

Letter Health Consultation

ANDERSON ISLAND SITE
(FORMERLY TEXACO INC., SHREVEPORT WORKS)

CADDO PARISH, LOUISIANA

EPA FACILITY ID: LAD980622278

JUNE 17, 2008

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. 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 which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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LETTER HEALTH CONSULTATION

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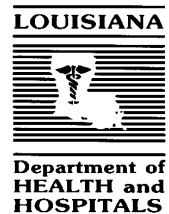
Prepared By:

Louisiana Department of Health and Hospitals
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry



Bobby Jindal
GOVERNOR

STATE OF LOUISIANA
DEPARTMENT OF HEALTH AND HOSPITALS



Alan Levine
SECRETARY

May 12, 2008

Tom Harris
Administrator, Environmental Technology Division
Louisiana Department of Environmental Quality
P.O. Box 4314
Baton Rouge, LA 70821-4314

Dear Mr. Harris:

In response to your request, the Louisiana Department of Health and Hospitals/Office of Public Health/Section of Environmental Epidemiology and Toxicology (DHH/OPH/SEET) has evaluated the Phase II Addendum fish samples collected from the Anderson Island (formerly Texaco Inc., Shreveport Works) site located in Shreveport, Caddo Parish, Louisiana. The following letter provides the results of SEET's assessment of the fish sampling conducted at the site.

Site Description and History

The Anderson Island (AI) site consists of approximately two hundred sixty acres and is located within the city limits of Shreveport, Louisiana (appendix A, map1). Texaco operated the Texaco Inc., Shreveport Works topping plant and tank farm at Anderson Island from approximately 1911 to 1939. The topping plant distilled fuels such as gasoline, kerosene, and diesel from crude oil. The portion of the crude remaining after extracting the fuels was shipped to another facility in Texas by pipeline. Petroleum and petroleum products such as gasoline and diesel fuel were transported to and from the site by rail and pipeline. Texaco dismantled the topping plant in 1940 and sold the property in 1941. Texaco leased thirty acres of the site and continued operating the pipeline until 1945. The property owners began residential development of the property in the early 1950's, which was essentially complete by 1980 [1].

Current land use of the AI site includes residential neighborhoods, a park, and commercial properties such as shopping centers and office complexes. The site is bounded on the north, northwest, and southwest by six bayou segments. Measured during the July 2005 sampling event, each of the six bayous ranged from approximately 500 to 4100 feet in length and from 2.8 to six feet deep [2]. The bayous are numbered by LDEQ from 1 to 6, with number 1 being the southernmost bayou segment, and each successive number proceeding clockwise to circumscribe the site, culminating with number 6 being the bayou segment at the northeast limit of the site.

Data Evaluation

Sediment Phase I & II Investigation

A sediment Phase I Investigation (SPI) was conducted by LDEQ in July 2005 in order to evaluate site conditions in the bayou sediments and surface waters surrounding the Anderson Island site. Bayou sediments were sampled from 26 locations in bayous 1-6, and a total of six surface water

samples were collected, one from each of the bayous (appendix A, map 2). All samples were analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX), total petroleum hydrocarbons (TPH), metals, and semi-volatile organic compounds (SVOCs), including polycyclic aromatic hydrocarbons (PAHs). Five of the sediment sample concentrations of SVOCs, specifically PAHs from bayous 1, 2 and 6 exceeded the LDEQ Risk Evaluation/Corrective Action Program (RECAP) sediment standards.

In August 2006, LDEQ conducted a sediment Phase II Investigation (SPII), collecting an additional 11 sediment samples from three of the six bayous (1, 2, and 6) surrounding the AI site (appendix A, map 3). Samples were collected from these bayous to further evaluate PAH concentrations at these locations. Samples were submitted to the laboratory for SVOCs analysis including PAHs. Ten of the sediment sample concentrations of PAHs from bayous 1, 2 and 6 exceeded RECAP.

In August 2007, SEET completed an evaluation of the SPI and SPII data [3]. The summary results are available in the appendix, B-1.

