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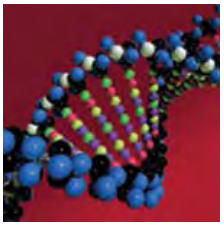

CURRENT CONDITIONS REPORT FOR THE SAGINAW RIVER, FLOODPLAIN, AND BAY

Prepared for

THE DOW CHEMICAL COMPANY

Prepared by

ENVIRON

14 September 2007

T A B L E S

Table 2-1. Significant Flood[a] Events on the Saginaw River in Saginaw, Michigan

Date	Gage Height (ft)	Remarks
March 24-27, 1904	24.9	Rain on snow pack and frozen soils.
May 1912	24.1	Runoff from snow melt.
March 1916	24.3	Thousands of acres of farmland inundated by 2-8 feet of water in Saginaw River basin. Damage in Saginaw, $200,000.
March 1918	23.5	Rain on snow pack and frozen soils
March 1919	23.1	Rain on snow pack and frozen soils
April 4-11, 1947	19.9	Most damaging since 1904. Result of thunderstorms and snowmelt.
March 19-23, 1948	22.1	In Saginaw and Tittabawassee River basins, worst since 1916.
April 14, 1973	23.35	Rain on snow pack.
April 17, 1978	23.35	Rain on snow pack.
March 29, 1984	24.05	Rain on snow pack and frozen soils
September 10-15, 1986	24.16	Extended rainfall. Record flood levels on Tittabawassee River.
October 3, 1986	22.8	Extended rainfall.
March 5-13, 2004	19.92	Rain on snow pack and frozen soils
March 12-20, 2006	19.89	Rain on snow pack and frozen soils

a Flood level as defined by USGS for gage height > 19 ft at the Saginaw River gage station (04157000)

Sources:

http://mi.water.usgs.gov/fdfloods.php
http://waterdata.usgs.gov/nwis/uv?04157000
http://www.crh.noaa.gov/ahps2/period.php?wfo=dtx&gage=sagm4&view=1,1,1,1,1,1,1,1&toggles=10,7,8,2,9,15,6&type=0

Table 2-2. Probing Transect Data Summary, Upper Saginaw River

Transect	River Mile	No. of Probing Locations	Water Depth (ft)			Sediment Thickness (ft)		
			Mean	Minimum	Maximum	Mean	Minimum	Maximum
3	22.0	7	10.2	3.0	18.0	3.1	0.3	7.0
4	21.75	6	13.4	9.0	16.5	6.6	2.5	8.5
5	21.5	6	10.1	4.0	12.0	7.2	0.2	12.8
6	21.25	6	9.6	2.5	12.0	8.1	0.5	12.0
7	21.0	6	10.9	3.5	15.0	9.3	7.0	13.5
8	20.75	7	9.1	6.0	10.0	10.0	7.5	12.0
9	20.5	7	9.3	6.0	12.0	7.7	2.0	14.0
10	20.25	10	8.9	1.5	13.0	7.2	3.0	10.0
11	20.0	6	12.9	8.8	20.0	6.8	4.5	11.0
12	19.25	8	12.9	9.0	15.0	8.2	5.0	11.5
13	19.0	5	11.5	7.0	15.0	6.8	3.0	11.0
14	18.75	8	16.7	13.0	20.0	5.2	0.5	8.5
15	18.5	8	14.3	8.0	16.0	6.9	4.0	10.0
16	18.25	10	18.0	9.0	22.0	3.7	1.8	6.0
17	18.0	6	13.5	6.0	16.5	7.1	3.5	11.0
18	17.75	5	16.3	15.0	17.5	6.3	4.5	11.0

Source: CH2MHill 2005

Table 2-3. Grain Size Summary, Upper Saginaw River

Location	Surface Interval		Subsurface Interval	
	Depth (ft)	Particle Size Classification [a]	Depth (ft)	Particle Size Classification[a]
SAR-03166	0-0.3	silt w/sand	2.7 – 3 3.8 – 4.3	sand sandy silt
SAR-03167	0-0.3	sand	4 - 4.5	sandy silt
SAR-03168	0-0.3	sandy silt	2.3 – 2.7 3.5 – 4	sand w/ gravel clay w/sand
SAR-03169	0-0.3	sand	2.5 – 3	sand w/ gravel
SAR-03170	0-0.3	sand	1.7 – 2 3.5 – 4	silt w/sand silty sand
SAR-03171	0-0.3	sand	1.4 – 1.8	sand
SAR-03179	0-0.3	sand		
SAR-03180	0-0.3	silty sand	2.5 – 3.1	silty sand
SAR-03184	0-0.3	sand	2.6– 3.2	sand
SAR-03185	0-0.3	sand	1 – 1.6	silt
SAR-03186	0-0.3	sand	1.5 – 2	sand
SAR-03187			0.5 – 0.8 3.5 – 4	sand silt w/sand
SAR-03189	0-0.3	sand		
SAR-03190	0-0.3	sand	5.3 – 5.8	sand w/gravel
SAR-03225	0-0.3	sand	3.5 – 3.9	silt

a. The Unified Soil Classification System (USCS) (ASTM D2488-00) was used to classify the lithology of grain size results. Since the grain size analysis only records the particle size and not the sorting (for example, poorly sorted or well sorted), the sorting portion of the USCS sediment classification has been omitted.
ID: identification
ft: feet

Table 2-4. Land Use Types by Acreage and Proportion

	Floodplain[a] Acreage				Proportion in Floodplain[a]			
Land Use Category	USR	LSR-SC	LSR-BC	Total Floodplain[a]	% in USR	% in LSR-SC	% in LSR-BC	% of Total Floodplain[a] Area Comprised by Land Use Category
Open Water	360.0	1295.0	2035.5	3690.6	9.8	35.1	55.2	11.4
Developed, Open Space	583.6	1109.7	961.2	2654.4	22.0	41.8	36.2	8.2
Developed, Low Intensity	394.3	1907.9	1022.3	3324.5	11.9	57.4	30.8	10.3
Developed, Medium Intensity	198.6	906.9	543.1	1648.6	12.0	55.0	32.9	5.1
Developed, High Intensity	150.8	310.0	145.7	606.5	24.9	51.1	24.0	1.9
Barren Rock	1.3	121.6	134.8	257.8	0.5	47.2	52.3	0.8
Deciduous Forest	93.4	546.6	372.7	1012.8	9.2	54.0	36.8	3.1
Evergreen Forest	1.1	8.9	4.2	14.2	7.8	62.5	29.7	0.0
Mixed Forest	8.5	40.0	15.1	63.6	13.3	62.9	23.8	0.2
Shrub/scrub	0.4	33.6	4.4	38.5	1.2	87.3	11.6	0.1
Grassland/herbaceous	22.9	266.9	96.1	385.8	5.9	69.2	24.9	1.2
Pasture/hay	46.5	1024.1	479.5	1550.1	3.0	66.1	30.9	4.8
Cultivated crops	235.3	10044.7	4599.9	14879.9	1.6	67.5	30.9	45.9
Woody Wetlands	47.1	964.3	671.0	1682.4	2.8	57.3	39.9	5.2
Emergent Herbaceous Wetlands	15.1	423.0	153.4	591.6	2.6	71.5	25.9	1.8

a. The floodplain is defined as the Federal Emergency Management Administration (FEMA) 100-year floodplain for purposes of calculation acreage
Land use data from the USGS 2001 National Landcover Data Set at: http://www.mrlc.gov/zones/show_data.asp?szone=8. Descriptions of land use classes can be found at http://www.mrlc.gov/nlcd_definitions.asp
LSR-BC: Lower Saginaw River - Bay County
LSR-SC: Lower Saginaw River - Saginaw County
USR: Upper Saginaw River

Table 2-5. Fish Consumption Advisory for Saginaw River and Bay

			General Population									Women and Children								
			Length (inches)									Length (inches)								
Water Body	**Species**	**Contaminant(s)**	**6-8**	**8-10**	**10-12**	**12-14**	**14-18**	**18-22**	**22-26**	**26-30**	**30+**	**6-8**	**8-10**	**10-12**	**12-14**	**14-18**	**18-22**	**22-26**	**26-30**	**30+**
Lake Huron	Brown Trout	PCBs			U	U	U	W	W	W	W			M	M	M	O	O	O	O
	Burbot	PCBs	U	U	U	U	U	U	U	U	U	W	W	W	W	W	W	W	W	W
	Chinook Salmon	PCBs			U	U	U	U	U	U	U			M	M	M	M	M	M	M
	Coho Salmon	PCBs			U	U	U	U	U	U	U			M	M	M	M	M	M	M
	Lake Trout	PCBs, Dioxins			W	W	W	W	W	O	O			O	O	O	O	O	O	O
	Rainbow Trout (including Steelhead)	PCBs			U	U	U	U	U	U	U			M	M	M	M	M	M	M
	Whitefish	PCBs, Dioxins	U	U	U	U	U	W	O	O	O	W	W	W	W	W	O	O	O	O
Saginaw Bay (also follow Lake Huron advisories above)	Carp	PCBs, Dioxins	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	Channel Catfish	PCBs, Dioxins				W	W	O	O	O	O				O	O	O	O	O	O
	Northern Pike	PCBs							U	U	U							W	M	M
	Suckers	PCBs	U	U	U	U	U	U	U	U	U	W	W	W	W	M	M	M	M	M
	Walleye	Mercury, PCBs					U	U	W	W	W					W	M	M	M	M
	White Bass	PCBs, Dioxins	U	U	U	W	W	W				M	M	M	O	O	O			
	White Perch	PCBs	U	U	U	U						M	M	M	M					
	Yellow Perch	PCBs	U	U	U	U	U					W	W	W	W	W				
Saginaw River (entire length)	Carp, Catfish	PCBs, Dioxins	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	White Bass	PCBs	W	W	W	W	W	W				6/y	6/y	6/y	6/y	6/y	6/y			
	All other species	PCBs, Dioxins	W	W	W	W	W	W	W	W	W	M	M	M	M	M	M	M	M	M

U: unlimited consumption
W: one meal per week
M: one meal per month
6/y: six meals per year
O: do not eat this fish
PCB: polychlorinated biphenyls
Source: MDCH 2007

Table 2-6. Summary of Population Size, Ethnicity, and Income of Residents of Region

	Bay City		Saginaw	
	Number	Percent	Number	Percent
TOTAL POPULATION	36,817	100	61,799	100
POPULATION AGE DISTRIBUTION				
Under 5 years	2,566	7	5,330	8.6
5 to 9 years	2,690	7.3	6,025	9.7
10 to 14 years	2,599	7.1	5,377	8.7
15 to 19 years	2,543	6.9	4,666	7.6
20 to 24 years	2,439	6.6	4,257	6.9
25 to 34 years	5,465	14.8	8,717	14.1
35 to 44 years	5,747	15.6	8,790	14.2
45 to 54 years	4,674	12.7	7,484	12.1
55 to 59 years	1,582	4.3	2,268	3.7
60 to 64 years	1,305	3.5	1,817	2.9
65 to 74 years	2,407	6.5	3,613	5.8
75 to 84 years	2,089	5.7	2,579	4.2
85 years and over	711	1.9	876	1.4
Median age (years)	35.2	NA	30.7	NA
RACE				
White	33,575	91.2	29,056	47
Black or African American	1,003	2.7	26,735	43.3
American Indian and Alaska Native	272	0.7	302	0.5
Asian	195	0.5	205	0.3
Native Hawaiian and Other Pacific Islander	3	0	10	0
Hispanic or Latino (of any race)	2,473	6.7	7,259	11.7
EMPLOYMENT STATUS				
Population 16 years and over	28,445	100	44,017	100
In labor force	17,699	62.2	25,901	58.8
Not in labor force	10,746	37.8	18,116	41.2
OCCUPATION				
Management, professional, and related occupations	4,097	24.9	4,794	21.3
Service occupations	3,102	18.8	5,842	26
Sales and office occupations	4,530	27.5	5,848	26
Farming, fishing, and forestry occupations	68	0.4	103	0.5
Construction, extraction, and maintenance occupations	1,594	9.7	1,612	7.2
Production, transportation, and material moving occupations	3,090	18.7	4,301	19.1
INCOME				
Median household income (dollars)	30,425	NA	26,485	NA
Per capita income (dollars)	16,550	NA	13,816	NA
Families living below poverty line	972	10.3	3,772	24.7
Individuals living below poverty line	5,336	14.6	17,389	28.5

NA: not applicable
Source: http://quickfacts.census.gov/qfd/states/26/26017.html

Table 2-7. Summary of Natural Communities[a]

Community Name	County(ies) of Documented Occurrence	Landscape Position	Diagnostic Features	Global Rank[b]	State Rank[c]	Characteristic Plants[d]	Associated Listed Plants[e]	Associated Listed Animals[e]
Dry-mesic northern forest	Bay	Sandy glacial outwash, sandy glacial lakeplains, and less often on thin glacial drift over bedrock, inland dune ridges and coarse-textured end moraines	Unique two-tiered canopy structure; broadly defined with numerous regional, physiographic and edaphic variants; sparse and depauperate shrub and herb strata	G4	S3	Two dominant trees are white pine and red pine; mid-tier dominants ed maple, paper, bigtooth aspen, trembling aspen, white oak (*Quercus alba*), red oak, black oak (*Quercus velutina*), and eastern hemlock (*Tsuga canadensis*)	Broad-leaved Puccoon (*Lithospermum latifolium*)	Bald eagle (*Haliaeetus leucocephalus*) and eastern Massasauga Rattlesnake (*Sistrurus c. catenatus*)
Great Lakes marsh	Bay	Restricted to glacial lakeplain deposits along the shorelines of the Great Lakes	Saginaw Lakeplain Marsh group; Southern wet meadow	G4	S3	Three-square bulrush (*Schoenoplectus pungens*); hardstem bulrush (*S. acutus*); softstem bulrush (*S. tabernaemontani*); common spikerush (*Eleocharis palustris var. palustris*); nodding beggarticks (*Bidens cernuus*); jewelweed (*Impatiens capensis*)	Slough grass (*Beckmannia syzigachne*)	King rail (*Rallus elegans*), spotted turtle (*Clemmys guttata*)
Lakeplain oak openings	Bay	Glacial lakeplains on sand ridges, level sandplains, or adjacent depressions	Rare, fire dependent oak savanna type	G1	S1	Bur oak (*Quercus macrocarpa*), pin oak (*Q. ellipsoidalis)* , and swamp white oak (*Q. bicolor*); big bluestem (*Andropogon gerardii*), blue-joint grass (*Calamagrostis canadensis)* , Pennsylvania sedge (*Carex pensylvanica*)	Three-awned grass (*Aristida longespica*); Clinton's bulrush (*Scirpus clintonii*)	Black rat snake (*Elaphe o. obsoleta*), eastern fox snake (*Elaphe vulpina gloydi*), eastern massasauga rattlesnake
Lakeplain wet prairie	Bay	Sandy glacial lakeplains and on deposits of dune sand in clay glacial lakeplains, such as those along the shoreline of Saginaw Bay	Rare, diverse, native lowland grassland	G2/G3	S2	Blue-joint grass, prairie cordgrass (*Spartina pectinata*), Baltic rush (*Juncus balticus*), upright sedge (*Carex stricta*), water sedge (*Carex aquatilis*), twig-rush (*Cladium mariscoides*), and shrubby cinquefoil (*Potentilla fruticosa*)	Prairie fringed orchid (*Platanthera leucophaea*); three-awned grass	Eastern fox snake, least bittern (*Ixobrychus exilis*), and king rail

Table 2-7. Summary of Natural Communities[a]

Community Name	County(ies) of Documented Occurrence	Landscape Position	Diagnostic Features	Global Rank[b]	State Rank[c]	Characteristic Plants[d]	Associated Listed Plants[e]	Associated Listed Animals[e]
Lakeplain wet-mesic prairie	Bay	Inland portions of Michigan's glacial lakeplains and low beach ridges near the Saginaw Bay shoreline	Rare, diverse, native lowland grassland	G2	S2	Big bluestem, sedges (*Carex* spp.), switch grass (*Panicum virgatum*), little bluestem, Indian grass, Ohio goldenrod (*Solidago ohioensis*), common mountain mint (*Pycnanthemeum virginianum*) swamp-betony (*Pedicularis lanceolata*)	Three-awned grass; tall green milkweed (*Asclepias hirtella*); prairie fringed orchid	Eastern fox snake and king rail
Mesic northern forest	Bay, Saginaw	Primarily on coarse-textured ground and end moraines but also commonly on silty/clayey lakeplains, thin glacial till over bedrock and medium-textured moraines and kettle-kame topography with moderately well drained to well-drained sandy lakeplain and sand dunes	Broadly defined with numerous regional, physiographic and edaphic variations	G4	S3	Sugar maple (*Acer saccharum*), eastern hemlock (*Tsuga canadensis), American beech (Fagus grandifolia), and yellow birch (Betula alleghaniensis); American basswood (Tilia americana), white pine, Red oak (Quercus rubra), white cedar (Thuja occidentalis), red maple (Acer rubrum), paper birch, and white ash (Fraxinus americana)*	None of the many associated species identified in the community abstract are listed as occurring in Bay or Saginaw counties	Wood turtle (*Glyptemys insculpta*), red-shouldered hawk (*Buteo lineatus*), bald eagle
Mesic southern forest	Saginaw	Level, eastern and western lakeplains; western sand dunes; till plains and end moraines	Small, scattered, disturbed fragments remain in Michigan; three physiographic subtypes; spring ephemerals	G3/G4	S3	Beech (*Fagus grandifolia)* and sugar maple (*Acer saccharum*) are primary trees; associates are bitternut hickory (*Carya cordiformis*), white ash, tulip tree (*Liriodendron tulipifera*), white oak, red oak, and basswood; pawpaw (*Asimina triloba*), musclewood (*Carpinus caroliniana*), dogwoods (*Cornus* spp.), leatherwood (*Dirca palustris*), witch hazel (*Hamamelis virginiana*), spicebush (*Lindera benzoin*); spring beauty (Claytonia virginica), toothwort (*Dentaria laciniata*), squirrel-corn (*Dicentra canadensis*)	Showy orchis (*Galearis spectabilis*)	Red-shouldered hawk

Table 2-7. Summary of Natural Communities[a]

Community Name	County(ies) of Documented Occurrence	Landscape Position	Diagnostic Features	Global Rank[b]	State Rank[c]	Characteristic Plants[d]	Associated Listed Plants[e]	Associated Listed Animals[e]
Poor conifer swamp	Bay, Midland, Saginaw	Depressions in glacial outwash and sandy glacial lakeplains	Nutrient poor forested peatlands	G4	S4	Black spruce (*Picea mariana*); Tamarack (*Larix laricina*); Labrador tea (*Ledum groenlandicum*); bog-rosemary (*Andromeda glaucophylla*); peat mosses (*Spagnum spp.)*	None of the several species identified in the community abstract are listed as occurring in these counties	Bald eagle; osprey (*Pandion haliaetus*)
Southern swamp	Bay	Depressions and channels of ground moraines, on glacial lake plains, and also in depressions of glacial outwash, especially near moraines	Inundated in the spring and sometimes into the summer creating a depauperate understory	G3	S3	Dominant species often are sugar maple, red maple, white ash, and black ash (*Fraxinus nigra*)	None listed	None listed

a. Source: Michigan Natural Communities: Draft List and Descriptions date April 21, 2006 accessed online at http://web4.msue.msu.edu/mnfi/pub/abstracts.cfm

b. G1 - Critically imperiled globally because of extreme rarity (5 or fewer occurrences range-wide or very few remaining individuals or acres) or because of some factors(s) making it especially vulnerable to extinction. G2 - Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range. G3 - Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single wesern state, a physiographic region in the East) or because of other factor(s) making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100. G4 - Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery. Source: See note 1.

c. S1 - critically imperiled in the state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation in the state. S2 - Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state. S3 - Rare or uncommon in state (on the order of 21 to 100 occurrences). S4 - Apparently secure in state, with many occurrences. Source: See note 1.

d. These are but a few of the dominant plants listed in the community abstract available on the MNFI website at http://web4.msue.msu.edu/mnfi/pub/abstracts.cfm)

e. For a more complete federally- and state-listed rare plants and animals associated with each community, see Table 2.7 and the community abstracts.

Table 2-8. Threatened and Endangered Species in the Saginaw and Bay Counties

Common Name	Scientific Name	Federal Status	State Status	County(s) of Documented Occurance[a]	Natural Community Associations
Reptiles					
Spotted Turtle	*Clemmys guttata*		T	Sag	dmsf, msf, glm, lwp, lwmp
Black Rat Snake	*Elaphe obsoleta obsoleta*		SC	Sag	msf
Eastern Fox Snake	*Elaphe vulpina gloydi*		T	Sag	oo, lwp, lwmp, glm, msf
Blanding's Turtle	*Emys blandingii*		SC	Bay, Sag	flm, msf
Wood Turtle	*Glyptemys insculpta*		SC	Mid, Sag	msf, mnf
Eastern Massasauga Rattlesnake	*Sistrurus catenatus catenatus*	C	SC	Sag	msf, mnf, dmnf, dnf, pcs
Fishes					
Weed Shiner	*Notropis texanus*		X	Sag?	?
Channel Darter	*Percina copelandi*		E	Sag?	glm?
River Darter	*Percina shumardi*		E	Sag?	SR? SB?
Sauger	*Sander canadensis*		T	Bay?	SB?
Birds					
Northern Goshawk	*Accipiter gentilis*		SC	Bay, Mid	?
Cooper's Hawk	*Accipiter cooperii*		SC	Sag	msf, mnf, dmnf
American Bittern	*Botaurus lentiginosus*		SC	Bay, Sag	glm, lwp, lwmp
Red-shouldered Hawk	*Buteo lineatus*		T	Mid	msf, mnf, mdnf
Black Tern	*Chlidonias niger*		SC	Bay, Mid, Sag	glm
Northern Harrier	*Circus cyaneus*		SC	Bay, Sag	glm, lwp, lwmp
Marsh Wren	*Cistothorus palustris*		SC	Bay, Sag	glm
Common Moorhen	*Gallinula chloropus*		SC	Bay, Sag	glm
Bald Eagle[b]	*Haliaeetus leucocephalus*	T	T	Bay, Mid, Sag	dmnf, mnf, pcs
Least Bittern	*Ixobrychus exilis*		T	Bay	glm
Black-crowned Night-heron	*Nycticorax nycticorax*		SC	Bay	glm
Prothonotary Warbler	*Protonotaria citrea*		SC	Sag	pcs, glm
King Rail	*Rallus elegans*		E	Bay, Sag	glm, lwp, lwmp
Caspian Tern	*Sterna caspia*		T	Bay	SR, SB, glm
Forster's Tern	*Sterna forsteri*		SC	Bay	glm, SR, SB
Common Tern	*Sterna hirundo*		T	Bay, Mid	glm, SR, SB
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*		SC	Bay, Sag	glm
Insects					
Persius Duskywing	*Erynnis persius persius*		T	?	?
Frosted Elfin	*Incisalia irus*		T	Bay	lwp?, lwmp?
Riverine Snaketail Dragonfly	*Stylurus amnicola*		SC	?	?
Mussels					
Elktoe	*Alasmidonta marginata*		SC	Sag	TR, ?
Slippershell Mussel	*Alasmidonta viridis*		SC	Mid	ShR, ?
Snuffbox	*Epioblasma triquetra*		E	Mid, Sag	SR?
Hickorynut	*Obovaria olivaria*		SC	Sag	SR?
Ellipse	*Venustaconcha ellipsiformis*		SC	Mid	?

