	0.69
PCB-118	0.0145	4.03	0.0333	4.21	0.0268	2.54	0.0177	4.33	0.0231	3.53
PCB-105	0.0052	1.43	0.0109	1.37	0.0131	1.25	0.0065	1.59	0.0089	1.36
PCB-126	0.3190	88.67	0.7070	89.30	0.9710	92.19	0.3660	89.51	0.5908	90.41
PCB-156	0.0012	0.35	0.0017	0.21	0.0027	0.25	0.0009	0.21	0.0016	0.24
PCB-157	0.0003	0.07	0.0004	0.05	0.0007	0.06	0.0002	0.05	0.0004	0.06
PCB-169	0.0159	4.42	0.0333	4.21	0.0336	3.19	0.0138	3.37	0.0242	3.70
Totals for Coplanar PCBs	***0.3598***	***100***	***0.7917***	***100***	***1.0533***	***100***	***0.4089***	***100***	***0.6535***	***100***
2,3,7,8-TCDF	0.1320	1.68	0.1200	1.40	0.1390	1.52	0.0590	2.33	0.1125	1.60
2,3,7,8-TCDD	0.3400	4.32	0.8900	10.36	0.6800	7.46	0.1900	7.50	0.5250	7.47
1,2,3,7,8-PeCDF	0.0600	0.76	0.0543	0.63	0.0477	0.52	0.0165	0.65	0.0446	0.63
2,3,4,7,8-PeCDF	0.6990	8.89	0.9600	11.18	0.7200	7.90	0.3150	12.43	0.6735	9.59
1,2,3,7,8-PeCDD	1.3600	17.29	3.0900	35.97	2.4100	26.44	0.5800	22.89	1.8600	26.47
1,2,3,4,7,8-HxCDF	0.7170	9.12	0.4150	4.83	0.4350	4.77	0.1360	5.37	0.4258	6.06
1,2,3,6,7,8-HxCDF	0.4780	6.08	0.3450	4.02	0.3440	3.77	0.1080	4.26	0.3188	4.54
2,3,4,6,7,8-HxCDF	0.4330	5.50	0.2560	2.98	0.3140	3.44	0.1420	5.61	0.2863	4.07
1,2,3,4,7,8-HxCDD	0.3650	4.64	0.3350	3.90	0.4200	4.61	0.0920	3.63	0.3030	4.31
1,2,3,6,7,8-HxCDD	0.7260	9.23	0.6490	7.56	0.8860	9.72	0.2010	7.93	0.6155	8.76
1,2,3,7,8,9-HxCDD	0.6500	8.26	0.5710	6.65	0.7900	8.67	0.1950	7.70	0.5515	7.85

Table 8. 2001 Toxicity Equivalents (TEQ_{05}) Levels for Vinton, Calcasieu Parish, Louisiana (page 2 of 2)

Congener	Sampling Period 1 (1/15/01 – 2/10/01)		Sampling Period 3 (5/16/01 – 6/12/01)		Sampling Period 4 (7/24/01 – 8/14/01)		Sampling Period 5 (9/11/01 – 10/8/01)		Mean Result*	
	TEQ_{05} Level† (fg/m^3)	TEQ_{05} Profile‡ (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	Mean TEQ_{05} Level (fg/m^3)	Mean TEQ_{05} Profile (percent)
1,2,3,7,8,9-HxCDF	0.0760	0.97	0.0200	0.23	0.0290	0.32	NR	0.00	0.0313	0.45
1,2,3,4,6,7,8-HpCDF	0.4690	5.96	0.1327	1.54	0.2011	2.21	0.0722	2.85	0.2188	3.11
1,2,3,4,6,7,8-HpCDD	1.1000	13.98	0.6924	8.06	1.4681	16.10	0.3670	14.49	0.9069	12.91
1,2,3,4,7,8,9-HpCDF	0.0759	0.96	0.0108	0.13	0.0232	0.25	0.0074	0.29	0.0293	0.42
OCDD	0.1446	1.84	0.0456	0.53	0.2010	2.20	0.0504	1.99	0.1104	1.57
OCDF	0.0402	0.51	0.0029	0.03	0.0084	0.09	0.0019	0.07	0.0134	0.19
Totals for PCDDs/PCDFs	***7.8657***	***100***	***8.5897***	***100***	***9.1165***	***100***	***2.5334***	***100***	***7.0266***	***100***
Totals for Dioxin-like Compounds§	***8.2255***	***NA***	***9.3814***	***NA***	***10.1698***	***NA***	***2.9423***	***NA***	***7.6801***	***NA***

* Mean Sampling Result = (sum of the values for each sampling period) / number of sampling periods. Of note, the sampling results from sampling periods 2 and 6 were not included in this table. In sampling period 2, the Vinton sample was lost prior to analysis and in sampling period 6, the Vinton sampler experienced motor failure.
† TEQ_{05} Level = congener concentration (from Table 3, Appendix B) x congener TEF_{05} (from Table 1, Appendix B)
‡ TEQ_{05} Profile = (TEQ_{05} level / sum of TEQ_{05} levels) x 100
§ Dioxin-like compounds refer to coplanar PCBs and PCDDs/PCDFs.

fg/m^3 femtograms per cubic meter
NA not applicable
NR no value reported
TEF_{05} toxicity equivalence factors published by the World Health Organization in 2005
TEQ_{05} toxicity equivalents calculated from toxicity equivalence factors published by the World Health Organization in 2005

Congener Nomenclature Key:

HpCDD	heptachlorodibenzo-*p*-dioxin	PCDD	polychlorinated dibenzo-*p*-dioxin
HpCDF	heptachlorodibenzofuran	PCDF	polychlorinated dibenzofuran
HxCDD	hexachlorodibenzo-*p*-dioxin	PeCDD	pentachlorodibenzo-*p*-dioxin
HxCDF	hexachlorodibenzofuran	PeCDF	pentachlorodibenzofuran
OCDD	octachlorodibenzo-*p*-dioxin	TCDD	tetrachlorodibenzo-*p*-dioxin
OCDF	octachlorodibenzofuran	TCDF	tetrachlorodibenzofuran
PCB	polychlorinated biphenyl		

Table 9. 2001 Toxicity Equivalents (TEQ_{05}) Levels for Bayou D'Inde, Calcasieu Parish, Louisiana (page 1 of 3)

Congener	Sampling Period 1 (1/15/01–2/10/01)		Sampling Period 2 (3/15/01–4/11/01)		Sampling Period 3 (5/16/01–6/12/01)		Sampling Period 4 (7/24/01–8/14/01)		Sampling Period 5 (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result*	
	TEQ_{05} Level[†] (fg/m^3)	TEQ_{05} Profile[‡] (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	Mean TEQ_{05} Level (fg/m^3)	Mean TEQ_{05} Profile (percent)
PCB-77	0.0069	0.67	0.0072	0.79	0.0134	0.78	0.0119	0.57	0.0089	0.63	0.0097	0.71	0.0097	0.68
PCB-118	0.0357	3.46	0.0358	3.93	0.0693	4.02	0.0568	2.71	0.0640	4.54	0.0497	3.64	0.0519	3.65
PCB-105	0.0114	1.11	0.0110	1.20	0.0242	1.40	0.0288	1.37	0.0219	1.55	0.0199	1.46	0.0195	1.37
PCB-126	0.9490	92.08	0.8370	91.84	1.5930	92.31	1.9710	93.93	1.2920	91.66	1.2490	91.56	1.3152	92.40
PCB-156	0.0019	0.18	0.0018	0.20	0.0038	0.22	0.0047	0.23	0.0036	0.26	0.0028	0.21	0.0031	0.22
PCB-157	0.0005	0.04	0.0004	0.05	0.0010	0.06	0.0012	0.06	0.0009	0.06	0.0006	0.05	0.0008	0.06
PCB-169	0.0252	2.45	0.0182	1.99	0.0210	1.22	0.0240	1.14	0.0183	1.30	0.0324	2.38	0.0232	1.63
Totals for Coplanar PCBs	***1.0306***	***100***	***0.9114***	***100***	***1.7257***	***100***	***2.0984***	***100***	***1.4096***	***100***	***1.3641***	***100***	***1.4234***	***100***
2,3,7,8-TCDF	0.2290	2.40	0.1335	2.55	0.1860	4.86	0.9760	20.07	0.1750	3.54	0.2160	0.48	0.3193	2.61
2,3,7,8-TCDD	0.3400	3.56	0.2500	4.78	0.4200	10.97	0.7900	16.25	0.3300	6.67	0.7300	1.63	0.4767	3.90
1,2,3,7,8-PeCDF	0.0990	1.04	0.0378	0.72	0.0300	0.78	0.0840	1.73	0.0357	0.72	0.0693	0.15	0.0593	0.49
2,3,4,7,8-PeCDF	1.4460	15.15	0.6120	11.70	0.4800	12.54	0.9420	19.37	0.5280	10.68	1.3980	3.11	0.9010	7.37
1,2,3,7,8-PeCDD	1.7200	18.02	1.0850	20.74	0.9400	24.56	0.7700	15.84	1.1500	23.26	9.2400	20.58	2.4842	20.33
1,2,3,4,7,8-HxCDF	1.0500	11.00	0.2965	5.67	0.1750	4.57	0.2160	4.44	0.2860	5.78	0.9810	2.18	0.5008	4.10

Table 9. 2001 Toxicity Equivalents (TEQ_{05}) Levels for Bayou D'Inde, Calcasieu Parish, Louisiana (page 2 of 3)

Congener	Sampling Period 1 (1/15/01–2/10/01)		Sampling Period 2 (3/15/01–4/11/01)		Sampling Period 3 (5/16/01–6/12/01)		Sampling Period 4 (7/24/01–8/14/01)		Sampling Period 5 (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result*	
	TEQ_{05} Level[†] (fg/m^3)	TEQ_{05} Profile[‡] (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	Mean TEQ_{05} Level (fg/m^3)	Mean TEQ_{05} Profile (percent)
1,2,3,6,7,8-HxCDF	0.7450	7.81	0.2685	5.13	0.1550	4.05	0.1890	3.89	0.2230	4.51	0.7880	1.75	0.3948	3.23
2,3,4,6,7,8-HxCDF	0.8350	8.75	0.4250	8.12	0.1620	4.23	0.2030	4.18	0.2820	5.70	1.3290	2.96	0.5393	4.41
1,2,3,4,7,8-HxCDD	0.2770	2.90	0.1825	3.49	0.1120	2.93	0.0740	1.52	0.1700	3.44	2.9800	6.64	0.6326	5.18
1,2,3,6,7,8-HxCDD	0.5430	5.69	0.3890	7.44	0.1850	4.83	0.1530	3.15	0.4000	8.09	6.6440	14.80	1.3857	11.34
1,2,3,7,8,9-HxCDD	0.4940	5.18	0.5030	9.62	0.5300	13.85	0.1240	2.55	0.3440	6.96	6.6250	14.75	1.4367	11.76
1,2,3,7,8,9-HxCDF	0.1420	1.49	0.0250	0.48	NR	0.00	0.0100	0.21	NR	0.00	0.1230	0.27	0.0500	0.41
1,2,3,4,6,7,8-HpCDF	0.5920	6.20	0.2599	4.97	0.0841	2.20	0.1036	2.13	0.1813	3.67	0.8179	1.82	0.3398	2.78
1,2,3,4,6,7,8-HpCDD	0.8360	8.76	0.6537	12.50	0.3339	8.72	0.1958	4.03	0.7092	14.34	11.7850	26.24	2.4189	19.80
1,2,3,4,7,8,9-HpCDF	0.0888	0.93	0.0280	0.54	NR	0.00	0.0065	0.13	0.0232	0.47	0.1158	0.26	0.0437	0.36
OCDD	0.0804	0.84	0.0741	1.42	0.0328	0.86	0.0226	0.46	0.0926	1.87	1.0249	2.28	0.2212	1.81
OCDF	0.0269	0.28	0.0073	0.14	0.0015	0.04	0.0027	0.06	0.0147	0.30	0.0401	0.09	0.0156	0.13
Totals for PCDDs/PCDFs	***9.5441***	***100***	***5.2308***	***100***	***3.8273***	***100***	***4.8622***	***100***	***4.9447***	***100***	***44.9070***	***100***	***12.2196***	***100***
Totals for Dioxin-like Compounds[§]	***10.5747***	***NA***	***6.1422***	***NA***	***5.5530***	***NA***	***6.9606***	***NA***	***6.3543***	***NA***	***46.2711***	***NA***	***13.6430***	***NA***

Table 9. 2001 Toxicity Equivalents (TEQ_{05}) Levels for Bayou D'Inde, Calcasieu Parish, Louisiana (page 3 of 3)

*	Mean Sampling Result = (sum of the values for each sampling period) / number of sampling periods
†	TEQ_{05} Level = congener concentration (from Table 4, Appendix B) x congener TEF_{05} (from Table 1, Appendix B)
‡	TEQ_{05} Profile = (TEQ_{05} level / sum of TEQ_{05} levels) x 100
§	Dioxin-like compounds refer to coplanar PCBs and PCDDs/PCDFs

fg/m^3	femtograms per cubic meter
NA	not applicable
NR	no value reported
TEF_{05}	toxicity equivalence factors published by the World Health Organization in 2005
TEQ_{05}	toxicity equivalents calculated from toxicity equivalence factors published by the World Health Organization in 2005

Congener Nomenclature Key:

HpCDD	heptachlorodibenzo-*p*-dioxin	PCDD	polychlorinated dibenzo-*p*-dioxin
HpCDF	heptachlorodibenzofuran	PCDF	polychlorinated dibenzofuran
HxCDD	hexachlorodibenzo-*p*-dioxin	PeCDD	pentachlorodibenzo-*p*-dioxin
HxCDF	hexachlorodibenzofuran	PeCDF	pentachlorodibenzofuran
OCDD	octachlorodibenzo-*p*-dioxin	TCDD	tetrachlorodibenzo-*p*-dioxin
OCDF	octachlorodibenzofuran	TCDF	tetrachlorodibenzofuran
PCB	polychlorinated biphenyl		

Table 10. 2001 Toxicity Equivalents (TEQ$_{05}$) Levels for Lighthouse Lane, Calcasieu Parish, Louisiana (page 1 of 3)

