APPENDIX A
FISH CONSUMPTION ADVISORY

M. J. "Mike" Foster, Jr.
GOVERNOR

Bobby P. Jindal
Secretary
Department of Health & Hospitals
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Department of Wildlife & Fisheries
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The following fish consumption advisory was issued on 9-4-97 by the Department of Health and Hospitals, the Department of Environmental Quality, and the Department of Wildlife and Fisheries. For more information, please contact:

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FISH CONSUMPTION ADVISORY FOR KING MACKEREL IN THE GULF OF MEXICO OFF THE COAST OF LOUISIANA

Based on fish sampling in the Gulf of Mexico off of the coast of Louisiana, unacceptable levels of mercury have been detected in King Mackerel. Elevated levels of mercury have also been found in King Mackerel taken from Gulf Coast waters off of Florida, Alabama, Mississippi and Texas. Florida, Alabama and Texas have recently issued similar fish consumption advisories. The Louisiana Department of Health & Hospitals, Department of Environmental Quality, and Department of Wildlife & Fisheries advise that the following precautions be taken when eating King Mackerel taken off the coast of Louisiana.

For King Mackerel 39 inches or less in total length (distance from the outermost portion of the snout to the outermost portion of the caudal fin):

- **Pregnant women, breast-feeding women and children less than 7 years of age should limit consumption to one meal per month. (A meal is considered to be a half a pound of fish for adults and children.)**
- **Non-pregnant women, men, and children 7 years of age or older should limit consumption to four meals per month.**

For King Mackerel greater than 39 inches in total length:

- **No consumption (all individuals)**

Each state's advisory differs slightly as to length of fish listed in the advisory. This resulted from each state using data from fish caught off their own coast.

Mercury is an element that occurs naturally in the environment. It is released into the atmosphere through natural processes and human activities. Consequently, there are small amounts of mercury in lakes, rivers and oceans. Nearly all fish contain trace amounts of mercury. They absorb mercury from the water and sediment as they feed on aquatic organisms. Larger predator fish contain more mercury than smaller fish. Therefore, it is recommended that smaller fish be consumed instead of larger ones.

People are exposed throughout their lives to low levels of mercury. One way they can be exposed to mercury is from eating contaminated fish. Health effects from harmful levels of mercury can include nervous system and kidney damage. Developing fetuses are more sensitive to the toxic effects of mercury, especially in the first trimester. In addition to developing fetuses, infants and children are more sensitive to the effects of mercury, therefore, consumption advisories are issued at lower tissue concentration levels for these groups.

This advisory is issued as a precaution. Further sampling will be carried out by LDEQ to determine the need for modifications to this advisory. If you have consumed King Mackerel from these waters, it is not likely that there is an immediate need to be concerned about the effect of mercury. For specific symptoms, though, your own physician should be consulted.

Jimmy Guidry, M.D.
State Health Officer and Assistant Secretary
Department of Health and Hospitals

Bobby P. Jindal
Secretary
Department of Health and Hospitals

James H. Jenkins, Jr.
Secretary
Department of Wildlife and Fisheries

J. Dale Givens
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Department of Environmental Quality

APPENDIX B
FISH TISSUE DATA FROM GULF OF MEXICO

Appendix B
Gulf of Mexico Fish Tissue Data

Subsegment	Site	Description	Date	Result (mg/kg)	Fish Species
010901	1251	Gulf of Mexico, Eugene Island 250, Louisiana	06/01/02	0.4728	Greater Amberjack
021102	0568	Gulf of Mexico south-southeast of Grand Isle, Louisiana	12/03/96	1.6730	King Mackerel
			12/03/96	0.4170	King Mackerel
			12/03/96	2.2020	King Mackerel
			12/03/96	0.5540	King Mackerel
			12/03/96	0.7260	King Mackerel
			12/03/96	0.3300	King Mackerel
	0646	Gulf of Mexico, WD-41, south of Chaland Pass, Louisiana	09/09/97	0.0200	Red Snapper
	0644	Gulf of Mexico, Sulphur Mine, Louisiana	09/17/97	0.0130	Cobia
			09/17/97	0.1810	Cobia
			10/01/97	0.1850	Cobia
			10/21/97	0.2000	Jack Crevalle
			10/21/97	0.2140	Spanish Mackerel
	0719	Gulf of Mexico, WD-40, Louisiana	02/24/98	0.0767	Red Drum
			02/24/98	0.0452	Red Drum
			02/24/98	0.0486	Lane Snapper
			02/24/98	0.3053	Red Drum
	0752	Gulf of Mexico, West Delta Block 93E, Louisiana	07/08/98	0.0776	Red Snapper
	0858	Gulf of Mexico, West Delta Block 21, Louisiana	06/02/99	0.0985	Spotted Seatrout
			06/02/99	0.1478	Spotted Seatrout
			06/02/99	0.2885	Spotted Seatrout
031201	0751	Gulf of Mexico, West Cameron Block 171, Louisiana	7/16/1998	0.2913	Spanish Mackerel
			7/16/1998	0.7975	King Mackerel
	0750	Gulf of Mexico, West Cameron Block 110, Louisiana	7/16/1998	0.3219	Spanish Mackerel
	0751	Gulf of Mexico, West Cameron Block 171, Louisiana	7/16/1998	0.1833	Spanish Mackerel
			7/16/1998	1.0577	King Mackerel
			7/16/1998	0.4999	King Mackerel
			7/16/1998	0.2904	Spanish Mackerel
			7/16/1998	0.5355	King Mackerel
			7/16/1998	1.1826	King Mackerel
			7/16/1998	0.4656	Spanish Mackerel

Appendix B
Gulf of Mexico Fish Tissue Data

Subsegment	Site	Description	Date	Result (mg/kg)	Fish Species
031201	0852	Calcasieu River Coastal Waters Southeast of Cameron Jetties, Louisiana	8/23/1998	0.0677	Red Drum
			8/23/1998	0.0784	Spotted Seatrout
			8/23/1998	0.1401	Spotted Seatrout
			8/23/1998	0.1016	Spotted Seatrout
			8/23/1998	0.1198	Spotted Seatrout
			8/23/1998	0.1003	Spotted Seatrout
	0877	Gulf of Mexico, West Cameron Block 140, Louisiana	7/22/1999	0.0697	Tripletail
			7/22/1999	0.8103	Red Drum
			7/22/1999	0.0409	Tripletail
			7/22/1999	0.0462	Tripletail
			7/22/1999	0.1509	Florida Pompano
	0750	Gulf of Mexico, West Cameron Block 110, Louisiana	7/20/2000	0.1483	Red Snapper
			7/20/2000	0.1325	Red Snapper
			7/20/2000	0.1118	Red Snapper
			7/20/2000	0.2723	Cobia
			7/20/2000	1.6780	King Mackerel
			7/20/2000	1.6850	King Mackerel
	0751	Gulf of Mexico, West Cameron Block 171, Louisiana	8/20/2001	0.2507	Spanish Mackerel
			8/20/2001	1.0547	King Mackerel
			8/20/2001	0.1334	King Mackerel
			8/20/2001	0.4317	King Mackerel
			8/20/2001	0.1515	King Mackerel
042209	0546	Breton Sound near blk 25, Louisiana	09/05/96	0.776	Cobia
050901	1023	Gulf of Mexico near ERC Rig-EC38A, Louisiana	07/09/00	1.0180	King Mackerel
	1029	Gulf of Mexico, West Cameron 181, Louisiana	07/26/00	0.4383	King Mackerel
			07/26/00	0.5207	King Mackerel
			07/26/00	1.3220	King Mackerel
			07/26/00	0.8747	King Mackerel
			07/26/00	0.9147	King Mackerel
	1133	Gulf of Mexico near EC rig 89, Louisiana	06/23/01	0.7343	King Mackerel
	1690	Gulf of Mexico, LDWF Zone 1	05/13/02	0.0800	Dolphin Fish
			07/06/02	0.6433	Greater Amberjack
			07/06/02	0.7745	Greater Amberjack

Appendix B
Gulf of Mexico Fish Tissue Data

Subsegment	Site	Description	Date	Result (mg/kg)	Fish Species
050901			07/06/02	0.4028	Warsaw Grouper
			07/06/02	0.6152	Blackfin Tuna
			07/06/02	3.2170	King Mackerel
			07/06/02	1.0780	Greater Amberjack
			07/06/02	1.6260	King Mackerel
			07/06/02	0.2295	Red Snapper
			07/06/02	2.1670	Cobia
			07/06/02	0.1809	Dolphin Fish
			07/06/02	0.2489	Dolphin Fish
			07/06/02	1.5250	King Mackerel
			07/07/02	0.7723	Blackfin Tuna
			07/07/02	0.3132	Red Snapper
			07/07/02	0.4765	Scamp Grouper
			07/07/02	0.8296	Cobia
			07/07/02	1.6700	Blackfin Tuna
			07/07/02	0.3145	Dolphin Fish
			07/07/02	1.9770	Cobia
			07/07/02	0.4958	Warsaw Grouper
			07/07/02	0.4188	Red Snapper
	2192	Gulf of Mexico, Vermilion Block 318, Louisiana	03/15/03	0.4655	Wahoo
			03/15/03	1.2050	King Mackerel
			03/15/03	1.2020	King Mackerel
			03/15/03	0.7092	King Mackerel
	2621	Gulf of Mexico, Vermilion Block 245, Louisiana	06/15/03	2.2210	King Mackerel
			06/15/03	2.3190	King Mackerel
			06/15/03	0.4320	Greater Amberjack
	1690	Gulf of Mexico, LDWF Zone 1	07/05/03	0.2665	Dolphin Fish
			07/05/03	0.1934	Red Snapper
			07/05/03	0.0559	Dolphin Fish
			07/05/03	0.0603	Dolphin Fish
			07/05/03	0.9320	Red Snapper
			07/05/03	0.8196	Greater Amberjack
			07/05/03	0.1972	Red Snapper
			07/05/03	0.5763	Greater Amberjack
			07/05/03	0.5069	Cobia
			07/05/03	0.7043	Cobia

Appendix B
Gulf of Mexico Fish Tissue Data

Subsegment	Site	Description	Date	Result (mg/kg)	Fish Species
050901			07/05/03	0.6613	Greater Amberjack
			07/05/03	0.1118	Red Snapper
			07/05/03	0.8038	King Mackerel
			07/05/03	0.4264	Greater Amberjack
			07/05/03	0.9107	King Mackerel
			07/05/03	1.7190	King Mackerel
			07/05/03	1.5550	King Mackerel
			07/06/03	0.1150	Yellowfin Tina
			07/06/03	0.2436	Blackfin Tuna
			07/06/03	0.9595	Blackfin Tuna
			07/06/03	0.1203	Yellowfin Tina
			07/06/03	0.6068	Cobia
			07/06/03	0.0828	Cobia
			07/06/03	0.0626	Dolphin Fish
			08/04/03	0.4742	Yellowedge Grouper
			08/04/03	0.4519	Scamp Grouper
			08/04/03	0.6573	Scamp Grouper
			08/04/03	0.5693	Scamp Grouper
061201	0703	Gulf of Mexico, Tete-Butte Reef, Louisiana	04/14/98	0.0218	Spotted Seatrout
			04/14/98	0.0673	Croaker
			05/04/98	0.0558	Spotted Seatrout
			05/04/98	0.0717	Spotted Seatrout
			05/20/98	0.1145	Spotted Seatrout
			06/23/98	0.1614	Spotted Seatrout
	0748	Gulf of Mexico, Diamond Reef, Louisiana	06/23/98	0.0894	Spotted Seatrout
			06/23/98	0.1338	Spotted Seatrout
			06/23/98	0.4557	Spotted Seatrout
	0703	Gulf of Mexico, Tete-Butte Reef, Louisiana	07/07/98	0.2436	Spotted Seatrout
	0749	Gulf of Mexico, South Marsh Island Block 6, Louisiana	07/24/98	0.5155	King Mackerel
			07/24/98	0.5951	King Mackerel
			07/24/98	0.9533	King Mackerel
			07/24/98	0.4421	King Mackerel
			07/24/98	0.6505	King Mackerel
			07/24/98	0.7036	King Mackerel

Appendix B
Gulf of Mexico Fish Tissue Data

Subsegment	Site	Description	Date	Result (mg/kg)	Fish Species
061201			07/24/98	0.7018	King Mackerel
	0703	Gulf of Mexico, Tete-Butte Reef, Louisiana	08/10/98	0.0953	Spotted Seatrout
070601	0569	Gulf of Mexico south of Grand Isle in West Delta Block 143, Louisiana	11/06/96	0.7130	King Mackerel
	0634	Gulf of Mexico, Southwest Pass, Louisiana	09/18/97	1.3860	King Mackerel
	0914	Gulf of Mexico, South of Southwest Pass, Louisiana	09/14/99	0.9667	King Mackerel
			09/14/99	1.3886	King Mackerel
			09/14/99	0.8910	King Mackerel
			09/14/99	2.3284	King Mackerel
			09/14/99	1.9466	King Mackerel
			09/14/99	0.6481	King Mackerel
	0569	Gulf of Mexico south of Grand Isle in West Delta Block 143, Louisiana	02/12/01	1.0400	Blackfin Tuna
			02/12/01	0.3281	Blackfin Tuna
	1692	Gulf of Mexico, LDWF Zone 3	07/07/02	0.0860	Red Snapper
			07/07/02	0.0866	Red Snapper
			07/27/02	0.1546	Cobia
			07/27/02	0.4869	Cobia
			07/27/02	0.4422	Cobia
			08/10/02	0.6854	King Mackerel
			08/10/02	3.3880	King Mackerel
			08/10/02	5.9040	King Mackerel
			08/11/02	2.4840	King Mackerel
			08/14/02	0.5939	Warsaw Grouper
			08/18/02	0.0947	Dolphin Fish
			08/18/02	0.1095	Dolphin Fish
			08/18/02	0.6538	King Mackerel
			08/18/02	1.0480	Blackfin Tuna
			08/20/02	0.2567	Yellowfin Tuna
			08/20/02	0.2692	Yellowfin Tuna
			08/20/02	0.1211	Red Snapper
			08/21/02	0.4941	Greater Amberjack
			08/21/02	0.5201	Greater Amberjack
			08/21/02	0.9254	Greater Amberjack
			08/24/02	0.0705	Dolphin Fish

Appendix B
Gulf of Mexico Fish Tissue Data

Subsegment	Site	Description	Date	Result (mg/kg)	Fish Species
070601			08/24/02	0.0568	Dolphin Fish
			08/24/02	0.2899	Warsaw Grouper
			02/13/03	0.7127	King Mackerel
			02/13/03	1.4270	Blackfin Tuna
			02/13/03	0.7456	Blackfin Tuna
			02/13/03	0.7074	Blackfin Tuna
			02/13/03	1.0340	Blackfin Tuna
			05/15/03	0.0602	Red Snapper
			05/15/03	0.0559	Red Snapper
			05/15/03	0.0560	Red Snapper
			05/15/03	0.0597	Red Snapper
			05/20/03	0.5326	King Mackerel
			05/20/03	0.2792	Cobia
			05/20/03	0.2622	Greater Amberjack
			05/20/03	0.2211	Gag Grouper
			06/08/03	0.0829	Gag Grouper
			06/08/03	0.1340	Gag Grouper
			06/08/03	0.6355	Cobia
			06/08/03	0.1685	Cobia
			06/09/03	0.6451	Cobia
			06/09/03	0.4456	Greater Amberjack
			06/09/03	0.2116	Greater Amberjack
			06/14/03	0.7262	Greater Amberjack
			06/18/03	0.4201	Greater Amberjack
			06/18/03	0.3795	King Mackerel
			06/18/03	0.7178	King Mackerel
			07/25/03	0.2730	Dolphin Fish
			07/25/03	0.0766	Dolphin Fish
			07/25/03	0.0734	Dolphin Fish
			07/25/03	0.4136	Dolphin Fish
			06/10/04	0.4847	Red Snapper
			06/10/04	0.8464	Red Snapper
			06/10/04	0.8732	Blackfin Tuna
			06/10/04	0.1174	Scamp Grouper

Appendix B
Gulf of Mexico Fish Tissue Data

Subsegment	Site	Description	Date	Result (mg/kg)	Fish Species
120806	0567	Gulf of Mexico south-southwest of Grand Isle, Louisiana	10/29/96	0.5190	King Mackerel
	0643	Gulf of Mexico, ST-128, south of Devils Island, Louisiana	09/18/97	0.4390	King Mackerel
			10/29/97	0.8260	King Mackerel
	1691	Gulf of Mexico, LDWF Zone 2	05/24/02	1.0850	Blackfin Tuna
			05/24/02	0.2211	Red Snapper
			05/24/02	0.7400	King Mackerel
			05/24/02	3.0280	Cobia
			05/24/02	0.3446	Greater Amberjack
			05/24/02	0.9342	Cobia
			05/24/02	3.0540	King Mackerel
			05/24/02	0.7458	Red Snapper
			05/24/02	0.0536	Red Snapper
			05/24/02	0.4775	Warsaw Grouper
			05/24/02	0.2036	Warsaw Grouper
			05/24/02	2.1090	Cobia
			05/24/02	1.6550	King Mackerel
			05/24/02	0.2768	Gag Grouper
			06/09/02	0.2697	Greater Amberjack
			06/09/02	0.2969	Greater Amberjack
			05/23/03	1.1280	King Mackerel
			05/23/03	1.1790	Red Snapper
			05/23/03	2.6420	King Mackerel
			05/23/03	0.0805	Red Snapper
			05/23/03	0.7630	Greater Amberjack
			05/23/03	0.6554	Red Snapper
			05/23/03	2.0430	King Mackerel
			05/23/03	1.6240	Cobia
			05/23/03	0.8323	Blackfin Tuna
			05/23/03	0.8799	Blackfin Tuna
			05/24/03	0.5569	Red Snapper
			05/24/03	0.3892	Warsaw Grouper
			05/24/03	1.1770	Blackfin Tuna
			05/24/03	0.1798	Gag Grouper
			05/24/03	0.0888	Dolphin Fish

Appendix B
Gulf of Mexico Fish Tissue Data

Subsegment	Site	Description	Date	Result (mg/kg)	Fish Species
120806			05/29/04	0.0184	Dolphin Fish
			05/29/04	0.1937	Greater Amberjack
			05/29/04	0.8018	Greater Amberjack
			05/29/04	0.1310	Yellowedge Grouper
			05/29/04	0.1928	Greater Amberjack

Result = mg/kg wet weight

Appendix B
Gulf of Mexico Fish Tissue Data

Subsegment	Site	Description	Date	Result (mg/kg)	Fish Species
120806			05/24/03	0.7913	Gag Grouper
			05/24/03	0.5129	Greater Amberjack
			05/24/03	0.0831	Dolphin Fish
			05/24/03	1.6310	King Mackerel
			05/24/03	0.9174	Cobia
			05/24/03	1.4170	Cobia
			05/24/03	0.0713	Dolphin Fish
			05/24/03	0.7460	Greater Amberjack
			05/24/03	0.7529	Blackfin Tuna
			05/24/03	0.9447	Greater Amberjack
			05/24/03	2.6820	Cobia
			05/24/03	0.5025	Gag Grouper
			05/24/03	0.0834	Dolphin Fish
			05/28/04	0.4704	Red Snapper
			05/28/04	0.5817	Cobia
			05/28/04	2.7860	Cobia
			05/28/04	0.5124	King Mackerel
			05/28/04	1.1440	King Mackerel
			05/28/04	1.5790	King Mackerel
			05/28/04	1.6070	King Mackerel
			05/28/04	0.6818	Red Snapper
			05/28/04	0.2789	Gag Grouper
			05/28/04	0.0992	Blackfin Tuna
			05/28/04	0.3788	Red Snapper
			05/28/04	0.4868	Blackfin Tuna
			05/28/04	0.1552	Blackfin Tuna
			05/28/04	0.0781	Yellowfin Tuna
			05/28/04	0.8833	Cobia
			05/28/04	0.5504	Cobia
			05/29/04	0.6803	Greater Amberjack
			05/29/04	0.3785	Scamp Grouper
			05/29/04	0.4089	Warsaw Grouper
			05/29/04	0.4281	Red Snapper
			05/29/04	0.0399	Dolphin Fish
			05/29/04	0.0167	Dolphin Fish
			05/29/04	0.3555	Dolphin Fish

APPENDIX C
LIST OF NPDES DISCHARGERS FROM PERMIT COMPLIANCE SYSTEM

Appendix C-1
Atachafalaya River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0089699	4952	BERWICK	SAINT MAR			0.5
LA0074292	4952	KROTZ SPR	SAINT LAN	KROTZ SPRINGS CITY OF		0.162
LA0065340	4952	MELVILLE	SAINT LAN	MELVILLE TOWN OF (STP)		0.25
LA0065986	4952	MORGAN CI	SAINT MAR	MORGAN CITY CITY OF (STP)	Major	4.5
LA0040193	4952	JEANERETT	IBERIA	CITY OF JEANERETTE	Major	1.32
LA0039152	4952	SIMMESPOR	AVOYELLES	SIMMESPORT TOWN OF (WWTP)		0.242
LA0110922	1389	PATTERSON	SAINT MAR	HYDROCARBON FLOW SPECIALIST IN		0
LA0092614	1389	MORGAN CI	SAINT MAR	DIAMOND TANK RENT-BAYOU VISTA		0.5
LA0070424	1389	MORGAN CI	SAINT MAR	CAMPBELL WELLS CORP. BATEMAN		0.5
LA0116301	1781	VIDALIA	CONCORDIA			0
LA0082279	3081	BATCHELOR	POINTE CO	NANYA PLASTICS AND J-M MFG CO		0.5
LA0101567	4225	MORGAN CI	SAINT MAR	TKO SERVICES		0.5
LA0078166	4952	LAFAYETTE	LAFAYETTE	ATCHAFALAYA ACRES		0.037
LA0096032	5171	KROTZ SPR	SAINT LAN	CABOT CORP		0.5

Appendix C-1
Barataria River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0032131	4952	LULING	SAINT CHA	ST. CHARLES PH-LULING STP	Major	2.6
LA0100846	4952	JEFFERSON	JEFFERSON	JEFFERSON PH. DEPT - ROSETHORN		0.9
LA0073954	3412	JEFFERSON	JEFFERSON	EVANS COOPERAGE	Major	0.0136
LA0038059	4952	WESTWEGO	JEFFERSON	CITY OF WESTWEGO	Major	2.77
LA0002143	1321	PARADIS	SAINT CHA	BRIDGELINE GAS - PARADIS		0.5
LA0058629	1389	HARVEY	JEFFERSON	NABORS OFFSHORE CORP		0.5
LA0076490	1389	LAFOURCHE	LAFOURCHE	M I DRILLING FLUIDS-FOURCHON		0.5
LA0089249	1389	HARVEY	JEFFERSON			0.5
LA0103977	1389	BELLE CHA	PLAQUEMIN	VERSABAR-BELLE CHASSE		0.5
LA0105937	1389	HARVEY	JEFFERSON	CHET MORRISON GENERAL CONTRACT		0.5
LA0106879	1389	BELLE CHA	PLAQUEMIN	TECHNICAL COMPRESSION SERVICES		0.5
LA0000035	2061	THIBODAUX	LAFOURCHE	S. LA. SUGAR COOPERATIVE INC.		0.5
LA0103225	2061	GRETNA	JEFFERSON	CROMPTON & KNOWLES		0.5
LA0003221	2077	EMPIRE	PLAQUEMIN	DAYBROOK FISHERIES INC		0.5
LA0003930	2091	HARVEY	JEFFERSON	SOUTHERN SHELLFISH - HARVEY		0.5
LA0006742	2091	WESTWEGO	JEFFERSON	LOUISIANA NEWPACK SHRIMP CO.		0.5
LA0104914	2091	GOLDEN ME	LAFOURCHE	YANKEE CANAL SEAFOOD		0.5
LA0110850	2091	EMPIRE	PLAQUEMIN	DBA FLOYDS SEAFOOD		0
LA0052698	2092	GOLDEN ME	LAFOURCHE	ST VINCENT GULF SHRIMP INC		0.5
LA0058441	2092	LAFITTE	JEFFERSON	LAFITTE FROZEN FOODS INC		0.5
LA0089397	2092	ALLEMANDS	SAINT CHA	FOUR R ENTERPRISE		0.5
LA0096661	2092	GOLDEN ME	LAFOURCHE	LA SHRIMP & PACKING CO		0.5
LA0105147	2092	GOLDEN ME	LAFOURCHE	MARGIE'S SEAFOOD		0.5
LA0001376	2493	MARRERO	JEFFERSON	MARRERO PROPERTY LLC		0.5
LA0006131	2621	LOCKPORT	LAFOURCHE	VALENTINE PAPER	Major	2.43
LA0087327	2821	BELLE CHA	PLAQUEMIN	SUN DRILLING PROD-BELLE CHASSE		0.5
LA0084123	3479	BELLE CHA	PLAQUEMIN	HOBSON GALVANIZING INC		0.5
LA0054496	3533	HARVEY	JEFFERSON	PETREX INC		0.5
LA0104736	3533	BELLE CHA	PLAQUEMIN	FLUID SYSTEMS		0.5
LA0115541	3599	LAROSE	LAFOURCHE			0
LA0007137	3731	HARVEY	JEFFERSON	BOLLINGER QUICK/AVONDALE INDUS		0.5
LA0084069	3731	LOCKPORT	LAFOURCHE	BOLLINGER SHIPYARD LOCKPORT		0.5
LA0100510	3731	LAFITTE	JEFFERSON	LASH MARINE SERVICES INC.		0.5
LA0102989	3731	LOCKPORT	LAFOURCHE	HALTER MARINE GRP INC		0.5

Appendix C-1
Barataria River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0103799	3731	HARVEY	JEFFERSON	GRETNA MACHINE & IRON WORKS		0.5
LA0104051	3731	LAFOURCHE	LAFOURCHE	BOLLINGER FOURCHON INC.		0.5
LA0105856	3731	LAROSE	LAFOURCHE	NORTH AMERICAN SHIPBUILDING IN		0.5
LA0106542	3731	HARVEY	JEFFERSON	TOTAL MARINE SVC OF JEFFERSON		0.5
LA0108944	3731	BELLE CHA	PLAQUEMIN	MARMAC CORP		0.5
LA0103110	3732	HARVEY	JEFFERSON	OCEAN TECH. SVCS.		0.5
LA0106488	3732	EMPIRE	PLAQUEMIN	PLAQUEMINES PH GOVERNMENT		0.5
LA0056600	4226	HARVEY	JEFFERSON			0.5
LA0075981	4226	AVOYELLES	AVOYELLES	INTERNATIONAL MATEX TANK TERMI		0.5
LA0089940	4226	SAINT JAM	SAINT JAM			0.5
LA0102865	4491	LAFITTE	JEFFERSON	BARNETT MARINE		0.5
LA0112453	4491	LAFOURCHE	LAFOURCHE	NATURES ULTIMATE SYS INC		0
LA0102881	4492	ALGIERS	ORLEANS	CRESCENT TOWING & SALVAGE		0.5
LA0075191	4493	ORLEANS P	ORLEANS			0.5
LA0110957	4499	GOLDEN ME	LAFOURCHE			0
LA0090689	4581	PLAQUEMIN	IBERVILLE	SOUTHERN SEAPLANES INC.		0.5
LA0049492	4612	GALLIANO	LAFOURCHE	LOOP INC	Major	1.57
LA0077178	4612	SAINT JAM	SAINT JAM	EQUUILON		0.5
LA0087459	4612	SAINT JAM	SAINT JAM	KOCH PETRO GROUP LP		0.5
LA0105864	4612	SAINT JAM	SAINT JAM	LOOP INC.		0.5
LA0086452	4922	PORT SULP	PLAQUEMIN			0.5
LA0061191	4941	ALGIERS	ORLEANS			0.5
LA0099473	4953	KENNER	JEFFERSON	RIVER BIRCH LANDFILL		0.5
LA0099783	4953	ASSUMPTIO	ASSUMPTIO	BELLE LANDFILL		0.9
LA0111015	4953	AVONDALE	JEFFERSON	STRANCO ENV RESOURCES INC		0
LA0105171	5082	BELLE CHA	PLAQUEMIN	LA MACHINERY		0.5
LA0046485	5153	WESTWEGO	JEFFERSON	WESTWEGO ELEVATOR-CONTINENTAL		0.5
LA0101524	5153	BELLE CHA	PLAQUEMIN	HSPV LLC-MYRTLE GROVE TERMINAL		0.5
LA0103802	5169	HARVEY	JEFFERSON			0.5
LA0073679	5171	JEFFERSON	JEFFERSON	ST SERVICES		0.5
LA0103349	5171	LAFOURCHE	LAFOURCHE	C-PORT LLC		0.5
LA0107573	5171	BELLE CHA	PLAQUEMIN	JOHN W. STONE OIL DISTRIBUTOR		0.5
LA0108138	5171	LAFOURCHE	LAFOURCHE	ASCO		0.5
LA0109428	5171	HARVEY	JEFFERSON	RETIF OIL & FUEL INC		0.5

Appendix C-1
Barataria River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0110523	5251	BELLE CHA	PLAQUEMIN			0.5
LA0083216	5499	MARRERO	JEFFERSON			0.5
LA0071731	6512	GRETNA	JEFFERSON	ENTERGY CORP		0.5
LA0091448	7213	GOLDEN ME	LAFOURCHE			0.5
LA0109479	7389	BELLE CHA	PLAQUEMIN	PROFESSIONAL DIVERS OF NEW ORL		0.5
LA0106739	7539	HARVEY	JEFFERSON	ROY E. STEEN CORPORATION		0.5
LA0095788	7542	THIBODAUX	LAFOURCHE	GAUBERT FOOD MARTS-THIBODAUX		0.5
LA0106607	7542	MARRERO	JEFFERSON	W JEFFERSON LEVEE DIST BRD OF		0.9
LA0090701	7699	BELLE CHA	PLAQUEMIN	WESTERN WIRELINE-BELLE CHASSE		0.5
LA0103900	7699	BELLE CHA	PLAQUEMIN	NREC POWER SYSTEMS INC		0.5

Appendix C-1
Calcasieu River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0020605	4952	KINDER	ALLEN	TOWN OF KINDER		0.97
LA0036366	4952	LAKE CHAR	CALCASIEU	CITY OF LAKE CHARLES	Major	4
LA0038709	4952	DE QUINCY	CALCASIEU	DEQUINCY TOWN OF	Major	1.1
LA0039136	4952	CAMERON	CAMERON	CAMERON PARISH SEWER DIST # 1		0.44
LA0039993	4952	DE RIDDER	VERNON	CALDWELL HOUSING CORP		0.5
LA0047236	4952	ROSEPINE	VERNON	ROSEPINE TOWN OF		0.3
LA0051161	4952	DE QUINCY	CALCASIEU	PHELPS CORRECTIONAL CENTER		0.9
LA0071757	4952	LEESVILLE	VERNON			0.21
LA0074357	4952	CALCASIEU	CALCASIEU	CALCASIEU PH. SD # 11		0.15
LA0101907	4952	KINDER	ALLEN	WACKENHUT CORRECTIONAL CENTER		0.5
LA0102725	4952	HACKBERRY	CAMERON	CAMERON PH. W.W. DIST. #2		0.9
LA0104787	4952	HOLLYBEAC	CAMERON	CAMERON-POLIC JURY-HOLLY BEACH		0.9
LA0054828	4959	CARLYSS	CALCASIEU	CHEMICAL WASTE MANAGEMANT INC	Major	2.14
LA0100099	2813	SULPHUR	CALCASIEU	PRAXAIR		0.5
LA0053708	2813	SULPHUR	CALCASIEU	AIR LIQUIDE AMERICA CORP		0.5
LA0080829	2819	CALCASIEU	CALCASIEU	LOUISIANA PIGMENT CO	Major	0.571
LA0001333	2819	CARLYSS	CALCASIEU	WR GRACE & CO	Major	3.02
LA0041025	2821	LAKE CHAR	CALCASIEU	CERTAINTEED CORPORATION	Major	1.45
LA0071382	2821	LAKE CHAR	CALCASIEU	WESTLAKE POLYMERS-LAKE CHARLES	Major	51.52
LA0103004	2821	SULPHUR	CALCASIEU	WESTLAKE PETROCHEMICALS		0.8
LA0003689	2821	LAKE CHAR	CALCASIEU	BASELL USA	Major	0.927
LA0003824	2822	LAKE CHAR	CALCASIEU	FIRESTONE SYNTHETIC RUBBER &	Major	3.46
LA0082511	2869	LAKE CHAR	CALCASIEU	WESTLAKE POLYMERS	Major	0.796
LA0000761	2869	LAKE CHAR	CALCASIEU	PPG-LAKE CHARLES	Major	2.91
LA0003336	2869	WESTLAKE	CALCASIEU	SASOL NORTH AMERICA INC.	Major	4.51
LA0005347	2869	WESTLAKE	CALCASIEU	LYONDELL CHEMICAL WORLDWIDE IN	Major	4.75
LA0069850	2869	LAKE CHAR	CALCASIEU	EQUISTAR CHEMICALS LP.	Major	9.15
LA0087157	2869	LAKE CHAR	CALCASIEU	WESTLAKE STYRENE CORP	Major	42.16
LA0003026	2911	WESTLAKE	CALCASIEU	CONOCO LAKE CHARLES REF	Major	5.4
LA0005941	2911	LAKE CHAR	CALCASIEU	CITGO PETROLEUM COMPANY	Major	55.01
LA0052370	2911	LAKE CHAR	CALCASIEU	CALCASIEU REF CO	Major	0.075
LA0101869	3443	SULPHUR	CALCASIEU	CETCO INC		0.5
LA0067083	4952	SULPHUR	CALCASIEU	CITY OF SULPHUR	Major	5.03
LA0036340	4952	LAKE CHAR	CALCASIEU	CITY OF LAKE CHARLES	Major	3.89

Appendix C-1
Calcasieu River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0108596	9999	LAKE CHAR	CALCASIEU	DENMAR ENTERPRISES		0.5
LA0105155	9999	SULPHUR	CALCASIEU	W-H HOLDINGS INC.		0.5
LA0106127	811	OAKDALE	ALLEN	ROY O. MARTIN LUMBER CO. LP		0.5
LA0095109	1389	LAKE CHAR	CALCASIEU			0.5
LA0102105	2011	LAKE CHAR	CALCASIEU	JOLLY'S CALCASIEU PACKING CO.		0.5
LA0003654	2077	HOUMA	TERREBONN			0.5
LA0081256	2092	HACKBERRY	CAMERON	ALPHA SEAFOOD ENTERPRISES INC.		0.5
LA0004901	2411	OAKDALE	ALLEN	BOISE CASCADE - OAKDALE		0.5
LA0079740	2411	BEAUREGAR	BEAUREGAR	TEMPLE-INLAND SOUTHWEST LA		0.5
LA0007927	2621	DE RIDDER	BEAUREGAR			38.75
LA0047058	2813	WESTLAKE	CALCASIEU	TESSENDERLO KERLEY INC		0.5
LA0051730	2813	WESTLAKE	CALCASIEU	AIR LIQUIDE AMERICA CORP		0.5
LA0094587	2813	WESTLAKE	CALCASIEU	MG INDUSTRIES		0.5
LA0107182	2813	WESTLAKE	CALCASIEU	PRAXAIR INC		0.5
LA0065161	2819	WESTLAKE	CALCASIEU	TETRA CHEMICALS-WESTLAKE		0.5
LA0102822	2819	WESTLAKE	CALCASIEU	OLIN-LAKE CHARLES PLANT		0.5
LA0000493	2861	OAKDALE	ALLEN	ARIZONA CHEMICAL CO.	Major	1.01
LA0000868	2861	DE RIDDER	BEAUREGAR	WESTVACO CHEM DIV DERIDDER	Major	7.3
LA0054399	2911	LAKE CHAR	CALCASIEU			0.5
LA0003735	2999	LAKE CHAR	CALCASIEU	LAKE CHARLES CARBON COMPANY	Major	4.68
LA0101869	3443	SULPHUR	CALCASIEU	CETCO INC		0.5
LA0064131	4226	WESTLAKE	CALCASIEU	LAKE CHARLES COKE HANDLING		0.5
LA0089362	4226	LAKE CHAR	CALCASIEU	WESTLAKE STYRENE-LAKE CHARLES		0.5
LA0055522	4491	LAKE CHAR	CALCASIEU	TRIENKLINE L N G LAKE CHARLES		0.5
LA0091812	4491	SULPHUR	CALCASIEU	LAKE CHARLES HARBOR & TERMINAL		0.5
LA0104981	4491	SULPHUR	CALCASIEU	DEVALL ENTERPRISES INC.		0.5
LA0112097	4612	CALCASIEU	CALCASIEU	HAYMARK TERM RAW MATERIAL SUPP		0
LA0005843	4911	LAKE CHAR	CALCASIEU	ROY S NELSON STATION	Major	8.32
LA0059030	4911	WESTLAKE	CALCASIEU	ENTERGY GULF STATES UTILITIES		0.5
LA0112704	4911	CALCASIEU	CALCASIEU	CALCASIEU POWER PLT		0
LA0000230	4922	PITKIN	VERNON			0.5
LA0110515	4952	LAKE CHAR	CALCASIEU	CHARDELE MOBILE ESTATES		0.015
LA0081981	4952	LAKE CHAR	CALCASIEU	LAKE STREET WATER CORP-BRIKEN		0.055
LA0111881	4922	WOODLAWN	TERREBONN	WOODLAWN COMPRESSOR STA		0

Appendix C-1
Calcasieu River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0105066	5082	SULPHUR	CALCASIEU	HEAD & ENGQUIST EQUIPMENT LLC		0.5
LA0053031	5171	HACKBERRY	CAMERON	US DEPT OF ENERGY		0.665
LA0104469	5171	CARLYSS	CALCASIEU	CONOCOPHILLIPS CO		0.5
LA0105295	5171	CAMERON	CAMERON	L&L OIL CO		0.5
LA0101958	5541	LAKE CHAR	CALCASIEU	EVANS OIL OF LA INC.		0.5
LA0105660	7542	SULPHUR	CALCASIEU	PILOT TRAVEL CENTERS LLC		0.5
LA0092975	8211	BEAUREGAR	BEAUREGAR	BEAUREGARD PH SCHOOL BOARD		0.9
LA0032221	9711	FORT POLK	VERNON	USA-FORT POLK	Major	0.881
LA0032239	9711	FORT POLK	VERNON			0.893

Appendix C-1
Pontchartrain River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0036153	2091	VIOLET	SAINT BER	BUMBLE BEE SEAFOODS LLC		0.5
LA0103543	2091	LEESVILLE	ASSUMPTION	ROBIN SEAFOOD CO.		0.5
LA0003280	2873	NEW ORLEA	ORLEANS	AIR PROD. & CHEMICAL INC.	Major	5.5
LA0003522	2911	NORCO	SAINT CHA	MOTIVA ENTERPRISES LLC	Major	6.41
LA0081353	2999	CHALMETTE	SAINT BER	CII CARBON LLC - CALCINER INDU		1.5
LA0003298	3241	NEW ORLEA	ORLEANS	BUZZI UNICEM USA		0.5
LA0045233	3339	BRAITHWAI	PLAQUEMIN	AMAX METALS RECOVERY-BRAITHWAI	Major	5.31
LA0110507	3731	NEW ORLEA	ORLEANS			0.5
LA0052256	3764	NEW ORLEA	ORLEANS	MICHOUD ASSEMBLY FACILITY	Major	13.82
LA0079251	4212	KENNER	JEFFERSON	JOBBERS OIL TRANSPORT CO INC		0.5
LA0000876	4226	CHALMETTE	SAINT BER	ST. BERNARD PORT HARBOR & TERM	Major	1.9
LA0075833	4226	SAINT ROS	SAINT CHA	INTERNATIONAL MATEX TANK		0.5
LA0114405	4231	NEW ORLEA	ORLEANS			0
LA0092681	4491	NEW ORLEA	ORLEANS	N.O.MARINE CONTRACTORS-NEW ORL		0.5
LA0108120	4491	CHALMETTE	SAINT BER	BULK MATERIAL TRANSFER		0.5
LA0094986	4493	CHALMETTE	SAINT BER	CHALMETTE FACILITY		0.5
LA0112003	4499	NEW ORLEA	ORLEANS			0
LA0116327	4499	SAINT BER	SAINT BER	PORT SHIP SERVICE INC.		0
LA0104329	4581	NEW ORLEA	ORLEANS	ARMY AVIATION SUPPORT FACILITY		0.734
LA0107107	4725	NEW ORLEA	ORLEANS	NEW ORLEANS TOURS		0.5
LA0004316	4911	NEW ORLEA	ORLEANS	ENTERGY NEW ORLEANS INC		55.01
LA0004324	4911	NEW ORLEA	ORLEANS	ENTERGY SERVICES INC.	Major	6.39
LA0068560	4953	NEW ORLEA	ORLEANS	BFI WASTE SYSTEMS OF N AMERICA		0.5
LA0105007	4953	NEW ORLEA	ORLEANS	AMID LANDFILL		0.5
LA0070602	5052	DAVANT	PLAQUEMIN	ELECTRO-COAL TRANSFER-DAVANT		0.5
LA0106071	5082	SAINT ROS	SAINT CHA	SCOTT CONSTRUCTION EQUIPMENT		0
LA0073091	5093	NEW ORLEA	ORLEANS			0.5
LA0105368	5093	KENNER	JEFFERSON	KENNER AUTO SALVAGE INC		0.5
LA0094102	5141	HARAHAN	JEFFERSON	GREAT ATLANTIC & PACIFIC TEA C		0.5
LA0104167	5172	JEFFERSON	JEFFERSON	RETIF OIL & FUEL-JEFFERSON		0.5
LA0097861	7353	KENNER	JEFFERSON	US RENTALS INC.		0.5
LA0108111	7542	NEW ORLEA	ORLEANS	TRIPLE E TRANSPORT INC.		0.5
LA0006751	8062	NEW ORLEA	ORLEANS	ALTON OCHSNER MEDICAL FOUNDATI		0.5
LA0091201	8222	NEW ORLEA	ORLEANS	DELGADO FIRE SCHOOL-NEW ORLEAN		0.5

Appendix C-1
Mermentau River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0044661	4952	KAPLAN	VERMILION	KAPLAN CITY OF	Major	0.55
LA0049883	4952	GUEYDAN	VERMILION	TOWN OF GUEYDAN		0.4
LA0020133	4952	LAKE ARTH	JEFFERSON	TOWN OF LAKE ARTHUR		0.75
LA0020133	4952	LAKE ARTH	JEFFERSON	TOWN OF LAKE ARTHUR		0.75
LA0066427	4952	JENNINGS	JEFFERSON			0.5
LA0066427	4952	JENNINGS	JEFFERSON			0.5
LA0041254	4952	CROWLEY	ACADIA	CROWLEY CITY OF	Major	2.5
LA0020591	4952	WELSH	JEFFERSON			0.7
LA0020591	4952	WELSH	JEFFERSON			0.7
LA0055085	4952	DUSON	LAFAYETTE	DUSON STP		0.215
LA0041769	4952	JENNINGS	JEFFERSON	CITY OF JENNINGS WWTP	Major	2.5
LA0041769	4952	JENNINGS	JEFFERSON	CITY OF JENNINGS WWTP	Major	2.5
LA0039055	4952	RAYNE	ACADIA	CITY OF RAYNE	Major	1.56
LA0038598	4952	CHURCH PO	ACADIA			0.5
LA0044865	4952	BASILE	EVANGELIN	BASILE TOWN OF		0.5
LA0061719	4952	JEFFERSON	JEFFERSON	ELTON TOWN OF-WASTEWATER TREA		0.193
LA0061719	4952	JEFFERSON	JEFFERSON	ELTON TOWN OF-WASTEWATER TREA		0.193
LA0020087	4952	OBERLIN	ALLEN	OBERLIN TOWN OF (STP)		0.363
LA0020125	4952	MAMOU	EVANGELIN	TOWN OF MAMOU WWTP		0.5
LA0079057	4952	PINE PRAI	EVANGELIN	PINE PRAIRIE VILLAGE OF		0.1
LA0033430	4952	OAKDALE	ALLEN	OAKDALE CITY OF	Major	0.79
LA0001007	1321	CAMERON P	CAMERON	DYNEGY MIDSTREAM		0.5
LA0005436	1321	EUNICE	SAINT LAN	TRANSCANADA		0.5
LA0106381	1381	EUNICE	SAINT LAN	GREY WOLF DRILLING CO		0.5
LA0111333	1389	CROWLEY	ACADIA	FDF CROWLEY CORPORATE OFFICE		0
LA0110566	1389	JENNINGS	JEFFERSON			0.5
LA0110566	1389	JENNINGS	JEFFERSON			0.5
LA0072184	2044	CROWLEY	ACADIA	WRIGHT ENRICHMENT INC.		0.5
LA0104523	2819	OPELOUSAS	SAINT LAN	CAL CHLOR CORP		0.5
LA0051799	2869	JEFFERSON	JEFFERSON	BCI LOUISIANA L.L.C.		0.5
LA0051799	2869	JEFFERSON	JEFFERSON	BCI LOUISIANA L.L.C.		0.5
LA0006963	2911	CHURCH PO	ACADIA	HPAD HOLDINGS LLC		0.5
LA0112836	3625	ACADIA PA	ACADIA			7.94
LA0006874	3731	JENNINGS	JEFFERSON	SBA SHIPYARDS INC		0.5

Appendix C-1
Mermentau River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0006874	3731	JENNINGS	JEFFERSON	SBA SHIPYARDS INC		0.5
LA0105970	4612	IOWA	CALCASIEU	CONOCO PIPE LINE CO.		0.5
LA0054721	4922	GRAND/CHE	CAMERON	ANR PIPELINE CO		0.5
LA0070068	4922	EUNICE	SAINT LAN	TEXAS GAS TRANS CORP		0.5
LA0088447	4922	EUNICE	SAINT LAN	ANR PIPELINE CO		0.5
LA0064530	4952	ESTHERWOO	ACADIA	VILLAGE OF ESTHERWOOD		0.08
LA0049271	4952	MERMENTAU	ACADIA	VILLAGE OF MERMENTAU-WWTP		0.04
LA0087742	4952	CHATAIGNI	EVANGELIN	VILLAGE OF CHATAIGNIER WWTP		0.05
LA0106585	4953	OAKDALE	ALLEN	TIMBERLANE LANDFILL		0.5
LA0064661	5169	RAYNE	ACADIA	BAHER PERFORMANCE CHEM-RAYNE		0.5

Appendix C-1
Vermillion-Teche River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0088765	4952	JEANERETT	IBERIA	ST MARY PH SEWER DIST # 10		0.16
LA0100480	4952	CHARENTON	SAINT MAR	ST MARY PH SD #9		0.9
LA0074861	4952	LAFAYETTE	LAFAYETTE	ROSEHILL SUBDIVISION		0.5
LA0092550	4952	NEW IBERI	IBERIA	PORT OF IBERIA-BD OF COMMISSIO		0.1
LA0033251	4952	DELCAMBRE	VERMILION	TOWN OF DELCAMBRE - WWTP		0.38
LA0039748	4952	ABBEVILLE	VERMILION	CITY OF ABBEVILLE	Major	1.6
LA0054739	4952	ERATH	VERMILION	ERATH TOWN OF (WWTP)		0.75
LA0044008	4952	NEW IBERI	IBERIA	NEW IBERIA CITY OF	Major	3.6
LA0065251	4952	NEW IBERI	IBERIA	NEW IBERIA CITY OF	Major	2.5
LA0074853	4952	DUSON	LAFAYETTE	ACADIANA TREATMENT-ABADIE OAKS		0.065
LA0056031	4952	VERMILION	VERMILION			0.9
LA0038440	4952	LOREAUVIL	IBERIA	LOREAUVILLE VILLAGE OF		0.1
LA0072265	4952	LAFAYETTE	LAFAYETTE	WATER & WASTEWATER UTIL/		0.5
LA0055328	4952	YOUNGSVIL	LAFAYETTE	YOUNGSVILLE TOWN OF		0.194
LA0103519	4952	YOUNGSVIL	LAFAYETTE	TOWN OF BROUSSARD		0.9
LA0078875	4952	LAFAYETTE	LAFAYETTE	ATS INC.		0.7
LA0096393	4952	YOUNGSVIL	LAFAYETTE	GARDEN HEIGHT WATER CO.		0.5
LA0078409	4952	LAFAYETTE	LAFAYETTE			0.5
LA0062791	4952	LAFAYETTE	LAFAYETTE			0.34
LA0075116	4952	LAFAYETTE	LAFAYETTE	CHARLESTON PLACE SUBDIVISION		0.556
LA0062910	4952	LAFAYETTE	LAFAYETTE			0.5
LA0042561	4952	LAFAYETTE	LAFAYETTE	LAFAYETTE CONSOLIDATED GOV'T	Major	6
LA0078247	4952	LAFAYETTE	LAFAYETTE	ACADIANA TREATMENT SYSTEMS		0.123
LA0077925	4952	LAFAYETTE	LAFAYETTE			0.5
LA0020613	4952	BROUSSARD	LAFAYETTE	TOWN OF BROUSSARD	Major	0.75
LA0078263	4952	LAFAYETTE	LAFAYETTE			0.133
LA0036374	4952	LAFAYETTE	LAFAYETTE	LAFAYETTE CONSOLIDATED GOV'T	Major	7
LA0079278	4952	LAFAYETTE	LAFAYETTE	LAFAYETTE CITY OF		0.9
LA0074781	4952	LAFAYETTE	LAFAYETTE	ILE DES CANNES-CHAMPIONS		0.311
LA0036382	4952	LAFAYETTE	LAFAYETTE	LAFAYETTE CONSOLIDATED GOV'T	Major	4
LA0034495	4952	SCOTT	LAFAYETTE	SCOTT TOWN OF		0.4
LA0109576	4952	GONZALES	ASCENSION			2
LA0036391	4952	LAFAYETTE	LAFAYETTE	LAFAYETTE CONSOLIDATED GOV'T	Major	1.5
LA0074870	4952	LAFAYETTE	LAFAYETTE			0.376
LA0077763	4952	LAFAYETTE	LAFAYETTE			0.5

Appendix C-1
Vermillion-Teche River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0103276	4952	PRAIRIEVI	ASCENSION	WASTEWATER TREATMENT		0.5
LA0065706	4952	CARENCRO	LAFAYETTE	CITY OF CARENCRO		0.5
LA0020150	4952	CARENCRO	LAFAYETTE	CITY OF CARENCRO - WWTP		0.525
LA0072001	4952	GRAND COT	SAINT LAN			0.163
LA0036404	4952	OPELOUSAS	SAINT LAN	OPELOUSAS CITY OF	Major	4.5
LA0078484	4952	OPELOUSAS	SAINT LAN	ACADIANA TREATMENT SYS INC		0.5
LA0109592	4952	VILLE PLA	EVANGELIN	EVANGELINE SEWAGE CO.		0.5
LA0020257	4952	BUNKIE	AVOYELLES	BUNKIE CITY OF	Major	0.968
LA0040126	4952	COTTONPOR	AVOYELLES	TOWN OF COTTONPORT		0.2
LA0059927	4952	CHENEYVIL	RAPIDES	CHENEYVILLE TOWN OF (STP)		0.182
LA0047031	4952	LECOMPTE	RAPIDES	LECOMPTE TOWN OF		0.3
LA0039012	4952	ALEXANDRI	RAPIDES			0.135
LA0039021	4952	ALEXANDRI	RAPIDES	RAPIDES PAR SD #1		0.14
LA0065064	4952	MOREAUVIL	AVOYELLES			0.15
LA0102512	279	ABBEVILLE	VERMILION	GMM ALLIGATOR FARM		0.5
LA0089346	279	NEW IBERI	IBERIA	LA DEPT-WILDLIFE-N.I. NUTRIA		0.5
LA0054682	1321	SAINT MAR	SAINT MAR	KOCH GATEWAY PIPELINE CO		0.5
LA0109487	1321	ERATH	VERMILION	BRIDGELINE GAS DISTRIBUTION LL		0.5
LA0102580	1321	GLENMORA	RAPIDES	EL PASO FIELD SERVICES		0.5
LA0101800	1381	DUSON	LAFAYETTE	BOP CONTROLS INC.		0.5
LA0109738	1382	LAFAYETTE	LAFAYETTE			0.5
LA0109711	1382	CARENCRO	LAFAYETTE	OMNI ENERGY SERVICES CORP		0.5
LA0090221	1389	INTERCOAS	VERMILION	PENNZOIL EXPLORATION & PROD CO		0.5
LA0103021	1389	NEW IBERI	IBERIA	STOLT COMEX SEAWAY INC.		0.5
LA0106461	1389	NEW IBERI	IBERIA	RED FOX COMPANIES OF NEW IBERI		0.5
LA0104710	1389	NEW IBERI	IBERIA	HERMAN RENTALS		0.5
LA0106313	1389	NEW IBERI	IBERIA	QUAIL TOOLS INC A PARKER CO		0.5
LA0109401	1389	NEW IBERI	IBERIA	PELLERIN'S TUBULAR SERVICE INC		0.5
LA0083780	1389	NEW IBERI	IBERIA			0.5
LA0090131	1389	IBERIA PA	IBERIA	VARCO BJ OIL TOOLS-BROUSSARD		0.5
LA0111121	1389	BROUSSARD	LAFAYETTE	SEE PG 2 COMMENTS ON PARISH LO		0
LA0101699	1389	BROUSSARD	LAFAYETTE	CONCENTRIC PIPE & TOOL RENTALS		0.5
LA0094404	1389	BROUSSARD	LAFAYETTE			0.5
LA0083739	1389	YOUNGSVIL	LAFAYETTE	ANADRILL SCHLUMBERGER-YOUNGSVI		0.5
LA0091511	1389	BROUSSARD	LAFAYETTE	NEWPARK WELLHEAD SERVICES		0.5

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Vermillion-Teche River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0109762	1389	BROUSSARD	LAFAYETTE	BOCO OF LA INC		0.5
LA0107425	1389	BROUSSARD	LAFAYETTE	MOORES WIRELINE INC		0.5
LA0084565	1389	BROUSSARD	LAFAYETTE	DRILEX SYSTEMS BROUSSARD		0.5
LA0085707	1389	LAFAYETTE	LAFAYETTE	BAKER OIL TOOLS		0.5
LA0110558	1389	JENNINGS	JEFFERSON	ASEP RENTAL INC.		0.5
LA0110558	1389	JENNINGS	JEFFERSON	ASEP RENTAL INC.		0.5
LA0101818	1389	BROUSSARD	LAFAYETTE	MAVERICK DIRECTIONAL SERVICES		0.5
LA0093955	1389	LAFAYETTE	LAFAYETTE	PATHFINDER ENERGY SVC INC		0.5
LA0106721	1389	LAFAYETTE	LAFAYETTE	BLOWOUT TOOLS INC		0.5
LA0094242	1389	LAFAYETTE	LAFAYETTE	FRANK'S CASING CREW & TOOL REN		0.5
LA0105074	1389	LAFAYETTE	LAFAYETTE	SUPERIOR ENERGY SERVICES LLC		0.5
LA0112551	1389	LAFAYETTE	LAFAYETTE	EMPLOYEE RESOURCES & TRAIN CNT		0
LA0080241	1389	LAFAYETTE	LAFAYETTE	SWACO GEOLOGRAPH CO		0.5
LA0103659	1389	LAFAYETTE	LAFAYETTE	LETTSWORTH OILFIELD SVCS		0.5
LA0105929	1389	SCOTT	LAFAYETTE	SOUTHLAND RENTAL INC.		0.5
LA0109240	1389	SCOTT	LAFAYETTE	STRATOGRAPH INC		0.5
LA0103233	1479	LYDIA	IBERIA	CAREY SALT CO.		0.5
LA0000264	1479	AVERY ISL	IBERIA	CARGILL INC.		0.5
LA0110663	1611	LAFAYETTE	LAFAYETTE	H & S CONST CO INC.		0
LA0095184	2015	PORT BARR	SAINT LAN	SAVOIE'S SAUSAGE & FOOD PRODUC		0.5
LA0006858	2033	AVERY ISL	IBERIA	MCILHENNY CO		0.5
LA0003344	2033	HESSMER	AVOYELLES	ALLEN CANNING - HESSMER		0.5
LA0000213	2061	JEANERETT	IBERIA			0.5
LA0004171	2061	NEW IBERI	IBERIA	CAJUN SUGAR COOPERATIVE INC		0.5
LA0002895	2061	NEW IBERI	IBERIA	IBERIA SUGAR CORP.		0.5
LA0110141	2062	ABBEVILLE	VERMILION			0.5
LA0004774	2077	VERMILION	VERMILION	ZAPATA PROTEIN (USA) INC.		0.5
LA0078336	2092	DELCAMBRE	VERMILION			1.57
LA0097811	2092	DELCAMBRE	VERMILION	OCEAN HARVEST WHOLESALE INC		0.5
LA0108855	2092	DELCAMBRE	VERMILION	DELCAMBRE SEAFOOD MARKET INC		0.5
LA0095079	2092	DELCAMBRE	VERMILION	OCEAN PRIDE SEAFOOD INC		0.5
LA0097438	2092	DELCAMBRE	VERMILION	SIMS BAYOU SEAFOOD PROCESSING		0.5
LA0088170	2099	ABBEVILLE	VERMILION			0.5
LA0088978	2298	LAFAYETTE	LAFAYETTE	THE AMERICAN GROUP		0.5
LA0003271	2819	WEEKS ISL	IBERIA	MORTON SALT WEEKS ISLAND		0.5

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NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0005959	2873	DONALDSON	ASCENSION			14.32
LA0001082	2895	FRANKLIN	SAINT MAR	CABOT CORP		0.5
LA0005827	2895	NEW IBERI	IBERIA	DEGUSSA CORP - LOUISA		0.5
LA0001091	2895	VILLE PLA	EVANGELIN	CABOT CORPORATION		0.5
LA0101427	3491	LAFAYETTE	LAFAYETTE	LOUISIANA SAFETY SYSTEMS		0.5
LA0108251	3533	BROUSSARD	LAFAYETTE	ABB VETCO GRAY INC		0.5
LA0109509	3533	LAFAYETTE	LAFAYETTE	MUD MOTORS INC		0.5
LA0083232	3533	BROUSSARD	LAFAYETTE	FMC CORP - LAFAYETTE		0.5
LA0104574	3569	NEW IBERI	IBERIA	AGGREKO INC.-NEW IBERIA		0.5
LA0102211	3731	ABBEVILLE	VERMILION	INTRACOASTAL CITY DRYDOCK & SH		0.5
LA0098949	3827	WEEKS ISL	IBERIA	MORTON INT'L INC. ADVANCED		0.5
LA0111864	3949	LAFAYETTE	LAFAYETTE			0
LA0096849	4215	NEW IBERI	IBERIA	UNITED PARCEL SERVICE		0.5
LA0070874	4231	NEW IBERI	IBERIA	NANCE & COLLUMS INC		0.5
LA0109151	4231	PORT BARR	SAINT LAN	CHARLES G. LAWSON TRUCKING IN		0.5
LA0106810	4491	NEW IBERI	IBERIA	MARINE FLEET FACILITY		0.5
LA0105783	4522	LAFAYETTE	LAFAYETTE	INDUSTRIAL HELICOPTERS		0.5
LA0001571	4612	WEEKS ISL	IBERIA	SHELL PIPELINE CO LP		0.5
LA0062201	4612	BOYCE	RAPIDES	PLACID PIPELINE		0.5
LA0116050	4619	ERATH	VERMILION	EQUILON PIPELINE CO. LLC		0
LA0002887	4911	BALDWIN	SAINT MAR	CENTRAL LA ELECTRIC COMPANY	Major	1.66
LA0060801	4911	LAFAYETTE	LAFAYETTE			0.049
LA0002879	4911	SAINT LAN	SAINT LAN	CLECO EVANGELINE	Major	1.5
LA0070050	4922	YOUNGSVIL	LAFAYETTE	TEXAS GAS TRANSM CORP		0.5
LA0104094	4941	ABBEVILLE	VERMILION	SE WATER DIST. #2-ABBEVILLE		0.9
LA0006602	4941	ABBEVILLE	VERMILION	ABBEVILLE CITY OF		0.08
LA0074888	4952	LAFAYETTE	LAFAYETTE			0.032
LA0062847	4952	YOUNGSVIL	LAFAYETTE	FLANDER'S GARDEN SUBDIVISION		0.04
LA0074829	4952	LAFAYETTE	LAFAYETTE	TWIN LAKES SUBDIVISION		0.03
LA0062804	4952	BROUSSARD	LAFAYETTE			0.047
LA0038393	4952	MAURICE	VERMILION	MAURICE VILLAGE OF		0.09
LA0078450	4952	LAFAYETTE	LAFAYETTE			0.046
LA0078883	4952	LAFAYETTE	LAFAYETTE	ACADIANA TREATMENT RIVERWOOD		0.075
LA0077798	4952	LAFAYETTE	LAFAYETTE			0.07
LA0075094	4952	LAFAYETTE	LAFAYETTE	MONTICELLO SUBDIVISION		0.033