Table 2-8. Threatened and Endangered Species in the Saginaw and Bay Counties

Common Name	Scientific Name	Federal Status	State Status	County(s) of Documented Occurance[a]	Natural Community Associations
Plants					
Three-awned Grass	*Aristida longespica*		T	Mid	lwp
Tall Green Milkweed	*Asclepias hirtella*		T	Bay	oo, lwp, lwmp
Forked Aster	*Aster furcatus*		T	Mid	?
Cooper's Milk-vetch	*Astragalus neglectus*		SC	Bay	oo, lwmp
Slough Grass	*Beckmannia syzigachne*		T	Bay	glm, lwp, lwmp
Prairie Indian-plantain	*Cacalia plantaginea*		SC	Bay	glm, lwp, lwmp
Hayden's Sedge	*Carex haydenii*		X	Mid	pcs, ?
False Hop Sedge	*Carex lupuliformis*		T	Bay	glm, lwp, lwmp
Weak Stellate Sedge	*Carex seorsa*		T	Mid	pcs
Ram's Head Lady's-slipper	*Cypripedium arietinum*		SC	Mid	pcs
Beak Grass	*Diarrhena americana*		T	Mid	?
Engelmann's Spike-rush	*Eleocharis engelmannii*		SC	Mid	lwp
Small Love Grass	*Eragrostis pilosa*		SC	Sag	?
Showy Orchis	*Galearis spectabilis*		T	Bay, Sag	msf, mnf
Whorled Pogonia	*Isotria verticillata*		T	Sag	msf, mnf, dmnf
Twinleaf	*Jeffersonia diphylla*		SC	Sag	msf
Broad-leaved Puccoon	*Lithospermum latifolium*		SC	Mid	msf, mnf, dmnf
Seedbox	*Ludwigia alternifolia*		SC	Sag	lwp, lwmp
Hickorynut	*Obovaria olivaria*		SC	Sag	?
Orange or Yellow Fringed Orchid	*Platanthera ciliaris*		T	Bay	lwp?, lwmp?
Prairie Fringed Orchid	*Platanthera leucophaea*	T	E	Bay, Sag	lwp, lwmp
Hairy Mountain-mint	*Pycnanthemum pilosum*		T	Sag	lwp?, lwmp?
Clinton's Bulrush	*Scirpus clintonii*		SC	Bay	oo, lwp
Fire Pink	*Silene virginica*		T	Bay	mnf?, msf?
Yellow Ladies'-tresses	*Spiranthes ochroleuca*		SC	Sag	mnf?, dmnf?
Virginia Spiderwort	*Tradescantia virginiana*		SC	Mid	mnf?, dmnf?, msf?

a. Only those species listed in the County Element Data for each species on the MNFI website are included; systematic surveys for all species that are known to be associated with these communities have not been conducted.
b. Final decision to delist the bald eagle was announced June 28, 2007 from the USFWS

C: Candidate
E: Endangered
SC: Special Concern
T: Threatened
X : Extirpated

Mid: Midland
Sag: Saginaw
Sag?: Historic record
? Distribution or habitat associations uncertain
SR?: historically known from Saginaw River
SB?: historically known from Saginaw Bay
TR: Tittabawassee River
ShR: Shiawassee River

dmnf: dry-mesic northern forest
dmsf: dry-mesic southern forest
dnf: dry northern forest
glm: Great Lakes marsh
lwp: lakeplain wet marsh
lwmp: lakeplain wet-mesic marsh
mnf: mesic northern forest
oo: lakeplain oak openings
pcs: poor conifer swamp

Table 3-1. U. S. Army Corps of Engineers Contract Dredging of the Saginaw River (1963-2006)

Fiscal Year	Cubic Yards	Placement/Dredge Area
1963	75,700	Open Water
1963	54,280	Open Water
1964	376,373	Open Water
1964	1,017,505	Open Water
1965	1,155	Open Water
1965	665,867	Open Water
1966	592,603	Open Water
1966	22,231	Open Water
1968	49,489	Open Water
1968	393,158	Open Water
1968	191,016	Open Water
1968	6,134	Open Water
1968	193,683	Open Water
1969	11,900	Open Water
1969	138,429	Open Water
1969	1,668,537	Open Water
1969	255,219	Open Water
1969	1,766,485	Open Water
1970	355,604	Open Water
1970	201,134	Open Water
1970	203,154	Open Water
1970	29,050	Open Water
1971	48,461	Skull Island CDF
1972	86,994	Skull Island CDF
1973	109,206	Middleground CDF
1974	138,540	Middleground CDF
1975	156,271	Middleground CDF
1976	91,733	Middleground CDF
1978	721,448	Bay CDF
1978	106,252	Middleground CDF / Bay CDF
1978	113,501	Middleground CDF
1978	1,641,232	Bay CDF
1979	102,392	Bay CDF
1979	237,464	Bay CDF
1979	12,538	Middleground CDF
1979	41,251	Middleground CDF
1980	159,730	Middleground CDF
1980	698,350	Bay CDF
1980	19,895	Middleground CDF
1980	13,391	Bay CDF
1981	68,554	Bay CDF
1981	425,410	Bay CDF
1981	36,711	Middleground CDF
1981	57,432	Middleground CDF
1981	48,229	Middleground CDF

Table 3-1. U. S. Army Corps of Engineers Contract Dredging of the Saginaw River (1963-2006)

Fiscal Year	Cubic Yards	Placement/Dredge Area
1981	19,393	Bay CDF
1982	16,181	Bay CDF
1982	565,828	Bay CDF
1982	60,835	Middleground CDF
1983	823,819	Bay CDF
1983	745,277	Bay CDF
1983	85,913	Middleground CDF
1984	157,471	Middleground CDF
1985	365,275	Bay CDF
1986	344,000	Bay CDF
1987	173,324	Bay CDF
1988	346,169	Bay CDF / South Cell
1989	345,409	Bay CDF
1991	771,705	Bay CDF
1992	313,826	Bay CDF
1993	405,833	Bay CDF
1994	185,219	Bay CDF - No work in CDF April 15-August 15
1995	333,840	Bay CDF
1996	164,772	Bay CDF
1997	235,949	Bay CDF
1998	142,765	Bay CDF
1999	376,136	Bay CDF
2000	184,987	Confined Saginaw Bay CDF
2001	44,861	Bay CDF
2002	261,992	Saginaw Bay CDF North Cell Contract Includes Berm Work
2004	144,149	Confined Bay CDF- Operations at Bay CDF Restricted to August 15- April 15 - Center 300'
2005	161,000	Confined Bay CDF- Operations at Bay CDF Restricted to August 15- April 15 Critical Shoals
2006	103,000	Confined Critical Shoals

CDF: Confined disposal facility
Source: ACOE 2007

Table 3-2. Active and Historical Landfills, Manufactured Gas Plants, and Former Department of Defense Sites Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Landfill	Historical Landfill	MGP	Defense
Upper Saginaw River						
GMC CENTRAL FOUNDRY DIV SAG MAL IRON	77 W CENTER ST	SAGINAW		1		
THE EAST SAGINAW GAS CO	HOLLAND AVE & WASHINGTON ST	SAGINAW			1	
Lower Saginaw River, Saginaw County						
SAGINAW RIVER GAS PLANT	N. WESTERVELT RD	ZILWAUKEE			1	
SAGINAW NGTR	SAGINAW NGTR	SAGINAW				1
GENERAL MOTORS CORP	1629 N WASHINGTON AVE	SAGINAW	1			
BUENA VISTA TWP LF	HACK ROAD & OUTER DR	SAGINAW		1		
Lower Saginaw River, Bay County						
DORE INDUSTRIAL DEVELOPMENT INC	501-607 MORTON & BACKUS ST	BAY CITY		1		
BAY CITY GAS CO	SAGINAW AND 11TH STREETS	BAY CITY			1	
WASTE MANAGEMENT	2900 N WATER ST	BAY CITY	1			
BAY CITY GAS CO	N. WATER STREET	BAY CITY			1	
CONSUMERS ENERGY CO	2742 WEADOCK HIGHWAY	ESSEXVILLE	1			
JC WEADOCK PLANT	2555 N WEADOCK HIGHWAY	ESSEXVILLE	1			

MGP: Manufactured gas plant
NGTR: National Guard target range
Source: EDR 2007

Table 3-3. Hazardous Waste Sites Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	NPL	CERCLIS	CERCLIS NFP	CORRACTS	RAATS	State Site	Deleted State Site
Upper Saginaw River									
1246 N NIAGARA ST	1246 N NIAGARA ST	SAGINAW						1	
ABLE INDUSTRIAL FABRICATION	2929 RIVER ST	SAGINAW						1	
ATWATER AND REMINGTON	424 ATWATER	SAGINAW						1	
AVERILL CTR	1151 N NIAGARA ST	SAGINAW						1	
B & P PROCESS EQUIPMENT AND SYSTEMS L.L.C.	1000 HESS ST	SAGINAW						1	
BAUER DRY CLEANING	311 N HAMILTON	SAGINAW						1	
BAUM ST 320 SOUTH	320 S BAUM ST	SAGINAW						1	1
BUSCARINO SITE	MICHIGAN AVE & HOLLAND AVE	SAGINAW			1				
CITY CLEANERS	408 POTTER ST	SAGINAW						1	
CITY OF SAGINAW	108 N NIAGARA ST	SAGINAW						1	
COURT STREET, 401	401 COURT STREET	SAGINAW						1	
CSX TRANSPORTATION INC	750 N WASHINGTON ST	SAGINAW						1	
EATON CORPORATION	1000 RUST AVE	SAGINAW					1		
FORMER HALL BARREL	6823 BAY RD	SAGINAW			1			1	
GMC CENTRAL FOUNDRY DIV SAG MAL IRON	77 W CENTER ST	SAGINAW				1		1	
HAMILTON ST. 412-414 S. SAGINAW	412 S HAMILTON ST	SAGINAW						1	
HAMILTON STREET, PARCEL 22	400 N HAMILTON	SAGINAW						1	
MERRILL FABRICATORS	2119 RIVER ST	SAGINAW						1	
NIAGARA 404 S	404 S NIAGARA	SAGINAW						1	
OJIBWAY ISLAND (NORTH END)	101 EZRA RUST DRIVE	SAGINAW						1	

Table 3-3. Hazardous Waste Sites Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	NPL	CERCLIS	CERCLIS NFP	CORRACTS	RAATS	State Site	Deleted State Site
SAGINAW DIVISION PLANT #2	1400 HOLMES ST	SAGINAW						1	
SAGINAW PRODUCTS CORP	68 WILLIAMSON ST	SAGINAW						1	
SAGINAW VALLEY ZOOLOGICAL SOCIETY	1730 S WASHINGTON	SAGINAW						1	
SAWMILL PARK	122-172 DAVENPORT	SAGINAW						1	
SIGINAW CITY SCHOOL DISTRICT	235 W GENESEE AVE	SAGINAW						1	
TBF GRAPHICS	832 S WATER ST	SAGINAW						1	
WALLER ST	312 WALLER ST	SAGINAW							1
WASHINGTON AVE 1137 S SAGINAW	1137 S WASHINGTON AVE	SAGINAW						1	
WASHINGTON AVE. 927 S.	927 S WASHINGTON	SAGINAW						1	
WEBBER STREET RETENTION BASIN	NW CORNER OF WEBBER AND FORDNEY	SAGINAW						1	
WICKES MACHINE CO	515 N WASHINGTON AVE	SAGINAW						1	
Lower Saginaw River, Saginaw County									
BUENA VISTA SCHOOLS	3267 WASWORTH ST	SAGINAW						1	1
BUENA VISTA TWP LF	HACK ROAD & OUTER DR	SAGINAW			1				
CARROLLTON RD 3100 CARROLLTON	3100 CARROLLTON RD	SAGINAW						1	
FERRO-MET SALVAGE	1011 N WASHINGTON	SAGINAW						1	
GENERAL MOTORS CORP	1629 N WASHINGTON AVE	SAGINAW						1	
GMC CHEVROLET SAGINAW CASTING & PARTS	2100 VETERANS MEMORIAL PARKWAY	SAGINAW				1			
LUNTZ CORPORATION	3666 CARROLLTON RD	CARROLLTON						1	
MAPLERIDGE RD 126, CARROLLTON	126 MAPLERIDGE RD	SAGINAW						1	
MI DEPT ENVIRONMENTAL QUALITY	344 W GENESEE AVE	SAGINAW			1			1	

Table 3-3. Hazardous Waste Sites Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	NPL	CERCLIS	CERCLIS NFP	CORRACTS	RAATS	State Site	Deleted State Site
MIDOT MAINT DIV SAGINAW	3504 E WASHINGTON AVE	BUENA VISTA TOWNSHIP			1	1	1		
MIDOT MAINT DIV SAGINAW	3504 E WASHINGTON AVE	SAGINAW						1	1
SAFETY KLEEN CORP	1811 WICCO DR	SAGINAW						1	
SAFETY-KLEEN CORP.	3899 WOLF RD	SAGINAW				1			
SARGENT DOCKS AND TERMINAL CO	5606 N WESTERVELT RD	SAGINAW						1	
SCHAEFER TECHNOLOGIES INC	3000 CARROLLTON RD	SAGINAW						1	
STONE TRANSPORT	3495 HACK RD	SAGINAW						1	
VETERANS MEMORIAL PARKWAY	1800 VETERANS MEMORIAL PARKWAY	SAGINAW						1	
Lower Saginaw River, Bay County									
105 18TH STREET	105 18TH STREET	BAY CITY						1	
ALAN E BOND TRUCKING-CRUSHING	3740 PATTERSON RD	BAY CITY							1
AMERICAN RECYCLING FIRE	4676 E. WILDER ROAD	BAY CITY		1					
AMOCO OIL CO	411 TIERNAN RD	BAY CITY						1	
BAY CITY INDUSTRIAL COMPLEX	112 N WATER ST	BAY CITY						1	
BAY CITY MIDDLEGROUNDS	800 EVERGREEN DRIVE	BAY CITY	1	1				1	
BAY HARBOR MARINA	5309 E WILDER RD	BAY CITY						1	
BAY INDUSTRIAL	1820 N TRUMBULL DR	BAY CITY						1	
BEACH AUTO PARTS	4421 ZIMMER RD	BAY CITY							1
CHAMBERS DICK AUTO BODY INC	515 WOODSIDE	ESSEXVILLE					1	1	
DAN DORE & ASSOCIATES	900 HARRY S. TRUMAN PARKWAY	BAY CITY			1			1	
DORE INDUSTRIAL DEVELOPMENT INC	501-607 MORTON & BACKUS ST	BAY CITY			1	1			

Table 3-3. Hazardous Waste Sites Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	NPL	CERCLIS	CERCLIS NFP	CORRACTS	RAATS	State Site	Deleted State Site
DOW CHEM CO BAY CITY PLP PLT	4675 E WILDER RD	BAY CITY			1				
DOW CHEMICAL COMPANY	4868 E WILDER RD	BAY CITY			1	1			
EJM MANUFACTURING LLC	209 MORTON ST	BAY CITY						1	
EXPRESS LUBE	1100 SALZBURG	BAY CITY						1	
FLETCHER OIL CO INC	800 MARQUETTE ST	BAY CITY						1	
FRANKS USED AUTO & PARTS	3033 BANGOR RD	BAY CITY						1	
GENERAL MOTORS CORPORATION	100 FITZGERALD ST	BAY CITY			1	1		1	
GM CPC KNIGHT MARINA	2331 KNIGHT RD	ESSEXVILLE							1
H HIRSCHFIELD SONS CO	1414 N MADISON AVE	BAY CITY						1	
JC WEADOCK PLANT	2555 N WEADOCK HIGHWAY	ESSEXVILLE							1
KOCH MATERIALS CO	318 ATLANTIC ST	BAY CITY						1	
LABADIE OLDSMOBILE	244 SAGINAW ST	BAY CITY			1			1	
MARQUETTE AVE., 500, BAY CITY	500 MARQUETTE AVE	BAY CITY						1	
MICHIGAN ARCHITECTURAL DEC	1317 N MADISON AVE	BAY CITY							1
MICHIGAN SUGAR CO	2600 S EUCLID AVE	BAY CITY							1
MIDLAND CONTRACTING	613 S WATER ST	BAY CITY						1	
OAKBROOK TRAILER PARK	406 STATE PARK DR	BAY CITY							1
PAINTER SUPPLY INC	406 E MIDLAND	BAY CITY						1	1
PEET PACKING CO	405 MORTON ST	BAY CITY						1	
RUPP OIL	711 MARTIN ST	BAY CITY						1	

Table 3-3. Hazardous Waste Sites Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	NPL	CERCLIS	CERCLIS NFP	CORRACTS	RAATS	State Site	Deleted State Site
SAGINAW BAY INDUSTRIES	242 N WATER ST	BAY CITY						1	
SALZBURG RD 905 BAY CITY	905 SALZBURG	BAY CITY						1	
SKIPPER MARINE OF MICHIGAN INC	1809 S WATER ST	BAY CITY						1	
TES DIVISION OF CCTC	903 WOODSIDE AVE	ESSEXVILLE					1	1	
ULTRA-CARBON	1310 MADISON AVE	BAY CITY						1	
VALLEY CHROME PLATERS CO	2020 S EUCLID AVE	BAY CITY		1					
W GERBER OTTO	205 S WATER ST	BAY CITY						1	
WILDER ROAD, 4676	4676 E. WILDER ROAD	BAY CITY						1	
Total in Upper Saginaw River			**0**	**0**	**2**	**1**	**1**	**28**	**2**
Total in Lower Saginaw River, Saginaw County			**0**	**0**	**3**	**3**	**1**	**13**	**2**
Total in Lower Saginaw River, Bay County			**1**	**3**	**6**	**3**	**2**	**28**	**8**
TOTAL SAGINAW RIVER FLOODPLAIN			**1**	**3**	**11**	**7**	**4**	**69**	**12**

Source: EDR 2007
NPL: National Priorities List (includes facilities on the NPL and those that are proposed for listing)
CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System
NFP: no further action
CORRACTS: corrective action sites under the Resource Conservation and Recovery Act (RCRA)
RAATS: RCRA Administrative Action Tracking System

Table 3-4. Facilities With Discharge Permits

Site	Address	City	Number of Discharge Permits
Upper Saginaw River			
CARROLLTON CONCRETE MIX INC	2924 CARROLLTON RD	SAGINAW	1
CITY ENVIRONMENTAL SERVICES INC	1311 N NIAGARA ST	SAGINAW	1
DIAL TENT & AWNING	5330 DAVIS ROAD	SAGINAW	1
FREDDS AUTO SALVAGE	70 W CENTER ST	SAGINAW	1
RIFKIN SCRAP IRON AND METAL CO	1445 N NIAGARA ST	SAGINAW	1
SAGINAW CO MS4	111 S MICHIGAN AVE	SAGINAW	1
SAGINAW MARINA INC	101 LEE ST	SAGINAW	1
Lower Saginaw River, Saginaw County			
VALLEY ASPHALT CO	2981 CARROLLTON RD	SAGINAW	1
SAGINAW ASPHALT-PORTABLE PLANT	SAGINAW ASPHALT-PORTABLE PLANT	SAGINAW	1
SAGINAW ASPHALT PAVING	3200 CARROLLTON RD	CARROLLTON	1
MICHIGAN SUGAR CO CARROLLTON PLANT	341 SUGAR ST	CARROLLTON	1
ALCHEM ALUMINUM INC	2600 NODULAR DR	SAGINAW	1
ALVAN MOTOR FREIGHT INC	2710 NODULAR DR	SAGINAW	1
BAY DOCK COMPANY-WIRT SAG. DOCK	4700 CROW ISLAND RD	SAGINAW	1
BAY SHIPPERS - SAGINAW	2677 NODULAR DR	SAGINAW	1
BUENA VISTA CHARTER TWP WWTP	2961 HACK RD	SAGINAW	1
CARROLLTON MUN GARAGE	1645 MAPLERIDGE RD	SAGINAW	1
CHAMPAGNE & MARX EXCAVATING	1200 KOCHVILLE RD	SAGINAW	1
CHAMPAGNE & MARX-CRUSHER #1	VARIOUS LOCATIONS	SAGINAW	1
CHAMPAGNE & MARX-CRUSHER #2	VARIOUS LOCATIONS	SAGINAW	1
CHAMPAGNE & MARX-CRUSHER #3	VARIOUS LOCATIONS	SAGINAW	1
CMI SCHNEIBLE COMPANY	2220 VETERANS MEMORIAL PARKWAY	SAGINAW	1

Table 3-4. Facilities With Discharge Permits

Site	Address	City	Number of Discharge Permits
FORMER BRUCE CARTAGE	3460 E WASHINGTON AVE	SAGINAW	1
GENERAL MOTORS CORP	1629 N WASHINGTON AVE	SAGINAW	1
LUNTZ CORPORATION	3666 CARROLLTON RD	SAGINAW	1
NATIONAL PATTERN INC	5900 SHERMAN ROAD	SAGINAW	1
R. R READY MIX	6050 MELBOURNE RD	SAGINAW	1
ROBIN GLEN MHP	5720 E WASHINGTON AVE	SAGINAW	1
SAGINAW BEARING CO	1400 AGRICOLA DR	SAGINAW	1
SAGINAW WWTP	2406 VETERANS MEMORIAL PARKWAY	SAGINAW	1
SARGENT DOCKS AND TERMINAL CO	5606 N WESTERVELT RD	SAGINAW	1
STONE TRANSPORT	3495 HACK RD	SAGINAW	1
Lower Saginaw River, Bay County			
ALAN E BOND TRUCKING-CRUSHING	3740 PATTERSON RD	BAY CITY	1
AMOCO OIL CO	411 TIERNAN RD	BAY CITY	1
ANDERSON SERVICE CENTER INC	2363 WEADOCK HIGHWAY	ESSEXVILLE	1
BANGOR TWP MS4-BAY	180 STATE PARK DR	BAY CITY	1
BAY CDC MS4-BAY	515 CENTER AVENUE	BAY CITY	1
BAY CITY WWTP	2905 N WATER ST	BAY CITY	2
BAY COUNTY DEPT OF WATER & SEWER	3933 PATTERSON RD	BAY CITY	1
BAY HARBOR MARINA	5309 E WILDER RD	BAY CITY	1
BAY WOOD HOMES INC	681 SOUTH RIVER RD	BAY CITY	1
BEACH AUTO PARTS	4421 ZIMMER RD	BAY CITY	1
BIT MAT PRODUCTS	401 TIERNAN RD	BAY CITY	1
BLOCKS MARINA-	996 RIVER RD	BAY CITY	1