From August 16-22, 2007, LDEQ contractors conducted a Sediment Phase II Addendum (SPIIA), collecting 25 fish tissue samples (using rod/reel and trot lines) from largemouth bass, yellow bullhead catfish and channel catfish located in bayous 1 and 2 where PAH sediment concentrations exceeded the RECAP in SPII (appendix A, map 4). In bayou 6, PAH concentrations in sediment also exceeded the RECAP in SPII, however bayou 6 was observed as being too shallow to support a fish population that would grow to sizes that humans would consume, and therefore was excluded from the SPIIA [4]. Upon collection of the samples, individual fish were weighed, retaining those with a weight of at least 0.5 pounds for representativeness of specimens likely to be potentially consumed by humans. Those fish were filleted in the field, with two fillets from each fish packed together in a plastic bag and preserved on ice for transport to the lab. The fish tissue samples were analyzed for SVOCs by US Environmental Protection Agency (EPA) Method SW8468270 [4]. The SPII determined concentrations of specific SVOCs as constituents of concern, and therefore the SPIIA workplan was limited to analysis of the following SVOCs/PAHs by bayou:

Bayou 1:

- Benzo(a)anthracene
- Benzo(a)pyrene (B(a)P)
- Benzo(b)fluoranthene
- Dibenz(a,h)anthracene
- Indeno(1,2,3-cd)pyrene

Bayou 2:

- Benzo(a)anthracene
- B(a)P

With the exception of B(a)P and indeno(1,2,3-cd)pyrene, all of the PAH concentrations in bass and catfish from bayou 1 were below the laboratory detection limit of 0.67 micrograms per kilogram (ug/kg). B(a)P was detected in nine of the eleven samples collected from bayou 1, while indeno(1,2,3-cd)pyrene was detected in two of the eleven (appendix B-2). Benzo(a)anthracene and B(a)P were not detected in any of the samples collected from Bayou 2.

Exposure Pathways

SEET evaluated the factors that lead to exposure in order to determine whether an individual would be exposed to PAHs detected in fish from bayou 1 at the AI site. During SEET's evaluation of SPI and SPII sediment data in August 2007, it was concluded that the City of Shreveport Ordinance Number 148, Section 62-59, *Swimming and Wading in Bayou Pierre and Old River* provides legal controls to minimize the potential for exposure to the bayous at the AI site. The City of Shreveport interprets the Ordinance to prohibit swimming and wading in all of the bayous at the AI site [4]. Furthermore, as per LDEQ, there has been no current or historical evidence or observation of swimming and/or fishing in any of the bayous, as they are generally unsuitable for recreational activities. The water surface is often covered by a thick layer of algae or other aquatic vegetation and the bed of the bayou is a thick, mucky consistency, which moves and is unstable under the weight of a person. The bayous typically contain trash and debris that make it dangerous and unappealing for wading [4]; which poses a physical hazard to anyone who may enter the bayou(s).

Public Health Implications

In spite of the lack of exposure, SEET estimated the risk of adverse health effects if the public were exposed to PAHs in fish from bayou 1 at the AI site. In the evaluation of PAHs detected in bayou 1, toxicity equivalency factors (TEFs) (EPA 1993a; Nisbet and LaGoy 1992) were used to weight each PAH's toxicity relative to the toxicity of B(a)P [5]. The TEF of B(a)P is set to 1. Multiplying the concentration of each PAH by its respective TEF produces a toxicity equivalence quotient (TEQ). Where applicable, the total TEQ at each sample location was used in this data evaluation. Furthermore, according to SEET's current approach to evaluating fish, concentrations of contaminants which were below the method detection limit were assigned a value of zero if more than half of the samples were below the detection limit, otherwise they were assigned a value of one-half the detection limit. Due to the detection limit protocol for fish, the TEQ approach was applicable to bayou 1 catfish samples 1 and 5 only (appendix B, B-3, 4).

Because B(a)P is a probable human carcinogen, SEET calculated a lifetime excess cancer risk (LECR) for adults related to exposure to B(a)P TEQ in fish collected from bayou 1 at the AI site. This LECR is based on daily exposure during a 70 year lifetime. The LECR indicates that a worst-case scenario of maximum detected B(a)P concentration in largemouth bass of 0.0013 mg/kg presents a cancer risk of 4.1 E-06, or approximately 4 excess cancers per 1,000,000 people. This is below SEET's acceptable cancer risk rate of 1 excess cancer per 10,000 people (1×10^{-4}).

Furthermore, SEET calculated a LECR for adults using a maximum detected B(a)P concentration in catfish (from bayou 1) of 0.004 mg/kg. Results indicate an estimated cancer risk of 1.2 E-05, which is slightly below SEET's acceptable cancer risk rate of 1 excess cancer per 10,000 people (1×10^{-4}).