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Vermillion-Teche River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0075132	4952	LAFAYETTE	LAFAYETTE	GREEN MEADOWS SUBDIVISION		0.035
LA0074764	4952	LAFAYETTE	LAFAYETTE	LANCASTER ESTATES SUBDIVISION		0.031
LA0075281	4952	LAFAYETTE	LAFAYETTE	SHADOWWOOD SUBDIVISION		0.059
LA0074951	4952	LAFAYETTE	LAFAYETTE	AVIES KNOLL SUBDIVISION		0.087
LA0074586	4952	LAFAYETTE	LAFAYETTE	RIVERGREEN SUBDIVISION		0.042
LA0077895	4952	LAFAYETTE	LAFAYETTE			0.062
LA0074730	4952	LAFAYETTE	LAFAYETTE	ACADIANA TREATMENT SYSTEMS		0.066
LA0076678	4952	LAFAYETTE	LAFAYETTE	SANDEST TERRACE/PLACE SUBDIVIS		0.043
LA0077003	4952	LAFAYETTE	LAFAYETTE	RIVERVIEW SUBDIVISION		0.05
LA0077917	4952	LAFAYETTE	LAFAYETTE	ACADIANA TREATMENT-GLAD SUBD		0.08
LA0074845	4952	LAFAYETTE	LAFAYETTE			0.065
LA0074748	4952	LAFAYETTE	LAFAYETTE	CROSS CREEK SUBDIVISION		0.032
LA0075477	4952	LAFAYETTE	LAFAYETTE			0.096
LA0078000	4952	LAFAYETTE	LAFAYETTE			0.024
LA0074772	4952	LAFAYETTE	LAFAYETTE	ACADIANA TREATMENT SYSTEM		0.04
LA0076023	4952	LAFAYETTE	LAFAYETTE	ACADIANA TREATMENT SYSTEMS		0.05
LA0077771	4952	LAFAYETTE	LAFAYETTE	TESI-SOUTHFIELD SQUARE		0.035
LA0078034	4952	LAFAYETTE	LAFAYETTE	ACADIANA TREATMENT-WOLF CREEK		0.036
LA0073946	4952	LAFAYETTE	LAFAYETTE	DERBY HEIGHTS SUBDIVISION		0.033
LA0076091	4952	LAFAYETTE	LAFAYETTE			0.035
LA0077721	4952	LAFAYETTE	LAFAYETTE			0.03
LA0078051	4952	LAFAYETTE	LAFAYETTE			0.026
LA0062880	4952	LAFAYETTE	LAFAYETTE			0.072
LA0077518	4952	LAFAYETTE	LAFAYETTE			0.091
LA0062839	4952	LAFAYETTE	LAFAYETTE			0.026
LA0077739	4952	LAFAYETTE	LAFAYETTE			0.027
LA0062898	4952	LAFAYETTE	LAFAYETTE			0.033
LA0054500	4952	LAFAYETTE	LAFAYETTE			0.024
LA0078204	4952	LAFAYETTE	LAFAYETTE			0.033
LA0062812	4952	CARENCRO	LAFAYETTE			0.043
LA0076104	4952	LAFAYETTE	LAFAYETTE			0.026
LA0083186	4952	OPELOUSAS	SAINT LAN			0.054
LA0066893	4952	EVERGREEN	AVOYELLES	EVERGREEN TOWN OF		0.09
LA0046469	4952	HESSMER	AVOYELLES			0.086
LA0038989	4952	ALEXANDRI	RAPIDES	RAPIDES PH SEWAGE DIST #1		0.06

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Vermillion-Teche River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0072541	4952	ALEXANDRI	RAPIDES	RAPIDES PH SEWAGE DIST #1		0.008
LA0078387	4952	LAFAYETTE	LAFAYETTE			0.038
LA0097888	4953	NEW IBERI	IBERIA	GORDON DOERLE BORROW PIT		0.5
LA0103624	4953	MAURICE	VERMILION	MAURICE DIRT & SAND		0.5
LA0078786	4953	LAFAYETTE	LAFAYETTE			0.5
LA0071048	4953	OPELOUSAS	SAINT LAN	VENTURA FOODS LLC FKA		0.5
LA0110124	4959	SCOTT	LAFAYETTE	SCOTT RECYCLING CENTER		0.5
LA0104566	5169	ABBEVILLE	VERMILION	GULF COAST CHEM-ABBEVILLE		0.5
LA0111325	5171	INTERCOAS	VERMILION	INTRACOASTRAL CITY FAC		0
LA0111651	5171	BOYCE	RAPIDES	BOYCE BRANCH		0
LA0109941	5541	LAFAYETTE	LAFAYETTE	TRAVELCENTERS OF AMERICA INC		0.5
LA0100242	6515	LAFAYETTE	LAFAYETTE	QUEEN'S ROW MOBILE HOME PARK		0.5
LA0097489	7359	LAFAYETTE	LAFAYETTE	GREEN'S PRESSURE TESTING		0.5
LA0100919	7359	LAFAYETTE	LAFAYETTE			0.5
LA0101796	7359	SCOTT	LAFAYETTE	DERRICK EQUIPMENT-SCOTT		0.5
LA0093653	7538	DELCAMBRE	VERMILION	TRANSCOASTAL MARINE SVC OF LA		0.5
LA0103969	7542	BROUSSARD	LAFAYETTE	HILL CITY OIL CO INC OF MS		0.5
LA0093360	8062	LAFAYETTE	LAFAYETTE	LAFAYETTE GEN MEDICAL CTR.		0.5
LA0087521	8731	LAFAYETTE	LAFAYETTE	US FISH & WILDIFE - LAFAYETTE		0.9
LA0108936	8731	LAFAYETTE	LAFAYETTE	ADVANCED POLYMER SYSTEMS INC		0.5
LA0109908	8734	NEW IBERI	IBERIA	HOH-PAK LTD		0.5
LA0083801	9223	COTTONPOR	AVOYELLES	LA DOC		0.263

Appendix C-1
Sabine River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0066621	4952	VINTON	CALCASIEU	VINTON TOWN OF		2.3

Appendix C-1
Terrebonne River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0020648	4952	PLAQUEMIN	IBERVILLE	CITY OF PLAQUEMINE	Major	1.5
LA0066486	4952	THIBODAUX	LAFOURCHE	THOROUGHBRED PARK SVC-THIBODAU		0.5
LA0033286	4952	LOCKPORT	LAFOURCHE	TOWN OF LOCKPORT - WWTP		0.79
LA0040207	4952	HOUMA	TERREBONN	TERREBONNE PH GOVT-HOUMA NORTH	Major	16
LA0040274	4952	HOUMA	TERREBONN	TERREBONNE PH GOVT-HOUMA-SOUTH	Major	8
LA0043966	4952	NAPOLEONV	ASSUMPTIO	NAPOLEONVILLE VILLAGE OF		0.2
LA0049344	4952	RACELAND	LAFOURCHE			0.3
LA0068241	4952	BRUSLY LA	WEST BATO	BRUSLY TOWN OF		0.7
LA0068501	4952	PORT ALLE	WEST BATO	WEST BATON ROUGE PH COUNCIL/WE		0.3
LA0072044	4952	HOUMA	TERREBONN			0.5
LA0074349	4952	SAINT MAR	SAINT MAR			0.15
LA0081809	4952	THIBODAUX	LAFOURCHE			0.5
LA0084425	4952	HOUMA	TERREBONN	VACCO MARINE INC.		0.5
LA0032948	4952	THIBODAUX	LAFOURCHE	CITY OF THIBODAUX - WWTP	Major	3.134
LA0088528	4952	NEW ROADS	POINTE CO	POINTE COUPEE SD #1		0.64
LA0108588	4952	PORT ALLE	WEST BATO	WEST BATON ROUGE PH COUNCIL		0.16
LA0068420	1389	BOURG	TERREBONN	U.S. LIQUIDS		0.01
LA0089648	3731	BOURG	TERREBONN	BOURG DRY DOCK & SERVICE		0.01
LA0105988	4953	AMELIA	SAINT MAR	EARTHLOCK TECHNOLOGIES LLC		NA

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Terrebonne River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0111236	279	HOUMA	TERREBONN			0
LA0106267	921	SCHRIEVER	TERREBONN	GULF COAST MINNOWS INC.		0.5
LA0072435	1321	PORT ALLE	WEST BATO	EXXON CO USA		0.5
LA0103039	1321	LAROSE	LAFOURCHE	DISCOVERY PRODUCER SVCS.		0.5
LA0105139	1381	HOUMA	TERREBONN	TARPON RENTALS INC.		0.5
LA0085138	1389	HOUMA	TERREBONN			0.5
LA0086975	1389	HOUMA	TERREBONN			0.5
LA0090972	1389	AMELIA	SAINT MAR	DELTA/GULF RENTAL TOOLS-AMELIA		0.5
LA0091081	1389	GROSSE TE	IBERVILLE	C&S WELL SVC-GROSSE TETE		0.5
LA0097268	1389	GRAY	TERREBONN	HALLIBURTON ENERGY SERVICES		0.5
LA0100072	1389	HOUMA	TERREBONN	PETRO TOOL AND SUPPLY		0.5
LA0105040	1389	HOUMA	TERREBONN	PORT MARINE VACUUM SERVICES IN		0.5
LA0107352	1389	HOUMA	TERREBONN	BILCO TOOLS		0.5
LA0111104	1389	HOUMA	TERREBONN	FRANKS CASING CREW & RENTAL		0
LA0055620	1623	GIBSON	TERREBONN	J RAY MCDERMOTT INC		0.5
LA0000485	2061	PAINCOURT	ASSUMPTIO			0.5
LA0000850	2061	BRUSLY LA	WEST BATO	CINCLARE CENTRAL FACTORY	Major	7
LA0001295	2061	WHITE CAS	IBERVILLE			0.5
LA0003034	2061	LAKELAND	POINTE CO	ALMA PLANTATION LTD.	Major	4.07
LA0007382	2061	BELLEROSE	ASSUMPTIO	SAVOIE INDUSTRIES INC.		0.5
LA0042510	2061	THIBODAUX	LAFOURCHE	LAFOURCHE SUGAR CORP		1.22
LA0004073	2091	CHAUVIN	TERREBONN	INDIAN RIDGE SHRIMP - CHAUVIN		0.5
LA0106038	2091	DULAC	TERREBONN	JENSEN SEAFOOD PACKING CO.INC.		0.5
LA0111139	2091	PIERRE PA	ASSUMPTIO	BENSON SEAFOOD INC.		0
LA0003719	2092	DULAC	TERREBONN	GULF ISLAND SHRIMP & SEAFOOD		0.5
LA0053147	2092	TERREBONN	TERREBONN			0.5
LA0077461	2092	CHAUVIN	TERREBONN			1.15
LA0090913	2092	DULAC	TERREBONN	SCOTTICOS' OF DULAC		0.5
LA0090921	2092	DULAC	TERREBONN	SAMANIE PACKING-DULAC		0.5
LA0090981	2092	DULAC	TERREBONN	D'LUKE SEAFOOD-DULAC		0.5
LA0091278	2092	CHAUVIN	TERREBONN	TRIPLE T ENTERPRISES INC		0.5
LA0091413	2092	DULAC	TERREBONN			0.5

Appendix C-1
Terrebonne River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0070441	4491	DARROW	ASCENSION			0.5
LA0083674	4491	MODESTE	ASCENSION	T T BARGE CLEANING		0.5
LA0104884	4491	HOUMA	TERREBONN	CENAC TOWING CO.		0.5
LA0093084	4499	PLAQUEMIN	IBERVILLE			0.9
LA0103551	4612	HOUMA	TERREBONN	TEXACO PIPELINE		0.5
LA0105830	4612	GIBSON	TERREBONN	SHELL PIPELINE CO LP		0.5
LA0003042	4911	JARREAU	POINTE CO			3.31
LA0099210	4911	NEW ROADS	POINTE CO	LA ENERGY & POWER AUTHORITY		0.5
LA0100820	4911	TERREBONN	TERREBONN	TERREBONNE PARISH -		0.9
LA0109860	4911	PLAQUEMIN	IBERVILLE	LA ENERGY & POWER AUTHORITY (L		0.5
LA0109878	4911	MORGAN CI	SAINT MAR	LA ENERGY & POWER AUTHORITY (L		0.5
LA0046981	4922	COCODRIE	TERREBONN	TENNESSEE GAS PIPELINE CO.		0.5
LA0070025	4922	AMELIA	SAINT MAR	TEXAS GAS TRANSM CORP		0.5
LA0107212	4922	WHITE CAS	IBERVILLE	TEXAS EASTERN TRANSMISSION COR		0.5
LA0111210	4922	NAPOLEONV	ASSUMPTIO	GULF SOUTH PIPELINE CO LP		0
LA0086771	4952	MARINGOUI	IBERVILLE			0.073
LA0063941	4953	LIVONIA	POINTE CO			0.5
LA0111198	4953	LIVONIA	POINTE CO	WESTERN WASTE IND.		0
LA0103918	5013	MORGAN CI	SAINT MAR	LA MACHINERY-MORGAN CITY		0.5
LA0076171	5088	TERREBONN	TERREBONN			0.5
LA0086797	5169	PORT ALLE	WEST BATO	BOC GROUP - PORT ALLEN		0.5
LA0053040	5171	IBERVILLE	IBERVILLE	US DOE SPR BAYOU CHOCTAW OIL		0.759
LA0102091	5171	LIVONIA	POINTE CO	KOCH PIPELINE-LIVONIA TERMINAL		0.5
LA0109801	5171	MARRERO	JEFFERSON	HILL CITY OIL CO INC		0.5
LA0110591	5171	AMELIA	SAINT MAR			0.5
LA0104761	5172	HOUMA	TERREBONN	RETIF OIL & FUEL INC		0.5
LA0108987	5172	MORGAN CI	SAINT MAR	L&L OIL CO		0.5
LA0112267	7359	HOUMA	TERREBONN	BUCKNER RENTAL SERVICES INC		0
LA0103373	7538	PORT ALLE	WEST BATO	TIGATOR CORP.		0.5
LA0074331	7699	HOUMA	TERREBONN	UNIVERSAL COMPRESSION INC		0.5
LA0084301	7699	AMELIA	SAINT MAR	CORAL MARINE SERVICES INC		0.5
LA0091456	8249	MORGAN CI	SAINT MAR	TEXACO MORGAN CITY WAREHOUSE		0.5

Appendix C-1
Terrebonne River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE
						MGD
LA0102555	2421	MARINGOUI	IBERVILLE	WILLIAMS DRY KILN CO.		0.5
LA0063860	2813	ADDIS	WEST BATO	AIR PRODUCTS & CHEMICALS INC.		0.5
LA0103586	2819	PORT ALLE	WEST BATO	DISCOVERY CHEMICALS		0.5
LA0104159	2819	PORT ALLE	WEST BATO	TRANS CHEM-PORT ALLEN		0.5
LA0111023	2821	W BATON R	WEST BATO	SHINTECH LLC-ADDIS PLANT A		0
LA0047554	2895	ADDIS	WEST BATO	SID RICHARDSON CARBON ADDIS		0.5
LA0115100	2899	PLAQUEMIN	IBERVILLE	INEOS AMERICAS LLC		0
LA0111082	2911	PORT ALLE	WEST BATO	BATON ROUGE PROPYLENE CONCENTR		0
LA0090387	2951	ERWINVILL	WEST BATO	BIG RIVER INDUSTRIES		0.5
LA0104035	2951	PORT ALLE	WEST BATO	ASPHALT PRODUCTS-PORT ALLEN		0.5
LA0085821	2992	PORT ALLE	WEST BATO	EXXON CO USA		0.5
LA0102351	3296	PORT ALLE	WEST BATO	DISTRIBUTION INTERNATIONAL		0.5
LA0055581	3441	AMELIA	SAINT MAR	J. RAY MCDERMOTT INC.		0.5
LA0091961	3441	HOUMA	TERREBONN	GULF ISLAND FABRICATION INC.		0.5
LA0061867	3479	AMELIA	SAINT MAR	TUBOSCOPE VETCO INT'L		0.5
LA0092878	3479	PORT ALLE	WEST BATO	WESTSIDE COATING SERVICES INC		0.5
LA0103713	3533	HOUMA	TERREBONN	TUBE-ALLOY CORP.		0.5
LA0083721	3731	BRUSLY LA	WEST BATO	PORT ALLEN BARGE PLANT		0.5
LA0084077	3731	LAROSE	LAFOURCHE			0.5
LA0101320	3731	HOUMA	TERREBONN	QUALITY SHIPYARDS INC.		0.5
LA0102601	3731	AMELIA	SAINT MAR	BOLLINGER - AMELIA		0.5
LA0104558	3731	BOURG	TERREBONN	ACADIAN SHIPYARD-BOURG		0.5
LA0104868	3731	HOUMA	TERREBONN	MAIN IRON WORKS INC		0.5
LA0105708	3731	AMELIA	SAINT MAR	BOLLINGER MARINE FABRICA		0.5
LA0106712	3731	MORGAN CI	SAINT MAR	CONRAD INDUSTRIES INC		0.5
LA0112089	3731	AMELIA	SAINT MAR	PKA SVC MARINE IND IND		0
LA0114839	3799	HOUMA	TERREBONN	MARMAC LLC		0
LA0107247	3861	AMELIA	SAINT MAR	GLOBAL X-RAY & TESTING CORP.		0.5
LA0072231	4222	HOUMA	TERREBONN	CARO PRODUCE INC		0.5
LA0005568	4226	PORT ALLE	WEST BATO			0.5
LA0080888	4226	PORT ALLE	WEST BATO	WESTWAY TRADING CORP		0.5
LA0108685	4231	PORT ALLE	WEST BATO	ANDREWS TRANSPORTS INC		0.5

Appendix C-2
Atachafalaya River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE	HG LOAD	NOTE
						MGD	g/yr	
LA0089699	4952	BERWICK	SAINT MAR			0.5	8.3	1
LA0074292	4952	KROTZ SPR	SAINT LAN	KROTZ SPRINGS CITY OF		0.162	2.7	1
LA0065340	4952	MELVILLE	SAINT LAN	MELVILLE TOWN OF (STP)		0.25	4.2	1
LA0065986	4952	MORGAN CI	SAINT MAR	MORGAN CITY CITY OF (STP)	Major	4.5	75	1
LA0040193	4952	JEANERETT	IBERIA	CITY OF JEANERETTE	Major	1.32	22	1
LA0039152	4952	SIMMESPOR	AVOYELLES	SIMMESPORT TOWN OF (WWTP)		0.242	4.0	1
				UNASSIGNED WASTELOAD		3.5	58	1
					TOTAL	**10.5**	**174**	

1- Assumed Hg concentration in effluent = 12 nanograms per liter

GRAND TOTAL	**174 g/yr**

Appendix C-2
Barataria River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE	HG LOAD	NOTE
						MGD	g/yr	
LA0032131	4952	LULING	SAINT CHA	ST. CHARLES PH-LULING STP	Major	2.6	43	1
LA0100846	4952	JEFFERSON	JEFFERSON	JEFFERSON PH. DEPT - ROSETHORN		0.9	15	1
				UNASSIGNED WASTELOAD		6.5	108	1
						TOTAL	**166**	

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE	HG LOAD	NOTE
						MGD	g/yr	
LA0073954	3412	JEFFERSON	JEFFERSON	EVANS COOPERAGE	Major	0.0136	38	2
LA0038059	4952	WESTWEGO	JEFFERSON	CITY OF WESTWEGO	Major	2.77	120	2
						TOTAL	**158**	

1- Assumed Hg concentration in effluent = 12 nanograms per liter

2 - See Table 6.1 for Basis of Hg Load

GRAND TOTAL	**324 g/yr**

Appendix C-2
Pontchartrain River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE	HG LOAD	NOTE
						MGD	g/yr	
				UNNASSIGNED WASTELOAD	**TOTAL**	**32**	527.2	1

1- Assumed Hg concentration in effluent = 12 nanograms per liter

GRAND TOTAL	**527 g/yr**

Appendix C-2
Sabine River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE	HG LOAD	NOTE
						MGD	**g/yr**	
LA0066621	4952	VINTON	CALCASIEU	VINTON TOWN OF		2.3	38	1
				UNASSIGNED WASTELOAD		1.6	19	1
						TOTAL	**57**	

1- Assumed Hg concentration in effluent = 12 nanograms per liter

GRAND TOTAL	**57 g/yr**

Appendix C-2
Terrebonne River Basin
NPDES Permits

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE	HG LOAD	NOTE
						MGD	g/yr	
LA0020648	4952	PLAQUEMIN	IBERVILLE	CITY OF PLAQUEMINE	Major	1.5	25	1
LA0066486	4952	THIBODAUX	LAFOURCHE	THOROUGHBRED PARK SVC-THIBODAU		0.5	8.3	1
LA0033286	4952	LOCKPORT	LAFOURCHE	TOWN OF LOCKPORT - WWTP		0.79	13	1
LA0040207	4952	HOUMA	TERREBONN	TERREBONNE PH GOVT-HOUMA NORTH	Major	16	266	1
LA0040274	4952	HOUMA	TERREBONN	TERREBONNE PH GOVT-HOUMA-SOUTH	Major	8	133	1
LA0043966	4952	NAPOLEONV	ASSUMPTIO	NAPOLEONVILLE VILLAGE OF		0.2	3.3	1
LA0049344	4952	RACELAND	LAFOURCHE			0.3	5.0	1
LA0068241	4952	BRUSLY LA	WEST BATO	BRUSLY TOWN OF		0.7	12	1
LA0068501	4952	PORT ALLE	WEST BATO	WEST BATON ROUGE PH COUNCIL/WE		0.3	5.0	1
LA0072044	4952	HOUMA	TERREBONN			0.5	8.3	1
LA0074349	4952	SAINT MAR	SAINT MAR			0.15	2.5	1
LA0081809	4952	THIBODAUX	LAFOURCHE			0.5	8.3	1
LA0084425	4952	HOUMA	TERREBONN	VACCO MARINE INC.		0.5	8.3	1
LA0032948	4952	THIBODAUX	LAFOURCHE	CITY OF THIBODAUX - WWTP	Major	3.134	52	1
LA0088528	4952	NEW ROADS	POINTE CO	POINTE COUPEE SD #1		0.64	11	1
LA0108588	4952	PORT ALLE	WEST BATO	WEST BATON ROUGE PH COUNCIL		0.16	2.7	1
				UNNASSIGNED WASTE LOAD		19.75	328	
						TOTAL	**890**	

NPDES	SIC_CODE	CITY NAME	PARISH NAME	NAME	DISCHARGE	FLOW RATE	HG LOAD	NOTE
						MGD	g/yr	
LA0068420	1389	BOURG	TERREBONN	U.S. LIQUIDS		0.01	4.9	2
LA0089648	3731	BOURG	TERREBONN	BOURG DRY DOCK & SERVICE		0.01	90	2
LA0105988	4953	AMELIA	SAINT MAR	EARTHLOCK TECHNOLOGIES LLC		NA	0	2
						TOTAL	**94**	

1- Assumed Hg concentration in effluent = 12 nanograms per liter

2 - See Table 5.1 for Basis of Hg Load

GRAND TOTAL	**985 g/yr**

APPENDIX D
MISSISSIPPI RIVER WATER QUALITY DATA

Appendix D
Mississippi River
Dissolved Mercury in Water

SITE	PCODE	COLLECTION_DATE	RESULT	UNITS	SITE NAME	PARAMETER	SUBSEGMENT
0318	71900	5/1/2001	0.00083	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	9/4/2001	0.00088	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	12/3/2001	0.00086	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	1/8/2002	0.00141	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	3/12/2002	0.00034	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	3/12/2002	0.00073	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	4/2/2002	0.00017	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	4/2/2002	0.00092	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	4/2/2002	0.00097	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	4/2/2002	0.00017	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	4/2/2002	0.00092	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	4/2/2002	0.00097	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	4/9/2002	0.00397	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	4/23/2002	0.00549	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	4/23/2002	0.00091	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	4/23/2002	0.00153	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	4/23/2002	0.00073	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	4/23/2002	0.00611	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	5/14/2002	0.00014	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	5/14/2002	0.0008	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	10/14/2002	0.00099	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	1/21/2003	0.00126	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	4/22/2003	0.00073	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	7/22/2003	0.00038	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	12/16/2003	0.00152	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	3/9/2004	0.00131	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0318	71900	6/2/2004	0.00076	UG/L	Mississippi River south of Saint Francisville, Louisiana	HG, TOTAL	070201
0319	71900	5/1/2001	0.00129	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	9/4/2001	0.00103	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	12/3/2001	0.00085	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	1/8/2002	0.00146	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	3/12/2002	0.00065	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	3/12/2002	0.00011	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301

Appendix D
Mississippi River
Dissolved Mercury in Water

SITE	PCODE	COLLECTION_DATE	RESULT	UNITS	SITE NAME	PARAMETER	SUBSEGMENT
0319	71900	4/2/2002	0.0002	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	4/2/2002	0.0012	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	4/2/2002	0.0002	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	4/2/2002	0.0012	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	4/9/2002	0.00316	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	4/23/2002	0.00081	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	4/23/2002	0.00098	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	4/23/2002	0.00103	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	5/14/2002	0.00082	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	5/14/2002	0.00021	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	10/14/2002	0.00099	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	1/21/2003	0.00109	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	4/22/2003	0.0007	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	7/22/2003	0.00054	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	12/16/2003	0.00088	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	3/9/2004	0.00097	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0319	71900	6/2/2004	0.00067	UG/L	Mississippi River east of Plaquemine, Louisiana	HG, TOTAL	070301
0320	71900	9/4/2001	0.00104	UG/L	Mississippi River east of Belle Chase, Louisiana	HG, TOTAL	070301
0320	71900	11/27/2001	0.0012	UG/L	Mississippi River east of Belle Chase, Louisiana	HG, TOTAL	070301
0320	71900	1/14/2002	0.00173	UG/L	Mississippi River east of Belle Chase, Louisiana	HG, TOTAL	070301
0320	71900	4/9/2002	0.00377	UG/L	Mississippi River east of Belle Chase, Louisiana	HG, TOTAL	070301
0320	71900	7/15/2002	0.00092	UG/L	Mississippi River east of Belle Chase, Louisiana	HG, TOTAL	070301
0320	71900	10/14/2002	0.00031	UG/L	Mississippi River east of Belle Chase, Louisiana	HG, TOTAL	070301
0320	71900	1/21/2003	0.00113	UG/L	Mississippi River east of Belle Chase, Louisiana	HG, TOTAL	070301
0320	71900	4/22/2003	0.00084	UG/L	Mississippi River east of Belle Chase, Louisiana	HG, TOTAL	070301
0320	71900	7/22/2003	0.00111	UG/L	Mississippi River east of Belle Chase, Louisiana	HG, TOTAL	070301
0320	71900	12/16/2003	0.00082	UG/L	Mississippi River east of Belle Chase, Louisiana	HG, TOTAL	070301
0320	71900	3/15/2004	0.00056	UG/L	Mississippi River east of Belle Chase, Louisiana	HG, TOTAL	070301
0320	71900	6/2/2004	0.00041	UG/L	Mississippi River east of Belle Chase, Louisiana	HG, TOTAL	070301
		Average	**0.00114**	**UG/L**			

Appendix D
Mississippi River
Total Mercury in Sediments

SUBSEGMENT	SITE	PCODE	COLLECTION DATE	RESULT	UNITS	SITE NAME	PARAMETER
070101	1136	71921	7/16/2001	0.0303	mg/kg	Old River near Deer Park, Louisiana	HG
070101	1151	71921	9/24/2001	0.0795	mg/kg	Old River near Vidalia, Louisiana	HG
070201	0318	71921	8/1/2001	0.06	mg/kg	Mississippi River south of Saint Francisville, Louisiana	HG
070301	1131	71921	6/20/2001	0.008	mg/kg	Mississippi River near Donaldsonville, Louisiana	HG
			Average	**0.0445**	**mg/kg**		

Appendix D
Mississippi River
Total Suspended Solids

SITE	COLLECTION DATE	PCODE	PARAMETER	RESULT	SITE NAME
0318	1/2/2001	530	T.S.S.	178	Mississippi River south of Saint Francisville, Louisiana
0318	2/6/2001	530	T.S.S.	138	Mississippi River south of Saint Francisville, Louisiana
0318	3/6/2001	530	T.S.S.	125	Mississippi River south of Saint Francisville, Louisiana
0318	4/3/2001	530	T.S.S.	154	Mississippi River south of Saint Francisville, Louisiana
0318	5/1/2001	530	T.S.S.	200	Mississippi River south of Saint Francisville, Louisiana
0318	6/5/2001	530	T.S.S.	112	Mississippi River south of Saint Francisville, Louisiana
0318	7/10/2001	530	T.S.S.	196	Mississippi River south of Saint Francisville, Louisiana
0318	8/7/2001	530	T.S.S.	57	Mississippi River south of Saint Francisville, Louisiana
0318	9/4/2001	530	T.S.S.	168	Mississippi River south of Saint Francisville, Louisiana
0318	10/2/2001	530	T.S.S.	50	Mississippi River south of Saint Francisville, Louisiana
0318	11/5/2001	530	T.S.S.	99	Mississippi River south of Saint Francisville, Louisiana
0318	12/3/2001	530	T.S.S.	346	Mississippi River south of Saint Francisville, Louisiana
0318	1/8/2002	530	T.S.S.	80	Mississippi River south of Saint Francisville, Louisiana
0318	2/19/2002	530	T.S.S.	95	Mississippi River south of Saint Francisville, Louisiana
0318	3/19/2002	530	T.S.S.	148	Mississippi River south of Saint Francisville, Louisiana
0318	4/9/2002	530	T.S.S.	74	Mississippi River south of Saint Francisville, Louisiana
0318	5/14/2002	530	T.S.S.	123	Mississippi River south of Saint Francisville, Louisiana
0318	6/11/2002	530	T.S.S.	36	Mississippi River south of Saint Francisville, Louisiana
0318	7/16/2002	530	T.S.S.	42	Mississippi River south of Saint Francisville, Louisiana
0318	8/13/2002	530	T.S.S.	30	Mississippi River south of Saint Francisville, Louisiana
0318	9/17/2002	530	T.S.S.	37.3	Mississippi River south of Saint Francisville, Louisiana
0318	10/14/2002	530	T.S.S.	70	Mississippi River south of Saint Francisville, Louisiana
0318	11/18/2002	530	T.S.S.	66.7	Mississippi River south of Saint Francisville, Louisiana
0318	12/9/2002	530	T.S.S.	56	Mississippi River south of Saint Francisville, Louisiana
0318	1/21/2003	530	T.S.S.	75	Mississippi River south of Saint Francisville, Louisiana
0318	2/18/2003	530	T.S.S.	132	Mississippi River south of Saint Francisville, Louisiana
0318	3/25/2003	530	T.S.S.	75	Mississippi River south of Saint Francisville, Louisiana
0318	4/22/2003	530	T.S.S.	99.3	Mississippi River south of Saint Francisville, Louisiana
0318	5/20/2003	530	T.S.S.	133	Mississippi River south of Saint Francisville, Louisiana
0318	6/24/2003	530	T.S.S.	119	Mississippi River south of Saint Francisville, Louisiana
0318	7/22/2003	530	T.S.S.	110	Mississippi River south of Saint Francisville, Louisiana
0318	8/19/2003	530	T.S.S.	55	Mississippi River south of Saint Francisville, Louisiana
0318	9/23/2003	530	T.S.S.	70	Mississippi River south of Saint Francisville, Louisiana

Appendix D
Mississippi River
Total Suspended Solids

SITE	COLLECTION DATE	PCODE	PARAMETER	RESULT	SITE NAME
0318	10/21/2003	530	T.S.S.	62	Mississippi River south of Saint Francisville, Louisiana
0318	11/19/2003	530	T.S.S.	72	Mississippi River south of Saint Francisville, Louisiana
0318	12/16/2003	530	T.S.S.	48	Mississippi River south of Saint Francisville, Louisiana
0318	1/6/2004	530	T.S.S.	69	Mississippi River south of Saint Francisville, Louisiana
0318	2/3/2004	530	T.S.S.	105	Mississippi River south of Saint Francisville, Louisiana
0318	3/9/2004	530	T.S.S.	66	Mississippi River south of Saint Francisville, Louisiana
0318	4/13/2004	530	T.S.S.	141	Mississippi River south of Saint Francisville, Louisiana
0319	1/2/2001	530	T.S.S.	200	Mississippi River east of Plaquemine, Louisiana
0319	2/6/2001	530	T.S.S.	112	Mississippi River east of Plaquemine, Louisiana
0319	3/6/2001	530	T.S.S.	170	Mississippi River east of Plaquemine, Louisiana
0319	4/3/2001	530	T.S.S.	153	Mississippi River east of Plaquemine, Louisiana
0319	5/1/2001	530	T.S.S.	168	Mississippi River east of Plaquemine, Louisiana
0319	6/5/2001	530	T.S.S.	132	Mississippi River east of Plaquemine, Louisiana
0319	7/10/2001	530	T.S.S.	188	Mississippi River east of Plaquemine, Louisiana
0319	8/7/2001	530	T.S.S.	34.4	Mississippi River east of Plaquemine, Louisiana
0319	9/4/2001	530	T.S.S.	143	Mississippi River east of Plaquemine, Louisiana
0319	10/2/2001	530	T.S.S.	18.5	Mississippi River east of Plaquemine, Louisiana
0319	11/5/2001	530	T.S.S.	78	Mississippi River east of Plaquemine, Louisiana
0319	12/3/2001	530	T.S.S.	76	Mississippi River east of Plaquemine, Louisiana
0319	1/8/2002	530	T.S.S.	47.3	Mississippi River east of Plaquemine, Louisiana
0319	2/19/2002	530	T.S.S.	110	Mississippi River east of Plaquemine, Louisiana
0319	3/19/2002	530	T.S.S.	114	Mississippi River east of Plaquemine, Louisiana
0319	4/9/2002	530	T.S.S.	103	Mississippi River east of Plaquemine, Louisiana
0319	5/14/2002	530	T.S.S.	126	Mississippi River east of Plaquemine, Louisiana
0319	6/11/2002	530	T.S.S.	42	Mississippi River east of Plaquemine, Louisiana
0319	7/16/2002	530	T.S.S.	48	Mississippi River east of Plaquemine, Louisiana
0319	8/13/2002	530	T.S.S.	53	Mississippi River east of Plaquemine, Louisiana
0319	9/17/2002	530	T.S.S.	22.5	Mississippi River east of Plaquemine, Louisiana
0319	10/14/2002	530	T.S.S.	52	Mississippi River east of Plaquemine, Louisiana
0319	11/18/2002	530	T.S.S.	64	Mississippi River east of Plaquemine, Louisiana
0319	12/9/2002	530	T.S.S.	41	Mississippi River east of Plaquemine, Louisiana
0319	1/21/2003	530	T.S.S.	76.4	Mississippi River east of Plaquemine, Louisiana
0319	2/18/2003	530	T.S.S.	151	Mississippi River east of Plaquemine, Louisiana

Appendix D
Mississippi River
Total Suspended Solids

SITE	COLLECTION DATE	PCODE	PARAMETER	RESULT	SITE NAME
0319	3/25/2003	530	T.S.S.	81	Mississippi River east of Plaquemine, Louisiana
0319	4/22/2003	530	T.S.S.	86	Mississippi River east of Plaquemine, Louisiana
0319	5/20/2003	530	T.S.S.	54.5	Mississippi River east of Plaquemine, Louisiana
0319	6/24/2003	530	T.S.S.	92	Mississippi River east of Plaquemine, Louisiana
0319	7/22/2003	530	T.S.S.	26.7	Mississippi River east of Plaquemine, Louisiana
0319	8/19/2003	530	T.S.S.	62	Mississippi River east of Plaquemine, Louisiana
0319	9/23/2003	530	T.S.S.	78	Mississippi River east of Plaquemine, Louisiana
0319	10/21/2003	530	T.S.S.	19	Mississippi River east of Plaquemine, Louisiana
0319	11/19/2003	530	T.S.S.	34	Mississippi River east of Plaquemine, Louisiana
0319	12/16/2003	530	T.S.S.	41	Mississippi River east of Plaquemine, Louisiana
0319	1/6/2004	530	T.S.S.	63	Mississippi River east of Plaquemine, Louisiana
0319	2/3/2004	530	T.S.S.	103	Mississippi River east of Plaquemine, Louisiana
0319	3/9/2004	530	T.S.S.	89.5	Mississippi River east of Plaquemine, Louisiana
0319	4/13/2004	530	T.S.S.	104	Mississippi River east of Plaquemine, Louisiana
0320	1/2/2001	530	T.S.S.	76	Mississippi River east of Belle Chase, Louisiana
0320	3/6/2001	530	T.S.S.	227	Mississippi River east of Belle Chase, Louisiana
0320	4/3/2001	530	T.S.S.	84	Mississippi River east of Belle Chase, Louisiana
0320	5/1/2001	530	T.S.S.	152	Mississippi River east of Belle Chase, Louisiana
0320	5/29/2001	530	T.S.S.	168	Mississippi River east of Belle Chase, Louisiana
0320	6/26/2001	530	T.S.S.	126	Mississippi River east of Belle Chase, Louisiana
0320	8/7/2001	530	T.S.S.	36	Mississippi River east of Belle Chase, Louisiana
0320	9/4/2001	530	T.S.S.	22	Mississippi River east of Belle Chase, Louisiana
0320	10/2/2001	530	T.S.S.	7	Mississippi River east of Belle Chase, Louisiana
0320	11/6/2001	530	T.S.S.	27	Mississippi River east of Belle Chase, Louisiana
0320	11/27/2001	530	T.S.S.	13.5	Mississippi River east of Belle Chase, Louisiana
0320	1/14/2002	530	T.S.S.	95	Mississippi River east of Belle Chase, Louisiana
0320	2/18/2002	530	T.S.S.	99	Mississippi River east of Belle Chase, Louisiana
0320	3/18/2002	530	T.S.S.	45	Mississippi River east of Belle Chase, Louisiana
0320	4/8/2002	530	T.S.S.	34.6	Mississippi River east of Belle Chase, Louisiana
0320	5/13/2002	530	T.S.S.	137	Mississippi River east of Belle Chase, Louisiana
0320	6/10/2002	530	T.S.S.	60	Mississippi River east of Belle Chase, Louisiana
0320	7/15/2002	530	T.S.S.	23.5	Mississippi River east of Belle Chase, Louisiana
0320	8/12/2002	530	T.S.S.	13	Mississippi River east of Belle Chase, Louisiana

Appendix D
Mississippi River
Total Suspended Solids

SITE	COLLECTION DATE	PCODE	PARAMETER	RESULT	SITE NAME
0320	9/16/2002	530	T.S.S.	6.5	Mississippi River east of Belle Chase, Louisiana
0320	10/14/2002	530	T.S.S.	40	Mississippi River east of Belle Chase, Louisiana
0320	11/19/2002	530	T.S.S.	40.8	Mississippi River east of Belle Chase, Louisiana
0320	12/9/2002	530	T.S.S.	28	Mississippi River east of Belle Chase, Louisiana
0320	1/21/2003	530	T.S.S.	70	Mississippi River east of Belle Chase, Louisiana
0320	2/18/2003	530	T.S.S.	44	Mississippi River east of Belle Chase, Louisiana
0320	3/25/2003	530	T.S.S.	67.1	Mississippi River east of Belle Chase, Louisiana
0320	4/22/2003	530	T.S.S.	42.5	Mississippi River east of Belle Chase, Louisiana
0320	5/20/2003	530	T.S.S.	119	Mississippi River east of Belle Chase, Louisiana
0320	6/17/2003	530	T.S.S.	67	Mississippi River east of Belle Chase, Louisiana
0320	7/22/2003	530	T.S.S.	32.7	Mississippi River east of Belle Chase, Louisiana
0320	8/19/2003	530	T.S.S.	23.5	Mississippi River east of Belle Chase, Louisiana
0320	9/23/2003	530	T.S.S.	23.3	Mississippi River east of Belle Chase, Louisiana
0320	10/21/2003	530	T.S.S.	8	Mississippi River east of Belle Chase, Louisiana
0320	11/12/2003	530	T.S.S.	6	Mississippi River east of Belle Chase, Louisiana
0320	12/16/2003	530	T.S.S.	80	Mississippi River east of Belle Chase, Louisiana
0320	1/13/2004	530	T.S.S.	64	Mississippi River east of Belle Chase, Louisiana
0320	2/10/2004	530	T.S.S.	266	Mississippi River east of Belle Chase, Louisiana
0320	3/16/2004	530	T.S.S.	93	Mississippi River east of Belle Chase, Louisiana
0320	4/6/2004	530	T.S.S.	60	Mississippi River east of Belle Chase, Louisiana
			Average	**85.7**	**mg/L**

Appendix D
Mississippi River
Annual Average Flow Data

Entity	Gage No.	Year	ft^3/sec
USGS	7373291	1929	641,300
USGS	7373291	1930	418,800
USGS	7373291	1931	283,100
USGS	7373291	1932	515,800
USGS	7373291	1933	522,000
USGS	7373291	1934	291,600
USGS	7373291	1935	573,600
USGS	7373291	1936	346,500
USGS	7373291	1937	514,000
USGS	7373291	1938	510,700
USGS	7373291	1939	445,500
USGS	7373291	1940	313,000
USGS	7373291	1941	375,700
USGS	7373291	1942	498,600
USGS	7373291	1943	520,200
USGS	7373291	1944	475,400
USGS	7373291	1945	683,500
USGS	7373291	1946	508,600
USGS	7373291	1947	425,900
USGS	7373291	1948	448,100
USGS	7373291	1949	554,600
USGS	7373291	1950	695,700
USGS	7373291	1951	624,900
USGS	7373291	1952	466,500
USGS	7373291	1953	373,100
USGS	7373291	1954	261,799
USGS	7373291	1955	363,400
USGS	7373291	1956	331,800
USGS	7373291	1957	548,300
USGS	7373291	1958	481,700
USGS	7373291	1959	382,100
USGS	7373291	1960	408,800
USGS	7373291	1961	514,399
USGS	7373291	1962	475,400
USGS	7373291	1963	270,800
USGS	7373291	1964	367,000
USGS	7373291	1965	416,100
USGS	7373291	1966	370,500
USGS	7373291	1967	385,400
USGS	7373291	1968	432,800
USGS	7373291	1969	457,400
USGS	7373291	1970	437,300
USGS	7373291	1971	388,200

Appendix D
Mississippi River
Annual Average Flow Data

Entity	Gage No.	Year	ft^3/sec
USGS	7373291	1972	480,800
USGS	7373291	1973	719,800
USGS	7373291	1974	586,000
USGS	7373291	1975	562,900
USGS	7373291	1976	364,000
USGS	7373291	1977	379,100
USGS	7373291	1978	459,600
USGS	7373291	1979	708,300
USGS	7373291	1980	437,400
USGS	7373291	1981	363,200
USGS	7373291	1982	544,400
USGS	7373291	1983	682,200
USGS	7373291	1984	615,700
USGS	7373291	1985	591,500
		Average	**470,435**

APPENDIX E
NONPOINT SOURCE WATERSHED LOADING ESTIMATES

Appendix E

Table E-1: Dissolved and Particulate Mercury Loading Estimates based on Assumption that 100% of Loading is Transported to 303(d) Listed Coastal Subsegments

Basin	Sub Seg	Adj or Cont	Annual Rainfall (in/yr)	Annual Runoff (ft3/yr)	TSS Load (lb/yr)	Rainfall Volume (m3/yr)	Watershed Area (km2)	Rainfall Hg Conc (ug/l)	Dissolved Hg Load (g/yr)	Particulate Hg Load (g/yr)
Atchafalaya Basin - Basin 01										
1	10101	C	61.0	6,912,144,384.0	17,007,600	467,181,632.0	301.5	0.00951	1,861.87	852.88
1	10201	C	60.7	2,708,022,016.0	6,175,866	153,979,152.0	99.9	0.01067	818.22	309.70
1	10301	C	60.6	16,855,269,376.0	47,555,652	1,375,118,336.0	893.7	0.01063	5,072.63	2,384.77
1	10401	C	61.0	14,403,510,272.0	47,345,008	1,318,702,848.0	851.1	0.01073	4,376.39	2,374.21
1	10501	C	60.8	50,993,266,688.0	68,176,848	2,224,670,208.0	1,440.9	0.01117	16,127.19	3,418.86
1	10502	C	62.0	17,194,113,024.0	21,066,936	715,760,704.0	454.5	0.01378	6,711.30	1,056.44
1	10601	C	63.0	1,766,511,616.0	3,083,851	89,641,400.0	56.0	0.01111	555.68	154.65
1	10701	C	64.4	2,919,833,600.0	7,255,529	188,394,464.0	115.1	0.01241	1,025.63	363.84
1	10801	A	63.7	7,918,092,800.0	10,132,930	318,613,920.0	196.8	0.01330	2,981.06	508.14
1	10802	A	63.3	10,368,840,704.0	12,603,333	430,520,672.0	267.6	0.01211	3,554.53	632.02
1	10803	C	63.5	1,148,991,872.0	1,692,189	46,253,864.0	28.7	0.01243	404.49	84.86
BASIN 01 Totals			**61.3**	**133,188,596,352.0**	**242,095,742**	**7,328,837,200.0**	**4,705.9**	**0.1279**	**43,489.00**	**12,140.35**
Barataria Basin - Basin 02										
2	20101	C	62.3	19,427,528,704.0	43,066,684	1,150,112,128.0	727.2	0.01265	6,957.88	2,159.66
2	20102	C	63.6	9,878,414,336.0	15,791,444	489,901,120.0	303.1	0.01529	4,278.22	791.89
2	20103	C	63.0	360,092,032.0	426,365	12,499,482.0	7.8	0.01573	160.39	21.38
2	20201	C	63.0	4,143,507,200.0	4,992,427	165,449,248.0	103.4	0.01397	1,638.63	250.35
2	20202	C	62.8	14,948,302,848.0	25,715,244	730,664,512.0	458.2	0.01479	6,260.15	1,289.54
2	20301	C	63.2	8,718,271,488.0	12,037,578	374,179,712.0	232.9	0.01384	3,416.99	603.65
2	20302	C	63.1	3,745,318,912.0	6,452,963	185,252,336.0	115.6	0.01695	1,797.65	323.60
2	20303	C	61.6	6,875,007,488.0	9,221,415	277,983,904.0	177.7	0.01757	3,420.88	462.43
2	20304	C	62.6	19,735,769,088.0	26,958,542	792,734,016.0	498.5	0.01399	7,816.46	1,351.89
2	20401	C	62.5	411,241,152.0	1,732,894	43,759,440.0	27.5	0.01199	139.67	86.90
2	20402	C	63.0	97,336,440.0	307,033	10,438,134.0	6.5	0.01401	38.62	15.40
2	20403	C	63.0	431,129,568.0	631,656	17,363,636.0	10.9	0.01841	224.69	31.68
2	20501	C	61.0	3,012,906,240.0	4,832,014	134,831,984.0	87.0	0.01580	1,347.76	242.31
2	20601	C	61.0	7,055,966,720.0	14,444,120	380,355,680.0	245.5	0.01186	2,369.85	724.33
2	20701	C	61.0	3,595,229,184.0	4,410,416	140,197,792.0	90.5	0.01492	1,518.51	221.17
2	20801	C	63.0	12,996,133,888.0	19,901,480	587,760,320.0	367.4	0.01333	4,904.56	998.00
2	20802	C	62.3	6,205,158,400.0	9,380,648	272,748,992.0	172.2	0.01179	2,072.07	470.41
2	20901	C	63.0	4,040,185,344.0	4,783,759	148,260,208.0	92.7	0.01081	1,236.40	239.89
2	20902	C	63.0	7,749,026,816.0	9,175,190	279,595,264.0	174.7	0.01383	3,035.34	460.11

Appendix E

Table E-1: Dissolved and Particulate Mercury Loading Estimates based on Assumption that 100% of Loading is Transported to 303(d) Listed Coastal Subsegments

Basin	Sub Seg	Adj or Cont	Annual Rainfall (in/yr)	Annual Runoff (ft3/yr)	TSS Load (lb/yr)	Rainfall Volume (m3/yr)	Watershed Area (km2)	Rainfall Hg Conc (ug/l)	Dissolved Hg Load (g/yr)	Particulate Hg Load (g/yr)
2	20903	C	63.0	10,854,330,368.0	12,958,366	474,239,232.0	296.4	0.01250	3,841.88	649.82
2	20904	C	63.0	9,414,900,736.0	11,640,204	389,519,904.0	243.4	0.01162	3,096.75	583.72
2	20905	A	63.0	3,790,612,224.0	4,631,936	155,739,024.0	97.3	0.01244	1,335.37	232.28
2	20906	C	63.0	15,849,041,920.0	18,836,096	684,938,304.0	428.0	0.01438	6,453.38	944.57
2	20907	A	63.0	5,363,335,168.0	6,625,742	243,698,048.0	152.3	0.01567	2,379.27	332.26
2	21001	A	63.0	22,471,084,032.0	31,240,010	1,108,674,048.0	692.8	0.01330	8,461.27	1,566.59
2	21101	A	63.0	2,875,949,312.0	4,190,787	823,820,992.0	514.8	0.01380	1,123.78	210.15
BASIN 02 Totals			**62.7**	**204,045,779,608.0**	**304,385,010**	**10,074,717,460.0**	**6,324.4**	**0.3652**	**79,326.44**	**15,263.97**
Calcasieu Basin - Basin 03										
3	30101	C	55.0	1,745,836,160.0	5,475,216	173,599,696.0	124.3	0.00807	398.87	274.57
3	30102	C	58.0	22,491,531,264.0	59,587,588	1,886,076,032.0	1,280.7	0.00849	5,407.16	2,988.13
3	30103	C	61.9	13,908,416,512.0	39,471,672	1,239,246,208.0	787.8	0.00952	3,748.25	1,979.38
3	30104	C	62.4	3,031,983,872.0	9,211,691	331,867,072.0	209.3	0.00856	735.20	461.94
3	30201	C	57.7	2,484,192,256.0	5,637,272	167,264,896.0	114.1	0.00932	655.87	282.69
3	30301	C	55.8	2,688,993,792.0	5,693,447	127,268,424.0	89.7	0.01638	1,246.86	285.51
3	30302	C	56.0	366,993,408.0	824,575	16,561,312.0	11.7	0.01154	119.88	41.35
3	30303	C	55.0	276,645,920.0	698,979	16,664,378.0	11.9	0.01728	135.34	35.05
3	30304	C	56.0	765,385,664.0	2,378,731	50,114,180.0	35.3	0.01381	299.40	119.29
3	30305	C	55.0	684,447,040.0	2,323,144	55,234,928.0	39.5	0.01372	265.93	116.50
3	30306	C	57.0	210,426,672.0	694,535	15,513,124.0	10.7	0.01474	87.84	34.83
3	30401	A	57.3	11,146,222,592.0	16,006,700	426,614,912.0	293.0	0.01702	5,370.73	802.69
3	30402	C	57.1	8,851,175,424.0	12,816,425	325,240,256.0	224.1	0.01191	2,986.21	642.70
3	30403	C	57.0	15,534,511,104.0	18,997,128	513,511,296.0	354.6	0.01490	6,552.80	952.65
3	30501	C	56.6	1,263,279,744.0	3,356,574	102,550,576.0	71.3	0.00756	270.38	168.32
3	30502	C	59.3	9,417,189,376.0	28,220,984	947,883,392.0	629.3	0.00956	2,548.21	1,415.19
3	30503	C	57.9	1,260,504,960.0	4,142,018	110,529,560.0	75.1	0.00899	321.02	207.71
3	30504	C	59.8	5,600,624,640.0	17,431,556	605,273,600.0	398.4	0.00965	1,530.91	874.14
3	30505	C	60.7	3,862,552,576.0	11,699,365	437,682,976.0	284.0	0.00865	945.83	586.69
3	30506	C	57.1	6,826,226,688.0	25,929,188	715,025,984.0	492.7	0.00895	1,730.61	1,300.27
3	30507	C	59.0	922,401,856.0	2,757,740	81,511,672.0	54.4	0.00870	227.36	138.29
3	30508	C	59.6	4,581,327,872.0	13,645,819	434,134,176.0	286.9	0.01009	1,308.62	684.30
3	30601	C	57.1	600,354,304.0	2,655,084	69,125,816.0	47.7	0.00804	136.65	133.14
3	30602	C	59.0	6,317,159,936.0	23,067,288	696,034,176.0	464.4	0.00994	1,778.17	1,156.75

Appendix E

Table E-1: Dissolved and Particulate Mercury Loading Estimates based on Assumption that 100% of Loading is Transported to 303(d) Listed Coastal Subsegments

Basin	Sub Seg	Adj or Cont	Annual Rainfall (in/yr)	Annual Runoff (ft3/yr)	TSS Load (lb/yr)	Rainfall Volume (m3/yr)	Watershed Area (km2)	Rainfall Hg Conc (ug/l)	Dissolved Hg Load (g/yr)	Particulate Hg Load (g/yr)
3	30603	C	59.0	1,283,942,784.0	5,743,351	149,689,856.0	99.9	0.00891	323.97	288.01
3	30701	C	60.0	7,612,264,448.0	36,630,292	805,213,248.0	528.4	0.01047	2,257.11	1,836.90
3	30702	C	56.8	3,388,356,352.0	17,076,234	334,053,632.0	231.5	0.01086	1,041.57	856.32
3	30801	C	57.0	1,252,406,528.0	2,884,736	91,589,552.0	63.3	0.01145	406.08	144.66
3	30802	C	58.5	4,912,251,904.0	17,013,598	537,534,656.0	362.0	0.00933	1,297.60	853.18
3	30803	C	57.5	5,855,993,344.0	20,353,058	633,499,648.0	433.4	0.00948	1,572.03	1,020.64
3	30804	C	57.1	1,416,728,064.0	5,001,424	135,581,952.0	93.6	0.01590	637.70	250.81
3	30805	C	57.6	1,732,282,496.0	8,448,731	192,895,264.0	131.9	0.00951	466.35	423.68
3	30806	C	57.1	5,711,192,576.0	18,475,724	580,232,704.0	400.0	0.01191	1,926.58	926.50
3	30807	C	57.0	6,812,373,504.0	19,749,928	715,009,856.0	493.5	0.01111	2,142.65	990.40
3	30901	C	56.9	1,416,838,656.0	4,807,707	123,415,688.0	85.3	0.01211	485.86	241.09
3	31001	C	57.0	3,510,137,600.0	18,215,300	381,465,216.0	263.5	0.01148	1,140.62	913.44
3	31002	C	57.8	6,510,874,624.0	10,918,980	284,842,048.0	194.0	0.01326	2,444.47	547.55
3	31101	C	56.5	13,224,602,624.0	39,577,152	848,659,392.0	591.2	0.01492	5,588.67	1,984.67
BASIN 03 Totals			**58.4**	**189,478,629,136.0**	**537,618,930**	**15,358,211,354.0**	**10,362.3**	**0.4261**	**60,539.34**	**26,959.92**
Pontchartrain Basin - Basin 04										
4	41101	C	61.0	1,030,533,504.0	1,722,887	44,640,960.0	28.8	0.01842	537.40	86.40
4	41201	C	61.0	3,002,032,640.0	4,459,538	125,113,824.0	80.7	0.02014	1,711.82	223.63
4	41202	C	61.0	880,370,240.0	1,764,896	39,732,876.0	25.6	0.01995	497.22	88.50
4	41203	C	61.0	1,084,208,768.0	1,525,068	42,052,612.0	27.1	0.01682	516.53	76.48
4	41301	C	61.0	56,084,208.0	103,830	2,612,111.3	1.7	0.01270	20.17	5.21
4	41302	C	61.0	5,218,430,464.0	15,478,766	353,297,280.0	228.0	0.01464	2,163.24	776.21
4	41401	C	61.0	4,751,954,432.0	8,536,026	222,630,384.0	143.7	0.01559	2,097.33	428.06
4	41501	C	61.0	248,393,024.0	811,569	11,225,116.0	7.2	0.01211	85.19	40.70
4	41601	C	61.0	414,332,160.0	781,619	16,555,091.0	10.7	0.01238	145.21	39.20
4	41701	C	61.0	1,250,623,104.0	1,773,550	43,770,192.0	28.2	0.01812	641.73	88.94
4	41703	C	61.0	3,118,286,848.0	3,819,007	117,380,336.0	75.8	0.01552	1,370.66	191.51
4	41704	C	61.0	1,399,405,440.0	1,701,785	49,867,492.0	32.2	0.02108	835.23	85.34
4	41801	C	61.0	3,934,479,104.0	6,748,386	188,384,864.0	121.6	0.01098	1,222.91	338.41
4	41802	C	61.0	25,886,558.0	30,651	989,174.8	0.6	0.01059	7.76	1.54
4	41803	C	61.0	25,253,830.0	29,902	965,076.7	0.6	0.01017	7.27	1.50
4	41804	C	61.0	40,510,564.0	48,748	1,757,440.0	1.1	0.01023	11.73	2.44
4	41805	C	61.0	28,576,422.0	49,782	1,454,113.4	0.9	0.01118	9.04	2.50

Appendix E

Table E-1: Dissolved and Particulate Mercury Loading Estimates based on Assumption that 100% of Loading is Transported to 303(d) Listed Coastal Subsegments