Table 3-4. Facilities With Discharge Permits

Site	Address	City	Number of Discharge Permits
CARBONE OF AMERICA	900 HARRISON ST	BAY CITY	1
CECO-DE KARN & JC WEADOCK PLG	2742 WEADOCK HIGHWAY	ESSEXVILLE	1
COMPUTER OPERATED MFG INC	1710 LEWIS ST	BAY CITY	1
DOW CHEM-BAY CITY	99 TIERNAN RD	BAY CITY	1
ESSEXVILLE MS4-BAY	1107 WOODSIDE AVE	ESSEXVILLE	1
ESSEXVILLE WWTP	1008 BURNS ST	ESSEXVILLE	1
ESSROC CEMENT CORP	1601 SALINE ST	ESSEXVILLE	1
GM-BAY CITY PLANT	1001 WOODSIDE AVE	BAY CITY	1
GOUGEON BROTHERS, INC	100 PATTERSON AVE	BAY CITY	1
H HIRSCHFIELD SONS CO	1414 N MADISON AVE	BAY CITY	1
JAMES CLEMENTS AIRPORT	614 S RIVER RD	BAY CITY	1
MARATHON PETROLEUM CO	1806 MARQUETTE ST	BAY CITY	1
MARATHON PETROLEUM CO LLC	5011 E WILDER RD	BAY CITY	2
MICHIGAN SUGAR CO	2600 S EUCLID AVE	BAY CITY	1
NORTHERN CONCRETE PIPE INC	401 KELTON ST	BAY CITY	1
PAYNE AUTO INC-BAY CI	100 RIVER ROAD	BAY CITY	1
PIER 7 MARINA INC	963 E MIDLAND ST	BAY CITY	1
PYRAMID PAVING CO	1503 PINE ST	ESSEXVILLE	1
QUALITY TRANSPARENT BAG INC	110 MCGRAW ST	BAY CITY	1

Table 3-4. Facilities With Discharge Permits

Site	Address	City	Number of Discharge Permits
RENOSOL CORPORATION	691 S RIVER RD	BAY CITY	1
S C JOHNSON HOME STORAGE INC	4867 EAST WILDER ROAD	BAY CITY	1
SAND & STONE INC ESSEXVILLE	1008 SCHEURMANN ST	ESSEXVILLE	1
SCHMIDT INDUSTRIES	3290 PATTERSON RD	BAY CITY	1
SHORT FREIGHT LINES INC	459 RIVER RD	BAY CITY	1
SKIPPER MARINE OF MICHIGAN INC	1809 S WATER ST	BAY CITY	1
STRAITS WOOD TREATING	4804 E WILDER RD	BAY CITY	1
WIRT TRANSPORT CO INC	400 MARTIN ST	BAY CITY	1
Total in Upper Saginaw River			**7**
Total in Lower Saginaw River, Saginaw County			**25**
Total in Lower Saginaw River, Bay County			**41**
TOTAL SAGINAW RIVER FLOODPLAIN			**73**

Source: EDR 2007

Table 3-5. Reported Spills Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Source of Information			
			ERNS	HMIRS	DOT-OPS	PEAS
Upper Saginaw River						
3120 S WASHINGTON ST M-13	3120 S WASHINGTON ST	SAGINAW	1			
600 COURT ST	600 COURT ST	SAGINAW	1			
CINDERELLA INC	1215 S JEFFERSON AVE	SAGINAW	1			
CSX TRANSPORTATION INC	750 N WASHINGTON ST	SAGINAW		4		2
EATON CORPORATION	1000 RUST AVE	SAGINAW	1	1		
GENESEE PACKAGING PLANT	109 MCCOSKEY ST	SAGINAW	1			
GMC CENTRAL FOUNDRY DIV SAG MAL IRON	77 W CENTER ST	SAGINAW	3			3
J R HEINEMAN & SONS INC	1224 N NIAGARA ST	SAGINAW				1
Unidentified	Not Available	SAGINAW	1			
Unidentified	128 N WARREN	SAGINAW				1
Unidentified	729 N. PORTER	SAGINAW				1
Lower Saginaw River, Saginaw County						
3161 CARLTON RD	3161 CARLTON RD	SAGINAW	1			
MICHIGAN SUGAR CO CARROLLTON PLANT	341 SUGAR ST	CARROLLTON				1
PEERLESS TERMINAL CO	3160 CARROLLTON RD	SAGINAW	1			
Unidentified	3654 CHURCH ST	SAGINAW				1
Unidentified	3331 ELM ST	SAGINAW				1
1626 N WASHINGTON	1626 N WASHINGTON	SAGINAW	1			
1927 EAST BAY CITY ROAD- PRIVATE PROPERTY	1927 EAST BAY CITY ROAD	SAGINAW	1			
1957 FINDLEY RD	1957 FINDLEY ST	SAGINAW	1			

Table 3-5. Reported Spills Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Source of Information			
			ERNS	HMIRS	DOT-OPS	PEAS
736 N OUTER DR	736 N OUTER DR	SAGINAW	1			
BUENA VISTA CHARTER TWP WWTP	2961 HACK RD	SAGINAW				1
CMS ENERGY CORPORATION	5600 WESTERVELT RD	SAGINAW				1
FEDEX	3280 COMMERCE CENTER DR	SAGINAW		43		
GENERAL MOTORS CORP	1629 N WASHINGTON AVE	SAGINAW	4			1
GMC CHEVROLET SAGINAW CASTING & PARTS	2100 VETERANS MEMORIAL PARKWAY	SAGINAW	1			
M-81 EXPRESS STOP	3670 E WASHINGTON RD	SAGINAW				1
ROADWAY PACKAGE SYSTEMS	1750 WICCO DR	SAGINAW		22		
SAFETY-KLEEN CORP.	3899 WOLF RD	SAGINAW	5	7		
SAGINAW WWTP	2406 VETERANS MEMORIAL PARKWAY	SAGINAW	1			
T JACKS TRUCKING	3657 WOLF RD	SAGINAW		3		
VETERANS MEMORIAL HWY	1801 VETERANS MEMORIAL HWY	SAGINAW	1			
YELLOW FREIGHT SYSTEM INC	3751 WOLF RD	SAGINAW		2		
Unidentified	3749 WOLF RD	SAGINAW		2		
Unidentified	3600 CARROLLTON ROAD	NONE GIVEN			1	
Unidentified	3460 E WASHINGTON AVE	SAGINAW		1		
Unidentified	722 N OUTER DR	SAGINAW				1
Unidentified	2971 WADSWORTH	SAGINAW				1
Lower Saginaw River, Bay County						
207 S LINN ST	207 S LINN ST	BAY CITY	1			
2474 N WEADOCK HIGHWAY	2474 N WEADOCK HIGHWAY	ESSEXVILLE	1			
2643 N WEADOCK HIGHWAY	2643 N WEADOCK HIGHWAY	ESSEXVILLE	1			

Table 3-5. Reported Spills Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Source of Information			
			ERNS	HMIRS	DOT-OPS	PEAS
305 ATLATIC ST	305 ATLANTIC ST	BAY CITY	1			
398 STATE PARK DR.	398 STATE PARK DR	BAY CITY	2			
4367 WHEELER	4367 WHEELER	BAY CITY	1			
511 KELTON ST	511 KELTON ST	BAY CITY	1			
AMOCO OIL CO	411 TIERNAN RD		1			
BAY CITY OPS 100 FITZGERALD	BAY CITY OPS 100 FITZGERALD	BAY CITY	1			
BAY CITY WWTP	2905 N WATER ST	BAY CITY				1
BAY COUNTY DEPT OF WATER & SEWER	3933 PATTERSON RD	BAY CITY	1			1
BAY HARBOR MARINA	5309 WILDER RD	BAY CITY	1			
BROADWAY EXPRESS FUELS	2509 BROADWAY ST	BAY CITY				1
BUCKEYE PIPELINE CO	4741 WILDER RD	BAY CITY	1			1
CARBONE OF AMERICA	900 HARRISON ST	BAY CITY	1			
CAROLTON CONCRETE	1500 MAIN ST	ESSEXVILLE	1			
CONSUMERS ENERGY CO	2742 WEADOCK HIGHWAY	ESSEXVILLE	2			
DE KARNS PLANTS 3 & 4	2680 WEADOCK HIGHWAY	ESSEXVILLE	2			
DOW CHEMICAL COMPANY	4868 E WILDER RD	BAY CITY	1			
GENERAL MOTORS CORPORATION	100 FITZGERALD ST	BAY CITY	1			1
H HIRSCHFIELD SONS CO	1414 N MADISON AVE	BAY CITY	1			
JC WEADOCK PLANT	2555 N WEADOCK HIGHWAY	ESSEXVILLE	1			2
MARATHON PETROLEUM CO	1806 MARQUETTE ST	BAY CITY				1
MARATHON PETROLEUM CO LLC	5011 E WILDER RD	BANGOR	1			
MICHEAL SUPERMARKET	211 WASHINGTON AVE	BAY CITY	1			
MICHIGAN SUGAR CO	2600 S EUCLID AVE	BAY CITY				11
MOBILE MARINE	3456 PATTERSON RD	BAY CITY				1

Table 3-5. Reported Spills Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Source of Information			
			ERNS	HMIRS	DOT-OPS	PEAS
OPS	100 FITZGERALD ST	BAY CITY	1			
SHEEN SIZE: UNKNOWN	SHEEN SIZE: UNKNOWN	BAY CITY	1			
SKIPPER MARINE OF MICHIGAN INC	1809 S WATER ST	BAY CITY	1			
USCG STATION	2405 WEADOCK RD	ESSEXVILLE	1			
WHEELER & BANGOR ST	WHEELER & BANGOR ST	KAWKAWLIM	1			
WHEELER LANDING YACHT CLUB	600 MARQUETTE	BAY CITY	1			1
Unidentified	3712 MARGARET LN	BANGOR			1	
Unidentified	3765 UTAH DRIVE	BAY CITY				1
Unidentified	3309 STATE ST RD	BAY CITY				1
Unidentified	WHEELER RD. / STATE PARK	BAY				1
Unidentified	4459 E WHEELER RD	BAY CITY				1
Unidentified	3600 PATTERSON ROAD	BAY CITY				1
Unidentified	4751 E WILDER RD	BAY CITY		5		
Unidentified	1606 WOODSIDE AVE	ESSEXVILLE			1	
Unidentified	1316 WOOD SIDE AVE	ESSEXVILLE				1
Unidentified	3211 N WATER ST	BAY CITY			1	
Unidentified	903 E. INDIANA ST	BAY CITY				1
Unidentified	201 E CALUMET	BAY CITY				1
Unidentified	3322 KRISTIN COURT	BAY CITY				1
Unidentified	805 SALZBURG AVE	BAY CITY			1	
Unidentified	5604 MEADOW VIEW DR	BAY CITY				1

Table 3-5. Reported Spills Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Source of Information			
			ERNS	HMIRS	DOT-OPS	PEAS
Unidentified	2918 S EUCLID AVE	BAY CITY				1
Unidentified	765 S RIVER RD	BAY CITY				1
Total Upper Saginaw River			**9**	**5**	**0**	**8**
Total Lower Saginaw River, Saginaw County			**18**	**80**	**1**	**9**
Total Lower Saginaw River, Bay County			**31**	**5**	**4**	**33**
TOTAL SAGINAW RIVER FLOODPLAIN			**58**	**90**	**5**	**50**

Source: EDR 2007
DOT-OPS: Department of Transporation, Office of Pipeline Safety Incident and Accident data.
ERNS: The Emergency Response Notification System records and stores information on reported releases of oil and hazardous substances. The source of this database is the U.S. EPA.
HMIRS: The Hazardous Materials Incident Report System contains hazardous materials spill incidents reported to the Department of Transportation
PEAS: Environmental pollution emergencies reported to the Department of Environmental Quality such as tanker accidents, pipeline breaks, and release of reportable quantities of hazardous substances.

Table 3-6. Facilities Within or Adjacent to the Saginaw River Floodplain Reporting Non-Zero Emissions to the Toxics Release Inventory in 2005

Facility	TRI Chemicals	On-Site Releases (lbs/yr)	Off-Site Releases (lbs/yr)	Total Releases (lbs/yr)
Upper Saginaw River				
Eaton Corporation	Chromium	0	163	163
1000 Rust Ave	Lead	0	4	4
Saginaw	Manganese	0	650	650
GMC Central Foundry Div Sag Mal Iron	Chromium compounds	446	440	886
77 W Center St	Cumene Hydroperoxide	550	390	940
Saginaw	Diisocyanates	nr	nr	0
	Lead compounds	364.8	3800.8	4165.6
	Manganese compounds	1790	8810	10600
Lower Saginaw River, Saginaw County				
Alchem Aluminum Inc	Dioxin and Dioxin-like compounds	0.001	0.059	0.059
2600 Nodular Dr	Lead	0	1	1
Saginaw				
General Motors Corp	Diethanolamine	0	370	370
1629 N Washington Ave	Diisocyanates	24	0	24
Saginaw	Ethylbenzene	11500	0	11500
	N-methyl-2-pyrrolidone	2670	0	2670
	Phenol	2370	0	2370
	Styrene	18500	0	18500
	Sulfuric acid	70	0	70
	Toluene	11500	0	11500
	Triethylamine	22400	0	22400
Michigan Sugar Co Carrollton Plant	Ammonia	3900	0	3900
341 Sugar St				
Carrollton				
Safety-Kleen Corp.	Ethylene glycol	14	0	14
3899 Wolf Rd				
Saginaw				

Table 3-6. Facilities Within or Adjacent to the Saginaw River Floodplain Reporting Non-Zero Emissions to the Toxics Release Inventory in 2005

Facility	TRI Chemicals	On-Site Releases (lbs/yr)	Off-Site Releases (lbs/yr)	Total Releases (lbs/yr)
Lower Saginaw River, Bay County				
Carbone of America	Chlorine	209	0	209
900 Harrison St				
Bay City				
Consumers Energy Co	Ammonia	4149	0	4149
2742 Weadock Highway	Barium compounds	926674	0	926674
Essexville	Chromium compounds	34570	0	34570
	Copper compounds	54242	0	54242
	Dioxin and Dioxin-like compounds	0.002	0	0.002
	Hydrochloric acid	1996934	0	1996934
	Hydrogen fluoride	189585	0	189585
	Lead compounds	17849.3	0	17849.3
	Manganese compounds	81062	0	81062
	Mercury compounds	325.42	0	325.42
	Naphthalene	8	0	8
	Nickel compounds	33177	0	33177
	Polycyclic aromatic compounds	3.7	0	3.7
	Sulfuric acid	194056	0	194056
	Vanadium compounds	83496	0	83496
	Zinc compounds	58081	0	58081
GM-Bay City Plant	Copper	1	9353	9354
1001 Woodside Ave	Lead	0.7	1509	1509.7
Bay City	Manganese	14	316	330
	Nickel	1	15	16
Marathon Petroleum Co	1,2,4-Trimethylbenzene	255	0	255
1806 Marquette St	Benzene	1000	0	1000
Bay City	Benzo(g,h,i)perylene	1	0	1
	Ethylbenzene	500	0	500
	Lead compounds	1.3	0.4	1.7
	N-Hexane	2050	0	2050
	Naphthalene	255	0	255

Table 3-6. Facilities Within or Adjacent to the Saginaw River Floodplain Reporting Non-Zero Emissions to the Toxics Release Inventory in 2005

Facility	TRI Chemicals	On-Site Releases (lbs/yr)	Off-Site Releases (lbs/yr)	Total Releases (lbs/yr)
	Polycyclic aromatic compounds	4	0	4
	Toluene	1250	0	1250
	Xylene (mixed isomers)	1005	0	1005
Michigan Sugar Co 2600 S Euclid Ave Bay City	Ammonia	28560	0	28560
TOTAL SAGINAW RIVER FLOODPLAIN		**3,785,418.22**	**25,822.26**	**3,811,240.48**

Source: http://www.epa.gov/triexplorer/
TRI: Toxics Release Inventory

Table 3-7. Facilities with Underground or Above Ground Storage Tanks Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Leaking Underground Storage Tanks	Underground Storage Tanks	Above Ground Storage Tanks
Upper Saginaw River					
423 SOUTH MICHIGAN AVENUE	423 S MICHIGAN AVE	SAGINAW	1		
606 S. WASHINGTON AVE.	606 S WASHINGTON AVE	SAGINAW	1		
7-ELEVEN STORE #148	6980 BAY RD	SAGINAW		1	
7-ELEVEN STORE #162	614 S WASHINGTON	SAGINAW		1	
AGINAW MACHINE SYSTEMS INC	800 N HAMILTON ST	SAGINAW	1	1	
ALL SEASONS AUTOMOTIVE	300 N MICHIGAN AVE	SAGINAW	1	2	
AMOCO OIL #7333	301 S MICHIGAN AVE	SAGINAW	1	2	
AT&T	430 S WASHINGTON AVE	SAGINAW	1	1	1
AUBRY CLEANERS	214 JANES ST	SAGINAW	1		
B & P PROCESS EQUIPMENT AND SYSTEMS L.L.C.	1000 HESS ST	SAGINAW		1	
BAUER DRY CLEANING	311 N HAMILTON	SAGINAW		1	
BUSHEY RADIATOR & AUTO GLASS	715 S FRANKLIN	SAGINAW	1	1	
CAR WASH	630 S WASHINGTON	SAGINAW	1	1	
CARROLLTON CONCRETE MIX INC	2924 CARROLLTON RD	SAGINAW	1	1	
CENTRAL MICHIGAN RAILWAY	310 MEREDITH ST	SAGINAW	1	1	
CINDERELLA INC	1215 S JEFFERSON AVE	SAGINAW		1	
CITY ENVIRONMENTAL SERVICES INC	1311 N NIAGARA ST	SAGINAW	1	1	1
CITY OF SAGINAW	2600 CARROLLTON RD	SAGINAW	1		
CITY OF SAGINAW	612 FEDERAL AVE	SAGINAW	1	1	
CITY OF SAGINAW	1315 S WASHINGTON AVE	SAGINAW		1	
CITY OF SAGINAW	108 N NIAGARA ST	SAGINAW		1	
CITY OF SAGINAW GARAGE	1435 S WASHINGTON AVE	SAGINAW	1	1	
COATES TIRE CO	300 JANES AVE	SAGINAW	1	1	
COVENANT HEALTH CARE MICHIGAN	515 N MICHIGAN AVE	SAGINAW		1	

Table 3-7. Facilities with Underground or Above Ground Storage Tanks Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Leaking Underground Storage Tanks	Underground Storage Tanks	Above Ground Storage Tanks
CROSSTOWN MARATHON	306 E REMINGTON ST	SAGINAW	1	1	
DAWKINS SERVICE	300 S WARREN AVE	SAGINAW	1	1	
DAWN DONUTS, UNIT #22-653	318 S MICHIGAN AVE	SAGINAW	1	1	
DIXIE CYCLE SALES INC DBA WESTBAY HONDA	6170 BAY RD	SAGINAW		1	
DORE ENVIRONMENTAL	107 W GENESEE AVE	SAGINAW		1	
EATON CORPORATION	1000 RUST AVE	SAGINAW	1	1	
EMERSON STREET RETENTION BASIN	725 SOUTH WATER ST	SAGINAW	1	1	
FILL & WASH	216 THOMPSON ST	SAGINAW	1	1	
FILL & WASH	1500 S MICHIGAN AVE	SAGINAW	1	1	
FILL & WASH	409 DEARBORN ST	SAGINAW	1	1	
FIRESTONE BUILDING	130 S WATER	SAGINAW	1	1	
FOREST LAWN CEMETARY	3210 S WASHINGTON AVE	SAGINAW	1	1	
FORMER B F BOODRICH BLDG	210 N WARREN AVE	SAGINAW	1		
FORMER DRAPER PROPERTY	1450 N MICHIGAN	SAGINAW	1	1	
FRUTCHEY BEAN CO	105 LYON ST	SAGINAW		1	
GARBER BUICK CO	315 W GENESEE	SAGINAW	1	1	
GASE BAKERIES	404 W GENESEE AVE	SAGINAW	1	1	
GMC CENTRAL FOUNDRY DIV SAG MAL IRON	77 W CENTER ST	SAGINAW	1	1	
PHYSICIAN'S OFFICE BUILDING	800 COOPER	SAGINAW		1	
INTERCITY TRUCKING SERVICE	2870 EDDY ST	SAGINAW	1	1	
J R HEINEMAN & SONS INC	1224 N NIAGARA ST	SAGINAW	1	1	
JEFFERSON OIL CO	536 S WATER	SAGINAW			1
JONES TRANSFER CO-SAGINAW	1221 N NIAGARA ST	SAGINAW	1	1	
KNIGHT ENTERPRISES INC K73	2811 S WASHINGTON AVE	SAGINAW	1	1	

Table 3-7. Facilities with Underground or Above Ground Storage Tanks Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Leaking Underground Storage Tanks	Underground Storage Tanks	Above Ground Storage Tanks
LOWE'S HOME IMPROVEMENT STORE #562	2258 TITTABAWASSEE RD	SAGINAW			1
MARATHON STATION	1923 N MICHIGAN AVE	SAGINAW	1	1	
MDNR REAL ESTATE DIV #25967	2725 S WASHINGTON	SAGINAW	1	1	
MERRILL FABRICATORS	2119 RIVER ST	SAGINAW		1	
MI DEPT/TRANSPORTATION	6530 BAY RD	SAGINAW	1		
MICHIGAN & DAVENPORT SUNOCO	2205 N MICHIGAN AVE	SAGINAW	1	1	
MICHIGAN AIR GAS	5645 BAY RD	SAGINAW			1
MICHIGAN AIRGAS	311 STOKER DR	SAGINAW	1	1	
MICHIGAN BELL TELEPHONE CO	309 S WASHINGTON AVE	SAGINAW		1	
MONARCH SERVICE	734 N WASHINGTON AVE	SAGINAW	1	1	
MOONEY INVESTMENT CO	824 GRATIOT AVE	SAGINAW	1	1	
MORLEY PARK	101 N WATER STREET	SAGINAW	1		
NEXT DOOR FOOD STORE	2482 TITTABAWASSEE RD	SAGINAW	1	1	
PAXSON OIL CO	1824 N MICHIGAN AVE	SAGINAW	2	2	
PINE CREEK LAND MANAGEMENT	2525 CARROLLTON RD	SAGINAW	1	1	
POCHELON LINCOLN MERCURY	215 W GENESEE AVE	SAGINAW	1	1	
PONY EXPRESS COURIER CORP	306 STOKER DR	SAGINAW	1	1	
RIFKIN SCRAP IRON AND METAL CO	1445 N NIAGARA ST	SAGINAW	1	1	
RITE AID CORP	812 WILLIAMS ST	SAGINAW	1	1	
S MICHIGAN EXPRESS STOP	408 S MICHIGAN AVE	SAGINAW	1	1	