Congener	Sampling Period 1 (1/15/01–2/10/01)		Sampling Period 2 (3/15/01–4/11/01)		Sampling Period 3 (5/16/01–6/12/01)		Sampling Period 4 (7/24/01–8/14/01)		Sampling Period 5* (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result†	
	TEQ$_{05}$ Level‡ (fg/m^3)	TEQ$_{05}$ Profile§ (percent)	TEQ$_{05}$ Level (fg/m^3)	TEQ$_{05}$ Profile (percent)	TEQ$_{05}$ Level (fg/m^3)	TEQ$_{05}$ Profile (percent)	TEQ$_{05}$ Level (fg/m^3)	TEQ$_{05}$ Profile (percent)	TEQ$_{05}$ Level (fg/m^3)	TEQ$_{05}$ Profile (percent)	TEQ$_{05}$ Level (fg/m^3)	TEQ$_{05}$ Profile (percent)	Mean TEQ$_{05}$ Level (fg/m^3)	Mean TEQ$_{05}$ Profile (percent)
PCB-77	0.0062	0.90	0.0145	0.84	0.0200	0.89	0.0151	0.64	0.0096	0.83	0.0078	0.84	0.0122	0.81
PCB-118	0.0260	3.76	0.0697	4.06	0.1059	4.72	0.0687	2.92	0.0525	4.54	0.0386	4.18	0.0602	3.98
PCB-105	0.0087	1.26	0.0200	1.17	0.0331	1.48	0.0282	1.20	0.0191	1.65	0.0123	1.33	0.0202	1.33
PCB-126	0.6160	89.08	1.5740	91.72	2.0480	91.31	2.1950	93.44	1.0450	90.25	0.8290	89.7	1.3845	91.47
PCB-156	0.0018	0.26	0.0029	0.17	0.0050	0.23	0.0060	0.26	0.0031	0.26	0.0021	0.23	0.0035	0.23
PCB-157	0.0004	0.06	0.0008	0.04	0.0013	0.06	0.0015	0.06	0.0007	0.06	0.0005	0.05	0.0009	0.06
PCB-169	0.0324	4.69	0.0342	1.99	0.0297	1.32	0.0345	1.47	0.0279	2.41	0.0339	3.67	0.0321	2.12
Totals for Coplanar PCBs	***0.6915***	***100***	***1.7161***	***100***	***2.2430***	***100***	***2.3489***	***100***	***1.1579***	***100***	***0.9242***	***100***	***1.5136***	***100***
2,3,7,8-TCDF	0.2580	3.16	0.4480	5.02	--	--	0.1840	5.40	0.2440	3.32	0.2410	1.49	0.2750	3.12
2,3,7,8-TCDD	0.2800	3.43	0.5100	5.71	--	--	0.2700	7.93	0.2800	3.81	0.2600	1.61	0.3200	3.63
1,2,3,7,8-PeCDF	0.1050	1.28	0.1113	1.25	--	--	0.0411	1.21	0.0585	0.80	0.0846	0.52	0.0801	0.91
2,3,4,7,8-PeCDF	1.1820	14.46	1.7610	19.71	--	--	0.4980	14.62	0.7260	9.87	1.7040	10.52	1.1742	13.32
1,2,3,7,8-PeCDD	1.5900	19.46	1.6200	18.14	--	--	0.5800	17.03	1.1100	15.09	2.3100	14.27	1.4420	16.36
1,2,3,4,7,8-HxCDF	0.8270	10.12	0.5700	6.38	--	--	0.3390	9.95	0.8050	10.94	1.1990	7.40	0.7480	8.49

Table 10. 2001 Toxicity Equivalents (TEQ_{05}) Levels for Lighthouse Lane, Calcasieu Parish, Louisiana (page 2 of 3)

Congener	Sampling Period 1 (1/15/01–2/10/01)		Sampling Period 2 (3/15/01–4/11/01)		Sampling Period 3 (5/16/01–6/12/01)		Sampling Period 4 (7/24/01–8/14/01)		Sampling Period 5* (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result†	
	TEQ_{05} Level‡ (fg/m^3)	TEQ_{05} Profile§ (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	Mean TEQ_{05} Level (fg/m^3)	Mean TEQ_{05} Profile (percent)
1,2,3,6,7,8-HxCDF	0.5240	6.41	0.5220	5.84	--	--	0.2460	7.22	0.5660	7.69	0.9510	5.87	0.5618	6.38
2,3,4,6,7,8-HxCDF	0.5600	6.85	0.7350	8.23	--	--	0.2860	8.40	0.5630	7.65	1.4990	9.26	0.7286	8.27
1,2,3,4,7,8-HxCDD	0.2800	3.43	0.2610	2.92	--	--	0.0800	2.35	0.2470	3.36	0.6720	4.15	0.3080	3.50
1,2,3,6,7,8-HxCDD	0.5940	7.27	0.5300	5.93	--	--	0.1720	5.05	0.5220	7.10	1.4850	9.17	0.6606	7.50
1,2,3,7,8,9-HxCDD	0.5420	6.63	0.4700	5.26	--	--	0.1310	3.85	0.4060	5.52	1.5750	9.73	0.6248	7.09
1,2,3,7,8,9-HxCDF	0.0630	0.77	0.0850	0.95	--	--	0.0170	0.50	0.0350	0.48	0.1420	0.88	0.0684	0.78
1,2,3,4,6,7,8-HpCDF	0.3740	4.58	0.2686	3.01	--	--	0.2125	6.24	0.6022	8.19	0.7071	4.37	0.4329	4.91
1,2,3,4,6,7,8-HpCDD	0.8480	10.38	0.8847	9.90	--	--	0.2521	7.40	0.8881	12.07	2.8349	17.51	1.1416	12.95
1,2,3,4,7,8,9-HpCDF	0.0541	0.66	0.0366	0.41	--	--	0.0255	0.75	0.0953	1.30	0.1090	0.67	0.0641	0.73
OCDD	0.0774	0.95	0.1120	1.25	--	--	0.0618	1.81	0.1205	1.64	0.3917	2.42	0.1527	1.73
OCDF	0.0138	0.17	0.0075	0.08	--	--	0.0104	0.31	0.0871	1.18	0.0280	0.17	0.0294	0.33
Totals for PCDDs/PCDFs	***8.1723***	***100***	***8.9327***	***100***	***--***	***--***	***3.4064***	***100***	***7.3557***	***10 0***	***16.1933***	***100***	***8.8122***	***100***
Totals for Dioxin-like Compounds¶	***8.8638***	***NA***	***10.6488***	***NA***	***NA***	***NA***	***5.7554***	***NA***	***8.5136***	***NA***	***17.1175***	***NA***	***10.3258***	***NA***

Table 10. 2001 Toxicity Equivalents (TEQ_{05}) Levels for Lighthouse Lane, Calcasieu Parish, Louisiana (page 3 of 3)

*	Sampling results were from the rotating field monitor that was stationed at Lighthouse Lane during sampling period 5.
†	Mean Sampling Result = (sum of the values for each sampling period) / number of sampling periods
‡	TEQ_{05} Level = congener concentration (from Table 5, Appendix B) x congener TEF_{05} (from Table 1, Appendix B)
§	TEQ_{05} Profile = (TEQ_{05} level / sum of TEQ_{05} levels) x 100
¶	Dioxin-like compounds refer to coplanar PCBs and PCDDs/PCDFs

fg/m^3	femtograms per cubic meter
NA	not applicable
--	original data lost as a result of laboratory error
TEF_{05}	toxicity equivalence factors published by the World Health Organization in 2005
TEQ_{05}	toxicity equivalents calculated from toxicity equivalence factors published by the World Health Organization in 2005

Congener Nomenclature Key:

HpCDD	heptachlorodibenzo-*p*-dioxin	PCDD	polychlorinated dibenzo-*p*-dioxin
HpCDF	heptachlorodibenzofuran	PCDF	polychlorinated dibenzofuran
HxCDD	hexachlorodibenzo-*p*-dioxin	PeCDD	pentachlorodibenzo-*p*-dioxin
HxCDF	hexachlorodibenzofuran	PeCDF	pentachlorodibenzofuran
OCDD	octachlorodibenzo-*p*-dioxin	TCDD	tetrachlorodibenzo-*p*-dioxin
OCDF	octachlorodibenzofuran	TCDF	tetrachlorodibenzofuran
PCB	polychlorinated biphenyl		

Table 11. 2001 Toxicity Equivalents (TEQ_{05}) Levels for Mossville, Calcasieu Parish, Louisiana (page 1 of 3)

Congener	Sampling Period 2 (3/19/02–4/15/02)		Sampling Period 3 (5/16/01–6/12/01)		Sampling Period 4 (7/24/01–8/14/01)		Sampling Period 5 (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result*	
	TEQ_{05} Level † (fg/m^3)	TEQ_{05} Profile‡ (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	Mean TEQ_{05} Level (fg/m^3)	Mean TEQ_{05} Profile (percent)
PCB-77	0.0115	0.70	0.0142	0.81	0.0115	0.62	0.0092	0.81	0.0092	0.36	0.0111	0.62
PCB-118	0.0469	2.85	0.0852	4.84	0.0671	3.60	0.0590	5.21	0.0454	1.79	0.0607	3.40
PCB-105	0.0183	1.11	0.0292	1.66	0.0329	1.77	0.0224	1.98	0.0172	0.68	0.0240	1.34
PCB-126	1.4996	91.02	1.5920	90.44	1.7110	91.92	1.0140	89.62	2.2450	88.65	1.6124	90.24
PCB-156	0.0041	0.25	0.0046	0.26	0.0056	0.30	0.0031	0.27	0.0028	0.11	0.0040	0.22
PCB-157	0.0009	0.05	0.0011	0.06	0.0013	0.07	0.0007	0.06	0.0007	0.03	0.0010	0.06
PCB-169	0.0662	4.02	0.0339	1.93	0.0321	1.72	0.0231	2.04	0.2121	8.38	0.0735	4.11
Totals for Coplanar PCBs	***1.6475***	***100***	***1.7602***	***100***	***1.8615***	***100***	***1.1315***	***100***	***2.5324***	***100***	***1.7867***	***100***
2,3,7,8-TCDF	0.7335	3.91	0.2620	4.52	0.2350	3.32	0.2120	1.64	1.3010	1.55	0.5488	2.14
2,3,7,8-TCDD	0.5244	2.80	0.4800	8.28	0.7500	10.59	0.7300	5.63	1.8400	2.20	0.8640	3.37
1,2,3,7,8-PeCDF	0.2781	1.48	0.0732	1.26	0.0660	0.93	0.0609	0.47	0.7845	0.94	0.2525	0.98
2,3,4,7,8-PeCDF	2.3771	12.68	0.8280	14.28	0.9120	12.88	0.9510	7.34	12.9810	15.50	3.6096	14.07
1,2,3,7,8-PeCDD	2.3446	12.51	1.8700	32.26	1.6700	23.58	3.6400	28.08	16.6700	19.91	5.2389	20.42
1,2,3,4,7,8-HxCDF	3.2329	17.25	0.5100	8.80	0.6000	8.47	0.4560	3.52	6.1550	7.35	2.1908	8.54
1,2,3,6,7,8-HxCDF	2.2830	12.18	0.3620	6.24	0.4710	6.65	0.4050	3.12	5.3190	6.35	1.7680	6.89

Table 11. 2001 Toxicity Equivalents (TEQ_{05}) Levels for Mossville, Calcasieu Parish, Louisiana (page 2 of 3)

Congener	Sampling Period 2 (3/19/02–4/15/02)		Sampling Period 3 (5/16/01–6/12/01)		Sampling Period 4 (7/24/01–8/14/01)		Sampling Period 5 (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result*	
	TEQ_{05} Level† (fg/m^3)	TEQ_{05} Profile‡ (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	Mean TEQ_{05} Level (fg/m^3)	Mean TEQ_{05} Profile (percent)
2,3,4,6,7,8-HxCDF	1.6175	8.63	0.2640	4.55	0.4955	7.00	0.5170	3.99	6.5490	7.82	1.8887	7.36
1,2,3,4,7,8-HxCDD	0.3219	1.72	0.1360	2.35	0.1915	2.70	0.5840	4.50	3.3970	4.06	0.9261	3.61
1,2,3,6,7,8-HxCDD	0.5957	3.18	0.2600	4.49	0.3850	5.44	1.4130	10.90	6.9460	8.30	1.9200	7.48
1,2,3,7,8,9-HxCDD	0.5308	2.83	0.2190	3.78	0.3185	4.50	1.2200	9.41	6.8780	8.22	1.8333	7.14
1,2,3,7,8,9-HxCDF	0.2662	1.42	0.0120	0.21	0.0385	0.54	0.0160	0.12	0.4880	0.58	0.1641	0.64
1,2,3,4,6,7,8-HpCDF	2.3065	12.31	0.1901	3.28	0.3714	5.24	0.2858	2.20	2.2194	2.65	1.0746	4.19
1,2,3,4,6,7,8-HpCDD	0.8223	4.39	0.2659	4.59	0.4679	6.61	2.2426	17.30	10.7287	12.81	2.9055	11.32
1,2,3,4,7,8,9-HpCDF	0.2913	1.55	0.0236	0.41	0.0420	0.59	0.0292	0.23	0.2938	0.35	0.1360	0.53
OCDD	0.1014	0.54	0.0340	0.59	0.0523	0.74	0.1916	1.48	1.1296	1.35	0.3018	1.18
OCDF	0.1148	0.61	0.0069	0.12	0.0152	0.21	0.0107	0.08	0.0418	0.05	0.0379	0.15
Totals for PCDDs/PCDFs	***18.7420***	***100***	***5.7967***	***100***	***7.0818***	***100***	***12.9648***	***100***	***83.7218***	***100***	***25.6606***	***100***
Totals for Dioxin-like Compounds§	***20.3895***	***NA***	***7.5569***	***NA***	***8.9433***	***NA***	***14.0963***	***NA***	***86.2542***	***NA***	***27.4473***	***NA***

Table 11. 2001 Toxicity Equivalents (TEQ_{05}) Levels for Mossville, Calcasieu Parish, Louisiana (page 3 of 3)

*	Mean Sampling Result = (sum of the values for each sampling period) / number of sampling periods. Of note, no samples were collected at the Mossville location during the first two sampling periods as site access agreements were not yet secured. The additional sample collected from March 19 to April 15, 2002, was included.
†	TEQ_{05} Level = congener concentration (from Table 6, Appendix B) x congener TEF_{05} (from Table 1, Appendix B)
‡	TEQ_{05} Profile = (TEQ_{05} level / sum of TEQ_{05} levels) x 100
§	Dioxin-like compounds refer to coplanar PCBs and PCDDs/PCDFs

fg/m^3	femtograms per cubic meter
NA	not applicable
TEF_{05}	toxicity equivalence factors published by the World Health Organization in 2005
TEQ_{05}	toxicity equivalents calculated from toxicity equivalence factors published by the World Health Organization in 2005

Congener Nomenclature Key:

HpCDD	heptachlorodibenzo-*p*-dioxin	PCDD	polychlorinated dibenzo-*p*-dioxin
HpCDF	heptachlorodibenzofuran	PCDF	polychlorinated dibenzofuran
HxCDD	hexachlorodibenzo-*p*-dioxin	PeCDD	pentachlorodibenzo-*p*-dioxin
HxCDF	hexachlorodibenzofuran	PeCDF	pentachlorodibenzofuran
OCDD	octachlorodibenzo-*p*-dioxin	TCDD	tetrachlorodibenzo-*p*-dioxin
OCDF	octachlorodibenzofuran	TCDF	tetrachlorodibenzofuran
PCB	polychlorinated biphenyl		

Table 12. 2001 Toxicity Equivalents (TEQ_{05}) Levels for Westlake, Calcasieu Parish, Louisiana (page 1 of 3)

Congener	Sampling Period 1 (1/15/01–2/10/01)		Sampling Period 2 (3/15/01–4/11/01)		Sampling Period 3 (5/16/01–6/12/01)		Sampling Period 4 (7/24/01–8/14/01)		Sampling Period 5 (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result*	
	TEQ_{05} Level[†] (fg/m^3)	TEQ_{05} Profile[‡] (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	Mean TEQ_{05} Level (fg/m^3)	Mean TEQ_{05} Profile (percent)
PCB-77	0.0057	0.66	0.0075	0.83	0.0081	0.85	0.0100	0.51	0.0098	0.86	0.0094	0.88	0.0084	0.73
PCB-118	0.0378	4.39	0.0366	4.05	0.0444	4.69	0.0349	1.80	0.0538	4.75	0.0476	4.44	0.0425	3.72
PCB-105	0.0135	1.57	0.0128	1.42	0.0160	1.69	0.0218	1.12	0.0219	1.93	0.0177	1.65	0.0173	1.51
PCB-126	0.7670	89.14	0.8210	90.95	0.8540	90.11	1.7890	92.07	1.0210	90.09	0.9540	89.06	1.0343	90.49
PCB-156	0.0025	0.29	0.0021	0.23	0.0024	0.25	0.0054	0.28	0.0028	0.25	0.0028	0.26	0.0030	0.26
PCB-157	0.0006	0.07	0.0005	0.06	0.0006	0.06	0.0013	0.06	0.0007	0.06	0.0007	0.07	0.0007	0.06
PCB-169	0.0333	3.87	0.0222	2.46	0.0222	2.34	0.0807	4.15	0.0234	2.06	0.0390	3.64	0.0368	3.22
Totals for Coplanar PCBs	***0.8604***	***100***	***0.9027***	***100***	***0.9477***	***100***	***1.9431***	***100***	***1.1334***	***100***	***1.0712***	***100***	***1.1430***	***100***
2,3,7,8-TCDF	0.2430	1.84	0.2280	3.71	0.1790	3.35	0.3220	1.39	0.1900	1.22	0.3980	1.36	0.2600	1.69
2,3,7,8-TCDD	0.5000	3.80	0.3100	5.05	0.3400	6.36	0.8700	3.77	0.7300	4.69	0.5500	1.88	0.5500	3.57
1,2,3,7,8-PeCDF	0.0879	0.67	0.0555	0.90	0.0519	0.97	0.1776	0.77	0.0732	0.47	0.1572	0.54	0.1006	0.65
2,3,4,7,8-PeCDF	1.3860	10.52	0.7890	12.85	0.6450	12.07	3.0720	13.30	1.2750	8.19	2.6520	9.07	1.6365	10.61
1,2,3,7,8-PeCDD	3.5400	26.87	1.4200	23.12	1.3500	25.26	1.9600	8.49	3.8200	24.53	5.4000	18.47	2.9150	18.90
1,2,3,4,7,8-HxCDF	0.6650	5.05	0.3900	6.35	0.3440	6.44	3.6060	15.61	0.6560	4.21	1.6020	5.48	1.2105	7.85