Basin	Sub Seg	Adj or Cont	Annual Rainfall (in/yr)	Annual Runoff (ft3/yr)	TSS Load (lb/yr)	Rainfall Volume (m3/yr)	Watershed Area (km2)	Rainfall Hg Conc (ug/l)	Dissolved Hg Load (g/yr)	Particulate Hg Load (g/yr)
4	41806	C	61.0	52,492,504.0	62,153	2,006,004.4	1.3	0.01067	15.86	3.12
4	41807	C	61.0	31,644,158.0	37,468	1,209,283.5	0.8	0.01017	9.11	1.88
4	41808	C	61.0	2,209,080,320.0	3,731,570	115,704,520.0	74.7	0.01171	732.64	187.13
4	41901	C	61.0	952,535,232.0	1,511,720	39,677,172.0	25.6	0.01206	325.27	75.81
4	42001	C	61.0	2,753,140,224.0	3,279,453	1,611,529,728.0	1,039.7	0.01288	1,004.16	164.45
4	42002	C	61.0	70,261,696.0	83,659	2,600,351.8	1.7	0.01154	22.97	4.20
4	42003	C	61.0	16,609,880,064.0	19,727,252	674,564,480.0	435.2	0.01115	5,244.74	989.26
4	42004	C	61.0	1,479,223,680.0	1,774,192	55,714,116.0	36.0	0.01151	482.03	88.97
4	42101	C	61.1	11,184,666,624.0	14,303,226	444,592,544.0	286.3	0.01443	4,570.92	717.26
4	42102	A	62.5	18,394,130,432.0	24,153,288	855,193,088.0	538.8	0.01377	7,172.04	1,211.21
4	42103	C	62.5	2,249,298,176.0	2,663,277	83,993,208.0	52.9	0.01427	908.68	133.56
4	42104	C	62.9	8,700,203,008.0	10,304,931	322,405,920.0	201.9	0.01227	3,021.95	516.76
4	42105	C	61.1	9,524,312,064.0	11,316,928	350,435,616.0	225.9	0.01443	3,891.31	567.51
4	42201	A	61.0	951,291,264.0	1,128,325	3,456,554,752.0	2,229.7	0.01159	312.23	56.58
4	42202	A	61.0	518,478,912.0	659,536	1,442,501,120.0	930.2	0.01295	190.10	33.07
4	42203	C	61.3	2,110,601,088.0	2,500,995	549,119,616.0	352.6	0.01183	707.20	125.42
4	42204	C	61.2	4,213,316,096.0	4,991,039	259,044,464.0	166.6	0.01099	1,311.35	250.29
4	42205	C	61.3	1,507,439,232.0	1,814,428	207,914,832.0	133.5	0.01205	514.15	90.99
4	42206	C	61.1	1,553,730,816.0	1,876,538	358,600,544.0	231.1	0.01259	553.88	94.10
4	42207	C	61.2	2,961,016,832.0	3,526,802	397,789,120.0	255.9	0.01088	912.28	176.86
4	42208	C	61.3	1,103,915,264.0	1,320,853	359,234,560.0	230.6	0.01195	373.54	66.24
BASIN 04 Totals			**61.2**	**115,640,018,996.0**	**160,153,642**	**12,852,813,982.7**	**8,265.7**	**0.5063**	**44,156.86**	**8,031.21**
Mermentau Basin - Basin 05										
5	50101	C	59.6	9,407,839,232.0	45,497,784	981,495,680.0	648.6	0.01000	2,664.41	2,281.57
5	50102	C	61.0	525,370,880.0	2,763,671	57,712,132.0	37.2	0.00904	134.51	138.59
5	50103	C	59.2	5,193,534,464.0	26,537,716	550,842,944.0	366.0	0.01047	1,539.12	1,330.78
5	50201	C	59.2	12,718,478,336.0	71,215,528	1,451,852,672.0	965.7	0.01058	3,808.84	3,571.24
5	50301	C	60.6	15,443,970,048.0	58,707,412	1,473,760,768.0	957.3	0.00941	4,115.56	2,943.99
5	50302	C	62.6	1,364,873,728.0	4,925,866	159,312,480.0	100.1	0.00786	303.62	247.02
5	50303	C	62.8	3,698,392,064.0	12,160,458	395,843,616.0	248.2	0.00811	849.50	609.81
5	50304	C	62.6	6,321,360,384.0	17,602,350	451,901,216.0	284.3	0.00972	1,739.04	882.70
5	50401	C	59.5	2,794,468,608.0	11,781,560	262,682,048.0	173.8	0.01272	1,006.83	590.81
5	50402	C	59.0	2,672,645,376.0	8,025,567	176,780,288.0	118.0	0.01173	887.91	402.46

Appendix E

Table E-1: Dissolved and Particulate Mercury Loading Estimates based on Assumption that 100% of Loading is Transported to 303(d) Listed Coastal Subsegments

Basin	Sub Seg	Adj or Cont	Annual Rainfall (in/yr)	Annual Runoff (ft3/yr)	TSS Load (lb/yr)	Rainfall Volume (m3/yr)	Watershed Area (km2)	Rainfall Hg Conc (ug/l)	Dissolved Hg Load (g/yr)	Particulate Hg Load (g/yr)
5	50501	C	59.1	10,316,816,384.0	58,637,968	1,185,680,896.0	790.4	0.01243	3,630.70	2,940.51
5	50601	C	58.1	18,861,082,624.0	71,112,448	1,515,666,304.0	1,026.7	0.01334	7,122.46	3,566.07
5	50602	C	58.2	13,259,053,056.0	17,299,082	502,786,144.0	340.1	0.01652	6,203.88	867.50
5	50603	C	59.3	4,230,977,024.0	26,262,168	521,826,912.0	346.6	0.01112	1,331.85	1,316.97
5	50701	C	59.0	28,247,746,560.0	34,354,136	999,877,632.0	667.2	0.01548	12,380.13	1,722.75
5	50702	C	60.3	16,209,016,832.0	63,483,584	1,396,374,016.0	912.1	0.01318	6,049.98	3,183.50
5	50703	C	60.7	36,701,274,112.0	46,000,180	1,376,013,056.0	892.6	0.01504	15,633.48	2,306.77
5	50801	A	58.3	12,605,200,384.0	17,433,260	506,200,672.0	341.8	0.01956	6,982.55	874.22
5	50802	A	60.1	13,574,789,120.0	16,127,128	519,400,128.0	340.5	0.01160	4,460.00	808.73
BASIN 05 Totals			**60.0**	**214,146,889,216.0**	**609,927,865**	**14,486,009,604.0**	**9,557.3**	**0.2279**	**80,844.38**	**30,585.99**
Vermilion-Teche Basin - Basin 06										
6	60101	C	60.8	3,226,381,824.0	10,023,610	337,887,424.0	218.9	0.00777	709.83	502.65
6	60102	C	61.2	6,419,440,128.0	17,658,044	626,052,416.0	402.7	0.00900	1,636.53	885.50
6	60201	C	61.0	3,053,682,688.0	10,315,095	328,087,360.0	211.8	0.00771	666.39	517.27
6	60202	C	61.0	2,980,354,304.0	11,340,504	280,947,392.0	181.3	0.00855	721.58	568.69
6	60203	C	61.0	1,443,123,200.0	4,797,335	147,754,592.0	95.4	0.00814	332.47	240.57
6	60204	C	61.0	7,449,006,592.0	31,055,356	754,932,032.0	487.2	0.00964	2,033.85	1,557.33
6	60205	C	60.6	1,700,705,024.0	9,082,622	200,708,176.0	130.4	0.01062	511.23	455.47
6	60206	C	61.0	1,137,542,912.0	2,841,921	99,468,208.0	64.2	0.00849	273.51	142.51
6	60207	C	61.0	7,456,907,264.0	38,019,424	893,033,472.0	576.4	0.00900	1,900.11	1,906.56
6	60208	C	60.2	11,648,741,376.0	40,094,088	1,065,675,648.0	697.3	0.00796	2,624.80	2,010.59
6	60209	C	58.8	3,147,916,800.0	13,256,691	291,792,320.0	195.2	0.00808	720.25	664.78
6	60210	C	61.0	2,958,147,584.0	17,997,038	386,238,944.0	249.3	0.00888	743.81	902.50
6	60211	C	60.2	3,055,979,264.0	17,483,784	370,811,744.0	242.6	0.01150	995.09	876.76
6	60212	C	60.9	8,002,027,520.0	37,993,200	829,894,464.0	536.9	0.00732	1,659.53	1,905.24
6	60301	C	59.0	445,700,896.0	2,280,205	48,972,468.0	32.7	0.01085	136.96	114.35
6	60401	C	59.8	973,322,880.0	4,984,941	109,118,280.0	71.9	0.01085	298.97	249.98
6	60501	C	63.0	2,922,503,936.0	11,034,979	258,076,992.0	161.3	0.01274	1,054.20	553.37
6	60601	C	63.0	154,422,816.0	460,038	11,707,924.0	7.3	0.01168	51.09	23.07
6	60701	C	60.4	1,202,391,168.0	4,696,067	105,695,600.0	68.9	0.01069	363.89	235.49
6	60702	C	61.2	8,135,231,488.0	14,200,762	394,804,096.0	254.1	0.01014	2,334.91	712.12
6	60703	C	59.1	6,721,554,944.0	25,630,450	588,525,632.0	392.3	0.00988	1,880.23	1,285.29
6	60801	C	59.6	12,579,993,600.0	58,369,620	1,256,203,264.0	829.8	0.01015	3,617.15	2,927.06

Appendix E

Table E-1: Dissolved and Particulate Mercury Loading Estimates based on Assumption that 100% of Loading is Transported to 303(d) Listed Coastal Subsegments

Basin	Sub Seg	Adj or Cont	Annual Rainfall (in/yr)	Annual Runoff (ft3/yr)	TSS Load (lb/yr)	Rainfall Volume (m3/yr)	Watershed Area (km2)	Rainfall Hg Conc (ug/l)	Dissolved Hg Load (g/yr)	Particulate Hg Load (g/yr)
6	60802	C	60.2	8,496,713,216.0	44,305,344	964,193,664.0	630.1	0.01237	2,976.47	2,221.78
6	60803	C	61.0	340,260,480.0	500,852	12,788,095.0	8.3	0.01803	173.68	25.12
6	60804	C	61.0	600,408,512.0	743,289	22,116,908.0	14.3	0.01983	337.16	37.27
6	60805	C	59.0	572,195,648.0	1,498,055	38,721,120.0	25.8	0.01064	172.39	75.12
6	60901	C	60.0	4,749,661,184.0	21,141,064	459,250,816.0	301.1	0.01302	1,750.92	1,060.16
6	60902	C	61.0	104,870,368.0	511,497	10,526,752.0	6.8	0.01199	35.62	25.65
6	60903	C	61.0	1,133,609,344.0	6,836,342	146,012,832.0	94.2	0.01216	390.39	342.82
6	60904	C	61.0	9,803,846,656.0	26,722,714	647,058,048.0	417.4	0.01104	3,064.24	1,340.06
6	60906	C	62.8	12,402,158,592.0	21,258,708	609,672,128.0	381.9	0.01236	4,340.51	1,066.06
6	60907	C	63.0	3,434,523,136.0	5,372,841	161,505,408.0	100.9	0.01418	1,379.20	269.43
6	60908	C	59.0	1,111,440,000.0	4,478,035	100,264,608.0	66.9	0.01250	393.44	224.56
6	60909	C	61.0	254,315,120.0	488,779	12,277,442.0	7.9	0.01275	91.84	24.51
6	60910	C	61.0	1,835,623,552.0	4,960,882	117,963,248.0	76.1	0.01293	671.91	248.77
6	61001	C	63.0	177,944,384.0	234,993	553,611,008.0	346.1	0.00984	49.60	11.78
6	61002	A	63.0	107,699,536.0	127,742	384,872,352.0	240.5	0.00952	29.05	6.41
6	61101	C	61.0	3,492,755,968.0	4,231,805	134,220,112.0	86.6	0.01297	1,282.31	212.21
6	61102	C	61.0	3,757,522,176.0	4,568,219	140,749,824.0	90.8	0.01630	1,734.32	229.08
6	61103	A	61.0	11,479,950,336.0	13,722,481	449,806,528.0	290.3	0.00999	3,245.95	688.14
6	61104	C	61.0	1,681,468,928.0	2,018,645	980,748,736.0	632.7	0.01356	645.55	101.23
6	61105	A	61.9	11,647,951,872.0	13,815,612	461,039,808.0	293.3	0.01155	3,809.82	692.81
BASIN 06 Totals			**60.9**	**173,999,997,216.0**	**561,153,671**	**15,793,787,885.0**	**10,220.0**	**0.4672**	**51,840.75**	**28,140.12**
Mississippi Basin - Basin 07										
7	70401	A	62.5	10,652,131,328.0	13,872,914	626,774,400.0	394.9	0.01102	3,324.91	695.68
7	70402	A	62.6	4,235,451,904.0	5,222,228	162,291,056.0	102.1	0.01139	1,366.23	261.88
7	70403	A	62.2	8,531,879,424.0	10,544,455	365,309,600.0	231.2	0.01216	2,937.42	528.77
7	70404	A	62.9	4,103,749,632.0	5,180,503	458,102,432.0	286.6	0.01036	1,203.44	259.79
BASIN 07 Totals			**62.6**	**27,523,212,288.0**	**34,820,099**	**1,612,477,488.0**	**1,014.8**	**0.0449**	**8,832.00**	**1,746.12**
Sabine Basin - Basin 11										
11	110304	A	56.4	4,807,431,168.0	7,093,662	184,450,960.0	128.7	0.02651	3,608.54	355.73
11	110601	C	57.7	6,902,429,184.0	20,994,630	479,870,464.0	327.3	0.01426	2,787.88	1,052.82
11	110602	C	57.0	19,932,225,536.0	27,627,292	755,992,384.0	522.2	0.01882	10,621.89	1,385.42
11	110801	C	59.0	581,475,712.0	852,527	27,692,870.0	18.5	0.01350	222.29	42.75

Appendix E

Table E-1: Dissolved and Particulate Mercury Loading Estimates based on Assumption that 100% of Loading is Transported to 303(d) Listed Coastal Subsegments

Basin	Sub Seg	Adj or Cont	Annual Rainfall (in/yr)	Annual Runoff (ft3/yr)	TSS Load (lb/yr)	Rainfall Volume (m3/yr)	Watershed Area (km2)	Rainfall Hg Conc (ug/l)	Dissolved Hg Load (g/yr)	Particulate Hg Load (g/yr)
BASIN 11 Totals			**57.2**	**32,223,561,600.0**	**56,568,111**	**1,448,006,678.0**	**996.7**	**0.0731**	**17,240.60**	**2,836.72**
Terrebonne Basin - Basin 12										
12	120101	C	61.0	3,576,182,784.0	14,210,957	370,771,072.0	239.3	0.01583	1,602.82	712.64
12	120102	C	61.0	714,064,960.0	3,847,400	87,305,136.0	56.3	0.01261	255.02	192.94
12	120103	C	60.9	2,245,081,088.0	8,746,418	222,078,464.0	143.6	0.01479	940.52	438.61
12	120104	C	60.8	3,949,233,920.0	14,866,114	425,190,304.0	275.3	0.01283	1,435.27	745.49
12	120105	C	61.0	1,533,007,360.0	6,764,584	165,415,328.0	106.8	0.01420	616.34	339.22
12	120106	C	59.0	93,293,576.0	476,044	9,441,009.0	6.3	0.03302	87.24	23.87
12	120107	C	59.1	5,987,370,496.0	10,022,557	343,848,192.0	228.9	0.01270	2,153.74	502.60
12	120108	C	61.0	2,260,763,136.0	8,825,324	216,028,688.0	139.4	0.01334	853.83	442.56
12	120109	C	59.4	2,797,830,400.0	10,324,914	249,893,552.0	165.5	0.02040	1,615.81	517.76
12	120110	C	61.0	890,384,960.0	3,864,091	98,354,952.0	63.5	0.01311	330.41	193.77
12	120111	C	60.8	1,868,008,960.0	8,210,104	202,589,712.0	131.2	0.01214	642.30	411.71
12	120112	C	61.0	1,405,343,744.0	7,275,481	164,451,040.0	106.1	0.01032	410.72	364.84
12	120201	C	60.5	11,315,877,888.0	24,934,304	716,657,344.0	466.5	0.01818	5,823.80	1,250.38
12	120202	C	63.4	9,783,951,360.0	19,569,238	555,105,152.0	344.5	0.01240	3,435.92	981.34
12	120203	C	65.0	107,187,392.0	289,482	5,480,185.0	3.3	0.00982	29.80	14.52
12	120204	C	62.4	12,585,393,152.0	21,249,342	611,002,304.0	385.7	0.01276	4,546.93	1,065.59
12	120205	C	63.8	7,481,332,736.0	9,632,048	311,132,864.0	192.1	0.01096	2,322.80	483.02
12	120206	C	60.9	7,639,569,920.0	24,606,562	629,233,344.0	406.5	0.01346	2,912.26	1,233.94
12	120207	C	65.0	659,485,888.0	814,776	28,868,482.0	17.5	0.01383	258.20	40.86
12	120301	C	63.3	4,112,709,632.0	8,485,689	229,839,936.0	142.9	0.01094	1,273.97	425.53
12	120302	C	63.4	7,382,722,048.0	16,775,347	449,204,512.0	278.9	0.01022	2,135.88	841.23
12	120303	C	63.0	2,481,638,656.0	5,345,659	142,073,520.0	88.8	0.00888	624.09	268.07
12	120304	C	63.0	466,129,856.0	852,532	21,077,328.0	13.2	0.00932	123.07	42.75
12	120401	A	63.4	18,529,427,456.0	21,977,718	757,361,408.0	470.2	0.01373	7,202.02	1,102.11
12	120402	A	64.3	9,439,371,264.0	11,483,284	385,446,656.0	236.2	0.01190	3,180.25	575.85
12	120403	C	63.3	13,391,857,664.0	18,374,224	569,991,616.0	354.5	0.01081	4,099.17	921.41
12	120404	C	63.0	3,119,057,152.0	3,693,102	122,095,904.0	76.3	0.01492	1,317.59	185.20
12	120405	C	63.0	3,290,722,048.0	4,044,260	132,181,504.0	82.6	0.01358	1,265.42	202.81
12	120406	C	63.0	5,673,191,424.0	6,783,330	218,816,624.0	136.7	0.01978	3,177.38	340.16
12	120501	C	63.0	538,351,680.0	1,486,695	34,729,408.0	21.7	0.01004	152.99	74.55
12	120502	C	63.0	1,680,796,672.0	2,470,643	75,932,944.0	47.5	0.01421	676.23	123.90

Appendix F
Atachafalaya River Basin
Mercury in Sediments

SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
010301	0436	71921	1/9/2001	S	0.1037	mg/kg	Lake Henderson east of Henderson, Louisiana	HG
010301	0436	71921	4/3/2001	S	0.1836	mg/kg	Lake Henderson east of Henderson, Louisiana	HG
010301	0436	71921	7/9/2001	S	0.0038	mg/kg	Lake Henderson east of Henderson, Louisiana	HG
010301	0436	71921	11/15/2001	S	0.18056	mg/kg	Lake Henderson east of Henderson, Louisiana	HG
010301	0436	71921	1/24/2002	S	0.29018	mg/kg	Lake Henderson east of Henderson, Louisiana	HG
010301	0436	71921	6/17/2002	S	0.26667	mg/kg	Lake Henderson east of Henderson, Louisiana	HG
010301	0436	71921	11/14/2002	S	0.14037	mg/kg	Lake Henderson east of Henderson, Louisiana	HG
010401	1241	71921	2/25/2002	S	0.08757	mg/kg	Little Alabama Bayou southeast of Krotz Springs, Louisiana	HG
010401	0506	71921	2/25/2002	S	0.13107	mg/kg	Big Alabama southeast of Krotz Springs, Louisiana	HG
010501	0755	71921	9/5/2001	S	0.0594	mg/kg	Millers Chute East of Grand Lake, Louisiana	HG
010501	1143	71921	9/12/2001	S	0.0826	mg/kg	Duck Lake northeast of Centerville, Louisiana	HG
010501	1150	71921	9/17/2001	S	0.0709	mg/kg	Grand Lake (East) east of New Iberia, Louisiana	HG
010501	0915	71921	9/17/2001	S	0.0854	mg/kg	Little Bayou Pigeon, west of New Iberia, Louisiana	HG
010501	0613	71921	3/12/2002	S	0.06448	mg/kg	Buffalo Cove west of Shaw Island, Louisiana	HG
010501	0611	71921	3/12/2002	S	0.10887	mg/kg	Bayou Gravenberg north of Fishers Island, Louisiana	HG
010501	1955	71921	8/20/2002	S	0.05544	mg/kg	Murphy Lake southwest of Bayou Sorrel, Louisiana	HG
010501	0912	71921	8/22/2002	S	0.09511	mg/kg	Bayou Cowan, Louisiana	HG
010501	2074	71921	9/16/2002	S	0.04741	mg/kg	Upper Grand River west of Grand River, Louisiana	HG
010501	0982	71921	10/23/2002	S	0.05994	mg/kg	Bayou Bristow, Work Canal, Southeast of Des Glaise, Louisiana	HG
010501	0734	71921	1/30/2003	S	0.0189	mg/kg	Upper Grand River near Cow Island, Louisiana	HG
010502	1142	71921	9/12/2001	S	0.1055	mg/kg	Mystic Crew Bayou southwest of Belle River, Louisiana	HG
				Average	**0.1067**	**mg/kg**		
SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
010301	0436	9900008	11/15/2001	S	0.67	ug/kg	Lake Henderson east of Henderson, Louisiana	METHYL-HG
010301	0436	9900008	1/24/2002	S	3.16	ug/kg	Lake Henderson east of Henderson, Louisiana	METHYL-HG
010301	0436	9900008	6/17/2002	S	2.59	ug/kg	Lake Henderson east of Henderson, Louisiana	METHYL-HG
010301	0436	9900008	11/14/2002	S	1.88	ug/kg	Lake Henderson east of Henderson, Louisiana	METHYL-HG
010401	0506	9900008	2/25/2002	S	0.95	ug/kg	Big Alabama southeast of Krotz Springs, Louisiana	METHYL-HG
010401	1241	9900008	2/25/2002	S	0.96	ug/kg	Little Alabama Bayou southeast of Krotz Springs, Louisiana	METHYL-HG
010501	0613	9900008	3/12/2002	S	0.94	ug/kg	Buffalo Cove west of Shaw Island, Louisiana	METHYL-HG
010501	0611	9900008	3/12/2002	S	1.06	ug/kg	Bayou Gravenberg north of Fishers Island, Louisiana	METHYL-HG
010501	1955	9900008	8/20/2002	S	0.43	ug/kg	Murphy Lake southwest of Bayou Sorrel, Louisiana	METHYL-HG
010501	0912	9900008	8/22/2002	S	0.46	ug/kg	Bayou Cowan, Louisiana	METHYL-HG
010501	2074	9900008	9/16/2002	S	0.39	ug/kg	Upper Grand River west of Grand River, Louisiana	METHYL-HG
010501	0982	9900008	10/23/2002	S	0.67	ug/kg	Bayou Bristow, Work Canal, Southeast of Des Glaise, Louisiana	METHYL-HG
010501	0734	9900008	1/30/2003	S	0.18	ug/kg	Upper Grand River near Cow Island, Louisiana	METHYL-HG
				Average	**1.10**	**ug/kg**		

Appendix E

Table E-1: Dissolved and Particulate Mercury Loading Estimates based on Assumption that 100% of Loading is Transported to 303(d) Listed Coastal Subsegments

Basin	Sub Seg	Adj or Cont	Annual Rainfall (in/yr)	Annual Runoff (ft3/yr)	TSS Load (lb/yr)	Rainfall Volume (m3/yr)	Watershed Area (km2)	Rainfall Hg Conc (ug/l)	Dissolved Hg Load (g/yr)	Particulate Hg Load (g/yr)
12	120503	C	63.0	272,333,600.0	827,484	20,454,428.0	12.8	0.00981	75.61	41.50
12	120504	C	63.0	882,063,872.0	2,312,745	61,478,284.0	38.4	0.01106	276.36	115.98
12	120505	C	63.0	72,002,312.0	360,980	7,931,196.0	5.0	0.01015	20.70	18.10
12	120506	C	63.0	674,382,016.0	1,053,608	30,456,668.0	19.0	0.01985	378.99	52.84
12	120507	C	63.0	4,148,986,112.0	5,848,824	181,379,248.0	113.3	0.01038	1,220.05	293.30
12	120508	C	63.0	876,803,968.0	1,749,728	43,040,612.0	26.9	0.00999	248.15	87.74
12	120509	C	63.0	3,012,406,528.0	3,892,341	122,558,328.0	76.6	0.01414	1,206.36	195.19
12	120601	C	63.0	572,541,440.0	1,175,307	32,073,840.0	20.0	0.00955	154.77	58.94
12	120602	C	63.0	618,454,144.0	1,155,011	32,748,398.0	20.5	0.01018	178.31	57.92
12	120603	C	63.0	2,889,585.0	15,370	381,544.3	0.2	0.00981	0.80	0.77
12	120604	C	63.0	4,059,564,800.0	6,137,176	187,594,304.0	117.2	0.01007	1,157.01	307.76
12	120605	C	63.0	4,221,438,464.0	5,647,331	181,501,584.0	113.4	0.00970	1,159.40	283.20
12	120701	A	63.0	17,220,718,592.0	20,791,824	675,314,624.0	422.0	0.01258	6,135.08	1,042.65
12	120702	C	63.0	429,611,584.0	548,415	28,297,436.0	17.7	0.01182	143.77	27.50
12	120703	A	63.0	10,593,314,816.0	12,661,984	419,585,664.0	262.2	0.01223	3,667.97	634.96
12	120704	C	63.0	11,528,858,624.0	13,759,529	507,824,672.0	317.4	0.01229	4,013.06	690.00
12	120705	C	63.0	5,051,777,024.0	6,078,300	200,508,624.0	125.3	0.01210	1,730.83	304.81
12	120706	A	63.0	18,037,399,552.0	22,056,548	772,001,280.0	482.4	0.01507	7,699.36	1,106.07
12	120706	C	63.0	5,845.9	7	230.7	0.0	0.01100	0.00	0.00
12	120707	C	63.0	3,584,824,576.0	4,244,629	128,916,600.0	80.6	0.01445	1,466.40	212.86
12	120708	A	63.0	16,303,981,568.0	19,512,364	785,866,624.0	491.1	0.01231	5,683.79	978.48
12	120709	C	63.0	2,201,488,128.0	2,641,697	117,592,880.0	73.5	0.01042	649.41	132.47
12	120801	A	63.0	485,191,104.0	575,484	268,406,032.0	167.7	0.01109	152.37	28.86
12	120802	A	63.0	322,886,112.0	382,975	402,209,760.0	251.3	0.00962	87.99	19.20
12	120803	A	63.0	950,965,120.0	1,151,963	698,989,760.0	436.8	0.01183	318.66	57.77
12	120804	C	63.0	173,707,120.0	205,677	267,067,216.0	166.9	0.01140	56.08	10.31
12	120805	A	63.0	316,404,736.0	379,559	228,483,200.0	142.8	0.01119	100.21	19.03
BASIN 12 Totals			**62.4**	**253,614,340,614.9**	**435,469,080**	**14,954,261,521.0**	**9,428.8**	**0.7391**	**93,483.27**	**21,837.43**

GRAND TOTALS	**479,752.63**	**147,541.83**

APPENDIX F
LDEQ MERCURY IN SEDIMENT DATA

Appendix F
Barataria River Basin
Mercury in Sediments

SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
020301	1244	71921	4/17/2002	S	0.1942	mg/kg	Petite Lac Des Allemands south of Des Allemands, Louisiana	HG
020303	0636	71921	4/23/2001	S	0.0903	mg/kg	Lake Cataouatche South of Avondale, Louisiana	HG
020304	0558	71921	4/18/2001	S	0.0742	mg/kg	Lake Salvador southeast of Carmadelle, Louisiana	HG
020304	0598	71921	4/25/2001	S	0.0411	mg/kg	Lake Salvador south of Westwego, Louisiana	HG
020304	0639	71921	4/30/2001	S	0.0809	mg/kg	Lake Salvador South of Avondale, Louisiana	HG
020401	0294	71921	1/30/2002	S	0.1705	mg/kg	Bayou Lafourche at Lockport, Louisiana	HG
020701	1128	71921	4/25/2001	S	0.0865	mg/kg	Bayou Segnette Waterway near Crown Point, Louisiana	HG
020802	1129	71921	5/2/2001	S	0.0940	mg/kg	The Pen east of Lafitte, Louisiana	HG
020901	0900	71921	3/17/2003	S	0.0486	mg/kg	Bayou Perot southwest of Barataria, Louisiana	HG
020901	2190	71921	3/17/2003	S	0.0683	mg/kg	Bayou Rigolettes near Lafitte, Louisiana	HG
					0.0949	**mg/kg**		
SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
020301	1244	9900008	4/17/2002	S	0.9700	ug/kg	Petite Lac Des Allemands south of Des Allemands, Louisiana	METHYL-HG
020401	0294	9900008	1/30/2002	S	1.9200	ug/kg	Bayou Lafourche at Lockport, Louisiana	METHYL-HG
020901	2190	9900008	3/17/2003	S	0.8900	ug/kg	Bayou Rigolettes near Lafitte, Louisiana	METHYL-HG
020901	0900	9900008	3/17/2003	S	1.7700	ug/kg	Bayou Perot southwest of Barataria, Louisiana	METHYL-HG
					1.39	**ug/kg**		

Appendix F
Calcasieu River Basin
Mercury in Sediments

SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
030201	0093	71921	4/24/2002	S	0.1068	mg/kg	Calcasieu River at Moss Bluff, Louisiana	HG
030201	0093	71921	12/2/2002	S	0.00829	mg/kg	Calcasieu River at Moss Bluff, Louisiana	HG
030507	0380	71921	2/17/2003	S	0.10431	mg/kg	Bundick Lake southeast of DeRidder, Louisiana	HG
030702	0131	71921	5/29/2002	S	0.15321	mg/kg	English Bayou near Lake Charles, Louisiana	HG
030801	0986	71921	6/5/2001	S	0.068	mg/kg	West Fork Calcasieu River, Louisiana	HG
030801	0986	71921	4/22/2002	S	0.17328	mg/kg	West Fork Calcasieu River, Louisiana	HG
030801	0437	71921	12/2/2002	S	0.05762	mg/kg	West Fork Calcasieu River north of Westlake, Louisiana	HG
030804	1125	71921	2/1/2001	S	0.1022	mg/kg	Little River near Moss Bluff, Louisiana	HG
030806	1124	71921	1/30/2001	S	0.0916	mg/kg	Houston River northwest of Westlake, Louisiana	HG
031001	1153	71921	10/15/2001	S	0.39386	mg/kg	Salt Lake near Sulphur, Louisiana	HG
031101	0602	71921	2/19/2001	S	0.0467	mg/kg	Sweet Lake northeast of Cameron, Louisiana	HG
031101	0606	71921	2/21/2001	S	0.085	mg/kg	Willow Lake northeast of Cameron, Louisiana	HG
					0.12	**mg/kg**		
SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
030201	0093	9900008	4/24/2002	S	1.67	ug/kg	Calcasieu River at Moss Bluff, Louisiana	METHYL-HG
030201	0093	9900008	12/2/2002	S	0.29	ug/kg	Calcasieu River at Moss Bluff, Louisiana	METHYL-HG
030507	0380	9900008	2/17/2003	S	0.74	ug/kg	Bundick Lake southeast of DeRidder, Louisiana	METHYL-HG
030702	0131	9900008	5/29/2002	S	0.73	ug/kg	English Bayou near Lake Charles, Louisiana	METHYL-HG
030801	0986	9900008	4/22/2002	S	1.83	ug/kg	West Fork Calcasieu River, Louisiana	METHYL-HG
030801	0437	9900008	12/2/2002	S	0.63	ug/kg	West Fork Calcasieu River north of Westlake, Louisiana	METHYL-HG
031001	1153	9900008	10/15/2001	S	0.77	ug/kg	Salt Lake near Sulphur, Louisiana	METHYL-HG
					0.95	**ug/kg**		

Appendix F
Pontchartrain River Basin
Mercury in Sediment

SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
040201	0630	71921	4/16/2001	S	0.2488	mg/kg	City Park Lake at Baton Rouge, Louisiana	HG
040201	0645	71921	5/29/2001	S	0.4062	mg/kg	University Lake in Baton Rouge, Louisiana	HG
040302	0043	71921	9/23/2002	S	0.0557	mg/kg	Amite River at Port Vincent, Louisiana	HG
040303	0228	71921	2/12/2001	S	0.087	mg/kg	Amite River at mile 6.5, at Clio, Louisiana	HG
040303	0228	71921	11/20/2002	S	0.12487	mg/kg	Amite River at mile 6.5, at Clio, Louisiana	HG
040305	0236	71921	9/23/2002	S	0.19342	mg/kg	Colyell Bay near Port Vincent, Louisiana	HG
040402	0237	71921	12/11/2002	S	0.0421	mg/kg	Amite River Diversion Canal NE of Sorrento, Louisiana	HG
040403	0156	71921	1/11/2001	S	0.1275	mg/kg	Blind River northwest of Gramercy, Louisiana	HG
040403	0156	71921	1/10/2002	S	0.18377	mg/kg	Blind River northwest of Gramercy, Louisiana	HG
040403	0156	71921	1/9/2003	S	0.06327	mg/kg	Blind River northwest of Gramercy, Louisiana	HG
040502	0996	71921	2/7/2001	S	0.1037	mg/kg	Blood River at confluence with Lizard Creek Northwest of Warsaw Landing	HG
040502	0427	71921	7/30/2001	S	0.14	mg/kg	Tickfaw River east of Killian, Louisiana	HG
040502	0996	71921	7/30/2001	S	0.12	mg/kg	Blood River at confluence with Lizard Creek Northwest of Warsaw Landing	HG
040701	0033	71921	12/16/2002	S	0.00441	mg/kg	Tangipahoa River west of Robert, Louisiana	HG
040702	0467	71921	2/6/2001	S	0.015	mg/kg	Tangipahoa River west of Madisonville, Louisiana	HG
040702	0467	71921	6/4/2002	S	0.06359	mg/kg	Tangipahoa River west of Madisonville, Louisiana	HG
040801	0409	71921	5/21/2002	S	0.09842	mg/kg	Tchefuncte River near Covington, Louisiana	HG
040801	0409	71921	7/31/2002	S	0.08191	mg/kg	Tchefuncte River near Covington, Louisiana	HG
040804	0411	71921	5/21/2002	S	0.2542	mg/kg	Bogue Falaya at Covington, Louisiana	HG
040901	0419	71921	5/20/2002	S	0.14283	mg/kg	Bayou Lacombe north of Lacombe, Louisiana	HG
040901	0419	71921	4/2/2003	S	0.0689	mg/kg	Bayou Lacombe north of Lacombe, Louisiana	HG
040902	0420	71921	7/23/2001	S	0.12	mg/kg	Bayou Lacombe east of Lacombe, Louisiana	HG
040905	1077	71921	7/24/2001	S	0.09	mg/kg	Bayou Liberty at Hwy. 433 Bridge	HG
040905	1077	71921	7/29/2002	S	0.04722	mg/kg	Bayou Liberty at Hwy. 433 Bridge	HG
040907	0301	71921	7/24/2001	S	0.23	mg/kg	Bayou Bonfouca at Slidell, Louisiana	HG
041001	0596	71921	4/2/2003	S	0.01193	mg/kg	Lake Pontchartrain south of Bayou Lacombe, Louisiana	HG
					0.1202	**mg/kg**		
SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
040302	0043	9900008	9/23/2002	S	0.36	ug/kg	Amite River at Port Vincent, Louisiana	METHYL-HG
040303	0228	9900008	11/20/2002	S	1.07	ug/kg	Amite River at mile 6.5, at Clio, Louisiana	METHYL-HG
040305	0236	9900008	9/23/2002	S	1.07	ug/kg	Colyell Bay near Port Vincent, Louisiana	METHYL-HG
040402	0237	9900008	12/11/2002	S	0.34	ug/kg	Amite River Diversion Canal NE of Sorrento, Louisiana	METHYL-HG
040403	0156	9900008	1/10/2002	S	2.19	ug/kg	Blind River northwest of Gramercy, Louisiana	METHYL-HG
040403	0156	9900008	1/9/2003	S	0.75	ug/kg	Blind River northwest of Gramercy, Louisiana	METHYL-HG
040701	0033	9900008	12/16/2002	S	0	ug/kg	Tangipahoa River west of Robert, Louisiana	METHYL-HG
040702	0467	9900008	6/4/2002	S	0.09	ug/kg	Tangipahoa River west of Madisonville, Louisiana	METHYL-HG
040801	0409	9900008	5/21/2002	S	1.77	ug/kg	Tchefuncte River near Covington, Louisiana	METHYL-HG
040801	0409	9900008	7/31/2002	S	0.79	ug/kg	Tchefuncte River near Covington, Louisiana	METHYL-HG
040804	0411	9900008	5/21/2002	S	0.45	ug/kg	Bogue Falaya at Covington, Louisiana	METHYL-HG
040901	0419	9900008	5/20/2002	S	1.06	ug/kg	Bayou Lacombe north of Lacombe, Louisiana	METHYL-HG
040901	0419	9900008	4/2/2003	S	1.46	ug/kg	Bayou Lacombe north of Lacombe, Louisiana	METHYL-HG
040905	1077	9900008	7/29/2002	S	0.19	ug/kg	Bayou Liberty at Hwy. 433 Bridge	METHYL-HG
041001	0596	9900008	4/2/2003	S	0.18	ug/kg	Lake Pontchartrain south of Bayou Lacombe, Louisiana	METHYL-HG
					0.78	**ug/kg**		

Appendix F
Mermentau River Basin
Mercury in Sediment

SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
050101	1240	71921	2/13/2002	S	0.10106	mg/kg	Eunice City Park Lake, Eunice, Louisiana	HG
050101	1240	71921	11/12/2002	S	0.05986	mg/kg	Eunice City Park Lake, Eunice, Louisiana	HG
050101	1031	71921	4/7/2003	S	0.08555	mg/kg	Bayou des Cannes, Louisiana	HG
050201	1032	71921	1/15/2003	S	0.15404	mg/kg	Bayou Plaquemine Brule, Louisiana	HG
050401	0003	71921	1/15/2003	S	0.12422	mg/kg	Mermentau River at Mermentau, Louisiana	HG
050501	1008	71921	10/2/2002	S	0.06729	mg/kg	Bayou Queue de Tortue north of Leleux, Louisiana	HG
050602	1236	71921	1/28/2002	S	0.10485	mg/kg	Lake Misere southwest of Lake Arthur, Louisiana	HG
050602	0739	71921	2/12/2003	S	0.0359	mg/kg	Lake Misere near Bayou Misere, Louisiana	HG
050701	0737	71921	2/12/2003	S	0.03986	mg/kg	Grand Lake near Hackberry Point, Louisiana	HG
050702	0757	71921	8/16/2001	S	0.0623	mg/kg	Seventh Ward Canal South of Kaplan, Louisiana	HG
050702	0757	71921	9/9/2002	S	0.08401	mg/kg	Seventh Ward Canal South of Kaplan, Louisiana	HG
050702	1960	71921	9/9/2002	S	0.0499	mg/kg	Intracoastal Waterway west of Bowman Locks, Louisiana	HG
050702	0756	71921	9/30/2002	S	0.05466	mg/kg	North Prong of Schooner Bayou, Louisiana	HG
050702	0881	71921	9/30/2002	S	0.1027	mg/kg	Warren Canal near Intracoastal Waterway, Louisiana	HG
					0.0804	**mg/kg**		
SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
050101	1240	9900008	2/13/2002	S	0.21	ug/kg	Eunice City Park Lake, Eunice, Louisiana	METHYL-HG
050101	1240	9900008	11/12/2002	S	0.45	ug/kg	Eunice City Park Lake, Eunice, Louisiana	METHYL-HG
050101	1031	9900008	4/7/2003	S	1.18	ug/kg	Bayou des Cannes, Louisiana	METHYL-HG
050201	1032	9900008	1/15/2003	S	1.18	ug/kg	Bayou Plaquemine Brule, Louisiana	METHYL-HG
050401	0003	9900008	1/15/2003	S	0.77	ug/kg	Mermentau River at Mermentau, Louisiana	METHYL-HG
050501	1008	9900008	10/2/2002	S	0.89	ug/kg	Bayou Queue de Tortue north of Leleux, Louisiana	METHYL-HG
050602	1236	9900008	1/28/2002	S	1.21	ug/kg	Lake Misere southwest of Lake Arthur, Louisiana	METHYL-HG
050602	0739	9900008	2/12/2003	S	0.42	ug/kg	Lake Misere near Bayou Misere, Louisiana	METHYL-HG
050701	0737	9900008	2/12/2003	S	0.34	ug/kg	Grand Lake near Hackberry Point, Louisiana	METHYL-HG
050702	0757	9900008	9/9/2002	S	0.63	ug/kg	Seventh Ward Canal South of Kaplan, Louisiana	METHYL-HG
050702	1960	9900008	9/9/2002	S	0.47	ug/kg	Intracoastal Waterway west of Bowman Locks, Louisiana	METHYL-HG
050702	0756	9900008	9/30/2002	S	0.74	ug/kg	North Prong of Schooner Bayou, Louisiana	METHYL-HG
050702	0881	9900008	9/30/2002	S	0.81	ug/kg	Warren Canal near Intracoastal Waterway, Louisiana	METHYL-HG
					0.72	**ug/kg**		

Appendix F
Vermillion-Teche River Basin
Mercury in Sediment

SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
060201	1171	71921	11/27/2001	S	0.10569	mg/kg	Bayou Amy north of Henderson, Louisiana	HG
060202	2073	71921	9/18/2002	S	0.04938	mg/kg	Boeuf-Cocodrie Diversion Canal west of Dubuisson, Louisiana	HG
060202	0618	71921	2/20/2003	S	0.07469	mg/kg	Lake Dubuisson near Dubuisson, Louisiana	HG
060203	0379	71921	10/17/2001	S	0.2652	mg/kg	Lake Chicot south of St. Landry, Louisiana	HG
060203	0379	71921	11/25/2002	S	0.14128	mg/kg	Lake Chicot south of St. Landry, Louisiana	HG
060702	1235	71921	1/14/2002	S	0.14716	mg/kg	Lake Fausse Point east of New Iberia, Louisiana	HG
060702	0594	71921	1/16/2002	S	0.18845	mg/kg	Lake Dauterive northeast of Loreauville, Louisiana	HG
060702	1235	71921	11/6/2002	S	0.10503	mg/kg	Lake Fausse Point east of New Iberia, Louisiana	HG
060702	0594	71921	1/13/2003	S	0.09257	mg/kg	Lake Dauterive northeast of Loreauville, Louisiana	HG
060702	1235	71921	1/13/2003	S	0.11984	mg/kg	Lake Fausse Point east of New Iberia, Louisiana	HG
060801	0521	71921	11/13/2001	S	0.11812	mg/kg	Vermilion River at Lafayette, Louisiana	HG
060801	0521	71921	1/21/2003	S	0.07666	mg/kg	Vermilion River at Lafayette, Louisiana	HG
060802	0624	71921	12/11/2001	S	0.10855	mg/kg	Vermilion River near Abbeville, Louisiana	HG
060802	0624	71921	1/27/2003	S	0.0883	mg/kg	Vermilion River near Abbeville, Louisiana	HG
060908	0642	71921	1/8/2002	S	0.25714	mg/kg	Spanish Lake near New Iberia, Louisiana	HG
060908	0642	71921	1/7/2003	S	0.08717	mg/kg	Spanish Lake near New Iberia, Louisiana	HG
060909	0595	71921	5/31/2001	S	0.0921	mg/kg	Lake Peigneur at Jefferson Island, Louisiana	HG
061103	1959	71921	9/4/2002	S	0.08703	mg/kg	Freshwater Bayou Canal southwest of Intracoastal City, Louisiana	HG
					0.1225	**mg/kg**		
SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
060201	1171	9900008	11/27/2001	S	0.29	ug/kg	Bayou Amy north of Henderson, Louisiana	METHYL-HG
060202	2073	9900008	9/18/2002	S	0.43	ug/kg	Boeuf-Cocodrie Diversion Canal west of Dubuisson, Louisiana	METHYL-HG
060202	0618	9900008	2/20/2003	S	0.49	ug/kg	Lake Dubuisson near Dubuisson, Louisiana	METHYL-HG
060203	0379	9900008	10/17/2001	S	0.66	ug/kg	Lake Chicot south of St. Landry, Louisiana	METHYL-HG
060203	0379	9900008	11/25/2002	S	1.43	ug/kg	Lake Chicot south of St. Landry, Louisiana	METHYL-HG
060702	1235	9900008	1/14/2002	S	1.46	ug/kg	Lake Fausse Point east of New Iberia, Louisiana	METHYL-HG
060702	0594	9900008	1/16/2002	S	0.93	ug/kg	Lake Dauterive northeast of Loreauville, Louisiana	METHYL-HG
060702	1235	9900008	11/6/2002	S	1.01	ug/kg	Lake Fausse Point east of New Iberia, Louisiana	METHYL-HG
060702	0594	9900008	1/13/2003	S	0.31	ug/kg	Lake Dauterive northeast of Loreauville, Louisiana	METHYL-HG
060702	1235	9900008	1/13/2003	S	0.93	ug/kg	Lake Fausse Point east of New Iberia, Louisiana	METHYL-HG
060801	0521	9900008	11/13/2001	S	1.31	ug/kg	Vermilion River at Lafayette, Louisiana	METHYL-HG
060801	0521	9900008	1/21/2003	S	1.27	ug/kg	Vermilion River at Lafayette, Louisiana	METHYL-HG
060802	0624	9900008	12/11/2001	S	1.03	ug/kg	Vermilion River near Abbeville, Louisiana	METHYL-HG
060802	0624	9900008	1/27/2003	S	0.98	ug/kg	Vermilion River near Abbeville, Louisiana	METHYL-HG
060908	0642	9900008	1/8/2002	S	3.47	ug/kg	Spanish Lake near New Iberia, Louisiana	METHYL-HG
060908	0642	9900008	1/7/2003	S	1.05	ug/kg	Spanish Lake near New Iberia, Louisiana	METHYL-HG
061103	1959	9900008	9/4/2002	S	0.48	ug/kg	Freshwater Bayou Canal southwest of Intracoastal City, Louisiana	METHYL-HG
					1.03	**ug/kg**		

Appendix F
Mississippi River Basin
Mercury in Sediment

SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
070101	1136	71921	7/16/2001	S	0.0303	mg/kg	Old River near Deer Park, Louisiana	HG
070101	1151	71921	9/24/2001	S	0.0795	mg/kg	Old River near Vidalia, Louisiana	HG
070201	0318	71921	8/1/2001	S	0.06	mg/kg	Mississippi River south of Saint Francisville, Louisiana	HG
070301	1131	71921	6/20/2001	S	0.008	mg/kg	Mississippi River near Donaldsonville, Louisiana	HG
					0.0445	**mg/kg**		

Appendix F
Sabine River Basin
Mercury in Sediment

SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
110101	0529	71921	5/8/2001	S	0.0575	mg/kg	Toledo Bend Reservoir near Hunter, Louisiana	HG
110101	0531	71921	5/8/2001	S	0.1607	mg/kg	Toledo Bend Reservoir near San Patrice, Louisiana	HG
110101	0531	71921	10/23/2001	S	0.16674	mg/kg	Toledo Bend Reservoir near San Patrice, Louisiana	HG
110101	0529	71921	10/23/2001	S	0.08659	mg/kg	Toledo Bend Reservoir near Hunter, Louisiana	HG
110101	0535	71921	10/24/2001	S	0.15662	mg/kg	Toledo Bend Reservoir near Toro, Louisiana	HG
110101	0529	71921	5/6/2002	S	0.05891	mg/kg	Toledo Bend Reservoir near Hunter, Louisiana	HG
110503	0522	71921	2/14/2001	S	0.0521	mg/kg	Vernon Lake south of Anacoco, Louisiana	HG
110503	1164	71921	2/18/2002	S	0.08125	mg/kg	Vernon Lake northeast of Standard, Louisiana	HG
110503	0522	71921	2/17/2003	S	0.01761	mg/kg	Vernon Lake south of Anacoco, Louisiana	HG
					0.0931	**mg/kg**		
SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
110101	0529	9900008	10/23/2001	S	0.32	ug/kg	Toledo Bend Reservoir near Hunter, Louisiana	METHYL-HG
110101	0531	9900008	10/23/2001	S	0.48	ug/kg	Toledo Bend Reservoir near San Patrice, Louisiana	METHYL-HG
110101	0535	9900008	10/24/2001	S	1.62	ug/kg	Toledo Bend Reservoir near Toro, Louisiana	METHYL-HG
110101	0529	9900008	5/6/2002	S	0.21	ug/kg	Toledo Bend Reservoir near Hunter, Louisiana	METHYL-HG
110503	1164	9900008	2/18/2002	S	3.84	ug/kg	Vernon Lake northeast of Standard, Louisiana	METHYL-HG
110503	0522	9900008	2/17/2003	S	0.07	ug/kg	Vernon Lake south of Anacoco, Louisiana	METHYL-HG
					1.09	**ug/kg**		

Appendix F
Terrebonne River Basin
Mercury in Sediment

SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
120107	0998	71921	9/16/2002	S	0.07581	mg/kg	Upper Grand River at levee	HG
120204	0588	71921	1/22/2002	S	0.20538	mg/kg	Grassy Lake southwest of Napoleonville, Louisiana	HG
120302	0730	71921	1/30/2002	S	0.14897	mg/kg	Lake Fields near Lockport, Louisiana	HG
120304	0615	71921	4/11/2002	S	0.11272	mg/kg	Intracoastal Waterway near Bourg, Louisiana	HG
120401	2191	71921	3/19/2003	S	0.03937	mg/kg	Bayou Penchant southeast of Morgan City, Louisiana	HG
120403	0520	71921	4/15/2002	S	0.21608	mg/kg	Union Oil Canal System southwest of Houma, Louisiana	HG
120403	0520	71921	2/10/2003	S	0.07114	mg/kg	Union Oil Canal System southwest of Houma, Louisiana	HG
120403	0934	71921	2/10/2003	S	0.07363	mg/kg	Intracoastal Waterway at Venvirotek Dock, Louisiana	HG
120403	0502	71921	2/24/2003	S	0.153	mg/kg	Bay Wallace south of Gibson, Louisiana	HG
120403	2159	71921	2/27/2003	S	0.0244	mg/kg	Bayou Black southeast of Morgan City, Louisiana	HG
120403	2618	71921	4/9/2003	S	0.33842	mg/kg	Hanson Canal southwest of Houma, Louisiana	HG
120403	0443	71921	4/9/2003	S	0.11249	mg/kg	Orange Grove Canal west of Houma, Louisiana	HG
120406	0513	71921	3/6/2001	S	0.0621	mg/kg	Lake de Cade west of Dulac, Louisiana	HG
120502	1127	71921	3/15/2001	S	0.088	mg/kg	Bayou Grand Caillou north of Boudreaux, Louisiana	HG
120508	0344	71921	3/13/2001	S	0.0489	mg/kg	Houma Navigation Canal south of Houma, Louisiana	HG
120508	0444	71921	3/27/2001	S	0.0633	mg/kg	Fohs Canal southwest of Dulac, Louisiana	HG
					0.1146	**mg/kg**		
SUBSEGMENT	SITE	PCODE	COLLECTION_DATE	MEDIA	RESULT	UNITS	SITE NAME	PARAMETER
120107	0998	9900008	9/16/2002	S	0.94	ug/kg	Upper Grand River at levee	METHYL-HG
120204	0588	9900008	1/22/2002	S	2.15	ug/kg	Grassy Lake southwest of Napoleonville, Louisiana	METHYL-HG
120302	0730	9900008	1/30/2002	S	2.22	ug/kg	Lake Fields near Lockport, Louisiana	METHYL-HG
120304	0615	9900008	4/11/2002	S	0.86	ug/kg	Intracoastal Waterway near Bourg, Louisiana	METHYL-HG
120401	2191	9900008	3/19/2003	S	1.63	ug/kg	Bayou Penchant southeast of Morgan City, Louisiana	METHYL-HG
120403	0520	9900008	4/15/2002	S	2.13	ug/kg	Union Oil Canal System southwest of Houma, Louisiana	METHYL-HG
120403	0520	9900008	2/10/2003	S	0.58	ug/kg	Union Oil Canal System southwest of Houma, Louisiana	METHYL-HG
120403	0934	9900008	2/10/2003	S	1.11	ug/kg	Intracoastal Waterway at Venvirotek Dock, Louisiana	METHYL-HG
120403	0502	9900008	2/24/2003	S	1.89	ug/kg	Bay Wallace south of Gibson, Louisiana	METHYL-HG
120403	2159	9900008	2/27/2003	S	0.69	ug/kg	Bayou Black southeast of Morgan City, Louisiana	METHYL-HG
120403	2618	9900008	4/9/2003	S	8.23	ug/kg	Hanson Canal southwest of Houma, Louisiana	METHYL-HG
120403	0443	9900008	4/9/2003	S	2.72	ug/kg	Orange Grove Canal west of Houma, Louisiana	METHYL-HG
					2.10	**ug/kg**		

APPENDIX G
USEPA REMSAD MODELING REPORT

EPA Region 6

REMSAD Air Deposition Modeling in Support of TMDL Development for Southern Louisiana

Final Report

August 5, 2004

04-038

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EPA Region 6

REMSAD Air Deposition Modeling in Support of TMDL Development for Southern Louisiana

Final Report

August 5, 2004

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04-038

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Executive Summary

This report presents the results of modeling conducted by ICF Consulting for EPA Region 6 to estimate air deposition of mercury to Louisiana gulf coastal basins. EPA Region 6 is tasked with developing Total Maximum Daily Load (TMDL) estimates for mercury in the gulf coastal basins of Louisiana. The state water quality standards divide the state waters of the Gulf of Mexico into separate segments based on drainage basin. The Louisiana 1999 court-ordered 303(d) list includes the following segments based on mercury in fish tissue: segment 031201, Calcasieu River Basin - Coastal Bays and Gulf Waters to State three Mile Limit; segment 010901, Atchafalaya Bay and Delta and Gulf Waters to State 3-mile Limit; segment 021102, Barataria Basin Coastal Bays and Gulf Waters to the State Three mile limit; segment 042209, Lake Pontchartrain Basin Coastal Bays and Gulf waters to State Three-mile limit; segment 06120, Vermilion-Teche River Basin–Coastal Bays and Gulf Waters to State three-mile limit; segment 07060 1, Mississippi River Basin Coastal Bays and Gulf waters to State Three-mile limit; segment 110701, Sabine River Coastal Bays and Gulf Waters to State three-mile limit; segment 120806, Terrebonne basin Coastal Bays and Gulf Waters to the State three-mile limit.

ICF Consulting utilized the REMSAD model, developed in work for EPA Office of Water (OW), to provide estimates of air deposition of mercury to the coastal basins. This information will be used to support the development of TMDLs for these listed coastal segments in Louisiana.

The REMSAD model includes the capability of tagging emissions (a way of estimating the contribution of emissions to deposition). This modeling of mercury included tags to evaluate the contributions of sources to mercury deposition in southern Louisiana.

REMSAD Model Description

The Regional Modeling System for Aerosols and Deposition (REMSAD) Version 7 was used for all modeling reported in this document. REMSAD is a three-dimensional grid model designed to calculate the concentrations of both inert and chemically reactive pollutants by simulating the physical and chemical processes in the atmosphere that affect pollutant concentrations. REMSAD provides estimates of the concentrations and deposition of the simulated pollutants at each grid location in the modeling domain. Post-processing can provide concentration averages and deposition totals over any subset of the time span of the simulation. Concentration and deposition estimates can be obtained from REMSAD outputs at specific locations by utilizing the simulated values in specific grid cells. Further information on REMSAD can be found in the main body of the report and in the user's manual (SAI, 2002).

REMSAD simulates both wet and dry deposition of gaseous and particulate species. Wet deposition occurs as a result of precipitation scavenging. Dry deposition is calculated for each species based on land-use characteristics and meteorological parameters.

The chemical transformations of mercury included in Version 7 of REMSAD are based on the review of current status of atmospheric chemistry of mercury presented by Lin and Pehkonen (1999). Species representing the oxidation state of mercury and the phase (gas or particulate) are tracked. These include HG0 (elemental mercury vapor), HG2 (divalent mercury compounds in gas phase), and HGP (divalent mercury compounds in particulate phase). The mechanism includes the following categories of reactions:

- Gas phase oxidation reactions of elemental mercury (with ozone and peroxide) that form divalent mercury.

- Aqueous phase reactions of elemental mercury with the OH radical, chlorine, and ozone that form divalent mercury.
- Aqueous phase reactions of divalent forms of mercury with sulfites and the HO2 radical that reduce divalent mercury to elemental mercury.

A feature of REMSAD that is of particular importance to the current work is the mercury treatment that includes additional, tagged mercury species. In order to allow tagging of mercury, new species were added to the model with the same properties (molecular weight, deposition properties, chemical reactivity, etc.) as the original mercury species (HG0, HG2, and HGP) but with different names. More specifically, species named HG0_1, HG0_2, and so forth (that have the same properties as HG0) were added to the model. Similarly, species named HG2_1, HG2_2, etc., were added with the properties of HG2, and HGP_1, HGP_2, etc. were added with properties of HGP. Then by assigning a unique tag or identifier to the mercury emissions from each selected source or group of sources (e.g., HG0_1, HG2_1, and HGP_1), the mercury from a particular source or group of sources can be tracked independently of other mercury sources. (Emissions of HG0_1, HG2_1, and HGP_1 from other sources are, of course, equal to zero.) More than 20 separate mercury tags are currently available in the REMSAD system.

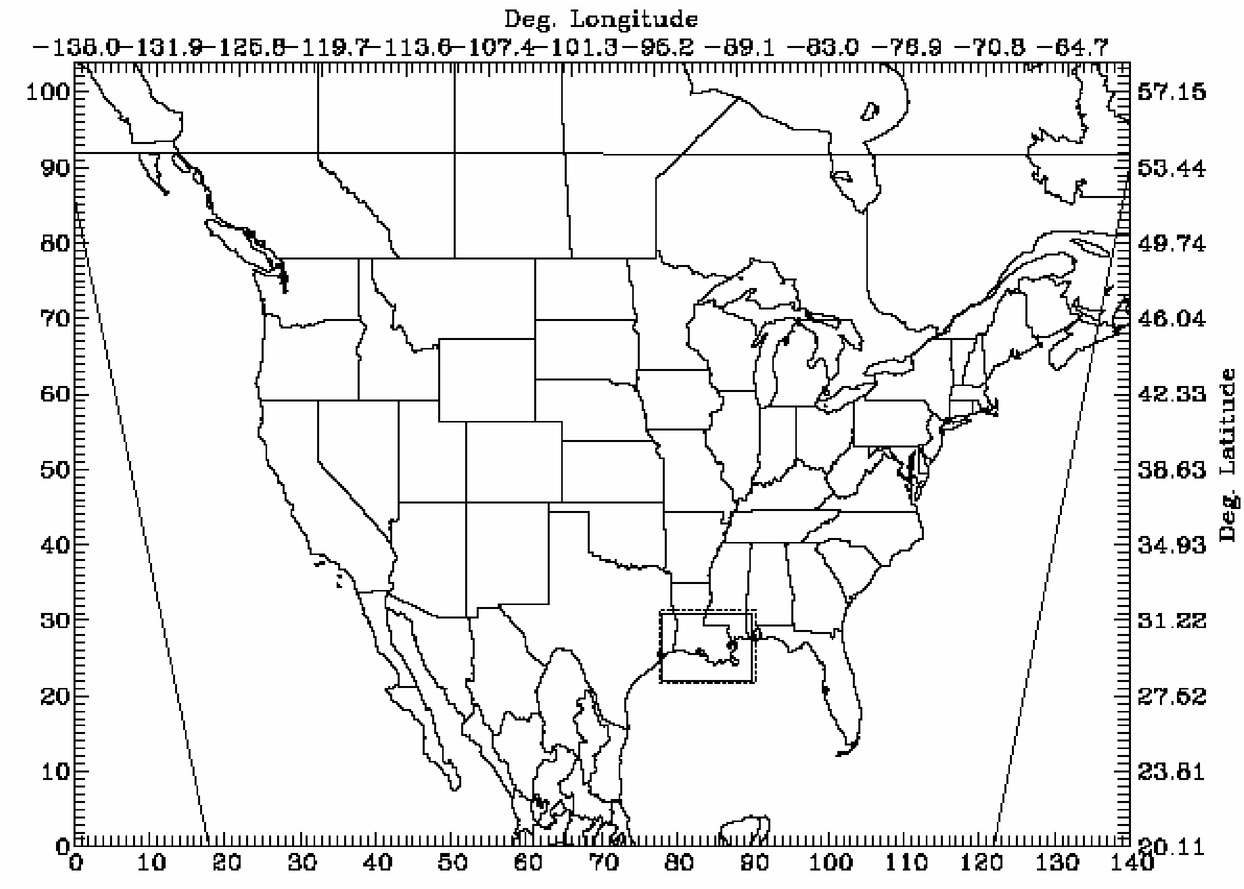
REMSAD requires a variety of input files that characterize and describe the emissions (elevated and low-level), meteorological conditions (wind speed and direction, pressure, temperature, etc.), initial and boundary species concentrations, geographical and land-use features, and chemistry parameters corresponding to the modeling domain and simulation period. Gridded emissions data files are generally processed from county level emissions estimates. Meteorological data are typically derived from the outputs of a prognostic meteorological model. Land use data are available from USGS.