Table 3-7. Facilities with Underground or Above Ground Storage Tanks Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Leaking Underground Storage Tanks	Underground Storage Tanks	Above Ground Storage Tanks
SAGINAW CITY SCHOOL DISTRICT	235 W GENESEE AVE	SAGINAW	1		
SAGINAW CIVIC CENTER	303 JOHNSON ST	SAGINAW	1	1	
SAGINAW COUNTY JAIL	208 S HARRISON ST	SAGINAW	1	1	
SAGINAW DIVISION PLANT #2	1400 HOLMES ST	SAGINAW	1	1	
SAGINAW GENERAL HOSPITAL	1447 N HARRISON ST	SAGINAW	1	1	
SAGINAW MARINA INC	101 LEE ST	SAGINAW	1	1	
SAGINAW MOSQUITO CONTROL	211 CONGRESS AVE	SAGINAW		1	1
SAGINAW PRODUCTS CORP	68 WILLIAMSON ST	SAGINAW		1	
SAGINAW RIVERFRONT PROPERTY	222 N NIAGRA	SAGINAW	1		
SAGINAW TRANSIT AUTHORITY	615 REGIONAL SERVICES	SAGINAW	1	1	
SAGINAW WATER TREATMENT PLANT	522 EZRA RUST	SAGINAW	1	1	
SAGINAW WELDING	5350 DAVIS RD	SAGINAW			1
SAINT MARY'S HOSPITAL	800 S WASHINGTON AVE	SAGINAW			1
SAINT MARY'S HOSPITAL	800 S WASHINGTON AVE	SAGINAW		1	
SAM'S CLUB #6663	5644 BAY RD	SAGINAW		1	
SAROW OLDSMOBILE INC	321 N MICHIGAN AVE	SAGINAW	1	1	
SBS PRODUCTS INC	302 WALLER ST	SAGINAW	1	1	
SPEEDWAY 2242	2215 TITTABAWASSEE RD	SAGINAW	1	1	
ST LUKE'S HOSPITAL	700 COOPER ST	SAGINAW	1	1	
SUPER FLITE OIL CO INC	1602 N BOND ST	SAGINAW	1	1	
SUPERIOR DAIRIES	1411 HOLMES ST	SAGINAW			1
TOTAL PETROLEUM CO 2608	6483 BAY RD	SAGINAW	1	1	

Table 3-7. Facilities with Underground or Above Ground Storage Tanks Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Leaking Underground Storage Tanks	Underground Storage Tanks	Above Ground Storage Tanks
TREASURE ISLAND	924 N NIAGARA ST	SAGINAW	1		
TRI CITY SEAL COATING	2870 HARRISON ST	SAGINAW	1	1	
US POSTAL SERVICE	1233 S WASHINGTON	SAGINAW	1	1	
WAREHOUSE	425 S WARREN AVE	SAGINAW	1	1	
WEST PIER MARQUETTE	145 DAVENPORT	SAGINAW	1	1	
Lower Saginaw River, Saginaw County					
AGRICO CHEMICAL CO	1753 N 6TH ST	SAGINAW		1	
SAGINAW ROCK PRODUCTS CO	1701 N 1ST ST	SAGINAW	1	1	1
YEONG P. HONG	509 SHATTUCK RD	SAGINAW	1	1	
FERRO-MET SALVAGE	1011 N WASHINGTON	SAGINAW	1	1	
VALLEY ASPHALT CO	2981 CARROLLTON RD	SAGINAW	1	1	2
MAC ARTHUR ROOFING & SHEET METAL	3046 CARROLLTON RD	SAGINAW		1	
SAGINAW ASPHALT PAVING	3200 CARROLLTON RD	CARROLLTON	1	1	
PEERLESS TERMINAL CO	3160 CARROLLTON RD	SAGINAW	1	1	
MICHIGAN SUGAR CO CARROLLTON PLANT	341 SUGAR ST	CARROLLTON	1	1	
STATUIB #1 JOHN H NICKODENS	3161 CARROLLTON RD	SAGINAW	1	1	
SOLID STATE SERVICE	548 SHATTUCK RD	SAGINAW		1	
AL-JEAN CORPORATION	1750 WICCO DR	SAGINAW	1		
ALVAN MOTOR FREIGHT INC	2710 NODULAR DR	SAGINAW	1	1	1
ATLAS WAREHOUSING CO	3720 E WASHINGTON RD	SAGINAW		1	
AYLA LAND CO	100 E JOHNSON	SAGINAW	1	1	
BARBS PARTY STORE	370 N ADAM ST	SAGINAW	1	1	
BAY DOCK COMPANY-WIRT SAG. DOCK	4700 CROW ISLAND RD	SAGINAW		1	
BECKER MARINE SALES & SERVICE INC	355 N ADAMS ST	SAGINAW	1		
BOURDOW TRUCKING CO INC	6950 N MICHIGAN	SAGINAW	1	1	

Table 3-7. Facilities with Underground or Above Ground Storage Tanks Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Leaking Underground Storage Tanks	Underground Storage Tanks	Above Ground Storage Tanks
BROOKS BEVERAGE	2717 N WASHINGTON AVE	SAGINAW	1		
BUENA VISTA CHARTER TWP WWTP	2961 HACK RD	SAGINAW	1	1	
BULK PLANT	1840 VETERANS MEMORIAL PARKWAY	SAGINAW	1	1	
CARROLLTON HIGH SCHOOL	1235 MAPLE RIDGE RD	SAGINAW	1	1	
CARROLLTON MUN GARAGE	1645 MAPLERIDGE RD	SAGINAW	1	1	
CENTRAL TRANSPORT	1831 FINDLEY ST	SAGINAW		1	
CHAMPAGNE & MARX EXCAVATING INC	1445 LIBERTY RD	SAGINAW	1	1	
CITY/SAGINAW-RESOURCE RECOVERY	911 VETERANS MEMORIAL PARKWAY	SAGINAW	1	1	
CUMMINS BRIDGEWAY LLC	722 N OUTER DR	SAGINAW	1	1	
DARLING INTERNATIONAL INC	340 TYLER ST	CARROLLTON	1	1	2
DIESEL TRUCK SALES INC	2619 N WASHINGTON	SAGINAW	1	1	
DON PLOWDREY	1548 PIERCE RD	SAGINAW		1	
FLYING J TRAVEL PLAZA	3475 E WASHINGTON	SAGINAW	1	1	1
FORMER BRUCE CARTAGE	3460 E WASHINGTON AVE	SAGINAW	1	1	
GENERAL MOTORS CORP	1629 N WASHINGTON AVE	SAGINAW	1	1	
GLASTENDER INCORPORATED	1455 AGRICOLA DR	SAGINAW		1	
GMC CHEVROLET SAGINAW CASTING & PARTS	2100 VETERANS MEMORIAL PARKWAY	SAGINAW	1	1	
JACK DEISIG	6170 HACK RD	SAGINAW		1	
LAFARGE NORTH AMERICA INC	30 MAPLERIDGE RD	CARROLLTON	1	1	
LUNTZ CORPORATION	3666 CARROLLTON RD	CARROLLTON	1	1	
M-81 EXPRESS STOP	3670 E WASHINGTON RD	SAGINAW	1	1	1
MI DEPT ENVIRONMENTAL QUALITY	1412 N WASHINGTON	SAGINAW	1		
MID MICHIGAN EQUIPMENT CO	3235 E WASHINGTON RD	SAGINAW		1	1
PBG MICHIGAN LLC	736 N OUTER DR	SAGINAW	1	1	
PURITY CYLINDER GASES INC	3595 WOLF RD	SAGINAW			1

Table 3-7. Facilities with Underground or Above Ground Storage Tanks Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Leaking Underground Storage Tanks	Underground Storage Tanks	Above Ground Storage Tanks
R. R READY MIX	6050 MELBOURNE RD	SAGINAW	1	1	
ROBERT RUYTS	6370 WILSHIRE RD	SAGINAW		1	
SAFETY-KLEEN CORP.	3899 WOLF RD	SAGINAW			1
SAGINAW WWTP	2406 VETERANS MEMORIAL PARKWAY	SAGINAW	1	1	
STANLEY CUPP	3460 CARROLLTON RD	CARROLLTON	1	1	
STONE TRANSPORT	3495 HACK RD	SAGINAW			1
STONE TRANSPORT	3761 WOLF RD	SAGINAW		1	
STONE TRANSPORT	3429 WOLF RD	SAGINAW	1	1	
SUPER FLITE OIL CO INC	416 S WESTERVELT RD	SAGINAW	1	1	
T JACKS TRUCKING	3657 WOLF RD	SAGINAW		1	
TRI CITY PATTERN CO	3811 CARROLLTON RD	CARROLLTON	1	1	
TRI CITY WAREHOUSE CO	1957 FINDLEY ST	SAGINAW		1	
UPPER LAKES TIRE OF SAGINAW	3685 E WASHINGTON RD	SAGINAW	1	1	
WEILAND SALES INC	3165 WOLF RD	SAGINAW			1
YELLOW FREIGHT SYSTEM INC	3751 WOLF RD	SAGINAW		1	
ZILWAUKEE DEPT OF PUBLIC WORKS	205 S FRANKLIN	SAGINAW	1	1	
Lower Saginaw River, Bay County					
105 18TH STREET	105 18TH STREET	BAY CITY		1	
7-ELEVEN STORE #159	1915 S EUCLID AVE	BAY CITY	1	1	
7-ELEVEN W/GAS STORE #79	6275 WESTSIDE SAGINAW RD	BAY CITY		1	
A.W. EURICH PLUMBING & HEATING C	610 ADAMS ST	BAY CITY		1	
AGA GAS, INC.	4385 WILDER RD	BAY CITY			1
AMOCO OIL CO	411 TIERNAN RD	BAY CITY	1	1	1
AMOCO OIL CO	WILDER RD & PRAIRIE	BAY CITY		1	
AMOCO OIL CO	415 E MIDLAND	BAY CITY		1	

Table 3-7. Facilities with Underground or Above Ground Storage Tanks Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Leaking Underground Storage Tanks	Underground Storage Tanks	Above Ground Storage Tanks
BANGOR CHARTER TWP	3921 WHEELER RD	BAY CITY	1	1	
BAY AGGREGATES INC	301 N WATER ST	BAY CITY		1	
BAY CAST INC	400 WEBSTER ST	BAY CITY		1	
BAY CITY AIRGAS GREAT LAKE	311 COLUMBUS AVE	BAY CITY	1		
BAY CITY AIRGAS GREAT LAKES	311 COLUMBUS AVE	BAY CITY		1	1
BAY CITY DPW	800 S WATER ST	BAY CITY	1	1	
BAY CITY E.TERMINAL (FORMER UDS)	5013 WILDER RD	BAY CITY			1
BAY CITY ELEC LIGHT & POWER	900 S WATER ST	BAY CITY	1		
BAY CITY ELECTRIC LIGHT & POWER	1000 S WATER ST	BAY CITY			1
BAY CITY FIRE DEPT #4	212 S DEAN ST	BAY CITY		1	
BAY CITY HOUSING COMMISSION	1200 N MADISON AVE	BAY CITY		1	
BAY CITY INDUSTRIAL COMPLEX	112 N WATER ST	BAY CITY	1	1	
BAY CITY MILLING	715 MCGRAW ST	BAY CITY	1	1	
BAY CITY POST OFFICE	1000 WASHINGTON AVE	BAY CITY	1	1	
BAY CITY WWTP	2905 N WATER ST	BAY CITY		1	1
BAY COUNTY BUILDING	911 N MADISON	BAY CITY	1	1	
BAY COUNTY CONFERENCE CENTER	621 N WATER	BAY CITY		1	
BAY COUNTY DEPT OF WATER & SEWER	3933 PATTERSON RD	BAY CITY	1	1	
BAY COUNTY GOLF COURSE	584 W HAMPTON RD	ESSEXVILLE		1	
BAY COUNTY HISTORICAL SOCIETY	321 WASHINGTON AVE	BAY CITY	1	1	
BAY COUNTY LAW ENFORCEMENT CTR	501 3RD ST	BAY CITY	1	1	
BAY COUNTY LIBRARY	500 CENTER AVE	BAY CITY	1	1	
BAY COUNTY PARKING LOT	1211 MADISON DIRECTLY BEHIND EAS	BAY CITY		1	
BAY HARBOR MARINA	5309 E WILDER RD	BAY CITY	1	1	
BAY METRO TRANSIT	1510 N JOHNSON	BAY CITY	1	1	

Table 3-7. Facilities with Underground or Above Ground Storage Tanks Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Leaking Underground Storage Tanks	Underground Storage Tanks	Above Ground Storage Tanks
BAY METRO WATER PLANT	460 STATE PARK DR	BAY CITY		1	
BAY VALLEY OIL	1311 S HENRY STREET	BAY CITY	1	1	
BAY VALLEY RESORT	2470 OLD BRIDGE RD	BAY CITY	1	1	
BEN KARBOWSKI OIL CO	101 TIERNAN	BAY CITY			1
BIT MAT PRODUCTS	401 TIERNAN RD	BAY CITY			1
BOATHOUSE MARINE INC	1111 N WATER ST	BAY CITY		1	
BOSCO FRUIT CO.	407 11TH ST	BAY CITY	1	1	
BROADWAY EXPRESS FUELS	2509 BROADWAY ST	BAY CITY	1	1	
CITY OF ESSEXVILLE	1600 WOODSIDE AVE	ESSEXVILLE	1		
CJS RICHARDSON STORE	2705 BANGOR RD	BAY CITY		1	
COCA COLA BOTTLING CO	2500 BROADWAY	BAY CITY	1	1	
CONSUMERS ENERGY CO	2742 WEADOCK HIGHWAY	ESSEXVILLE			1
CORY PLACE - PARKING LOT	908 N MADISON	BAY CITY		1	
DE KARNS PLANTS 3 & 4	2680 WEADOCK HIGHWAY	ESSEXVILLE	1	1	
DORE INDUSTRIAL DEVELOPMENT INC	501-607 MORTON & BACKUS ST	BAY CITY		1	
DORES STORE	6183 W SIDE SAGINAW RD	BAY CITY		1	
DUNLOP PONTIAC INC	517 WASHINGTON AVE	BAY CITY	1	1	
ESSEXVILLE MARATHON	1703 WOODSIDE AVE	ESSEXVILLE	1	1	
ESSEXVILLE WWTP	1008 BURNS ST	ESSEXVILLE		1	
FIRE STATION #5	1209 E SMITH ST	BAY CITY	1	1	
FIRESTONE STORE #2541/006483	416 WASHINGTON AVE	BAY CITY	1	1	
FLETCHER OIL CO INC	800 MARQUETTE ST	BAY CITY	1	1	1
FORMER AUTO SALES & SERVICE	600 SAGINAW ST	BAY CITY	1		
FORMER BRESNAN BUILDING	1211 WOODSIDE AVE	ESSEXVILLE	1	1	
FORMER FREEDOM DRIVING AIDS	901 SALZBURG AVE	BAY CITY	1	1	

Table 3-7. Facilities with Underground or Above Ground Storage Tanks Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Leaking Underground Storage Tanks	Underground Storage Tanks	Above Ground Storage Tanks
FORMER GAS STATION	250 WASHINGTON AVE	BAY CITY	1		
FORMER MEL'S SERVICE	702 N HENRY ST	BAY CITY	1	1	
FORWARD CORP	6180 S WESTSIDE SAGINAW RD	BAY CITY	1	1	
GARFIELD MART INC	322 GARFIELD AVE	BAY CITY	1	1	
GENERAL MOTORS CORPORATION	100 FITZGERALD ST	BAY CITY	1	1	
GENERAL PARTS INC	508 MCGRAW ST	BAY CITY	1	1	
GILROYS	515 LAFAYETTE	BAY CITY			1
GOODYEAR AUTO SVC CTR GALLERIA	520 CENTER AVE	BAY CITY	1	1	
GRAND RENTAL STATION	1109 SALZBURG AVE	BAY CITY			1
H HIRSCHFIELD SONS CO	3125 N WATER ST	BAY CITY		1	
H HIRSCHFIELD SONS CO	1414 N MADISON AVE	BAY CITY	1	1	
HAYWARD FARMS	1993 RUSSEL RD	BAY CITY		1	
HENRY REALTY	823 GARFIELD	BAY CITY	1	1	
HEREFORD & HOPS	902 E MIDLAND	BAY CITY	1	1	
HOLY TRINITY CHURCH	906 S WENONA ST	BAY CITY		1	
HUGHES ELEMENTARY SCHOOL	805 LANGSTAFF ST	ESSEXVILLE	1	1	
INTERNATIONAL RV WORLD	2717 DELTA RD	BAY CITY			1
ITI SITE	800 MARTIN ST	BAY CITY	1	1	
JACK WALRAVEN CONTRACTING CO	1200 MARQUETTE AVE	BAY CITY		1	
JAMES CLEMENTS AIRPORT	614 S RIVER RD	BAY CITY		1	
JC WEADOCK PLANT	2555 N WEADOCK HIGHWAY	ESSEXVILLE	1	1	2
KOCH MATERIALS CO	318 ATLANTIC ST	BAY CITY	1	1	1
L SURATH & SONS INC	1640 MARQUETTE ST	BAY CITY		1	
LABADIE OLDSMOBILE	244 SAGINAW ST	BAY CITY	1	1	
MARATHON PETROLEUM CO	1806 MARQUETTE ST	BAY CITY			1

Table 3-7. Facilities with Underground or Above Ground Storage Tanks Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Leaking Underground Storage Tanks	Underground Storage Tanks	Above Ground Storage Tanks
MARATHON PETROLEUM CO LLC	5011 E WILDER RD	BAY CITY		1	1
MARCAN	800 WOODSIDE AVE	BAY CITY		1	
MCCOY HEATING & COOLING	303 S WATER ST	BAY CITY	1	1	
MEL'S CAMPER SALES	3956 PATTERSON RD	BAY CITY			1
MICHIGAN BELL TELEPHONE COMP	807 WOODLAND ST	BAY CITY	1	1	
MICHIGAN BELL TELEPHONE COMPANY	605 CENTER AVE	BAY CITY		1	
MICHIGAN SUGAR CO	2600 S EUCLID AVE	BAY CITY	1	1	
MIKE COLLINS	301 WOODSIDE LN	BAY CITY	1	1	
MUNLEY-SMITH AVIATION INC	616 RIVER RD	BAY CITY	1	1	
NATIONAL CITY BANK	300 CENTER AVE	BAY CITY	1	1	
NORCO REALTY CO	110 WASHINGTON AVE	BAY CITY	1	1	
NORTHERN CONCRETE PIPE INC	401 KELTON ST	BAY CITY	1	1	1
NORTHERN SUPPLY CO	1111 S HENRY ST	BAY CITY		1	
NW CORNER SALZBURG & EUCLID	1912 S EUCLID AVE	BAY CITY	1		
OLD TOWN GARAGE	200 WASHINGTON AVE	BAY CITY	1	1	
P.T. SERVICE	200 SALZBURG AVE	BAY CITY	1	1	
PAINTER SUPPLY INC	1123 SAGINAW ST	BAY CITY		1	
PARKING LOT	1121 N SAGINAW ST	BAY CITY	1	1	
PARKWAY STORE	3885 KAWKAWLIN RIVER DR	BAY CITY	1	1	
PATTERSON SERVICE	1411 MARQUETTE	BAY CITY		1	
PAXSON OIL CO	1507 WOODSIDE AVE	ESSEXVILLE	1	1	
PEET PACKING CO	405 MORTON ST	BAY CITY	1	1	
PHILS BANK UNION 76	1017 MARQUETTE ST	BAY CITY	1	1	
PIER 7 MARINA INC	963 E MIDLAND ST	BAY CITY	1	1	
PYRAMID PAVING CO	1503 PINE ST	ESSEXVILLE	1	1	1

Table 3-7. Facilities with Underground or Above Ground Storage Tanks Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Leaking Underground Storage Tanks	Underground Storage Tanks	Above Ground Storage Tanks
QUALITY TRANSPARENT BAG INC	110 MCGRAW ST	BAY CITY	1	1	
RELIABLE LEASING CO	801 S HENRY ST	BAY CITY	1	1	
RENEW SYSTEMS INC	1009 S HENRY ST	BAY CITY	1	1	
RON CROOK SERVICE	363 1/2 STATE PARK DR	BAY CITY	1	1	
ROTH CLEANERS INC	2526 BROADWAY ST	BAY CITY	1	1	
RUPP OIL CO, INC	741 MARTIN ST	BAY CITY		1	
RYDER TRANSPORTATION SVCS LOC 1	3828 PATTERSON RD	BAY CITY	1	1	
SAGINAW ROCK PRODUCTS	300 S WATER ST	BAY CITY	1	1	
SAGINAW VALLEY MARINE TERMINAL	700 HARRISON ST	BAY CITY		1	
SALZBURG CLEANERS	1906 S ERIE ST	BAY CITY	1	1	
SALZBURG RD 905 BAY CITY	905 SALZBURG	BAY CITY	1	1	
SEARS, ROEBUCK & CO	401 SAGINAW ST	BAY CITY		1	
SHORT FREIGHT LINES INC	459 RIVER RD	BAY CITY	1	1	
SKIPPER MARINE OF MICHIGAN INC	1809 S WATER ST	BAY CITY	1	1	
SOUTHEND SHELL	2628 BROADWAY ST	BAY CITY	1	1	
SPEEDWAY #8715	1223 BROADWAY ST	BAY CITY	1	1	
SPEEDWAY SUPERAMERICA LLC	1809 S EUCLID AVE	BAY CITY	1	1	
STRAITS WOOD TREATING	4804 E WILDER RD	BAY CITY			1
THIRD & MADISON SUNOCO	510 3RD ST	BAY CITY	1	1	
TRANSPLASTICS INC	1500 PINE ST	ESSEXVILLE			1
TRIPLE CLEAN INC	601 GARFIELD AVE	BAY CITY	1	1	
TRIPLE CLEAN PETROLEUM CO	309 WOODSIDE AVE	ESSEXVILLE			1
TRIPLE R TRUCKING INC	1303 WOODSIDE AVE	ESSEXVILLE	1	1	1
USA DEPT OF DEFENSE	2455 WEADOCK HIGHWAY	ESSEXVILLE		1	

Table 3-7. Facilities with Underground or Above Ground Storage Tanks Within or Adjacent to the Saginaw River Floodplain

Site	Address	City	Leaking Underground Storage Tanks	Underground Storage Tanks	Above Ground Storage Tanks
VACANT LAND (FORMER MONARCH GAS)	1000 ADAMS ST	BAY CITY	1	1	
VALLEY CO	333 MORTON ST	BAY CITY	1	1	
W GERBER OTTO	205 S WATER ST	BAY CITY	1	1	
WHITES STATE STREET TOWING INC	706 STATE ST	BAY CITY	1	1	
WIRT TRANSPORT CO INC	400 MARTIN ST	BAY CITY		1	
WOLOHAN LUMBER CO	3013 N WATER ST	BAY CITY	1	1	
Total Upper Saginaw River			72	82	9
Total Lower Saginaw River, Saginaw County			41	52	13
Total Lower Saginaw River, Bay County			86	118	25
TOTAL SAGINAW RIVER FLOODPLAIN			**199**	**252**	**47**

Source: EDR 2007

Table 4-1. Summary of Investigations of Environmental Contamination of the Saginaw River, Floodplain, and Bay Since 1997