Table 12. 2001 Toxicity Equivalents (TEQ_{05}) Levels for Westlake, Calcasieu Parish, Louisiana (page 2 of 3)

Congener	Sampling Period 1 (1/15/01–2/10/01)		Sampling Period 2 (3/15/01–4/11/01)		Sampling Period 3 (5/16/01–6/12/01)		Sampling Period 4 (7/24/01–8/14/01)		Sampling Period 5 (9/11/01–10/8/01)		Sampling Period 6 (11/7/01–12/4/01)		Mean Sampling Result*	
	TEQ_{05} Level† (fg/m^3)	TEQ_{05} Profile‡ (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	TEQ_{05} Level (fg/m^3)	TEQ_{05} Profile (percent)	Mean TEQ_{05} Level (fg/m^3)	Mean TEQ_{05} Profile (percent)
1,2,3,6,7,8-HxCDF	0.5220	3.96	0.3220	5.24	0.2420	4.53	2.7520	11.91	0.5730	3.68	1.3700	4.69	0.9635	6.25
2,3,4,6,7,8-HxCDF	0.7280	5.53	0.3760	6.12	0.7870	14.73	3.1340	13.57	0.7460	4.79	1.6060	5.49	1.2295	7.97
1,2,3,4,7,8-HxCDD	0.5860	4.45	0.2120	3.45	0.1060	1.98	0.3990	1.73	0.7230	4.64	1.5830	5.42	0.6015	3.90
1,2,3,6,7,8-HxCDD	1.1800	8.96	0.4230	6.89	0.2050	3.84	0.8290	3.59	1.6790	10.78	3.1660	10.83	1.2470	8.08
1,2,3,7,8,9-HxCDD	1.0900	8.27	0.4590	7.47	0.6540	12.24	0.5510	2.39	1.5010	9.64	3.1810	10.88	1.2393	8.03
1,2,3,7,8,9-HxCDF	0.0870	0.66	0.0540	0.88	0.0000	0.00	0.2140	0.93	0.0310	0.20	0.1090	0.37	0.0825	0.53
1,2,3,4,6,7,8-HpCDF	0.3830	2.91	0.2001	3.26	0.1112	2.08	3.2469	14.06	0.3984	2.56	0.7582	2.59	0.8496	5.51
1,2,3,4,6,7,8-HpCDD	1.9000	14.42	0.7711	12.56	0.2831	5.30	1.2477	5.40	2.8620	18.38	5.9126	20.23	2.1628	14.02
1,2,3,4,7,8,9-HpCDF	0.0526	0.40	0.0258	0.42	0.0136	0.25	0.4160	1.80	0.0407	0.26	0.1190	0.41	0.1113	0.72
OCDD	0.2070	1.57	0.0976	1.59	0.0298	0.56	0.1524	0.66	0.2549	1.64	0.6454	2.21	0.2312	1.50
OCDF	0.0167	0.13	0.0076	0.12	0.0030	0.06	0.1481	0.64	0.0169	0.11	0.0229	0.08	0.0358	0.23
Totals for PCDDs/PCDFs	***13.1742***	***100***	***6.1407***	***100***	***5.3446***	***100***	***23.0977***	***100***	***15.5701***	***100***	***29.2323***	***100***	***15.4266***	***100***
Totals for Dioxin-like Compounds§	***14.0346***	***NA***	***7.0434***	***NA***	***6.2923***	***NA***	***25.0408***	***NA***	***16.7035***	***NA***	***30.3035***	***NA***	***16.5696***	***NA***

Table 12. 2001 Toxicity Equivalents (TEQ_{05}) Levels for Westlake, Calcasieu Parish, Louisiana (page 3 of 3)

*	Mean Sampling Result = (sum of the values for each sampling period) / number of sampling periods
†	TEQ_{05} Level = congener concentration (from Table 7, Appendix B) x congener TEF_{05} (from Table 1, Appendix B)
‡	TEQ_{05} Profile = (TEQ_{05} level / sum of TEQ_{05} levels) x 100
§	Dioxin-like compounds refer to coplanar PCBs and PCDDs/PCDFs

fg/m^3	femtograms per cubic meter
NA	not applicable
NR	no value reported
TEF_{05}	toxicity equivalence factors published by the World Health Organization in 2005
TEQ_{05}	toxicity equivalents calculated from toxicity equivalence factors published by the World Health Organization in 2005

Congener Nomenclature Key:

HpCDD	heptachlorodibenzo-*p*-dioxin	PCDD	polychlorinated dibenzo-*p*-dioxin
HpCDF	heptachlorodibenzofuran	PCDF	polychlorinated dibenzofuran
HxCDD	hexachlorodibenzo-*p*-dioxin	PeCDD	pentachlorodibenzo-*p*-dioxin
HxCDF	hexachlorodibenzofuran	PeCDF	pentachlorodibenzofuran
OCDD	octachlorodibenzo-*p*-dioxin	TCDD	tetrachlorodibenzo-*p*-dioxin
OCDF	octachlorodibenzofuran	TCDF	tetrachlorodibenzofuran
PCB	polychlorinated biphenyl		

Table 13. Summary of 2001 Mean Toxicity Equivalents (TEQ) Levels for Calcasieu Parish, Louisiana, Monitoring Locations

Monitoring Location	Mean TEQ_{98} Levels*			Mean TEQ_{05} Levels*		
	Coplanar PCB (fg/m^3 TEQ_{98})	PCDD/PCDF (fg/m^3 TEQ_{98})	Dioxin-like Compounds‡ (fg/m^3 TEQ_{98})	Coplanar PCB (fg/m^3 TEQ_{05})	PCDD/PCDF (fg/m^3 TEQ_{05})	Dioxin-like Compounds (fg/m^3 TEQ_{05})
Bayou D'Inde	1.6352	12.7017	14.3369	1.4233	12.2194	13.6427
Lighthouse Lane	1.7478	9.5269	11.2747	1.5136	8.8121	10.3257
Mossville	2.0138	28.0089	30.0227	1.7868	25.6606	27.4473
Westlake	1.3163	16.4066	17.7229	1.1430	15.4266	16.5696
Overall Mean for the Industrial Corridor†	*1.6783*	*16.6610*	*18.3393*	*1.4667*	*15.5298*	*16.9965*
Vinton (reference location)	0.7433	7.4226	8.1659	0.6535	7.0266	7.6801

* Mean TEQ Level = (sum of the TEQ values for each sampling period) / number of sampling periods
† Overall mean for Calcasieu Parish includes monitoring locations potentially impacted by the industrial corridor (i.e., Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake).
‡ Dioxin-like compounds refer to coplanar PCBs and PCDDs/PCDFs

fg/m^3 femtograms per cubic meter
PCB polychlorinated biphenyl
PCDD polychlorinated dibenzo-*p*-dioxin
PCDF polychlorinated dibenzofuran
TEQ_{98} toxicity equivalents calculated from toxicity equivalence factors published by the World Health Organization in 1998
TEQ_{05} toxicity equivalents calculated from toxicity equivalence factors published by the World Health Organization in 2005

Table 14. 2001 Toxics Release Inventory (TRI) Reported Dioxin Emission Releases for Facilities in Calcasieu Parish, Louisiana (page 1 of 2)

Facility Name	Fugitive Dioxin Air Emissions* (grams/year)	Stack Dioxin Air Emissions[†] (grams/year)	Total Dioxin Air Emissions (grams/year)	Percent of Total Dioxin Air Emissions in Calcasieu Parish	Rank in the US for Total Dioxin Air Emissions (out of 1,254 facilities)
Citgo Petroleum Corp.	0	0.7914	0.7914	23.66	435
Conocophillips Lake Charles Refinery	0	0.0867	0.0867	2.59	1127
Entergy Services Roy S. Nelson Plant	0	0.4	0.4	11.96	664
Georgia Gulf Lake Charles L.L.C.	0.39	0.09	0.48	14.35	613
Lake Charles Carbon Co.	0	0.095874	0.095874	2.87	1119
Louisiana Pigment Co. L.P.	0	0.145806	0.145806	4.36	985
Lyondell Chemical Co.	0	0.0046	0.0046	0.14	1216
PPG Industries Inc.	0	1.33	1.33	39.77	279
Sasol N.A. Inc. Lake Charles Chemical Complex	0.01	0	0.01	0.3	1204
Total Emissions	***0.4***	***2.94438***	***3.34438***	***100.00***	***NA***

Table 14. 2001 Toxics Release Inventory (TRI) Reported Dioxin Emission Releases for Facilities in Calcasieu Parish, Louisiana (page 2 of 2)

Sources: (1) US Environmental Protection Agency. 2011b. Toxics Release Inventory (TRI) Explorer. Releases: facility report: on-site fugitive air, on-site stack air, and total on-site air emissions (in grams), for facilities in all industries, dioxin and dioxin-like compounds, Calcasieu Parish, Louisiana, 2001. Data Source: 2009 Data Update as of February 2010. Data downloaded from www.epa.gov/tri on May 24, 2011.
(2) US Environmental Protection Agency. 2011c. Toxics Release Inventory (TRI) Explorer. Releases: facility report: on-site fugitive air, on-site stack air, and total on-site air emissions (in grams), for facilities in all industries (1,254), dioxin and dioxin-like compounds, U.S., 2001. Data Source: 2009 Data Update as of February 2010. Data downloaded from www.epa.gov/tri on May 27, 2011.

* Fugitive air emissions are all releases to air that are not released through a confined air stream. Fugitive emissions include equipment leaks, evaporative losses from surface impoundments and spills, and releases from building ventilation systems.

† Point source air emissions occur through confined air streams such as stacks, vents, ducts, or pipes.

NA not applicable

Table 15. Toxics Release Inventory (TRI) Reported Total Onsite Dioxin Air Emission Releases for Calcasieu Parish, the State of Louisiana, and the U.S.

Year	Total Onsite Dioxin Air Emissions* (grams)		
	Calcasieu Parish	Louisiana	U.S.
2000	3.601851	101.4005017	3751.166684
2001	3.34438	88.9561136	2861.729173
2002	3.489435	106.2225823	2756.073661
2003	3.831478	95.6167857	2119.052249
2004	3.848021	49.7159287	1100.143379
2005	3.628015	54.0558964	1222.586811
2006	3.645207	65.0366962	1489.137009
2007	3.129673	44.9403243	1500.054472
2008	2.753158	49.3787844	1472.084772
2009	3.4559821	49.3422429	1124.126016

Sources: (1) US Environmental Protection Agency. 2011e. Toxics Release Inventory (TRI) Explorer. TRI on-site and off-site reported disposed of or otherwise released (in grams), trend report for facilities in all industries, dioxin and dioxin-like compounds, Calcasieu Parish, Louisiana, 2000-2009. Data Source: 2009 Data Update as of February 2010. Data downloaded from www.epa.gov/tri on July 26, 2011.
(2) US Environmental Protection Agency. 2011f. Toxics Release Inventory (TRI) Explorer. TRI on-site and off-site reported disposed of or otherwise released (in grams), trend report for facilities in all industries, dioxin and dioxin-like compounds, US, 2000-2009. Data Source: 2009 Data Update as of February 2010. Data downloaded from www.epa.gov/tri on July 26, 2011.
(3) US Environmental Protection Agency. 2011g. Toxics Release Inventory (TRI) Explorer. TRI on-site and off-site reported disposed of or otherwise released (in grams), trend report for facilities in all industries, dioxin and dioxin-like compounds, Louisiana, 2000-2009. Data Source: 2009 Data Update as of February 2010. Data downloaded from www.epa.gov/tri on July 26, 2011.

* Total on-site air emissions includes both fugitive air emissions and point source air emissions. Fugitive air emissions are all releases to air that are not released through a confined air stream. Fugitive emissions include equipment leaks, evaporative losses from surface impoundments and spills, and releases from building ventilation systems. Point source air emissions occur through confined air streams such as stacks, vents, ducts, or pipes.

Appendix C: Public Health Evaluations

Public Health Evaluations

In 1997, the U.S. Environmental Protection Agency (EPA) Region VI and a community group from Calcasieu Parish, Louisiana, requested that the Agency for Toxic Substances and Disease Registry (ATSDR) evaluate dioxin levels reported in 11 human blood samples. Dioxin results from area sediment samples and a composite clam sample were also provided. ATSDR issued a health consultation concluding that blood serum dioxin levels were elevated in many of the blood samples and recommended identification of the dioxin exposure source(s) [ATSDR 1998b].

In response to this recommendation, ATSDR conducted an exposure investigation (EI) in the Mossville, LA, community in December 1998. The purpose of this EI was to determine if there was evidence for increased exposure to dioxins in residents of Mossville [ATSDR 1999]. Sampling conducted in this investigation consisted of blood samples from 28 residents, surface soil samples from three residences, and eggs from chickens raised at the home of one of the participants. All samples were analyzed for dioxin. Most participants had blood serum dioxin levels above the comparison population. The soil and egg samples did not contain dioxin at levels of health concern. Two recommendations documented in the 1998 EI were to (1) evaluate potential pathways for human exposure to dioxin from environmental and dietary sources, and (2) evaluate strategies to assess past exposures to dioxin [ATSDR 1999].

Following the completion of the EI, community members expressed concern that the source(s) of their dioxin exposures had not yet been identified. In 2001, ATSDR reviewed information from the previous investigations along with environmental sampling data generated by EPA. Using this review, ATSDR developed a follow-up EI to (1) conduct more comprehensive environmental sampling at participants' residences to better determine if sources of dioxin are present in their current home environments, and (2) re-sample participants' blood to evaluate how their dioxin levels are changing over time. Potential exposure to environmental dioxin sources was evaluated using limited sampling of soil in participants' yards, indoor house dust, private well water, homegrown fruits and vegetables, and locally caught fish. Some of ATSDR's findings were that [ATSDR 2006]

- Blood dioxin concentrations were elevated in many of the 2001 follow-up exposure investigation participants.
- Blood dioxin concentrations decreased in most participants between their initial and follow-up samplings.
- Blood dioxin concentrations were primarily elevated in older participants.
- The elevated blood dioxin levels in older participants were likely attributable to historical dioxin exposures.
- Dioxin concentrations in some fish were at levels of concern.
- Dioxin concentrations in surface soil, indoor dust, well water, and homegrown fruit, vegetables, and nuts were not at levels of concern.

Based on these conclusions, ATSDR's recommendations included encouraging residents to follow fish advisories currently in effect in their areas and continuing to investigate potential sources of historic and current dioxin exposure.