Simulation Setup and Source of Meteorological Data

The modeling domain for the REMSAD mercury simulation used the same definition as the 36 km domain used in work for EPA Office of Water (OW) in the TMDL pilot project for Wisconsin (Myers et al., 2003). In order to provide increased resolution in southern Louisiana, an additional 4 km sub-domain was added that encompassed the southern portion of the state, surrounding waters, and portions of neighboring states. The structure of the domain is shown in Figure ES-1.

Simulation of concentrations of mercury species in the atmosphere requires estimates of concentrations of several other species (e.g., ozone, SO2, the OH and HO2 radicals) that chemically interact with mercury. REMSAD simulations of mercury use the simulated concentrations of these species from a photochemical and particulate matter (PM) simulation of the same domain. Since the modeling domain and the PM precursor emissions were not changed in this application, it was not necessary to rerun the PM simulations in order to obtain estimates of the species that interact with mercury. Instead, the existing REMSAD simulation results that had been performed for EPA OW (Myers et al., 2002) were used to define the additional species concentrations needed for the mercury simulation.

Figure ES-1.
REMSAD Modeling Domain Used for the Simulation of Mercury Deposition in Southern Louisiana



The REMSAD model requires temporally resolved, gridded input fields of wind, temperature, water-vapor concentration, pressure, vertical exchange coefficients (K_v), cloud cover, cloud liquid water, rain liquid water, and rainfall rate. The meteorological inputs for this application were previously prepared in work for EPA OW (Myers, et al., 2003) using output from the Rapid Update Cycle (RUC) data analysis and forecast modeling system. (See http://maps.fsl.noaa.gov/, maintained by NOAA Forecast Systems Laboratory (FSL), RUC development group and Benjamin et al., 2003 for more information.) For the EPA OW project, the RUC data were postprocessed to prepare REMSAD model input files. The RUC meteorological fields at approximately 40 km resolution and with 40 layers of data were vertically and horizontally interpolated to the REMSAD grid. The processing software included procedures to perform this interpolation, fill in temporal gaps in the data, and convert the data to appropriate units for REMSAD. The full calendar year 1998 RUC output dataset was obtained and input fields were prepared for the REMSAD system, with updates every three hours, corresponding to the interval in the available RUC data.

Geographic input data used by the REMSAD model are terrain and land use. The terrain heights were derived from terrain data included in the RUC output files. Land use, which defines fractions of several different land cover types within each grid cell, was derived from USGS Land Use and Land Cover (LULC) data.

Emissions Updates

Prior to processing the emissions inventory, the inventory estimates of Louisiana mercury emissions were compared to other estimates of the emissions. Region 6 provided spreadsheets summarizing mercury emissions estimates from the Toxic Release Inventory (TRI) and from the Toxic Emissions Data Inventory (TEDI), both representing 2001 emissions levels. The inventory data to be used for REMSAD modeling were obtained from EPA OAQPS and include point source data for many individual stacks. Based on facility names in the OAQPS data, it was possible to match some of the records in the OAQPS data with corresponding data in the TRI and/or TEDI data. After consulting with Region 6 staff, the overall annual total emissions were updated in the OAQPS emissions inventory to the TEDI or TRI value, for certain point sources identified in the TEDI or TRI data. Area sources from the OAQPS data were retained. The emissions updates are summarized in Table ES-1.

Table ES-1.
Emissions Entries Updated Based on TEDI or TRI Data

Facility Name, OAQPS	Hg (tons/yr) Updated	Source	Hg (tons/yr) OAQPS
PPG Industries, Inc.	0.611	TEDI	0.6405
Big Cajun 2	0.4325	Tri	0.268597
Dolet Hills Power Station	0.1115	TRI	0.0797194
R S Nelson/R.S. Nelson	0.0835	TRI	0.1066872
Rodemacher Power Station Unit #2	0.069	TRI	0.048956
Gaylord Cont Corp/Gaylord Container Corp.	0.048	TEDI	0.0215083
International Paper/Mansfield Mill	0.0235	TEDI	0.000934
Georgia Pacific/Georgia-Pacific Corp./GP	0.0105	TEDI	0.0237791
Riverwood/Riverwood International Corp./Riverwood International USA, Inc.	0.009	TEDI	0.0200507
IP/Int. Paper/International Paper/International Paper Co. *(located in LA)*	0.0076	TRI	0.0541264
Shell Oil Co/Shell Oil Co.	0.007	TEDI	0.0066216
Rubicon Inc	0.006	TEDI	0.0125
Georgia Gulf Corporation	0.0035	TRI	0.0001286
Boise Cascade Corp/Boise Cascade Corp.	0.0015	TEDI	0.0149031
Willamette Industries/Willamette Industries Inc.	0.001	TRI	0.0106475
Boise Southern/Boise Southern Co.	0.0005	TEDI	0.001083
Union Carbide	0.0005	TEDI	0.0015
Murphy Oil USA, Inc.	0	TRI	0.0019723
Stone Container Corp/Stone Container Corp.	0	TEDI	0.0235901
Pioneer Americas LLC	0.624	TRI	0.600*

** This value from Iberville Parish Chemical Manufacturing emissions in the OAQPS data.*

Preparation of Mercury Emission Inputs

For this application, mercury emissions data for the U.S. were obtained from the EPA and processed using the Emissions Preprocessing System (EPS2.5). The emissions data for a base year of 1996 were used for this application and include mercury emissions (speciated into particulate, divalent, and elemental emissions) for mobile, area and point sources. The majority of the data in the inventory were based on the 1996 National Toxics Inventory (NTI). Some data in this inventory have been updated by EPA to include data that are more recent than 1996. For instance, utility source speciation testing data released in 2000 were used to update the utility emissions speciation. Further information on the mercury emissions speciation testing can be found at http://utility.rti.org/ and at http://www.epa.gov/mercury/. For Canada, mercury emission data were provided by Environment Canada for 1995 for area and point sources.

In addition to preparing the gridded, temporally varying emissions of each of three species of mercury (elemental, divalent gas, and divalent particulate), emissions were also developed for specific emissions categories within Louisiana and other regions within the modeling domain. For each species of mercury, there are 14 tags, or groupings of emissions: 10 tags for state of Louisiana, each for a different source category, a tag for Wisconsin (to facilitate comparisons with earlier simulations that focused on Wisconsin), a tag for the remaining U.S. states, a tag for Canada, and a final "tag" for all U.S. states and Canadian emissions. This final tag represents the overall, total mercury emissions and is used to provide a simulation of the overall mercury concentrations. This avoids the need to add up tagged results to obtain the total mercury concentration or deposition and provides a cross-check of the tagged results versus a standard mercury simulation. The emissions to be tagged for each state were identified using the FIPS code, and different tags for the state of Louisiana were extracted from the database by source category code.

The following source categories within Louisiana were tagged:

- Big Cajun 2 (all SCCs)
- RS Nelson (all SCCs)
- Other coal utilities (coal fired stacks only)
- BFI Health (medical waste incinerator)
- Remainder of medical waste incinerators
- Other incinerators: hazardous waste incinerators and on-site incineration in area source files
- PPG (chlor-alkali, SCC 30100802 only)
- Pioneer Americas (chlor-alkali)
- Other source categories
- Chemical Mfg in Iberville Parish (This category is not included as part of overall total)

A summary of the mercury emission totals is presented in Table ES-2. Data in the table are derived from the mercury emissions inventory acquired from EPA OAQPS with the updates based on TEDI and TRI data described above. Point sources include sources that emitted from individual (typically elevated) stacks. Mobile includes emissions from motor vehicles. Area sources include most other source types, particularly those that follow the residential population distribution, such as use of heating-oil.

Table ES-2.
Summary of 1996 Mercury Emissions Including Louisiana Updates for Modeling Domain

(Emissions in tons/year).

Location	Category	Area	Mobile	Point
Louisiana	Big Cajun 2	0.0000	0.0000	0.4354
Louisiana	RS Nelson	0.0000	0.0000	0.0841
Louisiana	Other Coal Utilities	0.0000	0.0000	0.1819
Louisiana	BFI Health	0.0000	0.0000	0.1448
Louisiana	Other Med. Waste Incinerators	0.0133	0.0000	0.0342
Louisiana	Other Incinerators	0.3926	0.0000	0.0044
Louisiana	PPG	0.0000	0.0000	0.6126
Louisiana	Pioneer Americas	0.0000	0.0000	0.6285
Louisiana	Other Louisiana	0.0839	0.1271	0.3073
Louisiana Total	All	0.4898	0.1271	2.4332
Remaining states	All	14.5932	6.5699	108.5303
All U.S.	All	15.2364	6.8297	114.3832
Canada	All	3.24		7.99

Results of the REMSAD Simulation for Mercury

Air Quality Inputs for the Simulation of Mercury

Initial and boundary concentrations must be specified for each of the three mercury species carried in the simulation: HG0 (elemental mercury), HG2 (divalent gas mercury), and HGP (divalent particulate mercury). Based on recommendations of other researchers and the desire to achieve roughly zero bias in the model results compared to observations, we used background concentrations of 1.7 ng/m^3 for HG0, 0.055 ng/m^3 for HG2, and 0.017 ng/m^3 for HGP. Since the model utilizes boundary and initial concentrations in ppm, we converted the mass per unit volume concentrations to ppm at 298 K and 1 atm. The initial and boundary concentrations in ppm are constant at all layer heights used in the model. Therefore, the mass per unit volume concentrations effectively decrease with height.

Simulation Spatial Patterns

Simulated concentrations of total mercury are relatively uniform with localized peaks in the vicinity of the highest emissions. There is a band of lower concentrations through the Rocky Mountain States. The total annual dry deposition distribution shows a gradual increase in deposition from northwest to southeast, but the highest deposition areas reflect the locations of the highest emissions. The total annual wet deposition, although exhibiting influence from the emissions, is dominated by the rainfall patterns showing high deposition over the Atlantic Ocean, the Gulf Coast, and along the Pacific Coast.

The simulated total annual deposition in southern Louisiana is near 20 g/km^2 or more from wet deposition and on the order of 7 g/km^2 from dry deposition for the 1998 meteorological year.

Simulated dry deposition estimates exceed 15 g/km^2 at two small areas in southern Louisiana. (These deposition estimates are averaged over 36 km grid cells. At 4 km resolution, localized areas of higher deposition in the vicinity of sources will be present.) Data are not available for 1998 to validate the simulated deposition values in southern Louisiana since deposition monitors in Louisiana did not begin full time operation until the following year.

Model Performance

Model performance is evaluated for total wet deposition of mercury against the monitors in the Mercury Deposition Network (MDN) available from the National Atmospheric Deposition Program (NADP). Model performance compared to MDN wet deposition monitors is good with a correlation coefficient (R^2) of nearly 0.6 and little bias. Data were not available to evaluate performance for dry deposition.

The Louisiana MDN sites were not operational in 1998, so the simulated wet deposition for Louisiana in 1998 cannot be directly evaluated against measurements. However, the MDN monitors began to come online in 1999, so a comparison can be made of the simulated values with the observations for 1999 through 2002. Comparison of the simulated 1998 wet deposition to these later years at the Louisiana monitors indicates that the model may be overestimating wet deposition in the Louisiana area.

Because there is no comparable network of dry mercury deposition monitors, it is not possible to adequately evaluate REMSAD performance for dry deposition by comparisons to observations. It should be noted, however, that the general approach to dry deposition in REMSAD is based upon the long-established methodology applied in the Regional Acid Deposition Model (RADM) (Wesley, 1989).

Estimation of Contributors to Deposition

The tagging approach allows estimates to be made of the contributions of different source categories and regions to mercury deposition. This tagging methodology was applied for the annual simulation of southern Louisiana for mercury, in conjunction with the overall simulation of mercury concentrations and deposition. Thus, estimates can be made of the contributions to deposition of the Louisiana source categories described above and in addition the contributions of areas outside of Louisiana. The initial and boundary concentrations were also tagged so that the contribution of mercury from outside the modeling domain can be estimated.

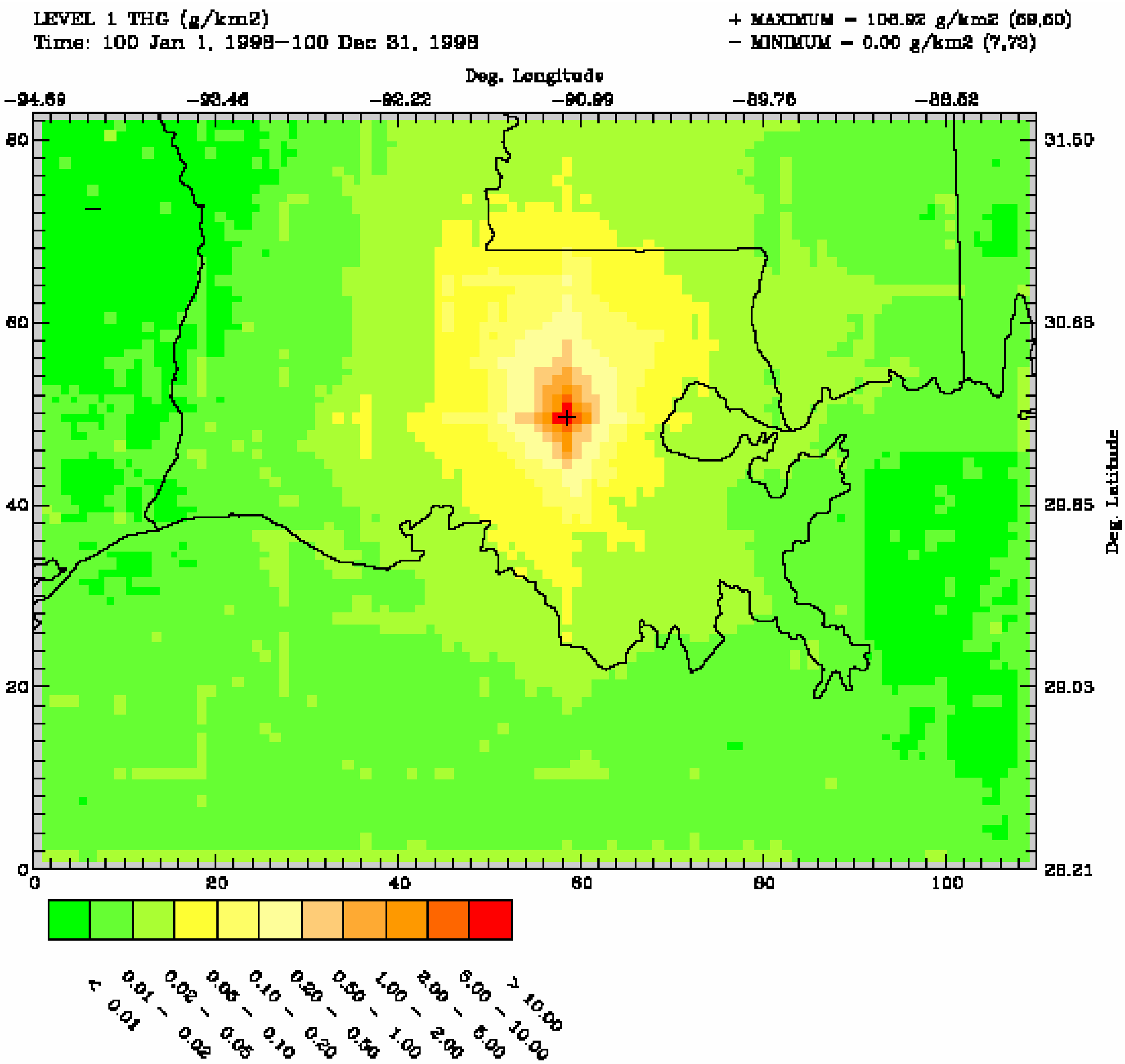
Tagging of emissions and boundary concentrations are prepared such that the sum of the concentrations of all tags would theoretically be the same as the concentration of the overall species. Similarly, the sum of the deposition of all tags would be the same as the deposition of the overall species.

The extent of the impact of the tagged categories can be visualized by plotting a spatial distribution of the contribution to total mercury deposition of a tagged species. An example of a plot of this type is shown in Figures ES-2. This plot shows the contribution to mercury deposition from the Pioneer Americas chlor-alkali plant. Note that the scale is pseudo-logarithmic in order to represent both small and large gradations in the magnitude of deposition. The deposition represented by the high end of the scale is therefore several orders of magnitude greater than that represented by the low end of the scale.

Deposition is plotted on the high-resolution sub-domain over southern Louisiana and therefore values are averaged over grid cells that are approximately 4 km on a side. The maximum deposition in any grid cell is noted at the upper right of the figure and the location of this maximum is noted on the plot by a "+" symbol.

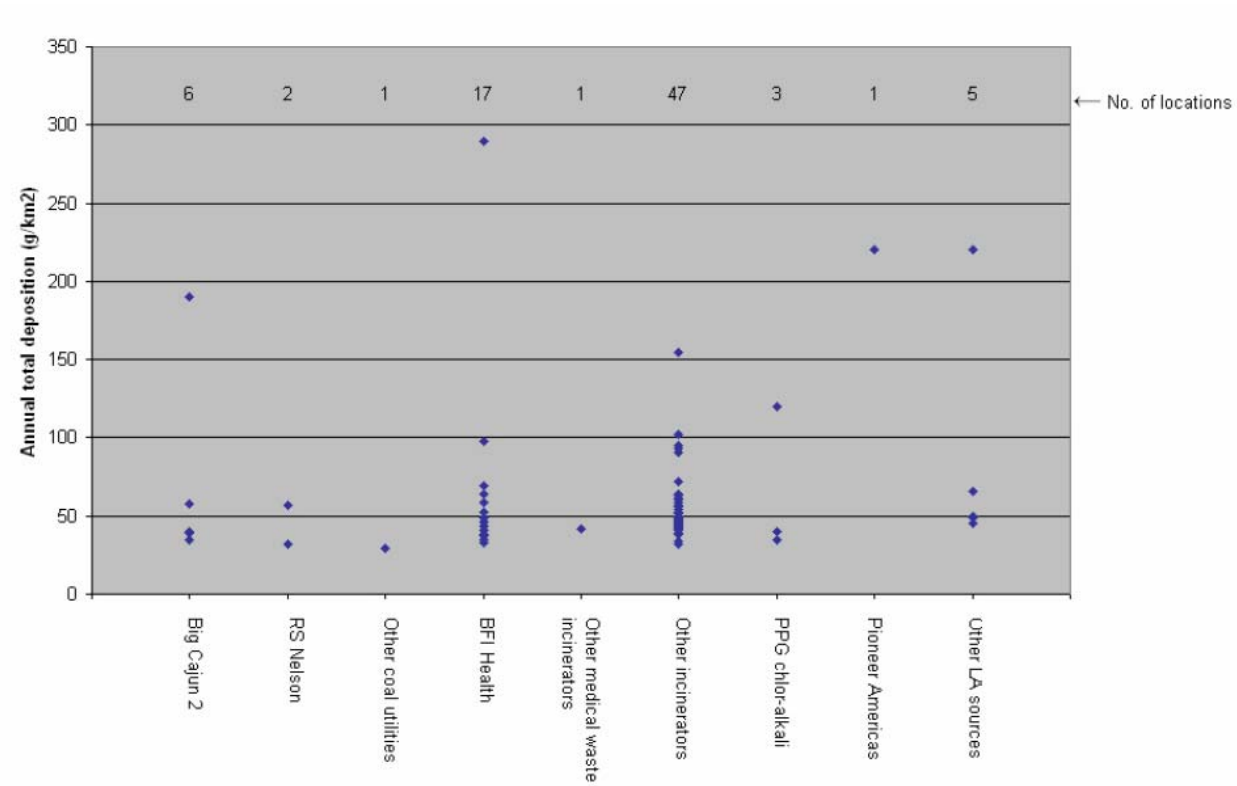
The pattern in this plot is typical of the pattern for each of the tagged categories. At some location, the larger emissions sources all contribute to deposition that is several times higher than the simulated average deposition levels in southern Louisiana (20 – 30 g/km^2; see section 6.2). The maximum deposition contribution is less than the average only for the "Other coal utilities" and "Other medical waste incinerators" categories. These categories contribute on the order of 30 – 50% of the mercury deposition at their maximum.

Figure ES-2.
Simulated Contribution to Total Annual Deposition of Mercury from Pioneer Americas Chlor-alkali



The area influenced by each source category is displayed in another manner in Figure ES-3. The chart displays a point for each location at which a source category contributes 25% or more of the total deposition. (For the purpose of this chart, a location refers to one of the 4 km grid cells in the southern Louisiana modeling domain used in our simulation. There are 8,748 grid cells in the 4 km resolution grid with about 2,700 of these cells in Louisiana.) The value of the total mercury deposition (from all source categories) is plotted above the source category that contributes more than 25% of the deposition. The total number of locations for which each source category contributes more than 25% is indicated above each column of points. Therefore, for instance, the Big Cajun 2 plant contributes 25% or more of the total mercury deposition at 6 locations in the southern Louisiana modeling domain. Each of the tagged categories contributes 25% at one or more locations. Many of the categories contribute to deposition of more than 100 g/km^2.

Figure ES-3.
Locations with Deposition Contributions > 25% from Louisiana Emissions Categories



Since the focus of this study is the gulf coastal basins of Louisiana, we also selected a number of locations near the Gulf Coast at which we examined details of estimates of contributions to deposition.

Simulated contributions at coastal sites typically are primarily from boundary concentrations (representing mercury that originated outside the modeling domain) although a few locations show large impacts from sources located nearby. In most cases, there is some contribution from other states, and in some cases this is the next largest contributor after boundary concentrations. For instance, see Figure ES-4a which displays contributions to dry deposition of mercury at a location within the Lower Calcasieu hydrologic unit near the Gulf Coast. (Table ES-3 shows the key to the colors used in the pie charts.) 85% of the contribution is from the boundary with 12% from other states. Other categories contribute only about 1% or less. Significant contributions do occur from incinerators such as BFI Health and others. For example, see Figure ES-4b, which shows the contributions to wet deposition of mercury at a location within the Lake Maurepas hydrologic unit. BFI Health contributes 22% of the wet deposition at this location with 73% coming from boundary and 2% each from other states and from other incinerators in Louisiana. At a few of the chosen locations, BFI Health or other Louisiana incinerators contribute more than half of the dry deposition of mercury. Sources such as Big Cajun 2 or other Louisiana sources sometimes contribute a few percent. The magnitude of wet deposition is larger than dry deposition, but wet deposition shows a lesser impact from emissions sources than does dry deposition.

Figure ES-4.
Simulated Contribution to
(a) Total Annual Dry Deposition of Mercury at a Location in the Lower Calcasieu Hydrologic Unit;
(b) Total Annual Wet Deposition of Mercury at a Location in the Lake Maurepas Hydrologic Unit

(a) **(b)**

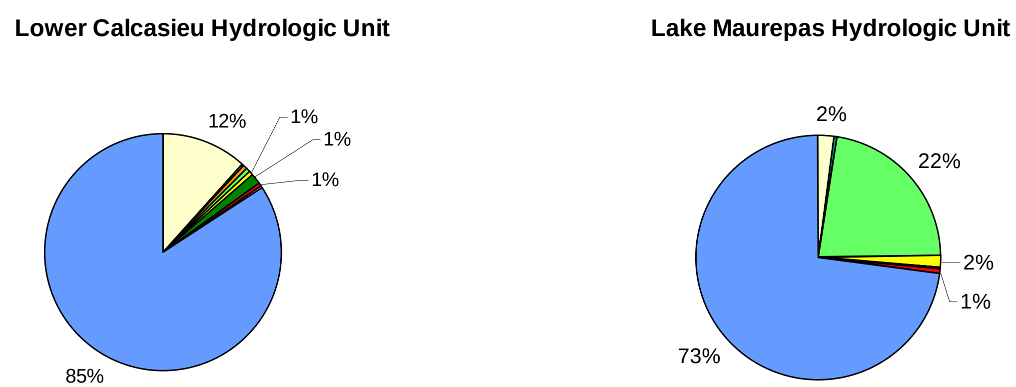


Table ES-3.
Color Codes Used in Figures ES-4

Wisconsin	Other States
Big Cajun 2	RS Nelson
Other Coal Utilities	BFI Health
Other MW	Other Incinerators
PPG Chlor-Alkali	Pioneer Americas
Other LA	Chemical Mfg. in Iberville Par.
Canada	Initial-Boundary Conditions

1. Introduction

This report presents the results of modeling conducted by ICF Consulting for EPA Region 6 to estimate air deposition of mercury to Louisiana gulf coastal basins. EPA Region 6 is tasked with developing Total Maximum Daily Load (TMDL) estimates for mercury in the gulf coastal basins of Louisiana. The state water quality standards divide the state waters of the Gulf of Mexico into separate segments based on drainage basin. The Louisiana 1999 court-ordered 303(d) list includes the following segments based on mercury in fish tissue: segment 031201, Calcasieu River Basin - Coastal Bays and Gulf Waters to State three Mile Limit; segment 010901, Atchafalaya Bay and Delta and Gulf Waters to State 3-mile Limit; segment 021102, Barataria Basin Coastal Bays and Gulf Waters to the State Three mile limit; segment 042209, Lake Pontchartrain Basin Coastal Bays and Gulf waters to State Three-mile limit; segment 06120, Vermilion-Teche River Basin - Coastal Bays and Gulf Waters to State three-mile limit; segment 07060 1, Mississippi River Basin Coastal Bays and Gulf waters to State Three-mile limit; segment 110701, Sabine River Coastal Bays and Gulf Waters to State three-mile limit; segment 120806, Terrebonne basin Coastal Bays and Gulf Waters to the State three-mile limit.

EPA Region 6 retained ICF Consulting to conduct REMSAD modeling and provide estimates of air deposition of mercury to the coastal basins. This information will be used to support the development of TMDLs for these listed coastal segments in Louisiana.

This report documents work conducted by ICF Consulting for Region 6 under EPA Contract Number 68-W-03-028, Work Assignment No. 22 and Work Assignment No. 1-15.

In work for EPA Office of Water (OW), ICF Consulting has developed REMSAD model input files for the simulation of PM and mercury for the 1998 calendar year. ICF has also developed a method called tagging that allows the estimation of the contribution of emissions from specific areas or specific emissions categories to deposition of mercury. These 1998 modeling files, comprising meteorological inputs, criteria pollutant emissions, and mercury emissions, were used as the basis for performance of the tasks described below.

In the current work, the modeling of mercury included tags to evaluate the contributions of sources to mercury deposition in southern Louisiana. The Louisiana model run included simulation of the overall mercury concentration, tags for ten categories of Louisiana emissions, a tag for the remainder of the U.S. emissions, a tag for Canada emissions, and tags for initial and boundary concentrations. In addition, in order to facilitate comparisons to past simulations, a tag for mercury emissions from the state of Wisconsin was included.

The REMSAD model outputs for wet and/or dry deposition were converted to GIS files, allowing the correlation of the model results with information stored in GIS systems. These GIS files were transferred to Region 6 for use in establishing the mercury loading from atmospheric deposition for hydrographic watersheds.

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2. REMSAD Model Description

2.1. General Description of the Model

The Regional Modeling System for Aerosols and Deposition (REMSAD) Version 7 was used for all modeling reported in this document. REMSAD is designed to support a better understanding of the distributions, sources, and removal processes relevant to fine particles and other airborne pollutants, including soluble acidic components and the toxics mercury, cadmium, dioxin, polycyclic organic matter (POM), and atrazine. Consideration of the different processes that affect primary and secondary (i.e., formed by atmospheric processes) particulate matter at the regional scale in different places is fundamental to advancing this understanding and to assessing the effects of proposed pollution control measures. These same control measures will, in most cases, affect ozone, particulate matter and deposition of pollutants to the surface.

REMSAD is a three-dimensional grid model designed to calculate the concentrations of both inert and chemically reactive pollutants by simulating the physical and chemical processes in the atmosphere that affect pollutant concentrations. REMSAD provides estimates of the concentrations and deposition of the simulated pollutants at each grid location in the modeling domain. Post-processing can provide concentration averages and deposition totals over any subset of the time span of the simulation. Concentration and deposition estimates can be obtained from REMSAD outputs at specific locations by utilizing the simulated values in specific grid cells.

REMSAD provides estimates of air concentrations of PM and its precursors and the toxics mercury, cadmium, dioxin, polycyclic organic matter (POM), and atrazine. REMSAD also provides estimates of the wet and dry deposition of airborne pollutants. REMSAD utilizes the micro-CB mechanism to simulate gas-phase photochemical processes in the atmosphere and also includes a chemical mechanism to calculate the transformations of mercury. For the simulation of mercury, REMSAD carries the species HG0 (representing elemental mercury), HG2 (representing divalent gas mercury), and HGP (representing divalent particulate mercury).

The basis for the REMSAD model is the atmospheric diffusion or species continuity equation. This equation represents a mass balance in which all of the relevant emissions, transport, diffusion, chemical reactions, and removal processes are expressed in mathematical terms.

The REMSAD system is built on the foundation of the variable-grid Urban Airshed Model (UAM V)—a regional-scale photochemical modeling system (SAI, 1999). Thus many features of the UAM-V are also available in REMSAD. The REMSAD model is capable of "nesting" one or more finer-scale subgrids within a coarser overall grid, which permits high resolution over source and/or receptor regions. The modeling system may be applied at scales ranging from a single metropolitan area to a continent containing multiple urban areas. To date, most applications have focused on the continental-scale. In addition, the model is typically exercised for a full year.

The REMSAD system consists of a series of preprocessor programs, the core model, and several postprocessing programs.

The major factors that affect the concentration and distribution of aerosols include:

- Spatial and temporal distribution of toxic and particulate emissions including sulfur dioxide (SO_2), oxides of nitrogen (NOx), volatile organic compounds (VOC), and ammonia (NH_3) (both anthropogenic and nonanthropogenic),
- Size composition of the emitted PM,

- Spatial and temporal variations in the wind fields,
- Dynamics of the boundary layer, including stability and the level of mixing,
- Chemical reactions involving PM, SO2, NOx and other important precursor species,
- Diurnal variations of solar insulation and temperature,
- Loss of primary and secondary aerosols and toxics by dry and wet deposition, and
- Ambient air quality immediately upwind and above the region of study.

The REMSAD model simulates these processes when it is used to simulate aerosol distribution and deposition. The model solves the species continuity equation using the method of fractional steps, in which the individual terms in the equation are solved separately in the following order: emissions are injected; horizontal advection/diffusion is solved; vertical advection/diffusion and deposition is solved; and chemical transformations are performed for reactive pollutants. The model performs this four-step solution procedure during one half of each advective (driving) time step, and then reverses the order for the following half time step. The maximum advective time step for stability is a function of the grid size and the maximum wind velocity or horizontal diffusion coefficient. Vertical diffusion is solved on fractions of the advective time step to keep their individual numerical schemes stable. A typical advective time step for coarse (50–80 km) grid spacing is 10–15 minutes, whereas time steps for fine grid spacing (10–30 km) are on the order of a few minutes.

Model inputs are prepared for meteorological and emissions data for the simulation days. Once the model results have been evaluated and determined to perform within prescribed levels, a projected emission inventory can be used to simulate possible policy-driven emission scenarios.

REMSAD provides gridded, averaged surface and multi-layer instantaneous concentrations, and surface deposition output for all species and grids simulated. The averaged surface concentrations and deposition are intended for comparison with measurements and ambient standards. The instantaneous concentration output is primarily used to restart the model, and to examine model results in the upper levels. Concentrations of particulates are passed as input to a postprocessor module that estimates atmospheric visibility. Wet and dry deposition fluxes are calculated hourly and may be accumulated for any desired interval.

The particulate matter species modeled by REMSAD include a primary coarse fraction (corresponding to particulates in the 2.5 to 10 micron size range), a primary fine fraction (corresponding to particulates less than 2.5 microns in diameter), and several secondary particulates (e.g., sulfates, nitrates, and organics). The sum of the primary fine fraction and all of the secondary species is assumed to be representative of PM2.5. This is calculated as part of a postprocessing step.

The photochemical mechanism module used in REMSAD is a reduced-form version of Version 4 of the Carbon-Bond Chemical Mechanism (CB-IV) (Gery et al., 1989) as enhanced to include radical-radical termination reactions. This reduced-form version is termed “micro-CB” and is based on a reduction in number of different organic compound species that are included. The inorganic and radical parts of the mechanism are identical to CB-IV. The organic portion of the chemistry is based on three primary organic compound species (VOC representing an average anthropogenic hydrocarbon species, and ISOP and TERP—representing biogenic hydrocarbon species) and one carbonyl species (CARB).

Secondary organic aerosol species (SOA) are known to result from the reactions of hydrocarbons in the atmosphere. REMSAD Version 7 includes a calculation of the yield of SOA from both anthropogenic and biogenic hydrocarbon species. Of the anthropogenic hydrocarbon emissions, the aromatic hydrocarbons are the principal contributors to SOA. Therefore, a provision is included in REMSAD to establish the aromatic fraction of VOC as a function of space and time. Biogenic emissions include the species TERP, representing monoterpenes, which are the principal biogenic precursors of SOA.

REMSAD simulates both wet and dry deposition of gaseous and particulate species. Wet deposition occurs as a result of precipitation scavenging. Dry deposition is calculated for each species based on land-use characteristics and meteorological parameters.
The chemical transformations of mercury included in Version 7 of REMSAD are based on the review of current status of atmospheric chemistry of mercury presented by Lin and Pehkonen (1999). Prior versions of REMSAD included only the aqueous phase reaction of mercury with ozone. Species representing the oxidation state of mercury and the phase (gas or particulate) are tracked. These include HG0 (elemental mercury vapor), HG2 (divalent mercury compounds in gas phase), and HGP (divalent mercury compounds in particulate phase).

In order to allow estimation of contribution of source categories and regions to deposition, a tagging scheme for the mercury (and other) species is an optional feature of REMSAD. Tagging allows the user to estimate the amounts of a pollutant deposited in a given area that are due to sources or sources regions of interest. This methodology differs from traditional "zero-out" techniques in that it provides estimates for multiple source categories or regions in a single simulation and accounts for all contributors at each location in the grid. That is, the tags are designated such that the sum of the deposition of all tags is equal to the simulated total deposition of mercury.

A feature of REMSAD that is of particular importance to the current work is the mercury treatment that includes additional, tagged mercury species. The original version of REMSAD included mercury in three forms: elemental, gaseous mercury (HG0); divalent, gaseous mercury (HG2); and divalent, particulate mercury (HG2P). In order to allow tagging of mercury, new species were added to the model with the same properties (molecular weight, deposition properties, chemical reactivity, etc.) as the original mercury species but with different names. More specifically, species named HG0_1, HG0_2, and so forth (that have the same properties as HG0) were added to the model. Similarly, species named HG2_1, HG2_2, etc., were added with the properties of HG2, and HGP_1, HGP_2, etc. were added with properties of HGP. Then by assigning a unique tag or identifier to the mercury emissions from each selected source or group of sources (e.g., HG0_1, HG2_1, and HGP_1), the mercury from a particular source or group of sources can be tracked independently of other mercury sources. (Emissions of HG0_1, HG2_1, and HGP_1 from other sources are, of course, equal to zero.) More than 20 separate mercury tags are currently available in the REMSAD system.

REMSAD requires a variety of input files that characterize and describe the emissions, meteorological conditions, initial and boundary species concentrations, geographical and land-use features, and chemistry parameters corresponding to the modeling domain and simulation period. These inputs provide the basis for the air quality and deposition calculations. A summary of the inputs files is given in the following sub-section. REMSAD input files and standard preparation procedures are described in detail in the REMSAD user's guide (SAI, 2002).

The final portions of this section provide more detail on the mercury chemistry used in REMSAD and a description of recent updates to the REMSAD model.

2.2. Summary of Input File Requirements

There are seventeen input files for REMSAD. These fall into the general categories of emissions, initial and boundary conditions, meteorological fields, surface characteristics, chemical parameters, and simulation control parameters. The files are listed and briefly described in Table 2-1.

Table 2-1.
REMSAD Input Files

File Type/Name	Description	Data Sources in TMDL Modeling
Emissions		
EMISSIONS	Low-level emissions for area, mobile, low-level point, non-road, and biogenic sources	EPA OAQPS
PTSOURCE	Elevated point-source emissions	EPA OAQPS
Initial and Boundary Conditions		
AIRQUALITY	Initial species concentrations for each grid cell within the modeling domain	Estimated from the literature
BOUNDARY	Species concentrations along the lateral boundaries of the modeling domain	Estimated from the literature
CHLORINE	Surface chlorine concentrations	Estimated from the literature
Meteorological Fields		
WIND	u- and v- wind components	RUC
TEMPERATURE	Temperature	RUC
PSURF	Surface pressure	RUC
H2O	Water vapor concentration	RUC
VDIFFUSION	Vertical diffusivities or exchange coefficients	RUC
CLW	Cloud-water mixing ratio	RUC
RLW	Rain-water mixing ratio	RUC
RAIN	Rainfall rate	RUC
Surface Characteristics		
SURFACE	Land-use characteristics	USGS LULC data
TERRAIN	Terrain heights	RUC
Chemistry Parameters		
CHEMPARAM	Chemical reaction rates and other micro-CB parameters	Standard REMSAD file
RATES	Photolysis rates	Standard REMSAD file
Simulation Control		
SIMCONTROL	Simulation control parameters and option specifications	User specified

2.3. Mercury Chemistry Treatment

Mercury is volatile in elemental form but involatile in many oxidized inorganic forms and therefore may be present both in the gas and particulate phases. Gaseous mercury species other than elemental Hg may be present in the atmosphere (e.g., organo-mercury compounds). Estimates of mercury emissions include a significant fraction emitted as gaseous, oxidized mercury (EPA, 1996).

The chemical transformations of mercury included in REMSAD are based on the review of current status of atmospheric chemistry of mercury presented by Lin and Pehkonen (1999). Prior versions of REMSAD included only the aqueous phase reaction of mercury with ozone. Specific compounds of mercury are not tracked in REMSAD. However, species representing the oxidation state of mercury and the phase (gas or particulate) are tracked. The mercury species tracked in REMSAD are HG0 (elemental mercury vapor), HG2 (divalent mercury compounds in gas phase), and HGP (divalent mercury compounds in particulate phase). The reactions in REMSAD cause transfer of mercury mass from one of these states to another. In cloud water, HGP is assumed to dissolve with the solubility of HgO (mercury(II) oxide). In cloud water, some HG2 is assumed to be adsorbed to soot particles (e.g., see Seigneur et al., 1998). The treatment is parameterized via a simple formula. The species PEC (primary elemental carbon) is used as an indicator of the amount of soot present. Fifty-five percent of the dissolved divalent mercury (Hg2+) in aqueous phase is assumed to be adsorbed to soot particles when PEC is 450 ugm/(mole of air) or greater. When PEC is zero, no adsorption takes place. Between these two extremes, the fraction of adsorbed Hg2+ is linearly interpolated. REMSAD does not have an internal estimate of chlorine concentrations. Therefore, an input file is required to specify chlorine. The chlorine pathway is considered to be active only at night and chlorine at upper levels is typically set to zero. Chlorine concentrations are supplied at the surface with differing values over the ocean and over land. A typical value used for chlorine over the ocean is 125 ppt (Tokos et al., 1998). Chlorine over land areas is much lower. Discussions with experts suggested a value of 5 ppt over land. Chlorine concentrations are reduced linearly from the surface to zero at a height of 2000 m over the ocean or at a height of 1000 m over land. In order to treat reduction of HG2 by sulfur compounds, the average amount of dissolved SO2 is estimated during the calculation of the aqueous formation of sulfate (via reaction of SO2 with H2O2, O3, and O2). Equilibrium concentrations of HgSO3 and Hg(SO3)22- are calculated and then the production rate of HG0 from HgSO3 is calculated. The pH of cloud water is needed in order to calculate the Henry's law coefficients of some species. In these cases, pH is assumed to be 4.5. Some of the individual species-specific reactions such as photoreduction (for halo-compounds of divalent Hg) and reactions of dimethylmercury by OH, O3, NO3, Cl, O(3 P) have been neglected.

The routine that calculates chemical transformations of mercury is provided with total concentrations of HG0, HG2, and HGP. The routine calculates the fraction in gas and aqueous phases of each of these categories. Gas and aqueous chemical transformations are calculated independently. The routine then recombines the gas and aqueous fractions to return the new total concentrations of HG0, HG2, and HGP.

The following reactions are included in the REMSAD mechanism for mercury:

Table 2-2.
Mercury Chemical Mechanism in REMSAD, Version 7

Reaction	Rate (unit)
For HG0	
Gas phase	
$HG0 + O_3 \rightarrow HGP$	3.0e-20 ($cm^3 molecule^{-1} s^{-1}$)
$HG0 + NO_3 \rightarrow HGP$	4.0e-15 ($cm^3 molecule^{-1} s^{-1}$)(currently disabled)
$HG0 + H_2O_2 \rightarrow HG2$	8.5e-19 ($cm^3 molecule^{-1} s^{-1}$)
Aqueous phase	
$HG0 + O_3 \rightarrow HG2$	4.7e+7 ($M^{-1}s^{-1}$)
$HG0 + OH \rightarrow HG2$	2.0e+9 ($M^{-1}s^{-1}$)
$HG0 + Cl_{aq} \rightarrow HG2$	(See eq. 8 in Lin and Pehkonen, 1999)
$HgSO3 \rightarrow HG0$	$T\ e^{(31.971\ T - 12595)/T}\ s^{-1}$ (Van Loon et al., 2001)
For HG2	
Aqueous phase	
$HG2 + HO_2 \rightarrow HG0$	1.7e+4 ($M^{-1}s^{-1}$)
$HG2 + SO_3^{2-} \leftrightarrow HgSO_3$	5.e+12 (M^{-1})
$HgSO_3 + SO_3^{2-} \leftrightarrow Hg(SO_3)_2^{2-}$	2.5e+11 (M^{-1})
$Hg2 + OH^- \leftrightarrow Hg(OH)^+$	4.27e+10 (M^{-1})
$Hg2 + 2\ OH^- \leftrightarrow Hg(OH)_2$	1.74e+22 (M^{-1})
$Hg2 + OH^- + Cl^- \leftrightarrow HgOHCl$	1.78e+18 (M^{-2})
$Hg2 + Cl^- \leftrightarrow HgCl^+$	2.0e+7 (M^{-1})
$Hg2 + 2\ Cl^- \leftrightarrow HgCl_2$	1.e+14 (M^{-2})
$Hg2 + 3\ Cl^- \leftrightarrow HgCl_3^-$	1.e+15 (M^{-3})
$Hg2 + 4\ Cl^- \leftrightarrow HgCl_4^{2-}$	3.98e+15 (M^{-4})

Source: Lin and Pehkonen, 1999, except as noted.

2.4. Reemission Treatment

Re-emission of mercury from land or water surface is believed to occur but has not been accurately quantified. Sofiev and Galperin (2000) note that, “After oxidation and deposition, mercury can be reduced or methilated and then re-emitted back to air…” Syrakov (1998) states, “…a good deal of airborne mercury (both anthropogenic and natural) deposited in aquatic and terrestrial environment is re-emitted back to the atmosphere through natural processes, such as microbial activity.” Later in the same paper, he states, “The natural emission and the re-emission of mercury are mainly in the form of Hg0. Very small amount is in the form of organic mercury compounds which are reduced very soon to metal vapour condition in the atmosphere.” Other modelers (Shia, et al., 1999) note that, “The emissions from land and ocean consist of cycling of mercury associated with its natural budget (estimated to be 2000 Mg y-1) and recycling of previously deposited mercury of anthropogenic origin (estimated to be 2000 Mg y-1).” All of their natural and re-emitted mercury emissions are in the form of Hg0.

Syrakov describes a methodology for incorporating re-emission into a transport model and we used this methodology in REMSAD. Syrakov estimates the rate at which mercury becomes fixed (and therefore unavailable for re-emission) and the rate at which mercury is re-emitted. A re-emission mass is tracked which is a measure of the amount of mercury that could be re-emitted. Syrakov suggests the following parameterization and constants:

$$dQ_{av}/dt = D + W - a_{reemis}Q_{av} - a_{fix}Q_{av},$$

$$dQ_{fix}/dt = a_{fix}Q_{av},$$

$$RE = a_{reemis}Q_{av}$$

Here D is the dry deposition flux, W is the wet deposition flux, Q_{av} is the re-emission mass, Q_{fix} is the fixed (unavailable) mass, RE is the re-emission flux, and a_{fix} and a_{reemis} are fixation and re-emission coefficients (see Table 2-3).

Table 2-3.
Re-emission Coefficients

Coefficient	a_{reemis}	a_{fix}
Sea	0.005	0.000002
Land	0.0002T	0.000002T

(a_{reemis} and a_{fix} in hr^{-1}. T is temperature in C. a_{reemis} and a_{fix} over land are zero when T < 0.)

It is clear from the magnitude of these coefficients that the rate of re-emission of newly deposited material will be much faster than its rate of fixation. (The time to fix half of deposited mercury mass is on the order of years while the time to re-emit half of the deposited mercury is on the order of weeks.) Therefore, although conceptually attractive, initializing the Q_{av} mass with the results of an existing simulation would result in an apparent over estimation of Q_{av}. (Simulation results show annual deposition of between 10 and 100 g/km^2 while Syrakov estimates Q_{av} at only 0.2 g/km^2 over water and between 1.7 and 3.9 g/km^2 over land.) We therefore elected to initialize Q_{av} to 0.2 g/km^2 over water and 2.0 g/km^2 over land. We follow Syarkov’s treatment except that Q_{fix} is not tracked since it does not affect the evolution of Q_{av}.

Because of the uncertainties inherent in virtually all of the parameters required to implement this treatment, we have not made our base calculation dependent on the re-emission calculation. However, because of the availability of our mercury tagging species, we can track the re-emitted mercury as a separate species. Calculation of Q_{av} is dependent on deposition of all emissions and boundary concentrations. Re-emission takes place into one specific tag as elemental mercury.

2.5. Recent Model Updates

Although no model updates were implemented as part of this project, some updates to the REMSAD model that affect the model results are discussed here.

During work for EPA Office of Water, a direct comparison was made of the results of the aqueous mercury chemistry module in REMSAD with the results of the aqueous mercury chemistry module in CMAQ. As a result of this comparison, revisions were made in the numerical approach used in the REMSAD module that resulted in better agreement between the two models. The effect on REMSAD model results is, on average, to increase the amount of oxidation of elemental mercury that takes place in aqueous phase. In addition, the parameterization of the adsorptions of HG2 to soot particles was revised to make it more consistent with CMAQ. This change appeared to have only a limited effect on the simulation results. Further details on these updates and the comparison to CMAQ are included in a memo to EPA OW, dated 20 January 2004 (Myers, 2004).

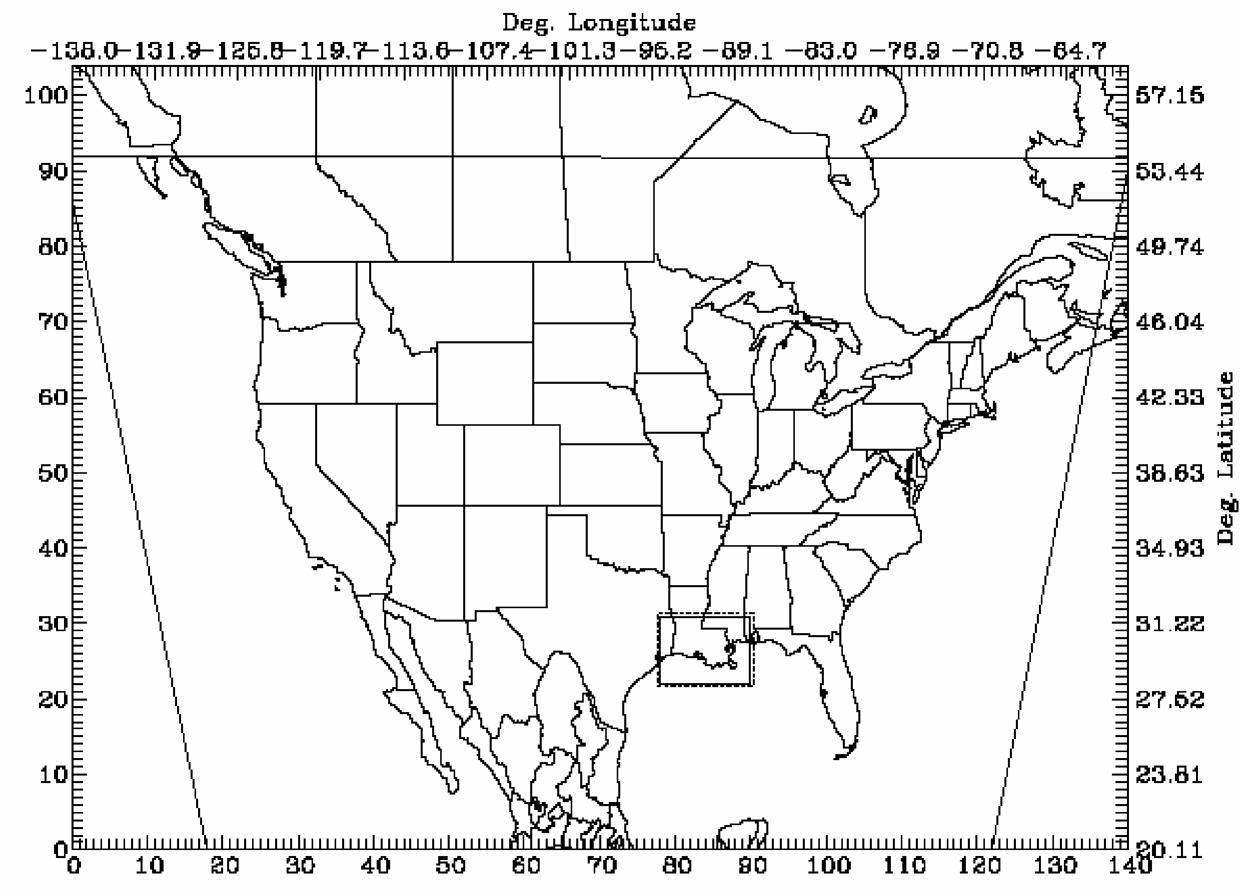
In work for EPA Region 3, we added the capability to REMSAD to track separately the deposition to different land-use types within a grid cell. The standard REMSAD output provides the average deposition over the area of a grid cell. The average value for a grid cell might not represent the deposition to water bodies within the grid cell very well since the area covered by water might make up a small fraction of the grid cell. Within REMSAD, calculations are carried out to derive the dry deposition rate for each of the land use types within a grid cell. In this modification, we provide the capability of saving the separate deposition rates for each land use type. Output is therefore available specifying, for instance, the deposition rate to water area and land area within a grid cell separately rather than just the average for the entire cell. This modification does not alter the REMSAD estimates of deposition but provides more detail in the saved information.

3. Simulation Setup and Source of Meteorological Data

3.1. REMSAD Mercury Simulation

The modeling domain for the REMSAD mercury simulation used the same definition as the 36 km domain used in work for EPA Office of Water (OW) in the TMDL pilot project for Wisconsin (Myers et al., 2003). In order to provide increased resolution in southern Louisiana, an additional 4 km sub-domain was added that encompassed the southern portion of the state, surrounding waters, and portions of neighboring states. The structure of the domain is shown in Figure 3-1.

Figure 3-1.
REMSAD Modeling Domain Used for the Simulation of Mercury Deposition in Southern Louisiana



Simulation of concentrations of mercury species in the atmosphere requires estimates of concentrations of several other species (e.g., ozone, SO2, the OH and HO2 radicals) that interact with mercury chemically. (See mercury chemical mechanism in Section 2.) REMSAD simulations of mercury use the simulated concentrations of these species from a photochemical and particulate matter (PM) simulation of the same domain. Since the modeling domain and the PM precursor emissions were not changed in this application, it was not necessary to rerun the PM simulations in order to obtain estimates of the species that interact with mercury. Instead, the existing REMSAD simulation results that had been performed for EPA OW (Myers et al., 2002) were used to define the additional species concentrations needed for the mercury simulation.

Existing meteorological data files used in the EPA OW project were also used in this simulation. These files are described below.

Emissions inventory data from the EPA OW project was also used as the basis for emissions in this simulation. Specific updates made to these emissions and emissions preparation procedures for the current simulation are described in later sections.

3.2. Meteorological Inputs

3.2.1. Source of meteorological data

The REMSAD model requires temporally resolved, gridded input fields of wind, temperature, water-vapor concentration, pressure, vertical exchange coefficients (K_v), cloud cover, cloud liquid water, rain liquid water, and rainfall rate. The meteorological inputs for this application had been prepared in work for EPA OW (Myers, et al., 2003) using output from the Rapid Update Cycle (RUC) data analysis and forecast modeling system. (See http://maps.fsl.noaa.gov/, maintained by NOAA Forecast Systems Laboratory (FSL), RUC development group for more information.) RUC modeling provides short-range weather forecasts for users such as the aviation community. RUC consists of both a data analysis system and a numerical meteorological forecast model. Data products from the RUC model were available for the 1998 calendar year and were supplied to SAI by NOAA staff. To our knowledge, this is the first time the RUC data have been used to supply inputs to an air quality model.

Although fundamentally a forecast model, one attractive feature of RUC is its ability to incorporate real-time data. The model is run for a specified period of time over the domain, three hours in this case, upon which time the model is “stopped” and an analysis field is generated using observed data and the previous 3-hour forecast. A new forecast is begun with the analysis field as the initial state. Thus, data assimilation is achieved through repeated reinitialization. Appropriate filtering prevents numerical effects from adversely affecting the simulation. The RUC database has undergone extensive testing and evaluation by NOAA. For additional information on RUC, the reader is referred to http://maps.fsl.noaa.gov/ and Benjamin et al., 2003.

The REMSAD modeling domain in Figure 3-1 is defined with 140 by 104 divisions in the West-East and South-North directions, respectively. The divisions are defined as uniform steps in degrees longitude and latitude, yielding approximately 36 km resolution in the coarse (or outermost) grid. The trapezoidal box on the figure shows the approximate area for which RUC outputs were available. For the REMSAD modeling, a boundary file was created that restricted modeling to cells within the area also covered by the RUC model. Within the coarse grid, a nested grid (at approximately 4 km resolution) was defined with grid spacing one-ninth the size of the coarse grid. The 4-km nested grid used in the mercury modeling is shown as a smaller box in the figure. Meteorological inputs were not prepared specifically for the nested domain; instead the meteorological information from the outer grid was interpolated to the inner grid.

The RUC system produces forecasts for up to 24 hours in the future and is initialized every three hours with observational data from a variety of sources (including surface (land and buoy), radiosonde, wind profiler, and aircraft measurements). In order to avoid introducing uncertainty from the forecasts into the REMSAD model inputs, the RUC model output products that were used to derive the REMSAD inputs were valid for within three hours of a model initialization (and thus are expected to represent the observed data well). The input data files for REMSAD were updated every three hours, corresponding to the interval in the available RUC data.

By using the RUC output, it was not necessary to set up, apply, and evaluate a meteorological model for this specific application. We were simply able to obtain the model outputs from NOAA. The quality of the RUC output data can be considered to be relatively consistent since the RUC input and output undergoes continuous, standardized review. Information on the review and validation of the RUC outputs can be found in the NWS Technical Procedures Bulletins, graphics, and other documents on the FSL site: http://maps.fsl.noaa.gov/. At the time that meteorological data files were being prepared for the EPA OW project, RUC output was generally available for November 1997 through May 2000, although some gaps existed within this time span.

3.2.2. RUC Postprocessing Procedures

For the EPA OW project, the RUC data was postprocessed to prepare REMSAD model input files. The postprocessing procedures used in the EPA OW project are described in this subsection. The horizontal and vertical resolution of the RUC output was appropriate for use in preparing meteorological inputs for the national-scale REMSAD modeling application. The horizontal resolution is on the order of 40 km. In the vertical, the domain consists of 40 layers. The quality of the RUC output was established through NOAA's routine procedures; and we relied on this quality assurance effort in using the outputs.

The full calendar year 1998 RUC output dataset was obtained and input fields were prepared for the REMSAD system. In order to do this, processing software was developed to read the RUC data, fill in data gaps, and prepare the data in the units and formats required by the REMSAD model. Processing of the RUC outputs into REMSAD data files involved several distinct steps.

The first step was to identify and fill in any gaps in the output dataset. The RUC forecast output has gaps (representing portions of the year) during which model outputs were not produced. These gaps are not filled in by NOAA staff since once the forecast time period has passed, the output is not of interest to their typical end-users. However, it was necessary to identify missing or incomplete days and fill in the gaps so that the REMSAD modeling could be continuous. To determine how to fill the data gaps, several rules were established:

- RUC output was considered complete for a given time period only when all the required variables were available.
- An entire day was considered missing if more than half the RUC output dataset intervals were missing.
- Missing days (or days with enough missing intervals to be considered missing) were filled in with data from the nearest day with complete data.
- Remaining missing time intervals were filled in using persistence (i.e., data from the most recent non-missing interval is considered to continue, or persist, into the missing interval.)

Thus, if output data were missing for July 8 and July 9, July 8 would use the information for July 7 and July 9 would use information for July 10. The REMSAD inputs were processed at 3-hour intervals, so if output for the 4–7 AM and 7–10 AM intervals were missing, the information for 1–4 AM was used for 4–7 AM and 7–10 AM. In total, approximately 8 percent of the 3-hour intervals were missing from the 1998 RUC output dataset.

After the data gaps were filled in, the RUC output fields were interpolated to the REMSAD horizontal grid system. The interpolation relied on information (in the RUC dataset) on the latitude and longitude location of each grid point in the RUC domain. Following horizontal interpolation, the RUC output fields were interpolated from the RUC vertical structure to the REMSAD vertical structure. The vertical structure of the RUC and REMSAD modeling domains is listed and compared in Table 3-1.