				Number of Sample Locations				
Media	**Sample Dates**	**Sample Type**	**Analyses**	**USR**	**LSR-SC**	**LSR-BC**	**SB**	**Source**
Soil	Dec 2000	Surface soil	PCDD/Fs	5				MDEQ
	Nov 2002	Soil cores	PCDD/Fs, PCBs		3	1	1	MDEQ
	Oct, Nov 2004	Soil cores	PCDD/Fs, metals, PCBs, pesticides, VOCs, SVOCs, hydrocarbons	5	4	11	6	MDEQ 2006
Sediment	Aug 1999	Surface sediment	PCDD/Fs, metals, PCBs, pesticides, TOC, grain size		8	na	6	ACOE
	Sept 2003	Sediment cores	PCBs			12		Taft 2004
	July 2004	Surface sediment grabs	PCDD/Fs	2	32	20		ACOE
	Oct, Nov 2004	Surface sediment grabs	PCDD/Fs, metals, PCBs, pesticides, VOCs, SVOCs, hydrocarbons	3	11	12	10	MDEQ 2006
	Dec 2004	Sediment cores	PCDD/Fs, metals, PCBs, SVOCs, TOC, grain size	15				CH2MHill 2005
	Nov, Dec 2006	Sediment cores	PCDD/Fs, TOC, grain size	8				ENVIRON 2007
Surface Water	Aug 1999	Bottom water	Hg, organic carbon, TSS		8	18	6	ACOE
	Spring-Fall 1999-2006 (207 dates)	Surface water	Metals, Nutrients, VOC (2 samples), TSS, TOC, Biological			1	20	MDEQ
	1998-2004 (23 dates)	Surface water	PCBs, pesticides (DDT and chlordane)			1		MDEQ
	Nov 2006, Mar 2007	Surface grabs	PCDD/Fs, organic carbon, TSS		23			ENVIRON 2007

Table 4-1. Summary of Investigations of Environmental Contamination of the Saginaw River, Floodplain, and Bay Since 1997

				Number of Sample Locations				
Media	**Sample Dates**	**Sample Type**	**Analyses**	**USR**	**LSR-SC**	**LSR-BC**	**SB**	**Source**
Fish	Sept 1998	Caged fish, whole body (1 species)	Hg, PCBs, pesticides		1	2		MDEQ 2007 FCMP
	Sept 1998	Resident, whole body (2 species)	PCDD/Fs, Hg, PCBs, pesticides,				1	MDEQ 2007 FCMP
	Sept 1998	Resident, edible tissue (3 species)	Hg, PCBs, pesticides				1	MDEQ 2007 FCMP
	Oct 1999	Resident, edible tissue (1 species)	PCDD/Fs, Hg, PCBs, pesticides,				1	MDEQ 2007 FCMP
	Aug 2001	Resident, whole body (1 species)	PCDD/Fs, Hg, PCBs, pesticides,				1	MDEQ 2007 FCMP
	July 2002	Caged fish, whole body (1 species)	PCDD/Fs, Hg, PCBs, pesticides,		1	2		MDEQ 2007 FCMP
	Aug, Sept 2003	Resident, whole body (4 species)	Hg, PCBs, pesticides				2	MDEQ 2007 FCMP
	Aug, Sept 2004	Resident, edible tissue (6 species)	Hg, PCBs, pesticides			1	1	MDEQ 2007 FCMP
	June 2005	Caged fish, whole body (1 species)	PCDD/Fs, Hg, PCBs, pesticides,			6	1	MDEQ 2007 FCMP
	Oct 2005	Resident, whole body (2 species)	PCDD/Fs, Hg, PCBs, pesticides,				1	MDEQ 2007 FCMP

Table 4-1. Summary of Investigations of Environmental Contamination of the Saginaw River, Floodplain, and Bay Since 1997

				Number of Sample Locations				
Media	**Sample Dates**	**Sample Type**	**Analyses**	**USR**	**LSR-SC**	**LSR-BC**	**SB**	**Source**
Wildlife	1999	Eagle Nestling Feathers & Plasma	Hg, PCBs, pesticides				5	Summer et al. 2002
	2000	Eagle Nestling Feathers & Plasma	Hg, PCBs, pesticides				4	Roe et al. 2003
	2001	Eagle Nestling Feathers & Plasma	Hg, PCBs, pesticides				7	Roe et al. 2004a
	2002	Herring Gull	Data not available					MDEQ 2007b
	2002	Eagle Nestling Feathers & Plasma	Hg, PCBs, pesticides				5	Roe et al. 2004b

a. As obtained from the USEPA STORET database (http://www.epa.gov/storet/dbtop.html)
FCMP: Fish Contaminant Monitoring Program online database (http://www.deq.state.mi.us/fcmp/)
Hg: mercury
LSR-BC: Lower Saginaw River - Bay County
LSR-SC: Lower Saginaw River - Saginaw County
MDEQ: Michigan Department of Environmental Quality
na: not applicable. This sampling was conducted prior to completion of sediment remediation dredging for PCBs in the LSR-BC in 2001.
PCBs: polychlorinated biphenyls
PCDD/Fs: dioxins and furans
SB: Saginaw Bay
SVOCs: semi-volatile organic chemicals
TOC: total organic carbon
TSS: total suspended solids
ACOE: United States Army Corps of Engineers
USR: Upper Saginaw River
VOCs: volatile organic chemicals

Table 4-2a. Summary of Analytical Results for Chemicals in Soil, Upper Saginaw River Floodplain

	Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCDD\Fs							
	1,3,6,8-Tetrachloro-dibenzodioxin	12 / 13	92	4.1E-01	2.0E+01	4.3E+00	ng/kg
	1,3,7,9-Tetrachloro-dibenzodioxin	7 / 13	54	6.1E-01	6.6E+00	1.4E+00	ng/kg
	2,3,7,8-Tetrachlorodibenzo-p-dioxin	13 / 19	68	4.6E-01	1.5E+01	2.7E+00	ng/kg
	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	12 / 19	63	4.0E-01	2.4E+01	4.3E+00	ng/kg
	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	14 / 19	74	2.7E-01	2.4E+01	3.3E+00	ng/kg
	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	17 / 19	89	3.2E-01	3.8E+01	9.1E+00	ng/kg
	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	15 / 19	79	7.6E-01	3.3E+01	6.0E+00	ng/kg
	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	19 / 19	100	1.5E+00	5.1E+02	1.3E+02	ng/kg
	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	18 / 19	95	2.7E+01	7.6E+03	1.6E+03	ng/kg
	1,3,6,8-Tetrachloro-dibenzofuran	6 / 13	46	1.5E-01	2.8E+00	5.7E-01	ng/kg
	2,3,7,8-Tetrachlorodibenzofuran	19 / 19	100	1.3E+00	2.2E+04	2.8E+03	ng/kg
	1,2,3,7,8-Pentachlorodibenzofuran	18 / 19	95	3.7E-01	9.9E+03	1.3E+03	ng/kg
	2,3,4,7,8-Pentachlorodibenzofuran	18 / 19	95	7.2E-01	7.5E+03	1.0E+03	ng/kg
	1,2,3,4,7,8-Hexachlorodibenzofuran	18 / 19	95	8.7E-01	7.8E+03	1.0E+03	ng/kg
	1,2,3,6,7,8-Hexachlorodibenzofuran	19 / 19	100	2.3E-01	7.1E+02	1.1E+02	ng/kg
	1,2,3,7,8,9-Hexachlorodibenzofuran	14 / 19	74	1.8E-01	8.6E+01	1.3E+01	ng/kg
	2,3,4,6,7,8-Hexachlorodibenzofuran	16 / 19	84	5.5E-01	4.7E+02	7.2E+01	ng/kg
	1,2,3,4,6,7,8-Heptachlorodibenzofuran	19 / 19	100	1.6E+00	4.6E+03	7.0E+02	ng/kg
	1,2,3,4,7,8,9-Heptachlorodibenzofuran	13 / 19	68	4.9E-01	1.9E+02	3.2E+01	ng/kg
	1,2,3,4,6,7,8,9-Octachlorodibenzofuran	19 / 19	100	1.9E+00	1.8E+03	4.1E+02	ng/kg
	Total Tetrachloro-dibenzodioxin	17 / 18	94	4.1E-01	8.9E+01	2.4E+01	ng/kg
	Total Pentachloro-dibenzodioxin	13 / 18	72	1.7E+00	5.4E+01	1.4E+01	ng/kg
	Total Hexachloro-dibenzodioxin	18 / 18	100	5.3E-01	2.0E+02	5.6E+01	ng/kg
	Total Heptachloro-dibenzodioxin	18 / 18	100	3.0E+00	9.2E+02	2.4E+02	ng/kg
	Total Tetrachloro-dibenzofuran	16 / 16	100	8.3E+00	1.2E+04	1.9E+03	ng/kg
	Total Pentachloro-dibenzofuran	17 / 17	100	5.5E+00	1.8E+04	2.1E+03	ng/kg
	Total Hexachloro-dibenzofuran	17 / 17	100	3.3E+00	7.5E+03	9.0E+02	ng/kg
	Total Heptachloro-dibenzofuran	17 / 17	100	3.3E+00	4.3E+03	7.0E+02	ng/kg
	2005 WHO Mammals TEQ (PCDD/Fs)	19 / 19	100	4.0E-01	5.7E+03	7.6E+02	ng/kg
Hydrocarbons							
	Octadecane	1 / 1	100	9.8E+02	9.8E+02	9.8E+02	µg/kg

Table 4-2a. Summary of Analytical Results for Chemicals in Soil, Upper Saginaw River Floodplain

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
Metals						
Aluminum	4 / 4	100	570	3800	2133	mg/kg
Arsenic	4 / 4	100	0.9	2.8	1.7	mg/kg
Barium	4 / 4	100	4.8	31	17	mg/kg
Calcium	4 / 4	100	3370	19900	9078	mg/kg
Chromium, total	4 / 4	100	2.2	9.9	5.9	mg/kg
Cobalt	1 / 4	25	3.1	3.1	1.5	mg/kg
Copper	3 / 4	75	2.1	10	5.2	mg/kg
Iron	4 / 4	100	1600	7300	4100	mg/kg
Lead	3 / 4	75	11	70	24	mg/kg
Lithium	2 / 4	50	3.7	5.9	2.9	mg/kg
Magnesium	4 / 4	100	1660	6250	3100	mg/kg
Manganese	4 / 4	100	26	200	100	mg/kg
Nickel	1 / 4	25	7.3	7.3	3.7	mg/kg
Potassium	4 / 4	100	72	710	388	mg/kg
Strontium	4 / 4	100	4	20	10	mg/kg
Titanium	4 / 4	100	35	75	63	mg/kg
Vanadium	2 / 3	67	3.5	8.9	4.3	mg/kg
Zinc	4 / 4	100	11	56	32	mg/kg
PCBs						
2,4,4',5-Tetrachlorobiphenyl	5 / 13	38	7.8E-03	1.8E+01	2.4E+00	µg/kg
3,3',4,4'-Tetrachlorobiphenyl	11 / 14	79	2.0E-02	1.5E+02	1.9E+01	µg/kg
3,4,4',5-Tetrachlorobiphenyl	10 / 17	59	1.1E-04	5.8E-02	7.1E-03	µg/kg
2,3,3',4,4'-Pentachlorobiphenyl	14 / 14	100	2.0E-02	3.6E+02	7.3E+01	µg/kg
2,3,4,4',5-Pentachlorobiphenyl	7 / 14	50	1.7E-02	4.3E+01	6.0E+00	µg/kg
2,3',4,4',5-Pentachlorobiphenyl	13 / 13	100	4.9E-02	7.9E+02	1.5E+02	µg/kg
2',3,4,4',5-Pentachlorobiphenyl	11 / 13	85	1.6E-02	9.7E+01	1.4E+01	µg/kg
3,3',4,4',5-Pentachlorobiphenyl	2 / 14	14	1.7E-03	8.3E+00	1.2E+00	µg/kg
2,3',4,4',5-Pentachlorobiphenyl & 2',3,4,4',5-Pentachlorobiphenyl	1 / 1	100	2.0E-01	2.0E-01	2.0E-01	µg/kg
2,3,3',4,4',5-Hexachlorobiphenyl	12 / 14	86	7.1E-03	1.3E+02	2.1E+01	µg/kg
2,3,3',4,4',5'-Hexachlorobiphenyl	5 / 13	38	1.4E-02	3.0E+01	5.0E+00	µg/kg
2,3,4,4',5,5'-Hexachlorobiphenyl	8 / 13	62	1.9E-02	5.4E+01	9.7E+00	µg/kg
3,3',4,4',5,5'-Hexachlorobiphenyl	1 / 1	100	4.7E-04	4.7E-04	4.7E-04	µg/kg
2,3,3',4,4',5,5'-Heptachlorobiphenyl	5 / 14	36	1.6E-03	1.9E+01	3.7E+00	µg/kg
2,2',3,3',4,4',5,5'6,6'-Decachlorobiphenyl	6 / 13	46	5.5E-02	3.7E+02	4.2E+01	µg/kg
Monochlorobiphenyl	9 / 13	69	1.8E-02	1.7E+02	2.8E+01	µg/kg
Dichlorobiphenyl	12 / 13	92	1.8E-02	5.8E+02	6.1E+01	µg/kg
Trichlorobiphenyl	13 / 13	100	1.1E-01	2.8E+03	3.4E+02	µg/kg
Tetrachlorobiphenyl	13 / 13	100	3.4E-01	9.5E+03	1.1E+03	µg/kg

Table 4-2a. Summary of Analytical Results for Chemicals in Soil, Upper Saginaw River Floodplain

	Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCBs (cont'd)							
	Pentachlorobiphenyl	13 / 13	100	3.4E-01	7.5E+03	1.2E+03	µg/kg
	Hexachlorobiphenyl	13 / 13	100	1.9E-01	3.7E+03	7.7E+02	µg/kg
	Heptachlorobiphenyl	13 / 13	100	2.1E-02	1.3E+03	2.7E+02	µg/kg
	Octachlorobiphenyl	8 / 13	62	9.2E-02	2.2E+02	4.4E+01	µg/kg
	Nonachlorobiphenyl	6 / 13	46	8.1E-02	3.1E+02	5.3E+01	µg/kg
	Total PCBs (Homologue)	13 / 13	100	1.1E+00	2.5E+04	4.0E+03	µg/kg
	2005 WHO Mammals TEQ (PCBs)	13 / 13	100	2.0E-01	9.3E+02	1.7E+02	ng/kg
Pesticides							
	4,4'-DDD	1 / 4	25	1.4E+01	1.4E+01	1.1E+01	µg/kg
	4,4'-DDE	1 / 4	25	2.7E+02	2.7E+02	7.5E+01	µg/kg
	4,4'-DDT	1 / 4	25	1.4E+02	1.4E+02	4.3E+01	µg/kg
SVOCs							
	2-Methylnaphthalene	1 / 8	13	0.0E+00	0.0E+00	1.3E+02	µg/kg
	Benzo(a)anthracene	1 / 4	25	2.8E+02	2.8E+02	1.1E+02	µg/kg
	Benzo(a)pyrene	1 / 4	25	2.8E+02	2.8E+02	1.5E+02	µg/kg
	Benzo(b)fluoranthene	1 / 4	25	3.7E+02	3.7E+02	1.7E+02	µg/kg
	Benzo(g,h,i)perylene	1 / 4	25	2.5E+02	2.5E+02	1.4E+02	µg/kg
	Bis(2-ethylhexyl) phthalate	1 / 4	25	4.6E+03	4.6E+03	1.2E+03	µg/kg
	Chrysene	2 / 4	50	1.1E+02	2.3E+02	1.1E+02	µg/kg
	Diethyl phthalate	1 / 4	25	1.5E+02	1.5E+02	7.9E+01	µg/kg
	Fluoranthene	2 / 4	50	1.5E+02	4.7E+02	1.8E+02	µg/kg
	Naphthalene	1 / 8	13	0.0E+00	0.0E+00	8.7E+01	µg/kg
	Pyrene	2 / 4	50	1.8E+02	4.8E+02	1.9E+02	µg/kg
Other							
	Hexene-dione	1 / 1	100	5.5E+02	5.5E+02	5.5E+02	µg/kg

a. Mean concentration calculation includes one half the reporting limit for non-detect values.
µg/kg: microgram per kilogram
mg/kg: milligram per kilogram
ng/kg: nanogram per kilogram
PCB: polychlorinated biphenyls
PCDD/Fs: dioxins and furans
SVOC: semi-volatile organic compounds
WHO: World Health Organization
2005 WHO Mammals TEQ: 2,3,7,8 -tetrachlodibenzo-p-dioxin equivalent concentration, based on 2005 toxicity equivalence scheme developed by the World Health Organization for mammals (Van den Berg 2006).

Table 4-2b. Summary of Analytical Results for Chemicals in Soil, Lower Saginaw River Floodplain, Saginaw County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCDD/Fs						
1,3,6,8-Tetrachloro-dibenzodioxin	7 / 12	58	3.0E-01	2.3E+00	7.2E-01	ng/kg
1,3,7,9-Tetrachloro-dibenzodioxin	5 / 12	42	1.0E-01	7.7E-01	2.6E-01	ng/kg
2,3,7,8-Tetrachlorodibenzo-p-dioxin	8 / 20	40	1.5E-01	1.0E+00	2.8E-01	ng/kg
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	6 / 20	30	1.5E-01	6.3E-01	2.1E-01	ng/kg
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	4 / 20	20	2.9E-01	8.6E-01	1.9E-01	ng/kg
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	11 / 20	55	3.9E-01	1.7E+00	6.4E-01	ng/kg
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	8 / 20	40	2.9E-01	1.5E+00	3.9E-01	ng/kg
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	17 / 20	85	9.4E-01	2.8E+01	8.9E+00	ng/kg
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	20 / 20	100	1.1E+00	2.8E+02	7.7E+01	ng/kg
1,3,6,8-Tetrachloro-dibenzofuran	4 / 12	33	7.0E-02	2.0E-01	8.7E-02	ng/kg
2,3,7,8-Tetrachlorodibenzofuran	20 / 20	100	7.7E-01	4.0E+02	8.4E+01	ng/kg
1,2,3,7,8-Pentachlorodibenzofuran	15 / 20	75	1.2E+00	3.4E+02	4.8E+01	ng/kg
2,3,4,7,8-Pentachlorodibenzofuran	19 / 20	95	3.1E-01	2.1E+02	3.7E+01	ng/kg
1,2,3,4,7,8-Hexachlorodibenzofuran	20 / 20	100	5.0E-01	2.4E+02	2.9E+01	ng/kg
1,2,3,6,7,8-Hexachlorodibenzofuran	18 / 20	90	1.6E-01	5.1E+01	6.4E+00	ng/kg
1,2,3,7,8,9-Hexachlorodibenzofuran	10 / 20	50	1.5E-01	4.1E+00	6.6E-01	ng/kg
2,3,4,6,7,8-Hexachlorodibenzofuran	17 / 20	85	1.9E-01	2.5E+01	3.6E+00	ng/kg
1,2,3,4,6,7,8-Heptachlorodibenzofuran	20 / 20	100	2.8E-01	6.1E+01	1.8E+01	ng/kg
1,2,3,4,7,8,9-Heptachlorodibenzofuran	11 / 20	55	5.7E-01	2.3E+01	2.3E+00	ng/kg
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	19 / 20	95	9.4E-01	6.2E+01	1.9E+01	ng/kg
Total Tetrachloro-dibenzodioxin	16 / 19	84	2.8E-01	6.8E+00	2.5E+00	ng/kg
Total Pentachloro-dibenzodioxin	16 / 19	84	4.9E-01	1.2E+01	2.1E+00	ng/kg
Total Hexachloro-dibenzodioxin	19 / 19	100	3.0E-01	2.3E+01	6.2E+00	ng/kg
Total Heptachloro-dibenzodioxin	18 / 19	95	3.8E-01	5.6E+01	1.7E+01	ng/kg
Total Tetrachloro-dibenzofuran	19 / 19	100	1.1E+01	1.2E+03	2.4E+02	ng/kg
Total Pentachloro-dibenzofuran	19 / 19	100	3.6E+00	1.1E+03	1.7E+02	ng/kg
Total Hexachloro-dibenzofuran	19 / 19	100	8.2E-01	4.2E+02	5.8E+01	ng/kg
Total Heptachloro-dibenzofuran	19 / 19	100	2.8E-01	1.1E+02	3.5E+01	ng/kg
2005 WHO Mammals TEQ (PCDD/Fs)	21 / 21	100	3.8E-01	1.4E+02	2.5E+01	ng/kg

Table 4-2b. Summary of Analytical Results for Chemicals in Soil, Lower Saginaw River Floodplain, Saginaw County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
Metals						
Aluminum	2 / 2	100	680	2200	1440	mg/kg
Arsenic	2 / 2	100	1	2.6	1.8	mg/kg
Barium	2 / 2	100	15	20	18	mg/kg
Calcium	2 / 2	100	18800	40500	29650	mg/kg
Chromium, total	2 / 2	100	2.9	6.3	4.6	mg/kg
Cobalt	1 / 2	50	2.2	2.2	1.6	mg/kg
Copper	1 / 2	50	8.3	8.3	4.7	mg/kg
Iron	2 / 2	100	2900	5000	3950	mg/kg
Lead	1 / 2	50	7.2	7.2	4.9	mg/kg
Lithium	1 / 2	50	4.5	4.5	2.8	mg/kg
Magnesium	2 / 2	100	5420	13700	9560	mg/kg
Manganese	2 / 2	100	41	120	81	mg/kg
Nickel	1 / 2	50	6	6	4.3	mg/kg
Potassium	2 / 2	100	109	500	305	mg/kg
Strontium	2 / 2	100	12	29	21	mg/kg
Titanium	2 / 2	100	91	130	111	mg/kg
Vanadium	2 / 2	100	6.8	8.2	7.5	mg/kg
Zinc	2 / 2	100	7.9	28	18	mg/kg
PCBs						
3,3',4,4'-Tetrachlorobiphenyl	10 / 20	50	5.1E-03	6.5E-02	1.3E-02	µg/kg
3,4,4',5-Tetrachlorobiphenyl	6 / 23	26	9.0E-05	6.5E-02	4.6E-03	µg/kg
2,3,3',4,4'-Pentachlorobiphenyl	17 / 20	85	2.9E-03	1.6E+00	1.5E-01	µg/kg
2,3,4,4',5-Pentachlorobiphenyl	10 / 20	50	4.3E-03	1.4E-01	1.3E-02	µg/kg
2,3',4,4',5-Pentachlorobiphenyl	18 / 20	90	7.8E-03	3.8E+00	3.4E-01	µg/kg
2',3,4,4',5-Pentachlorobiphenyl	10 / 20	50	1.3E-02	1.2E+00	9.3E-02	µg/kg
3,3',4,4',5-Pentachlorobiphenyl	1 / 20	5	1.2E-02	1.2E-02	1.9E-03	µg/kg
2,3,3',4,4',5-Hexachlorobiphenyl	12 / 20	60	6.4E-03	2.9E-01	3.2E-02	µg/kg
2,3,3',4,4',5'-Hexachlorobiphenyl	7 / 20	35	3.2E-03	6.8E-02	7.6E-03	µg/kg
2,3,4,4',5,5'-Hexachlorobiphenyl	8 / 20	40	3.3E-03	1.5E-01	1.5E-02	µg/kg
3,3',4,4',5,5',-Hexachlorobiphenyl	1 / 20	5	1.6E-03	1.6E-03	1.9E-03	µg/kg
2,3,3',4,4',5,5'-Heptachlorobiphenyl	3 / 20	15	1.0E-03	1.8E-02	2.9E-03	µg/kg
2,2',3,3',4,4',5,5'6,6'-Decachlorobiphenyl	10 / 20	50	2.6E-02	3.6E-01	6.1E-02	µg/kg
Monochlorobiphenyl	13 / 20	65	7.7E-03	8.5E-01	9.7E-02	µg/kg
Dichlorobiphenyl	13 / 20	65	1.4E-02	8.0E-01	1.8E-01	µg/kg
Trichlorobiphenyl	19 / 20	95	5.3E-03	2.6E+00	4.3E-01	µg/kg
Tetrachlorobiphenyl	20 / 20	100	4.4E-03	2.5E+01	2.2E+00	µg/kg

Table 4-2b. Summary of Analytical Results for Chemicals in Soil, Lower Saginaw River Floodplain, Saginaw County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCBs (cont'd)						
Pentachlorobiphenyl	20 / 20	100	1.0E-02	2.6E+01	2.4E+00	µg/kg
Hexachlorobiphenyl	20 / 20	100	3.7E-02	1.0E+01	1.1E+00	µg/kg
Heptachlorobiphenyl	19 / 20	95	4.0E-03	4.4E+00	4.7E-01	µg/kg
Octachlorobiphenyl	13 / 20	65	4.6E-03	1.2E+00	1.1E-01	µg/kg
Nonachlorobiphenyl	9 / 20	45	1.8E-02	6.9E-01	6.6E-02	µg/kg
Total PCBs (Homologue)	20 / 20	100	1.0E-01	7.0E+01	7.0E+00	µg/kg
2005 WHO Mammals TEQ (PCBs)	19 / 19	100	1.0E-01	1.5E+00	2.7E-01	ng/kg

a. Mean concentration calculation includes one half the reporting limit for all non-detect values.
µg/kg: microgram per kilogram
mg/kg: milligram per kilogram
ng/kg: nanogram per kilogram
PCB: polychlorinated biphenyls
PCDD/Fs: dioxins and furans
SVOC: semi-volatile organic compounds
VOC: volatile organic compounds
WHO: World Health Organization
2005 WHO Mammals TEQ: 2,3,7,8 -tetrachlodibenzo-p-dioxin equivalent concentration, based on 2005 toxicity equivalence scheme developed by the World Health Organization for mammals (Van den Berg 2006).