In 1999, the EPA Region VI began a remedial investigation (RI) of the Calcasieu Estuary in Calcasieu Parish, Louisiana. The RI examined the potential human health and environmental effects resulting from uncontrolled releases of chemical contaminants into the estuary. Sediment and water samples were analyzed for metals, polycyclic aromatic hydrocarbons (PAHs), herbicides, pesticides and polychlorinated biphenyls (PCBs), semivolatile organic compounds (SVOCs), and volatile organic compounds (VOCs). Sediment samples were also analyzed for dioxins. The Louisiana Department of Health and Hospitals/Office of Public Health (LDHH/OPH) performed an assessment of these data through a cooperative agreement with the ATSDR. LDHH/OPH findings indicated sediment and surface water contaminants were not at level of health concern [ATSDR 2005b, ATSDR 2005c].

In 2000, LDHH/OPH conducted the Mossville Residential Needs Assessment. The key findings were that Mossville has a stable population, that many residents lack health insurance coverage, that residents live in close proximity to industry, and that residents consume locally caught fish and wildlife.

Additionally, LDHH/OPH examined cancer incidence data for Calcasieu Parish from 1988- 2004. This review included 17 years of cancer incidence data and concluded that there is no clear pattern indicating that Calcasieu Parish has any consistently higher than expected rates for most cancers. The exceptions are melanoma of the skin which was consistently elevated in whites and cancer of the lung which was consistently elevated in women [ATSDR 2007].

In 2002, ATSDR conducted a population based exposure study of dioxin, PCB, and VOC levels comparing Calcasieu and Lafayette Parish residents. The preliminary results of the dioxin exposure study were shared with the community in 2004 and the final results were released to the community in 2006. The results of the PCB and VOC exposure studies were released to the community in July 2013. Overall, the findings were that [ATSDR 2005d, ATSDR 2013a, ATSDR 2013b]

- ATSDR’s Dioxin Exposure Study concluded that people living in Calcasieu Parish had mean blood dioxin levels similar to people living in Lafayette Parish and the general population in the Unites States and the mean blood dioxin levels found in Calcasieu Parish would not cause major health concerns.
- ATSDR’s PCB Exposure Study concluded that people living in Calcasieu Parish did not have blood levels of PCBs that would cause health concerns.
- ATSDR’s VOC Exposure Study concluded that people living in Calcasieu Parish did not have blood levels of VOCs that would cause health concerns.

In 2010, EPA sampled water, sediment, soil, and soil gas from the Mossville community. Municipal water supply, sediment and soil samples were analyzed for dioxins and furans, PCBs, SVOCs, pesticides, VOCs, and metals. Residential well water samples were analyzed for all of these compounds except dioxins. Soil gas samples were analyzed for VOCs only. Through its cooperative agreement with ATSDR, LDHH/OPH reviewed these data to determine whether concentrations of contaminants could pose harm to public health. LDHH/OPH released a public health assessment summarizing its findings in July 2013. Some of LDHH/OPH’s findings were that

- Current exposures to the chemicals found in municipal water samples from the Mossville Area of Interest (AOI) are not expected to harm people's health.
- Chemical concentrations reported in surface water and sediment from the three manmade ponds sampled in the Mossville AOI pose no harm to public health.
- Childhood exposures to lead should be kept as low as possible to prevent lead poisoning.
- A number of analytes (including dioxins, VOCs, PCBs, PAHs, trihalomethanes and metals) reported as non-detects in the various media were analyzed using method detection limits that were higher than the comparison values used as screening tools for health impact [ATSDR 2013c].

Sources:

[ATSDR] Agency for Toxic Substances and Disease Registry. 1998b. Calcasieu Estuary (Calcasieu Parish) Health Consultation. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 1999. Exposure Investigation Calcasieu Estuary Health Consultation. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2005b. Calcasieu Estuary Sediment Sample Evaluation Health Consultation. Prepared by the Louisiana Department of Health and Hospitals under Cooperative Agreement with ATSDR. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2005c. Calcasieu Estuary Water Sample Evaluation Health Consultation. Prepared by the Louisiana Department of Health and Hospitals under Cooperative Agreement with ATSDR. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2005d. Final Report: Serum Dioxin Levels in Residents of Calcasieu Parish, Louisiana. U.S. Department of Health and Human Services, Public Health Services, Atlanta, GA.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2006. Follow-up Exposure Investigation Calcasieu Estuary Health Consultation. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2007. Assessment of Cancer Incidence from the Louisiana Tumor Registry from 1988 – 2004 Health Consultation. Prepared by the Louisiana Department of Health and Hospitals under Cooperative Agreement with ATSDR. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2013a. Community Report: Comparison of Exposures to Polychlorinated Biphenyls among Louisiana Residents. US Department of Health and Human Services, Atlanta, GA.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2013b. Community Report: Comparison of Exposures to Volatile Organic Compounds among Louisiana Residents. US Department of Health and Human Services, Atlanta, GA.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2013c. Review of Data from the 2010 EPA Mossville Site Investigation Public Health Assessment (initial/public comment release). Prepared by the Louisiana Department of Health and Hospitals under Cooperative Agreement with ATSDR. Atlanta: US Department of Health and Human Services.

Appendix D: Public Comments

Public Comments

From July 9, 2013, through September 9, 2013, the Agency for Toxic Substances and Disease Registry (ATSDR) released this health consultation for public review and comment. Each written comment received was logged and became part of the administrative record. This appendix contains both the written comments received during the public comment period and ATSDR's response to those comments. Of note, ATSDR received comments on other issues and documents not related to this health consultation. Those comments and the agency's responses are presented following the health consultation-specific comments (see Comments and Responses 37–42.)

Comment 1: This report is dated July 2013. The report addresses the results of data collected in 2001. The data is more than 11 years old. The data collection was performed in response to a request made in 1997, more than 15 years ago.

> ***Response 1***: In Section 2.0, ATSDR explains that in addition to this health consultation, there are three additional reports being released at the same time for this site. Community leaders had expressed a desire to receive agency reports together, and ATSDR agreed to this request if there were no public health issues and concerns identified during the data evaluation process. ATSDR delayed the release of its analysis of the 2001 polychlorinated biphenyl (PCB) and dioxin air data so that all reports could be released in Calcasieu Parish at one time.

Comment 2: The ATSDR announced a public comment period, beginning July 9, 2013 and ending September 9, 2013, regarding its PCBs & Dioxins Ambient Air Evaluation. However, the ATSDR's report pertains to ambient air monitoring conducted 12 years ago in 2001 (PCBs & Dioxins Ambient Air Evaluation, p. 8). ATSDR provides no explanation for delaying the report of its findings for more than a decade. We recommend that ATSDR revise the *PCBs & Dioxins Ambient Air Evaluation* to include an explanation for the delay of 12 years between monitoring and reporting.

> ***Response 2***: ATSDR did provide an explanation for delaying the report in the last paragraph of Section 2.0 (Statement of Issues.)

Comment 3: There are significant ethical concerns pertaining to ATSDR's failure to produce timely reports of its findings. The ATSDR's delays are entirely out of keeping with the Environmental Protection Agency's ("EPA") *Scientific Integrity Policy*. The purpose of this policy is to ensure, among other things, that "scientific findings are generated and disseminated in a **timely** and transparent manner." EPA, *Scientific Integrity Policy*, 2012 (emphasis added.)

> ***Response 3***: Typically, ATSDR does not delay the report of agency findings. As stated previously, for Calcasieu Parish activities, community leaders had expressed a desire to receive agency reports together, and ATSDR agreed to this request if there were no public health issues and concerns identified during the data evaluation process (see Response 1.)

Comment 4: I hope that you consider what I say to be an attempt to get you to do some of the things that are described in the introductory "Note of Explanation" that you have right at the beginning of the document. That note describes things that ATSDR could recommend (beyond what you do recommend so far.) You could yet recommend such things as intensifying environmental sampling, removing contaminated material, conducting health surveillance activities, conducting biological indicators of exposure investigations, and providing education for health care providers in the area. I believe that all those things should be done but the way your report comes across seems to slam the door on any of them. That is most unfortunate.

> ***Response 4***: The recommendation in this health consultation is focused on the air exposure pathway. Specifically, ATSDR recommends to protect resident's health in Calcasieu Parish, facilities should reduce or stop releasing PCBs and dioxins into the air as a public health-protective action.
>
> Of note, many of the activities suggested by this commenter have already occurred. Appendix C provides information on public health evaluations that have occurred, including sampling a variety of environmental media, biological exposure investigations, a cancer incidence data review, and population-based exposure studies. In addition to the public health evaluations, in 1999, ATSDR worked with EPA, the Louisiana Department of Health and Hospitals (LDHH), and the community to present a symposium on environmental health for more than 360 doctors and nurses in the parish. In March and April 2010, ATSDR offered a series of free health classes to community members in order to share information about environmental health as well as other public health issues. ATSDR will continue to involve residents of Calcasieu Parish/Mossville in the agency's ongoing public health and health education activities and will provide technical assistance, as needed.

Comment 5: We submit these comments out of concern for fundamental human rights that are interdependent on a healthy environment. ATSDR bears responsibility for protecting these rights as the lead agency on assessing human health effects of exposures to toxic chemicals that include dioxins and PCBs. Dioxins cause cancer, impair the reproductive system, and disrupt the human hormone system, creating long-term health problems that can begin in the womb and last for a lifetime. PCBs also have a wide range of damaging effects on human health that include stomach, liver, and neurological disorders. ATSDR's environmental health assessment of dioxins and PCBs lacks scientific credibility and raises serious human rights issues.

> ***Response 5***: The agency practices the best science to meet the needs of site communities. This document follows ATSDR public health assessment procedures as outlined in the agency's guidance manual [ATSDR 2005a]. This health consultation document received internal review and clearance for technical accuracy. Further information regarding the ATSDR guidelines and procedures can be found at: http://www.atsdr.cdc.gov/about/index.html.

Comment 6: The exposure in the Mossville community is not just coming from Dioxin-like compounds in the air. The exposure to Dioxin-like compounds in the Mossville community is also coming from consumption of Dioxin contaminated fish and seafood known to be contaminated over acceptable levels as well as contaminated fruits, vegetables, soil, and household dust. ATSDR should have considered all pathways of exposure as they evaluated the exposure of community members to Dioxin-like compounds. The long term exposure of Mossville community members to Dioxin-like compounds has resulted in individuals in the community having blood Dioxin levels three times the national average. It is time ATSDR focuses its attention on reducing the exposure of Mossville community members to Dioxin-like compounds.

Response 6: Although this health consultation focuses on the ambient air exposure pathway, throughout the years, ATSDR has focused its efforts on a variety of environmental exposure pathways as well as blood levels in residents. Some ATSDR findings include:

- Dioxin sampling conducted during a 1998 exposure investigation consisted of blood samples from 28 Mossville residents, surface soil samples from three residences, and eggs from chickens raised at the home of one of the participants. All samples were analyzed for dioxin. Most participants had blood serum dioxin levels above the comparison population. The soil and egg samples did not contain dioxin at levels of health concern [ATSDR 1999].
- Dioxin sampling was conducted in 2001 during a follow-up exposure investigation on a group of 22 Mossville residents who previously participated in blood dioxin sampling projects. ATSDR offered to resample their blood for dioxin to determine concentration changes since their initial testing. Blood dioxin concentrations decreased in most participants between their initial and follow-up samplings. In addition, ATSDR found elevated dioxin levels in participants ages 45 and older while participants younger than 45 had normal levels. This elevation in older participants is not expected to result in illness. The elevated blood dioxin levels in older participants are likely from past exposures [ATSDR 2006].
- As part of the 2001 follow-up exposure investigation, potential exposures to environmental dioxin sources were evaluated. Limited environmental sampling of some participants' well water, soil, indoor dust and locally raised fruits, vegetables and nuts did not reveal dioxin levels of health concern. Data indicated that there were no unusual exposures to dioxin. However, some fish caught locally did have dioxin concentrations at levels of concern. ATSDR recommends parish residents follow the state's fishing advisories [ATSDR 2006].
- Parish-wide exposure studies conducted in 2002 showed that people living in Calcasieu Parish had mean blood dioxin levels similar to people living in Lafayette Parish and the general population in the Unites States [ATSDR 2005b]. These parish-wide studies conducted in 2002 also showed that the levels of PCBs and volatile organic compounds (VOCs) in Calcasieu residents' blood are similar to levels in the blood of people in Lafayette Parish and across the United States [ATSDR 2013a, ATSDR 2013b].

Additional information on these and other public health evaluations are included in Appendix C. Overall, ATSDR has considered many potential pathways of exposure to dioxin but did not find dioxin levels in people's bodies or homes that would cause health concerns. ATSDR found dioxin in some local fish at levels of concern and recommends people follow the fish advisories for the area.

Comment 7: The ATSDR notes on page 6 of the *PCBs & Dioxins Ambient Air Evaluation* that "over the years, the Calcasieu community has expressed concerns about dioxin air releases from facilities in the area." The ATSDR fails to disclose that these concerns are based on the ATSDR's dioxin exposure health assessments, which find an average concentration of dioxins in the blood of Mossville residents that is elevated three times above the national comparison group.[5] Furthermore, the ATSDR fails to report that the unique composition of dioxins and dioxin-like compounds in the blood of Mossville residents led an ATSDR health consultant to conclude that "local sources are likely responsible for the dioxin exposures."[6] And, finally, the ATSDR fails to acknowledge its resistance to the repeated demands of Mossville and Calcasieu Parish residents for investigating the nearby industrial facilities to determine whether they are the sources of the elevated dioxin exposures.[7]

> ***Response 7***: In response to this comment, ATSDR added and modified the text in Section 4.1 (page 6) to indicate: "In 1997, ATSDR was asked to evaluate blood samples provided by residents; the agency found that blood serum dioxin levels were elevated [ATSDR 1998]. Since then, the Calcasieu community has continued to express concerns about dioxin air releases from facilities in the area."
>
> With regard to local sources being responsible for the dioxin exposure, one part of ATSDR's 2001 exposure investigation was to conduct more comprehensive environmental sampling at participants' residences to better determine if sources of dioxin are present in their current home environments. ATSDR found that dioxin concentrations in surface soil, indoor dust, well water, and homegrown fruit, vegetables, and nuts were not at levels of concern. Data indicated that there were no unusual exposures to dioxin [ATSDR 2006].
>
> With regard to investigating nearby facilities, that is outside the purview and mission of ATSDR. As a public health advisory agency, ATSDR is responsible for determining whether people have harmful health effects from their exposure to hazardous chemicals and recommending actions that need to be taken to safeguard people's health. ATSDR has no regulatory authority. Appendix C describes ATSDR's public health evaluations and the recommendations the agency made related to the Calcasieu Parish/Mossville site. Of note, state and federal environmental regulatory agencies are tasked with investigating emission sources at facilities (through permitting and other programs.)

Comment 8: In Figures 1 and 2, the location of the Louisiana Pigment facility is not accurate.

> ***Response 8***: Thank you for your comment. ATSDR has moved the facility to the correct location in Figures 1 and 2, Appendix A.

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[5] U.S. Agency for Toxic Substances and Disease Registry, *Health Consultation, Calcasieu Estuary (a/k/a Mossville), Mossville, Calcasieu Parish, Louisiana*, EPA Facility ID No. 0002368173, available at: http://www.atsdr.cdc.gov/NEWS/mosshc_032002.html.

[6] Peter Orris and Katherine Kirkland, Cook County Hospital, Division of Occupational and Environmental Medicine, Report on Consulting Activities Related to Mossville, LA, November 4, 1999.

[7] Mossville Environmental Action Now, *et al*, Industrial Sources of Dioxin Poisoning in Mossville, Louisiana: A Report Based on the Government's Own Data, July 2007, available at: http://www.ehumanrights.org/docs/REVISED%20MOSSVILLE%20REPORT%20%28WEB,%20FULL%29.pdf.