Although there has been no evidence of fishing in the bayous, if ingestion of largemouth bass or catfish from bayou 1 at the AI site were to occur, such ingestion poses a low risk to the public. A detailed explanation of the ATSDR/SEET evaluation process and the adult LECR exposure assumptions can be accessed in appendix B.

Child Health Considerations:

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus adults need as much information as possible to make informed decisions regarding their children's health.

Due to the probable carcinogenic nature of B(a)P, SEET evaluated the LECR for children, using the same maximum detected B(a)P TEQ concentration (0.004 mg/kg) in catfish collected from bayou 1. The maximum detected concentration of B(a)P was observed at a level below that expected to present an unacceptable cancer risk (3.4×10^{-6}). Acceptable risk represents an estimated one excess cancer in 10,000 (1×10^{-4}) people exposed for a lifetime of 70 years in duration. If ingestion of fish from bayou 1 from the AI site were to occur, such contact poses a low risk to children. An explanation of the exposure assumptions for the child LECR is available in Appendix B. Furthermore, due to the stated City of Shreveport Ordinance described above deeming it unlawful to swim in the bayous and the knowledge of adherence to the advisory, there should be no exposure pathway between bayou 1 fish and the local population, including children surrounding the AI site.

Conclusions:

- With the exception of B(a)P and indeno(1,2,3-cd)pyrene, all of the PAH concentrations in bass and catfish from bayou 1 were below the laboratory detection limit. B(a)P was detected in nine of the eleven samples collected from bayou 1, while indeno(1,2,3-cd)pyrene was detected in two of the eleven.
- There has been no evidence of recreational usage of the bayous surrounding the AI site. The bayous typically contain trash and debris which poses a physical hazard, and therefore make it dangerous and unappealing for wading and/or recreational activities. Based on available data, there is no public health hazard related to B(a)P or indeno(1,2,3-cd)pyrene in fish from bayou 1 at the AI site.
- Although there has been no evidence of fishing in the bayous, if ingestion of largemouth bass or catfish from bayou 1 at the AI site were to occur, such ingestion poses a no apparent public health hazard to the public.

Recommendations:

- There are no recommendations at this time.

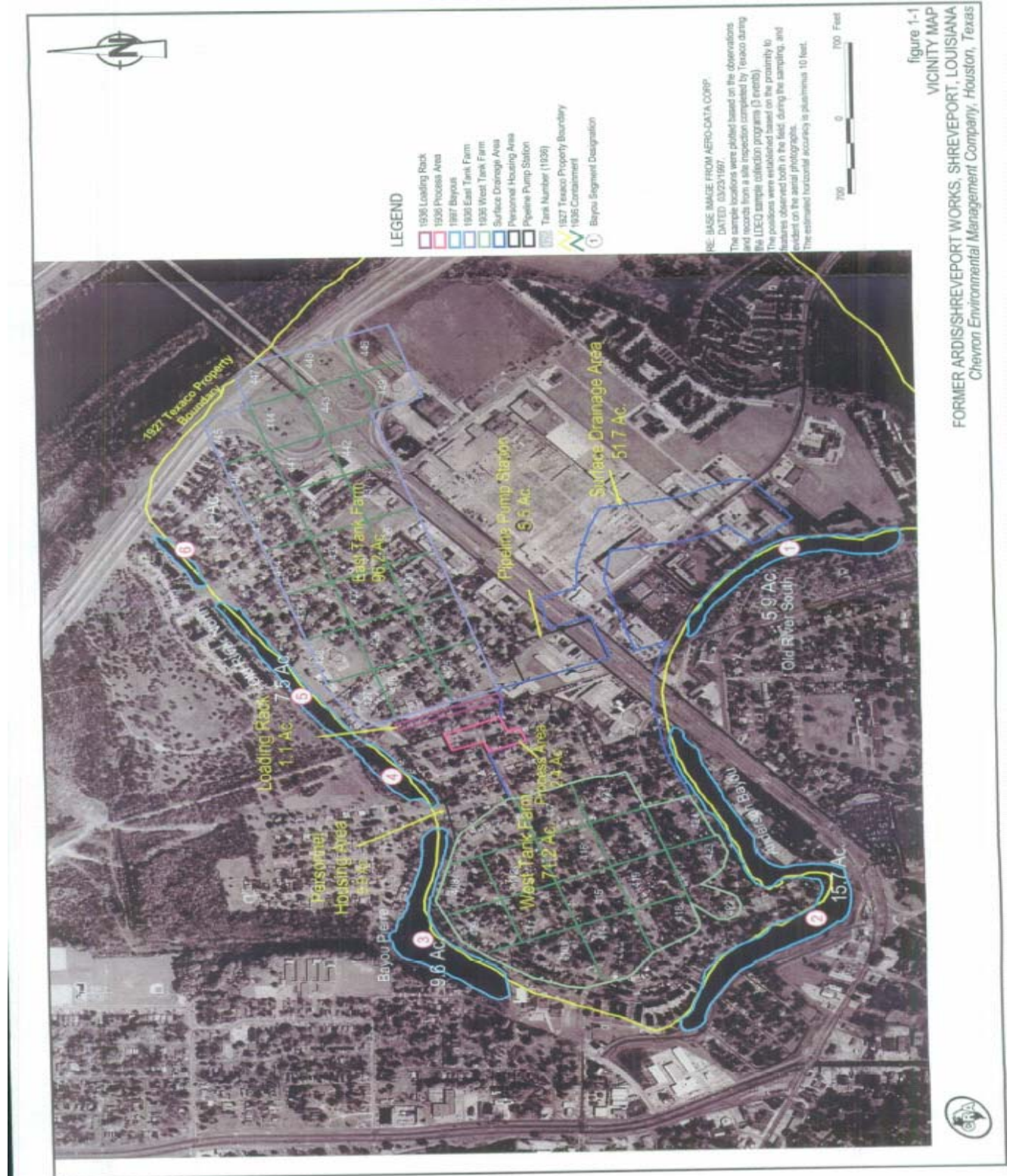
If additional data becomes available at a later date, SEET will be glad to consider a separate request for an evaluation. If there are any questions regarding this health consultation, please contact Darcie Olexia (504) 219-4579 or Kathleen Aubin (504) 219-4575.

