

APPENDIX C

**TEXAS DEPARTMENT OF HEALTH
JANUARY 12, 1995 MEMORANDUM
NUECES BAY AND PORT OF CORPUS CHRISTI
SEAFOOD SAMPLING DATA**

TEXAS DEPARTMENT OF HEALTH

Austin Texas

INTER-OFFICE MEMORANDUM

RECEIVED

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DIVISION OF EPIDEMIOLOGY & TOXICOLOGY

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Health Risk Assessment & Toxicology Program

DATE: January 12, 1995

SUBJECT: Nueces Bay and Port of Corpus Christi Seafood Sampling Data

BACKGROUND AND STATEMENT OF ISSUES

In March, 1994, the Texas Natural Resource Conservation Commission (TNRCC) presented results of an initial soil sampling effort for the Dona Park neighborhood in Corpus Christi. The results indicated that soil in the Dona Park neighborhood was contaminated with lead, cadmium, and zinc. They attributed this contamination to a former ASARCO site. The ASARCO site, which is currently owned by Encycle, is immediately north of the Dona Park neighborhood, south of the Turning Basin adjacent to Nueces Bay (Figure 1). Numerous refinery and chemical operations are within the immediate geographical area of the former ASARCO site. These include Coastal, Champlin, Southwestern, Valero, Koch, Javelina, and Citgo refineries as well as the American Chrome and Chemical Co. Subsequent sampling (June, 1994) by Dames & Moore (contractors for ASARCO) confirmed the presence of cadmium, zinc, and lead in surficial soil in Dona Park.

Residents of Dona Park have numerous health complaints which they attribute to the contamination from the former ASARCO site as well as from releases from nearby refinery stacks and large piles of coke along the canal, north of Encycle. During a Texas Department of Health (TDH) investigation of citizen health complaints, citizens had raised concerns about the safety of eating fish and shellfish taken from the Nueces Bay area. Apparently, there were reports of releases into the bay. In response to this concern and the potential bioavailability of certain metals to seafood, the TDH Bureau of Epidemiology asked the Division of Seafood Safety to collect fish and shellfish samples from Nueces Bay (NB) and the Turning Basin (TB) area. A total of 20 fish samples (NB, 14; TB, 6), 3 crab

samples (NB,1; TB,2), and 2 oyster samples (NB) were collected and analyzed for metals, pesticides, PCBs, and semi-volatile organic chemicals. With few exceptions zinc, mercury, copper, and arsenic were found at low levels in all 20 fish sampled (arsenic was reported below the detection limit in speckled trout; n=2). Arsenic, copper, mercury, and zinc were found at low levels in crab. Arsenic, cadmium, and copper were found at low levels in oysters; however, zinc was found at an average level of 2,389 mg/kg (Table 1). All other chemicals were found to be below the detection limits.

DISCUSSION

Although arsenic was found in fish, crabs, and oysters, the type of arsenic found in fish and shellfish (ie., an organic form of arsenic) is considered to be nonharmful and should not be a public health concern. The mercury levels reported in fish were generally low. Although mercury levels often increase with increasing fish length, for Black Drum (the species for which the most data were available) the regression coefficient for this relationship was not significantly different from zero ($p=0.259$; Figure 2). Thus, for Black Drum in Nueces Bay, we would not expect the mercury concentration in larger fish of this species to be of public health concern. The mercury levels in the Speckled Trout were higher than those observed in the Black Drum but still less than one-half the FDA action level for mercury in fish. Based on these data, the levels of mercury in these fish do not present a threat to public health.

Low concentrations of zinc were found in fish and crabs and high concentrations of zinc were found in oysters. Zinc is an essential food element needed by the body in small amounts. Too little zinc in the diet can lead to poor health, reproductive problems, and lowered ability to resist disease. However, too much zinc can be harmful to human health. The Recommended Dietary Allowances (RDAs) for zinc are 15 mg/day for men and 12 mg/day for women. Ingesting high doses of zinc (10-15 times higher than the RDA), even for a short time, may result in stomach cramps, nausea, and vomiting (ATSDR 1993). The levels of zinc in fish and crabs do not pose a threat to public health. However, based on these data, ingesting approximately two (2) to three (3) ounces of Nueces Bay oysters per day even for a short time could result in acute adverse health effects.