Comment 9: For whatever reasons a disconnect happened between the citizens of the Working Group and the professionals who were successors to the good scientists who began working with us, the consequences range from simple lack of confidence on our part, to mistakes that are in your report that could have been avoided had there been true ongoing communication. I do not know how many such mistakes there might be, but, as I pointed out in my 7/11/2013 comments, one that is easy to see, Figures 1 and 2, is the placement of the Toxics Release Inventory (TRI) sources, based upon its P.O. Box Zipcode. I suppose, Lyondell, well over into the city of Lake Charles, when the emitting facility is actually miles west of that location. I have no idea what that might have done to any of the calculations, but it does make we wonder what other things might be embedded in the report, things perhaps less obvious but maybe even more drastic. (The map in Figure 2 surely would give a distorted impression of coverage of the area to someone unfamiliar with reality.)

> ***Response 9***: Thank you for your comment. One of the primary purposes of the public comment version of ATSDR's documents is to allow for the correction of inaccurate information before the documents are released in their final form. ATSDR has moved the facility to the correct location in Figures 1 and 2, Appendix A. ATSDR notes that moving the facilities (both Louisiana Pigment and Lyondell) in the figures does not impact any calculations contained in this health consultation.

Comment 10: A fiasco developed in the overriding of our citizens' advisory committee's recommendations for air monitoring stations that truly ringed all the suspected dioxin emission sources – how the Batelle study shifted that focus to an alignment of stations that would cover only incoming emissions to Mossville – Now we see in your materials some of the distortions in data interpretation that have resulted from that aberrant application of the original logic.

> ***Response 10***: As stated in Section 5.2 (Air Monitoring Locations,) the Calcasieu Parish Air Monitoring Study (CPAMS) network was comprised of five monitoring locations in Calcasieu Parish. EPA Region 6 conducted air dispersion modeling to select four of these locations in the areas of greatest community impact from the surrounding industrial corridor. These four industrial corridor locations are Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake. These monitors did not only cover incoming emissions to Mossville but these other areas as well (see Figure 1, Appendix A.)

Comment 11: The Vinton station data in Figure 8 on page 38 clearly show much higher 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD spikes than the other stations. That should be taken as an evidence that the Vinton station was not a good choice for a "control" station because it is heavily-influenced by the prevailing wind from the Port Arthur industrial complex, only 30 miles away, or the paper mill north of Orange only about 10 miles away. A further thought to consider from that Vinton data is that the most substantial "fallout" from facilities may be at greater distances from the elevated stacks than would be detected by the ambient air monitoring stations within just a few miles. That possibility could be quite relevant to the meaningfulness of the "stadium" concept employed by the investigators, the interpretations of the data collected, and the conclusions rendered absent consideration of the fallout factor and the inappropriate placement of the "control" station.

Response 11: ATSDR does not consider Vinton to be a “control” station that is not impacted by dioxin in the air. Because of natural processes, there will always be dioxin in the environment [IWG 2010]. As stated in Section 5.2 (Air Monitoring Locations) and in Response 10, EPA Region 6 conducted air dispersion modeling to select four locations in the areas of greatest community impact from the surrounding Calcasieu Parish industrial corridor (Bayou D’Inde, Lighthouse Lane, Mossville, and Westlake.) EPA also established Vinton as a “reference” location. That is, based on the modeling, the Vinton location is not in an area of greatest community impact from the Calcasieu Parish industrial corridor. In this health consultation evaluation, ATSDR provides data specific to each of the five air monitoring locations because all five locations provide insight into parish-wide air emissions.

To address this comment, the final release of the health consultation clarifies that because the CPAMS network refers to the Vinton location as a “reference location,” ATSDR also refers to Vinton as a “reference location;” however, ATSDR notes that the Vinton location is impacted by regional dioxin air emissions (see Section 5.2.)

With regard to Figure 8, Appendix A, ATSDR agrees the Vinton toxicity equivalents (TEQ) profile shows higher 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD TEQs than the other stations. However, no dioxin congener TEQ at any location accounted for greater than 30% of the total dioxin TEQ. In addition, Figure 4, Appendix A, shows that Vinton has the lowest overall total PCB and dioxin TEQ when compared to the other four locations. Also of importance, Figure 6, Appendix A, shows the dioxin concentration profiles for the five locations, which are very similar and indicate OCDD is the predominant congener detected in air not 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD.

To address your comment, in the final release of this health consultation, ATSDR added text to Section 5.5 (page 10, 4^{th} bullet) that notes the 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD TEQs at the Vinton location were higher than the other four locations. Overall, based on a review of PCB and dioxin air monitoring data collected during the CPAMS from all five locations in Calcasieu Parish, breathing these levels is not expected to harm people’s health.

Comment 12: I realize that in my quick look I misinterpreted one of the figures. I said in the letter I sent to you: “The Vinton station data in Figure 8 on page 38 previously commented show much higher 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD spikes than the other stations.” Now I see that the bar graph was pointing out not changes across time but rather the weighting of toxicities according to congeners present. Regardless of my misinterpretation, what I was seeing then I still see, and that is the likelihood that the difference between the stations could be because of the influence of the Port Arthur air emissions. I looked at the data in Table 3 to see how the 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD values changed from one sampling period to another. By far, the highest readings were in the 05/16/01–06/12/01 period. Then I looked at the Wind Rose data. I could not find one specifically for the Vinton station for that limited sampling period but there was one for Mossville during that time. The Mossville Wind Rose for the 05/16/01–06/12/01 period shows the greatest Southwesterly wind influence of the year. That late spring/early summer time period is one with few passages of cold fronts, in fact, apparently none in 2001. That would mean the primary flow would be the usual incoming wind from the Gulf, around what is called the Bermuda High. Vinton, like Mossville, would be receiving that Southerly/Southwesterly flow. Therefore, I am convinced that the Vinton air monitoring data should be viewed as being something less than pristine controls.

> ***Response 12***: Thank you for providing your observations regarding the seasonal wind rose data, concentration data, and potential nearby sources. As stated in Response 11, ATSDR does not consider Vinton to be a "control" station. ATSDR clarifies in final release of this health consultation that Vinton is impacted by regional dioxin air emissions (see Section 5.2.)

Comment 13: Something else misleading that we could have corrected had we not been discarded was the placement and naming of an air station "Bayou d'Inde" when it was offset to the west of the main industrial sources, and, even though near the upper, uncontaminated headwaters of Bayou d'Inde, it was certainly not in the zone of the part of Bayou d'Inde that was the subject of the Superfund considerations and remedial actions that are still pending, the part of Bayou d'Inde that is synonymous with problems. To have a station offset from that region but bearing its label is misleading.

> ***Response 13***: The CPAMS was a voluntary cooperative effort among the EPA, Lake Area Industry Alliance, and the Louisiana Department of Environmental Quality (LDEQ.) ATSDR was not a part of this cooperative effort and therefore, was not a part of the decision process regarding the placement and naming of the air monitoring stations in the CAPMS network. Based on the CPAMS report, the four industrial corridor locations were picked based on EPA Region 6 air dispersion modeling to locate the areas of greatest community impact from the surrounding industrial corridor.
>
> As stated in Section 6.3.3 (4th paragraph), ATSDR notes the available Calcasieu Parish PCB and dioxin air data used in this health consultation evaluation were limited in scope. Specifically, the CPAMS was conducted over the course of only one year. In addition, the CPAMS was conducted at only five locations in the parish, yet the parish encompasses over 1,000 square miles. Because these CPAMS data were the only PCB and dioxin air data available to the agency, for the purpose of this health consultation, ATSDR assumed that the air collected from these five locations were representative of PCB and dioxin air levels throughout the entire parish.

Comment 14: Section 5.4 on page 8 of the PCB/Dioxin Report seems to imply that the full study of data quality that was a task being performed by Dr. Danielle DeVoney has not been incorporated into this work. She was looking into the data sets that were being used in the deliberations, an important thing to do since citizens had pointed out various misgivings we had about the veracity of some of the information being supplied and/or collected. Did Dr. DeVoney ever finish at least a draft of that investigation?

> ***Response 14***: Dr. DeVoney no longer works for ATSDR. In 2006, another ATSDR environmental health scientist, Ms. Danielle Langmann, was asked to complete an evaluation of the 2001 PCB and dioxin air data. Part of this evaluation included reviewing data quality. As stated in Section 5.4, a review of the air data indicates most of the PCB and dioxin data are adequate for public health evaluation purposes. The

exceptions were noted, and those data were not included in this health consultation evaluation.

Comment 15: Why do the various publications ATSDR has put out in the technical literature, referring to the Calcasieu investigations, have different controls applied and different techniques applied for removal of outliers?

Response 15: For this PCB and dioxin air evaluation health consultation, the agency did not remove outliers from the evaluation. The exclusion of outliers in other ATSDR reports should have been clearly explained in each specific report.

Comment 16: The ATSDR did not engage the Calcasieu community in any aspect of the ambient air monitoring study. ATSDR's failure to engage residents of Mossville and Calcasieu Parish, who over the years have not only expressed concerns about dioxin air releases but also conducted their own air monitoring, undermines the agency's commitment to achieving environmental justice and diminishes the scientific integrity of the ambient air monitoring study.

Response 16: As stated in Response 13, the CPAMS was a voluntary cooperative effort among the EPA, Lake Area Industry Alliance, and LDEQ. ATSDR was not a part of this cooperative effort and therefore, was not a part of the decision process regarding how the Calcasieu community was engaged during the ambient air monitoring study.

With regard to ATSDR-specific activities for Calcasieu Parish, ATSDR has engaged the community in a variety of ways. For example, ATSDR met with community members from Calcasieu Parish on December 8, 2009, to explore methods of collaborating effectively. The meeting was designed so that ATSDR could gain insight from some parish residents on how best to engage the entire community in presenting results from chemical exposure studies that were being completed, and to develop an action plan for future activities to support improved health in the community. See also Response 4, which provides additional ATSDR activities to engage the community.

Comment 17: ATSDR's decision to conduct the ambient air monitoring study with the Lake Area Industry Alliance ("LAIA") and the Louisiana Department of Environmental Quality ("LDEQ") further diminishes the scientific integrity of the ambient air monitoring study. The members of the LAIA include industrial companies operating facilities in the Mossville area that release PCBs and dioxins into the environment. The LDEQ's mismanagement of its regulatory authority and environmental programs has been the subject of numerous audit reports prepared by the State of the Louisiana Legislative Auditor, which find the LDEQ to fail in protecting the environment and public health. The demonstrable biased interest of the LAIA and the poor performance of the LDEQ raise obvious concerns that the data collected in the ambient air monitoring study lack credibility.

Response 17: As stated in Responses 13 and 16, the CPAMS was a voluntary cooperative effort among the EPA, Lake Area Industry Alliance, and LDEQ. ATSDR was not a part of this cooperative effort.

With regard to data credibility, as stated in Response 14, part of the health consultation evaluation included reviewing data quality. As stated in Section 5.4, a review of the air data indicates most of the PCB and dioxin data are adequate for public health evaluation purposes. The exceptions were noted, and those data were not included in the health consultation evaluation.

Comment 18: We recommend that the ATSDR disclose in its response to comments and make available on its website all agreements between the ATSDR, the LAIA and/or the LDEQ regarding the ambient air monitoring study as well as all communications pertaining to the study.

Response 18: As stated in Responses 13, 16, and 17, the CPAMS was a voluntary cooperative effort among the EPA, Lake Area Industry Alliance, and LDEQ. ATSDR was not a part of this cooperative effort.

Comment 19 (a–d): Why do I consider the Public Comment Version unscientific? It relies upon air monitoring data that has not been vetted properly: CPAMS data that is more than just suspect, data that was not collected and analyzed in the way that our Working Group had designed originally to prevent the kind of flawed outcome we now see. I have previously sent, several times, to ATSDR, the facts that:

Comment 19a. The placement of the air monitoring stations was skewed away from a pattern that would give universal coverage, that is, full downwind monitoring of all the major known and suspected sources of the contaminants, full coverage of ALL the nearby population centers, not just Mossville.

Response 19a: As stated in Response 10, EPA Region 6 conducted air dispersion modeling to select four locations in the areas of greatest community impact from the surrounding industrial corridor. These four industrial corridor locations are Bayou D'Inde, Lighthouse Lane, Mossville, and Westlake. These monitors did not only cover incoming emissions to Mossville but these other areas as well (see Figure 1, Appendix A.) Also, as stated in Response 13, ATSDR has noted limitations of the CPAMS data in its health consultation (see Section 6.3.3), including that the CPAMS was conducted at only five locations in the parish, yet the parish encompasses over 1,000 square miles.

Comment 19b. The promised sampling and analyses would be immune to interference by the industrial sources, who actually managed to become the ones conducting the sampling/analysis, the ones who first saw the data and were given permission to discard anything they considered to be "outliers," and the ones who provided, after months, the data they finally approved, to government agencies instead of to the public directly in "real time, online." We did not get the data as promised, yet you rely upon it as if we did.

Response 19b: As stated in previous comments, ATSDR was not a part of the CPAMS cooperative effort and therefore, was not a part of the decision processes regarding sampling, analysis, and reporting of the data. ATSDR relied on the validated data from the CPAMS study because it was the only PCB and dioxin data available to the agency for the air exposure pathway.

Comment 19c. We know that the Lighthouse Lane station, the fact that the episodic monitor "kept going off" led to changing its trigger point upward since it had become considered a nuisance. That kind of attitude showed us how must trust we could place in the industrial entities' takeover of the project that we had agreed to support before we were betrayed.

Response 19c: The PCB and dioxin air sampling data evaluated in this health consultation did not rely on episodic monitors and a trigger point based on a particular threshold. For the CAPMS project, PCBs and dioxins were measured using EPA Method TO-9A, which uses a high volume air sampler equipped with a quartz-fiber filter and a polyurethane foam adsorbent [EPA 1999]. A sample was collected from each location over a set 30-day period every other month from January 2001 through December 2001. Sections 5.1 and 5.3 further describe the air monitoring methods and sampling schedule.

Comment 19d. Therefore, what became known as the Calcasieu Parish Air Monitoring Study (CPAMS), once it was taken away from those of us who had worked diligently for years to bring it about, became corrupt and counterproductive. (you are probably unaware of the facts, as are not being litigated under RICO statues, that around the time of the CPAMS takeover at least one of the Lake Area Industry Alliance TRI sources you include in your report had secretly hired people to spy upon and disrupt local neighborhood and environmental group efforts to advocate for transparency, protective and remedial actions. We did not know about that at the time even though we were puzzled at many odd things that were happening. Now that the truth is coming out there are those extra factors that go into our nostalgic yearning for the time before the "system" we were trying to work within actually became a systematic suppressive force. We were not the only ones targeted, I am convinced. It is really too bad that somebody was so afraid of the science that they would go crooked and aggressive.)

Response 19d: As stated in previous comments, ATSDR was not a part of the CPAMS cooperative effort.

Comment 20: The Public Comment Version frequently ignores data gaps and jumps to conclusions that are not supportable, even if we were to assume that the data that exists are not corrupt. Let me start, using Figure 13, the "2001 Seasonal Variations of Dioxin-like Concentrations for Calcasieu Parish, Louisiana." In 4 of the 6 sampling periods data from one of the locations was not available. Mossville is missing from the first period. Vinton is missing from the second period. Lighthouse Lane is missing from the third period. The fourth and fifth periods are the only ones with all locations included. The sixth period is again missing Vinton. There is obviously frailty of having 2/3 of the sets incomplete and still trying to regard the overall set as robust.

Response 20: For the year of monitoring, ATSDR considers the data set robust even though station data are missing during some periods. Although ATSDR acknowledges these missing data samples impact comparisons between station locations during particular sampling periods, the missing data does not impact the agency's public health evaluation. Of importance, each dioxin sample was collected over a 30-day period because of technical restrictions in measuring low PCB and dioxin levels in the air. For the station locations with 6 sampling periods, this is equivalent to 6 months (180 days) or about half of the year that PCB and dioxin data are being collected for analysis and public health evaluation. For locations with only 4 sampling periods, this is equivalent to 4 months (120 days) or about one-third of the year that PCB and dioxin data are being collected for analysis and public health evaluation. For comparison, ambient air samples for many chemicals are typically collected over a 24-hour period once every six days. This typical sampling routine equates to only about 60 days during the year when a sample is collected for analysis. Overall, even with the missing data for some station locations, ATSDR considers the data set to be robust in that it measured PCB and dioxin levels for one-third to half of the year.