Table 4-2c. Summary of Analytical Results for Chemicals in Soil, Lower Saginaw River Floodplain, Bay County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCDD\Fs						
1,3,6,8-Tetrachloro-dibenzodioxin	26 / 38	68	1.9E-01	9.7E+01	8.0E+00	ng/kg
1,3,7,9-Tetrachloro-dibenzodioxin	20 / 38	53	2.5E-01	3.2E+01	2.9E+00	ng/kg
2,3,7,8-Tetrachlorodibenzo-p-dioxin	18 / 38	47	1.4E-01	2.8E+01	1.7E+00	ng/kg
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	19 / 39	49	1.8E-01	2.1E+01	1.4E+00	ng/kg
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	18 / 39	46	8.0E-02	8.8E+00	9.0E-01	ng/kg
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	27 / 39	69	1.8E-01	6.2E+01	5.1E+00	ng/kg
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	25 / 39	64	2.7E-01	2.8E+01	2.8E+00	ng/kg
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	38 / 39	97	3.8E-01	9.2E+02	7.4E+01	ng/kg
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	39 / 41	95	2.8E+00	8.6E+03	9.6E+02	ng/kg
1,3,6,8-Tetrachloro-dibenzofuran	15 / 38	39	1.0E-01	1.2E+01	1.3E+00	ng/kg
2,3,7,8-Tetrachlorodibenzofuran	38 / 39	97	2.7E-01	1.3E+03	8.1E+01	ng/kg
1,2,3,7,8-Pentachlorodibenzofuran	31 / 38	82	4.9E-01	1.1E+03	8.0E+01	ng/kg
2,3,4,7,8-Pentachlorodibenzofuran	34 / 38	89	4.3E-01	1.1E+03	7.1E+01	ng/kg
1,2,3,4,7,8-Hexachlorodibenzofuran	38 / 39	97	4.9E-01	6.8E+02	6.5E+01	ng/kg
1,2,3,6,7,8-Hexachlorodibenzofuran	37 / 39	95	2.0E-01	1.4E+02	1.6E+01	ng/kg
1,2,3,7,8,9-Hexachlorodibenzofuran	17 / 39	44	8.0E-02	2.6E+01	2.2E+00	ng/kg
2,3,4,6,7,8-Hexachlorodibenzofuran	33 / 39	85	1.2E-01	9.2E+01	1.1E+01	ng/kg
1,2,3,4,6,7,8-Heptachlorodibenzofuran	37 / 39	95	4.2E-01	1.5E+03	1.4E+02	ng/kg
1,2,3,4,7,8,9-Heptachlorodibenzofuran	25 / 39	64	1.6E-01	8.8E+01	6.6E+00	ng/kg
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	36 / 39	92	5.8E-01	2.0E+03	1.5E+02	ng/kg
Dihydro-methyl-dioxin	1 / 1	100	7.2E+05	7.2E+05	7.2E+05	ng/kg
Total Tetrachloro-dibenzodioxin	34 / 39	87	1.9E-01	2.3E+02	1.8E+01	ng/kg
Total Pentachloro-dibenzodioxin	30 / 39	77	3.4E-01	1.4E+02	9.4E+00	ng/kg
Total Hexachloro-dibenzodioxin	38 / 39	97	8.0E-02	4.6E+02	3.8E+01	ng/kg
Total Heptachloro-dibenzodioxin	39 / 39	100	3.8E-01	1.7E+03	1.4E+02	ng/kg
Total Tetrachloro-dibenzofuran	45 / 45	100	1.3E+00	5.7E+03	7.8E+02	ng/kg
Total Pentachloro-dibenzofuran	39 / 39	100	8.6E-01	4.8E+03	5.0E+02	ng/kg
Total Hexachloro-dibenzofuran	39 / 39	100	4.4E-01	2.3E+03	2.4E+02	ng/kg
Total Heptachloro-dibenzofuran	39 / 39	100	2.3E-01	3.3E+03	2.9E+02	ng/kg
2005 WHO Mammals TEQ (PCDD/Fs)	34 / 34	100	3.7E-02	6.0E+02	3.8E+01	ng/kg
Hydrocarbons						
Eicosane	2 / 2	100	6.3E+02	9.4E+02	7.9E+02	µg/kg
Hexatriacontane	3 / 3	100	7.0E+02	1.1E+03	9.3E+02	µg/kg
Octacosane	1 / 1	100	7.2E+02	7.2E+02	7.2E+02	µg/kg

Table 4-2c. Summary of Analytical Results for Chemicals in Soil, Lower Saginaw River Floodplain, Bay County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
Metals						
Aluminum	7 / 7	100	730	3000	1300	mg/kg
Arsenic	7 / 7	100	0.6	3.4	1.8	mg/kg
Barium	7 / 7	100	4.7	370	60.7	mg/kg
Beryllium	2 / 7	29	0.24	0.31	0.15	mg/kg
Calcium	7 / 7	100	2960	26500	12593	mg/kg
Chromium, total	7 / 7	100	2.4	13	5.0	mg/kg
Cobalt	1 / 7	14	2.5	2.5	1.2	mg/kg
Copper	6 / 7	86	2.4	65	13	mg/kg
Iron	7 / 7	100	1800	7700	3629	mg/kg
Lead	2 / 7	29	20	110	20	mg/kg
Lithium	1 / 7	14	3.4	3.4	1.3	mg/kg
Magnesium	7 / 7	100	1770	5360	3507	mg/kg
Manganese	7 / 7	100	27	110	58	mg/kg
Mercury	1 / 6	17	0.13	0.13	0.04	mg/kg
Nickel	2 / 7	29	8.1	11	4.5	mg/kg
Potassium	7 / 7	100	76	490	185	mg/kg
Sodium	1 / 7	14	99	99	36	mg/kg
Strontium	7 / 7	100	3.9	35	14	mg/kg
Titanium	7 / 7	100	33	100	66	mg/kg
Vanadium	6 / 7	86	2.3	8.6	4.5	mg/kg
Zinc	7 / 7	100	8.4	210	48	mg/kg
PCBs						
2,4,4',5-Tetrachlorobiphenyl	18 / 38	47	4.9E-03	1.7E+00	1.2E-01	µg/kg
3,3',4,4'-Tetrachlorobiphenyl	27 / 40	68	8.5E-03	1.3E+01	1.4E+00	µg/kg
3,4,4',5-Tetrachlorobiphenyl	25 / 45	56	3.4E-04	1.7E+00	8.9E-02	µg/kg
2,3,3',4,4'-Pentachlorobiphenyl	34 / 41	83	1.6E-02	5.5E+01	4.3E+00	µg/kg
2,3,4,4',5-Pentachlorobiphenyl	22 / 39	56	5.4E-03	4.3E+00	2.8E-01	µg/kg
2,3',4,4',5-Pentachlorobiphenyl	42 / 42	100	9.3E-03	8.7E+01	8.0E+00	µg/kg
2',3,4,4',5-Pentachlorobiphenyl	33 / 41	80	7.5E-03	3.2E+01	2.6E+00	µg/kg
3,3',4,4',5-Pentachlorobiphenyl	13 / 39	33	1.0E-02	1.9E+00	1.3E-01	µg/kg
2,3,3',4,4',5-Hexachlorobiphenyl	25 / 39	64	8.4E-03	9.7E+00	5.9E-01	µg/kg
2,3,3',4,4',5'-Hexachlorobiphenyl	22 / 39	56	2.3E-03	2.1E+00	1.4E-01	µg/kg
2,3,4,4',5,5'-Hexachlorobiphenyl	23 / 39	59	4.1E-03	8.0E+00	5.1E-01	µg/kg
3,3',4,4',5,5',-Hexachlorobiphenyl	3 / 39	8	3.3E-02	3.2E-01	4.2E-02	µg/kg
2,2',3,3',4,4',5-Heptachlorobiphenyl	2 / 4	50	2.3E-01	2.6E-01	1.3E-01	µg/kg

Table 4-2c. Summary of Analytical Results for Chemicals in Soil, Lower Saginaw River Floodplain, Bay County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCBs (cont'd)						
2,2',3,4,4',5,5'-Heptachlorobiphenyl	2 / 4	50	4.1E-01	4.4E-01	2.2E-01	µg/kg
2,3,3',4,4',5,5'-Heptachlorobiphenyl	14 / 38	37	1.1E-02	2.9E+00	2.1E-01	µg/kg
2,2',3,3',4,4',5,5'6,6'-Decachlorobiphenyl	24 / 39	62	2.3E-02	7.1E+01	2.6E+00	µg/kg
Monochlorobiphenyl	29 / 41	71	5.2E-03	5.5E+00	6.4E-01	µg/kg
Dichlorobiphenyl	45 / 50	90	2.0E-02	2.0E+02	1.9E+01	µg/kg
Trichlorobiphenyl	47 / 49	96	1.6E-02	3.5E+02	5.5E+01	µg/kg
Tetrachlorobiphenyl	48 / 48	100	9.3E-03	1.6E+03	1.5E+02	µg/kg
Pentachlorobiphenyl	43 / 43	100	1.8E-02	8.2E+02	7.0E+01	µg/kg
Hexachlorobiphenyl	41 / 42	98	5.2E-02	8.1E+02	6.9E+01	µg/kg
Heptachlorobiphenyl	38 / 41	93	7.7E-03	5.4E+02	4.8E+01	µg/kg
Octachlorobiphenyl	27 / 41	66	2.1E-02	1.0E+02	8.7E+00	µg/kg
Nonachlorobiphenyl	23 / 39	59	2.6E-02	4.2E+01	2.2E+00	µg/kg
Total PCBs (Homologue)	39 / 39	100	5.9E-02	3.4E+03	2.9E+02	µg/kg
2005 WHO Mammals TEQ (PCBs)	38 / 38	100	1.2E-01	2.0E+02	1.5E+01	ng/kg
PCB-1248 (Aroclor 1248)	1 / 7	14	6.6E+02	6.6E+02	1.4E+02	µg/kg
PCB-1254 (Aroclor 1254)	1 / 7	14	6.8E+02	6.8E+02	1.5E+02	µg/kg
PCB-1260 (Aroclor 1260)	1 / 7	14	8.3E+02	8.3E+02	1.7E+02	µg/kg
Sum PCBs (Aroclor)	1 / 7	14	2.5E+03	2.5E+03	8.1E+02	µg/kg
SVOCs						
2-Methylnaphthalene	1 / 14	7	0.0E+00	0.0E+00	1.4E+02	µg/kg
Benzo(a)anthracene	2 / 7	29	2.1E+02	2.6E+02	1.1E+02	µg/kg
Benzo(a)pyrene	1 / 7	14	2.9E+02	2.9E+02	1.4E+02	µg/kg
Benzo(b)fluoranthene	2 / 7	29	3.8E+02	4.5E+02	2.0E+02	µg/kg
Benzyl butyl phthalate	1 / 7	14	2.2E+02	2.2E+02	8.1E+01	µg/kg
Chrysene	2 / 7	29	2.8E+02	2.9E+02	1.2E+02	µg/kg
Diethyl phthalate	3 / 7	43	1.6E+02	3.5E+02	1.5E+02	µg/kg
Fluoranthene	2 / 7	29	5.8E+02	6.3E+02	2.1E+02	µg/kg
Naphthalene	1 / 14	7	0.0E+00	0.0E+00	9.8E+01	µg/kg
Phenanthrene	2 / 7	29	2.7E+02	4.2E+02	1.4E+02	µg/kg
Pyrene	2 / 7	29	4.9E+02	5.3E+02	1.9E+02	µg/kg

Table 4-2c. Summary of Analytical Results for Chemicals in Soil, Lower Saginaw River Floodplain, Bay County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
VOCs						
Toluene	2 / 7	29	7.2E+01	1.0E+02	4.7E+01	µg/kg
Other						
Dotriacontane	1 / 1	100	1.0E+03	1.0E+03	1.0E+03	µg/kg
Hexadecanoic acid	1 / 1	100	1.2E+03	1.2E+03	1.2E+03	µg/kg
Methyl-ester-Hexadecenoic acid	1 / 1	100	7.5E+02	7.5E+02	7.5E+02	µg/kg

a. Mean concentration calculation includes one half the reporting limit for all non-detect values.
µg/kg: microgram per kilogram
mg/kg: milligram per kilogram
ng/kg: nanogram per kilogram
PCB: polychlorinated biphenyls
PCDD/Fs: dioxins and furans
SVOC: semi-volatile organic compounds
VOC: volatile organic compounds
WHO: World Health Organization
2005 WHO Mammals TEQ: 2,3,7,8 -tetrachlodibenzo-p-dioxin equivalent concentration, based on 2005 toxicity equivalence scheme developed by the World Health Organization for mammals (Van den Berg 2006).

Table 4-2d. Summary of Analytical Results for Chemicals in Soil, Saginaw Bay Floodplain

	Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCDD\Fs							
	2,3,7,8-Tetrachlorodibenzo-p-dioxin	7 / 13	54	3.5E-01	1.7E+00	6.9E-01	ng/kg
	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	5 / 13	38	2.9E-01	3.3E+00	6.3E-01	ng/kg
	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	3 / 13	23	6.9E-01	3.3E+00	4.6E-01	ng/kg
	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	6 / 13	46	4.6E-01	7.0E+00	1.1E+00	ng/kg
	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	3 / 13	23	1.6E-01	3.5E+00	6.5E-01	ng/kg
	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	12 / 13	92	8.1E-01	7.1E+01	1.2E+01	ng/kg
	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	13 / 13	100	3.8E+00	5.1E+02	8.7E+01	ng/kg
	2,3,7,8-Tetrachlorodibenzofuran	12 / 13	92	6.0E-01	6.1E+02	7.7E+01	ng/kg
	1,2,3,7,8-Pentachlorodibenzofuran	8 / 13	62	5.4E-01	2.8E+02	2.7E+01	ng/kg
	2,3,4,7,8-Pentachlorodibenzofuran	8 / 13	62	5.4E-01	2.4E+02	2.3E+01	ng/kg
	1,2,3,4,7,8-Hexachlorodibenzofuran	12 / 13	92	2.7E-01	1.3E+02	1.4E+01	ng/kg
	1,2,3,6,7,8-Hexachlorodibenzofuran	10 / 13	77	4.1E-01	2.8E+01	4.2E+00	ng/kg
	1,2,3,7,8,9-Hexachlorodibenzofuran	3 / 13	23	1.6E-01	6.6E+00	8.3E-01	ng/kg
	2,3,4,6,7,8-Hexachlorodibenzofuran	6 / 13	46	1.5E-01	2.0E+01	2.3E+00	ng/kg
	1,2,3,4,6,7,8-Heptachlorodibenzofuran	13 / 13	100	8.8E-01	2.1E+02	2.8E+01	ng/kg
	1,2,3,4,7,8,9-Heptachlorodibenzofuran	4 / 13	31	2.3E-01	6.8E+00	1.2E+00	ng/kg
	1,2,3,4,6,7,8,9-Octachlorodibenzofuran	12 / 13	92	5.4E-01	1.8E+02	2.4E+01	ng/kg
	Total Tetrachloro-dibenzodioxin	2 / 5	40	1.0E+00	1.3E+01	2.9E+00	ng/kg
	Total Pentachloro-dibenzodioxin	2 / 5	40	1.6E+00	7.1E+00	1.8E+00	ng/kg
	Total Hexachloro-dibenzodioxin	3 / 5	60	7.4E-01	2.3E+01	5.4E+00	ng/kg
	Total Heptachloro-dibenzodioxin	5 / 5	100	1.0E+00	4.8E+01	1.2E+01	ng/kg
	Total Tetrachloro-dibenzofuran	5 / 5	100	4.6E+00	1.7E+03	4.7E+02	ng/kg
	Total Pentachloro-dibenzofuran	5 / 5	100	2.5E+00	1.1E+03	2.4E+02	ng/kg
	Total Hexachloro-dibenzofuran	5 / 5	100	8.0E-01	2.8E+02	6.3E+01	ng/kg
	Total Heptachloro-dibenzofuran	5 / 5	100	8.8E-01	1.3E+02	3.0E+01	ng/kg
	2005 WHO Mammals TEQ (PCDD/Fs)	13 / 13	100	1.1E-01	1.6E+02	2.0E+01	ng/kg
Metals							
	Aluminum	2 / 2	100	390	730	560	mg/kg
	Arsenic	2 / 2	100	1.0	1.6	1.3	mg/kg
	Barium	2 / 2	100	1.7	4.7	3.2	mg/kg
	Calcium	2 / 2	100	1370	9390	5380	mg/kg
	Chromium, total	1 / 2	50	4.4	4.4	2.7	mg/kg
	Copper	1 / 2	50	3	3	2.0	mg/kg
	Iron	2 / 2	100	1300	2100	1700	mg/kg
	Magnesium	2 / 2	100	632	3710	2171	mg/kg
	Manganese	2 / 2	100	16	49	33	mg/kg

Table 4-2d. Summary of Analytical Results for Chemicals in Soil, Saginaw Bay Floodplain

	Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
	Potassium	2 / 2	100	52	80	66	mg/kg
	Strontium	2 / 2	100	1.8	5.1	3.5	mg/kg
	Titanium	2 / 2	100	39	42	41	mg/kg
	Vanadium	1 / 2	50	2.3	2.3	1.4	mg/kg
	Zinc	2 / 2	100	15	28	22	mg/kg
PCBs							
	2,4,4',5-Tetrachlorobiphenyl	1 / 4	25	5.5E-03	5.5E-03	2.0E-03	µg/kg
	3,3',4,4'-Tetrachlorobiphenyl	12 / 13	92	1.1E-02	6.4E-01	1.1E-01	µg/kg
	3,4,4',5-Tetrachlorobiphenyl	9 / 15	60	8.9E-04	1.7E-02	4.3E-03	µg/kg
	2,3,3',4,4'-Pentachlorobiphenyl	13 / 13	100	2.1E-02	2.1E+00	4.0E-01	µg/kg
	2,3,4,4',5-Pentachlorobiphenyl	5 / 13	38	2.1E-03	3.3E-02	5.3E-03	µg/kg
	2,3',4,4',5-Pentachlorobiphenyl	8 / 8	100	4.7E-02	5.9E-01	1.8E-01	µg/kg
	2',3,4,4',5-Pentachlorobiphenyl	8 / 8	100	1.1E-02	1.6E-01	4.7E-02	µg/kg
	2,3',4,4',5-Pentachlorobiphenyl & 2',3,4,4',5-Pentachlorobiphenyl	5 / 5	100	2.0E-01	2.7E+00	1.7E+00	µg/kg
	3,3',4,4',5-Pentachlorobiphenyl	6 / 13	46	6.0E-04	1.7E-02	3.9E-03	µg/kg
	2,3,3',4,4',5-Hexachlorobiphenyl	11 / 13	85	1.5E-03	3.6E-02	8.6E-03	µg/kg
	2,3,3',4,4',5'-Hexachlorobiphenyl	3 / 13	23	2.9E-03	9.3E-03	2.2E-03	µg/kg
	2,3,4,4',5,5'-Hexachlorobiphenyl	3 / 5	60	2.0E-03	1.4E-02	5.0E-03	µg/kg
	2,3',4,4',5,5'-Hexachlorobiphenyl	4 / 8	50	1.4E-03	1.6E-02	3.3E-03	µg/kg
	3,3',4,4',5,5'-Hexachlorobiphenyl	4 / 8	50	2.1E-04	2.0E-03	1.2E-03	µg/kg
	2,3,3',4,4',5,5'-Heptachlorobiphenyl	3 / 13	23	1.1E-03	1.1E-02	2.4E-03	µg/kg
	Monochlorobiphenyl	2 / 5	40	3.7E-02	3.3E-01	7.4E-02	µg/kg
	Dichlorobiphenyl	5 / 5	100	9.9E-02	9.6E-01	2.9E-01	µg/kg
	Trichlorobiphenyl	5 / 5	100	1.9E-01	3.6E+00	9.8E-01	µg/kg
	Tetrachlorobiphenyl	5 / 5	100	6.9E-01	1.4E+01	3.9E+00	µg/kg
	Pentachlorobiphenyl	5 / 5	100	3.9E-01	4.5E+00	1.6E+00	µg/kg
	Hexachlorobiphenyl	5 / 5	100	2.3E-01	1.2E+00	5.4E-01	µg/kg
	Heptachlorobiphenyl	5 / 5	100	5.1E-02	4.1E-01	1.8E-01	µg/kg
	Octachlorobiphenyl	2 / 5	40	1.1E-02	1.7E-02	6.4E-03	µg/kg
	Total PCBs (Homologue)	5 / 5	100	1.7E+00	2.5E+01	7.6E+00	µg/kg
	2005 WHO Mammals TEQ (PCBs)	13 / 13	100	1.2E-01	1.9E+00	4.8E-01	ng/kg

Table 4-2d. Summary of Analytical Results for Chemicals in Soil, Saginaw Bay Floodplain

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
SVOCs						
2-Methylnaphthalene	1 / 4	25	0.0E+00	0.0E+00	1.4E+02	µg/kg
Hexachlorocyclopentadiene	1 / 2	50	0.0E+00	0.0E+00	6.3E+02	µg/kg
Naphthalene	1 / 4	25	0.0E+00	0.0E+00	9.3E+01	µg/kg
VOCs						
Ethyl benzene	1 / 2	50	2.4E+02	2.4E+02	1.3E+02	µg/kg
m,p-Xylene (sum of isomers)	1 / 2	50	6.0E+02	6.0E+02	3.3E+02	µg/kg
o-Xylene	1 / 2	50	2.4E+02	2.4E+02	1.3E+02	µg/kg
Toluene	2 / 2	100	6.1E+01	2.0E+03	1.0E+03	µg/kg

a. Mean concentration calculation includes one half the reporting limit for all non-detect values.
µg/kg: microgram per kilogram
mg/kg: milligram per kilogram
ng/kg: nanogram per kilogram
PCB: polychlorinated biphenyls
PCDD/Fs: dioxins and furans
SVOC: semi-volatile organic compounds
VOC: volatile organic compounds
WHO: World Health Organization
2005 WHO Mammals TEQ: 2,3,7,8 -tetrachlodibenzo-p-dioxin equivalent concentration, based on 2005 toxicity equivalence scheme developed by the World Health Organization for mammals (Van den Berg 2006).