Ingesting high levels of zinc (150 mg/day or more) for several months has been shown to produce copper deficiency and anemia as a result of the intestinal interaction of zinc and copper. Other adverse health effects of chronic excess zinc ingestion include gastric erosion, damage to the pancreas, and decreased levels of high-density lipoprotein (HDL) cholesterol. The Agency for Toxic Substances and Disease Registry (ATSDR) has adopted a chronic oral Minimal Risk Level (MRL) for zinc of 0.3 mg/kg/day. In general, the chronic oral MRL is an estimate of the daily exposure to a substance that is likely to be without appreciable risk of adverse (noncarcinogenic) effects over a chronic duration of exposure. The oral MRL for zinc is equivalent to EPA's reference dose for zinc and is based on hematological effects observed in women given daily supplements of 50 mg zinc as zinc gluconate for 10 weeks (Yadrick et al., 1989). Specifically, the observed effects included decreased hematocrit, serum ferritin, and erythrocyte superoxide dismutase activity. Accounting for a normal dietary intake of zinc, a lowest observable adverse effects level (LOAEL) of 1 mg/kg/day was derived for the most sensitive individuals. This LOAEL was divided by an uncertainty factor of three to derive the MRL. Based on these data, ingesting as little as one (1) ounce of Nueces Bay oysters

per day for 10 weeks would result in a dose that would exceed the LOAEL. Ingesting as little as 0.3 ounces per day would result in a dose greater than the chronic oral MRL. It is important to note that the MRL for zinc does not provide levels of concern for infants, children, or women who are breastfeeding..

CONCLUSIONS

Based on these data:

1. Consumption of fish and crabs from Nueces Bay does not pose any apparent threat to public health.
2. Mercury was found at the highest levels in Speckled Trout. However, the sample set was insufficient to adequately address the public health threat from consumption of this species.
2. Consumption of oysters from Nueces Bay may result in deleterious effects on the the digestive (acute effects) and hematologic systems (intermediate and chronic effects). Although these conclusions are based on a limited number of samples, historic data from composite samples support the finding of high levels of zinc in oysters from this area (930-1,800 mg/kg; mean=1,427; TDH 1994).

RECOMENDATIONS

1. The consumption of oysters from Nueces Bay is not recommended.
2. Collect additional samples of Speckled Trout and analyze for mercury content.

REFERENCES

Yadrick MK, Kenny MA, Winterfelt EA. 1989. Iron, copper, and zinc status: Response to supplementation with zinc or zinc and iron in adult females. *Am J Clin Nutr.* 49:145-150.

Agency for Toxic Substances and Disease Registry. Toxicological Profile for Zinc. Atlanta: ATSDR, May 1994.

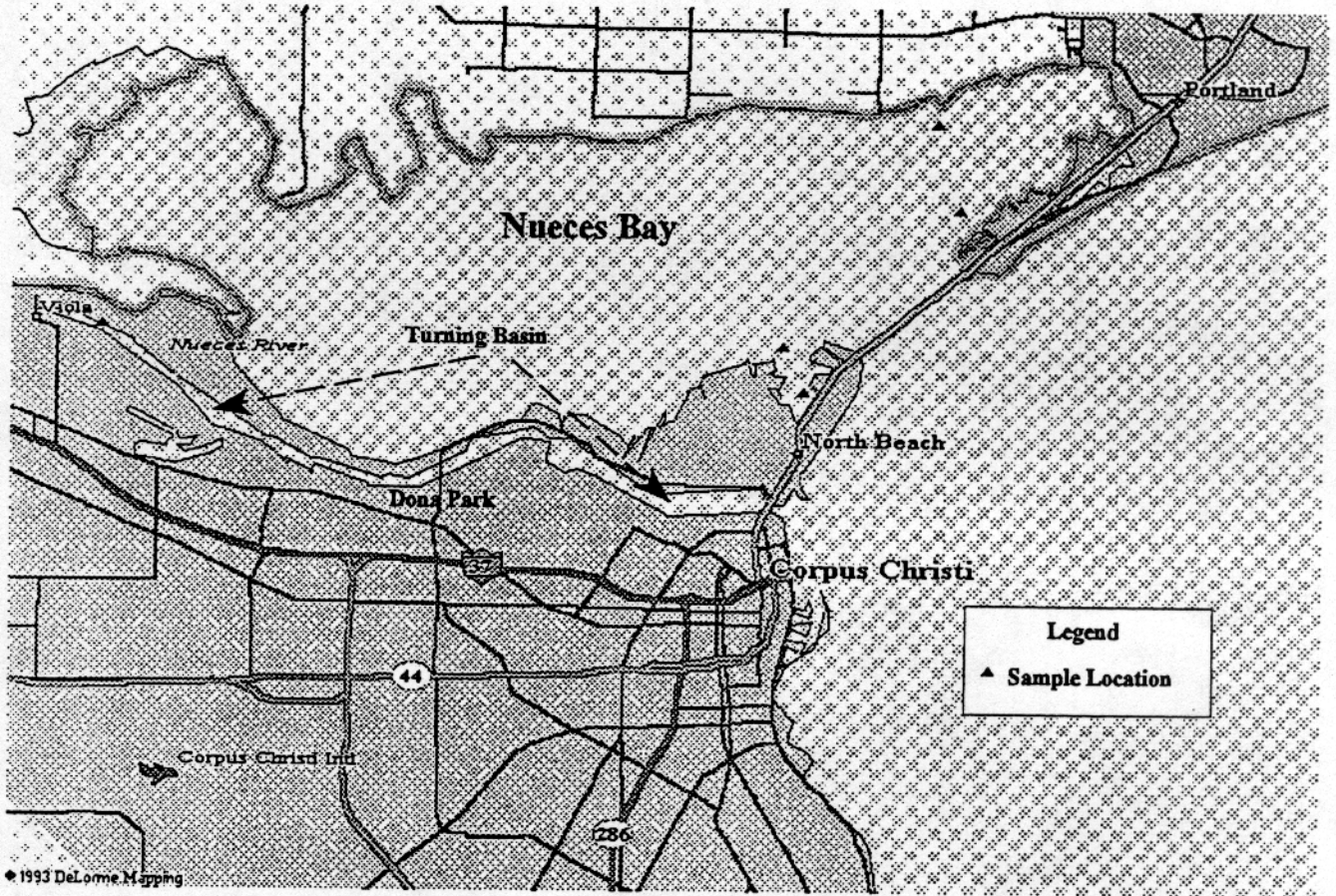
Texas Department of Health. Memorandum to Kirk Wiles from Norman Rice concerning trip report for Nueces Bay and Port of Corpus Christi.