Comment 21 (a–l): Regardless of the obviously frailty of having 2/3 of the sets incomplete and still trying to regard the overall set as robust, what do we see if we look at those specific gaps/periods more closely using Figure 13?

Comment 21a. Period 1, no Mossville, wintertime, wind mostly from the north yet highest concentrations of dioxin-like compounds in Westlake, upwind from urban as well as industrial area, downwind from forests. Was Mossville higher than Westlake as it seems to be during all other periods except Period 5, late summer? (Wind rose for Period 5 shows mostly northerly winds during that time although, from having grown up in Calcasieu Parish I would say that there would be a far more substantial southerly element to the winds during the months of September and October, certainly more than the less than 10% shown, so Period 5 must be considered likely anomalous, wind-wise.)

Response 21a: Thank you for providing your observations regarding the seasonal wind rose and concentration data. ATSDR evaluated available wind rose data to determine seasonal wind patterns throughout the parish. As stated in Section 6.1.2, these data suggest that seasonal variations are one of multiple factors influencing outdoor PCB and dioxin air levels in Calcasieu Parish. Seasonal variations alone cannot account for fluctuations in outdoor dioxin-like compound air concentrations.

Comment 21b. Something else to ponder from Period 1 is the relative deficit in dioxins at Lighthouse Lane compared with the stations receiving parallel winds: on its east side (Westlake) and west side (Bayou d'Inde.) Was that deficit because the trigger point had been resent to a higher threshold?

Response 21b: As stated in Response 19c, the PCB and dioxin sampling data evaluated in this health consultation does not rely on a trigger point related to a particular threshold. See Section 5.1 and 5.3 for a description of the air monitoring methods and sampling schedule.

Comment 21c. Period 2, no Vinton. (In my preliminary comments sent to you on 07/11/13 and 07/16/13 I gave my reasons for thinking that the Vinton station should not be considered a pristine "control" or reference location because it receives air from the Port Arthur industrial complex much of the year and from the paper mill nearby during another part of the year, i.e., dioxin sources are in both northerly and southerly directions. Besides that the Vinton station would be receiving at other times wind from the Calcasieu area to its east and the Beaumont/Houston area to its west.) In Period 2 the Lighthouse Lane station had the highest concentration of dioxin-like molecules. The wind rose shows a strong preponderance of wind from the southeast during that period. What is southeast of the Lighthouse Lane Station? One thing is the facility that sends black dust into the neighborhood, the petroleum coke bulk loading facility on the Calcasieu Ship Channel. (One of the original blood volunteers, the one with the second highest TEQs, lived in one of the Bayou d'Inde houses that had an ongoing struggle against coke dust. That facility, unfortunately, is not on your TRI list.) Again, closer cooperation with the citizens might have brought such "ground truths" into your investigations. (I do remember that in one of our very early Working Group meetings with ATSDR we did point out the blood volunteer's high readings and association with the coke dust. After the replacement of the original team, however, that kind of dialogue evaporated and apparently so did what we had all discussed previously.)

Response 21c: Thank you for providing your observations regarding the seasonal wind rose data, concentration data, and potential nearby sources. As stated in Response 21a, the data suggest that seasonal variations are one of multiple factors influencing outdoor PCB and dioxin air levels in Calcasieu Parish and seasonal variations alone cannot account for fluctuations in outdoor dioxin-like compound air concentrations.

With regard to the petroleum coke bulk loading facility on the Calcasieu Ship Channel, ATSDR did not include that facility in this health consultation because the facility was not listed in the TRI database as one of the regulated industries in Calcasieu Parish that released polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDDs/PCDFs) to the ambient air in 2001.

Please also note, with regard to ATSDR's parish-wide exposure studies, the transfer of the primary investigator lead to several personnel changes. However, ATSDR staff continued dialog with its work group regarding the parish-wide exposure studies. Also of note, there appears to be some confusion regarding the various "work groups" that have formed over the years related to the Calcasieu Parish/Mossville site. These groups formed for a variety of purposes and did not necessarily have the same members.

Comment 21d. Period 3, no Lighthouse Lane but still strong southerly component to the winds. Without Lighthouse Lane it is hard to follow up on the possibility of coke dust influence. Since the station to the west, Bayou d'Inde increased in dioxin-like concentrations as the wind became more directly from the Citgo/Westlake Group complex to its south, one could consider that complex to be the main contributor to the ambient air concentrations were it not for the similar increase in the Mossville reading. Meanwhile, Westlake remained unchanged from the previous period. What I am seeing in these data is an attempt by ATSDR to consolidate information into "periods" without taking into account discrete differences that existed intra-period. If I let myself assume that every data point was one which came from a proper sampling and correct analysis, than what I can see is that within any of the six periods, the wind was not likely to have been the same at each station during the samplings. If all monitors were running simultaneously, the only way these data could look the way they look is if the episodic data changed the pattern at each station during each period. Is that what happened?

Response 21d: The PCB and dioxin sampling data evaluated did not include episodic releases. For each sampling location, the monitors were running during the same 30-day period. In this health consultation, ATSDR only provides some general observations about seasonal variations and not definitive conclusions. As stated previously in Section 6.1.2 and in Responses 21a and 21c, these data suggest that seasonal variations are one of multiple factors influencing outdoor PCB and dioxin air levels in Calcasieu Parish. Seasonal variations alone cannot account for fluctuations in outdoor dioxin-like compound air concentrations.

Comment 21e. Whatever else may be confounded within the data, at least there is some coherence in sampling Period 3's data since it was the one in which the Vinton Station had (Figure 8) its highest TEQs from the 2,3,7,8-TCDD and 1,2,3,7,8-TCDD congeners and that is also when the wind rose data shows the most likely Port Arthur influence.

Response 21e: Thank you for your comment and observations regarding the seasonal wind rose data, concentration data, and potential nearby sources.

Comment 21f. Period 4, all stations present, summertime, not as many strong wind events other than in occasional thunderstorms, humidity usually greater, air usually more oppressive except after a thunderstorm, so Period 4 should have been something more representative of overall conditions zone-wide. Period 4 does seem to have all the stations except Vinton much more consistently-related in their dioxin-like concentrations. The quiet hours before dawn in the summertime allow radial flow from hazardous waste pits and other facilities. The heavy contaminants hug the ground and spread. Those things are well known to Calcasieu people who have lived around polluters.

Response 21f: Thank you for your comment and observations regarding the seasonal wind rose data, concentration data, and potential nearby sources.

Comment 21g. Period 5, again all stations present, later in the summer, and the anomalous wind rose notwithstanding, light winds, more radial dispersal from sources, and more homogeneity among stations, and if wind rose is correct, the period of least wind input from Port Arthur to Vinton seems to show up in the noticeable decline in the Vinton concentrations.

Response 21g: Thank you for your comment and observations regarding the seasonal wind rose data, concentration data, and potential nearby sources.

Comment 21h. Period 6, missing Vinton and showing a really noticeable elevation of concentrations in the Bayou d'Inde, Mossville, and Westlake stations but not Lighthouse Lane. Again, could the change in episodic monitor trigger set point at Lighthouse Lane have affected the graph? Trying to make sense of the relationships among the wind rose and the concentrations at each station in Period 6 is unrewarding, to understate things. A rare showing of east winds cannot be tied to the concentrations since Westlake would have shown as much elevation as Mossville, unless the SASOL/VISTA/Georgia Gulf complex could have accounted for the elevation in Mossville. The strong southeasterly components should have boosted Lighthouse Lane as much as Mossville/Bayou d'Inde. Also, missing the Vinton station missed an interesting annual ritual, the practice of Cameron Parish waterfowl hunters setting fire to the marshes to enable fresh green shoots to emerge so that migrating geese will choose those spots to alight. The strong southeasterly wind might have shoved up the concentrations of dioxins at Vinton but alas, no data. If it were marsh fires that boosted the three stations in the Calcasieu Industrial Corridor, why didn't they boost Lighthouse Lane?

Response 21h: Thank you for your comment and observations regarding the seasonal wind rose data, concentration data, and potential nearby sources. As stated previously in other responses, the PCB and dioxin sampling data evaluated in this health consultation did not rely on episodic monitors and trigger points.

Comment 21i. From my attempts to correlate Figure 13 with the available wind data, I conclude that no overall conclusions could have or should have been made whatsoever. I have to disagree with the assessment reported on Page 8 that the "sampling was proceeding very well: and that "most of the PCB and dioxin data" are "adequate for public health evaluation purposes…." The caveats that were expressed in that assessment surely did not at all portray the shortcoming of the data set. Had the true limitations been acknowledged nobody would have relied upon it for conclusions that could affect decisions yet to be made, decisions that involve the health of real people.

Response 21i: The laboratory followed quality assurance/quality control (QA/QC) and data reporting measures that ATSDR considers adequate for public health evaluation purposes. For further information, see Section 5.4. Also of note, ATSDR summarizes limitations of its public health evaluation in this health consultation (see Section 6.3.3.) Overall, there are recognized uncertainties in ATSDR's public health evaluation. However, providing a framework that puts site-specific exposures and the potential for harm into perspective is one of the primary goals of this health evaluation process [ATSDR 2005a].

Comment 21j. Section 6.4 of the report, a comparison of Calcasieu with the United States background air data relies entirely upon the CPAMS data. Therefore, for the reasons I have expressed above, it is hard for me to believe that the air near the TRI facilities had PCB and PCDD/PCDF congener concentration profiles so like the remote and rural locations chosen for comparison from places elsewhere in the United States. I suppose that, if we were to assume that all the data are absolutely correct, that the real conclusion would have to be that the Calcasieu industrial complex is having a widespread and profound effect upon the rest of the United States.

Response 21j: As stated previously, the CPAMS data were the only data available to ATSDR that provided PCB and dioxin levels in ambient air in Calcasieu Parish. ATSDR was not able to compare concentration profiles for the parish to suburban and urban concentration profiles for the U.S. because data were not available for suburban and urban levels for the year 2001. ATSDR was only able to compare PCB and PCDD/PCDF concentration profiles to determine similarities between Calcasieu Parish and U.S. rural and remote areas using available 2001 data. However, analysis of PCDDs/PCDFs by Cleverly et al. (2007) found that the congener distributional patterns of PCDDs/PCDFs in air were relatively constant at remote and rural locations, and match the profile of urban air. Overall, Cleverly et al. (2007) suggests that urban areas are regional sources of PCDDs/PCDFs and are affecting atmospheric levels in rural and remote areas of the United States.

As stated in Section 6.4, land use in the parish is a mixture of agricultural, residential, and industrial areas. As such, ATSDR is not surprised the congener concentration profiles for the parish are similar to the U.S remote and rural locations.

Comment 21k. Figure 8, PCDD/PCDF TEQs for Calcasieu: the most striking thing is what I have previously commented on, the dominance of Vinton for the two most dangerous congeners, 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD. Since Vinton was apparently chosen by EPA/ATSDR/Zarus-Lockheed/LAIA as the "reference" location, apparently meant to mimic the national remote/rural locations, it is useful to see bar graphs in Figure 21 of the congener profiles for TEQs at those locations, but the pattern from Vinton does not hold, another reason why the Vinton station cannot be considered a valid "reference."

Response 21k: As stated in Responses 13, 16, 17, and 18, the CPAMS was a voluntary cooperative effort among the EPA, Lake Area Industry Alliance, and LDEQ. ATSDR was not a part of this cooperative effort and therefore, was not a part of the decision process to choose Vinton as a reference location.

Comment 21l. Figures 14 and 16 show the annual dioxin emissions reported via TRI and the narrative in Section 6.2 attributes the substantial difference in the graphs between Calcasieu and Louisiana/rest of the U.S. to the fact that the Calcasieu sources are "not the types of facilities" located elsewhere and therefore did not decline as did the other sources undergoing mandated reductions. I realize that there is a difference between qualitative and quantitative factors, but if these particular graphs mean anything they mean that since the Calcasieu dioxin sources are not "municipal waste combustor, medical waste incinerators, and cement kilns burning hazardous wastes," then it would not be meaningful to compare the Calcasieu findings to the rest of Louisiana or the rest of the United States, as has been done in the report.

Response 21l: As stated in Section 6.2, ATSDR looked at the TRI data to provide general observations about reported PCDD/PCDF air emissions in the Calcasieu Parish area. In general, dioxin levels in the U.S. environment have been declining for the last 30 years due to reductions in man-made sources [IWG 2010]. Data for 2000–2009 for Calcasieu Parish, the state of Louisiana, and the U.S. were reviewed for any notable trends. ATSDR made observations that there were marked decreases in reported PCDD/PCDF air emissions from 2000 to 2009 for the state of Louisiana and the U.S., but TRI data for Calcasieu Parish indicated PCDD/PCDF air emissions in 2000 are similar to 2009. To explain this observation, ATSDR notes that the overall reduction in PCDD/PCDF releases for the state and U.S. is likely attributed to the control of air emissions of these compounds from municipal waste combustors, medical waste incinerators, and cement kilns burning hazardous waste. ATSDR considers this observation appropriate in this context.

Comment 22: Figures 1 and 2 – showing the location of the Entergy coal-fired electricity generating plant and the Toxic Release Inventory graph, Figure 14 on page 44: something does not fit with the information contained in a 10/17/2012 Public Notice about that Roy S. Nelson facility, a notice put out by the Louisiana Department of Environmental Quality, which shows over 227 pounds of chlorinated dibenzo-p-dioxins being emitted to the air each year. That is far, far more than your graph shows for all the industries, less than 4 grams per year, a many thousand-fold discrepancy.

Response 22: Figure 14 of the health consultation displays the EPA's TRI database total reported on-site dioxin air emissions in grams for facilities in Calcasieu Parish, Louisiana, for 2000–2009. These data are reported by industry to EPA and were downloaded by ATSDR staff directly from the TRI website. As such, ATSDR cannot change the data and graph. However, ATSDR agreed with the commenter that a page of the LDEQ Public Notice contains a table of estimated emissions that report dioxins emissions, both before and after 2010, for permitting that are well above the EPA TRI reported air emissions data. To address this concern, ATSDR contacted LDEQ. In response, ATSDR summarizes the information provided by LDEQ that provides further information regarding permitting [LDEQ 2013]:

The emission rates listed in the permit reflect the "potential to emit" of the facility. The federal regulations define "potential to emit" as: the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of fuel combusted, stored or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable.

The Roy S. Nelson's dioxin emissions are based on the "worst case" firing scenario for the plant for this pollutant; i.e., Unit 6 burning coal and all other units – at the same time – burning fuel oil. This scenario is unlikely to occur. As well, the calculations are based on emissions factors developed by the EPA for different operating facilities; i.e., the emission factor used is not specific to this facility but is a best estimate of emissions from similar type of operations.

The emission rates provided in permits are extremely conservative by design to account for an extreme operating scenario. It should also be noted that dispersion modeling indicates the concentrations of chlorinated dibenzo-p-dioxins are below its Louisiana Ambient Air Standards (AAS.)

Based on the information provided by LDEQ, ATSDR finds the discrepancy arises because the emissions numbers are reporting different information. TRI represents annual emissions estimates industry provides EPA regarding how much of each chemical was released to the environment during the past year. Permitting represents emission rates reflecting the potential to emit during a worst-case scenario.