Table 4-3a. Summary of Analytical Results for Chemicals in Sediment, Upper Saginaw River

	Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Coneentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCDD/Fs							
	1,3,6,8-Tetrachloro-dibenzodioxin	1 / 1	100	6.1E+00	6.1E+00	6.1E+00	ng/kg
	2,3,7,8-Tetrachlorodibenzo-p-dioxin	64 / 77	83	1.7E-01	2.8E+03	5.6E+01	ng/kg
	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	46 / 77	60	6.6E-02	1.5E+02	1.5E+01	ng/kg
	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	30 / 77	39	2.4E-01	1.1E+02	8.1E+00	ng/kg
	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	53 / 77	69	1.3E-01	6.4E+02	5.4E+01	ng/kg
	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	43 / 77	56	1.2E-01	2.2E+02	2.0E+01	ng/kg
	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	75 / 77	97	3.5E-01	1.1E+04	7.9E+02	ng/kg
	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	77 / 77	100	5.1E-01	9.7E+04	7.2E+03	ng/kg
	1,3,6,8-Tetrachloro-dibenzofuran	1 / 1	100	6.2E+00	6.2E+00	6.2E+00	ng/kg
	2,3,7,8-Tetrachlorodibenzofuran	76 / 77	99	3.0E-01	4.8E+04	3.1E+03	ng/kg
	1,2,3,7,8-Pentachlorodibenzofuran	72 / 78	92	1.6E-01	3.4E+04	1.8E+03	ng/kg
	2,3,4,7,8-Pentachlorodibenzofuran	71 / 77	92	2.2E-01	1.7E+04	1.3E+03	ng/kg
	1,2,3,4,7,8-Hexachlorodibenzofuran	70 / 78	90	1.8E-01	2.5E+04	1.2E+03	ng/kg
	1,2,3,6,7,8-Hexachlorodibenzofuran	65 / 78	83	1.5E-01	5.0E+03	3.2E+02	ng/kg
	1,2,3,7,8,9-Hexachlorodibenzofuran	54 / 77	70	9.6E-02	1.6E+03	6.3E+01	ng/kg
	2,3,4,6,7,8-Hexachlorodibenzofuran	57 / 77	74	2.2E-01	1.8E+03	1.1E+02	ng/kg
	1,2,3,4,6,7,8-Heptachlorodibenzofuran	75 / 78	96	1.7E-01	1.6E+04	1.3E+03	ng/kg
	1,2,3,4,7,8,9-Heptachlorodibenzofuran	58 / 77	75	8.8E-02	1.0E+03	8.7E+01	ng/kg
	1,2,3,4,6,7,8,9-Octachlorodibenzofuran	72 / 77	94	2.4E-01	4.0E+04	2.1E+03	ng/kg
	Total Tetrachloro-dibenzodioxin	76 / 77	99	1.8E-01	5.0E+03	2.2E+02	ng/kg
	Total Pentachloro-dibenzodioxin	75 / 77	97	6.9E-01	5.5E+04	1.5E+03	ng/kg
	Total Hexachloro-dibenzodioxin	74 / 77	96	3.2E-01	4.4E+03	4.1E+02	ng/kg
	Total Heptachloro-dibenzodioxin	76 / 77	99	5.6E-01	1.8E+04	1.4E+03	ng/kg
	Total Tetrachloro-dibenzofuran	78 / 78	100	5.1E-01	1.2E+05	8.6E+03	ng/kg
	Total Pentachloro-dibenzofuran	75 / 78	96	1.5E-01	9.0E+04	4.7E+03	ng/kg
	Total Hexachloro-dibenzofuran	73 / 78	94	2.2E-01	3.9E+04	2.8E+03	ng/kg
	Total Heptachloro-dibenzofuran	75 / 78	96	1.7E-01	4.3E+04	3.0E+03	ng/kg
	2005 WHO Mammals TEQ (PCDD/Fs)	77 / 77	100	3.2E-01	1.2E+04	1.0E+03	ng/kg
Metals							
	Aluminum	2 / 2	100	950	1700	1325	mg/kg
	Arsenic	33 / 33	100	1.5	20.6	6.7	mg/kg
	Barium	33 / 33	100	4.32	115	24	mg/kg
	Beryllium	17 / 33	52	0.0794	0.576	0.19	mg/kg

Table 4-3a. Summary of Analytical Results for Chemicals in Sediment, Upper Saginaw River

	Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Coneentration	Maximum Detected Concentration	Mean Concentration[a]	Units
Metals (cont'd)							
	Calcium	2 / 2	100	11100	21600	16350	mg/kg
	Chromium, Total	33 / 33	100	3.08	24.3	8.0	mg/kg
	Cobalt	31 / 33	94	0.817	7.97	2.5	mg/kg
	Copper	25 / 33	76	1.59	64.6	5.8	mg/kg
	Iron	2 / 2	100	2300	3700	3000	mg/kg
	Lead	33 / 33	100	1.13	19.9	5.2	mg/kg
	Lithium	32 / 33	97	0.749	20.6	5.4	mg/kg
	Magnesium	2 / 2	100	2990	5460	4225	mg/kg
	Manganese	2 / 2	100	54	120	87	mg/kg
	Mercury	9 / 33	27	0.0224	0.162	0.02	mg/kg
	Nickel	29 / 33	88	1.91	19.8	6.3	mg/kg
	Potassium	2 / 2	100	113	215	164	mg/kg
	Sodium	1 / 2	50	65	65	45	mg/kg
	Strontium	2 / 2	100	7.6	19	13	mg/kg
	Thallium	1 / 33	3	1.21	1.21	0.53	mg/kg
	Titanium	2 / 2	100	50	59	55	mg/kg
	Vanadium	32 / 32	100	2.12	24.4	8.3	mg/kg
	Zinc	33 / 33	100	7.55	75.4	23	mg/kg
PCBs							
	2,4,4',5-Tetrachlorobiphenyl	1 / 1	100	5.5E+02	5.5E+02	5.5E+02	µg/kg
	3,3',4,4'-Tetrachlorobiphenyl	1 / 1	100	6.2E+02	6.2E+02	6.2E+02	µg/kg
	3,4,4',5-Tetrachlorobiphenyl	1 / 1	100	5.5E-01	5.5E-01	5.5E-01	µg/kg
	2,3,3',4,4'-Pentachlorobiphenyl	1 / 1	100	5.9E+02	5.9E+02	5.9E+02	µg/kg
	2,3,4,4',5-Pentachlorobiphenyl	1 / 1	100	1.5E+03	1.5E+03	1.5E+03	µg/kg
	2,3',4,4',5-Pentachlorobiphenyl	1 / 1	100	1.3E+03	1.3E+03	1.3E+03	µg/kg
	2',3,4,4',5-Pentachlorobiphenyl	1 / 1	100	3.1E+02	3.1E+02	3.1E+02	µg/kg
	2,3,3',4,4',5-Hexachlorobiphenyl	1 / 1	100	1.9E+02	1.9E+02	1.9E+02	µg/kg
	2,3,4,4',5,5'-Hexachlorobiphenyl	1 / 1	100	1.9E+02	1.9E+02	1.9E+02	µg/kg
	2,2',3,3',4,4',5,5'6,6'-Decachlorobiphenyl	1 / 1	100	8.0E+01	8.0E+01	8.0E+01	µg/kg
	Monochlorobiphenyl	1 / 1	100	3.3E+03	3.3E+03	3.3E+03	µg/kg
	Dichlorobiphenyl	2 / 2	100	1.5E+01	4.4E+04	2.2E+04	µg/kg
	Trichlorobiphenyl	2 / 2	100	4.4E+01	5.6E+04	2.8E+04	µg/kg
	Tetrachlorobiphenyl	2 / 2	100	2.3E+01	4.0E+04	2.0E+04	µg/kg
	Pentachlorobiphenyl	1 / 1	100	1.0E+04	1.0E+04	1.0E+04	µg/kg

Table 4-3a. Summary of Analytical Results for Chemicals in Sediment, Upper Saginaw River

	Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Coneentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCBs (cont'd)	Hexachlorobiphenyl	1 / 1	100	3.6E+03	3.6E+03	3.6E+03	µg/kg
	Heptachlorobiphenyl	1 / 1	100	2.1E+03	2.1E+03	2.1E+03	µg/kg
	Octachlorobiphenyl	1 / 1	100	7.8E+01	7.8E+01	7.8E+01	µg/kg
	Nonachlorobiphenyl	1 / 1	100	7.3E+01	7.3E+01	7.3E+01	µg/kg
	Total PCBs (Homologue)	1 / 1	100	9.0E+04	9.0E+04	9.0E+04	µg/kg
	2005 WHO Mammals TEQ (PCBs)	1 / 1	100	4.9E-01	4.9E-01	4.9E-01	µg/kg
SVOCs							
	2-Methylnaphthalene	3 / 35	9	2.0E+01	3.1E+01	1.9E+02	µg/kg
	Acenaphthene	3 / 33	9	3.0E+01	1.4E+02	1.8E+02	µg/kg
	Acenaphthylene	2 / 33	6	4.2E+01	1.6E+02	1.9E+02	µg/kg
	Anthracene	8 / 33	24	1.2E+01	2.7E+03	2.5E+02	µg/kg
	Benzo(a)anthracene	6 / 33	18	1.6E+01	3.3E+03	3.0E+02	µg/kg
	Benzo(a)pyrene	27 / 33	82	7.7E+00	2.7E+03	1.9E+02	µg/kg
	Benzo(b)fluoranthene	12 / 33	36	1.3E+01	3.3E+03	2.7E+02	µg/kg
	Benzo(g,h,i)perylene	7 / 33	21	8.7E+00	1.5E+03	2.2E+02	µg/kg
	Benzo(k)fluoranthene	8 / 33	24	1.0E+01	1.2E+03	2.1E+02	µg/kg
	Chrysene	13 / 33	39	9.1E+00	3.1E+03	2.6E+02	µg/kg
	Dibenz(a,h)anthracene	3 / 33	9	3.2E+01	5.2E+02	2.0E+02	µg/kg
	Diethyl phthalate	1 / 2	50	2.4E+02	2.4E+02	1.5E+02	µg/kg
	Fluoranthene	17 / 33	52	9.8E+00	8.2E+03	4.7E+02	µg/kg
	Fluorene	5 / 33	15	1.2E+01	3.8E+02	1.9E+02	µg/kg
	Indeno(1,2,3-c,d)pyrene	3 / 33	9	5.9E+01	1.3E+03	2.3E+02	µg/kg
	Naphthalene	3 / 35	9	3.5E+01	4.2E+01	1.8E+02	µg/kg
	Phenanthrene	15 / 33	45	1.0E+01	5.8E+03	3.7E+02	µg/kg
	Pyrene	17 / 33	52	8.4E+00	5.9E+03	3.7E+02	µg/kg

a. Mean concentration calculation includes one half the reporting limit for all non-detect values.
µg/kg: microgram per kilogram
mg/kg: milligram per kilogram
ng/kg: nanogram per kilogram
PCBs: polychlorinated biphenyls
PCDD/Fs: dioxins and furans
SVOC: semi-volatile organic compound
WHO: World Health Organization
2005 WHO Mammals TEQ: 2,3,7,8-tetrachlorodibenzo-p-dioxin equivalent concentration, based on 2005 toxicity equivalence scheme developed by the World Health Organization for mammals (Van den Berg et al. 2006).

Table 4-3b. Summary of Analytical Results for Chemicals in Sediment, Lower Saginaw River, Saginaw County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Coneentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCDD/Fs						
1,3,6,8-Tetrachloro-dibenzodioxin	5 / 5	100	4.9E-01	1.5E+01	6.8E+00	ng/kg
1,3,7,9-Tetrachloro-dibenzodioxin	5 / 5	100	1.5E-01	4.9E+00	2.5E+00	ng/kg
2,3,7,8-Tetrachlorodibenzo-p-dioxin	52 / 56	93	2.0E-01	8.6E+01	6.5E+00	ng/kg
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	22 / 56	39	1.1E+00	6.5E+01	4.0E+00	ng/kg
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	12 / 56	21	2.5E-01	5.6E+00	1.3E+00	ng/kg
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	45 / 56	80	5.5E-01	5.3E+01	1.3E+01	ng/kg
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	40 / 56	71	1.7E-01	2.4E+01	6.2E+00	ng/kg
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	54 / 56	96	1.6E+00	1.7E+03	2.3E+02	ng/kg
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	55 / 56	98	1.6E+01	1.6E+04	2.1E+03	ng/kg
1,3,6,8-Tetrachloro-dibenzofuran	3 / 5	60	1.0E+00	2.4E+00	1.0E+00	ng/kg
2,3,7,8-Tetrachlorodibenzofuran	56 / 56	100	2.6E+00	2.6E+04	1.6E+03	ng/kg
1,2,3,7,8-Pentachlorodibenzofuran	54 / 56	96	8.9E-01	1.1E+04	7.7E+02	ng/kg
2,3,4,7,8-Pentachlorodibenzofuran	54 / 56	96	7.3E-01	8.6E+03	5.6E+02	ng/kg
1,2,3,4,7,8-Hexachlorodibenzofuran	53 / 56	95	2.6E+00	6.7E+03	4.4E+02	ng/kg
1,2,3,6,7,8-Hexachlorodibenzofuran	53 / 56	95	1.9E-01	2.0E+03	1.1E+02	ng/kg
1,2,3,7,8,9-Hexachlorodibenzofuran	20 / 56	36	2.1E-01	1.1E+02	8.0E+00	ng/kg
2,3,4,6,7,8-Hexachlorodibenzofuran	49 / 56	88	1.2E-01	6.5E+02	4.5E+01	ng/kg
1,2,3,4,6,7,8-Heptachlorodibenzofuran	54 / 56	96	2.7E+00	2.2E+03	4.4E+02	ng/kg
1,2,3,4,7,8,9-Heptachlorodibenzofuran	46 / 56	82	4.3E-01	3.6E+02	3.4E+01	ng/kg
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	52 / 56	93	3.0E+00	3.1E+03	5.5E+02	ng/kg
Total Tetrachloro-dibenzodioxin	53 / 55	96	1.1E+00	1.4E+02	3.2E+01	ng/kg
Total Pentachloro-dibenzodioxin	43 / 55	78	1.2E+00	1.4E+02	2.5E+01	ng/kg
Total Hexachloro-dibenzodioxin	51 / 55	93	6.6E-01	4.3E+02	1.0E+02	ng/kg
Total Heptachloro-dibenzodioxin	53 / 55	96	3.8E+00	4.5E+03	4.7E+02	ng/kg
Total Tetrachloro-dibenzofuran	56 / 56	100	6.2E+00	4.7E+04	3.5E+03	ng/kg
Total Pentachloro-dibenzofuran	53 / 55	96	2.4E+00	3.6E+04	2.6E+03	ng/kg
Total Hexachloro-dibenzofuran	53 / 55	96	1.7E+00	1.3E+04	9.8E+02	ng/kg
Total Heptachloro-dibenzofuran	53 / 55	96	5.0E+00	4.5E+03	9.6E+02	ng/kg
2005 WHO Mammals TEQ (PCDD/Fs)	55 / 55	100	5.9E-01	6.2E+03	4.4E+02	ng/kg
Hydrocarbons						
Pentacosane	1 / 1	100	8.3E+02	8.3E+02	8.3E+02	µg/kg
Tetramethyl-Hexadecane	1 / 1	100	1.3E+03	1.3E+03	1.3E+03	µg/kg
Tetramethyl-Pentadecane	1 / 1	100	2.5E+03	2.5E+03	2.5E+03	µg/kg
Trimethyl-Pentadecane	1 / 1	100	1.6E+03	1.6E+03	1.6E+03	µg/kg

Table 4-3b. Summary of Analytical Results for Chemicals in Sediment, Lower Saginaw River, Saginaw County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Coneentration	Maximum Detected Concentration	Mean Concentration[a]	Units
Metals						
Aluminum	10 / 10	100	720	12000	4293	mg/kg
Arsenic	10 / 10	100	1.4	8.6	4.3	mg/kg
Barium	10 / 10	100	6.2	87	32	mg/kg
Beryllium	3 / 10	30	0.33	0.58	0.22	mg/kg
Calcium	10 / 10	100	6270	70300	29443	mg/kg
Chromium, Total	9 / 10	90	2.6	24	10	mg/kg
Cobalt	7 / 10	70	2.2	7.8	3.2	mg/kg
Copper	8 / 10	80	5.7	34	12	mg/kg
Iron	10 / 10	100	2700	19000	7970	mg/kg
Lead	7 / 10	70	5.9	30	11	mg/kg
Lithium	8 / 10	80	2.2	21	7.2	mg/kg
Magnesium	10 / 10	100	3150	25000	10511	mg/kg
Manganese	10 / 10	100	59	510	214	mg/kg
Mercury	3 / 18	17	0.14	0.18	0.06	mg/kg
Nickel	6 / 10	60	5.3	20	8.3	mg/kg
Potassium	10 / 10	100	83	1510	534	mg/kg
Selenium	1 / 10	10	0.7	0.7	0	mg/kg
Silver	1 / 10	10	0.9	0.9	0	mg/kg
Sodium	6 / 10	60	61	139	71	mg/kg
Strontium	10 / 10	100	4.6	86	31	mg/kg
Titanium	10 / 10	100	44	180	98	mg/kg
Vanadium	10 / 10	100	2.2	27	11	mg/kg
Zinc	10 / 10	100	7	95	43	mg/kg
PCBs						
2,4,4',5-Tetrachlorobiphenyl	2 / 5	40	6.8E+00	9.6E+00	3.8E+00	µg/kg
3,3',4,4'-Tetrachlorobiphenyl	5 / 6	83.33	1.5E-02	6.9E+01	2.8E+01	µg/kg
3,4,4',5-Tetrachlorobiphenyl	3 / 5	60	5.8E-04	9.6E-03	3.9E-03	µg/kg
2,3,3',4,4'-Pentachlorobiphenyl	5 / 5	100	1.1E-01	2.4E+02	1.2E+02	µg/kg
2,3,4,4',5-Pentachlorobiphenyl	3 / 6	50	2.6E+01	4.9E+01	1.8E+01	µg/kg
2,3',4,4',5-Pentachlorobiphenyl	5 / 5	100	3.1E-02	5.3E+02	2.7E+02	µg/kg
2',3,4,4',5-Pentachlorobiphenyl	4 / 5	80	5.7E+00	1.3E+02	6.6E+01	µg/kg
2,3',4,4',5-Pentachlorobiphenyl & 2',3,4,4',5 Pentachlorobiphenyl	1 / 1	100	1.8E-01	1.8E-01	1.8E-01	µg/kg
3,3',4,4',5-Pentachlorobiphenyl	1 / 6	16.67	3.6E-04	3.6E-04	1.1E+00	µg/kg
2,3,3',4,4',5-Hexachlorobiphenyl	3 / 6	50	2.9E+01	6.6E+01	2.6E+01	µg/kg
2,3,3',4,4',5'-Hexachlorobiphenyl	2 / 6	33.33	1.3E+01	1.6E+01	5.6E+00	µg/kg
2,3,4,4',5,5'-Hexachlorobiphenyl	3 / 5	60	9.4E+00	3.1E+01	1.4E+01	µg/kg

Table 4-3b. Summary of Analytical Results for Chemicals in Sediment, Lower Saginaw River, Saginaw County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Coneentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCBs (cont'd)						
3,3',4,4',5,5'-Hexachlorobiphenyl	1 / 1	100	1.4E-04	1.4E-04	1.4E-04	µg/kg
2,2',3,3',4,4',5,5'6,6'-Decachlorobiphenyl	3 / 5	60	1.5E+02	3.0E+02	1.5E+02	µg/kg
Monochlorobiphenyl	4 / 5	80	2.0E-02	8.2E+02	4.0E+02	µg/kg
Dichlorobiphenyl	5 / 5	100	2.4E-02	4.1E+03	1.5E+03	µg/kg
Trichlorobiphenyl	5 / 5	100	9.6E-02	3.2E+03	1.7E+03	µg/kg
Tetrachlorobiphenyl	5 / 5	100	2.4E-01	6.5E+03	3.3E+03	µg/kg
Pentachlorobiphenyl	5 / 5	100	2.5E-01	4.6E+03	2.1E+03	µg/kg
Hexachlorobiphenyl	5 / 5	100	2.0E-01	3.2E+03	1.4E+03	µg/kg
Heptachlorobiphenyl	5 / 5	100	4.5E-02	1.2E+03	5.2E+02	µg/kg
Octachlorobiphenyl	3 / 5	60	3.0E+01	2.8E+02	9.3E+01	µg/kg
Nonachlorobiphenyl	2 / 5	40	1.0E+02	1.3E+02	5.0E+01	µg/kg
Total PCBs (Homologue)	5 / 5	100	8.9E-01	2.4E+04	1.1E+04	µg/kg
2005 WHO Mammals TEQ (PCBs)	5 / 5	100	5.1E-02	4.0E+02	2.2E+02	ng/kg
SVOCs						
2-Methylnaphthalene	1 / 15	7	0.0E+00	0.0E+00	1.8E+02	µg/kg
Benzyl butyl phthalate	1 / 10	10	1.8E+02	1.8E+02	8.2E+01	µg/kg
Bis(2-ethylhexyl) phthalate	1 / 10	10	5.9E+02	5.9E+02	1.9E+02	µg/kg
Diethyl phthalate	4 / 10	40	2.7E+02	3.1E+02	1.6E+02	µg/kg
Fluoranthene	3 / 10	30	2.2E+02	3.2E+02	1.3E+02	µg/kg
Naphthalene	1 / 15	7	0.0E+00	0.0E+00	1.1E+02	µg/kg
Phenanthrene	3 / 10	30	2.0E+02	2.4E+02	1.1E+02	µg/kg
Pyrene	3 / 10	30	2.1E+02	2.8E+02	1.2E+02	µg/kg
VOCs						
1,4-Dichlorobenzene	3 / 15	20	1.4E+02	2.1E+02	8.6E+01	µg/kg
Other						
Methyl-Tridecane	1 / 1	100	7.6E+02	7.6E+02	7.6E+02	µg/kg
Nonacosane	1 / 1	100	1.3E+03	1.3E+03	1.3E+03	µg/kg

a. Mean concentration calculation includes one half the reporting limit for all non-detect values.