Table 3-1.
Comparison of RUC and REMSAD Layer Heights

RUC Layer Number	Approximate RUC heights (m)	REMSAD Layer Number	REMSAD sigma levels	Approximate REMSAD Heights (m)
		1	0.9960	29.3
1	214.2	2	0.9882	86.6
2	429.4	3	0.9649	260.0
3	649.0	4	0.9161	637.0
4	873.9			
5	1104.8	5	0.8661	1040.0
6	1341.8			
7	1585.2	6	0.8119	1500.0
8	1834.7			
9	2091.0	7	0.7483	2070.0
10	2354.3			
11	2624.8			
12	2902.9			
13	3189.2	8	0.6556	2960.0
14	3484.7			
15	3789.4			
16	4103.5	9	0.5537	4060.0
17	4428.9			
18	4765.1			
19	5112.9			
20	5474.1	10	0.4492	5340.0
21	5848.8			
22	6238.9			
23	6645.6			
24	7069.9	11	0.3544	6670.0
25	7514.8			
26	7980.9			
27	8471.8	12	0.2596	8230.0
28	8991.0			
29	9544.4			
30	10139.5	13	0.1718	10000.0
31	10786.9			
32	11494.9			
33	12272.5	14	0.0873	12200.0
34	13140.2			
35	14111.0			
36	15228.5			
37	16573.4	15	0.0000	15800.0

Note: Heights define the tops of model layers above ground. REMSAD layers are defined in terms of sigma levels, which are the ratio of the pressure at the top of the layer minus surface pressure to the pressure at the top of the domain minus surface pressure.

Specific variables from the RUC output that were used in preparing the REMSAD meteorological input files are:

- u and v wind components
- pressure
- turbulent kinetic energy (TKE)
- potential temperature
- precipitation
- water vapor
- cloud liquid water mixing ratio
- rain liquid water mixing ratio.

Layer heights were also used to guide the interpolation. These variables were converted to the variables and units required by REMSAD. Note that TKE was used to derive the vertical exchange coefficients (K_vs) required by REMSAD. Also note that the precipitation fields were derived using observed data, rather than the RUC output fields.

Finally, some upper and lower bounds were applied to certain of the input variables. A minimum wind speed of 1 ms^{-1} was applied to the resultant of the u- and v-wind components, to avoid numerical instability issues in applying the REMSAD modeling system. Similarly, a minimum value of 1 m^2s^{-1} was applied to the K_vs. This assumes that there is always some residual diffusion across the (arbitrarily) specified model layers.

3.2.3. Quality Assurance of the RUC-Derived Meteorological Inputs

To first order, we relied on the quality assurance procedures applied by FSL to ensure the reasonableness of the RUC output fields and the agreement with observed data. The verification statistics can be found at http://maps.fsl.noaa.gov. A report summarizing RUC procedures and providing some performance summaries has been submitted for publication (Benjamin et al., 2003).

During the EPA OW project, most of the review/quality assurance procedures focused on the postprocessing steps. Specifically, the minimum, maximum, and average values for each variable and each day of processed output were examined. These values were checked for reasonableness and consistency with inputs for prior REMSAD applications. The REMSAD-ready meteorological inputs were also spot-checked (plotted and examined) to ensure that the characteristics and features present in the RUC output were retained following the postprocessing step.

The following graphical summaries were prepared to facilitate the review/evaluation of the meteorological inputs:

- x-y cross-section plots of the RUC wind fields for selected levels and times
- x-y cross-section plots of the REMSAD-ready wind, temperature, water-vapor concentration, vertical exchange coefficient, cloud-cover, liquid-water, and rainfall-rate fields for selected times and levels (to check for reasonableness).

3.3. Geographical Inputs

Geographic input data used by the REMSAD model are terrain and land use. The terrain heights were derived from terrain data included in the RUC output files. Terrain data were supplied for the coarse grid only. Land use, which defines fractions of several different land cover types within each grid cell, was derived from USGS Land Use and Land Cover (LULC) data. The land use data used for this project are available at approximately 200 m horizontal resolution. A description of the data is available at http://edcwww.cr.usgs.gov/products/ landcover/lulc.html. Land-use inputs were prepared for the REMSAD coarse grid and for the nested grid in the simulation. Data within each grid cell were calculated as the average of the raw data included within the cell.

The land use categories used by REMSAD and the associated surface roughness lengths for each category are presented in Table 3-2.

Table 3-2.
Land-Use Categories Recognized by REMSAD.

Category Number	Land-Use Category	Surface Roughness (meters)
1	Urban	3.00
2	Agricultural	0.25
3	Range	0.05
4	Deciduous forest	1.00
5	Coniferous forest including wetland	1.00
6	Mixed forest	1.00
7	Water	0.0001
8	Barren land	0.002
9	Nonforest wetlands	0.15
10	Mixed agricultural and range	0.10
11	Rocky (low shrubs)	0.10

4. Emissions Updates

Prior to processing the emissions inventory, the inventory estimates of Louisiana mercury emissions were compared to other estimates of the emissions. Region 6 provided spreadsheets summarizing mercury emissions estimates from the Toxic Release Inventory (TRI) and from the Toxic Emissions Data Inventory (TEDI), both representing 2001 emissions levels. These spreadsheets included information about total annual mercury emissions from a number of facilities, but did not include specific source coordinates or stack parameters and did not include information about the species of mercury emitted. TEDI data and TRI data both included brief text fields giving the names of the facilities in the files.

The inventory data to be used for REMSAD modeling was obtained from EPA OAQPS and includes point source data for many individual stacks. Based on facility names in the OAQPS data, it was possible to match some of the records in the OAQPS data with corresponding data in the TRI and/or TEDI data. The OAQPS data also includes area sources, but these entries are not broken down into individual sources. The area source entries give emissions data as totals for a parish for an emissions category. There were no individual facility names included in the OAQPS area source data. It was therefore not possible to match area source emissions with TEDI or TRI data.

Comparisons were made based on the total annual mercury emissions from sources matched between the TEDI and OAQPS data and between the TRI and OAQPS data. For the matched sources, both the TEDI and TRI data sets showed discrepancies (sometimes by orders of magnitude) with the OAQPS data. The TEDI data was sometimes higher than the OAQPS and sometimes lower. The same was true of the TRI data.

There were a number of sources in the TRI data that were not matched to OAQPS records, some of significant magnitude (e.g., Pioneers Americas LLC at 0.624 t/y in the TRI data.) The TEDI data also had some records not matched to OAQPS records, but these were not as large in magnitude as many of the TRI records.

A large number of records in the OAQPS data could not be matched to TEDI or TRI records. In particular, there were many hospitals and medical centers in the OAQPS data that did not appear in the TEDI or TRI data.

Review of the data and discussions with Region 6 staff reduced the sources that were considered good matches to the list in Table 4-1. Since source data other than emissions (e.g., stack parameters) were not available in the TRI or TEDI data, the stack information and speciation in the OAQPS data was retained and only the overall, annual emissions total for a source was updated. The table gives the name of the facility, the updated annual emissions value, the source of the updated value (either TEDI or TRI), and the original annual value in the OAQPS data. The Pioneer Americas facility was not present in the OAQPS data, so Region 6 provided location information and stack parameters for the source. It was added to the OAQPS data. We believe that the Iberville Parish Chemical Manufacturing emissions represented the Pioneer Americas emissions in the OAQPS inventory, so the Iberville Parish Chemical Manufacturing emissions were removed from the inventory. As noted in the following section, the Iberville Parish Chemical Manufacturing emissions were included as a separate tag in the emissions file. In the case of the International Paper emissions, matching of individual sources was difficult because of differing numbers of sources in the OAQPS data and the TRI and TEDI data. Therefore, the emissions in the OAQPS data were scaled such that the overall total for the International Paper sources matched the overall total in the updated emissions.

Table 4-1.
Emissions Entries Updated Based on TEDI or TRI Data

Facility Name, OAQPS	Hg (tons/yr) Updated	Source	Hg (tons/yr) OAQPS
PPG Industries, Inc.	0.611	TEDI	0.6405
Big Cajun 2	0.4325	Tri	0.268597
Dolet Hills Power Station	0.1115	TRI	0.0797194
R S Nelson/R.S. Nelson	0.0835	TRI	0.1066872
Rodemacher Power Station Unit #2	0.069	TRI	0.048956
Gaylord Cont Corp/Gaylord Container Corp.	0.048	TEDI	0.0215083
International Paper/Mansfield Mill	0.0235	TEDI	0.000934
Georgia Pacific/Georgia-Pacific Corp./GP	0.0105	TEDI	0.0237791
Riverwood/Riverwood International Corp./Riverwood International USA, Inc.	0.009	TEDI	0.0200507
IP/int. Paper/International Paper/International Paper Co. *(located in LA)*	0.0076	TRI	0.0541264
Shell Oil Co/Shell Oil Co.	0.007	TEDI	0.0066216
Rubicon Inc	0.006	TEDI	0.0125
Georgia Gulf Corporation	0.0035	TRI	0.0001286
Boise Cascade Corp/Boise Cascade Corp.	0.0015	TEDI	0.0149031
Willamette Industries/Willamette Industries Inc.	0.001	TRI	0.0106475
Boise Southern/Boise Southern Co.	0.0005	TEDI	0.001083
Union Carbide	0.0005	TEDI	0.0015
Murphy Oil USA, Inc.	0	TRI	0.0019723
Stone Container Corp/Stone Container Corp.	0	TEDI	0.0235901
Pioneer Americas LLC	0.624	TRI	0.600*

** This value from Iberville Parish Chemical Manufacturing emissions in the OAQPS data.*

The changes incorporated into the emissions data from the TRI and TEDI data represent the current best estimates of emissions from Louisiana sources in the year 2001. Subsequent to 2001, increases or decreases in emissions may occur, for example due to growth, changes in demand for electricity, or application of additional control technologies. This study does not directly address the effect such changes may have on deposition of mercury within Louisiana. However, the tagging results in Section 6 allow the estimation of the effects of changes in emissions from the tagged categories.

In addition to these updates to the Louisiana emissions, an update was made to data for a source in Indiana. Based on information from the Indiana Department of Environmental Management (IDEM), the emissions estimate that had been supplied to OAQPS for an important source of mercury in Indiana was overestimated by a factor of 100 (personal communication, Dwight Atkinson, 24 Feb. 2004). The emissions for this source were therefore reduced to be consistent with the most recent IDEM estimate. Although this change is unlikely to affect results in Louisiana, we felt it was worth eliminating this known problem in the inventory.

5. Preparation of Emission Inputs

Since the results of the EPA OW PM modeling was used to provide concentrations of non-mercury species, for this project emissions were only prepared for mercury. A description of the PM emissions processing procedures, and summaries of the PM-related emissions are included in an earlier report for EPA OW (Myers et al., 2002). Preparation of the mercury emissions is discussed in this section.

5.1. Data Preparation for Hg Modeling

For this application, mercury emissions data for the U.S. were obtained from the EPA and processed using the Emissions Preprocessing System (EPS2.5). The emissions data for a base year of 1996 were used for this application and include mercury emissions (speciated into particulate, divalent, and elemental emissions) for mobile, area and point sources. The majority of the data in the inventory were based on the 1996 National Toxics Inventory (NTI). Some data in this inventory have been updated by EPA to include data that are more recent than 1996. For instance, utility source speciation testing data released in 2000 were used to update the utility emissions speciation. Further information on the mercury emissions speciation testing can be found at http://utility.rti.org/ and at http://www.epa.gov/mercury/. For Canada, mercury emission data were provided by Environment Canada for 1995 for area and point sources. As the most recent data available, these data were used for our simulation with the 1998 meteorology described in Section 3.

In addition to preparing the gridded, temporally varying emissions of each of three species of mercury (elemental, divalent gas, and divalent particulate), emissions were also developed for specific emissions categories within Louisiana and other regions within the modeling domain. For each species of mercury, there are 14 tags, or groupings of emissions: 10 tags for state of Louisiana, each for a different source category, a tag for Wisconsin (to facilitate comparisons with earlier simulations that focused on Wisconsin), a tag for the remaining U.S. states, a tag for Canada, and a final "tag" for all U.S. states and Canadian emissions. This final tag represents the overall, total mercury emissions and is used to provide a simulation of the overall mercury concentrations. This avoids the need to add up tagged results to obtain the total mercury concentration or deposition and provides a cross-check of the tagged results versus a standard mercury simulation. The emissions to be tagged for each state were identified using the FIPS code, and different tags for the state of Louisiana were extracted from the database by source category code.

The following source categories within Louisiana were tagged:

- Big Cajun 2 (all SCCs)
- RS Nelson (all SCCs)
- Other coal utilities (coal fired stacks only)
- BFI Health (medical waste incinerator)
- Remainder of medical waste incinerators
- Other incinerators: hazardous waste incinerators and on-site incineration in area source files
- PPG (chlor-alkali, SCC 30100802 only)
- Pioneer Americas (chlor-alkali)
- Other source categories
- Chemical Mfg in Iberville Parish (This category is not included as part of overall total)

Note that because identification of the Pioneer Americas source was uncertain in the inventory, an individual point source representing the Pioneer Americas was added to the emissions. Based on correspondence with EPA Region 6 and State of Louisiana staff, we believe that the Chemical

Manufacturing category in Iberville Parish represented the emissions of the Pioneer Americas facility. The emissions inventory treats the mercury emissions from this chlor-alkali facility as an area source with 100% of the emissions elemental mercury. A more appropriate treatment for these emissions is as a point source with 3% of the emissions as divalent mercury. Thus, the point source was added to represent the Pioneer Americas emissions. As noted in table 4-1, the magnitude of the Pioneer Americas emissions was based on the TRI entry for this source. To avoid doubling counting of the Pioneer Americas emissions in the simulation, the Iberville Chemical Manufacturing emissions were not included in the overall mercury emissions. The Iberville Chemical Manufacturing emissions were included as a separate tag so that if necessary (e.g., if it were to be discovered later that the identification of these emissions with Pioneer Americas was incorrect) the effect of these emissions could be evaluated.

A summary of the mercury emission totals is presented in Table 5-1. Data in the table are derived from the mercury emissions inventory acquired from EPA OAQPS with the updates based on TEDI and TRI data described in Section 4. Point sources include sources that emitted from individual (typically elevated) stacks. Mobile includes emissions from motor vehicles. Area sources include most other source types, particularly those that follow the residential population distribution, such as use of heating-oil. The average speciation of the mercury emissions is presented in Table 5-2.

Table 5-1.
Summary of 1996 Mercury Emissions Including Louisiana Updates for Modeling Domain
(Emissions in tons/year).

Location	Category	Area	Mobile	Point
Louisiana	Big Cajun 2	0.0000	0.0000	0.4354
Louisiana	RS Nelson	0.0000	0.0000	0.0841
Louisiana	Other Coal Utilities	0.0000	0.0000	0.1819
Louisiana	BFI Health	0.0000	0.0000	0.1448
Louisiana	Other Med. Waste Incinerators	0.0133	0.0000	0.0342
Louisiana	Other Incinerators	0.3926	0.0000	0.0044
Louisiana	PPG	0.0000	0.0000	0.6126
Louisiana	Pioneer Americas	0.0000	0.0000	0.6285
Louisiana	Other Louisiana	0.0839	0.1271	0.3073
Louisiana*	Chem. Mfg. in Iberville Parish*	0.6045*	0.0000*	0.0000*
Louisiana Total	All	0.4898	0.1271	2.4332
Remaining states	All	14.5932	6.5699	108.5303
All U.S.	All	15.2364	6.8297	114.3832
Canada	All	3.24		7.99

** This category not included in overall emissions.*

Table 5-2.
Average Speciation of Mercury Emissions

Location	Category	HG0 (% Total)	HG2 (% Total)	HGP (% Total)
Louisiana	Big Cajun 2	69	31	< 1
Louisiana	RS Nelson	69	31	< 1
Louisiana	Other Coal Utilities	86	13	1
Louisiana	BFI Health	5	75	20
Louisiana	Other Med. Waste Incinerators	10	70	20
Louisiana	Other Incinerators	58	20	22
Louisiana	PPG	97	3	0
Louisiana	Pioneer Americas	97	3	0
Louisiana	Other Louisiana	73	17	11
Louisiana*	Chem. Mfg. in Iberville Parish*	100*	0*	0*
Remaining states	All	52	37	11
All U.S.	All	53	37	11
Canada	All	64	22	14

** This category not included in overall emissions.*

The mercury emissions for all US states and Canada resulting from the EPS 2.5 gridding process is illustrated in Figures 5-1a through 5-1f for summer weekday elemental (HG0_1), ionic (HG2_1) and particulate (HGP_1) emissions. The low-level emissions (emitted near the surface and included in layer 1) are shown in Figure 5-1a through 5-1c, and elevated point source emissions (emitted from tall stacks that typically emit into layers above layer 1) are shown in Figures 5-1d through 5-1f.

Figure 5-1a.
Low-Level Emissions of Elemental Mercury for the REMSAD Coarse Grid for a Summer Weekday

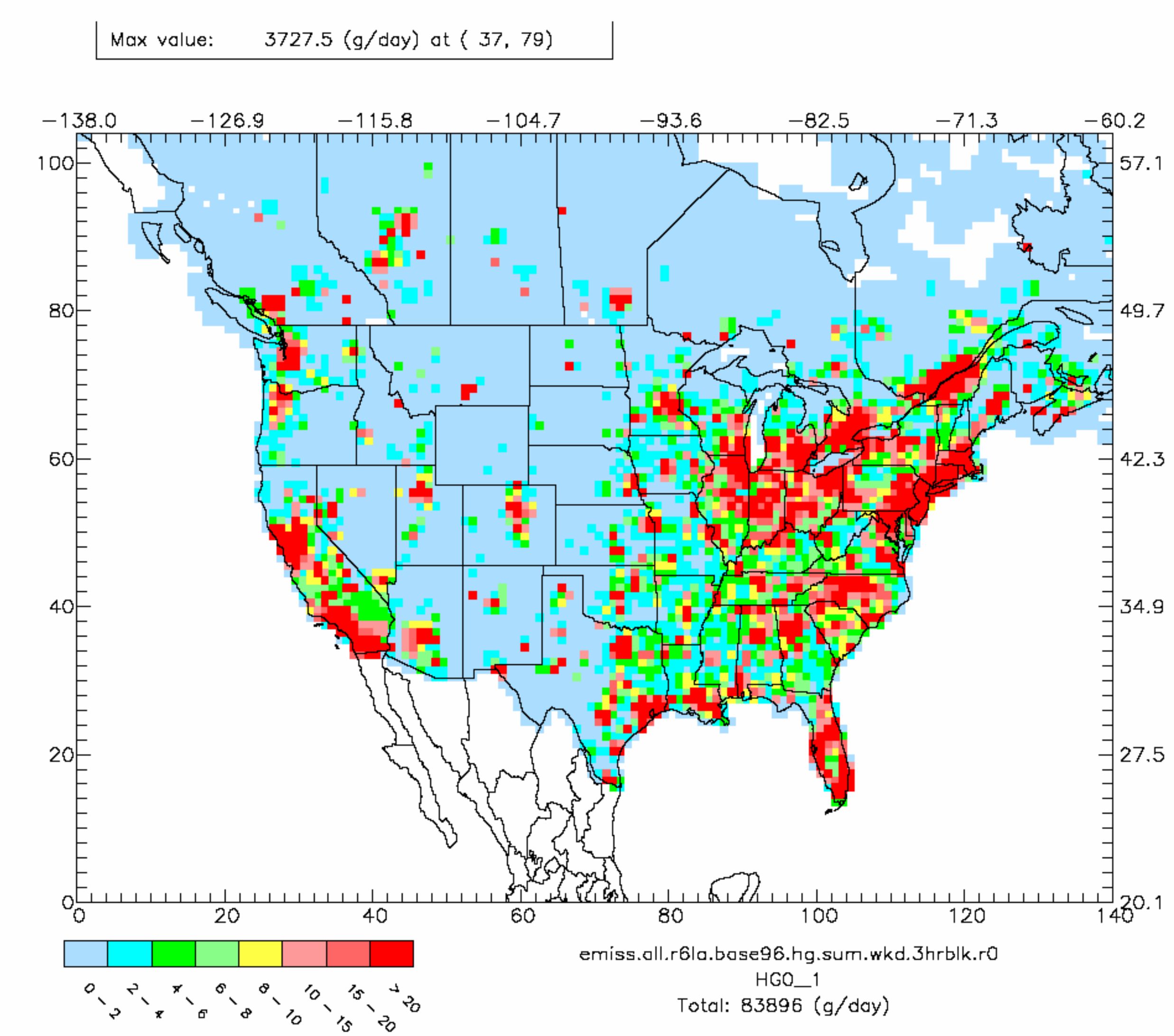


Figure 5-1b.
Low-Level Emissions of Divalent Mercury for the REMSAD Coarse Grid for a Summer Weekday

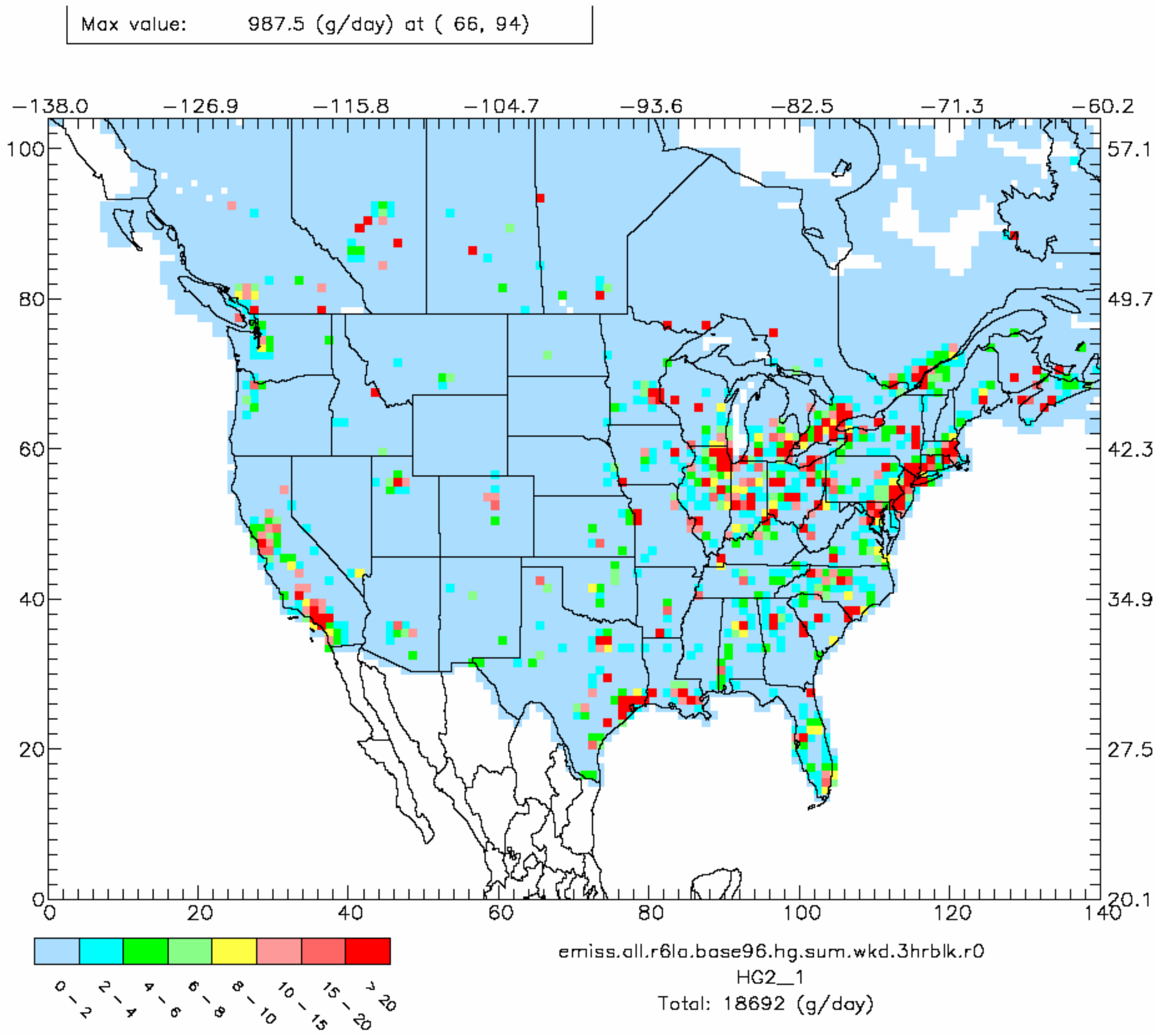


Figure 5-1c.
Low-Level Emissions of Particulate Mercury for the REMSAD Coarse Grid for a Summer Weekday

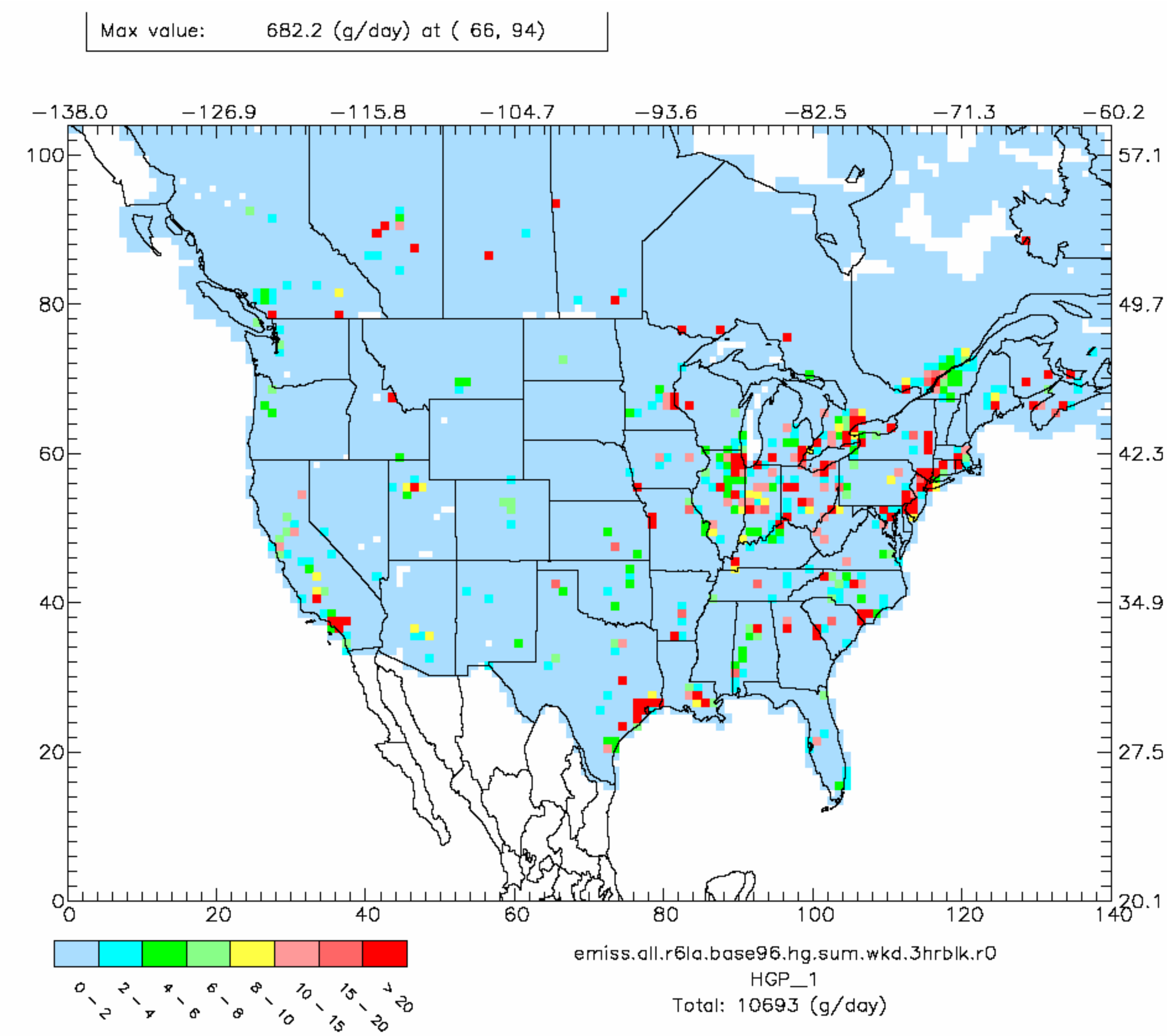


Figure 5-1d.
Elevated Point Source Emissions of Elemental Mercury for the REMSAD Coarse Grid for a Summer Weekday

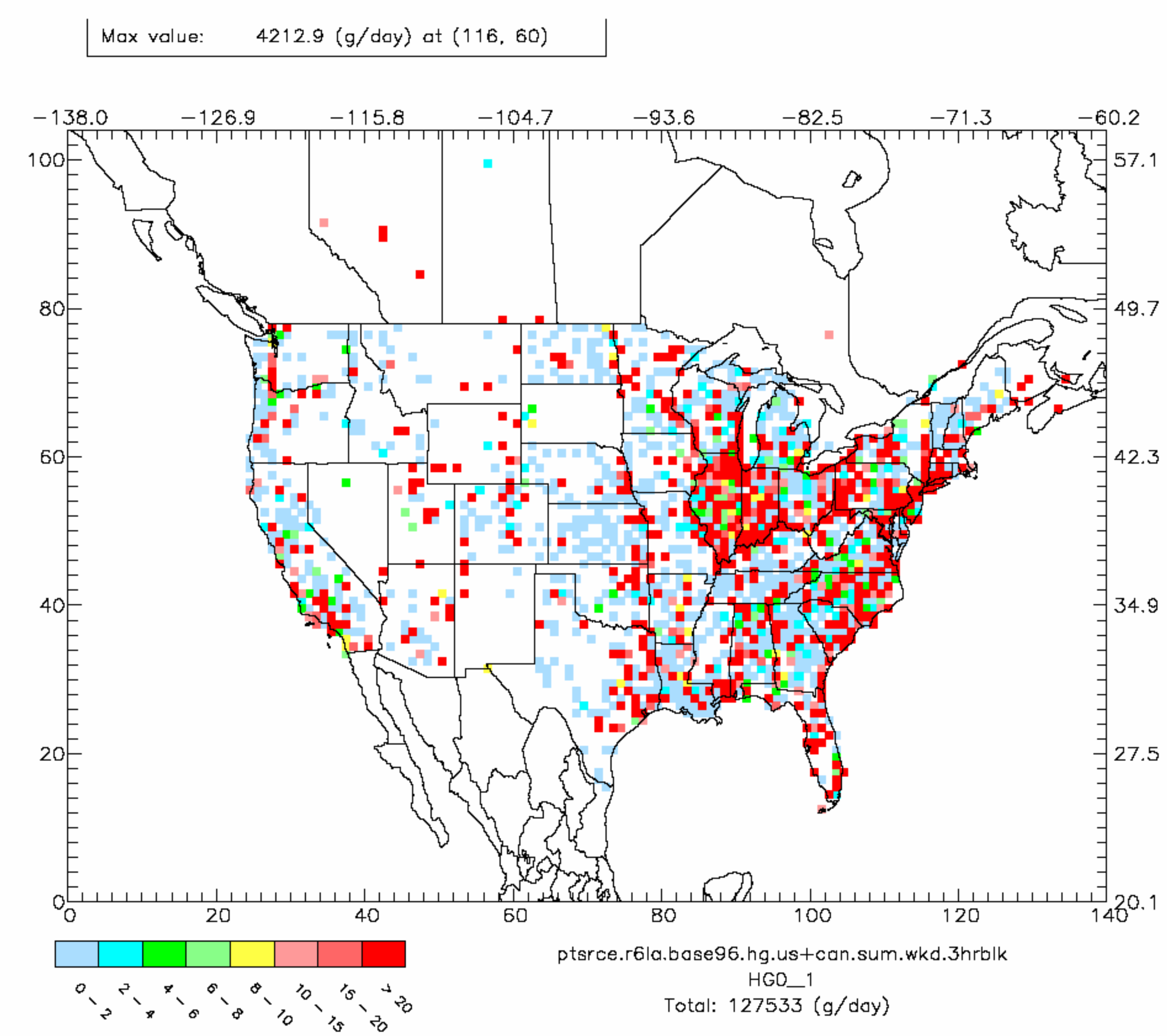


Figure 5-1e.
Elevated Point Source Emissions of Divalent Mercury for the REMSAD Coarse Grid for a Summer Weekday

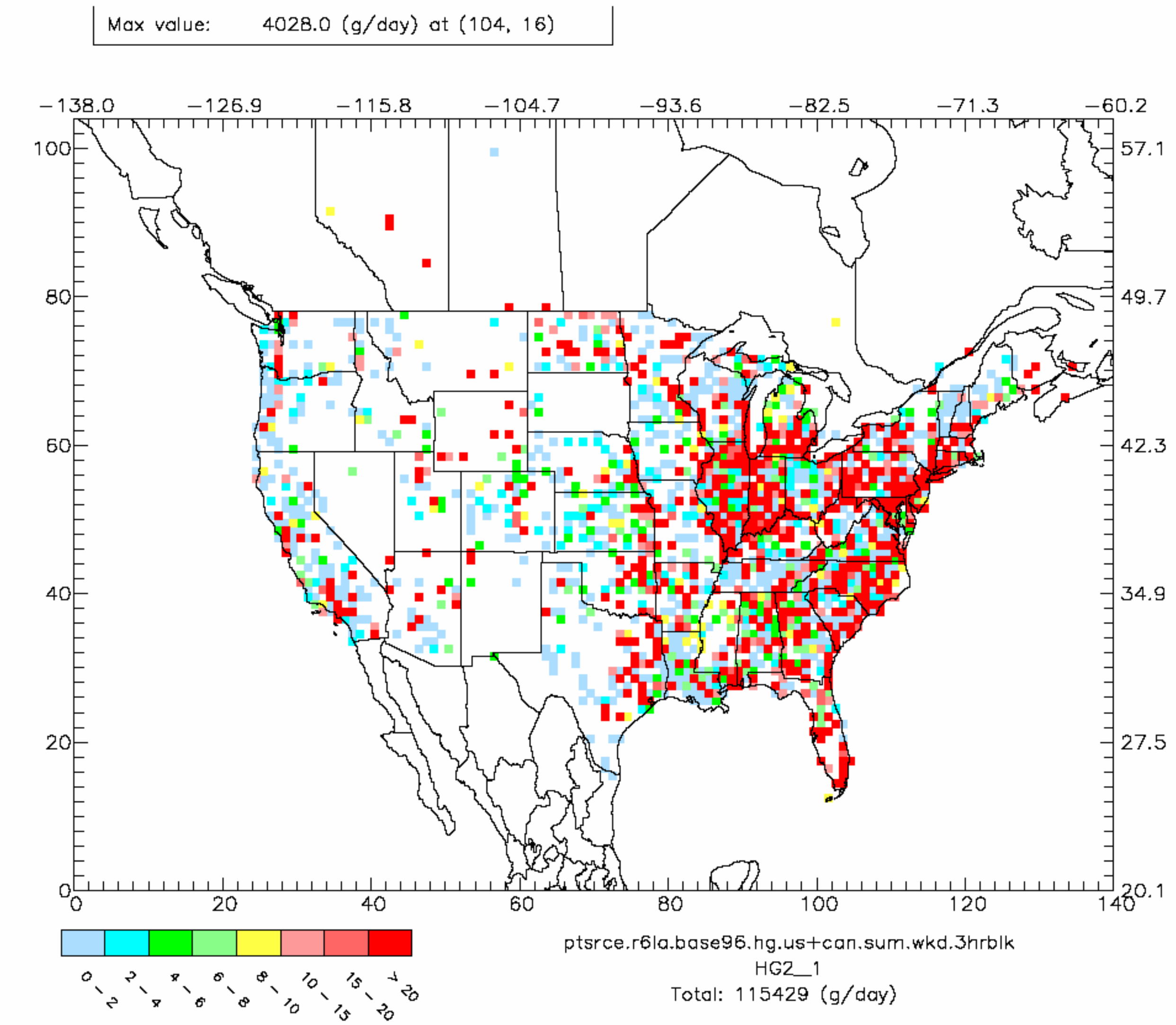
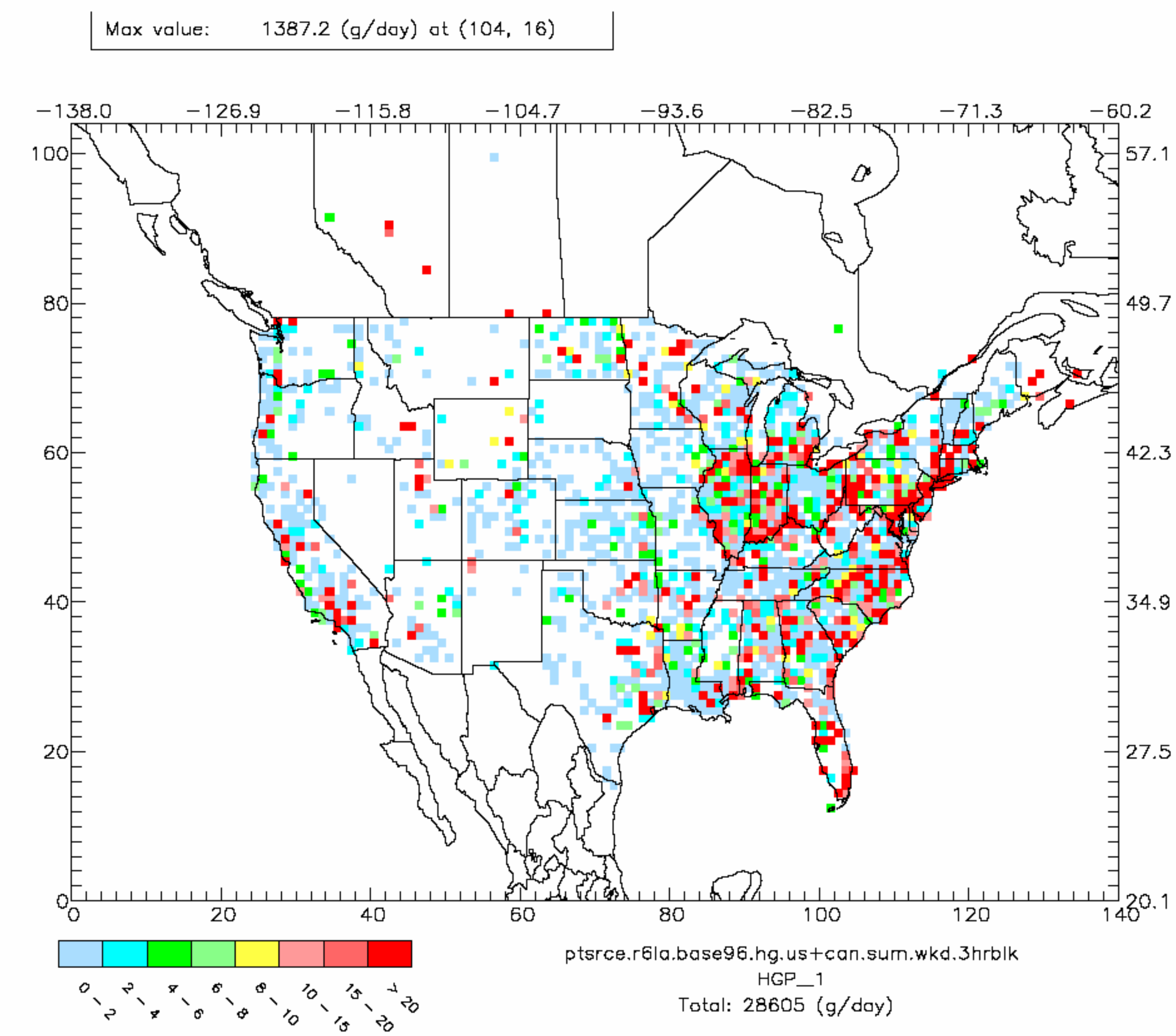


Figure 5-1f.
Elevated Point Source Emissions of Particulate Mercury for the REMSAD Coarse Grid for a Summer Weekday



5.2. Quality Assurance Procedures for Emission Processing

The actual estimates of emissions were provided in the emission inventory that we obtained from the EPA. The goal of our quality assurance procedures was therefore primarily to ensure that the emission estimates in the inventory are properly represented in the REMSAD data files. In addition, some subjective checks were made in order to identify possible unrealistic values or parameters in the original emissions inventory.

The QA procedures included:

- Cross checks of emissions totals in the inventory files compared to the REMSAD data files.
  - These types of checks were used to ensure that the processing had not left out emissions or made errors in conversion of units of emissions.
- Examination of displays of emissions density of area sources
  - These displays have, in past inventories, allowed us to identify states that had particular categories of emissions that were overestimated relative to other states. For example, for an early version of the inventory used in this project area emissions showed a very high density of NOx emissions in Kansas. It later was determined that wildfire emissions in the inventory were overestimated for Kansas. Similarly, for mercury, it was noted that Maine emissions were substantially higher than surrounding states. It was found that in the preparation of the emission inventory, the wrong units had been used for Maine crematorium emissions.
  - In one inventory, the displays of weekday and weekend emissions showed unreasonably high emissions for the weekends were present. Investigation revealed that there was an error in an early version of the temporal allocation factors for recreational marine vessels.
- Plots of point source emissions by emissions category or by individual state
  - Examination of these plots allowed mislocated sources to be identified. Plots of elevated sources of mercury for only North Carolina, for example, allowed us to identify any sources assigned to this state but mislocated or incorrectly assigned to the state.

6. Results of the REMSAD Simulation for Mercury

In this section we present the results of the REMSAD simulation for mercury. The first sub-section summarizes initial and boundary concentrations used in the simulation. A general discussion of the simulated annual results, including the spatial patterns, follows. The next sub-section presents a summary of model performance. The final sub-section discusses the results of tagging and estimates of contributions to deposition.

The emissions estimates used for several major categories of Louisiana emissions (see Sections 4 and 5) are based on estimates as of 2001. Mercury emissions will most likely decrease in the future due to increased regulation. On this basis, the deposition estimates from this simulation may be expected to be higher than what is to be expected in the future.

The PM modeling that was used to derive ozone, radical, SO2, and other concentrations utilized an emissions inventory representing 1996 emissions levels. Since 1996, some areas in Louisiana and in neighboring states have or will be implementing emissions controls on NOx, VOC, and other emissions in order, for instance, to meet Clean Air Act requirements for ozone and other pollutants. Near source deposition of mercury is driven primarily by the directly emitted divalent forms of mercury. However, reductions in the PM modeling emissions could reduce the estimated oxidation rate of emitted elemental mercury and therefore reduce the simulated downwind impact of sources both within and outside of Louisiana.

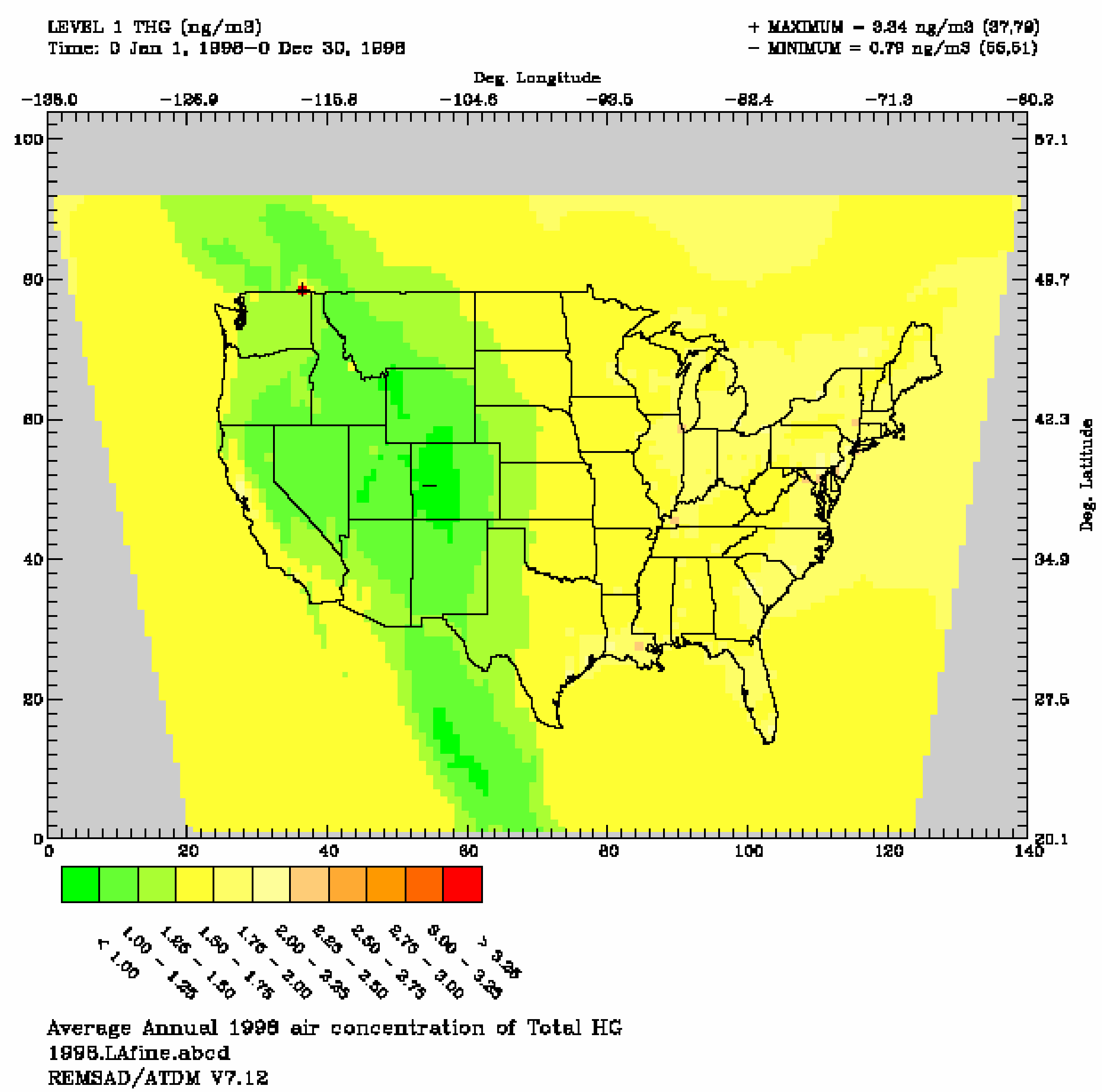
6.1. Air Quality Inputs for the Simulation of Mercury

Initial and boundary concentrations must be specified for each of the three mercury species carried in the simulation: HG0 (elemental mercury), HG2 (divalent gas mercury), and HGP (divalent particulate mercury). Because the simulation is continental in scale, the boundaries of the domain are located in relatively remote areas (e.g., the Pacific and Atlantic Oceans and northern Canada). The mercury concentrations along these boundaries were therefore assumed to be representative of global background. Boundary concentrations used in the WI TMDL pilot project were 1.7 ng/m^3 for elemental mercury, 0.08 ng/m^3 of divalent gas mercury, and 0.017 ng/m^3 of divalent particulate mercury (Myers, et al., 2003). Recent unpublished data suggest a wide variation in the background divalent mercury (HG2) concentrations (Russ Bullock, personal communication, 1 March 2002) from near zero to well above 0.08 ng/m^3. These unpublished data also suggested variation with height in both the elemental and divalent mercury concentrations. There is therefore still considerable difficulty in determining a proper specification of the HG2 boundary concentration. In this application, because the deposition estimates will be used in TMDL analysis, we felt it important not to underestimate background concentrations. Underestimation of background concentrations could lead to an overestimation of the potential effect of emissions reductions. An underestimation of boundary concentrations would therefore not provide an appropriate safety margin in TMDL estimates. We selected a boundary concentration for HG2 that resulted in near-zero bias in the REMSAD simulation results relative to observed MDN wet deposition observations. Based on recent simulations, the value of HG2 boundary concentration that resulted in near-zero bias was 0.055 ng/m^3. This value is near the value used by past modelers and is within the range suggested by the recent observations. Therefore, we elected to use this value for the HG2 boundary concentration. For elemental mercury (HG0) and divalent particulate mercury (HGP), we used the same values as those used in the WI TMDL pilot project. In summary, we used background concentrations of 1.7 ng/m^3 for HG0, 0.055 ng/m^3 for HG2, and 0.017 ng/m^3 for HGP. Since the model utilizes boundary and initial concentrations in ppm, we converted the mass per unit volume concentrations to ppm at 298 K and 1 atm. The initial and boundary concentrations in ppm are constant at all layer heights used in the model. As a result, the mass per unit volume concentrations effectively decrease with height.

6.2. Simulation Spatial Patterns

In this section we present spatial plots showing the pattern of both air concentration and deposition of mercury. Figure 6-1 shows the simulated annual average concentration of total mercury for the entire modeling domain at approximately 36-km resolution. This figure represents variations in concentration with varying shades of color. A key to the concentration range represented by each color is provided at the lower left of the plot. The simulated maximum and minimum concentration values are printed at the upper right of the figure with the locations indicated in grid cell units. A “plus” sign on the plot also indicates the location of the maximum simulated value. A “dash” indicates the location of the minimum simulated value. The distribution is relatively uniform with localized peaks in the vicinity of the highest emissions. There is a band of lower concentrations through the Rocky Mountain States.

Figure 6-1.
Simulated Annual Average Concentrations of Total Mercury.
(Note maximum in western Canada)



The distribution of total annual dry deposition of mercury is presented in Figure 6-2. The distribution shows a gradual increase in deposition from northwest to southeast, but the highest deposition areas reflect the emissions pattern. The total annual wet deposition is shown in Figure 6-3. This distribution, although exhibiting influence from the emissions pattern, is dominated by the rainfall patterns showing high deposition over the Atlantic Ocean, the Gulf Coast, and along the Pacific Coast.

Figure 6-2.
Simulated Total Annual Dry Deposition of Mercury

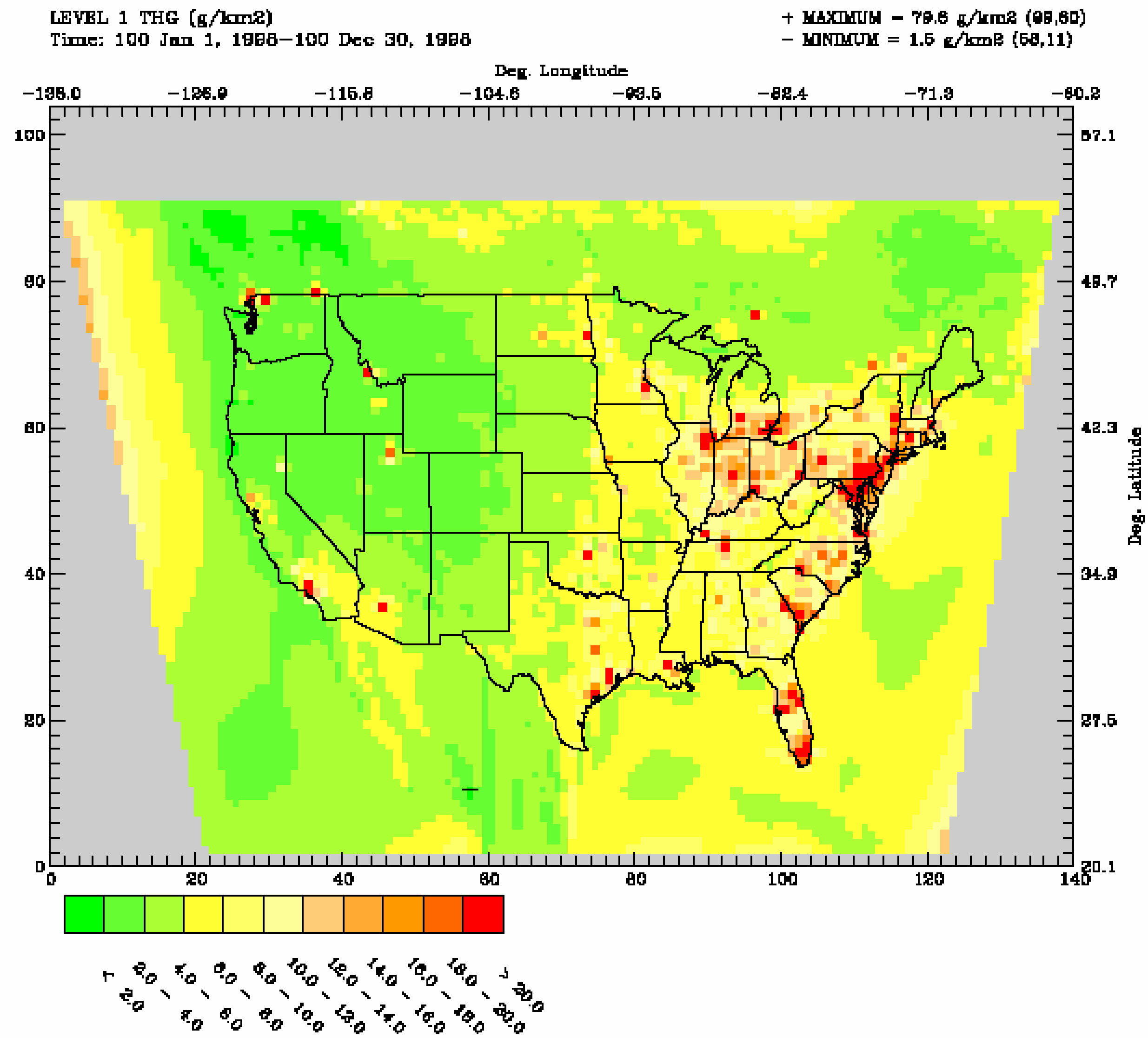
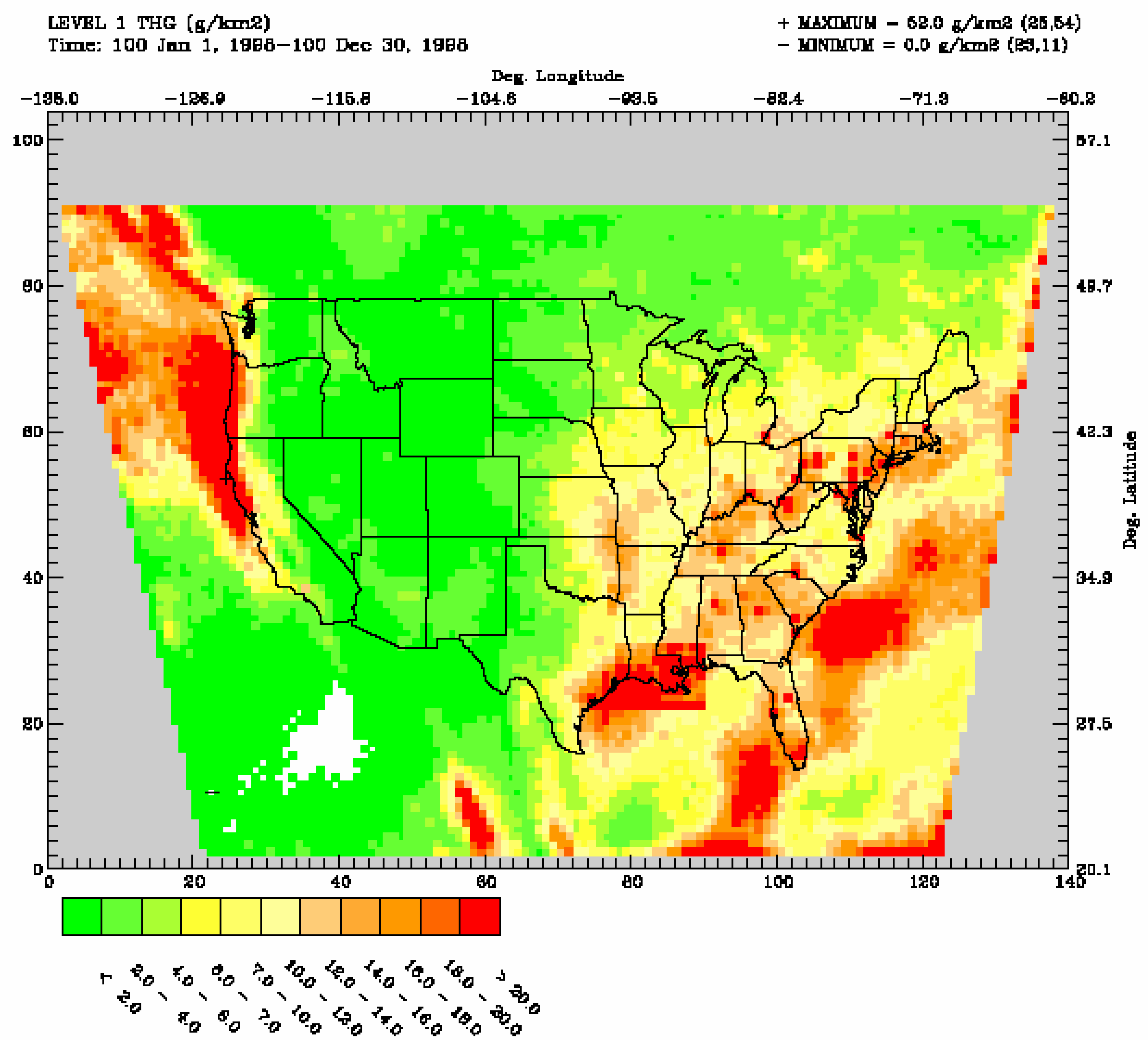


Figure 6-3.
Simulated Total Annual Wet Deposition of Mercury



The simulated total annual deposition in southern Louisiana is near 20 g/km^2 or more from wet deposition and on the order of 7 g/km^2 from dry deposition for the 1998 meteorological year. Simulated dry deposition estimates exceed 15 g/km^2 at two small areas in southern Louisiana. (These deposition estimates are averaged over 36 km grid cells. When results are displayed at 4 km resolution, localized areas of higher deposition in the vicinity of sources will be present. See section 6.4.) Data are not available for 1998 to validate the simulated deposition values in southern Louisiana since deposition monitors in Louisiana did not begin full time operation until the following year.

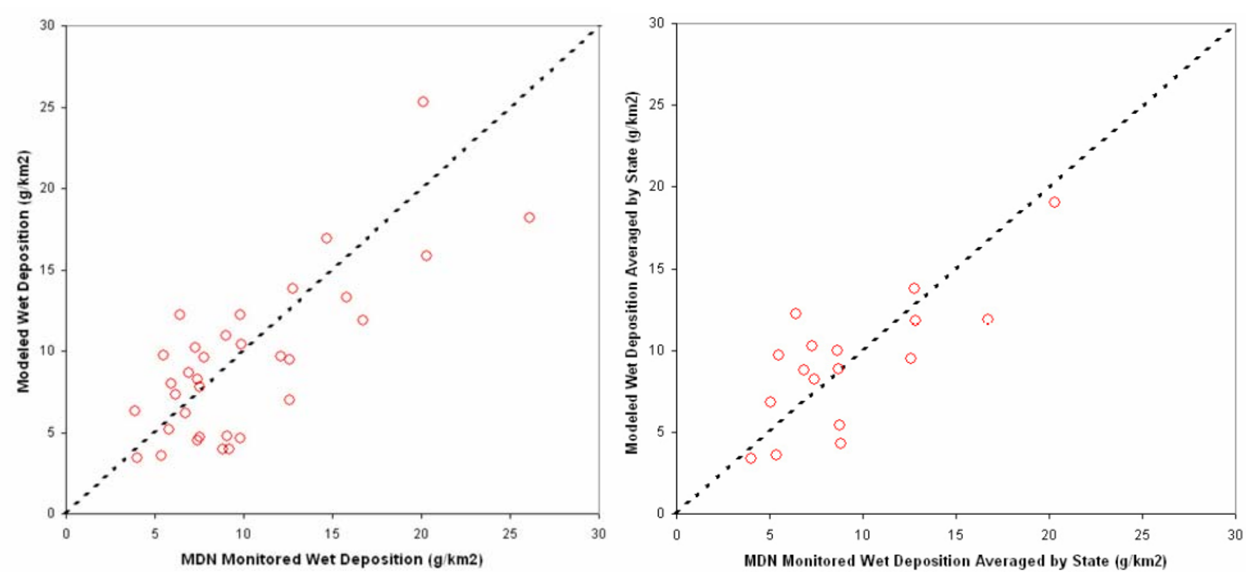
6.3. Model Performance

Model performance is evaluated for total wet deposition of mercury against the monitors in the Mercury Deposition Network (MDN) available from the National Atmospheric Deposition Program (NADP). An adequate database to evaluate the air concentrations simulated by the model is not available. Likewise, adequate data to evaluate performance for dry deposition are not available.