Sincerely,

Darcie Olexia, MSPH
Environmental Health Scientist Coordinator
Louisiana Office of Public Health
Section of Environmental Epidemiology & Toxicology

Kathleen G. Aubin, MSPH
Environmental Health Scientist Supervisor
Louisiana Office of Public Health
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Appendix A: Maps
Map 1. Anderson Island site vicinity map



Source: Conestoga-Rovers & Associates Sediment Phase I Investigation Report, Former Ardis/Shreveport Works, AI 4399. March 2006 [2].

Map 3. Anderson Island Sediment Phase II (SPII) Sampling Stations

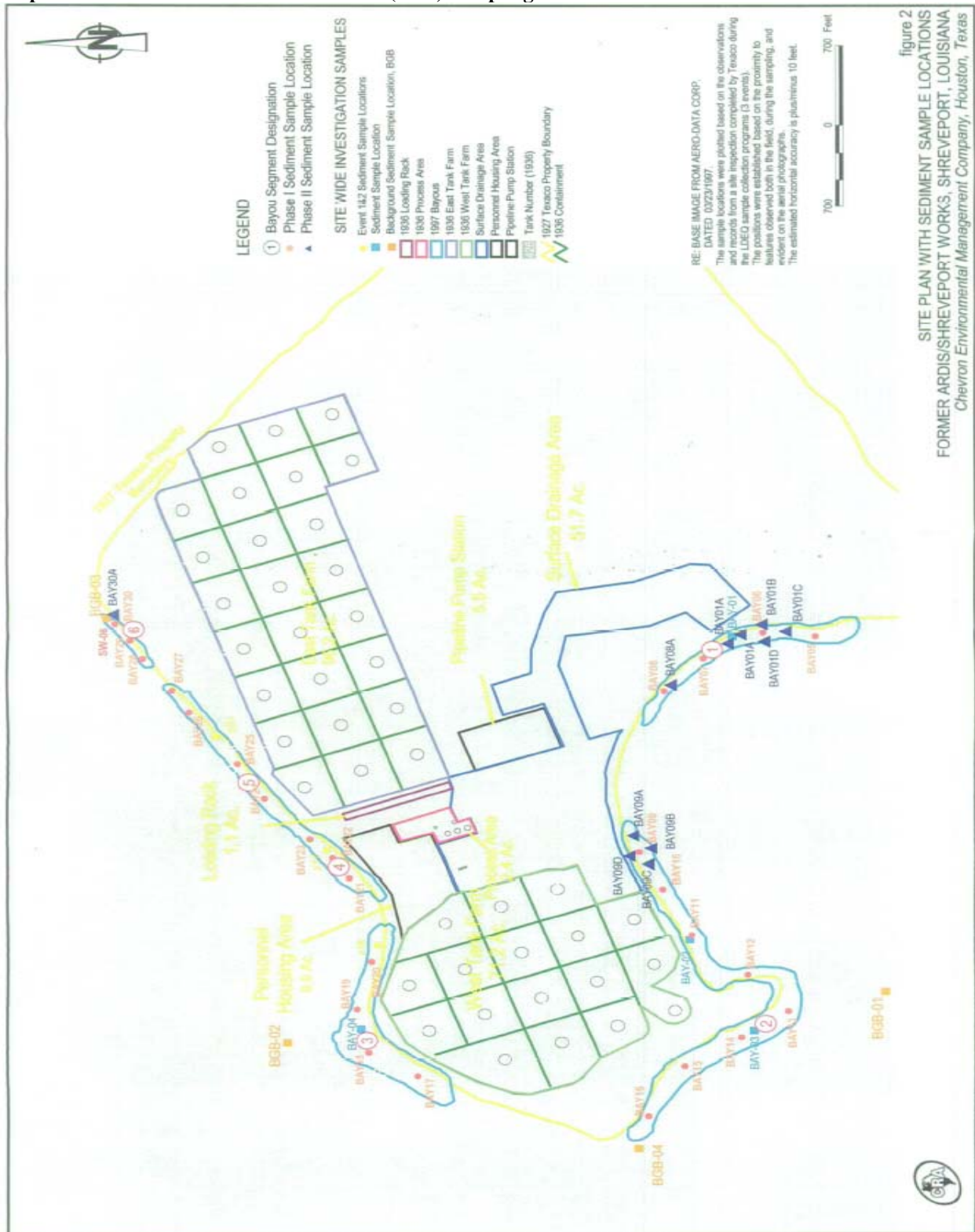


figure 2
 SITE PLAN WITH SEDIMENT SAMPLE LOCATIONS
 FORMER ARDIS/SHREVEPORT WORKS, SHREVEPORT, LOUISIANA
 Chevron Environmental Management Company, Houston, Texas

Source: Conestoga-Rovers & Associates Sediment Phase II Investigation Report, FormerArdis/Shreveport Works, AI 4399. December 2006 [6].

Map 4. Anderson Island Sediment Phase II Addendum (SPIIA) Fish Sampling Stations



Source: Conestoga-Rovers & Associates Sediment Phase II Addendum Investigation Report, FormerArdis/Shreveport Works, AI 4399. December 2007 [4].

Appendix B: Evaluation Process

Screening Process

Health based comparison values (CVs) were used to determine which samples needed further evaluation. CVs are not used to predict health effects or to set clean-up levels. Contaminants with media concentrations above a health based comparison value do not necessarily represent a health threat, but are selected for further evaluation. Contaminants with media concentrations below a health based comparison value are unlikely to be associated with illness and are not evaluated further.