Texas Department of Health. Fish Tissue Sampling Data 1980-1993. Austin: TDH, 1994.

Table 1 Nueces Bay Seafood Tissue Analysis		
Species	Contaminant	Range of Values (µg/kg)
Black Drum (n=11)	Arsenic	0.21 - 6.45
	Cadmium	<0.20
	Copper	<0.20 - 1.02
	Mercury	0.106 - 0.21
	Zinc	4.07 - 8.21
Red Drum (n=1)	Arsenic	0.277
	Cadmium	<0.20
	Copper	0.64
	Mercury	0.150
	Zinc	3.94
Speckled Trout (n=2)	Arsenic	<0.10
	Cadmium	<0.20
	Copper	0.69 - 4.14
	Mercury	0.352 - 0.413
	Zinc	4.52 - 4.64
Flounder (n=2)	Arsenic	0.128 - 0.230
	Cadmium	<0.20
	Copper	<0.20
	Mercury	0.113 - 0.291
	Zinc	3.26 - 3.59
Sheepshead (n=2)	Arsenic	0.140 - 0.147
	Cadmium	<0.20
	Copper	0.82 - 3.25
	Mercury	0.130 - 0.200
	Zinc	4.15 - 6.96
Gafftopsail Catfish (n=1)	Arsenic	0.326
	Cadmium	<0.20
	Copper	1.08
	Mercury	0.176
	Zinc	16.24
Snapper (n=1)	Arsenic	0.178
	Cadmium	<0.20
	Copper	0.24
	Mercury	0.114
	Zinc	3.49
Crab (n=3)	Arsenic	0.259 - 0.514
	Cadmium	<0.20
	Copper	8.80 - 16.91
	Mercury	0.100 - 0.180
	Zinc	50.66 - 75.78
Oyster (n=2)	Arsenic	0.259 - 0.333
	Cadmium	1.16 - 1.92
	Copper	63.22 - 71.83
	Mercury	<0.01
	Zinc	2,294 - 2,483

n = samples collected

Figure 1
Nueces Bay Seafood Sampling Locations



THE FOLLOWING SAMPLES WERE COLLECTED FROM NUECES BAY 08/16/94 THRU 08/18/94

NUECES BAY					
LAND TRACT #	723	LATITUDE	27°50.871 N	LONGITUDE	97°25.560 W
LAND TRACT #	752	LATITUDE	27°51.602 N	LONGITUDE	97°21.412 W
LAND TRACT #	790	LATITUDE	27°52.442 N	LONGITUDE	97°22.033 W
LAND TRACT #	708A	LATITUDE	27°49.600 N	LONGITUDE	97°25.014 W