A scatter plot showing the simulated total annual wet deposition of mercury versus the observed values at the MDN sites is presented in Figure 6-4a. There does not appear to be a strong bias in the simulation results, but there is some scatter about the 1:1 line throughout the range of values. A scatter plot for state averages (average of the total wet deposition for all monitors within each state) is presented in Figure 6-4b. This distribution also exhibits little bias and the average for most states is well represented.

Figure 6-4.
Simulated Total Annual Wet Deposition of Mercury Compared to MDN Observed Data for: (a) Individual Sites; and (b) State Averages

(a) (b)



The information from both scatter plots is summarized using statistics in Table 6-1. In both cases, the simulated values show a good correlation with the observed data with an R^2 of 0.579 for all sites and 0.566 for the state averages. The normalized bias is slightly negative at -1.7% for all sites, but is positive for state averages at 5.9%. The normalized gross error is 31.2% for all sites and is somewhat smaller for the state averages at 30.3%. Performance for this simulation is therefore comparable to that achieved by other researchers. (E.g., Seigneur et al., 2003 report a correlation of 0.72, bias of -11%, and gross error of 28% for the state averages from their mercury simulation.)

Table 6-1.
Statistical Evaluation of Simulated Total Annual Wet Deposition of Mercury Against Observed Data from MDN Sites

	All sites	State Averages
Number of data pairs	33	17
R^2	0.579	0.566
Normalized % error	31.2	30.3
Normalized % bias	-1.7	5.9

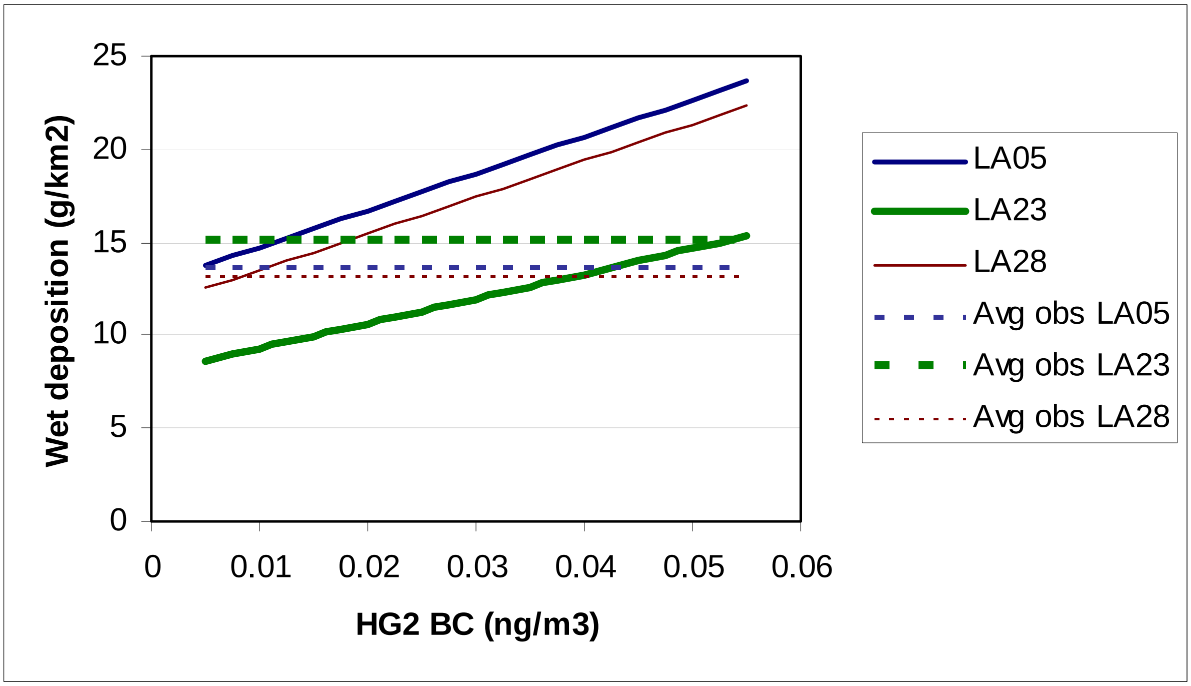
The Louisiana MDN sites were not operational in 1998, so the simulated wet deposition for Louisiana in 1998 cannot be directly evaluated against measurements. However, the MDN monitors began to come online in 1999, so a comparison can be made of the simulated values with the observations in later years. Table 6-2 shows the simulated wet deposition values for 1998 along with the observed values when available for the years 1999 through 2002. Except for the LA10 site, the simulated value appears high compared to the average observed value over the range of years available. There is substantial variation in the observed values, however. Therefore, some of the difference might be explained by differing conditions in 1998. Given the range of observed values and the simulated values for 1998, the possibility that the model may be overestimating wet deposition in the Louisiana area must be considered when utilizing these model results.

Table 6-2.
Comparison of 1998 Simulated Wet Deposition with MDN Observed Data for 1999 through 2002

MDN Site	1998, Simulated (g/km^2)	1999, Observed (g/km^2)	2000, Observed (g/km^2)	2001, Observed (g/km^2)	2002, Observed (g/km^2)
LA05	23.65	13.71	11.35	17.67	12.02
LA10	9.3	13.22	13.10	18.39	14.23
LA23	15.27	NA	NA	16.87	13.21
LA28	22.33	13.36	11.23	14.47	13.48

Since the simulation included tagging of boundary concentrations of mercury (with a breakdown among elemental mercury, divalent gas mercury, and particulate mercury), the influence of differing assumptions for boundary concentrations can be made. Section 6.1 noted that there is considerable uncertainty surrounding the specification of a boundary concentration for divalent gas mercury. The influence on simulated wet deposition at the Louisiana sites of varying the boundary concentration of divalent gas mercury within the range of uncertainty is illustrated in Figure 6-5. The chart shows the estimates of simulated wet deposition at three Louisiana MDN monitors as a function of HG2 boundary concentration. The simulated values are compared to the average observed wet deposition averaged over the years 1999 through 2002 at each of these monitors. The fourth Louisiana site was not included since the simulated value there is already below the observed wet deposition.

Figure 6-5.
Influence of HG2 Boundary Concentrations on Simulated Wet Deposition at Louisiana MDN Monitors



For two of the sites, in order to bring the simulated wet deposition value down to a value that is comparable to the average observed value, the HG2 boundary value must be reduced to a very low value (0.005 ng/m^3 for LA05, 0.008 ng/m^3 for LA28; both quite a bit below 0.0125 ng/m^3 that we might consider a minimum). For the 3rd site, any reduction in the boundary HG2 would result in a simulated value that is below the observed wet deposition. Based on choice of the HG2 boundary concentration, simulated wet deposition estimates could therefore differ by about 7 g/km^2.

Because there is no comparable network of dry mercury deposition monitors, it is not possible to adequately evaluate REMSAD performance for dry deposition by comparisons to observations. It should be noted, however, that the general approach to dry deposition in REMSAD is based upon the long-established methodology applied in the Regional Acid Deposition Model (RADM) (Wesley, 1989). Under this scheme, the dry deposition flux of a pollutant is proportional to its concentration in the lowest model layer and its deposition velocity. Deposition velocities differ for gaseous and particulate species and depend in part on such parameters as atmospheric stability, air density and viscosity, the molecular weight of the depositing species, and the type of surface in question (e.g., water, forest, etc.). A more thorough discussion of dry deposition in REMSAD and similar models can be found in Section 2 of this report, in the REMSAD User's Manual (SAI, 2002), and in Wesley (1989).

It should also be noted that recently published research suggests that many bodies of water are super-saturated with elemental mercury (Schroeder and Munthe, 1998). The presence of elemental mercury in such quantities would result in no net deposition of dry-deposited elemental mercury. Due to such evidence, we, like other modelers (Pai et al., 1997), have assumed that there is no net dry deposition of elemental mercury.

6.4. Estimation of Contributors to Deposition

6.4.1. Data Setup for Tagging

Section 2 describes the tagging methodology for mercury that has been incorporated into REMSAD. The tagging approach allows estimates to be made of the contributions of different source categories and regions to mercury deposition. This tagging methodology was applied for the annual simulation of southern Louisiana for mercury, in conjunction with the overall simulation of mercury concentrations and deposition. Thus, estimates can be made of the contributions to deposition of several Louisiana source categories and in addition the contributions of areas outside of Louisiana. Section 5 describes the specific emissions tags that were developed for the emissions data files.

In addition to the emissions, the initial and boundary concentrations data files must be set up for tagging. The initial and boundary concentrations used for the overall (standard) mercury species are described earlier in this section. These same initial and boundary concentrations were used for tagged mercury species with tag numbers 20 through 22. Three tags are used so that the contribution of HG0 on the boundary can be evaluated separately from the contribution of HG2 on the boundary and the contribution of HGP on the boundary. That is, the species with name of HG0_20 was given the same initial and boundary concentration as HG0_1 while HG2_20 and HGP_20 were given zeros. HG0_21 and HGP_21 had zero initial and boundary concentrations while HG2_21 had the same initial and boundary concentration as HG2_1. Finally, HG0_22 and HG2_22 were given zero initial and boundary concentrations with HGP_22 having the same initial and boundary concentrations as HGP_1. Emissions of the tags 20 through 22 species were all zero. For each individual tagged emissions category, the corresponding tag species has zero initial and boundary concentrations. Thus, for instance, for the Canadian emissions (tag 14), only grid cells in Canada have emissions of HG0_14, HG2_14, and HGP_14 and the initial and boundary concentrations for these species are zero. At any point in the modeling domain, concentrations or deposition of HG0_14, HG2_14, or HGP_14 that are present must have originated from Canadian emissions.

The simulation including all the tags therefore effectively incorporates numerous sensitivity simulations in which all emissions other than the tagged emissions have been zeroed out, but accomplishes this in a single simulation.

Although not required in order to utilize mercury tagging, our standard procedure for setting up tagging has been to prepare emissions such that the sum of all tagged emissions is the same as the total emissions of mercury. Boundary and initial concentrations are only applied to the specific boundary and initial conditions tags, which have no emissions. Therefore, in the simulation results, the sum of the concentrations of all tags would theoretically be the same as the concentration of the overall species. Similarly, the sum of the deposition of all tags would be the same as the deposition of the overall species. In our examination of the tagged results, we have been able to compare the sum of the tags to the overall species and found that the largest discrepancy is about 5%. This consistency gives us confidence that our assumption that we can treat tags as independent species is valid.

The simulation reported here included tags for several Louisiana emissions categories, boundary and initial concentrations, and Canadian emissions. The remainder of the states are tagged collectively.

6.4.2. Results of the Tagging Simulation

The tagging simulation allows individual estimates of the impact of each of the tagged sources to be made. The extent of the impact of the tagged categories can be visualized by plotting the spatial distributions of the contribution to total mercury deposition of each of the tagged species. Figures 6-6a through 6-6i present these spatial distributions for each of the tagged Louisiana emissions categories. The same scale for magnitude of deposition is used on all of the figures. Note, however, that the scale is pseudo-logarithmic in order to represent both small and large gradations the magnitude of deposition. The deposition represented by the high end of the scale is therefore several orders of magnitude greater than that represented by the low end of the scale.

Deposition is plotted on the high-resolution sub-domain over southern Louisiana and therefore values are averaged over grid cells that are approximately 4 km on a side. The maximum deposition in any grid cell is noted at the upper right of the figure and the location of this maximum is noted on the plot by a “+” symbol.

At some location, the larger emissions sources all contribute to deposition that is several times higher than the simulated average deposition levels in southern Louisiana (20 – 30 g/km^2; see section 6.2). The maximum deposition contribution is less than the average only for the “Other coal utilities” and “Other medical waste incinerators” categories. These categories contribute on the order of 30 – 50% of the mercury deposition at their maximum.

The area influenced by each source category is displayed in another manner in Figure 6-7. The chart displays a point for each location at which a source category contributes 25% or more of the total deposition. (For the purpose of this chart, a location refers to one of the 4 km grid cells in the southern Louisiana modeling domain used in our simulation. There are 8,748 grid cells in the 4 km resolution grid with about 2,700 of these cells in Louisiana.) The value of the total mercury deposition (from all source categories) is plotted above the source category that contributes more than 25% of the deposition. The total number of locations for which each source category contributes more than 25% is indicated above each column of points. Therefore, for instance, the Big Cajun 2 plant contributes 25% or more of the total mercury deposition at 6 locations in the southern Louisiana modeling domain. Each of the tagged categories contributes 25% at one or more locations. Many of the categories contribute to deposition of more than 100 g/km^2.

Figure 6-6a.
Simulated Contribution to Total Annual Deposition of Mercury from Big Cajun 2

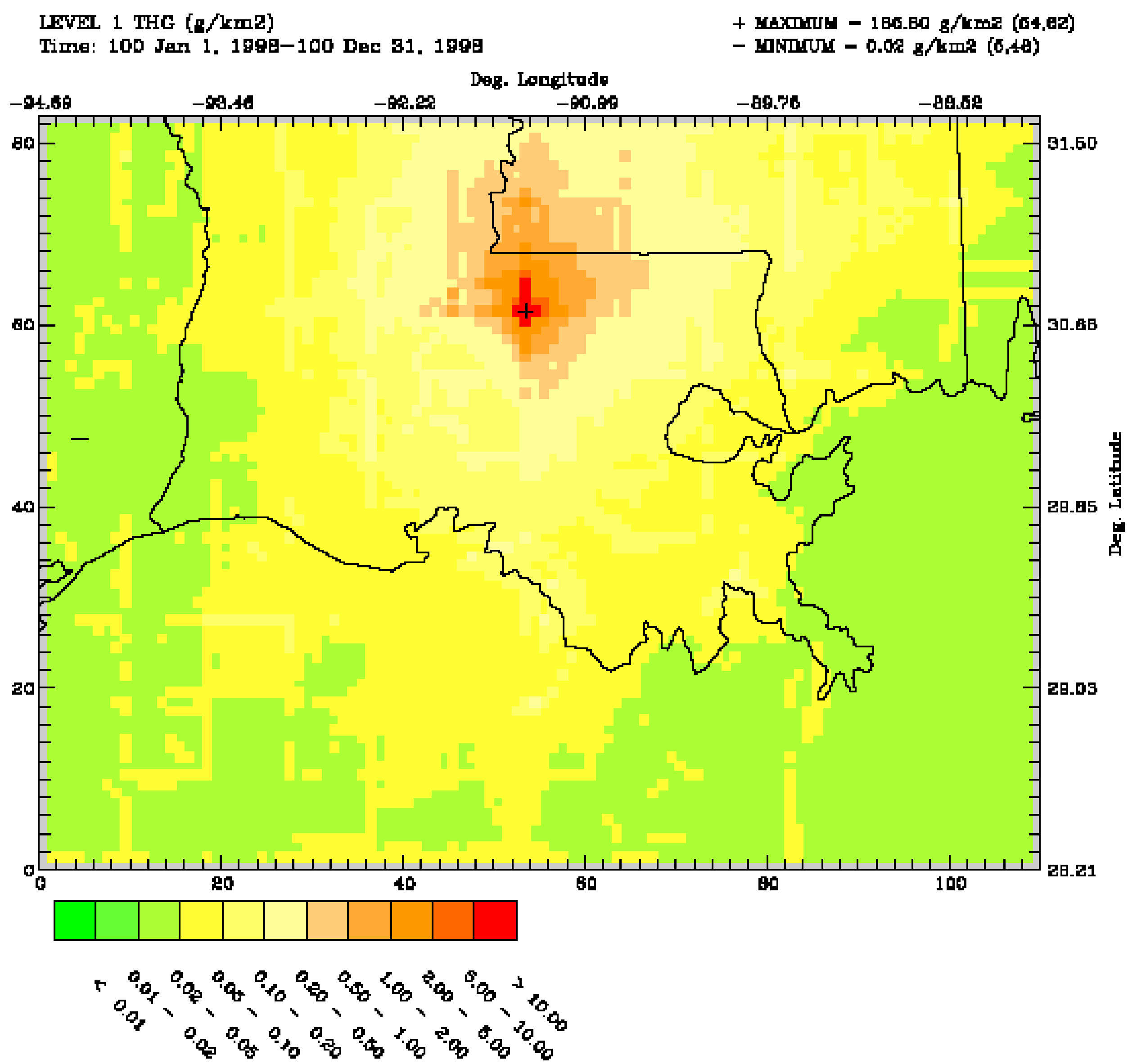


Figure 6-6b.
Simulated Contribution to Total Annual Deposition of Mercury from RS Nelson

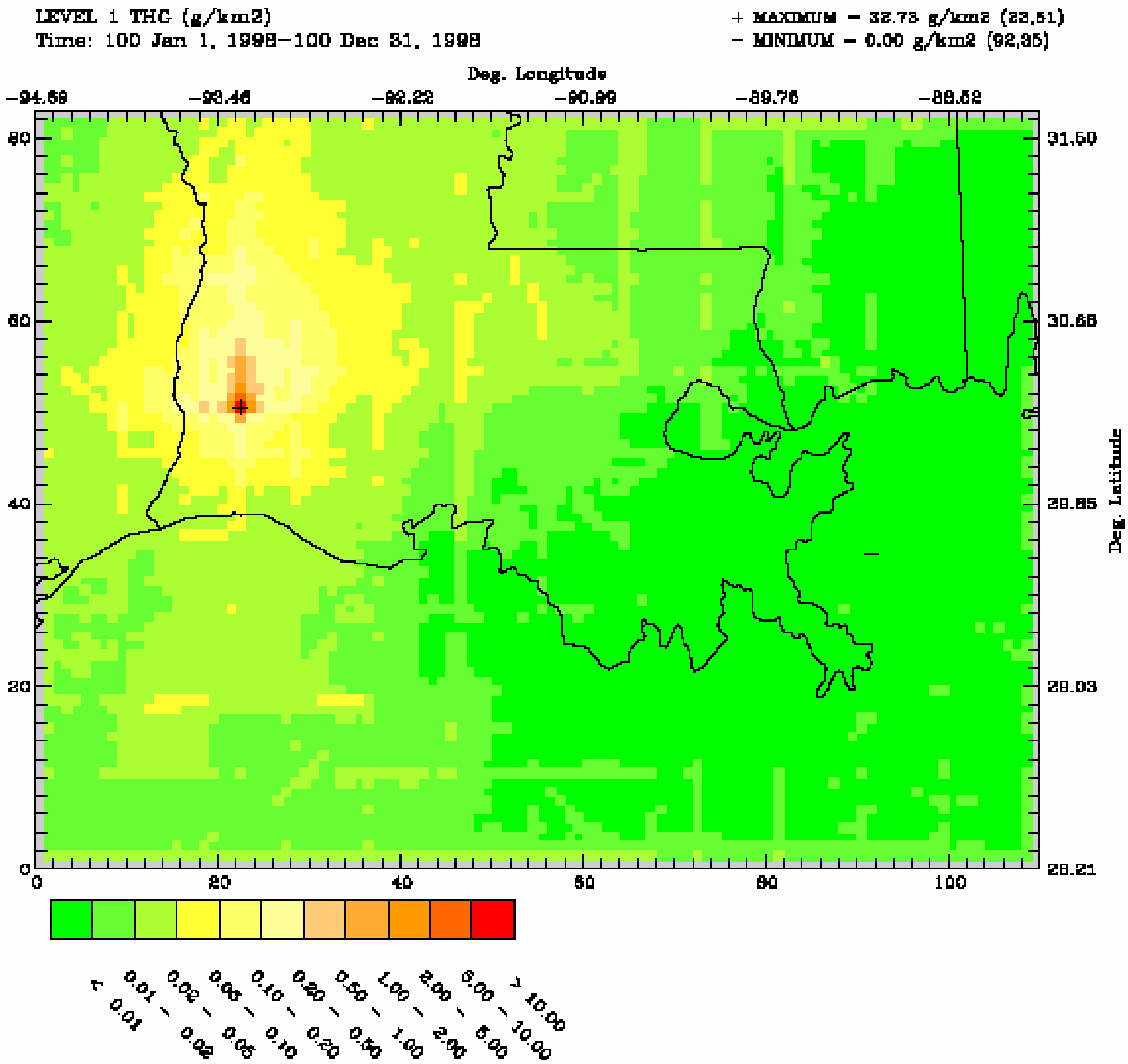


Figure 6-6c.
Simulated Contribution to Total Annual Deposition of Mercury from Other Louisiana Coal Utilities

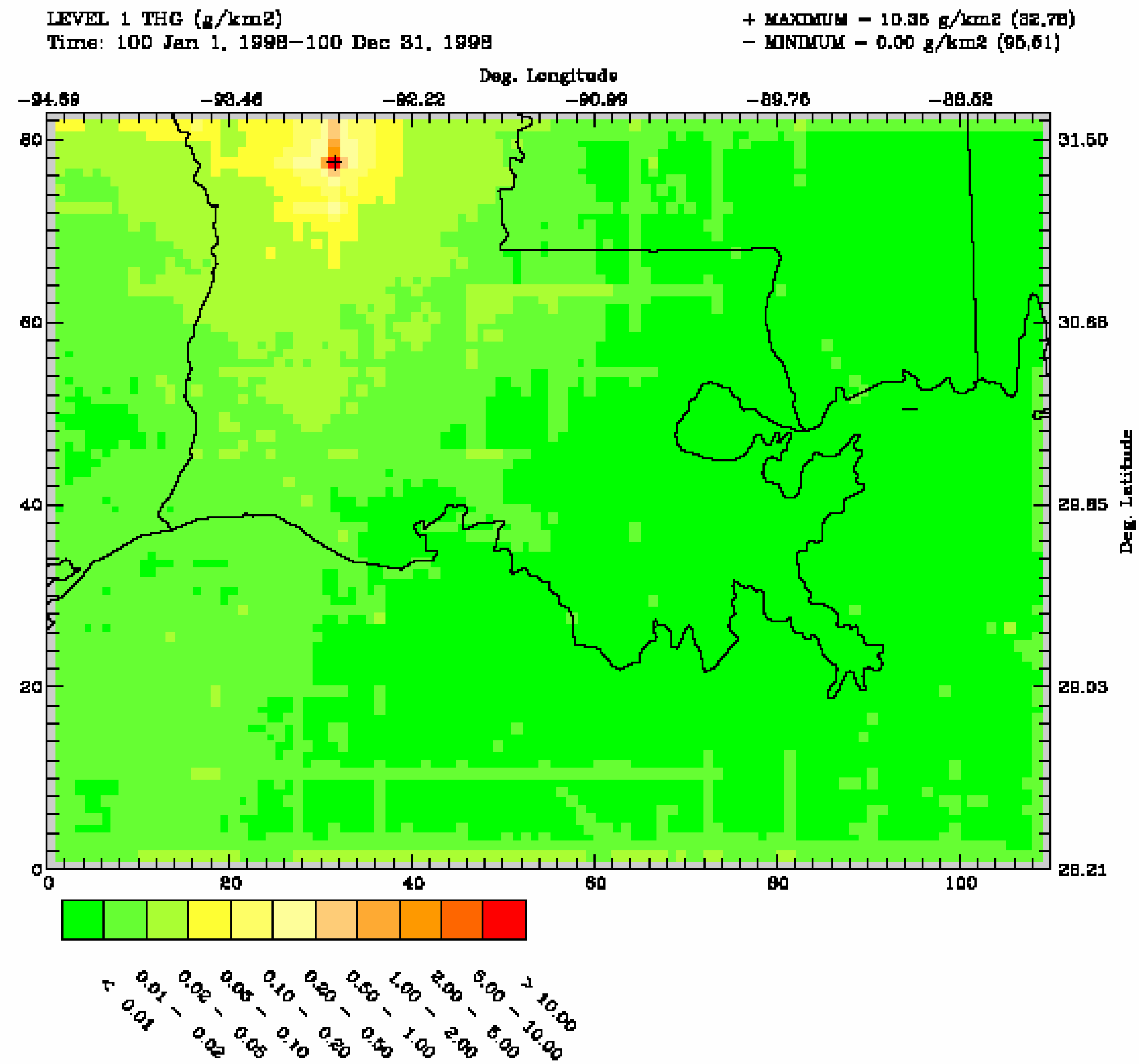


Figure 6-6d.
Simulated Contribution to Total Annual Deposition of Mercury from BFI Health

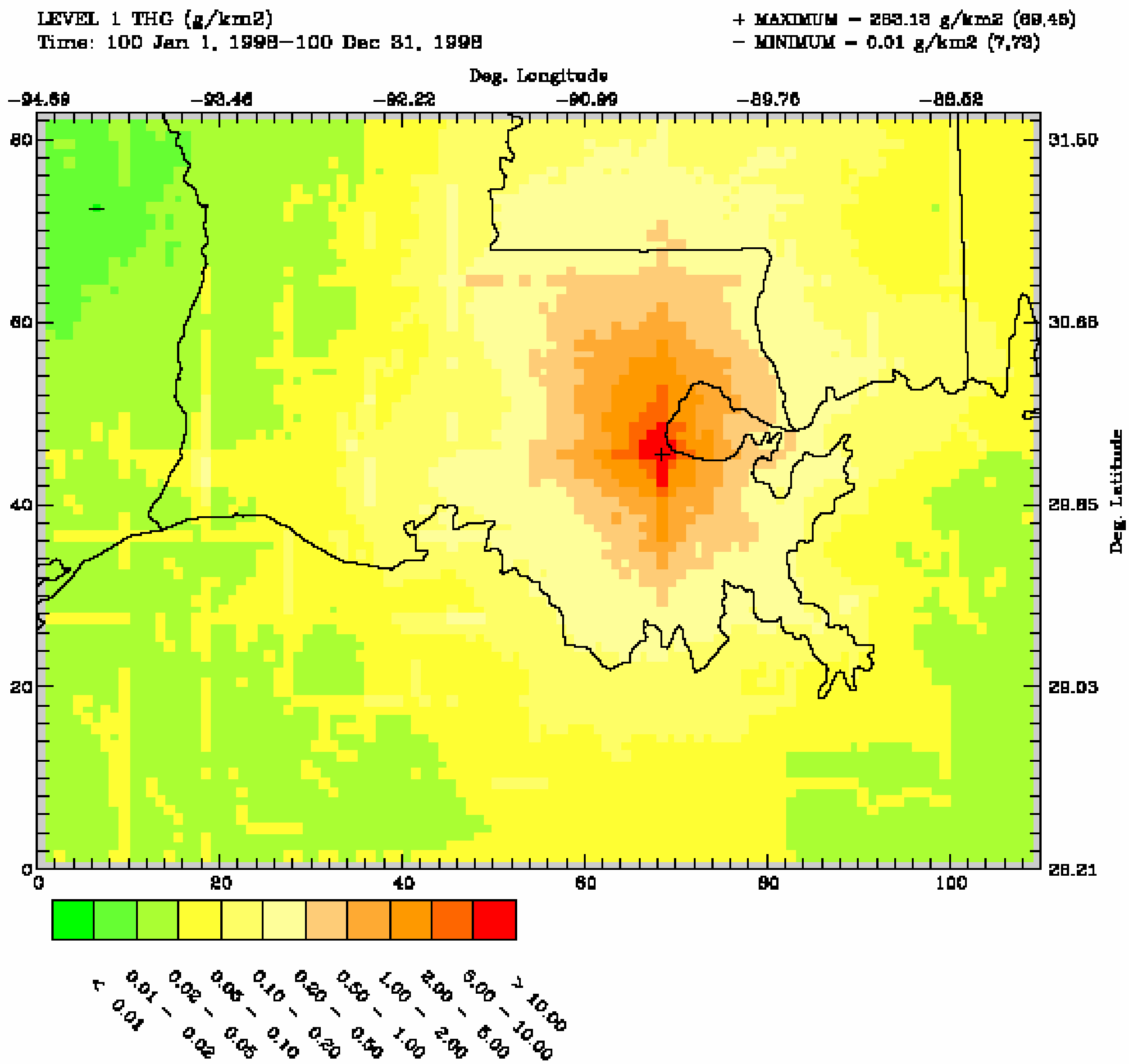


Figure 6-6e.
Simulated Contribution to Total Annual Deposition of Mercury from Other Louisiana Medical Waste Incinerators

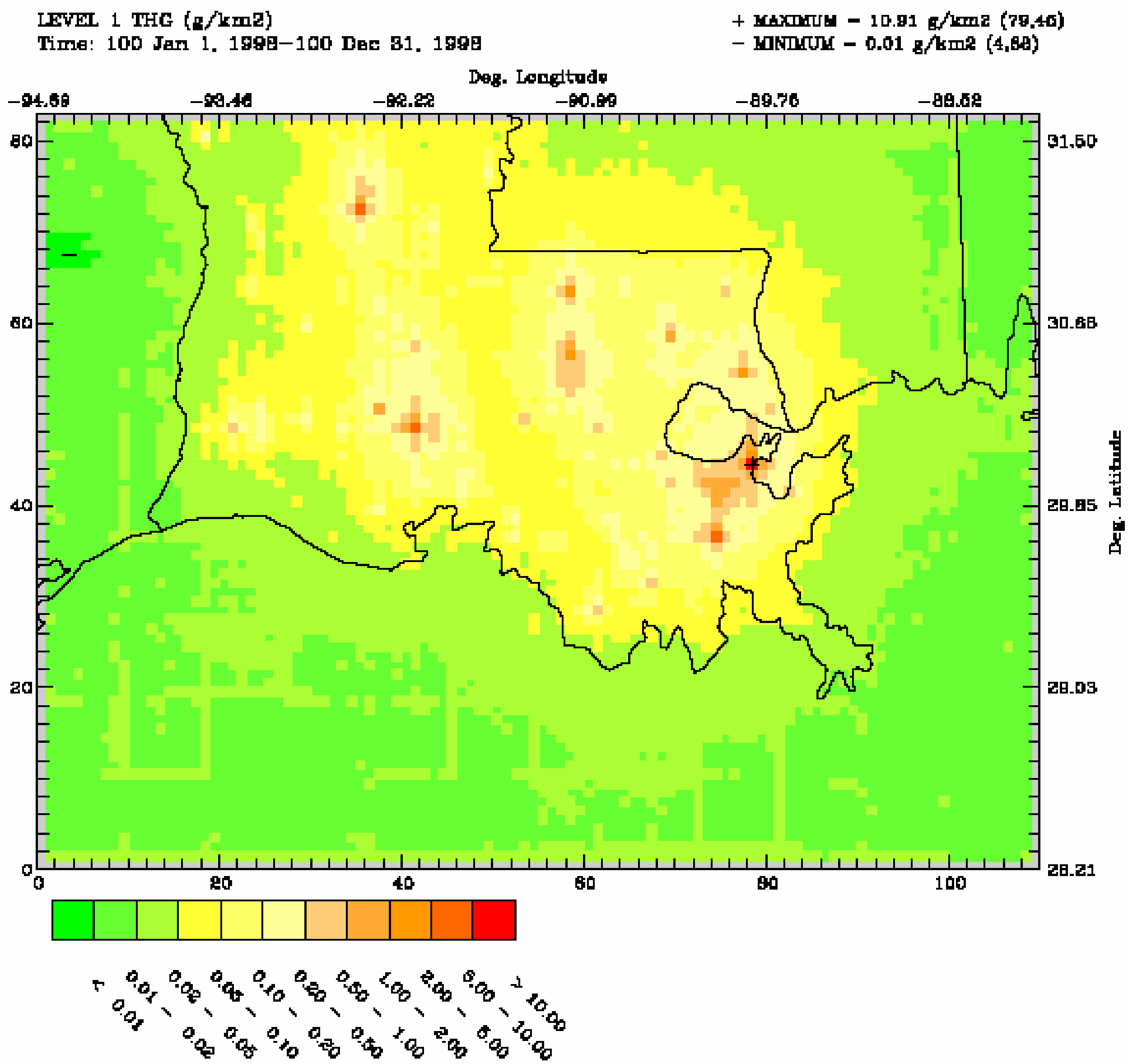


Figure 6-6f.
Simulated Contribution to Total Annual Deposition of Mercury from Other Louisiana Incinerators

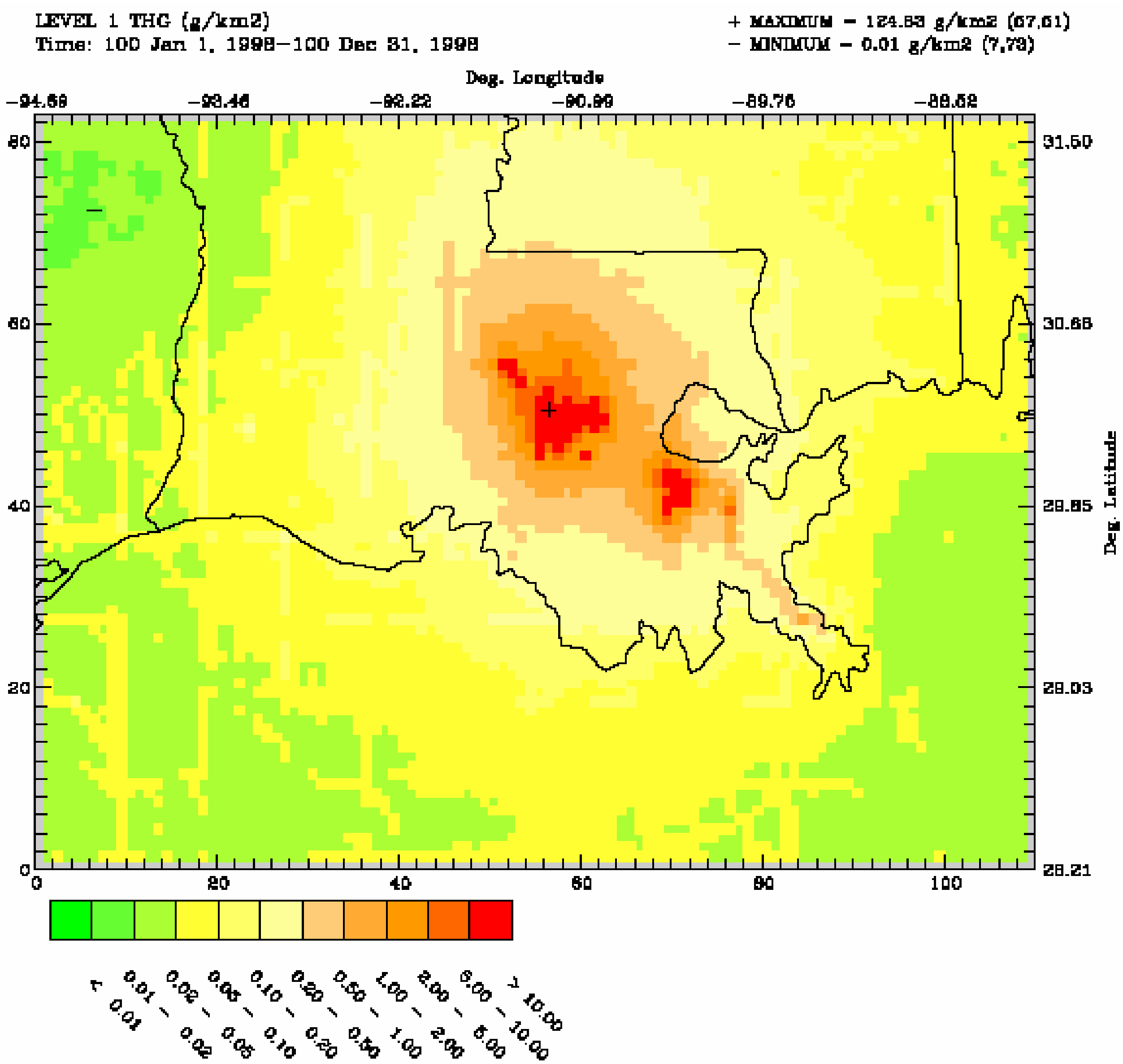


Figure 6-6g.
Simulated Contribution to Total Annual Deposition of Mercury from PPG Chlor-alkali

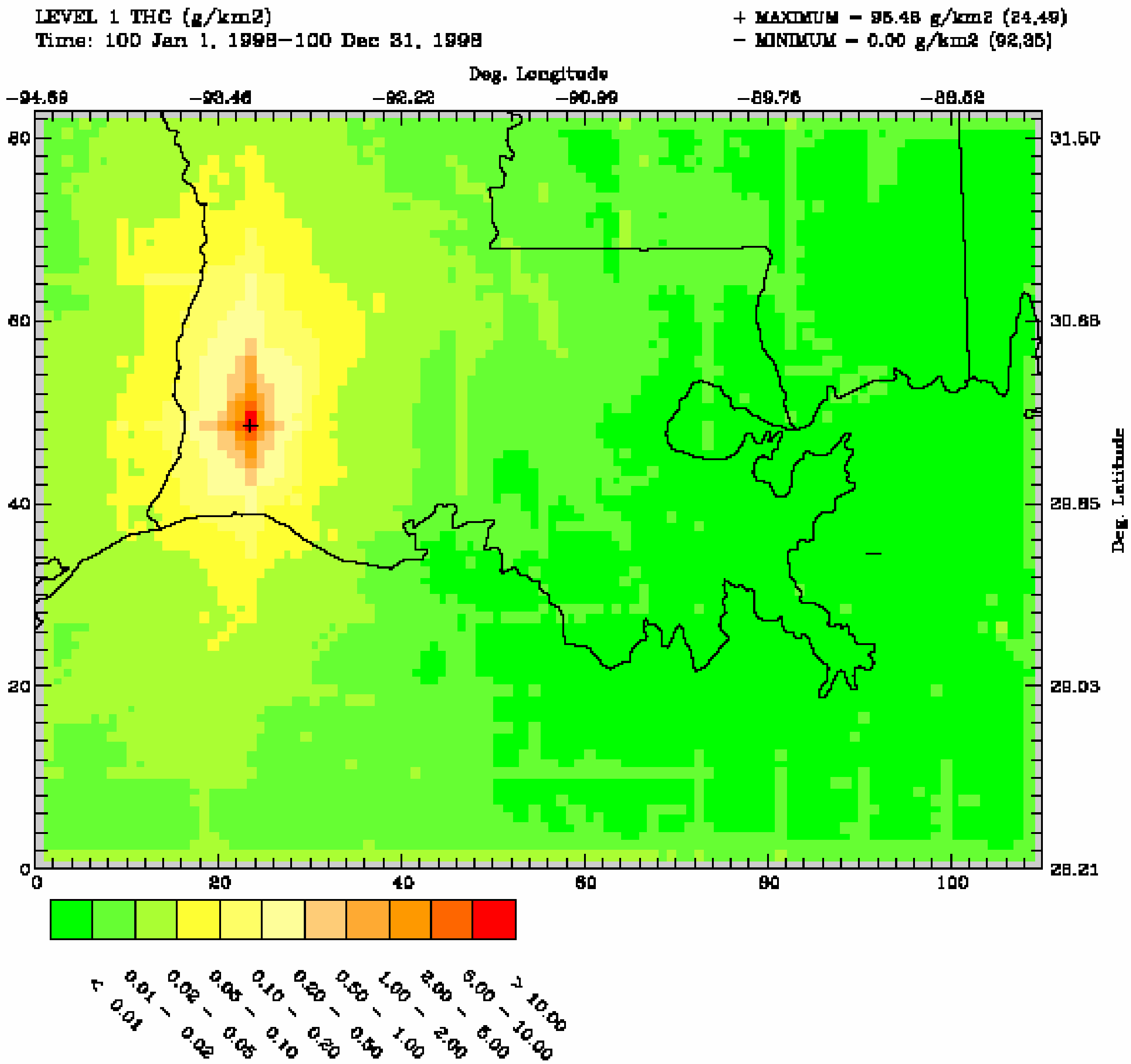


Figure 6-6h.
Simulated Contribution to Total Annual Deposition of Mercury from Pioneer Americas Chlor-alkali

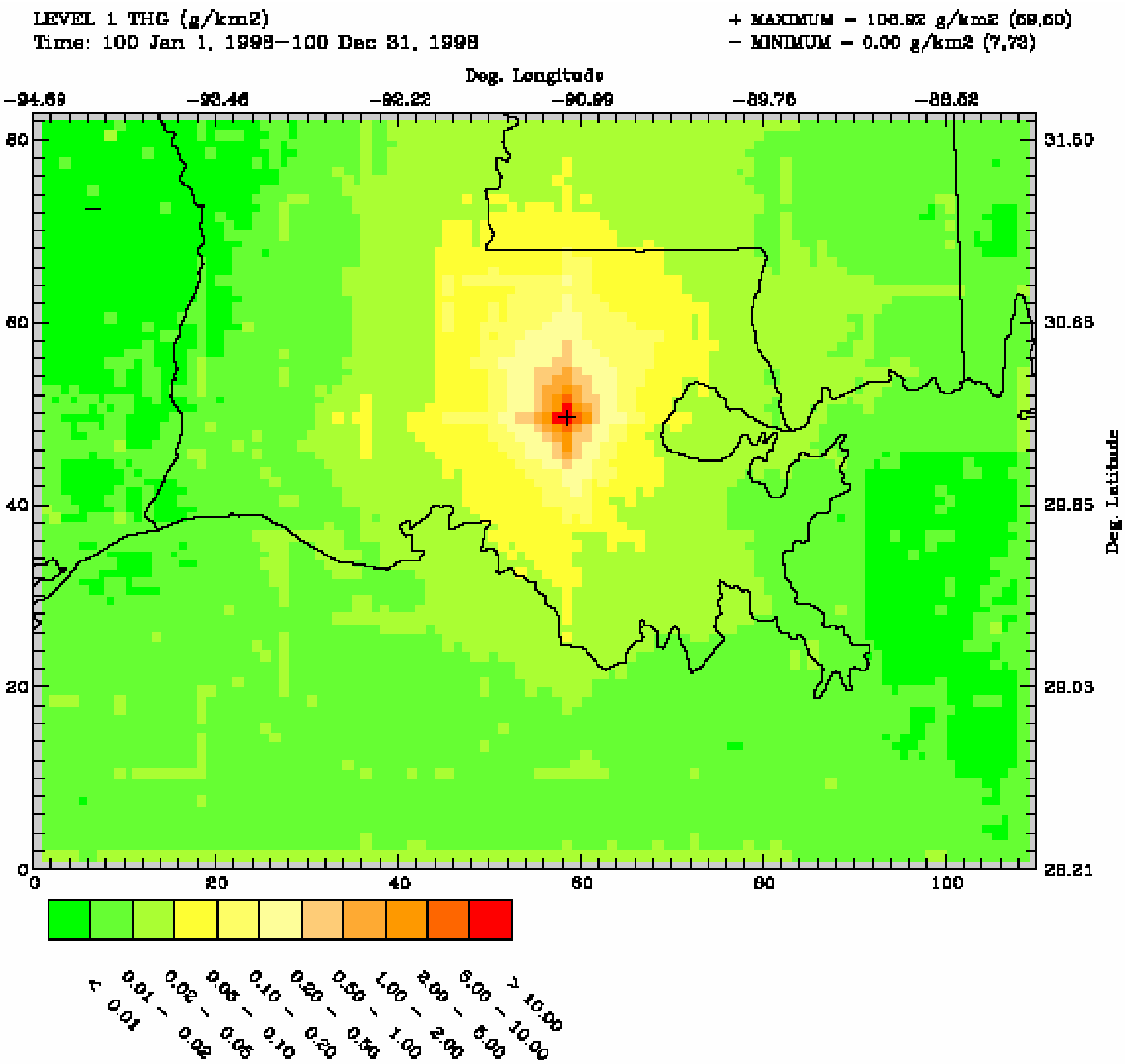


Figure 6-6i.
Simulated Contribution to Total Annual Deposition of Mercury from Other Louisiana Sources

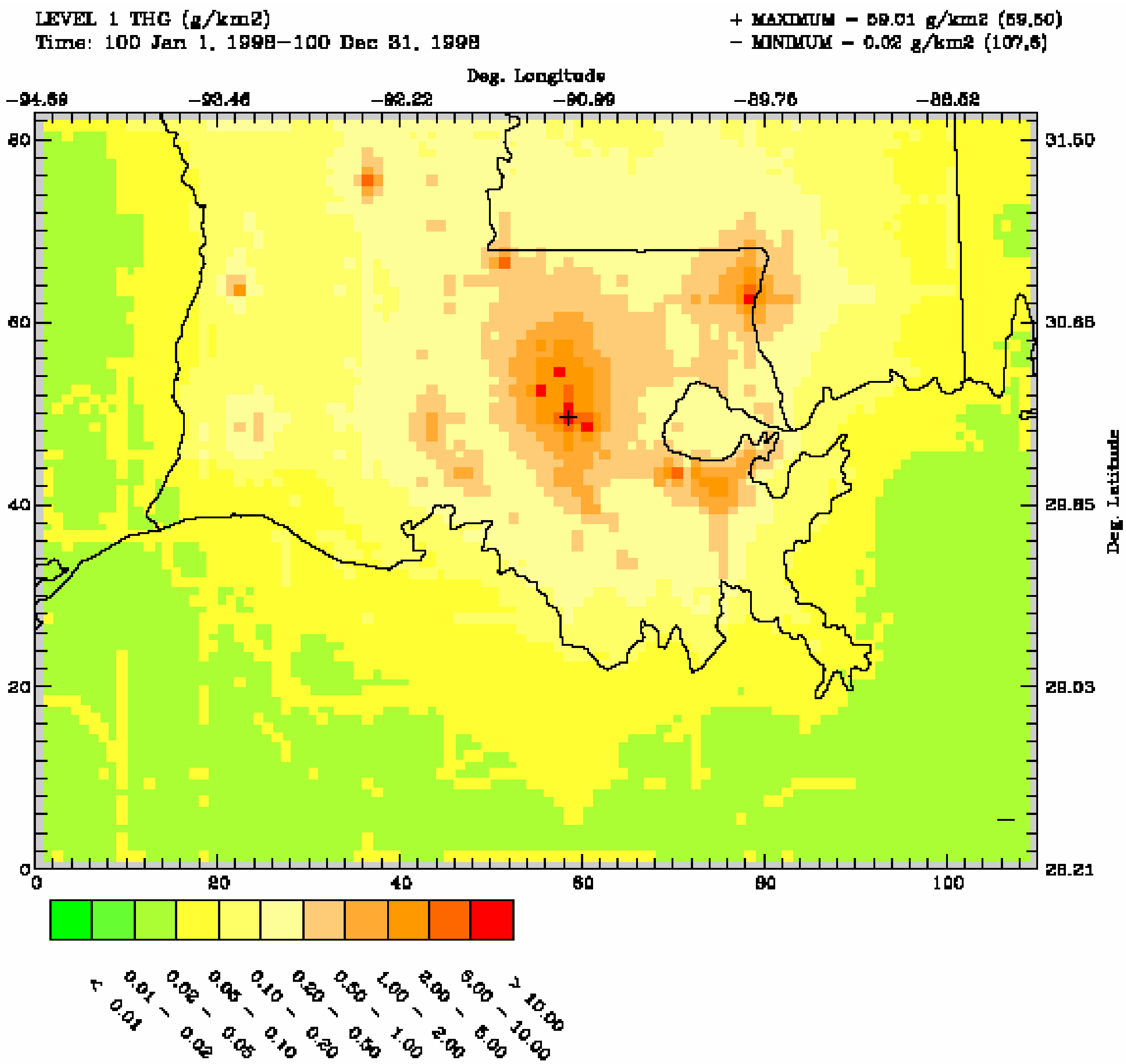
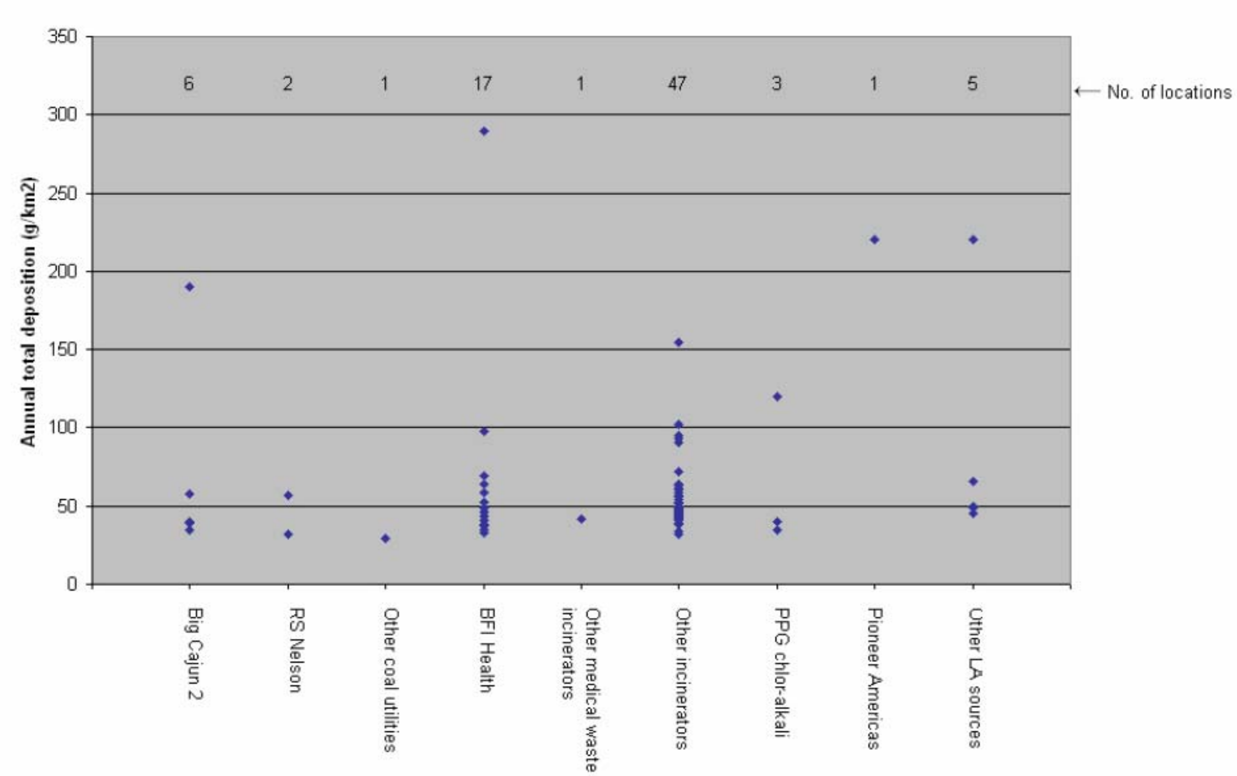


Figure 6-7. Locations with deposition contributions > 25% from Louisiana emissions categories



Since the focus of this study is the gulf coastal basins of Louisiana, we have selected a number of locations near the Gulf Coast for which we provide details of estimates of contributions to deposition. More detailed information has been provided to Region 6 as electronic GIS files containing the simulated deposition in each grid cell of the high-resolution sub-domain.

We selected two locations for each of the major hydrologic cataloging units along the Louisiana coast. One location was on the coast (referred to as "coastal" below) and one was located more inland but still near the coast ("near coastal" below). The hydrologic cataloging units and the locations of the sites chosen for analysis are listed in Table 6-3.

Table 6-3.
Locations of Near Coastal and Coastal Sites

Cataloging Unit	Near Coastal		Coastal	
	Lon	Lat	Lon	Lat
Lower Calcasieu	-93.36778	30.02444	-93.47056	29.78722
Mermentau	-92.66389	29.91833	-92.64389	29.62694
Vermillion	-92.0225	30.11278	-91.86417	29.555
Bayou Teche	-91.62889	29.96806	-91.58583	29.64361

West Central Louisiana Coastal	-91.02944	29.7725	-90.71611	29.18778
East Central Louisiana Coastal	-90.37333	29.84778	-89.71583	29.33222
East Louisiana Coastal	-89.96722	29.78667	-89.53528	29.77194
Lake Maurepas	-90.735	30.16778	-90.44528	30.19083
Lake Pontchartrain	-90.26667	30.75889	-89.9725	30.3375

The simulated dry deposition for each of the near coastal locations is presented in Figure 6-8a with a breakdown showing the contribution of each of the tagged source categories. In the figures, each of the categories is color coded to a pie slice with the percentage contribution noted on the chart. Categories contributing less than 1% are not noted on the chart. The key to the color codes for all the figures is presented below in Table 6-4. (The order of the slices in the pies starting from the 12 o'clock position and going clockwise is Wisconsin, Other states, Big Cajun 2, RS Nelson, Other Coal Utilities, BFI Health, MWI, Other Incinerators, PPG Chlor-alkali, Pioneer Americas, Other Louisiana, Chemical Manufacturing in Iberville Parish, Canada, and Initial and Boundary Concentrations.) The absolute magnitude of the simulated deposition at all sites is listed in Table 6-5. All locations have significant contributions from boundary concentrations with most sites having most of the deposition from this source. Boundary concentrations represent mercury that originated outside of the modeling domain. All locations show some contribution from states other than Louisiana, on average about 10%. The BFI incinerator contributes 5% or more to dry deposition at 5 of the 9 near coastal locations. The largest Louisiana source contribution is other incinerators at the East Central LA Coast near coastal site. Of all the locations considered here, this site has the highest simulated dry deposition. Other Louisiana sources contribute several percent at most locations.

Table 6-4.
Color Codes Used on Figures 6-8 and 6-9

Wisconsin	Other States
Big Cajun 2	RS Nelson
Other Coal Utilities	BFI Health
Other MW	Other Incinerators
PPG Chlor-Alkali	Pioneer Americas
Other LA	Chemical Mfg. in Iberville Par.
Canada	Initial-Boundary Conditions

Table 6-5.
Simulated Annual Total Dry and Wet Deposition (g/km^2) at Near Coastal and Coastal Sites

Cataloging Unit	Wet Dep Near Coastal	Dry Dep Near Coastal	Wet Dep Coastal	Dry Dep Coastal
Lower Calcasieu	19.15	7.78	33.36	7.66
Mermentau	22.68	7.37	19.32	7.47
Vermillion	23.5	8.79	23.38	5.17
Bayou Teche	17.18	7.43	16.07	6.71
West Central Louisiana Coastal	23.07	6.83	20.79	7.29
East Central Louisiana Coastal	25.09	17.76	21.88	6.75
East Louisiana Coastal	22.03	8.62	22.62	7.54
Lake Maurepas	25.59	10.48	26.23	12.77
Lake Pontchartrain	26.01	8.6	16.49	7.84

The magnitude of wet deposition is larger than dry deposition, but wet deposition shows a lesser impact from emissions sources than does dry deposition. In Figure 6-8b, initial and boundary concentrations dominate at all the near coastal sites. There is consistently a few percent contribution from other states. BFI shows some contribution at several sites. Other incinerators make a comparatively significant contribution at the East Central LA Coastal site.