EPA's cancer slope factor (CSF) for benzo(a)pyrene ($7.3 \text{ (mg/kg-day)}^{-1}$) was used as a CV in this evaluation [7]. An oral CSF is an upper bound estimate of increased cancer risk from a lifetime (70 years) exposure to a contaminant via ingestion. CSFs are developed by the EPA and are based on a qualitative weight-of-evidence approach and a quantitative evaluation of human and animal toxicity studies of a substance. Cancer rates are calculated by multiplying each exposure dose by the EPA CSF. The results estimate the worst-case maximum increase in the risk of developing cancer after exposure to a contaminant. This estimation is accurate within one order of magnitude. Therefore, a calculated cancer risk of 2 excess cancers per 10,000 people may actually be 2 excess cancers per 1,000 people or 2 excess cancers per 100,000 people. The risk above which cancer may potentially be due to an external cause rather than to population variation is 10^{-4} or 1 excess cancer per 10,000 people.

B-1: Summary of SEET's evaluation of PAHs detected in sediment from bayous 1, 2 and 6 at the AI site during the SPI and SPII, July 2005 and August 2006. Extracted from LDHH/OPH/SEET Under Cooperative Agreement with ATSDR, Health Consultation: A Review of Surface Water and Sediment Data Texaco, Inc. Shreveport Works Site, Anderson Island, Caddo Parish, Louisiana, August 21, 2007 [3]

Sediment Phase I Investigation (SPI)

With the exception of PAHs, all sediment and surface water sample concentrations were below health based comparison values (CVs). Total PAHs in sediment exceeded the Cancer Risk Evaluation Guide (CREG) at five of the 26 sampling locations from bayous 1 thru 6.

