TEXAS DEPARTMENT OF HEALTH
SEAFOOD SAFETY DIVISION

RESULTS AND RISK ANALYSIS FOR FISH TISSUE

COLLECTED FROM

FOSDIC LAKE

MARCH 30, 1995

METALS IN FISH TISSUE TAKEN FROM FOSDIC LAKE

SAMPLE	ARSENIC	CADMIUM	COPPER	LEAD	MERCURY	ZINC
	DETECTION LIMIT (ppm)					
	0.1	0.2	0.2	1.0	0.01	0.4
LARGEMOUTH BASS 49 cm	nd	nd	0.22	nd	0.463	4.0
LARGEMOUTH BASS 40 cm	nd	nd	3.62	nd	0.280	5.63
LARGEMOUTH BASS 40 cm	nd	nd	0.22	nd	0.271	3.28
LARGEMOUTH BASS 44 cm	nd	nd	1.46	nd	0.234	12.0
WHITE CRAPPIE 22 cm	nd	nd	0.34	nd	0.160	14.35
WHITE CRAPPIE 24 cm	0.105	nd	0.57	nd	0.171	14.2
CHANNEL CATFISH 22 cm 22 cm	nd	nd	0.54	nd	nd	10.09

PESTICIDES IN FISH TISSUE TAKEN FROM FOSDIC LAKE

Pesticide	Detection Limit (ppb)	Largemouth Bass; 49 cm
		CONCENTRATION (PPB)
DDT	10	nd*
DDD	10	nd
DDE	5	54
op'DDE	5	nd
ALDRIN	2	nd
DIELDRIN	6	13
ENDRIN	6	nd
CHLORDANE	10	350
HEPTACHLOR	2	nd
HEPTACHLOR EPOX	4	nd
METHOXYCHLOR	30	nd
TOXAPHENE	100	nd
HEXACHLOROBENZENE	2	nd
MALATHION	20	nd
ETHYL PARATHION	10	nd
METHYL PARATHION	10	nd
DIAZINON	10	nd
CHLOROPYRIFOS	10	nd
ENDOSULFAN	10	nd
ENDOSULFAN SULFATE	10	nd
ALACHLOR	8	nd
DACTHAL	3	nd
ALPHA BHC	2	nd
BETA BHC	2	nd
DELTA BHC	2	nd
LINDANE	2	nd

*non-detectable

PCB'S IN FISH TISSUE TAKEN FROM FOSDIC LAKE

PCB Aroclor	Detection Limit (ppb)	Largemouth Bass; 49 cm
		CONCENTRATION (PPB)
1016	40	nd*
1221	40	nd
1232	40	nd
1242	40	nd
1248	40	nd
1254	40	nd
1260	40	190
1262	40	nd

*non-detectable

Data Summary

Chemical	Average Concentration (ppm)
Chlordane	0.350
DDE	0.054
Dieldrin	0.013
PCB Aroclor 1260	0.190
arsenic	0.015
copper	0.996
mercury	0.226
zinc	9.07

CARCINOGENIC RISK

CHEMICAL	CONCENTRATION (ppm)	CANCER RISK
Chlordane	0.350	0.83×10^{-4}
DDE	0.054	3.37×10^{-6}
Dieldrin	0.013	3.8×10^{-5}
Aroclor 1260	0.190	2.69×10^{-4}
Cumulative Cancer Risk		**3.94×10^{-4}**

Chlordane, DDE, dieldrin, and aroclor 1260 are all classified as (B2) probable human carcinogens, based on increased incidence of hepatic carcinoma in laboratory animals. Persons consuming fish from Fosdic Lake may be exposed to a number of these chemicals simultaneously. Since each of these chemicals is capable of inducing the same health effect (liver cancer), the risk is additive for all four. The cumulative risk is based on a 70 kg adult consuming one meal per week for a period of 30 years.

NONCARCINOGENIC RISK

CHEMICAL	CONCENTRATION (ppm)	HAZARD INDEX
Chlordane	0.350	2.5
Dieldrin	0.013	0.1
HAZARD RATIO		**2.6**

The hazard ratio is a ratio of the calculated dose to reference dose. The reference dose is defined as the level unlikely to cause significant adverse health effects associated with a threshold mechanism of action in humans exposed over a lifetime. Hazard ratios are summed across similarly acting chemicals.

Adverse liver effects formed the basis for RfD's for chlordane and dieldrin. Reference doses have not been established for Aroclor 1260 or DDE and are not based on toxic effects to the liver for the metals detected. At an average consumption rate of 30 grams per day, over a period of 30 years, the levels of chlordane and dieldrin in fish tissue exceed the RfD by 2.6 times for adverse effects on the liver. The level of dieldrin is 10 times below the reference dose. The level for PCB's is 2.5 times above the reference dose.

Short term, high dose exposure to chlordane can also cause neurotoxicity, including symptoms of hyperexcitability, dizziness, headache, convulsions, depression, and muscle tremors. Chronic exposure can result in liver lesions and blood disorders, such as anemia. Chlordane has a high potential for bioaccumulation.

Toxicological effects for aroclor 1260 can include liver damage, stomach, thyroid, and kidney damage, porphyria, reproductive and immunosuppressive effects. DDE and metals were not found at levels of public health concern.

SUMMARY

Fosdic Lake is a small urban storm drain retention pond located in a highly populated, older residential area of Fort Worth. In the summer of 1994, the city of Fort Worth conducted initial sampling of several urban storm drainage ponds being stocked with fish as part of an urban fisheries program. In response to high levels of chlordane and other contaminants of concern, the City requested that TDH conduct additional sampling of Fort Worth reservoirs.

Seven samples, including largemouth bass, white crappie, and channel catfish were collected from Fosdic Lake. Six samples were analyzed for metals only and one bass was analyzed for metals, PCB's and pesticides. Metal levels were not of public health concern. PCB aroclor 1260 was found at 190 ppb and chlordane was found at 350 ppb. DDE and dieldrin were found at lower levels, but were considered in overall cancer risk.

The limited data in this analysis indicate that a person consuming Fosdic Lake fish would be exposed to a number of chemical contaminants simultaneously that will primarily affect the liver and nervous system. Carcinogenic risk to the liver is calculated as 4 in 10,000 persons exposed to one meal per week for 30 years. The consumption limit for a $1x10^{-4}$ risk level is 0.43 meals per month.

The EPA recommended dose for noncarcinogenic effects on the liver, such as liver lesions was exceeded by 2.5 times, due to chlordane and dieldrin for persons consuming an average of one meal per week of Fosdic Lake fish over a period of 30 years. Chlordane and aroclor 1260 may also cause adverse effects on the nervous system at these levels.

The risk level for Fosdic Lake exceeds TDH criteria for issuance of a fish consumption advisory. The number of samples used in this risk assessment is extremely limited; however, it should be considered that initial sampling by Fort Worth has previously indicated high levels of chlordane and PCB's in their urban ponds. Similar environmental conditions exist in an additional pond sampled by TDH which also resulted in high levels of chlordane and aroclor 1260.