Figure 6-8a.
Simulated Contributions to Dry Deposition at Near Coastal Sites

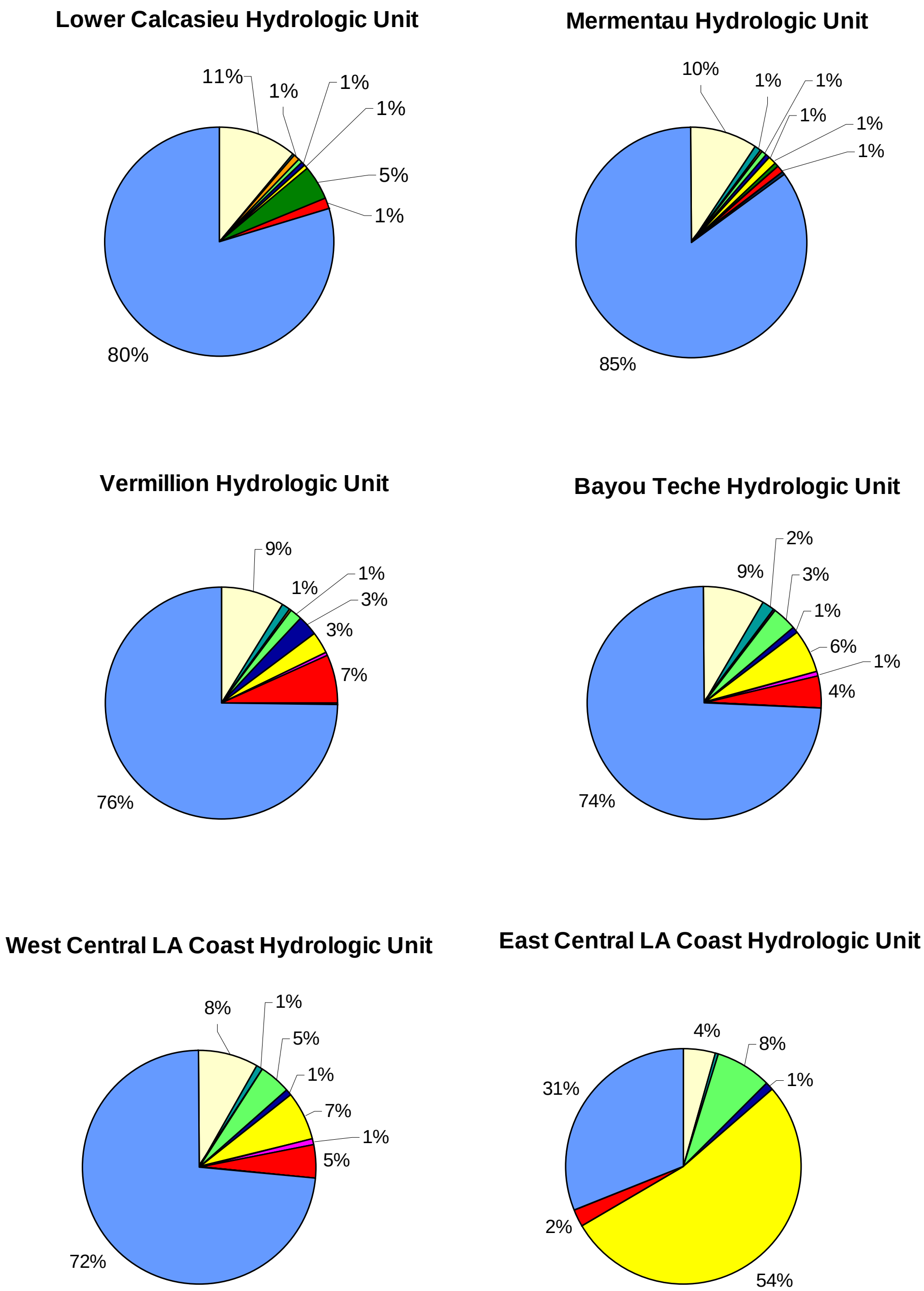
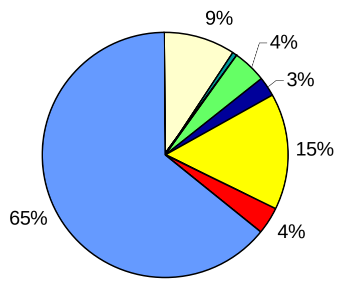
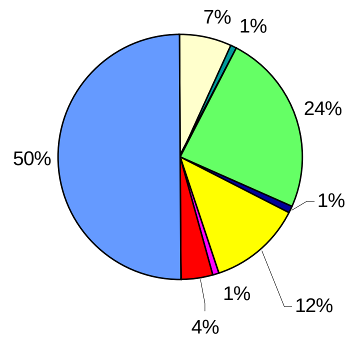


Figure 6-8a *(continued)*

East LA Coast Hydrologic Unit



Lake Maurepas Hydrologic Unit



Lake Pontchartrain Hydrologic Unit

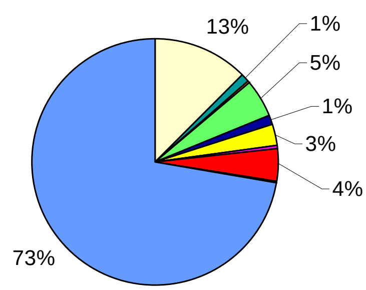


Figure 6-8b.
Simulated Contributions to Wet Deposition at Near Coastal Sites

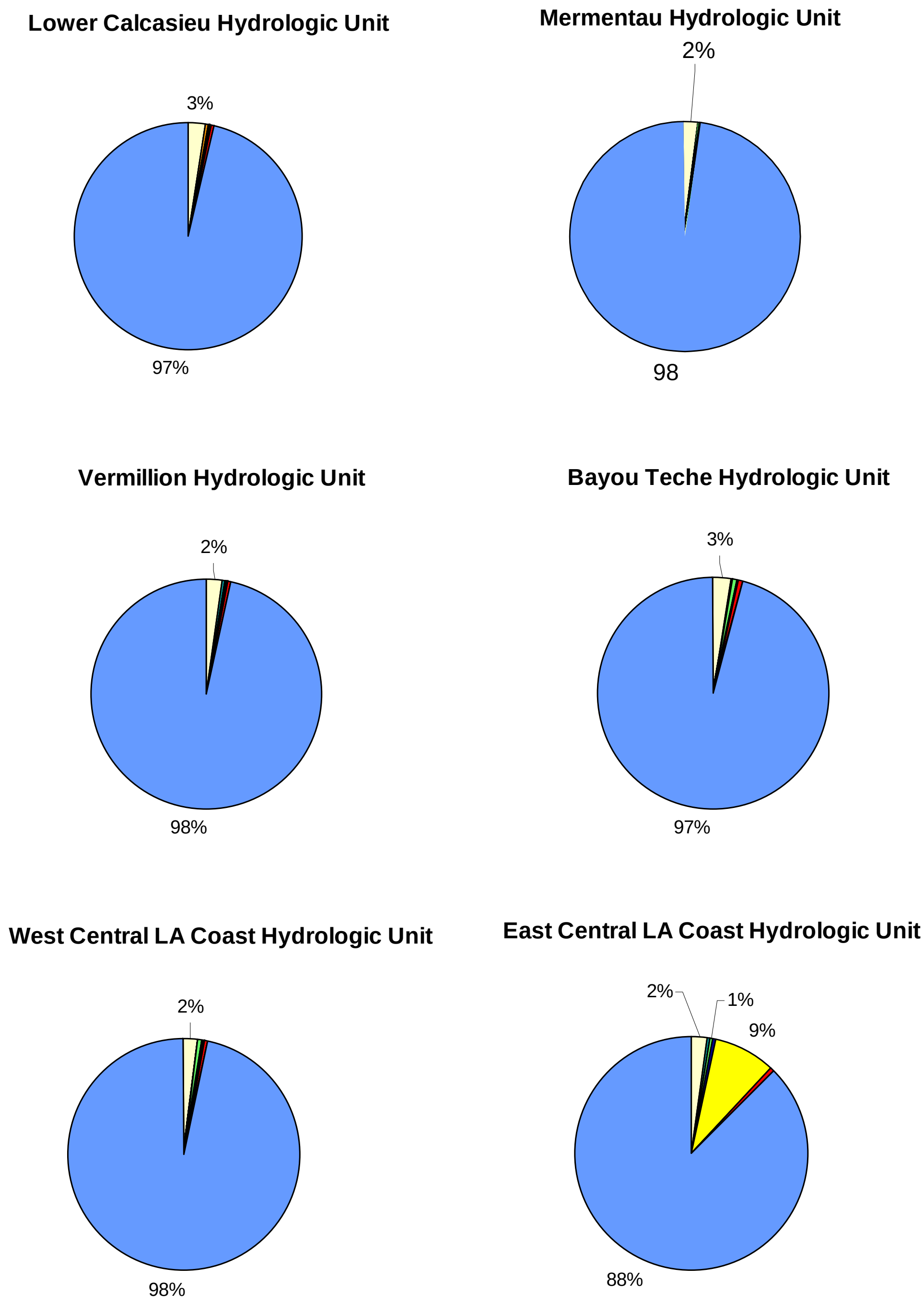
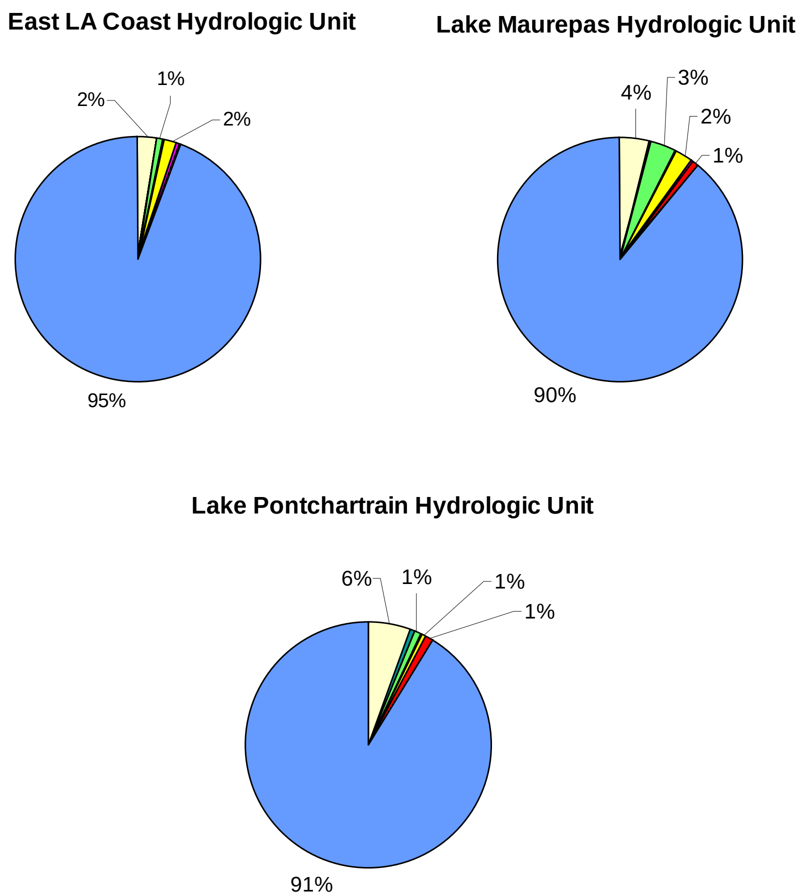


Figure 6-8b *(continued*)



The largest contributor to dry deposition, after boundary concentrations, at the coastal sites typically is other states (see Figure 6-9a). For most coastal sites, the contribution of boundary concentrations is larger than for the corresponding near coastal site. An exception to this is the Lake Maurepas coastal site where 59% of the dry deposition comes from BFI. Other sources such as other incinerators, other Louisiana sources, and Big Cajun 2 contribute up to a few percent.

The simulated contributions to wet deposition at the coastal sites (see Figure 6-9b) are dominated by boundary concentrations, more than 90% at all sites except Lake Maurepas. Other states contribute 2% or a little more at all sites. At Lake Maurepas, BFI contributes 22% with another few percent coming from other incinerators and other Louisiana sources.

Figure 6-9a.
Simulated Contributions to Dry Deposition at Coastal Sites

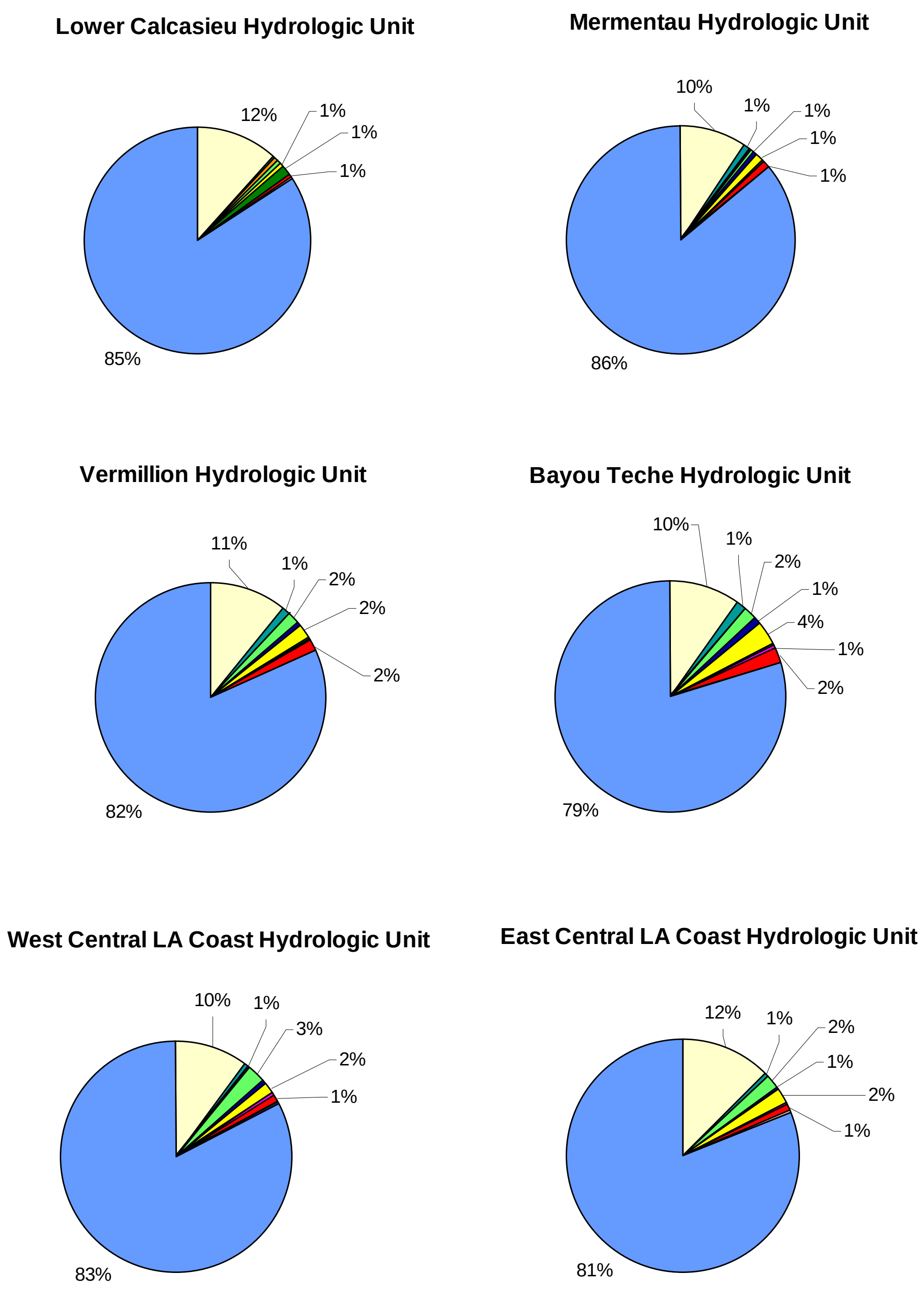
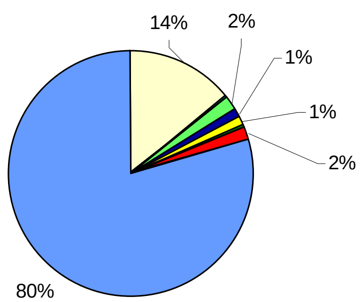
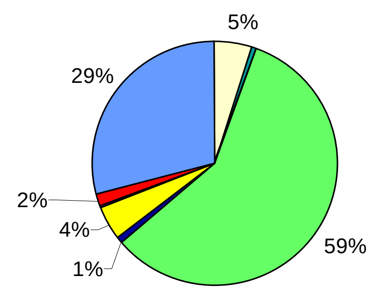


Figure 6-9a *(continued)*

East LA Coast Hydrologic Unit



Lake Maurepas Hydrologic Unit



Lake Pontchartrain Hydrologic Unit

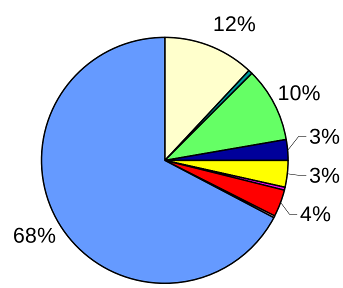
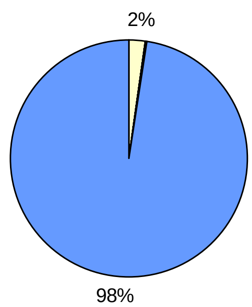
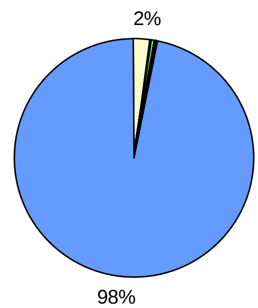


Figure 6-9b.
Simulated Contributions to Wet Deposition at Coastal Sites

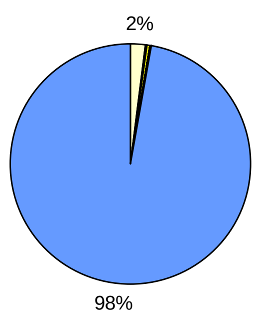
Lower Calcasieu Hydrologic Unit



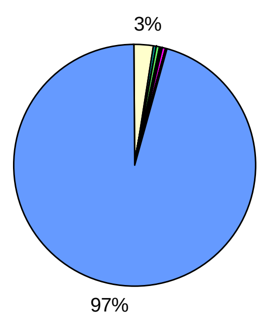
Mermentau Hydrologic Unit



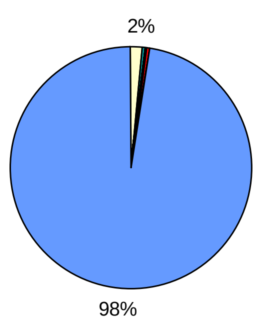
Vermillion Hydrologic Unit



Bayou Teche Hydrologic Unit



West Central LA Coast Hydrologic Unit



East Central LA Coast Hydrologic Unit

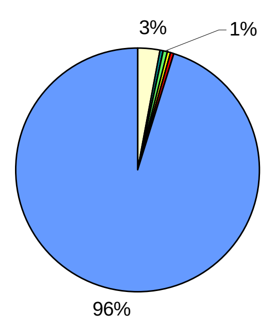
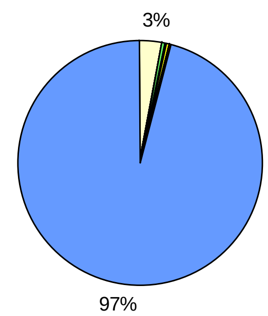
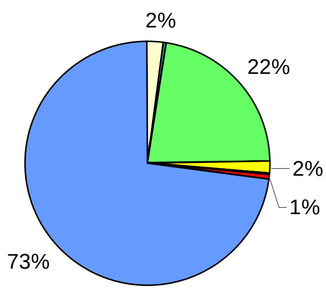


Figure 6-9b *(continued)*

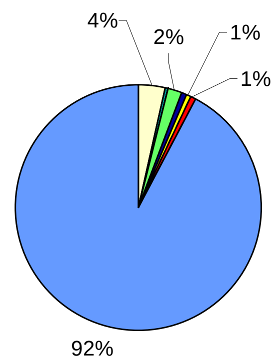
East LA Coast Hydrologic Unit



Lake Maurepas Hydrologic Unit



Lake Pontchartrain Hydrologic Unit



7. Summary

Utilizing meteorological data for 1998 developed under earlier work for EPA's Office of Water, annual REMSAD simulations of mercury deposition to southern Louisiana have been conducted. Emissions developed from inventories acquired from EPA OAQPS include tagging of mercury emissions for several categories in Louisiana, other states, Canada, and initial and boundary concentrations.

Model performance compared to MDN wet deposition monitors is good with a correlation coefficient (R^2) of nearly 0.6 and little bias. Data were not available to evaluate performance for dry deposition.

Simulated annual dry deposition in southern Louisiana is typically near 7 g/km2, but two small areas exceed 15 g/km2. Simulated wet deposition in southern Louisiana is generally greater than 20 g/km2, with some areas exceeding 30 g/km2.

Simulated contributions at coastal sites typically are primarily from boundary concentrations although a few locations show large impacts from sources located nearby. In most cases, there is some contribution from other states, and in some cases this is the next largest contributor after boundary concentrations. Of the tagged Louisiana sources, the most significant contributors are BFI Health and other incinerators.

8. References

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APPENDIX H
RESPONSE TO PUBLIC COMMENTS

RESPONSE TO COMMENTS

1. Louisiana Mid-Continent Oil and Gas Association

Comment No. 1

Mid-Continent submitted written comments on the previous EPA notice (69 FR 71409). Mid-Continent requests these comments be added to the docket for this notice as appropriate. Specifically, Comments 1, 3, 4 and 7 should be included (section references must be changed to reflect the new report's numbering system).

Response

Comment acknowledged. EPA will only respond to comments 1,3,4, and 7.

Comment No. 2

Mid-Continent supports the report's conclusion that an adaptive management approach is appropriate for the TMDLs. The activities outlined on page ES-6 are reasonable and appropriate based on the current information available for these waterbodies.

Response
Comment acknowledged.

Comment No. 3

Mid-Continent, however, opposes the proposed endpoint selection of 0.5 mg/kg for fish tissue concentration. The endpoint should be based on Louisiana's criteria for these waterbody segments based on actions taken by the state and not on a "potential" action the state might take based on a lower criteria.

As correctly noted, Louisiana has issued a fish consumption advisory for king mackerel in the Gulf of Mexico based on a 1.0 mg/kg criteria. The state has not at this time however, issued advisories for fish species in these segments with tissue concentrations averaging greater than 0.5 mg/kg but less than 1 mg/kg. These species include blackfin tuna, cobia, and greater amberjack.

The TMDL determination by Louisiana rules is supposed to be water segment specific based on the criteria imposed by the state for that specific waterbody. Since no fish advisories have been issued for the Gulf of Mexico based on concentrations less than 1 mg/kg, then it is inappropriate for EPA to suggest a level lower than that level in this TMDL proposal. Mid-Continent recommends the load reduction goal in Section 7.2 be based on this higher threshold.

Response

USEPA disagrees that its water quality target for this TMDL of 0.5 mg/kg is inappropriate. Louisiana has not adopted a numeric value for protection of human health. They have however, adopted a narrative water quality criterion to protect human health. See Section LAC 33:IX.1113.B.5. This narrative water quality criterion provides: “No substances shall be present in waters of the state or the sediments underlying said waters in quantities that alone or in combination will be toxic to human plant, or animal life or significantly increase health risks due to exposure to the substances or consumption of contaminated fish or aquatic life.”

The State of Louisiana, in part, protects from violations of this narrative criterion by issuing fish consumption advisories according to state developed and approved methodologies. The Louisiana Department of Health and Hospitals (LDHH) and LDEQ coordinate in the assessment of data for health risks and jointly issue advisories if warranted. The Louisiana Department of Wildlife and Fisheries and the Louisiana Department of Agriculture and Forestry are also apprised of the situation and allowed to comment. LDHH and LDEQ use a limited meals approach in establishing health advisories. The two lead agencies will consider issuing a health advisory limiting fish consumption for pregnant or breast feeding women and children under seven for locations and species where the average concentration of mercury exceeds 0.5 parts per million (ppm) in fish and shellfish. At average concentrations exceeding 1.0 ppm, the agencies will recommend limited meals or no consumption for pregnant or breast feeding women and children under seven and limited consumption for the general population. In addition, LDHH considers other types of information when making advisory decisions. These considerations include, but are not limited to, information on sensitive subpopulations and local fish consumption practices that can affect exposure, the number of samples within a species, and the size and number of fish collected (See LDEQ website http://www.deq.state.la.us/surveillance/mercury/2000report/intro.htm). USEPA believes that it was appropriate and consistent with the State’s narrative water quality standards to establish the fish tissue target for this TMDL at the same 0.5 ppm tissue concentration used by the state to issue first stage fish advisories. According to State procedures if average fish tissue levels are reduced below this level no fish consumption advisories are warranted and USEPA would interpret this to mean that the narrative WQS for fish consumption are being supported.

The commenter has stated the State of Louisiana has not issued advisories for fish species, such as blackfin tuna, cobia, and greater amberjack, in these segments with tissue concentrations averaging greater than 0.5 mg/kg but less than 1 mg/kg and that this implies that EPA’s proposed 0.5 mg/kg target is inappropriate. EPA disagrees with this comment. The proposed TMDLs only address the impairment due to mercury in fish tissue of king mackerel and the fact that the State of Louisiana has not issued fish advisories for species with an average fish tissue concentration between 0.5 and 1.0 mg/kg does not impact EPA’s decision to use a target of 0.5 mg/kg for these TMDLs.

Comment No. 4 Additional Reference Study

Mid-Continent requests that the attached study entitled “Fates and Effects of Mercury from Oil and Gas Exploration and Production Operations in the Marine Environment” by Dr. J. M. Neff of Battelle Memorial Institute be included in the docket. This study was prepared for the American Petroleum Institute (API) in July 2002 and was intended to summarize the relevant available information regarding mercury impacts from oil and gas operations in the Gulf of Mexico. Should this report include information that contradicts the EPA analysis, the EPA should reconcile such differences and re-propose the TMDLs as appropriate.

Response

The information has been included in the administrative record.

Comment No. 5 Subsection 5.5.4 – Mercury Meters

Mid-Continent supports the position that mercury from gas metering locations should not be included in the analysis. The referenced 25,000 – 30,000 metering stations are a historical estimated number based on gas wells drilled between 1950 and 1990 and do not represent the number of "active" locations with mercury meters. Starting in the late 1960s and early 1970s, industry began to transition to either dry flow or electronic meters. Additionally, it is estimated that 70% of these potential locations are in north Louisiana and are not part of this geographic study area. Additionally, any contamination would be very localized and unlikely to migrate to a waterbody segment. Industry estimates that there are approximately 1500 active sites with mercury meters with the great majority being located in north Louisiana.

Mid-Continent is actively participating in the DEQ's Mercury Initiative Industrial Processes Workgroup. This issue was discussed in a meeting on December 7, 2004. The results from this effort will further reduce the potential contribution of this source of mercury on these waterbodies.

Response

Comment acknowledged.

Comment No. 6 Subsection 5.5.4 – Drilling Fluids

Mid-Continent also supports the position that drilling mud discharges have minimal impacts. These discharges were halted in the coastal waters of Louisiana in the early 1990s. Mid-Continent also agrees that the mercury in barite is of a form (mercuric sulfide) which is very insoluble. More on this can be found in the aforementioned API study.

Response

Comment acknowledged.

Comment No. 7 Section 6.4 Margin of Safety

Mid-Continent concurs with EPA's decision that an explicit margin of safety was not appropriate for inclusion in this analysis.

Response

Comment acknowledged.

2. Louisiana Chemical Association (LCA)

Comment No. 8

The only significant change that LCA was able to discern in the limited time provided for comment was that EPA deleted three water segments from the TMDL and readjusted the total loading to account for removal of these three segments. These were: 031201 in the Calcasieu basin, 050901 in the Mermentau basin, and 061201 in the Vermillion-Teche basin. EPA indicated that these subsegments were deleted from the TMDL because EPA already established TMDLs for these three subsegments. LCA believes that EPA cannot simply dismiss the new proposal without response to comments to indicate why the new proposal was not based on better data and should not take precedence over the existing TMDL. It is well established that TMDLs can and should be changed based upon improved information. While LCA supports that a water segment cannot be regulated by two TMDLs simultaneously for the same pollutant, EPA should discuss in the response to comments here why the newer proposal reflected in the Original TMDL, presumably based upon better information and modeling of air deposition sources, was not used to revise the existing TMDLs for these subsegments

Response

EPA originally intended to revise the TMDLs for Subsegments 031201 in the Calcasieu basin, 050901 in the Mermentau basin, and 061201 in the Vermillion-Teche basin. After reviewing the revised and previously established TMDLs, EPA determined that the approach used here agreed very closely with the established TMDLs and changes in the TMDL loadings were not significant enough to warrant revision at this time. EPA does note that it views all of the TMDLs as adaptive management TMDLs and that EPA will revise and update them when data or information warrants a revision.

Comment No. 9

It should be noted that fish tissue data and other data from these three subsegments still appears as part of the analysis and support for the Revised TMDL. LCA requests that EPA identify in a response to comments whether any data from these three subsegments was still relied upon by EPA to formulate TMDLs for waters outside of those three subsegments and whether such reliance is appropriate given that the three subsegments were removed from the TMDL.

Response

The commenter correctly noted that EPA used the fish tissue data for subsegments 031201 in the Calcasieu basin, 050901 in the Mermentau basin, and 061201 in the Vermillion-Teche basin to determine the reduction in mercury loading required to meet the goal of 0.5 mg/kg of mercury in fish tissue of king mackerel. EPA believes that it is appropriate to use all available data to develop TMDLs. EPA believes the fact that the king mackerel is highly mobile supports that fish tissue data taken off the Louisiana coast would be representative of any location off the coast. EPA also notes that every Gulf Coast state has issued a fish consumption advisory for king mackerel due to mercury in fish tissue and that there is a relatively high degree of consistency in mercury concentrations of king mackerel along the Louisiana coast and other Gulf Coast states.

Comment No. 10

LCA believes that EPA does not have legal authority to establish the TMDL based upon an endpoint of 0.5 mg/Kg of mercury in fish tissue when this level is not a state water quality standard. EPA may only establish TMDLs where the water segment at issue is impaired due to a violation of an applicable state water quality standard. Louisiana has numeric criteria for mercury in marine waters which is 2 ppb as an acute criteria and 0.025 ppb as a trigger value for chronic criteria which requires fish tissue testing to determine whether the tissue exceeds the FDA action level of 1.0 mg/kg . This value was established to protect humans who eat such marine species, thus protecting the fishable uses of the state waters. The state criteria is not arbitrary or capricious and is based on the recognized safe level established by the Federal Food and Drug Administration. The legally established criteria is not 0.5 mg/Kg in fish tissue – the end point used by EPA in this Revised TMDL. EPA has no authority to establish a water quality standard for Louisiana and must change the end-point to be equivalent to the state standard. *See, e.g., Stinson v. United States*, 508 U.S. 36, 44-45, 113 S. Ct. 1913, 1918-1919 (1993).

Response

USEPA disagrees that its water quality target for this TMDL suffers from legal deficiencies. Louisiana has not adopted a numeric value for protection of human health. They have however, adopted a narrative water quality criterion to protect human health. See Section LAC 33:IX.1113.B.5. This narrative water quality criterion provides: “No substances shall be present in waters of the state or the sediments underlying said waters in quantities that alone or in combination will be toxic to human plant, or animal life or significantly increase health risks due to exposure to the substances or consumption of contaminated fish or aquatic life.”

The State of Louisiana, in part, protects from violations of this narrative criterion by issuing fish consumption advisories according to state developed and approved methodologies. The Louisiana Department of Health and Hospitals (LDHH) and LDEQ coordinate in the assessment of data for health risks and jointly issue advisories if warranted. The Louisiana Department of Wildlife and Fisheries and the Louisiana Department of Agriculture and Forestry are also apprised of the situation and allowed to comment. LDHH and LDEQ use a limited meals approach in establishing health advisories. The two lead agencies will consider issuing a health advisory limiting fish consumption for pregnant or breast feeding women and children under seven for locations and species where the average concentration of mercury exceeds 0.5 parts per million (ppm) in fish and shellfish. At average concentrations exceeding 1.0 ppm, the agencies will recommend limited meals or no consumption for pregnant or breast feeding women and children under seven and limited consumption for the general population. In addition, LDHH considers other types of information when making advisory decisions. These considerations include, but are not limited to, information on sensitive subpopulations and local fish consumption practices that can affect exposure, the number of samples within a species, and the size and number of fish collected (LDEQ website http://www.deq.state.la.us/surveillance/mercury/2000report/intro.htm) USEPA believes that it was appropriate and consistent with the State’s narrative water quality standards to establish the fish tissue target for this TMDL at the same 0.5 ppm tissue concentration used by the state to issue first stage fish advisories. According to State procedures if average fish tissue levels are reduced below this level no fish consumption advisories are warranted and USEPA would interpret this to mean that the narrative WQS for fish consumption are being supported.

In addition, USEPA has determined that fish tissues in king mackerel in Louisiana's coastal waters contain levels of mercury from municipal, industrial and other (i.e., air) sources at levels that are harmful to humans who consume king mackerel from them. Therefore, USEPA has concluded that these waters exceed Louisiana's narrative water quality criterion for toxic pollutants. In view of that conclusion, USEPA has the authority to establish a TMDL to address that impairment. Congress did not limit the term "applicable water quality standards" in CWA section 303(d)(1)(C) to standards based upon numeric criteria, and USEPA's 1985 regulations at 40 C.F.R. Section 130.7(b)(3) define "applicable water quality standards" to refer to "those water quality standards established under section 303 of the Act, including . . . narrative criteria. See also 40 C.F.R. Section 130.7(c)(1). ("TMDLs shall be established at levels necessary to attain and maintain the applicable narrative and numerical WQS"). Indeed, the use of narrative water quality criteria has been explicitly recognized by the courts when applying "applicable standards" in the TMDL context, see Dioxin/Organochlorine Center v. Clarke, 57 F.3d 1517, 1521 & n.6, 1524 (9th Cir. 1995), as well as in the NPDES permitting context, See, e.g., American Paper Institute v. USEPA, 996 F.2d 346 (D.C. Cir. 1993). Therefore, USEPA is authorized to apply Louisiana's narrative water quality criterion for toxic pollutants in establishing these TMDLs.

While it is accurate that Louisiana has also adopted a numeric water quality criterion of 25 ng/l for the protection of aquatic life, the Coastal Bays and Gulf Water of Louisiana are listed as not meeting uses designed to protect human health. Therefore, USEPA properly chose to apply Louisiana's narrative water quality criterion for the protection of human health from the effects of toxics under these facts. USEPA reasonably decided it would not be appropriate to ignore the narrative criteria applicable to human health merely because a less protective numeric criterion for aquatic life exists. The narrative and numeric criteria for mercury are complementary; in the absence of a numeric water quality criterion explicitly calculated to protect human health, it is appropriate to use the narrative criterion when human health is at issue. Again, based on information specific to this waterbody USEPA has determined that sufficient loading capacity exists such that if point sources maintain a concentration of mercury equivalent to the state adopted criterion to protect for aquatic life the human health loading targets for the waterbody will be met.

USEPA further notes that the federal water quality standards regulations at 40 C.F.R. Part 131 requires adoption of water quality criteria that protect designated uses. Such criteria must be based on sound scientific rationale, must contain sufficient parameters to protect the designated use, and may be expressed in either narrative or numeric form. In adopting water quality criteria, States, Territories and authorized Tribes are expected to establish numerical values based on 304(a) criteria, 304(a) criteria modified to reflect site specific conditions, or other scientifically defensible methods, or establish narrative criteria where numerical criteria cannot be determined, or to supplement narrative criteria. See 40 C.F.R. Section 131.11. Narrative criteria are descriptions of the conditions of the waterbody necessary to attain and maintain its designated use, while numeric criteria are values expressed as levels, concentrations, toxicity units or other measures that quantitatively define the permissible level of protection. To adequately protect designated uses, USEPA believes water quality standards should include both narrative and numeric water quality criteria. In certain circumstances it is possible that numeric water quality criteria can be met and the designated uses still not be achieved. For example, factors such as food web structure, the concentration of dissolved organic carbon in the ambient water, and accumulations in the sediment may affect uptake of mercury into fish flesh on a site-specific basis. In these circumstances, USEPA recommends States and authorized Tribes translate the applicable narrative criteria on a site-specific basis, or if necessary adopt site-specific numeric criteria, to protect designated uses. However, ultimately, the TMDLs should be established to implement the applicable designated uses and criteria.

Finally USEPA notes that calculating a water quality target based on a state's narrative criterion is analogous to the act of deriving water quality-based permit limits from such criteria. USEPA has promulgated and successfully defended a regulation that describes three different approaches that permitting authorities can employ to interpret a state's narrative water quality criterion. See 40 CFR § 122.44(d)(1)(vi); see also American Paper Institute vs. EPA, 996 F.2d 346 (D.C. Cir. 1996) (upholding regulation as consistent with the purposes of the Clean Water Act). Two approaches are relevant here. One way is using the water quality criterion recommendations published by USEPA under CWA section 304(a). See 40 CFR § 122.44(d)(1)(vi)(B). A second way is to calculate a numeric criterion that the permitting authority demonstrates will attain and maintain applicable narrative water quality criteria and fully protect the designated use. See CFR § 122.44(d)(1)(vi)(A). Under this approach, the permitting authority may use a proposed state numeric criterion or an explicit policy or regulation interpreting its narrative water quality criterion supplemented with other relevant information, including predicted local human consumption of aquatic foods, the state's determination of an appropriate risk level, and other site-specific scientific data that may not be included in USEPA's criteria documents. See id; see also 54 Fed Reg. 23,868 - 23876 (June 2, 1989). Under this approach, the authority interpreting the state narrative is authorized to employ any information that it believes will produce a limitation that will attain and maintain the water quality criteria and fully protect the designated uses. USEPA has employed the second approach in interpreting Louisiana's narrative water quality criterion, albeit for a slightly different, although related, purpose. Because the wasteload allocations in today's TMDL ultimately will become the basis for NPDES permit limits for certain dischargers, see 40 CFR § 122.44(d)(1)(vii)(B), it is reasonable for USEPA to apply the principles of the permitting regulation in the course of developing the TMDL.

Comment No. 11

1. General--Incorporation of Other Comments.

LCA hereby adopts and incorporates by reference those comments on the Proposed TMDLs made by (a) members of LCA, (b) the Louisiana Mid-Continent Oil and Gas Association ("LMOGA"), (c) members of LMOGA, (d) members of the American Chemistry Council, and (e) the Louisiana Department of Environmental Quality ("LDEQ") to the extent such comments are not inconsistent with the comments made herein by LCA.

Response

Comment noted.

Comment No. 12-14 General--Inappropriate Use of Narrative Standard to Develop TMDLs.

Comment No. 12

a. Use of Hg Levels in King Mackerel as Basis for TMDLs. EPA is basing the need for TMDLs solely on the fact that king mackerel in the Gulf of Mexico--which range widely through the whole gulf, not just Louisiana--have an average concentration of Hg in their tissue in excess of the Food and Drug Administration ("FDA") action level. LCA submits that it may be inappropriate to base TMDLs solely on the exceedances of the FDA Hg action level in just one fish species, rather than considering an average of Hg levels in all potentially affected fish species. At a minimum, LCA submits that it is overly conservative to assume that a person would eat only one kind of fish.

Response

The State of Louisiana issued a fish advisory for king mackerel on August 4, 1997, a copy of which can be found in Appendix A of the report, for subsegments 10901, 021102, 031201, 042209, 050901, 061201, 070601, 110701, and 120806. These subsegments were included in the Consent Decree between EPA and the Sierra Club (2002) as requiring TMDLs to be established for mercury in fish tissue of king mackerel. The impairment is specifically for mercury in the fish tissue of king mackerel and it would be inappropriate to base the TMDL on data from any other fish species.

Comment No. 13

b. Louisiana's Hg Human Health Numeric Criterion. In the Draft TMDL Report--Mercury TMDLs for Coastal Bays and Gulf Waters of Louisiana, Subsegments 10901, 021102, 031201, 042209, 050901, 061201, 070601, 110701, and 120806, November 2004 (hereinafter the "Draft TMDL Report"), EPA states that Louisiana has only an aquatic protection criteria--not a human health protection criteria--for mercury in marine waters.[1] EPA states, therefore, that it may use the state narrative criterion--"no toxics in toxic amounts"--[2] to develop Hg TMDLs for Louisiana waters. EPA has selected 0.5 mg/kg Hg in fish tissue as the appropriate value to support this narrative criteria.

While the Louisiana water quality criterion for Hg is technically listed in the "aquatic protection" column of the numerical criteria chart,[3] it is, in fact, a human health criterion. This is evident by the fact that the standard is tied to the Food and Drug Administration's value for the amount of Hg that may exist in the edible portions of fish tissues. As noted in the applicable Louisiana water quality standards:

> If the four-day average concentration for total mercury exceeds . . . 0.025 ug/L in saltwater more than once in a three-year period, the edible portion of aquatic

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[1] *See,* Draft TMDL Report, Section 3.3, p. 3-2.

[2] *See,* Draft TMDL Report, Sections 3.2 and 3.3, pp. 3-1 to 3-3; and LAC 33:IX.1113.B.5.

[3] *See,* Table 1 of LAC 33:IX.1113.

> species of concern must be analyzed to determine whether the concentration of methyl mercury exceeds the FDA action level (1.0 mg/kg). If the FDA action level is exceeded the state must notify the appropriate EPA Regional Administrator, initiate a revision of its mercury criterion in its water quality standards so as to protect designated uses, and take other appropriate action such as issuance of a fish consumption advisory for the affected area.[4]

Response

The commenter has stated that their interpretation of Louisiana's adopted water quality standards is that adopted a numeric water quality criterion of 25 ng/l for the protection of aquatic life is also an applicable human health criteria. The standards require that LDEQ analyze fish tissue if the four day average concentration of the chronic water quality criteria is exceeded more than once in a three-year period to determine if the edible portion of aquatic species of concern exceeds the FDA action level of 1.0 mg/kg. EPA disagrees with this interpretation of the standards. The segments in question are listed as not meeting uses designed to protect human health due to mercury in fish tissue of king mackerel not because they have exceeded the numeric criteria of 25 ng/l. Therefore, USEPA properly chose to apply Louisiana's narrative water quality criterion for the protection of human health from the effects of toxics under these facts. USEPA reasonably decided it would not be appropriate to ignore the narrative criteria applicable to human health merely because a less protective numeric criterion for aquatic life exists. The narrative and numeric criteria for mercury are complementary; in the absence of a numeric water quality criterion explicitly calculated to protect human health, it is appropriate to use the narrative criterion when human health is at issue applicable narrative criteria on a site-specific basis, or if necessary adopt site-specific numeric criteria, to protect designated uses. However, ultimately, the TMDLs should be established to implement the applicable designated uses and criteria.

Comment No. 14

c. <u>Inappropriate Use of Narrative Criterion When Numerical Criterion Exits</u>. EPA states that TMDLs are needed because the excessive levels of Hg in king mackerel violate the "**narrative**" water quality criteria ("WQC") in LAC 33:IX.1113.B.5. However, as noted above, the Louisiana Water Quality standards actually do provide numerical criteria for Hg for the protection of human health, and therefore, EPA cannot use the narrative criteria to develop Hg TMDLs. LAC 33:IX.1113.B.5 states, in pertinent part:

> The numerical criteria (LAC 33:IX.1113.C.6) specify allowable concentrations in water for several individual toxic substances to provide protection from the toxic effects of these substances. Requirements for the protection from the toxic effects of other toxic substances not included in the numerical criteria and required under the general criteria are described in LAC 33:IX.1121.

[4] *See*, Footnote 11 to Table 1 of LAC 33:IX.1113.

LAC 33:IX.113.C.6 provides a numerical criterion for Hg for marine waters for the protection of human health. Thus, EPA must use this Louisiana numerical criterion, not the general narrative criteria for Hg, when establishing any TMDLs for Louisiana coastal waters and bays.

However, as acknowledged by EPA in the Draft TMDL Report, "there have been no known violations of the numeric ambient water quality criterion for mercury . . . ."[5] LCA thus submits that EPA's development of Hg TMDLs based solely on the supposed violation of the state's narrative "fishable" water quality standard is unjustified and should not proceed.

Response

Please see the response to comment No. 13 above.

Comment No. 15 General--Inappropriate Use of 0.5 mg/kg for Acceptable Hg Fish Tissue Concentration.

LCA opposes EPA's proposed selection of a fish tissue concentration of mercury of 0.5 mg/kg as the endpoint, or water quality target, for establishing Hg TMDLs in Louisiana.[6] While LCA agrees that the endpoint should be based on fish consumption criteria, the endpoint should be based on Louisiana's existing numerical criteria for Hg in marine waters. Thus, LCA submits that the trigger level for the concentration of mercury in fish tissue should be 1.0 mg/kg, as set forth in Footnote 11 of Table 1 of LAC 33:IX.1113, and not 0.5 mg/kg, simply because the Louisiana Department of Environmental Quality ("LDEQ") "**will consider** issuing a limited consumption advisory for children under the age of 7 and pregnant or breast feeding women when the edible fish tissue mercury concentration exceeds 0.5 mg/kg (LDEQ 2000)."[7]

As EPA correctly notes, Louisiana has issued a fish consumption advisory for king mackerel in the Gulf of Mexico based on the 1.0 mg/kg criteria.[8] However, the state has not issued advisories for fish species with tissue concentrations of Hg averaging greater than 0.5 mg/kg but less than 1.0 mg/kg. These species include blackfin tuna, cobia, and greater amberjack.

A TMDL determination is water segment specific based on the criteria imposed by the state for that specific waterbody. Since no fish advisories have been issued for the Gulf of Mexico based on Hg concentrations in fish tissue of less than 1.0 mg/kg, it is inappropriate for EPA to establish an endpoint for the concentration of mercury in fish tissue lower than that level. Thus, LCA submits that EPA's establishment of Hg TMDLs based on an endpoint of 0.5 mg/kg of mercury in fish tissue is inappropriate. At a minimum, the TMDLs should be reevaluated based on the 1.0 mg/kg standard actually used by the State of Louisiana.

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[5] Draft TMDL Report, Section 3.2, p. 3-1.

[6] *See*, Section 3.3 of the Draft TMDL Report, pp. 3-2 to 3-3.

[7] (Emphasis added.) Draft TMDL Report, Section 3.3, p. 3-2.

[8] *See*, Draft TMDL Report, Section 1, p.1-1, and Appendix A.

Response

Please see response to Comment No. 3 above.

Comment No. 16 General--Establishment of TMDLs for Subsegments Not Impaired by Hg.

LCA submits that it is inappropriate for EPA to develop Hg TMDLs for any water body subsegment which has not been listed as having been impaired by Hg. In particular, LCA questions whether EPA's development of an Hg TMDL for the Vermilion-Teche River Basin (Subsegment 061201) is appropriate.

LCA likewise submits that it is inappropriate for EPA to develop Hg TMDLs for Subsegments 110701 (Sabine River Basin) and 010901 (Atchafalya River Basin) where EPA has no data for such subsegments showing levels of Hg in fish tissue in excess of 0.5 mg/kg, much less the more appropriate endpoint of 1.0 mg/kg.[9]

Response

EPA has reviewed the information developed for these reports and has determined to not revise the existing TMDL for subsegment 061201 Vermilion-Teche River Basin.

EPA believes that it is appropriate to establish TMDLs for mercury in fish tissue for Subsegments 110701 (Sabine River Basin) and 010901 (Atchafalya River Basin). EPA is establishing TMDLs for mercury in fish tissue of king mackerel for these subsegments as per the requirements of the 2002 Consent Decree between EPA and the Sierra Club.

Comment No. 17 General--Assumption of Linear Relationship Between Hg Loadings and Hg in Fish Tissue.

EPA correctly acknowledges that a "connection must be made between the mercury concentration in fish tissue and the point source and nonpoint source loads of mercury in the environment."[10] EPA then **assumes a linear relationship between mercury loadings and fish tissue concentration** because the Everglades Mercury Cycle Model ("E-MCM") predicted a linear relationship between **atmospheric deposition** and fish tissue concentration.[11] EPA assumes, based on this model developed for the Everglades, that all reductions in point source and nonpoint source loadings will have a direct linear impact on reductions in fish tissue. This is an astounding leap. EPA does not address the validity of the E-MCM model, does not address how conditions in Louisiana coastal bays are similar to the conditions in the Everglades such that use of the conclusions of the Everglades study are valid for Louisiana coastal areas, and EPA does not address the uncertainty factors inherent in applying the conclusions of the E-MCM model to Lousiaina without even attempting to use Louisiana inputs and to run the model here. EPA needs

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[9] Draft TMDL Report, Section 4.2, p. 4-1, and Table 4.2, p. 4-4.

[10] Draft TMDL Report, Section 3.4, p. 3-3.

[11] *Id.*

to provide the basis for this model and indicate whether it has been appropriately peer-reviewed and validated, particularly for use in the Louisiana TMDLs. LCA also questions whether the model has ever been used anywhere other than the Everglades?

LCA further notes that the fish in the Everglades study that demonstrated a linear relationship was large mouth bass, a fresh water fish that does not possess the same characteristics as a king mackerel. Mercury concentration in king mackerel have been demonstrated to be more of a function of food intake and than a function of the mercury concentration in the waterbody. The fish consumption advisories around the country for mercury in king mackerel demonstrate that the Hg concentration in the fish is a function of fish length (which corresponds to age and weight of the fish). Because king mackerel have a life of approximately 20 years, the higher mercury concentration in larger fish may be caused by food chain consumption occurring a decade earlier and not necessarily the food consumption of today. EPA presents no evidence of a “direct” correlation between water quality and species that are “high” on the food chain.

LCA submits that further testing and analysis is required before any such assumption can be justified. Atmospheric deposition of air contaminants is not the same as the discharge of water-borne pollutants, which can have different effects on the receiving water bodies. Moreover, as EPA acknowledges, neither EPA nor anyone else has conducted any in-depth simulation of the fate and transport of mercury in the water column or sediment resuspension of the coastal bays and gulf waters of Louisiana.[12] Given this obvious lack of reliable information, LCA submits that EPA’s assumption of a linear relationship between mercury loadings and fish tissue concentration is unwarranted and should not serve as the basis for the establishment of Hg TMDLs in the affected Louisiana water bodies. (EPA even acknowledges problems with its assumption of such a linear relationship. *See,* Draft TMDL Report, Section 5.5.3, pp. 5-14 and 5-15.) At a minimum, EPA must provide a better explanation of the suitability of the E-MCM model as a basis for preparation of the Proposed TMDLs.

Response

USEPA concurs with the commenter that the relationship between mercury loading to a watershed and the accumulation of mercury in fish tissue is complex and highly variable and is influenced by a number of natural processes. This representation of mercury fate establishes a spatially varying relationship between point and atmospheric loadings, total mercury in soil, total mercury in water and sediment, methyl mercury in water and sediment, and mercury in fish tissue. This analysis assumes that reductions in loadings will lead to proportional mercury loading reductions in all media over time. While this seems to be relatively simple it does represent our current knowledge of mercury cycling in the environment.

Studies done around the nation indicate methylation uptake rates of available mercury can vary widely with some studies confirming a linear relationship between loading and bioaccumulation in fish tissue. Recent modeling results from pilot studies in the Everglades (EPA, 2003b) support that for the Everglades there is a linear relationship between mercury deposition and levels of mercury in fish. This relationship of fish mercury levels and deposition is almost 1:1. While it is not

[12] *See,* Draft TMDL Report, Section 5.5.3, p 5-15.

appropriate to transfer these results directly to other sites, it does provide support that this assumption is realistic and has been substantiated in at least one other location. USEPA recognizes that there is uncertainty regarding whether this relationship applies in all cases, and the Agency is working to improve the predictability of the models for mercury cycling in other systems, such as wetlands, tributary systems, and marine systems. A comprehensive data collection effort throughout the coastal watersheds as well as within appropriate reference watersheds involving water, sediment, and fish sampling in tandem would be necessary to demonstrate more specific methylation rates. However, without additional watershed specific data to demonstrate a substantial decrease in the bioavailability of mercury in water or sediment, USEPA has selected a conservative approach to calculate the estimated loading and necessary TMDL. The conservative assumption that 100% of the mercury loading is bioavailable is an implicit component of the margin of safety, which is a required element of a TMDL.

This analysis assumes that reductions in loadings will lead to proportional mercury loading reductions in all media over time. While the spatial representations and time trends predicted by the model are uncertain, the expected reduction of mercury concentrations in soil, water, sediment, and fish due to reduced loadings is sound. It should be obvious that present concentrations in fish have resulted from loadings averaged over an appropriate time (as affected by transport, transformation, and bioaccumulation processes). Further, if all loadings could be completely eliminated, the mercury concentrations in all media and fish would eventually equilibrate to very low levels, below concentrations of concern relative to human health. We assume that methylation/demethylation rates and food web structure will be unaffected by future mercury load reductions. Therefore, predicted mercury concentrations in all media at a location (given sufficient time to re-equilibrate) will be related to load reductions in a roughly linear manner. This approach used the best technology we have available for developing a TMDL for mercury.

Comment No. 18 General--Assumption of Zero Hg Point Source Loadings in Mississippi River Basin.

EPA simply assumes that all Hg loading in the Mississippi River Basin are from nonpoint sources because “it was beyond the scope of these TMDLs to differentiate point sources from nonpoint sources of mercury for a geographic area covering almost two-thirds of the continental United States.”[13] The net result is that EPA provides a zero waste load allocation for point source dischargers of Hg within the Mississippi River subsegment.[14] It will be unreasonable--not to mention patently unfair--for EPA to impose permit limitations on point source dischargers of Hg based on a zero waste load allocation for the 070601 subsegment, simply because EPA found it difficult to determine the Hg loadings from point sources into the Mississippi River Basin. LCA thus assumes that EPA has no intention of imposing Hg permit limits on such point source dischargers based on the proposed TMDLs. If LCA’s assumption is incorrect, LCA submits that the TMDLs proposed by EPA for the Mississippi River Basin coastal bays and gulf waters of Louisiana (subsegment 070601) are inappropriate and must be revised to address point source discharges of Hg.

[13] Draft TMDL Report, Section 6.1, p. 6-1.

[14] Draft TMDL Report, Section 6.5, Tables 6.6 and 6.7, p. 6-5.

Response

EPA concurs with concerns raised in the comment and acknowledges that it was not our intent to establish zero WLAs for subsegment 070601. EPA has added the following footnote to the TMDL and revised the 1 TMDL in Table ES-4 and Table 7.4 as follows:

EPA notes that the load allocation for the Mississippi River basin accounts for the mercury load from upstream sources in the basin (including point and nonpoint sources). Because of the large geographic scope of the basin and the difficulty in identifying specific sources, EPA has not allocated specific waste loads to point sources in the Mississippi River basin upstream of the TMDL area. However, EPA understands that Louisiana will issue NPDES permits for sources in the upstream area within the State's jurisdiction, and in doing so will evaluate whether the point source discharge will cause or contribute to a localized exceedance of the applicable water quality standard and determine the appropriate permit limit accordingly. Thus, the inability to identify and assign specific WLAs to sources in areas outside the basins subject to the TMDL does not mean that such sources will be unable to obtain NPDES permits.

Comment No. 19 General--Establishment of TMDLs Premature.

According to EPA, air rules already promulgated will result in a greater than 70% reduction in Hg emissions with a corresponding reduction in fish tissue mercury concentrations.[15] LCA submits that this 70% reduction in Hg air emissions, in and of itself, may be sufficient to adequately reduce the levels of Hg in fish tissue, especially if an appropriate endpoint of 1.0 mg/kg is used. Given this, LCA submits that additional study is warranted prior to the establishment of Hg TMDLs for the affected water bodies. EPA has stated publicly that when sufficient reductions can reasonably be predicted from air emission control rules, no TMDL is needed, and the waterbody may be delisted.

See http://www.cdphe.state.co.us/hm/mercury/workshop/presentations/cocca.pdf at page 18 of 21. At a minimum, no permitted dischargers should be subjected to new or revised permit limitations until the effect of these reduced Hg air emissions has been appropriately analyzed.

Response

EPA disagrees that future estimated reduction in mercury emissions expected from air rules eliminate the need to establish TMDLs or require additional requirements for point source dischargers. USEPA recognizes that it is possible that reductions in mercury emissions from air sources may, by themselves, eventually result in the attainment of water quality standards for the affected waters. However, while USEPA projects significant reductions from current or proposed regulations, for a number of TMDLs USEPA cannot be certain at this time that all reductions needed to meet the TMDLs load allocations will be achieved. One way that USEPA is accounting

[15] Draft TMDL Report, Section 7.1, p. 7-2.

for these uncertainties is by assigning cumulative wasteload allocations that assume that mercury dischargers will either maintain their effluent at or below applicable wasteload allocations for mercury or will implement feasible minimization measures (i.e., do the best they can to reduce their loadings of mercury to the affected water). USEPA is also accounting for these uncertainties through its margin of safety. In addition, these measures can conceivably yield reductions beyond those actually contemplated in the cumulative WLAs, thus providing an additional reserve load to offset equivalent reductions that ultimately may not be achieved from the air sources.

EPA does not have reasonable assurances that "more than enough" reductions will be achieved through new air rules and controls. The assumed reductions are a National average and may not adequately characterize the reductions that may or may not take place in and around these watersheds. This leads to uncertainty about whether or not more than the needed reduction will actually be attained and if sufficient assimilative capacity will be created to all point sources to remain at existing effluent quality. Also contributing to this uncertainty is that fact that the reductions provide an indicator of overall reduction to the watershed and do not account for possible localized effects of effluent containing mercury. Local characteristics such as water velocity, bed substrate, oxygen content and microbial community structure all contribute to methylation potential. Since these characteristics have not been defined for each of the dischargers in the area, there exists the potential that effluent containing mercury may cause localized exceedences of the criteria and therefore, BMPs and/or numeric limits are necessary in order to assure that the discharge does not cause and/or contribute to an exceedance of the applicable water quality standard. In conclusion, due to uncertainty in the TMDL analysis, BMPs and/or numeric limits are necessary to meet the assumptions of the TMDL and assure compliance with the water quality standards." The concentration-based water quality criterion for mercury explicitly takes into account bioconcentration of grams of mercury in fish tissue, thus reflecting both concentration and mass concerns. While it is possible that individual dischargers implementing mercury minimization measures might exceed the WLA of 12 ng/l on a case-by-case basis, the extra discharges are already reflected in the cumulative wasteload allocations of these TMDLs, which also reflect the numerous other NPDES dischargers that appear to be maintaining mercury discharges below 12 ng/l. This means that the total point source loading, in the aggregate, would be at or below the cumulative WLA.

Comment No. 20 General--Effect of Proposed TMDLs on Dischargers Outside of the Listed Subsegments.

In the Draft TMDL Report, EPA seems to indicate that dischargers outside of the listed subsegments may be affected by the Hg TMDLs if, for example, they are located in the same coastal basin as an affected subsegment. *See, e.g.*, EPA's statement in Section 7.2 of the Draft TMDL Report, page 7-3, that "LDEQ should develop a prioritization strategy for determining the need for additional permit requirements for facilities within each coastal basin." LCA submits that only dischargers within the listed subsegments as set forth in the title of the Draft TMDL Report[16] should be affected by the proposed TMDLs, absent new notice to dischargers in upstream basin subsegments and an opportunity for them to comment on the proposed TMDLs.

[16] That is, Subsegments 10901, 021102, 031201, 042209, 050901, 061201, 070601, 110701, and 120806.

Response

EPA does not concur that assertion that a new notice to dischargers in upstream basin subsegments and an opportunity for them to comment on the proposed TMDLs must be given. EPA provided adequate notice and opportunity for comment to affected stakeholders, through publication in newspapers and the federal register.

Comment No. 21 General--Effect of Proposed TMDLs on Existing TMDLs.

In 2002, EPA developed final TMDLs for the Calcasieu, Mermentau, and Vermilion-Teche systems. It is not clear whether the currently proposed Hg TMDLs are intended to supersede or modify the previously issued TMDLs. In the Draft TMDL Report, EPA states: "Where the technical information supports consistency between these {previously issued} TMDLs and this proposal, EPA intends individual allocations to be consistent among all of the mercury TMDLs."[17] What does that mean? This is not explained. Again, if EPA intends for the present TMDLs proposed in this action to have any impact on upstream dischargers, EPA must send a new notice and allow opportunity for comment.

Response

As discussed in Comment No. 8 and Comment No. 16 above, EPA has determined to not revise the TMDLs for the Calcasieu, Mermentau, and Vermilion-Teche systems.

Comment No. 22 General--Unjust Burden on Louisiana for Regional/Global Problem.

If, as EPA states, Hg contributions come from local, regional, and global sources,[18] why does Louisiana have to provide all of the Hg reductions necessary to achieve the targeted endpoint? It seems that in preparing the Proposed TMDLS, EPA has assumed that all of the Hg loadings and all of the Hg reductions affecting king mackerel in Louisiana coastal waters must come from Louisiana. Given the breath of sources for the Hg contamination, coupled with this species' movement all over the Gulf of Mexico, an assumption that all of the Hg loadings and all of the Hg reductions affecting king mackerel in Louisiana coastal waters must come from Louisiana is completely arbitrary (and a bit of a "hit and miss" approach). If, for example, another state has significant contributions of Hg, then the percentage Hg reductions in Louisiana may not be sufficient to achieve the targeted endpoint. At a minimum, EPA must justify its focus on Louisiana for the resolution of a problem which is not solely of Louisiana's making.

Response

The draft report does not require Louisiana to provide all of the mercury reduction to achieve the targeted endpoint. In Section 2 of the revised draft report EPA states that it expects that a combination of ongoing and future activities under the Clean Air Act, applicable across all states,

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[17] Draft TMDL Report, "Additional Information for the TMDL Reviewers."

[18] Draft TMDL Report, Section 5.1, p. 5-1.

will achieve reductions in air deposition of mercury that will make progress toward achievement of water quality standards.

Comment No. 23-27 Section 2 of Draft TMDL Report--Study Area Description, pp. 2-1 through 2-11.

Comment No. 23

a. EPA "elected" to use a regional rather than waterbody-specific approach for developing the TMDLs. Why are the proposed TMDLs regional and not for the whole Gulf of Mexico if other states are contributing to the problem? EPA should treat dischargers and emitters of mercury the same in all states. LCA submits that EPA may have acted arbitrarily in developing Hg TMDLs solely for the Louisiana coast.

Response

In the revised report EPA has chosen a waterbody specific approach for the TMDLs. EPA Region 6 is establishing TMDLs for the State of Louisiana in accordance with terms of the 2002 Consent Decree between EPA and the Sierra Club. The Consent Decree does not address TMDLs in other Gulf States, which EPA expects will develop their own mercury TMDLs, as appropriate.

Comment No. 24

b. Did EPA investigate king mackerel migration/lifestyle patterns? LCA could not find this within the Draft TMDL Report. LCA submits that no Hg TMDLs should be proposed based solely on Hg levels in king mackerel without adequate consideration of such migration/life style patterns. Further, it is not clear that EPA collected sufficiently representative samples as there is no QA/QC or sampling/analysis plan. It is critical that EPA collect a wide range of king mackerel from commercial and recreational fisheries, of different sizes, from different seasons of the year, and from inshore and offshore areas to ensure that the king mackerel data used herein is sufficiently representative to support these TMDLs. LCA requests that EPA provide this information.

Response

EPA based its decisions on king mackerel fish tissue data collected under a sampling plan developed by the State of Louisiana. The data is the best available information that EPA has at its disposal to develop mercury TMDLs. Because of the lack of data and information, EPA has decided to take an adaptive management approach as outlined in Section 2 of the Final Report. An adaptive management approach will allow EPA to update the TMDLs as new information and data is developed.

Comment No. 25

c. EPA failed to describe the methodology by which it defined the study area. Without a further explanation and justification for the study area, LCA cannot determine whether the area selected is appropriate. Why not a larger area of Louisiana? Why not a smaller area?