Table 1 depicts total PAHs detected above health based comparison values in bayou sediment samples from the AI site. Toxicity equivalency factors (TEFs) were used to weight each PAH's toxicity relative to the toxicity of B(a)P. The TEF of B(a)P is set to 1. Multiplying the concentration of each PAH by its respective TEF produces a toxicity equivalence quotient (TEQ). The total TEQ at each sample location was used in this data evaluation. To ensure a conservative, protective estimation, constituents with non-detect values are assumed at half the method detection limit in the total PAH determination.

Table 1. Total PAHs detected in sediment (bayous 1, 2, and 6) above health based comparison values at the Anderson Island site, Caddo Parish, LA. SPI, July 2005.

Detected Contaminant (mg/kg) ¹	Bayou 1			Bayou 2	Bayou 6	Health Based Comparison Values (mg/kg) ¹
	BAY 06	BAY 07	BAY 08	BAY 09	BAY 30	
Total PAHs ²	.685	.124	.315	.116	.145	0.1 CREG ³

¹mg/kg- milligrams per kilogram; ²PAHs- Polycyclic aromatic hydrocarbons; ³CREG- ATSDR Cancer Risk Evaluation Guide (CREGs, developed by ATSDR, are media-specific CVs used to identify concentration of cancer-causing substances that are unlikely to result in an increase of cancer rates in an exposed population.)

Sediment Phase II Investigation (SPII)

Each of the sediment sampling locations exceeded the CREG (table 2).

Table 2. Total PAHs detected in sediment (bayous 1, 2, and 6) above health based comparison values at the Anderson Island site, Caddo Parish, LA. SPII, August 2006.

Detected Contaminant (mg/kg) ¹	Bayou 1					Bayou 2				Bayou 6	HealthBased Comp.Values (mg/kg) ¹
	BAY 06A	BAY 06B	BAY 06C	BAY 06D	BAY 08A	BAY 09A	BAY 09B	BAY 09C	BAY 09D	BAY 30A	
Total PAHs ²	.221	1.13	.375	.196	.254	.154	.131	.410	.237	.170	0.1 CREG ³

¹mg/kg- milligrams per kilogram; ²PAHs- Polycyclic aromatic hydrocarbons; ³CREG- ATSDR Cancer Risk Evaluation Guide

SEET evaluated bayou sediments and surface water data from the SPI and SPII sampling events. Ingestion of or dermal contact with site-related bayou sediments and/or surface water are not expected to cause adverse health effects.

Additionally, SEET estimated the adult cancer risk for ingestion of and dermal contact with total PAH contaminated bayou sediments at the Anderson Island site. Benzo(a)pyrene (B(a)P) is classified by EPA as a probable human carcinogen. Carcinogenic risk was calculated by multiplying the adult exposure dose over a lifetime by the B(a)P cancer slope factor (SF) of 7.30 E+00 (mg/kg/day)⁻¹. Evaluation of potential carcinogenic risk due to a lifetime (70 year) exposure to B(a)P equivalents using standard default values (100 mg of contaminated sediment ingested twice per week, 70 kg body weight) indicates that B(a)P equivalents at a maximum detected sediment concentration of 1.13 mg/kg presents a cancer risk of 3.2 E-06, or 3.2 excess cancers per 1,000,000 people. This is below SEET's acceptable cancer risk rate of 1 excess cancer per 10,000 people (1 x 10⁻⁴).

Evaluation of potential carcinogenic risk due to a lifetime (70 year) dermal exposure to B(a)P equivalents (twice weekly exposure, 70 kg body weight) indicates that B(a)P equivalents at a maximum detected sediment concentration of 1.13 mg/kg presents a cancer risk of 5.8 E-06. This estimate is also below SEET's acceptable cancer risk rate of 1 excess cancer per 10,000 people (1 x 10⁻⁴).

Concentrations detected at each of the sampling locations were observed at levels resulting in a carcinogenic risk below that expected to present and unacceptable cancer risk. Acceptable risk represents an estimated one excess cancer in 10,000 (1 x 10⁻⁴) people exposed for a lifetime of 70 years in duration. If ingestion of or dermal contact with sediments containing total PAHs were to occur, such contact poses no apparent public health hazard to residents.