Comment 23: Your report assumes that the Toxic Release Inventory Data supplied by industry to EPA is correct. It may not be correct. In my preliminary comments sent to you on 07/11/2013, I sent you a copy of a Public Notice put out 10/17/2012 by LDEQ about the chlorinated dibenzo-P-dioxin emissions from the Entergy Services Nelson Plant, one of the TRI sources shown in your Figure 1. The amount of dioxins emitted, according to that Public Notice was more than 227 pounds a year. You did respond to me saying you were going to check into that obvious discrepancy between TRI and Public Notice, say that maybe the units in the Public Notice were not really "tons." I have done some calculations and even if the number should have been listed as ounces the Entergy plant would have accounted for roughly all of the dioxin you assume to have been emitted during the 2001 ATSDR investigation. All the other potential TRI sources in Table 14 would have to be ignored together, even though Citgo was double the Entergy emissions, Georgia Gulf emitted as much or more than Entergy, and PPG's releases were more than three time Entergy's releases. If the LDEQ Public Notice were not in ounces but pounds or tons as it says, what else does that mean for any use of the Calcasieu TRI data in the Public Comment version?

Response 23: Please see Response 22, which discusses the discrepancy between TRI and the LDEQ permit notice. Also of note, Section 6.2.1 provides information regarding the limitations of the TRI data.

Comment 24: The ATSDR's recognition that the accuracy of toxic emission reports prepared by regulated industries cannot be verified (*PCBs & Dioxins Ambient Air Evaluation* page 6) should have alerted the agency to the potential for industrial facilities, represented by the LAIA, to lower emissions during ambient air monitoring periods.

Response 24: Thank you for sharing your concern; however, ATSDR considers it unlikely that facilities in Calcasieu Parish in some way operated differently to reduce their emissions during the six sampling periods, which is half the year.

Comment 25: On pages 11 and 17 of the *PCBs & Dioxins Ambient Air Evaluation*, ATSDR presents data from the ambient air monitoring study in which the air monitor in Mossville detected a concentration of dioxins that is 35.2% higher than the EPA's carcinogenic target risk for inhalation of dioxins and dioxin-like compounds. ATSDR entirely disregards the maximum level of dioxins and dioxin-like compounds detected by the Mossville air monitor, which is also higher than all other dioxin levels detected by other air monitors in the surrounding area. Instead, ATSDR reviewed only the mean levels of dioxins and dioxin-like compounds detected by air monitors in Mossville and the surrounding area, which are lower than the EPA's target risk for cancer.

> ***Response 25***: When evaluating cancer risk, ATSDR assumes that exposure is continuous over the long term—that is, chronic exposures occur 24 hours a day, 365 days a year, for many years. As such, maximum levels during a 30-day sampling period represent an intermediate exposure, not a chronic exposure. The total TEQ_{05} values for dioxin-like compounds at the Mossville station for the five 30-day sampling periods were 20.39 femtograms per cubic meter (fg/m^3), 7.56 fg/m^3, 8.94 fg/m^3, 14.09 fg/m^3 and 86.25 fg/m^3. Therefore, these data indicate residents are not being exposed 24 hours a day, 365 days a year, for life to levels over the 2,3,7,8-TCDD EPA carcinogenic target risk (TR) for inhalation of 64 fg/m^3. Only one of the five sampling periods exceeded the carcinogenic TR value, with the mean value (27.45 fg/m^3 TEQ_{05}) below the TR. ATSDR notes that although concentrations at or below a health-based guideline may reasonably be considered safe, concentrations above these guidelines will not necessarily be harmful. Although one maximum 30-day concentration exceeds this TR, residents are not exposed all year to this maximum level. The mean value provides a closer approximation to year-long, chronic exposure levels than the one 30-day maximum value.
>
> However, to address this commenter's concern, ATSDR calculated a cancer risk estimate using the California EPA (Cal/EPA) inhalation unit risk (IUR) of 38 $(\mu g/m^3)^{-1}$ and the highest 30-day concentration (86.25 fg/m^3 TEQ_{05}) detected at the Mossville location. The Mossville cancer risk estimate is 3×10^{-6} using this maximum 30-day concentration. The Mossville cancer risk estimate was 1×10^{-6} using the mean concentration at this location. Both cancer risk estimates suggest minimal risk for the Calcasieu Parish population because the cancer risk estimates were very low. Based on these data, ATSDR finds that PCB and dioxin air exposures are not likely to result in a cancerous adverse impact to human health.

Comment 26: Given the potential for industrial companies to lower emissions in order to avoid high detections, ATSDR should not rely exclusively on the mean levels to evaluate ambient air quality. By disregarding the maximum level of dioxins and dioxin-like compounds detected in Mossville, the ATSDR concludes that all levels of dioxins are not expected to be of health concern (page 17). However, this maximum level raises a health concern for elevated cancer risk that the ATSDR has no reason to ignore.

> ***Response 26***: Please see Response 25. Using both mean and maximum levels, ATSDR finds that PCB and dioxin air exposures are not likely to result in a cancerous adverse impact to human health.

Comment 27: Based on the monthly air sampling performed in 2001:

- The Mossville sampling locations contained the highest mean Dioxin TEQ level (27.45 fg/m^3) of all locations sampled.
- The Mossville sampling location also had the highest individual TEQ level of all locations sampled during Sampling Periods 2 (20.39 fg/m^3 – March-April 2001) and Sampling Period 6 (86.25 fg/m^3 – November 2001.)
- Sampling results were not available at the Mossville sampling location during Sampling Period 1 (January-February 2001.)
- The Mossville monthly air TEQ level for Sampling Period 6 in November 2001 (86.25 fg/m^3) exceeded the EPA Carcinogenic Target Risk Level for inhalation of 2,3,7,8-TCDD of 64 fg/m^3.
- The Mossville mean TEQ Level and monthly levels for all months sampled in 2001 exceeded the mean US Remote Level of 1.26 fg/m^3.
- The Mossville mean TEQ Level and monthly level for Sampling Periods 2 (March-April 2001), 5 (September-October 2001) and 6 (November-December 2001) exceeded the USA Rural Level of 11.32 fg/m^3.
- The Mossville mean TEQ level and monthly levels of Sampling Periods 2 (March-April 2001) and 6 (November-December 2001) exceeded the mean US Suburban Level of 17.5 fg/m^3.

Thus, the community of Mossville is being exposed to level of Dioxins in excess of EPA Carcinogenic Target Risk Levels as well as US Remote, Rural, and Suburban Levels. Based on the air sampling results the Mossville community is most at risk to exposure to Dioxin like compounds.

> ***Response 27***: Thank you for your comment and observations regarding the Mossville sampling data and U.S. background data levels. Figures 17, Appendix A, graphically displays the overall mean dioxin-like compound TEQ_{98} levels for Mossville and the other stations, as well as U.S. remote, rural, suburban, and urban locations.
>
> As stated previously in Responses 25 and 26, using both mean and maximum levels at the Mossville location, ATSDR finds that PCB and dioxin air exposures are not likely to result in a cancerous adverse impact to human health. In addition, these mean and maximum dioxin-like compound TEQ_{05} levels at the Mossville location are about three orders of magnitude below the non-cancer Cal/EPA chronic inhalation reference exposure level (REL) of 40,000 fg/m^3. Based on these mean and maximum levels at the Mossville location, PCB and dioxin air exposures are also unlikely to result in harmful non-cancer health effects in exposed residents.

Comment 28: ATSDR provides a flawed analysis of disproportionate exposures. Mossville and surrounding areas are rural and suburban communities. In the *PCBs & Dioxins Ambient Air Evaluation*, ATSDR presents the US background levels of dioxins and dioxin-like compounds in remote areas, rural areas, suburban areas, and urban areas. The US background levels for rural and suburban areas are significantly below the maximum and mean levels detected by air monitors in Mossville and surrounding areas (pages 19-20). However, the ATSDR unreasonably compares the air monitoring results in Mossville and the surrounding area to the significantly higher US background level for urban areas.

Response 28: As stated in Section 6.4, land use in the parish is a mixture of agricultural, residential, and industrial areas. Therefore, the agency provides observations regarding dioxin-like compound TEF_{98} levels at Calcasieu Parish air monitors compared to remote, rural, suburban, and urban PCB and dioxin air levels. ATSDR did not unreasonably compare the Mossville results to only urban areas. In Section 6.4.2, one of the agency's observations states:

- The mean level of 30.02 fg/m^3 TEQ_{98} at one Calcasieu Parish industrial location (Mossville) exceeded mean U.S. remote (1.26 fg/m^3 TEQ_{98}), rural (11.32 fg/m^3 TEQ_{98}), and suburban (17.5 fg/m^3 TEQ_{98}) levels, but was less than mean U.S. urban levels (120.9 fg/m^3 TEQ_{98}).

Comment 29: Most of the scientists I know have what laymen call "common sense." That is the ability to see things as they are. Some people do not see things clearly, in fact they are mentally blinded by irrelevant or erroneous factors to which they cannot assign proper weight. Such people see unreality. To me, the Public Comment Version demonstrates such blindness, a very telling lack of common sense, when it describes the Calcasieu industrial corridor, page 20, as having TEQs an order of magnitude lower than what would be expected for an urban area. For one thing, the industrial corridor is surrounded by "an urban area." What do you want us to believe, that the industrial corridor is somehow emitting vacuoles that entrap the urban dioxins at the fencelines of the industrial plants? Would you have us believe that the industrial area actually cleanses the ambient air? For the Calcasieu industrial area to be "ten time lower than" the TEQs seen in urban areas in other parts of the United States defies common sense and that makes the validity of the report impossible to accept even if the report might seem "politically correct." (The ONLY possible way that I can see for such a thing to be remotely possible would be if sampling events during the six air sampling periods were each scheduled to take place during and just after a scrubbing rainfall! Did that happen? If it did not happen that way then common sense must override your conclusions and require some kind of reexamination of the data you used so that people will know how the errors in conclusions developed.)

Response 29: The agency provides observations regarding dioxin-like compound TEF_{98} levels at Calcasieu Parish air monitors compared to remote, rural, suburban, and urban PCB and dioxin air levels. These observations help to determine whether the parish's PCB and dioxin air levels are elevated compared to national levels. As stated in Response 28 and in Section 6.4, land use in the parish is a mixture of agricultural, residential, and industrial areas. As stated in Response 21j, Cleverly et al. (2007) suggests that urban areas (i.e., cities) are regional sources of dioxin. As such, ATSDR is not surprised that the mean dioxin-like compound TEQ_{98} level for the Calcasieu Parish industrial corridor was similar to U.S. suburban levels and 10 times lower than those seen in other U.S. urban areas.

Comment 30: To uphold human rights that are interdependent on a healthy environment and to ensure scientific integrity, we recommend that the ATSDR revise the *PCBs & Dioxins Ambient Air Evaluation* to:
(1) assess the public health impact of the maximum dioxin and dioxin-like compounds detected in Mossville that is above the EPA cancer target risk for inhalation of dioxins; and

(2) evaluate the elevated levels of dioxins and dioxin-like compounds in Mossville and the surrounding area using the appropriate comparison to US background levels of dioxins and dioxin-like compounds in rural and suburban areas.

Response 30: As stated previously in Responses 25, 26 and 27, using both mean and maximum levels at the Mossville location, ATSDR finds that PCB and dioxin air exposures are not likely to result in a cancerous adverse impact to human health. ATSDR also stated previously that land use in the parish is a mixture of agricultural, residential, and industrial areas. Therefore, the agency finds it is appropriate to provide observations regarding dioxin-like compound levels at Calcasieu Parish air monitors compared to U.S. remote, rural, suburban, and urban air levels.

Comment 31: The report does not follow up on things that the data pointed toward. For example,

Comment 31a. Looking at Figure 6, PCDD/PCDF Concentration Profiles for Calcasieu Parish, Louisiana, there seem to be hints that a truly precise, comprehensive monitoring program could indeed separate and define the origins of particular congeners dominant at each station. That kind of outcome was one thing the Working Group had sought and that ATSDR and EPA had thought could come from the investigation. The LAIA takeover of the CPAMS effort scuttled that whole hope. Jerry Clifford of EPA and Dale Given of LDEQ should be held accountable for having let that takeover happen, supposedly to save the taxpayers' money. As we can see, what happened has turned out to be a much more expensive waste of the taxpayers' money through the attempts to generate reports that "reassure" the public and politicians that no amount of dioxin-like materials can be released at harmful levels in Calcasieu.

Response 31a: As stated in previous comments, ATSDR was not a part of the CPAMS cooperative effort and therefore, was not a part of the decision processes regarding the sampling design. ATSDR relied on the validated data from the CPAMS study because it was the only PCB and dioxin data available to the agency for evaluating the air exposure pathway. ATSDR reviewed the CPAMS data quality, and found that these data were suitable for public health evaluation purposes.

Comment 31b. Similarly, Figure 7 on PCBs seems to hint at the possibility of defining sources of different congeners, just as the study had been planned. For example, the Lighthouse Lane station, in four of the five discernible congener graphs, shows a greater TEQ than does Mossville. Had that data been trustworthy, it could have been very valuable when compared with the TEQs in the individual blood samples from people in the different neighborhoods in the parish. That was one of the citizens' goals discussed in the Working Group's early sessions and accepted by ATSDR. Again, since this is based on CPAMS data, however, it could be just meaningless.

Response 31b: As stated previously, ATSDR was not a part of the CPAMS cooperative effort and therefore, was not a part of the decision processes regarding the sampling design.

Comment 31c. Another value of the Lighthouse Lane information shown in Figures 7 and 8 and in the Tables 3–12, all of which taken together, could be to help identify whatever extractive mechanism is at work there, cleansing the Calcasieu ambient air. Since the Lighthouse Lane area is centrally-located in the "Industrial Corridor" and has the lowest PCDD/PCDF TEQs in that corridor, perhaps Lighthouse Lane is also the nearest air station to the dioxin scrubber that takes Calcasieu down to some of the cleanest air in America.

> ***Response 31c***: ATSDR stated in Section 7.0 (Conclusions), that the mean dioxin-like compound TEQ_{98} level for the Calcasieu Parish industrial corridor was similar to U.S. suburban levels.

Comment 32: I keep coming back to the conclusion you voice that, in effect, Calcasieu is less impacted by industrial air emissions than is the Lafayette area, or, even more incredibly, much less affected than is the United States as a whole. That is just defiant of common sense.

Response 32: In this health consultation, ATSDR did not compare Calcasieu Parish air levels to those of Lafayette Parish. ATSDR did not obtain or review air data for Lafayette Parish. This health consultation specifically reviewed 2001 air data on PCB and dioxin levels in Calcasieu Parish. In addition, the agency provides observations regarding dioxin-like compound levels at Calcasieu Parish air monitors compared to U.S. remote, rural, suburban, and urban PCB and dioxin air levels. The dioxin air data indicate that in 2001 the Calcasieu Parish industrial corridor was greater than U.S. remote and rural levels, similar to U.S. suburban levels, and 10 times lower than those seen in other U.S. urban areas.

Comment 33: Although you do make clear that the conclusions of the study are limited to one year, 2001, and that your work does not account for elevated dioxin levels in the blood of people sampled, inevitably people are going to try to extrapolate in all directions from the report. Some will say the one year tells the story for all years, that there were more than enough air monitoring locations and samples, that the data are coherent and logical, that Calcasieu can take a lot more emissions of Polychlorinated Anythings. Regardless of your flimsy recommendations that people follow the seafood advisories and that sources of contaminants make further efforts to diminish their emissions, the overall impact of the ATSDR's "Ambient Air Evaluation of Polychlorinated Biphenyls and Dioxins, Calcasieu Parish, Louisiana" will be adverse, the opposite of protective public health. Those of us in the original Working Group had all seen how local industrial powers had managed to co-opt earlier health study efforts. That is why we were so happy that a large, American government agency was coming to help do things correctly, scientifically, and immunized against politics.

Response 33: As a public health advisory agency, ATSDR is responsible for (1) determining whether people have harmful health effects from their exposure to hazardous chemicals and (2) recommending actions that need to be taken to safeguard people's health. In Section 7.0 (Conclusions), ATSDR clearly states it

> *cannot conclude whether breathing PCBs and dioxins in outdoor air during other timeframes could have harmed people's health. Because historical and current*

levels of PCBs and dioxins in Calcasieu Parish air are not available, the extent to which they may have varied from the 2001 data evaluated in this health consultation is unknown.