DATE, SAMPLE #, SPECIES, LENGTH AND WEIGHT, ANALYSIS

08/17/94	NUE 723 - 1	Black Drum	50 cm	2000 gm
08/17/94	NUE 723 - 2	Black Drum	55 cm	2400 gm
08/17/94	NUE 723 - 3	Black Drum	53 cm	2100 gm
08/17/94	NUE 723 - 4	Black Drum	49 cm	2000 gm
08/17/94	NUE 723 - 5	Black Drum	46 cm	1500 gm
08/17/94	NUE 723 - 6	Black Drum	50 cm	1900 gm
08/17/94	NUE 723 - 7	Speckled Trout	37 cm	500 gm
08/17/94	NUE 723-790	Blue Crab	(19 cm, 2-15 cm, 2-12 cm ♂)	
08/17/94	NUE 752 - 1	American Oyster	(25-30 - 3")	
08/16/94	NUE 790 - 1	Black Drum	51 cm	2000 gm
08/16/94	NUE 790 - 2	Black Drum	52 cm	2100 gm
08/16/94	NUE 790 - 3	Black Drum	55 cm	2200 gm
08/16/94	NUE 790 - 4	Southern Flounder	46 cm	1100 gm
08/16/94	NUE 790 - 5	Sheepshead	44 cm	1700 gm
08/16/94	NUE 790 - 6	Sheepshead	36 cm	1000 gm
08/16/94	NUE 790 - 7	Black Drum	47 cm	1500 gm
08/18/94	NUE 708A - 1	American Oyster	(30-40 - 2-3")	

Metals Scan

NUECES BAY LCRA LAB COLLECTED 08/16-18/94
METALS

METALS						
SAMPLE #	ARSENIC	CADMIUM	COPPER	LEAD	MERCURY	ZINC
723-1	0.286**	<0.20	0.34	<1.0	0.169	6.54
723-2	0.351	<0.20	0.93	<1.0	0.210	4.94
723-3	0.514	<0.20	1.02	<1.0	0.203	5.33
723-4	0.687	<0.20	0.40	<1.0	0.179	7.04
723-5	0.219	<0.20	0.55	<1.0	0.172	8.21
723-6	0.280	<0.20	0.49	<1.0	0.171	6.96
723-7	<0.1	<0.20	0.69	<1.0	0.413	4.64
723-790	0.259	<0.20	8.80	<1.0	0.180	50.66
752-1	0.259	1.92	63.22	<1.0	<0.010	2293.99
790-1	0.465	<0.20	0.71	<1.0	0.179	4.47
790-2	0.604	<0.20	0.56	<1.0	0.201	5.12
790-3	0.307	<0.20	0.32	<1.0	0.192	3.77
790-4	0.128	<0.20	<0.20	<1.0	0.291	3.26
790-5	0.147	<0.20	3.25	<1.0	0.200	6.96
790-6	0.140	<0.20	0.82	<1.0	0.130	4.15
790-7	0.384	<0.20	<0.20	<1.0	0.131	4.07
708A-1	0.333	1.16	71.83	<1.0	<0.010	2482.66

** - Parts Per Million (mg/kg)

APPENDIX D

LIST OF ABBREVIATIONS/ACRONYMS

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BEG	Bureau of Economic Geology
CBBF	Coastal Bend Bays Foundation
CCBNEP	Corpus Christi Bay National Estuary Program
cfu	Colony Forming Unit
dL	Deciliter (=100 mL)
EPA (USEPA)	U.S. Environmental Protection Agency
FC	Fecal Coliforms
GIS	Geographic Information System
GIWW	Gulf Intracoastal Waterway
GLO	Texas General Land Office
MF	Membrane Filter
MPN	Most Probable Number
MRL	Minimum Risk Level
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NSSP	National Shellfish Sanitation Program
QA	Quality Assurance
PH&S	Public Health and Safety
PSP	Paralytic Shellfish Poison
Svs	Screening Values
TAMU-CC	Texas A&M University - Corpus Christi
TC	Total Coliforms
TDWR	Texas Department of Water Resources
TNRCC	Texas Natural Resource Conservation Commission
TNTC	Too Numerous to Count
TPWD	Texas Parks and Wildlife Department
TWC	Texas Water Commission
TWDB	Texas Water Development Board
USCE	U.S. Army Corps of Engineers
USGS	United States Geological Survey
USFWS	United States Fish and Wildlife Service
UTMSI	University of Texas Marine Science Institute