B-2: PAHs detected in largemouth bass and yellow bullhead and channel catfish from bayous 1 and 2 at the AI site [4]

Bayou	Species	Sample ID	Sample Date	PAH results in mg/kg ¹				
				Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene
Bayou 1	Bass	BASS-1	08/18/07	<0.00067	0.0013*	<0.00067	<0.00067	<0.00067
		BASS-2	08/20/07	<0.00067	0.00089	<0.00067	<0.00067	<0.00067
		BASS-3	08/20/07	<0.00067	0.0012	<0.00067	<0.00067	<0.00067
		BASS-4	08/20/07	<0.00067	0.0011	<0.00067	<0.00067	<0.00067
		BASS-5	08/20/07	<0.00067	0.00097	<0.00067	<0.00067	<0.00067
		BASS-6	08/20/07	<0.00067	<0.00067	<0.00067	<0.00067	<0.00067
	Catfish	CAT-1	08/16/07	<0.00067	<0.00067	<0.00067	<0.00067	0.00069
		CAT-2	08/17/07	<0.00067	0.0013	<0.00067	<0.00067	<0.00067
		CAT-3	08/17/07	<0.00067	0.0023	<0.00067	<0.00067	<0.00067
		CAT-4	08/17/07	<0.00067	0.004*	<0.00067	<0.00067	<0.00067
CAT-5		08/20/07	<0.00067	0.0015	<0.00067	<0.00067	0.00091	
Bayou 2	Bass	BASS-1	08/20/07	<0.00067	<0.00067			
		BASS-2	08/21/07	<0.00067	<0.00067			
		BASS-3	08/21/07	<0.00067	<0.00067			
		BASS-4	08/21/07	<0.00067	<0.00067			
		BASS-5	08/21/07	<0.00067	<0.00067			
		BASS-6	08/22/07	<0.00067	<0.00067			
		BASS-7	08/22/07	<0.00067	<0.00067			
	Catfish	CAT-1	08/21/07	<0.00067	<0.00067			
		CAT-3	08/22/07	<0.0033	<0.0033			
		CAT-4	08/22/07	<0.00067	<0.00067			
		CAT-5	08/22/07	<0.00067	<0.00067			
		CAT-6	08/22/07	<0.0011	<0.0011			
		CAT-7	08/22/07	<0.00067	<0.00067			
		CAT-8	08/22/07	<0.00067	<0.00067			

¹mg/kg- milligrams/kilogram; * denotes maximum detected concentration used for calculation of the lifetime expected cancer risk (LECR)

B-3: PAH Toxicity Equivalency Factors (TEFs) and the Toxicity Equivalence Quotient for Bayou 1 catfish sample B1-CAT-1

Compound	Detected Concentration (mg/kg) ¹	TEF ²	B1-CAT-1 TEQ ³
Benzo(a)anthracene		0.1	
Benzo(a)pyrene	<0.00067*	1	0.000335
Benzo(b)fluoranthene		0.1	
Dibenz(a,h)anthracene		5	
Indeno(1,2,3-cd)pyrene	0.00069	0.1	0.000069
Total Benzo(a)pyrene Toxic Equivalent			0.0004

¹mg/kg- milligrams per kilogram; ²TEF- Toxicity Equivalency Factor [5]; ³TEQ- Toxicity Equivalence Quotient; *denotes ½ the detection limit was used

B-4: PAH Toxicity Equivalency Factors (TEFs) and the Toxicity Equivalence Quotient for Bayou 1 catfish sample B1-CAT-5

Compound	Detected Concentration (mg/kg) ¹	TEF ²	B1-CAT-1 TEQ ³
Benzo(a)anthracene		0.1	
Benzo(a)pyrene	0.0015	1	0.0015
Benzo(b)fluoranthene		0.1	
Dibenz(a,h)anthracene		5	
Indeno(1,2,3-cd)pyrene	0.00091	0.1	0.000091
Total Benzo(a)pyrene Toxic Equivalent			0.0015

¹mg/kg- milligrams per kilogram; ²TEF- Toxicity Equivalency Factor; ³TEQ- Toxicity Equivalence Quotient

B-5: Equation variables for the calculation of an adult fish ingestion exposure dose using the maximum concentration of B(a)P detected in largemouth bass from Bayou 1, sample ID B1-BASS-1

Variable	Value Used
C = contaminant concentration for B(a)P	0.0013 mg/kg
IR = Adult fish intake rate	30,000 mg/day
CF = conversion factor	10 ⁻⁶ kg/mg
EF = Exposure Factor (unitless)	1
BW = Adult bodyweight	70 kg

The adult fish ingestion dose can be estimated as follows:

$$ID_f = [(C) (IR) (CF) (EF) / (BW)]$$

Where:

ID_s = Adult fish ingestion dose (mg/kg/day)