ATSDR cannot prevent people from coming to their own conclusions based on the available data. The agency can only provide its own scientific review and succinctly state its findings.

Comment 34: Although the industrial parrots like to accuse some citizens of believing in "junk science," we have never had to defend against that kind of criticism because we do our homework so that we can demand adherence, by ourselves and by others, to the highest scientific standards possible. This is another time that the industrial agents will not get a chance to say that we have been taken in by "junk science."

Response 34: ATSDR also adheres to the highest scientific standards. This document followed ATSDR public health assessment procedures as outlined in the agency's guidance manual [ATSDR 2005a]. This document received internal review and clearance for technical accuracy before being released to the public.

Comment 35: In the Next Steps (page 2) and Recommendations (page 22) sections, the ATSDR states that facilities that release Dioxins into Calcasieu Parish air should continue to reduce or eliminate these releases whenever possible as a public health-protective action. The phrase "continue to reduce or eliminate those releases" of Dioxins is contrary to the data ATSDR presented in the report in section 6.2. ATSDR evaluated the releases of Dioxins and Furans from Calcasieu Parish industrial facilities from 2000 (first year required to report Dioxins and Furans to EPA TRI) to 2009. The ATSDR overall assessment "indicated PCDD/PCDF air emissions (in Calcasieu Parish) in 2000 are similar to 2009." In addition, ATSDR stated Calcasieu Parish showed the sharpest rise in PCDD/PCDF air emissions in between 2008 and 2009. Based on this evaluation, Dioxin air emissions do not continue to be reduced. ATSDR must change this phrase in the Next Steps and Recommendations sections to remove the word continue.

Response 35: Thank you for your comment. ATSDR has made the recommended changes to those sections.

Comment 36: The recommendation by ATSDR to reduce or eliminate Dioxin and Furan releases by the industrial facilities in Calcasieu Parish is an appropriate recommendation. However, waiting more than a decade after the monitoring data was collected and indicated concentrations of Dioxins and Furans in the air in Calcasieu Parish in the area of the industrial facilities was elevated is inappropriate. Why has ATSDR waited so long to make the recommendation and what is ATSDR going to do to encourage EPA and LA DEQ to implement immediate steps to require the industrial facilities in Calcasieu Parish to reduce these emissions? ATSDR must immediately take steps to require actions by regulatory agencies and industrial facilities in Calcasieu Parish to implement measures to reduce Dioxin and Furan emissions in order to reduce the exposure being experienced by Calcasieu Parish individuals and communities.

Response 36: Typically, ATSDR does not delay the report of agency findings. As stated previously, for Calcasieu Parish activities, community leaders had expressed a desire to receive agency reports together, and ATSDR agreed to this request if there were no public health issues and concerns identified during the data evaluation process (see Response 1.) With regard to the agency's recommendation to reduce or eliminate dioxin air releases, as a public health advisory agency, ATSDR cannot require regulatory agencies and industrial facilities take action. The agency instead shares its recommendations with the appropriate regulatory agencies for follow-up.

Comment 37: I have read the health consultation report and have this to comment on. Ever since the accidental releases of Polycholorinated Biphenyls/Dioxins and other known toxins in Calcasieu Parish, there have been lies, deceit, and betrayal of all the true facts. This has to stop. Man cannot survive in such a cesspool and we refuse to agree with these false reports. I cannot believe our government agencies would stoop so low as to cover up every test result put before them about our air, water and land. The big question? Why wasn't protocol taken? Why didn't Industries contact the State DEQ like they were supposed to? Why didn't the State give Industries a time limit to comply for incidental releases? Instead it looks as though Industry was calling the shots. Why wasn't there an evacuation call for near-by communities? Why did it take so long to fix the problems? For the sake of those asking, I know what I am talking about. The start of this whole situation is in Mossville. There were offsite incidents that happened and no one is addressing them anymore. Before all the air/health/land/water monitoring done by the activists and others, Industries committed all these selfish acts and the State overlooked all of what happened. There were accidents, no evacuation, no mention of anything. Every Government Official knew what happened to cause all this. Mossville started out complaining about the E.D.C./CHROMIUM that spilled over into the community, under residents' homes. Public health has not taken president to this data which ATSDR/CDC knows is the problem as well as what we breathe over time, over 60 years, day in and day out, no peace. Not even from the noises we had to put up with on a daily basis, no one tested hearing or eye site. Yes we can discuss the health consultation, but why when all isn't truthful.

Comment 37 came with a letter attached, and the text is inserted here:

Over 60 years, we have brought forth the real issues of Mossville Louisiana. We would like to know why Mossville community was put on what was described as Baby Superfund, not properly accessed, properly Super Funded and put on the NPL and relocated. This should have been done a long time ago when the off site spill happened. This was a horrific spill. Instead LDEQ/ATSRD?CDC?EPA took their time answering Mossville citizens' concerns and this allowed Industries/ attorneys to come into the community of Mossville and take advantage of its citizens. DEQ/EPA knew well beyond that time in the 70's, 80's and early 90's, that massive contaminations plagued our historical African-American community in Mossville, Louisiana. This killer was so massive that it killed over 300 souls in my community.

We ask that Mossville residents be given the right answers and that honest punitive justice be given to those who deserve punishment. No more rock throwing and hiding of hands, for we know who all is at fault of this massive air, water, drinking water and land contamination of EDC and Chromium plumes.

The same Government entities, (EPA, ATSDR, CDC, DHH, DEQ, Homeland Security, FEMA, US JUSTICE DEPT. ETC.) we put our trust in to protect us, let us down and decided to keep secrets of what happened to the residents of Mossville, Louisiana. We were exposed to all kinds of toxins in Mossville, Louisiana and live with these polluters only 80 ft. from our homes.

We can never get back our history, it has been destroyed threw negligence. We have had outstanding, horrific losses to many to list here. I want Justice and Justice now!

Our history was lost. There were citizens who died from this contamination. Mossville residents fear the thought of cancer. There is a cluster of cancer and diseases in Mossville, Louisiana. We live in the hearts of huge, smoking, sinking, polluting Industries. Who are major industries who provide many services to the U.S. at the expense of innocent people who live 80 ft to ½ mile from them. If you care about your citizens, then why were secrets kept from citizens about the harm these giant manufactures?

What did Mossville or any other poor community do to deserve this kind of sentence? These companies have more than enough money to pay for their wrongs, to make them right with communities who do not have enough distance to run to get out of harms way.

The people of Mossville, Louisiana weren't even offered a buffer zone when we requested , back in the early 90's. We were called names and sharp darts were thrown as mockery to local advocates with no remorse. Everyday we had to breathe, drink, swallow, bathe, and live on and in an unclean community and contaminated soil. We grew our food and our children played in contamination.

What did our Children do to deserve this? What did our Mothers and Fathers do to deserve this type of abuse?

First time parents only wanted the best way of life for their Children, just as you wanted for yours and the rest of the country populous who became new parents for the first time. No one deserves to have their love ones taken from them behind contracting chronic illnesses for economic progress.

When will the Government except blame that they did not follow through in protecting its citizens from greed stricken companies who care only to lie and not take responsibility for what they do wrong? It is time for our Government to make these companies compensate, acknowledge, apologize to the Mossville citizens and other communities who are surrounded by Industries who are right next-door to neighboring communities. Industries like this should not be allowed to white wash their bad deeds and excuse them under the rug.

I also ask that Justice be prevailed on our past lawsuit Sally Comeaux v. Conoco, Condea Vista, Continental Oil Company, E.I DuPont et al. We deserve the same justice that was given to the white citizens of the Pit1 and Pit2 in Carlyss, Louisiana. The case was and still is a disgrace.

This was a recklessly, intentionally wronged us, our children and abused our senior citizens. Their solicitation, reckless behavior, deceptive, cunning, outrageous behavior was intentional and citizens were not paid or treated right accordingly.

The residents did not receive market values for their homes, land, nor were they compensated for their health. Health was taken away from Mossville citizens case. Workers in similar cases feared contracting cancer from EDC were compensated for the same contaminations Mossville residents were exposed to and lived on for over forty/fifty years and was never compensated.

Discrimination reared its ugly head in this case allowing part of our community to be left behind to continue to suffer at the hands of polluters next door. No, we are not free of the injustices done to our community folk in Mossville and surrounding areas, and we refuse to run like a dog with its tail tuck tight behind. We will fight for Justice for All. We expect to be treated like human beings, not like trash.

Recommendations
♦ *Cluster cancer studies should be done.*
♦*Compensation for our loss of our mothers, fathers, sisters and brothers. Our homes, land, and our way of life, and livelihoods and history.*
♦ *True test results of air, water, and land in Calcasieu, not just the Calcasieu estuary, but, Lockport Expansion Area/ Mossville Community/ and the Cal. Estuary.*
♦*Overdue buffer zones put in place in too close communities, so this want happen again.*
♦ *New tap testing, because of new evidence.*
♦*Fines against Industries/DEQ for not doing proper reporting and not following the law /protocol for spills and releases.*
♦*Residents need of physiatrists that can help them overcome such horrific consequences.*
♦*NPL/ SUPERFUND.*
♦*A toxic Toxicologist.*
♦*All private water well tests that were done when contamination of EDC and CHROMIUM was first discovered back in early 70's to presented to Mossville residents. The studies continue in Cal. Parish until the truth is revealed.*

Response37: ATSDR thanks the commenter for providing a personal history of contamination and other issues related to the Calcasieu Parish/Mossville site.

Many of these issues are outside the specific focus of this health consultation, which evaluates PCB and dioxin air data from 2001. Response 4 and Appendix C provide information on other ATSDR public health evaluations that have occurred, including sampling a variety of environmental media, biological exposure investigations, a cancer incidence data review, and population-based exposure studies.

More recently, to address community concerns, EPA performed a Site Investigation in Mossville in April 2010 and released the results in May 2011. EPA sampled water, sediment, soil, and soil gas from the Mossville community. Through a cooperative agreement with ATSDR, LDHH evaluated these samples in a public health assessment that was released for public comment on July 9, 2013 [ATSDR 2013c]. See ATSDR's "*Mossville (Calcasieu Parish), Louisiana*" website for further information on the agency's involvement throughout the years at http://www.atsdr.cdc.gov/sites/mossville/index.html.

Also, ATSDR notes that some of the issues raised by this commenter are outside the mission of the agency. For example, ATSDR does not

- conduct large-scale site- or release-related environmental sampling. These are the responsibility of the EPA and state environmental agencies.
- enforce regulations. ATSDR is an advisory, non-regulatory public health agency.
- provide medical treatment and health care services.

Comment 38: ATSDR's delayed reporting of toxic exposures in Mossville, Louisiana and surrounding areas has become an agency practice. The ATSDR delayed reporting the results of its 2001 re-testing of Mossville residents' blood and environment for dioxins until 2006. Additionally, ATSDR delayed reporting the results of its 2002 initial dioxin testing of blood samples from residents in Calcasieu Parish, Louisiana until 2006. The unreasonable delay is in sharp contrast to the ATSDR's dioxin testing of blood samples from Mossville residents in December 1998, the results of which were first reported four months later in April 1999 and finalized in November 1999.

Response 38: Typically, ATSDR does not delay the report of agency finding. The process took long because of changes in agency policy as well as changes in personnel. In addition, during a 2006 community meeting, community leaders expressed a desire to receive all remaining environmental and exposure study reports together. ATSDR agreed to this request if there were no public health issues and concerns identified during the data analysis and evaluation process.

Comment 39: The "Community Report" pamphlet that accompanies the main report talks about excluding samples that seemed to come from people exposed to tobacco smoke. Were suspected-tobacco-affected samples also excluded from the comparison set referred to in Table 4 of the pamphlet, the NHANES data?

Response 39: Yes, suspected-tobacco-affected samples were also excluded from the comparison set.

Comment 40: Are the materials on VOCs also open for public comment?

Response 40: No, the community reports are final documents. Community reports are generated based on the findings from exposure studies or health studies, which are not released to the public for comments. However, they are internally and externally peer reviewed by several scientists. If community members have any questions about these reports, ATSDR staff will be glad to answer them and explain. Call ATSDR at 1-800-CDC-INFO and ask for information on the community reports for Calcasieu Parish/Mossville site.

Comment 41: Yes, as citizens we did not get everything right, for example, our not realizing that in the Lafayette area there was a smelting industry that made that place a less-than-suitable comparison zone. On the other hand, looking back I remain convinced that the original discussions we had with the ATSDR people and their respect for our suggestions had placed the investigations on mostly strong tracks, both in public trust and in pure science. The derailment has been agonizing to watch.

> ***Response 41***: For the parish-wide community reports, the comparison group from Lafayette Parish was chosen because it is similar to Calcasieu Parish in characteristics like geography, total population, age and race mix, poverty level, diet and lifestyle, but it has fewer chemical plants. The community reports received extensive internal and external peer review to ensure the agency was providing the public with the best science possible.

Comment 42: I have heard the director of the Regional Cancer Center, Dr. Larry Hauskins, express concern that he sees a very high rate of cancer in residents from Beauregard Parish, downwind much of the year from the Calcasieu industrial zone.

> ***Response 42***: With regard to Beauregard Parish cancer incidence rates, the commenter should contact Ms. Patty Andrews with the Louisiana Tumor Registry at (504) 568-5795.

Sources:

[ATSDR] Agency for Toxic Substances and Disease Registry. 1998. Calcasieu Estuary (Calcasieu Parish) Health Consultation. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 1999. Exposure Investigation Calcasieu Estuary Health Consultation. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2005a. Public health assessment guidance manual (update). Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2005b. Final Report: Serum Dioxin Levels in Residents of Calcasieu Parish, Louisiana. U.S. Department of Health and Human Services, Public Health Services, Atlanta, GA.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2006. Follow-up Exposure Investigation Calcasieu Estuary Health Consultation. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2013a. Community Report: Comparison of Exposures to Polychlorinated Biphenyls among Louisiana Residents. U.S. Department of Health and Human Services, Atlanta, GA.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2013b. Community Report: Comparison of Exposures to Volatile Organic Compounds among Louisiana Residents. U.S. Department of Health and Human Services, Atlanta, GA.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2013c. Review of Data from the 2010 EPA Mossville Site Investigation Public Health Assessment (initial/public comment release). Prepared by the Louisiana Department of Health and Hospitals under Cooperative Agreement with ATSDR. Atlanta: US Department of Health and Human Services.

Cleverly D, Ferrario J, Byrne C, Riggs K, Joseph D, Hartford P. 2007. A general indication of the contemporary background levels of PCDDs, PCDFs, and coplanar PCBs in the ambient air over rural and remote areas of the United States. Environ. Sci. Technol. 41: 1537-1544.

[EPA] US Environmental Protection Agency. 1999. Compendium method TO-9A: determination of polychlorinated, polybrominated and brominated/chlorinated dibenzo-p-dioxins and dibenzofurans in ambient air. EPA Office of Research and Development. EPA/625/R-96/010b. Available online at http://www.epa.gov/ttnamti1/files/ambient/airtox/to-9arr.pdf

[IWG] Interagency Working Group on Dioxin. 2010. Dioxin: frequently asked questions (FAQs). The dioxin Interagency Working Group (IWG) consists of representatives from the following federal agencies: Department of Health and Human Services, Department of Agriculture, Department of Veterans Affairs, Environmental Protection Agency, Department of Defense, Department of State, and Executive Office of the President. Hypertext last updated 2010-MAY-21. URL: http://www.fda.gov/Food/FoodSafety/FoodContaminantsAdulteration/ChemicalContaminants/DioxinsPCBs/ucm077524.htm

[LDEQ] Louisiana Department of Environmental Quality. 2013. September 27th electronic mail from Shannon Pusateri, Air Permits, LDEQ, to Danielle Langmann, Environmental Health Scientist, ATSDR, regarding a 2012 Public Notice for the Entergy Services' Roy S. Nelson Plant. Baton Rouge, LA.