Response

The fish consumption advisory extends all along the Louisiana coast to the 3-mile limit in the Gulf of Mexico. EPA believes it is appropriate to consider both the adjacent and contributing watersheds because they are hydraulically connected to the listed segments. In addition, these areas represent a non-point source of mercury because of atmospheric deposition.

Comment No. 26

d. EPA states that it made “the decision not to attempt to estimate background levels of Hg or model Hg cycling within the Gulf of Mexico.” This appears completely arbitrary and affects the key assumptions supporting the TMDLs (i.e., that all point source loadings within the study area end up in the subsegments at issue and that either 50% or 100% of all nonpoint source loadings do so as well). As noted above, there is no attempt to simulate or otherwise do any in-depth anaysis of Hg fate/transport in affected water bodies. LCA believes that EPA has done cycling and fate/transport studies for other mercury TMDLs. EPA’s unsupported assumptions grossly overestimate the amount of bioavailable mercury (i.e., methyl mercury) available for uptake in king mackerel in the subsegments at issue.

Response

EPA acknowledges the limitations of its assumptions in its approach to the TMDLs. However, EPA believes this is a reasonable approach given the uncertainties and the fact that a TMDL is required under the court order. To address the validity of these assumptions, EPA has chosen to take an adaptive management approach to these TMDLs. This will allow EPA to update and revise the TMDLs as new information and data are developed.

Adaptive management plays a key role in the implementation process for achieving load reductions. Using a value-added bottom-up approach, TMDL development uses the best available data. Progress towards achieving load allocations are periodically assessed through phased implementation using measurable milestones. Under adaptive management, a watershed plan should not be delayed because of a lack of data and information for the “perfect solution.” The process should use an iterative approach that continues while better data are collected, results analyzed, and the watershed plan enhanced, as appropriate. Thus, implementation can focus on a cumulative reduction in loadings under a plan that is flexible enough to allow for refinement, which better reflects the current state of knowledge about the system and incorporates new and innovative techniques.

Comment No. 27

e. EPA treats the Mississippi River as a nonpoint source contribution. Why doesn’t EPA do the same with the Atchafalaya River, as portions of the flow from the Mississippi River are diverted to the Atchafalya River? (This same reasoning would apply with respect to any other water body receiving diversion flow from the Mississippi River.)

Response

The limited data and resources available to assess, model and differentiate point sources from nonpoint sources throughout the entire Mississippi River Basin precluded USEPA from considering mercury concentrations (and estimated loading) from the Mississippi River as anything but an aggregate load. In contrast, USEPA considered the Atchafalaya River Basin as a discrete coastal basin for which a pollutant source assessment and pollutant loading estimates could be conducted. Individual point source dischargers and nonpoint sources were investigated and estimated for the Atchafalaya River Basin. USEPA concurs that there are diversions from the Mississippi River to the Atchafalaya River, however by conducting a basin scale assessment of the Atchafalaya River Basin, a more accurate estimate of mercury loading can be provided.

Comment No. 28-30 Section 3 of Draft TMDL Report--Problem Identification and Endpoint Identification, pp. 3-1 through 3-3.

Comment No. 28

a. **<u>Section 3.1 Problem Definition</u>.** EPA states that king mackerel have excess Hg. However, there is no demonstrated king mackerel problem in some of the subsegments. As such, at a minimum in order to justify Hg TMDLs in such subsegments, EPA must provide more data about king mackerel living habits and patterns. Only by providing such information can EPA justify its assumption that king mackerel are influenced by all of these subsegments even if there is no demonstrated problem within a subsegment.

EPA did not describe its fish testing protocol, and LCA has no way of knowing whether the Hg levels found, as reflected in the Draft TMDL Report, were solely from the edible portions of tested fish, nor whether the samples collected are representative. This is critical, as only the Hg levels in the edible portions of the tested fish are relevant. To the extent the proposed TMDLs were based on Hg levels in the non-edible portions of the tested fish, such TMDLs are invalid.

Response

As previously mentioned, EPA is required by the Consent Decree between EPA and Sierra Club to develop TMDLs for mercury in fish tissue in king mackerel for all of the subsegments as provided in the 1998 court ordered list of impaired waters (303(d) list) for the State of Louisiana. The data that was used to develop the TMDLs was obtained from the State of Louisiana. The state collected the samples of edible fish tissue following a sampling plan developed by LDEQ. It should also be noted that the State has made no recommendations to remove any such waters on subsequent lists.

Comment No. 29

b. **<u>Section 3.2 LDEQ Surface Water Quality Standards</u>.** EPA acknowledges that there have been “no known violations of the numeric ambient water quality criterion for mercury.” EPA erroneously states that even if this is so, there is a violation of the narrative standard due to the fish consumption advisory. However, as noted above, under LAC

33:IX.1113.B, the narrative standard does not apply when there is a more specific numeric standard.

Response

Please see responses to Comment No. 10 and 13 above.

Comment No. 30

c. **<u>Section 3.3 Endpoint Identification</u>.** EPA states that "an endpoint for mercury can be established as a water numeric criterion, a sediment concentration, or a fish tissue value." This is not correct; the endpoint must match Louisiana's approved WQC for mercury. In this case, Louisiana's standard does use water numeric criterion coupled with fish tissue values, but the value stated in the Louisiana rule is 1.0 mg/kg of Hg in the edible portion of fish tissue. *See*, Comment 3 above.

EPA states that the narrative criteria is appropriate because Louisiana does not explicitly use a mercury WQC for human health; i.e., that the Louisiana WQC is for aquatic protection. As noted in Comments 2.b and c above, this makes no sense when the WQC ties into the FDA action level, which is specifically designed as a human health protection value.

EPA states that an endpoint of 0.5 mg/kg in fish tissue has been used in previous Hg TMDLs in Louisiana but cites only "(USEPA 2003)," not a Federal Register citation. In the references to the Draft TMDL Report, this citation is to the TMDL for Little River and Catahoula Lake. The fact that EPA erroneously used 0.5 mg/kg as an endpoint for Hg in fish tissue before does not make its currently proposed usage correct. LCA has no members on Little River and Catahoula Lake and did not have opportunity to comment with respect to this previously issued TMDL.

EPA states that essentially all Hg in fish is methylmercury, so EPA has made that assumption. LCA questions whether EPA has specific data on king mackerel; i.e., does EPA have specific scientific support for the proposition that all mercury in **king mackerel** is methylmercury?

Response

The appropriateness of using 0.5 mg/kg in fish tissue as target endpoint has been addressed in Comment 3 above.

In response to the question of whether all mercury in fish is methylmercury, EPA has made this assumption based on the fact that the organic form mercury, methylmercury is the only form that can be readily bioaccumulated by fish. This is a valid assumption in that, almost regardless of the source of data, methymercury constitutes > 90% of total mercury in fish tissue.

Comment No. 31-33 Section 4 of Draft TMDL Report-Data Assessment, pp. 4-1 through 4-7.

Comment No. 31

a. **<u>Section 4.2 Fish Tissue Data</u>.** LCA notes that when looking at all fish tested, the average level of Hg in fish tissue is actually below 0.5 mg/kg. Given this, LCA questions whether EPA acted appropriately in basing the proposed Hg TMDLs on a single species--king mackerel--particularly where that species is highly mobile and ranges to other states.

Response

See response to Comment No. 3 above.

Comment No. 32

b. <u>Section 4.3 Sediment Data</u>. It is not clear how EPA used the sediment data from "adjacent and contributing watersheds." LCA requests that EPA explain how EPA used this data to develop the proposed Hg TMDLs.

Response

The Hg sediment data in Table 5.4 was averaged (excluding the Mississippi River sediment data) resulting in an overall Hg in sediment concentration of 0.11 mg/kg. This average sediment concentration was then multiplied by the TSS load predicted by the PLOAD model times the appropriate conversion factors to give the particulate Hg load for each subsegment in the study area.

Comment No. 33

c. <u>Section 4.4 Atmospheric Deposition Data</u>. LCA asks that EPA justify its use of weekly atmospheric deposition data. How did EPA average the data? Did EPA use a strict numerical average or did EPA appropriately provide statistical adjustments to the average to account for the fact that only one sample per week was taken?

LCA questions whether the use of data from only four air monitoring stations is enough to make a good estimate for the REMSAD model used in the Draft TMDL Report. Should data from air monitoring stations in Texas or Mississippi also have been included?

Response

USEPA used the Mercury Deposition Network (MDN) data only as a comparison to check the assumptions of the REMSAD model. That is, the MDN data was not used as an input to the REMSAD model. While the REMSAD data varied somewhat from the actual MDN data, USEPA relied on the REMSAD data to determine these TMDLs because it was the same order of magnitude as the MDN data and a good estimate based on the complexities of mercury deposition modeling.

Comment No. 34-37 Section 5 of Draft TMDL Report--Identification of Pollution Sources, pp. 5-1 through 5-11.

Comment No. 34

a. <u>Section 5.1 Mercury Cycle</u>. LCA notes that methyl mercury, not mercury, is the problem. Thus, not all mercury loadings will transfer into a linear relationship with fish tissue levels. There is a relationship only where there is methylation. Again, a careful comparison of the exact conditions in the Everglades study to the conditions in each subsegment at issue in Louisiana would be necessary to support this conclusion. LCA submits that EPA also needs to direct more attention to whether there are means to control/reduce methylation, not simply reduce the loadings of mercury.

Response

Please see response to Comment No. 17 above.

Comment No. 35

b. **<u>Section 5.2 Methylmercury Formation and Destruction.</u>** EPA states that high levels of dissolved oxygen promote methylation, citing one EPA study in 1995. However, EPA states without citation that high levels of dissolved organic carbon in surface waters and pore waters are a characteristic of wetlands **and** that with "wetlands comprising 34 percent of the land use in the adjacent coastal and contributing watersheds of the study area, methylation of mercury is likely occurring." LCA submits that fish tissue levels in those adjacent and contributing watersheds would be a much better measure of whether methylation is actually occurring. Thus, LCA submits that EPA should investigate the fish tissue levels in adjacent coastal and contributing watersheds before drawing its afore-mentioned conclusion, especially if the dischargers in such areas will be affected by the proposed Hg TMDLs (e.g., through Hg permit limits or requirements).

Response

EPA agrees that investigating the fish tissue levels in adjacent coastal and contributing watersheds would be beneficial. However, given the time constraints placed on EPA by the Consent Decree, it was necessary that EPA use existing data. As mentioned in the TMDL, EPA is taking an adaptive management approach to these TMDLs and may revise them as new information and data become available.

Comment No. 36

c. **<u>5.3 Sources of Mercury Contamination</u>.** EPA acknowledges that a large percentage of total mercury in river systems is transported in particulate phase as surface bound inorganic mercury, particularly where suspended particle concentrations are elevated. Thus, such total mercury should not be bioavailable. This provides additional support for the need for an appropriate fate/transport analysis of Hg discharges into the environment. EPA simply cannot assume all total mercury discharges will methylate. At a minimum, EPA should do a test or pilot study on use of the E-MCM model on one of the subsegments in question prior to finalizing the proposed Hg TMDLs.

Response

EPA concurs that fate/transport analysis of mercury discharges into the environment would be beneficial. However, as cited above this information is not currently available. As additional information becomes available it ma be possible to revise the TMDLs.

Comment No. 37

d. __**Section 5.4 Point Sources – Wastewater Discharges**__**.** In determining the mercury loadings, EPA did not consider discharges authorized under NPDES/LPDES general permits such as the coastal oil & gas permits, stormwater permits, etc. Likewise, EPA did not consider potential discharges from the huge number of camps in the affected areas (that may not be authorized under any general permits). LCA submits that without consideration of the loadings from these dischargers, EPA has not adequately determined the true point source Hg loadings in the affected areas.

While EPA used two studies on municipal waste water treatment plants, clean techniques were only used for certain in one of those studies. LCA submits that EPA should use the 15 ng/L from the Arkansas study as it did use clean techniques. Can EPA provide any rationale why the results from the Arkansas study would be unsuitable for Louisiana?

What 6 states were involved in the Association of Metropolitan Sewerage Agencies study? Has EPA established that the conditions in these 6 states are same as in Louisiana? Why didn't EPA sample Louisiana municipal wastewater treatment plants in Louisiana in the study area to get more accurate estimates directly applicable in Louisiana? These inputs are a major component of the Draft TMDL Report and should be based on Louisiana data. As it stands, LCA submits that EPA is essentially guessing that the affected Louisiana facilities each meet an average of 12 ng/L of mercury in their wastewater discharges.

As noted in Table 5.1, Footnote 5, for some NPDES point sources, EPA used the daily maximum Hg permit limit times 365 to determine Hg loading. This is too high. EPA should apply a factor to determine the average, not the maximum, even if there is only a permit limit for a maximum. This was done for Westlake Petrochemicals (2 facilities), Basell USA, and Calcasieu Refining--all of which are within the Calcasieu River Basin. These 3 facilities account for about 5,000 g/yr in Hg loading, or about 15% of the total Hg loading for Calcasieu River Basin NPDES point source dischargers. Thus, this issue is not insignificant. It should be a simple matter to readjust the values provided in the table to reflect a realistic estimate based on average flows.

EPA used only point sources with NPDES Hg limits and municipal wastewater treatment plants to determine Hg point source loadings. LCA questions whether EPA should also have included other potential point source discharges of Hg (e.g., laboratories, nonmunicipal sewerage treatment plants, dischargers subject to general permits, etc.). Would this have a significant impact on EPA's estimated point source Hg loadings?

Response

EPA and LDEQ have considerable experience in issuing permits to individual dischargers in Louisiana. Based on that experience EPA and LDEQ have determined that only certain categories of dischargers have the potential to discharge mercury over the target concentration of 12 ng/l. As stated in the revised draft report EPA expects LDEQ to use this information to screen dischargers with more than 12 ng/l for possible additional permit requirements such as a mercury minimization plan.

EPA has chosen to set the target concentration for mercury at 12 ng/l. This is based on data developed by facilities located throughout the United States. EPA would have preferred to establish the target concentration based on actual data for discharges in Louisiana, however data generated by the implementation of these TMDLs and other site specific information developed by individual dischargers may be used to revise these TMDLs.

Comment No. 38-40 e. 5.5 Nonpoint Sources of Mercury Contamination.

Comment No. 38

i. <u>5.5.1 Mississippi River Loading</u>.

EPA assumes that the Hg concentration of the total suspended solids is in equilibrium with the river bottom sediments. LCA questions whether this is a valid assumption. What is EPA's justification for this?

LCA submits that any Hg data used by EPA to determine Mississippi River loading of Hg should have been gathered by clean techniques. Was this the case?

Response

As previously discussed EPA was required to make certain assumptions due to data available and the time constraints placed on the agency by the Consent Decree.

EPA notes that these assumptions and the impact that they have on the TMDLs may be revised upon the development of new information or data as part of the adaptive management approach.

Comment No. 39

ii. <u>5.5.2 Air Emissions</u>.

Why did EPA use the REMSAD model rather than CAM-X?

Has REMSAD Version 7.0 (used by EPA) been validated? Were problems encountered with earlier versions of the model corrected in this Version 7?

EPA used a grid resolution of 4 km, which LCA understand is a much finer resolution than that for which model was designed. Is REMSAD Version 7.0 actually capable of getting this resolution? What was the basis for EPA's use of a grid resolution of 4 km? Why wasn't 20 km used? Has EPA previously applied the model in this fashion (i.e., using a 4 km resolution)?

EPA notes that the REMSAD model was "enhanced" for this TMDL. How was it enhanced and have those enhancements been subject to peer review?

Why did EPA use 1998 meteorological data instead of data corresponding to the 2001 TRI and TEDI data? That is, why wasn't 2001 meteorological data used?

EPA indicates that nearly all of the wet deposition of Hg in Louisiana is from background--which LCA understands to mean global sources and sources outside of Louisiana. According to EPA, "tagged" sources contributed a greater percentage of the dry deposition at some basins, but EPA does not discuss how this impacts any conclusions about the TMDLs or potential control measures. For example, the tagged sources in Calcasieu [Nelson Steam and PPG] account for only 3% of the dry deposition in the coastal area and 9% in the near coastal area, whereas boundary conditions account for 85% and 80% in those areas, respectively. However, in Lake Maurepas, tagged sources account for 66% of the coastal deposition and 43% of the near coastal area dry deposition. Overall, it seems that the primary sources for wet and dry deposition are from global or out-of-state sources of Hg. Given this, do the tagged sources really justify the imposition of Hg TMDLs?

Response

The commenter questioned why EPA used the REMSAD model instead of CAM-X. The REMSAD model has been developed, peer reviewed, and applied by EPA in recent years to estimate mercury deposition and has demonstrated good performance when comparing wet deposition results to MDN measurements.

The commenter has asked if the REMSAD Version 7.0 (used by EPA) been validated and if problems encountered with earlier versions of the model corrected in this Version. As noted above, REMSAD has undergone external peer review. Version 7 addresses updates and modifications that were raised during that review.

EPA used a grid resolution of 4 km, which a much finer resolution than that for which model was designed. The commenter questions if REMSAD Version 7.0 actually capable of getting this resolution as well as the basis for EPA's use of a grid resolution of 4 km instead of 20 km and if EPA has previously applied the model in this fashion (i.e., using a 4 km resolution). The formulation of REMSAD is derived from the UAM-V photochemical model which routinely uses resolutions as fine as 4 km. There is nothing in the formulation of REMSAD that limits it to a coarser resolution than UAM-V. REMSAD has been applied at 12 km and 4 km resolution in previous applications for EPA.

The commenter has asked how the REMSAD model was "enhanced" for this TMDL and if those enhancements been subject to peer review. Capabilities were added in recent applications to facilitate tracking deposition to land and water surfaces separately, due to the importance and implications of directly deposited mercury to a waterbody versus that indierctly deposited to the land surfaces that drain into a given waterbody. REMSAD, and gridded models in general, routinely process land-type input data and related data in order to determine appropriate dry deposition velocities. The "enhancement" referred to thus does not constitute a new physical or chemical treatment, but is more akin to a post-processing accounting excercise of existing capabilities that have already undergone peer review.

The commenter questioned the use of 1998 meteorological data instead of data corresponding to the 2001 TRI and TEDI data. When the project was begun, meteorological data from 1996 and 1998 were available. 1998 was chosen as it most closely corresponded to the timeframe of the emissions data.

The commenter questions if the tagged sources really justify the imposition of Hg TMDLs. As stated in previous comments the TMDLs being established are due to mercury in fish tissue of king mackerel. The information on tagged sources is provided as additional information to the public on local sources of mercury in the environment.

Comment No. 40

iii. <u>5.5.3 Watershed Mercury Loading</u>.

EPA states that it had too limited data to conduct detailed hydrodynamic modeling. LCA submits that EPA should obtain the required data and conduct the necessary modeling before imposing Hg TMDLs.

Why does EPA use options for calculating/estimating Hg nonpoint source loading which are not the same as those used by EPA to calculate/estimate Hg point source loading? Would Hg from point sources behave differently? If so, what is EPA’s basis for drawing such conclusion?

LCA submits that Option 1 for estimating Hg nonpoint source loading does not comport with reality, because under this option, EPA assumes that 100% of the Hg from nonpoint sources reaches the coastal areas at issue and that no Hg is left behind. To the extent that there is any Hg in aquatic species or sediment in upstream areas, this assumption cannot be correct. Moreover, the fact that dredging is periodically required in these upstream areas is proof enough that sediment--and any Hg adhering to it--settles out upstream.

LCA also questions the scientific basis for Option 2, which assumes that 50% of the rainfall runoff load and 50% of the sediment load from **contributing** watersheds and 100% of the rainfall runoff and sediment load from **adjacent** watersheds reaches the coastal areas at issue. EPA does not discuss how the fact that a watershed is contributing or adjacent affects either of the loadings from rainfall runoff or sediment. EPA must better articulate the basis for the estimates provided via Options 1 and 2 and explain why contributing watersheds and adjacent watersheds should be treated differently from a scientific viewpoint.

Response

EPA acknowledges that it has used conservative estimates to determine the point and nonpoint source loadings. EPA has chosen to use the 100% loading option to estimate loadings to the watersheds. This is the most conservative and defensible approach to estimating the loadings to the subsegments. As previously discussed EPA was required to make certain assumptions due to data available and the time constraints placed on the agency by the Consent Decree.

EPA notes that these assumptions and the impact that they have on the TMDLs may be revised upon the development of new information or data as part of the adaptive management approach.

Comment No. 41

iv. 5.5.4 Miscellaneous Mercury Sources.

EPA did not include loadings of mercury from discharges from offshore platforms because the studies on sediments in these areas indicate the Hg is not methylating. Why wasn't this same rationale used to reduce the estimates of loadings from other sources where the sediment conditions are similar? Do any coastal permits have Hg monitoring requirements? Could a ratio be developed?

Response

The information reviewed by EPA indicates that discharges from offshore platforms indicate that mercury is not methylating. EPA did not extrapolate this information to other dischargers because EPA does not have the information available at this time to determine of the conditions are similar. Also the discharges in question are for the discharge of drilling muds and cuttings and its doubtful that there would be similar types of discharges onshore.

Comment No. 42-46 Section 6 of Draft TMDL Report--TMDL Calculations, pp. 6-1 through 6-6.

Comment No. 42

a. 6.2 Load Reduction Goal.

As noted above, LCA submits that in establishing any Hg TMDLs for the affected subsegments, EPA should use average concentrations of Hg in all affected fish species, not just king mackerel. *See*, Comment 2.a above.

As noted above, LCA submits that in establishing any Hg TMDLs for the affected subsegments, EPA should use an endpoint of 1.0 mg/kg of Hg in fish tissue, not 0.5 mg/kg. *See*, Comment 3 above.

Response

See the response to Comment No. 3 above.

Comment No. 43

b. 6.3 TMDL Determination.

LCA submits that as EPA appears to be establishing a single Hg TMDL for all of Louisiana's coastal bays and gulf waters, the Hg percentage of reduction ultimately deemed necessary should be obtainable from any one or more of the affected basins. That is, under the proposed TMDLs, the 57% Hg reduction should not be limited to a 57% reduction within each basin, as long the there is a 57% Hg reduction in all basins taken as a whole. This would allow LDEQ flexibility in establishing Hg point source limits; e.g., where the Hg discharges from a facility in Basin A are reduced 100%, the Hg discharges from a facility in Basin B may only need to be reduced 33%.

Response

The final TMDL report demonstrates that approximately 99 percent of the mercury loading in the subsegments in question is coming from air deposition and that most of the mercury that is being deposited by air deposition is coming from sources outside of Louisiana. Therefore, EPA does not expect that one basin will have a reduction that is significantly greater than any other basin and that this is a moot issue.

Comment No. 44

c. 6.4 Margin of Safety.

LCA supports EPA's position that there should be no explicit margin of safety ("MOS") for the proposed Hg TMDLs because the over-conservatism used in the development of such TMDLs provides an implicit MOS.

LCA submits that EPA should list as another factor of over-conservatism that the end point is only for one species of fish and it is highly unlikely that humans would consume just this one fish species.

Response

EPA does not concur in that some individuals consume much greater than the average consumption rate assumed by the state. Due the size of this fish, a very high risk exists to those individuals consuming this species alone. This high risk of mercury to consumers, particularly children and women of child bearing age, warrants EPA taking a conservative approach.

Comment No. 45

d. 6.5 TMDL.

EPA indicates that trading within a subsegment will be allowed, which LCA supports. However, LCA submits that EPA should also allow trading between basins. *See*, Comment 15.b above. As EPA notes, it is the total Hg loading into Louisiana coastal bays and gulf waters that matters, not the individual contribution of Hg loading in any one basin.

Does EPA intend to restrict trading of Hg loadings between point source and nonpoint source dischargers? This cannot be correct, and LCA requests that EPA clearly state that such trading will be allowed. As long as the mercury loadings to the affected waterbodies are reduced, EPA should not restrict the manner in which such reductions can occur.

LCA objects to EPA's proposed establishment of waste load allocations ("WLAs") and load allocations ("LAs"). This is not EPA's function. While EPA can establish Hg TMDLs, LDEQ, which has been delegated the authority to administer the NPDES program in Louisiana, is the agency with authority to establish WLAs and LAs in Louisiana. Neither the consent decree nor the 1999 court order authorized EPA to establish WLAs and LAs, and EPA simply should not attempt to usurp the state's authority in this fashion. If the state can achieve whatever percentage reduction of Hg loadings is ultimately required by the final TMDLs, it is no business of EPA how such reductions are achieved (i.e., through reductions of point source or nonpoint source discharges of Hg). Morever, in proposing the WLAs and LAs, EPA appears to be requiring proportional reductions of Hg loadings within each basin based on the relative contributions of point sources and nonpoint sources. Such a proportional reduction is not required; what matters is the reduction of the total Hg loadings to the affected waterbodies, however achieved. (For example, if the required reductions can be achieved through the control of mercury air emissions, there is no need to limit point source discharges of Hg.) For all of these reasons, LCA strenuously objects to the proposed WLAs and LAs in Tables 6.6 and 6.7 of the Draft TMDL Report.[19]

Response

The issue of allowing trading between point sources and between basins need not be resolved at this time. USEPA generally does not support trading of persistent bioacculmulative toxic pollutants (PBTs). The 2003 policy does indicate that USEPA would consider supporting a limited number of pilot projects to gauge the potential for trading to reduce PBT loadings in situations where the predominant PBT loading does not come from point sources, trading activity does not cause an exceedence of an aquatic life or human health criterion, and trading results in a substantial net reduction of the PBT. LDEQ may as it implements these TMDLs determine that the trading being requested is appropriate. EPA notes that it has estimated that a major portion of the load for the subsegments covered by these TMDLs is coming from nonpoint sources/air deposition from sources outside of Louisiana and that LDEQ may not be able to demonstrate that trades outside of its area of legal jurisdiction are consistent with the TMDL calculations.

The comment that EPA lacks the authority to establish Waste Load Allocations (WLAs) and Load Allocations (LA) in Louisiana is incorrect. The TMDL regulations found at 40 CFR 130.7 require that TMDLs include both WLAs and LAs and therefore EPA has included them in these TMDLs.

Comment No. 46

e. <u>6.6 Seasonal Variation</u>.

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[19] See, e.g., **http://www.e3ventures.com/mercury/PDF/coccaP1.pdf,** where at least one EPA representative acknowledges that waters can be delisted or taken off a TMDL list if reductions in atmospheric deposition will be sufficient to meet water quality standards without controls on point sources.

What is the support for EPA's statement that the hypoxia in the Gulf of Mexico is conducive to methylation? If this is actually the case, should EPA account for reductions in mercury methylation expected from efforts to reduce hypoxia in the Gulf of Mexico?

Response

While efforts are underway to reduce nutrient loads to the Gulf, any reductions will occur over many years. It is preliminary to make to account for reductions in mercury methylation expected from efforts to reduce hypoxia in the Gulf of Mexico and is beyond the scope of this study.

Comment No. 47-49 Section 7 of Draft TMDL Report--Ongoing and Future Pollutant Loading Reductions, pp. 7-1 through 7-5.

Comment No. 47

a. <u>7.1 Air and Waste</u>.

According to EPA, Hg emissions are expected to be reduced by 20% in Louisiana because of the activities of coal-fired power plants under the Clear Skies Initiative. How much reduction will occur out of state? Given that boundary conditions [global and out-of-state] were the primary contributors of both wet and dry atmospheric deposition of Hg according to the REMSAD model report, LCA submits that EPA must account for expected out-of-state reductions in Hg emissions in preparing the Hg TMDLs.

As one of the prime contributors was the BFI Medical Incinerator near New Orleans, LCA submits that EPA should account for the projected impact of the medical waste incinerator rule on this source and other state medical waste incinerators. The anticipated in-state reduction of Hg emissions should be considered by EPA in preparing the Hg TMDLs.

Given an expected 70% reduction in nonpoint source air emissions of Hg, LCA again questions whether EPA is justified in adopting any Hg TMDLs. At a minimum, the expected 70% reduction of Hg air emissions should provide reasonable assurance of reduction in Hg loadings into affected waterbodies without the need for any point source reductions of Hg loadings.

Response

EPA has relied on expected nationwide reductions under the Clean Air Act and is not able to conduct a detailed analysis for this TMDL regarding what the reductions would be in Louisiana. In addition, there is uncertainty regarding what the actual percent reductions will be once the controls are implemented. However, as contemplated by Section 303(d)(1)(C), the TMDL quantifies the water quality problem facing coastal Louisiana and identifies the loadings of mercury that would need to be reduced in order for the watersheds to achieve applicable standards for mercury.

Although EPA expects significant reductions in mercury from Clean Air Act Initiatives, EPA is still required by the Consent Decree to develop TMDLs for the subsegments in this report. EPA is also interested in confirming its assumptions that point source dischargers are not significant contributors of mercury into the environment.

Comment No. 48

b. <u>7.2 Municipal and Industrial Dischargers</u>.

LCA submits that it is a state (LDEQ) function--not an EPA function--to (i) prioritize among basins, (ii) determine the appropriate allocations between basins, (iii) determine appropriate WLAs and LAs, and (iv) develop appropriate permit terms and limitations. EPA should thus delete all of Section 7.2 of the Draft TMDL Report, which is not needed in a TMDL.

Response

EPA concurs that LDEQ is responsible for determining when it will address an individual permit application. EPA is only suggesting that LDEQ take the above mentioned items into consideration as determined by its permitting priorities.

Comment No. 49

c. <u>7.3 Pollution Prevention and 7.4 LDEQ Statewide Mercury Program</u>.

While LCA does not disagree with the statements made by EPA in Sections 7.3 and 7.4 of the Draft TMDL Report, LCA submits that these sections are superfluous and not appropriate to a TMDL, as they are within the jurisdiction of the state.

Response

Comment acknowledged. These sections have been included for the public's benefit and knowledge.

3. Utility Water Action Group (UWAG)

Comment No. 50

Although the revised report contains a more complicated expression of the wasteload allocation (*i.e.*, individual loads for POTWs, gross "unassigned" loads for larger industrial point sources, and an apparent exemption for smaller industrial point sources), the report is inconsistent about the impact of the wasteload allocation on point sources (compare ES-4, ES-5, 7-4 and 8-3). These inconsistencies leave open the possibility that dischargers without sources of mercury in their operations nonetheless will be subject to new, more onerous permit requirements under 40 CFR § 122.44(d)(1)(vii)(B). Such a result would be untenable, especially in the context of a ubiquitous background pollutant like mercury.

Given these complexities and uncertainties, not to mention the jurisdictional limitation EPA and states face in their attempt to deal with a multi-media issue like mercury within the confines of a statute focusing exclusively on water, the TMDL process seems ill-suited for effectively managing mercury in the nation's waterbodies. To the extent that EPA and states continue to believe that the TMDL process is appropriate, however, they need to proceed in a flexible and iterative manner that ensures: (a) adequate and appropriate information will be developed and analyzed *before* significant regulatory decisions are made; and (b) only those point sources that increase mercury loading from their operations are targeted for regulation.

Response

EPA agrees that the development of TMDLs for multi-media implementation is difficult. However, EPA is required by the Consent Decree to establish mercury TMDLs for the subsegments in question. EPA does not agree that there is an inconsistency between sections 7-4 and 8-3. Both sections refer to actions that EPA expects LDEQ to take to implement these TMDLs. Only those permittees that currently have a mercury limitation in their permit or those that have demonstrated by sample data to be discharging above the target concentration of 12 ng/l will be impacted by these TMDLs. We are aware that there will be issues that arise during the permitting process that were not considered during the development of the TMDLs, however EPA believes that these TMDLs allow LDEQ the flexibility to address any unforeseen issues.

Comment No. 51 Reliance on Migratory Fish Tissue Data Collected Outside of the Affected Segments

UWAG has concerns about the fish tissue data used by EPA to develop the TMDL. Not only are those data from migratory fish (king mackerel), they also were collected, with limited exception, from sites <u>outside</u> of the affected segments. UWAG fails to see how such data can legitimately be used to predict the assimilative capacity of the affected segments or justify loading reductions from affected sources, since the fish could have ingested mercury (and, in any event, were sampled) in a completely different water many miles, states and even countries away. UWAG believes that EPA's reliance on such data in this proceeding raises significant legal, technical and policy concerns. To address those concerns, EPA should postpone further action on the TMDL until adequate, local non-migratory fish tissue data are available.

Response

EPA is aware that the data used to develop the TMDL is from sites outside the affected segments. As has been previously discussed, EPA is relying on the best available data provided by the State of Louisiana to develop these TMDLs. EPA contends that its approach should have an effect on mercury loading, and therefore, bioaccumulation. EPA has also stated its intention to use an adaptive management approach, which may allow these TMDLs to be updated when new data or information is made available.

Comment No. 52 Requirements for Point Sources

The Draft TMDL contains aggregate wasteload allocations expressed as annual mass caps for each coastal segment. Although EPA assumes that each point source will discharge mercury at concentrations of 12 ng/L or less, this assumption is not embodied in EPA's aggregate wasteload allocations. In other words, EPA did not calculate an individual loading for each point source based on assumed discharge concentrations and then aggregate those loadings. To the contrary, EPA listed a substantial majority of point sources as having zero loading of mercury (*see* Appendix C of the Draft TMDL).

To avoid confusion during the implementation process, EPA should clarify that the TMDL only expresses aggregate wasteload allocations. Individual wasteload allocations and, in turn, individual permit requirements, cannot be determined unless and until the state demonstrates, as part of TMDL implementation, that the average net mercury level in a point source's discharge in fact exceeds 12 ng/L.

UWAG believes that EPA properly left to the state the authority to choose among various TMDL implementation options. Those options should include:

(a) certification that there are no operations that could reasonably be expected to increase mercury loading in the receiving water (thus obviating the need for monitoring requirements or other permit conditions for point sources that do not contribute to the mercury load or that do so only as a pass-through pollutant or in storm water runoff);

(b) in the absence of such a certification, monitoring to demonstrate that the average net mercury level in a source's discharge does not exceed 12 ng/L; and

(c) if the average net mercury level in fact exceeds 12 ng/L, then a mercury minimization plan may be an appropriate condition, and certainly would be necessary before the state considered numeric limits.

Response

The waste load allocations have been revised as discussed in Comment No. 37 above. EPA concurs that LDEQ has a number of options available to implement the final TMDLs and that the TMDLs may be revised as new information and data is made available

4. City of Lafayette

Comment No. 53 Implementation of Mercury TMDLs and Wasteload Allocations (WLA's)

There appears to be substantial internal contradiction within the Draft Report with regard to the discretion available to the State of Louisiana in its implementation of TMDLs and WLAs. As discussed below, EPA should make clear consistently throughout the Draft Report that the State has considerable discretion in determining how to implement the Hg TMDL and WLA program, including the development of the data necessary to support sound implementation decisions.

Some parts of the Draft Report include language which proposes implementation of TMDLs and WLAs by means which are both premature and more stringent than necessary to meet the applicable narrative standard or any other applicable standards. In addition, these proposed implementation methods are presented in a way which suggests that the State of Louisiana has less discretion than it in fact has under applicable federal law as to how it may implement the mercury TMDLs and WLAs. Other parts of the Draft Report appear to indicate that the State has considerable flexibility and discretion in determining which Hg discharge levels may require Hg minimization or other control measures and how, whether, and when WLAs should be satisfied. These parts of the Draft Report strongly suggest that such State discretion is particularly warranted given the lack of technical data needed to determine scientifically sound TMDLs and WLAs.

For the reasons discussed below, the Draft Report should make clear that Hg minimization or other control requirements are not triggered for a particular source when any clean monitoring simply detects Hg in effluent and are not automatically triggered even when such monitoring detects Hg at levels above the level assumed in determining the WLA**.** Moreover, the Draft Report should clarify and emphasize that the State of Louisiana has considerable discretion in determining when and how the assigned WLAs are to be implemented, particularly given the significant lack of monitoring data and incomplete site specific information about many point sources of Hg.

Response

EPA does not believe that there is an internal contradiction within the report with regard to the discretion granted LDEQ to implement the TMDLs. Please see the response to Comment No. 50 above. The measures that EPA expects that LDEQ will take to implement the TMDLS found in Section 7.4 of the report have been discussed between both agencies.

Comment No. 54 EPA Should Make Clear that the State Is Not Required Under the TMDL Requirements to Prescribe Mercury Minimization Measures or Effluent Limits Whenever Mercury Is Detected in Effluent from Larger Sanitary Waste Water Treatment Plants and Other Point Sources.

The Draft Report states that if Sanitary Waste Water Treatment Plants (WWTPs) with discharges greater than 100,000 gpd detect mercury in their effluent after using clean techniques, those facilities "will be required to develop a mercury minimization plan for their facility and all sources discharging" into the treatment plant. The Draft Report specifies similar requirements for non-sanitary point sources that discharge more than 100,000 gpd. (Draft Report, p. 7-4). Read literally, this language appears to require that if *any* Hg is detected in the effluent from any of these plants, using the highly sensitive method 1631, then the plant must undertake Hg minimization measures. Federal law does not mandate such a requirement, and EPA should not impose it on the State. EPA has no authority to impose such minimization measures under the TMDL provisions until it has been established, at very least, that effluent from a particular Sanitary WWTP or other point source would result in an exceedance of the WLA (and in this particular case, EPA acknowledges the "uncertainty in the TMDL [and by default the WLA] analysis" (*Id*., p. 8-3) which would result in implementation of costly minimization measures not supported by relevant site specific data). 40 C.F.R. 122.44(d)(1)(vii)(B) authorizes the permitting authority to establish effluent limits to protect a narrative water quality criterion that are consistent with the assumptions and requirements of any available WLA for a particular discharge. It does not authorize EPA to require a State permitting authority to establish a more stringent limit. Moreover, as discussed below, the Draft Report contradicts itself in a different section by apparently reaching just the opposite conclusion and also suggesting that Hg minimization may not even be necessary where effluent levels exceed 12 ng/L, the level upon which the WLAs in the Draft Report are based. Accordingly, EPA should make clear in the final TMDL Report that the State of Louisiana is not required under Federal law to establish any type of limit or control measure designed to reduce a Sanitary WWTP's or other point source facility's mercury levels in the effluent simply because Hg has been detected in the facility's effluent.

Response

The commenter is correct that LDEQ is not required by the TMDL to prescribe Mercury Minimization Measures or effluent limits whenever mercury is detected in effluent from larger sanitary waste water treatment plants (SWWTPs). EPA expects that LDEQ will only consider additional requirements such as the ones mentioned for those facilities whose effluent is above 12 ng/l mercury and has revised Section 7.4 accordingly. LDEQ is required to demonstrate that the permits that it issues to facilities covered by these TMDLs are consistent with the assumptions and requirements of the WLAs, EPA has only suggested possible mechanisms that LDEQ can use to demonstrate that the permits are consistent with the TMDLs.

Comment No. 55 EPA Should Make Clear that the Draft Report When Issued in Final will Not Automatically Require the State to Require Point Sources, Including Sanitary WWTPs, to Undertake Hg Minimization or Other Hg Controls to Meet Their Assigned WLAs, Even If Initial Monitoring Using Clean Techniques Suggests a Source's Hg Discharge May Exceed the WLA.

While, as noted above, the Draft Report appears to indicate in one place an intention that Hg minimization measures be adopted for Sanitary WWTPs and other point sources with discharges greater than 100,000 gpd if any Hg is detected in effluent, the Draft Report at p. 8-3 indicates that the State has considerable discretion in determining when and how such minimization measures or other controls should be implemented. The Draft Report states that "[I]f a facility is found to discharge mercury at levels above 12 ng/L, a mercury minimization plan *may* be required." (emphasis added). Underscoring the "uncertainty in the TMDL analysis," it further explains that the State of Louisiana may consider site-specific characteristics in determining whether and the extent to which sources should be required to implement Hg minimization programs and that the State has considerable discretion in determining when and whether to prescribe additional limits in the permits of potential Hg sources (p. 8-3). As we understand it, the Draft Report also explains that through a variety of actions, other than immediately prescribing permit limits based on the assumptions used for determining the WLAs, the State can "over the long-term" demonstrate that WLAs are being met.

We support this approach, as we have interpreted it, but urge EPA to explain clearly and consistently throughout the Draft Report that the State has considerable discretion in determining whether, when, and how Hg minimization measures and other measures intended to meet the WLAs should be implemented. In particular, the Draft Report should emphasize that the State has the discretion to prescribe Hg minimization and other control measures on Sanitary WWTPs and other point sources in a step wise fashion, after it has obtained and evaluated adequate data, including data on effluent Hg levels on a basin wide basis and data on site specific conditions, to determine if water quality standards have actually been exceeded and, if so, the optimal method for achieving such standards.

Moreover, the Draft Report should indicate clearly that it may be appropriate to defer prescribing permit limits or conditions to reduce effluent levels to meet the proposed WLAs until more accurate TMDLs and WLAs are established based on new and relevant site specific data. Indeed, the Draft Report appears to support this approach in certain places. For example, the report states that EPA recognizes that it may be appropriate to revise the TMDLs based on information gathered and analyses performed after July 2005. (p. 2-1). Further, the Draft Report states that EPA "is not requiring point source reductions at this time" because of the very small contribution of point sources to the basin TMDLs and the lack of testing by method 1631. (p. 7-3.) These extremely important points strongly support our position that the EPA should make clear that the State has wide discretion in its approaches to implementing the Hg TMDL and WLA program. Any suggestion that the State of Louisiana has no option but to require point sources that discharge over 100,000 gallons per day to implement Hg minimization programs if Hg is detected in the effluent above the 12 ng/l level, let alone in any detectable amount, is unsupportable, particularly given the lack of relevant data. Imposing such a rigid approach on the State in turn would result in many dischargers expending considerable time and resources to make, at most, de minimis reductions in Hg that would have negligible impact on the environment.

In summary, we believe that more relevant and site specific data need to be collected before any Hg minimization programs are mandated and that the State of Louisiana must have considerable flexibility and discretion in the implementation of the TMDLs contained in the Draft Report, based on several important considerations, including:

- The lack of data on effluent levels and site specific conditions and the lack of numeric water quality criteria relevant to the Draft Report, each of which would have considerable bearing on the level of Hg minimization that may be appropriate for specific point sources.

- The unnecessary economic hardship that could result if onerous Hg minimization measures or controls were prematurely prescribed before effluent data for most sources in a particular basin and information on site-specific conditions are developed.

- The arbitrary assumption of 12 ng/L mercury in discharges from municipal WWTPs with discharges greater than 100,000 gpd in determining WLAs, which is based on extremely limited data.

- The likely need to soon revise the TMDLs based on newly developed data.

- The de minimis impact of point sources of Hg on the total Hg wasteload for the six coastal waterbodies.

Response

The TMDLs do not require LDEQ to take specific actions to implement the TMDLs as stated in Comment No. 54 above. EPA does expect that LDEQ will take into account site specific conditions and new information as it is generated during the implementation of the these TMDLs. However, as stated in the previous comment LDEQ is required to demonstrate that the permits it issues that implement TMDLs are consistent with the assumptions and requirements of the WLAs.

Comment No. 56 Miscellaneous Corrections

While the Draft Report is not intended to establish TMDLs for segment 061201 or for sources discharging into the Vermilion-Teche basin, it contains statements suggesting that the report in fact is establishing TMDLs and WLAs for such sources. To minimize potential confusion on this matter, we urge EPA to make appropriate corrections, including:

P. 3-2 (Table 3.1): Either Lafayette should be eliminated from the table, or a clear explanation should be provided that the Table covers areas for which the Draft Report is not establishing TMDLs.

P. 6-8 and Appendix C-2: Page 6-8 states that Appendix C-2 "lists only those facilities for which wasteloads are being established in these TMDLs." Appendix C-2, however, lists point sources from the Vermilion-Teche River Basin and mercury loads calculated for each such source, apparently based on the same assumptions for calculating WLAs for point sources intended to be covered by the Draft Report. The Draft Report should make the necessary corrections to clarify that the sources discharging into the Vermilion-Teche basin in fact have not been assigned WLAs by that report. For purposes of clarity, we suggest that all the sources discharging into the Vermilion-Teche basin be eliminated from Appendix C-2.

Response

Lafayette has not been eliminated from Table 3.1 because it was included in the original study area. Please see Comment No. 8 above.

Appendix C-2 has been revised to remove the Vermilion-Teche, Calcasieu, and Mermentau Basin dischargers.

5. Louisiana Department of Environmental Quality

Comment No. 57

This TMDL was developed because there is an advisory for king mackerel in Louisiana's coastal waters. However, all of the Gulf Coast states have a similar advisory in place for king mackerel. King mackerel is a marine species that migrates from south Florida waters in winter to more northerly waters in spring and spawns in midsummer offshore. The king mackerel lives its entire life in the open waters of the Gulf of Mexico. Thus, it is unlikely that placing effluent limitations on potential or assumed wastewater discharge sources in Louisiana will result in any reduction in mercury concentrations in king mackerel. EPA in its own reports has often cited air emissions from coal-fired utilities as the primary current source of mercury in the environment in the United States.

Response

Please see previous responses.

Comment No. 58

EPA defines the area affected by the king mackerel advisory as consisting of 1,657 square miles of estuaries and 394,880 acres of wetlands. In actuality, the area under advisory is the coastal Gulf

Waters to the State 3-mile limit, this does not include inland estuaries and wetlands because the king mackerel is a pelagic fish. This should be clarified in the report. (Section 3.0, page 3-1)

Response

The final report has been revised to reflect this information.

Comment No. 59

LDEQ has concerns about many of the assumptions made in the calculation of mercury loads in this TMDL.

> It was assumed that a linear relationship exists between the mercury load to the coastal subsegments and the king mackerel tissue mercury concentrations. The relationship between mercury load to a waterbody and the accumulation of mercury in the fish tissue is not thoroughly understood. Indeed, studies of fish tissue concentrations of mercury in freshwater species do not indicate a linear relationship between water column or sediment concentrations and fish tissue concentrations. These relationships are likely even more complex in the marine environment. A TMDL based on this relationship is disputable. (Executive Summary and Section 6.5.3, page 6-13)
>
> EPA assumes 100% of rainfall runoff of dissolved mercury is transported to 303-listed coastal subsegments. LDEQ disagrees with this assumption. This is an overly conservative assumption. (Section 6.5.3, page 6-14)
>
> EPA assumes that 100% of mercury associated with soil erosion is transported to the coastal subsegments. LDEQ disagrees with this assumption. There is insufficient data to support this assumption. (Section 6.5.3, page 6-14)
>
> EPA assumes that 100% of both dissolved and particulate mercury loads generated by contributing and adjacent watersheds reach the listed coastal subsegments and are available for uptake, bioaccumulation, and biomagnification. LDEQ disagrees with this assumption. This is an overly conservative assumption, and there is insufficient data to support this assumption. (Section 7.1, page 7-1)

Response

LDEQ's comments are acknowledged and have been addressed previously in this document.

Comment No. 60 Specific Corrections

Introduction (page1-1): Correct the statement that states, "The Consent Decree, *later modified by LDEQ*, required the establishment of TMDLs to address the fish consumption advisory." The Consent Decree to which this statement refers is between the U.S. EPA and the plaintiffs, and **it was not modified by LDEQ**.

Section 2 (page 2-1): In the phrase "complex *atmosphere* chemistry" replace the word atmosphere with **atmospheric**.

Section 2.2 (page 2-2): Method *1613* E should be Method **1631**. In statement that reads, "As targeted NPDES permits are reissued, dischargers will be required…" insert the word **some** in front of dischargers.

Section 6.0 (page 6-1, 2nd paragraph): In the statement concerning sulfate-reducing bacteria, insert the word **requirements** after oxygen concentration so that it reads "…sulfate--reducing bacteria whose oxygen concentration **requirements** are low…"

Response

The final report incorporates the corrections requested.

6. Lula Westfield

Comment No. 61

Lula-Westfield, L.L.C. is a privately held company that owns and operates two separate raw cane sugar factories located in Assumption Parish, both of which have NPDES permits controlling discharges to the Barataria basin of coastal Louisiana. The proposed TMDLs would, if promulgated, impose very expensive mercury monitoring, reporting and permitting requirements on our present and future discharges, and possibly restrict or forbid construction of the future plant expansion and byproduct utilization projects that are necessary for survival of the Louisiana sugar cane industry in this region. Furthermore, recent and severe economic problems in the Louisiana sugar cane industry have created a situation in which a requirement for added costly expenditures to comply with mercury TMDL requirements could be fatal to this company in particular, and to the Louisiana sugar cane industry in general. It is our position that the proposed TMDL is unlawful, unwise, and as likely to harm the mercury situation as it is to improve it.

Response

The commenter has stated their concern about the TMDL imposing costly mercury monitoring, reporting and permitting requirements on their current and future operations. EPA is taking an adaptive management approach to these TMDLs to develop information and data to support future revisions to these TMDLs. The final TMDL report has not allocated any individual waste load allocations to the commenter or any other sugar cane related discharges and EPA does not expect that any additional requirements will be placed on the sugar cane industry as a result of these TMDLs. As stated in previous comments, LDEQ is responsible for implementing the TMDLs and will determine what, if any, requirements the facilities in question will have to comply with to demonstrate that the facility's LPDES permit is consistent with the TMDL.

Comment No. 62

The subject report asserts that mercury TMDLs are being established in accordance with requirements of Section 303 of the Clean Water Act, which section calls for TMDLs where there is non-attainment of a properly established water quality standard. The report admits there is no evidence of any violation of the water quality standard for mercury in any of Louisiana's coastal waters, nor any indication that the mercury standard is in jeopardy of violation. However, the report attempts to justify imposing TMDLs for mercury in the Barataria and other southern Louisiana basins because king mackerels caught in the Gulf of Mexico near Louisiana have "elevated levels of mercury". Reportedly, a "fish consumption advisory" issued by some state agencies advises limited eating of the species for health reasons, but the arbitrarily established fish mercury content alert level (0.5 ppm) is not a water quality standard nor is it a legally enforceable standard of any kind. Such fish may and are being lawfully marketed and consumed without any restrictions or food label warnings. In the absence of any nonattainment of the water quality standard, there is no legal basis for imposing TMDLs for mercury.

Response

Please see the response to Comment No. 3 above.

Comment No. 63

While effort to reduce mercury in consumer food commendable, in this case the effort is misguided. There is no data that mercury levels in king mackerels are actually "elevated", how long such situation has existed, and how widespread the alleged "elevated" mercury situation is along the U.S. Coast of the Gulf of Mexico. There is no scientific basis on which to assert that any of the mackerel mercury content is due to discharges in the Barataria basin, and no scientific or common sense basis upon which to allocate total maximum daily mercury discharge loads there. Regulating mercury in the Barataria basin is no more likely to help the mackerel-mercury situation than it is to harm it.

Response

At this time, every Gulf Coast state has issued a fish consumption advisory for mercury for king mackerel. The commenter is correct and the draft report supports the assumption that the primary source of mercury in fish tissue is not the Barataria Basin. The report does document that there are point source discharge of mercury into the Barataria Basin that may be contributing to the elevated levels of mercury in the fish tissue of king mackerel. Therefore, the commenter's assertion that regulating the discharge of mercury in the Barataria basin, if it is actually occurring will not have a positive effect on the level of mercury in the fish tissue of king mackerel is disputable.

Comment No. 64

King mackerel is a pelagic (ocean dwelling) species that does not frequent Louisiana's less saline embayments. The fish sampling and analysis data cited in this report do indicate apparently "elevated" mercury content in king mackerel as well as other pelagic species tested. However, in three of the total eight fish sampling stations reported, including the station near Barataria Bay, fish species that do frequent the less saline embayments such as red drum, spotted seatrout and croaker were collected along with king mackerels, and all were found to very low in mercury content. Drainage from coastal Louisiana watersheds appears not to be the cause of the mercury problem in pelagic fish species; rather, it appears that these basins in their present condition actually help the king mackerel by providing a better (much lower mercury content) fish food supply than available to the king mackerel elsewhere in the Gulf of Mexico.

Response

Comment acknowledged.

Comment No. 65

The draft TMDL document's fish sampling data does, however, suggest a far more likely cause of pelagic fish-mercury situation. The king mackerel sample with the very highest mercury content in seawater is associated with turbidity (i.e. river silt). The annual "dead zone" reported in the Gulf associated with high Mississippi River inflow provides ample opportunity for mercury methylation in the very area where the reportedly "elevated" king mackerel samples were collected. EPA should have done something about the "dead zone" problems years ago instead of wasting resources on specious mercury TMDL issues in the Barataria and other coastal basins of Louisiana.

Response

The impact of the hypoxia or "dead zone" in the Gulf of Mexico on mercury levels in the fish tissue is a subject for future research and is beyond the scope of this report.

7. Iberia Sugar Cooperative

Comment No. 66

Iberia Sugar Cooperative, Inc. owns a raw cane sugar factory located in Iberia Parish, which has a NPDES permit controlling discharges to the Barataria basin of coastal Louisiana. The proposed TMDLs would, if promulgated, impose very expensive mercury monitoring, reporting and permitting requirements on our present and future discharges. Furthermore, recent and severe economic problems in the Louisiana sugar cane industry have created a situation in which a requirement for added costly expenditures to comply with mercury TMDL requirements could be fatal to this company in particular, and to the Louisiana sugar cane industry in general. It is our position that the proposed TMDL is unlawful, unwise, and as likely to harm the mercury situation as it is to improve it.

Response

See response to Comment No. 61 above.

Comment No. 67

The subject report asserts that mercury TMDLs are being established in accordance with requirements of Section 303 of the Clean Water Act, which section calls for TMDLs where there is non-attainment of a properly established water quality standard. The report admits there is no evidence of any violation of the water quality standard for mercury in any of Louisiana's coastal waters, nor any indication that the mercury standard is in jeopardy of violation. However, the report attempts to justify imposing TMDLs for mercury in the Barataria and other southern Louisiana basins because king mackerels caught in the Gulf of Mexico near Louisiana have “elevated levels of mercury”. Reportedly, a “fish consumption advisory” issued by some state agencies advises limited eating of the species for health reasons, but the arbitrarily established fish mercury content alert level (0.5 ppm) is not a water quality standard nor is it a legally enforceable standard of any kind. Such fish may and are being lawfully marketed and consumed without any restrictions or food label warnings. In the absence of any nonattainment of the water quality standard, there is no legal basis for imposing TMDLs for mercury.

Response

Please see response to Comment No. 3 above.

Comment No. 68

While effort to reduce mercury in consumer food commendable, in this case the effort is misguided. There is no data that mercury levels in king mackerels are actually “elevated”, how long such situation has existed, and how widespread the alleged “elevated” mercury situation is along the U.S. Coast of the Gulf of Mexico. There is no scientific basis on which to assert that any of the mackerel mercury content is due to discharges in the Barataria basin, and no scientific or common sense basis upon which to allocate total maximum daily mercury discharge loads there. Regulating mercury in the Barataria basin is no more likely to help the mackerel-mercury situation than it is to harm it.

Response

See response to Comment No. 63 above.

Comment No. 69

King mackerel is a pelagic (ocean dwelling) species that does no frequent Louisiana’s less saline embayments. The fish sampling and analysis data cited in this report do indicate apparently “elevated” mercury content in king mackerel as well as other pelagic species tested. However, in three of the total eight fish sampling stations reported, including the station near Barataria Bay, fish species that do frequent the less saline embayments such as red drums, spotted seatrout and croaker were collected alon with king mackerels, and all were found to very low in mercury content. Drainage from coastal Louisiana watersheds appears not to be the cause of the mercury problem in pelagic fish species; rather, it appears that these basins in their present condition actually the king mackerel by providing a better (much lower mercury content) fish food supply than available to the king mackerel elsewhere in the Gulf of Mexico.

Response

See response to Comment No. 64 above.

Comment No. 70

The draft TMDL document's fish sampling data does, however, suggest a far more likely cause of pelagic fish-mercury situation. The king mackerel sample with the very highest mercury content in seawater is associated with turbidity (i.e. river silt). The annual "dead zone" reported in the Gulf associated with high Mississippi River inflow provides ample opportunity for mercury methylation in the very area where the reportedly "elevated" king amckerel samples were collected. EPA should have done something about the "dead zone" problems years ago instead of wasting resources on specious mercury TMDL issues in the Barataria and other coastal basins of Louisiana.

Response

See response to Comment No. 65 above.

8. American Sugar Cane League

Comment No. 71

The proposed TMDLs would, if promulgated, impose very expensive mercury monitoring, reporting and permitting requirements on our present and future discharges, and possibly restrict or forbid agricultural land-use changes and the construction of the future plant expansion and byproduct utilization projects that are necessary for survival of the Louisiana sugar cane industry in this region. Furthermore, recent and severe economic problems in the Louisiana sugar cane industry have created a situation in which a requirement for added costly expenditures to comply with mercury TMDL requirements could be fatal to the Louisiana sugar cane industry. It is our position that the proposed TMDL is unlawful, unwise, and as likely to harm the mercury situation as it is to improve it.

Response

See response to Comment No. 61 above.

Comment No. 72

The subject report asserts that mercury TMDLs are being established in accordance with requirements of Section 303 of the Clean Water Act, which section calls for TMDLs where there is non-attainment of a properly established water quality standard. The report admits there is no evidence of any violation of the water quality standard for mercury in any of Louisiana's coastal waters, nor any indication that the mercury standard is in jeopardy of violation. However, the report attempts to justify imposing TMDLs for mercury in the Barataria and other southern Louisiana basins because king mackerels caught in the Gulf of Mexico near Louisiana have "elevated levels of mercury". Reportedly, a "fish consumption advisory" issued by some state agencies advises limited eating of the species for health reasons, but the arbitrarily established fish mercury content alert level (0.5 ppm) is not a water quality standard nor is it a legally enforceable standard of any kind. Such fish may and are being lawfully marketed and consumed without any restrictions or food label warnings. In the absence of any nonattainment of the water quality standard, there is no legal basis for imposing TMDLs for mercury.

Response

Please see response to Comment No. 62 above.

Comment No. 73

While effort to reduce mercury in consumer food commendable, in this case the effort is misguided. There is no data that mercury levels in king mackerels are actually “elevated”, how long such situation has existed, and how widespread the alleged “elevated” mercury situation is along the U.S. Coast of the Gulf of Mexico. There is no scientific basis on which to assert that any of the mackerel mercury content is due to discharges in any of the affected basin subsegments, and no scientific or common sense basis upon which to allocate total maximum daily mercury discharge loads there.

Response

See response to Comment No. 63 above.

Comment No. 74

King mackerel is a pelagic (ocean dwelling) species that does no frequent Louisiana’s less saline embayments. The fish sampling and analysis data cited in this report do indicate apparently “elevated” mercury content in king mackerel as well as other pelagic species tested. However, in three of the total eight fish sampling stations reported, including the station near Barataria Bay, fish species that do frequent the less saline embayments such as red drums, spotted seatrout and croaker were collected along with king mackerels, and all were found to very low in mercury content. Drainage from coastal Louisiana watersheds appears not to be the cause of the mercury problem in pelagic fish species; rather, it appears that these basins in their present condition actually the king mackerel by providing a better (much lower mercury content) fish food supply than available to the king mackerel elsewhere in the Gulf of Mexico.

Response

See response to Comment No. 64 above.

Comment No. 75

The draft TMDL document’s fish sampling data does, however, suggest a far more likely cause of pelagic fish-mercury situation. The king mackerel sample with the very highest mercury content in seawater is associated with turbidity (i.e. river silt). The annual “dead zone” reported in the Gulf associated with high Mississippi River inflow provides ample opportunity for mercury methylation in the very area where the reportedly “elevated” king mackerel samples were collected. EPA should have done something about the “dead zone” problems years ago instead of wasting resources on specious mercury TMDL issues in the Barataria and other coastal basins of Louisiana.

Response

See response to Comment No. 65 above.