C = Contaminant concentration (mg/kg)

IR = Adult fish intake rate (mg/day)

EF = Exposure factor (unitless) = (exposure frequency) (exposure duration) / (exposure time) = [(7 days/week) (365 days/year) (70 years)] / [(70years) (365 days/year)] = 1

BW = Adult bodyweight (kg)

CF = Conversion factor (10⁻⁶ kg/mg)

B-6: Equation variables for calculation of an adult Lifetime Excess Cancer Risk (LECR) using the maximum concentration of B(a)P detected in largemouth bass from Bayou 1, sample ID B1-BASS-1

Variable	Value Used
ID _f = Adult fish ingestion exposure dose	5.6 x 10 ⁻⁷ mg/kg/day
CSF = Cancer slope factor B(a)P	7.3 (mg/kg-day) ⁻¹

The adult LECR can be estimated as follows:

$$\text{LECR} = (\text{ID}_f) (\text{CSF})$$

Where:

LECR = Adult lifetime excess cancer risk (unitless)

ID_f = fish ingestion exposure dose (mg/kg/day)

CSF = cancer slope factor ((mg/kg-day)⁻¹)

B-7: Equation variables for calculation of a child fish ingestion exposure dose using the maximum concentration of B(a)P detected in catfish from Bayou 1, sample ID B1-CAT-4

Variable	Value Used
C = contaminant concentration for B(a)P	0.004 mg/kg
IR = Child fish intake rate	15,000 mg/day
CF = conversion factor	10 ⁻⁶ kg/mg
EF = Exposure Factor (unitless)	1
BW = Child bodyweight	35 kg

The child fish ingestion dose can be estimated as follows:

$$\text{ID}_s = [(C) (IR) (CF) (EF) / (BW)]$$

Where:

ID_s = Child fish ingestion dose (mg/kg/day)

C = Contaminant concentration (mg/kg)

IR = Child fish intake rate (mg/day)

EF = Exposure factor (unitless) = (exposure frequency) (exposure duration) / (exposure time) = [(7 days/week) (365 days/year) (70 years)] / [(70years) (365 days/year)] = 1

BW = Child bodyweight (kg)

CF = Conversion factor (10⁻⁶ kg/mg)

B-8: Equation variables for calculation of a Lifetime Excess Cancer Risk (LECR) for children using the maximum concentration of B(a)P detected in catfish from Bayou 1, sample ID B1-CAT-4

Variable	Value Used
ID _f = Child fish ingestion exposure dose	1.7 x 10 ⁻⁶ mg/kg/day
CSF = Cancer slope factor	7.3 (mg/kg-day) ⁻¹
EF = Exposure factor (unitless)	0.28*

The child LECR can be estimated as follows:

$$\text{LECR} = (\text{ID}_f) (\text{CSF}) (\text{EF})$$

Where:

LECR = Child lifetime excess cancer risk (unitless)

ID_f = Child fish ingestion exposure dose (mg/kg/day)

CSF = cancer slope factor ((mg/kg-day)⁻¹)

EF = Exposure factor (unitless) = exposure duration / lifetime = (20 years) / (70 years) = 0.28

* In the LECR child evaluation, SEET utilized a 20 year fraction of the lifetime (70 years) exposure duration, thereby decreasing the exposure factor for children. This is used due to the assumption that a child will relocate from the parental residence after 20 years.

B-9: Summary Lifetime Excess Cancer Risk (LECR) for adults and children using the maximum concentration of B(a)P detected in largemouth bass from Bayou 1, sample ID B1-BASS-1 and in catfish from Bayou 1, sample ID B1-CAT-4

Lifetime Expected Cancer Risk	B1-BASS-1	B1-CAT-4
Adult LECR:		
	4.1 x 10 ⁻⁶	1.2 x 10 ⁻⁵
Child LECR:		
	1.1 x 10 ⁻⁶	3.4 x 10 ⁻⁶

References

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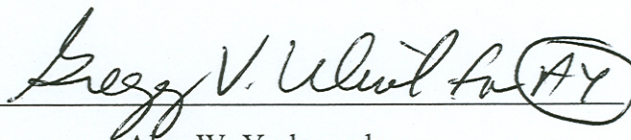
Certification

This health consultation for Texaco Inc., Shreveport Works/ Anderson Island Site was prepared by Louisiana Department of Health and Hospitals under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodology and procedure existing at the time the health consultation was initiated.



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The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.



Alan W. Yarbrough
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