µg/kg: microgram per kilogram
mg/kg: milligram per kilogram
ng/kg: nanogram per kilogram
PCBs: polychlorinated biphenyls
PCDD/Fs: dioxins and furans
WHO: World Health Organization
2005 WHO Mammals TEQ: 2,3,7,8-tetrachlorodibenzo-p-dioxin equivalent concentration, based on 2005 toxicity equivalence scheme developed by the World Health Organization for mammals (Van den Berg et al. 2006).

Table 4-3c. Summary of Analytical Results for Chemicals in Sediment, Lower Saginaw River, Bay County

	Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCDD/Fs							
	1,3,6,8-Tetrachloro-dibenzodioxin	3 / 3	100	3.4E+00	2.4E+01	1.1E+01	ng/kg
	1,3,7,9-Tetrachloro-dibenzodioxin	3 / 3	100	1.1E+00	7.9E+00	3.8E+00	ng/kg
	2,3,7,8-Tetrachlorodibenzo-p-dioxin	25 / 28	89	6.7E-01	3.2E+01	7.9E+00	ng/kg
	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	15 / 28	54	5.3E-01	2.2E+01	5.2E+00	ng/kg
	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	10 / 28	36	3.7E-01	1.2E+01	2.4E+00	ng/kg
	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	24 / 28	86	1.8E+00	1.2E+02	2.1E+01	ng/kg
	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	22 / 28	79	9.9E-01	3.6E+01	9.1E+00	ng/kg
	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	26 / 28	93	4.0E+00	3.4E+03	3.6E+02	ng/kg
	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	27 / 28	96	2.1E+01	2.3E+04	2.8E+03	ng/kg
	1,3,6,8-Tetrachloro-dibenzofuran	3 / 3	100	3.5E-01	4.0E-01	3.8E-01	ng/kg
	2,3,7,8-Tetrachlorodibenzofuran	27 / 28	96	1.8E+00	1.2E+03	4.3E+02	ng/kg
	1,2,3,7,8-Pentachlorodibenzofuran	26 / 28	93	1.6E+01	7.0E+02	1.8E+02	ng/kg
	2,3,4,7,8-Pentachlorodibenzofuran	26 / 28	93	1.1E+01	6.0E+02	1.4E+02	ng/kg
	1,2,3,4,7,8-Hexachlorodibenzofuran	26 / 28	93	6.9E+00	5.3E+02	1.3E+02	ng/kg
	1,2,3,6,7,8-Hexachlorodibenzofuran	25 / 28	89	5.4E+00	2.2E+02	4.5E+01	ng/kg
	1,2,3,7,8,9-Hexachlorodibenzofuran	8 / 28	29	1.2E+00	8.0E+00	2.2E+00	ng/kg
	2,3,4,6,7,8-Hexachlorodibenzofuran	24 / 28	86	3.7E+00	7.9E+01	1.6E+01	ng/kg
	1,2,3,4,6,7,8-Heptachlorodibenzofuran	27 / 28	96	7.4E+00	2.1E+03	4.9E+02	ng/kg
	1,2,3,4,7,8,9-Heptachlorodibenzofuran	25 / 28	89	2.6E+00	1.5E+02	2.5E+01	ng/kg
	1,2,3,4,6,7,8,9-Octachlorodibenzofuran	27 / 28	96	9.1E+00	9.0E+03	8.8E+02	ng/kg
	Total Tetrachloro-dibenzodioxin	25 / 28	89	5.0E+00	1.4E+02	4.7E+01	ng/kg
	Total Pentachloro-dibenzodioxin	22 / 28	79	3.5E+00	1.4E+02	4.0E+01	ng/kg
	Total Hexachloro-dibenzodioxin	25 / 28	89	1.4E+01	4.6E+02	1.5E+02	ng/kg
	Total Heptachloro-dibenzodioxin	26 / 28	93	7.6E+00	5.5E+03	6.5E+02	ng/kg
	Total Tetrachloro-dibenzofuran	27 / 28	96	3.4E+00	2.9E+03	1.0E+03	ng/kg
	Total Pentachloro-dibenzofuran	26 / 28	93	4.8E+01	2.7E+03	7.3E+02	ng/kg
	Total Hexachloro-dibenzofuran	26 / 28	93	1.1E+01	2.1E+03	5.0E+02	ng/kg
	Total Heptachloro-dibenzofuran	27 / 28	96	1.4E+01	8.3E+03	1.2E+03	ng/kg
	2005 WHO Mammals TEQ (PCDD/Fs)	27 / 28	96	2.2E+00	4.4E+02	1.4E+02	ng/kg
Hydrocarbons							
	Hexatriacontane	2 / 2	100	7.2E+02	1.1E+03	9.1E+02	µg/kg
	Methyl-propyl-dodecane	1 / 1	100	9.6E+02	9.6E+02	9.6E+02	µg/kg
	Octadecene	1 / 1	100	1.1E+03	1.1E+03	1.1E+03	µg/kg
Metals							
	Aluminum	11 / 11	100	1,400	8,400	3,173	mg/kg
	Arsenic	11 / 11	100	1.5	49	7.9	mg/kg
	Barium	11 / 11	100	11	94	34	mg/kg

Table 4-3c. Summary of Analytical Results for Chemicals in Sediment, Lower Saginaw River, Bay County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
Metals (cont'd)						
Cadmium	1 / 11	9	3.2	3.2	1.2	mg/kg
Calcium	11 / 11	100	10,800	70,800	27,191	mg/kg
Chromium, Total	11 / 11	100	3.4	150	23	mg/kg
Cobalt	8 / 11	73	2.5	7.1	3.1	mg/kg
Copper	10 / 11	91	4	72	17	mg/kg
Iron	11 / 11	100	3,300	19,000	7,245	mg/kg
Lead	8 / 11	73	6.9	73	18	mg/kg
Lithium	9 / 11	82	2.8	16	5.1	mg/kg
Magnesium	11 / 11	100	4,920	17,800	8,863	mg/kg
Manganese	11 / 11	100	88	410	196	mg/kg
Mercury	3 / 11	27	0.08	0.43	0.08	mg/kg
Nickel	7 / 11	64	5.2	32	9.8	mg/kg
Potassium	11 / 11	100	150	1,170	427	mg/kg
Selenium	1 / 11	9	0.7	0.7	0.29	mg/kg
Silver	2 / 11	18	0.3	1.2	0.24	mg/kg
Sodium	6 / 11	55	70	139	70	mg/kg
Strontium	11 / 11	100	9.3	140	36	mg/kg
Titanium	11 / 11	100	56	130	87	mg/kg
Vanadium	11 / 11	100	3.8	18	7.8	mg/kg
Zinc	11 / 11	100	13	230	63	mg/kg
PCBs						
2,4,4',5-Tetrachlorobiphenyl	2 / 2	100	1.4E-02	4.7E-02	3.1E-02	µg/kg
3,3',4,4'-Tetrachlorobiphenyl	2 / 2	100	1.3E-01	7.4E-01	4.4E-01	µg/kg
3,4,4',5-Tetrachlorobiphenyl	2 / 2	100	1.4E-02	4.7E-02	3.1E-02	µg/kg
2,3,3',4,4'-Pentachlorobiphenyl	2 / 2	100	3.7E-01	1.2E+00	7.7E-01	µg/kg
2,3,4,4',5-Pentachlorobiphenyl	2 / 2	100	3.4E-02	1.4E-01	8.7E-02	µg/kg
2,3',4,4',5-Pentachlorobiphenyl	2 / 2	100	8.7E-01	3.2E+00	2.1E+00	µg/kg
2',3,4,4',5-Pentachlorobiphenyl	2 / 2	100	2.4E-01	8.9E-01	5.6E-01	µg/kg
3,3',4,4',5-Pentachlorobiphenyl	1 / 2	50	2.2E-02	2.2E-02	1.2E-02	µg/kg
2,3,3',4,4',5-Hexachlorobiphenyl	2 / 2	100	1.0E-01	2.7E-01	1.9E-01	µg/kg
2,3,3',4,4',5'-Hexachlorobiphenyl	2 / 2	100	2.5E-02	6.6E-02	4.6E-02	µg/kg
2,3,4,4',5,5'-Hexachlorobiphenyl	2 / 2	100	4.8E-02	1.1E-01	7.9E-02	µg/kg
2,3,3',4,4',5,5'-Heptachlorobiphenyl	2 / 2	100	3.2E-02	4.3E-02	3.8E-02	µg/kg
2,2',3,3',4,4',5,5'6,6'-Decachlorobiphenyl	2 / 2	100	3.5E-01	6.6E-01	5.0E-01	µg/kg
Monochlorobiphenyl	2 / 2	100	3.7E-01	8.9E-01	6.3E-01	µg/kg
Dichlorobiphenyl	2 / 2	100	2.6E+00	3.2E+01	1.7E+01	µg/kg
Trichlorobiphenyl	3 / 3	100	4.5E+00	5.8E+01	3.7E+01	µg/kg
Tetrachlorobiphenyl	3 / 3	100	1.3E+01	9.6E+01	6.7E+01	µg/kg
Pentachlorobiphenyl	2 / 2	100	7.8E+00	3.6E+01	2.2E+01	µg/kg

Table 4-3c. Summary of Analytical Results for Chemicals in Sediment, Lower Saginaw River, Bay County

	Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCBs (cont'd)							
	Hexachlorobiphenyl	2 / 2	100	5.7E+00	1.4E+01	9.6E+00	µg/kg
	Heptachlorobiphenyl	2 / 2	100	3.3E+00	5.4E+00	4.4E+00	µg/kg
	Octachlorobiphenyl	2 / 2	100	6.7E-01	1.4E+00	1.0E+00	µg/kg
	Nonachlorobiphenyl	2 / 2	100	4.2E-01	5.3E-01	4.7E-01	µg/kg
	Total PCBs (Homologue)	2 / 2	100	3.8E+01	2.4E+02	1.4E+02	µg/kg
	2005 Who Mammals TEQ (PCBs)	2 / 2	100	2.9E-01	2.5E+00	1.4E+00	ng/kg
	PCB-1242 (Aroclor 1242)	30 / 40	75	8.1E+00	5.1E+03	5.0E+02	µg/kg
	PCB-1254 (Aroclor 1254)	1 / 11	9	2.2E+02	2.2E+02	8.5E+01	µg/kg
	PCB-1260 (Aroclor 1260)	5 / 16	31	8.2E+01	2.8E+02	1.1E+02	µg/kg
	Sum PCBs (Aroclor)	30 / 40	75	8.1E+00	5.3E+03	6.9E+02	µg/kg
SVOCs							
	Anthracene	1 / 11	9	2.1E+02	2.1E+02	1.6E+02	µg/kg
	Benzo(a)anthracene	2 / 11	18	3.3E+02	3.7E+02	2.0E+02	µg/kg
	Benzo(a)pyrene	1 / 11	9	3.9E+02	3.9E+02	3.1E+02	µg/kg
	Benzo(b)fluoranthene	2 / 11	18	3.4E+02	5.6E+02	3.5E+02	µg/kg
	Benzyl butyl phthalate	1 / 11	9	2.5E+02	2.5E+02	1.6E+02	µg/kg
	Bis(2-ethylhexyl) phthalate	1 / 11	9	5.9E+02	5.9E+02	3.3E+02	µg/kg
	Chrysene	2 / 11	18	3.5E+02	4.2E+02	2.0E+02	µg/kg
	Diethyl phthalate	3 / 11	27	2.2E+02	4.0E+02	2.2E+02	µg/kg
	Fluoranthene	4 / 11	36	1.3E+02	9.2E+02	3.2E+02	µg/kg
	Phenanthrene	2 / 11	18	6.4E+02	6.8E+02	2.5E+02	µg/kg
	Pyrene	3 / 11	27	3.5E+02	1.0E+03	3.2E+02	µg/kg
VOCs							
	1,4-Dichlorobenzene	2 / 14	14	1.2E+02	2.8E+02	1.4E+02	µg/kg

a. Mean concentration calculation includes one half the reporting limit for all non-detect values.
µg/kg: microgram per kilogram
mg/kg: milligram per kilogram
ng/kg: nanogram per kilogram
PCBs: polychlorinated biphenyls
PCDD/Fs: dioxins and furans
SVOC: semi-volatile organic compound
WHO: World Health Organization
VOC: volatile organic compound
2005 WHO Mammals TEQ: 2,3,7,8-tetrachlorodibenzo-p-dioxin equivalent concentration, based on 2005 toxicity equivalence scheme developed by the World Health Organization for mammals (Van den Berg et al. 2006).

Table 4-3d. Summary of Analytical Results for Chemicals in Sediment, Saginaw Bay

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCDD\Fs						
1,3,6,8-Tetrachloro-dibenzodioxin	6 / 6	100	2.5E-01	2.0E+00	1.2E+00	ng/kg
1,3,7,9-Tetrachloro-dibenzodioxin	2 / 6	33	6.1E-01	7.5E-01	3.6E-01	ng/kg
2,3,7,8-Tetrachlorodibenzo-p-dioxin	8 / 12	67	3.9E-01	1.3E+01	4.7E+00	ng/kg
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	9 / 12	75	2.3E-01	1.4E+01	4.9E+00	ng/kg
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	8 / 12	67	2.4E-01	7.8E+00	2.7E+00	ng/kg
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	12 / 12	100	1.0E-01	3.5E+01	1.3E+01	ng/kg
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	12 / 12	100	8.0E-02	2.4E+01	8.7E+00	ng/kg
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	12 / 12	100	5.0E-01	5.3E+02	1.8E+02	ng/kg
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	11 / 12	92	3.7E+01	4.5E+03	1.6E+03	ng/kg
1,3,6,8-Tetrachloro-dibenzofuran	3 / 6	50	2.0E-01	4.2E-01	1.8E-01	ng/kg
2,3,7,8-Tetrachlorodibenzofuran	12 / 12	100	5.0E-01	3.7E+02	1.4E+02	ng/kg
1,2,3,7,8-Pentachlorodibenzofuran	12 / 12	100	1.8E-01	1.9E+02	6.6E+01	ng/kg
2,3,4,7,8-Pentachlorodibenzofuran	12 / 12	100	1.7E-01	1.6E+02	5.7E+01	ng/kg
1,2,3,4,7,8-Hexachlorodibenzofuran	12 / 12	100	1.9E-01	2.0E+02	6.5E+01	ng/kg
1,2,3,6,7,8-Hexachlorodibenzofuran	11 / 12	92	8.8E-01	5.2E+01	2.0E+01	ng/kg
1,2,3,7,8,9-Hexachlorodibenzofuran	9 / 12	75	3.7E-01	3.9E+00	1.4E+00	ng/kg
2,3,4,6,7,8-Hexachlorodibenzofuran	11 / 12	92	6.3E-01	3.8E+01	1.5E+01	ng/kg
1,2,3,4,6,7,8-Heptachlorodibenzofuran	12 / 12	100	8.7E-01	9.0E+02	3.1E+02	ng/kg
1,2,3,4,7,8,9-Heptachlorodibenzofuran	9 / 12	75	6.6E-01	3.6E+01	1.3E+01	ng/kg
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	12 / 12	100	5.2E-01	1.2E+03	3.6E+02	ng/kg
Total Tetrachloro-dibenzodioxin	12 / 12	100	2.5E-01	8.2E+01	3.5E+01	ng/kg
Total Pentachloro-dibenzodioxin	10 / 12	83	1.2E+00	9.9E+01	3.7E+01	ng/kg
Total Hexachloro-dibenzodioxin	12 / 12	100	5.9E-01	3.2E+02	1.2E+02	ng/kg
Total Heptachloro-dibenzodioxin	12 / 12	100	9.9E-01	9.9E+02	3.5E+02	ng/kg
Total Tetrachloro-dibenzofuran	12 / 12	100	5.8E+00	1.0E+03	4.4E+02	ng/kg
Total Pentachloro-dibenzofuran	12 / 12	100	2.6E+00	7.3E+02	2.7E+02	ng/kg
Total Hexachloro-dibenzofuran	12 / 12	100	1.1E+00	6.4E+02	2.5E+02	ng/kg
Total Heptachloro-dibenzofuran	12 / 12	100	1.3E+00	1.7E+03	6.1E+02	ng/kg
2005 WHO Mammals TEQ (PCDD/Fs)	12 / 12	100	1.6E-01	1.5E+02	6.1E+01	ng/kg

Table 4-3d. Summary of Analytical Results for Chemicals in Sediment, Saginaw Bay

	Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
Hydrocarbons							
	Tetradecyl ester Dodecanoic acid	2 / 2	100	1.2E+03	1.3E+03	1.3E+03	µg/kg
Metals							
	Aluminum	6 / 6	100	880	6300	3647	mg/kg
	Arsenic	6 / 6	100	1.4	6.1	3.4	mg/kg
	Barium	6 / 6	100	6	59	30	mg/kg
	Beryllium	3 / 6	50	0.32	0.38	0.22	mg/kg
	Calcium	6 / 6	100	14100	66400	40167	mg/kg
	Chromium, Total	6 / 6	100	3.8	20	11	mg/kg
	Cobalt	3 / 6	50	4.9	6.3	3.3	mg/kg
	Copper	5 / 6	83	2	23	11	mg/kg
	Iron	6 / 6	100	2400	15000	7833	mg/kg
	Lead	3 / 6	50	8.5	25	11	mg/kg
	Lithium	4 / 6	67	2.4	17	7.1	mg/kg
	Magnesium	6 / 6	100	5510	23100	13597	mg/kg
	Manganese	6 / 6	100	69	380	208	mg/kg
	Mercury	7 / 12	58	0.09	0.14	0.08	mg/kg
	Nickel	3 / 6	50	14	17	9	mg/kg
	Potassium	6 / 6	100	103	11000	2204	mg/kg
	Selenium	1 / 6	17	0.7	0.7	0.325	mg/kg
	Sodium	5 / 6	83	66	114	80	mg/kg
	Strontium	6 / 6	100	8.4	58	34	mg/kg
	Titanium	6 / 6	100	56	120	87.67	mg/kg
	Vanadium	6 / 6	100	3.2	17	10	mg/kg
	Zinc	6 / 6	100	11	140	55	mg/kg
PCBs							
	2,4,4',5-Tetrachlorobiphenyl	2 / 6	33	8.1E-03	8.3E-03	4.0E-03	µg/kg
	3,3',4,4'-Tetrachlorobiphenyl	6 / 6	100	2.6E-02	1.7E-01	1.1E-01	µg/kg
	3,4,4',5-Tetrachlorobiphenyl	2 / 5	40	8.1E-03	8.3E-03	4.5E-03	µg/kg
	2,3,3',4,4'-Pentachlorobiphenyl	6 / 6	100	5.2E-02	2.6E-01	1.6E-01	µg/kg
	2,3,4,4',5-Pentachlorobiphenyl	5 / 6	83	1.2E-02	2.2E-02	1.4E-02	µg/kg
	2,3',4,4',5-Pentachlorobiphenyl	6 / 6	100	9.3E-02	4.5E-01	3.0E-01	µg/kg
	2',3,4,4',5-Pentachlorobiphenyl	6 / 6	100	3.5E-02	1.1E-01	7.7E-02	µg/kg
	3,3',4,4',5-Pentachlorobiphenyl	2 / 6	33	5.1E-03	5.4E-03	3.4E-03	µg/kg
	2,3,3',4,4',5-Hexachlorobiphenyl	6 / 6	100	7.1E-03	2.9E-02	2.0E-02	µg/kg
	2,3,3',4,4',5'-Hexachlorobiphenyl	4 / 6	67	4.8E-03	7.3E-03	5.6E-03	µg/kg
	2,3,4,4',5,5'-Hexachlorobiphenyl	4 / 6	67	8.2E-03	1.2E-02	8.2E-03	µg/kg
	2,2',3,3',4,4',5-Heptachlorobiphenyl	1 / 1	100	4.0E-02	4.0E-02	4.0E-02	µg/kg

Table 4-3d. Summary of Analytical Results for Chemicals in Sediment, Saginaw Bay

	Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCBs (cont'd)							
	2,2',3,4,4',5,5'-Heptachlorobiphenyl	1 / 1	100	7.9E-02	7.9E-02	7.9E-02	µg/kg
	2,2',3,3',4,4',5,5'6,6'-Decachlorobiphenyl	4 / 6	67	5.1E-02	1.2E-01	6.1E-02	µg/kg
	Monochlorobiphenyl	4 / 5	80	3.6E-02	9.9E-02	6.4E-02	µg/kg
	Dichlorobiphenyl	6 / 6	100	9.6E-02	9.0E-01	5.1E-01	µg/kg
	Trichlorobiphenyl	6 / 6	100	7.3E-01	2.8E+00	1.6E+00	µg/kg
	Tetrachlorobiphenyl	6 / 6	100	1.9E+00	8.1E+00	4.3E+00	µg/kg
	Pentachlorobiphenyl	6 / 6	100	7.3E-01	3.6E+00	2.2E+00	µg/kg
	Hexachlorobiphenyl	6 / 6	100	2.3E-01	1.2E+00	7.8E-01	µg/kg
	Heptachlorobiphenyl	6 / 6	100	3.2E-02	5.0E-01	2.9E-01	µg/kg
	Octachlorobiphenyl	4 / 6	67	8.1E-03	8.7E-02	3.8E-02	µg/kg
	Nonachlorobiphenyl	3 / 6	50	1.8E-02	4.0E-02	2.2E-02	µg/kg
	Total PCBs (Homologue)	6 / 6	100	3.8E+00	1.7E+01	9.8E+00	µg/kg
	2005 WHO Mammals TEQ (PCBs)	5 / 5	100	2.4E-01	6.3E-01	4.8E-01	ng/kg
SVOCs							
	Fluoranthene	1 / 6	17	2.7E+02	2.7E+02	1.1E+02	µg/kg
	Diethyl phthalate	1 / 6	17	1.9E+02	1.9E+02	9.2E+01	µg/kg
	Pyrene	1 / 6	17	2.0E+02	2.0E+02	9.3E+01	µg/kg
Other							
	Hexadecyl ester Dodecanoic acid	1 / 1	100	1.2E+03	1.2E+03	1.2E+03	µg/kg

a. Mean concentration calculation includes one half the reporting limit for all non-detect values.
µg/kg: microgram per kilogram
mg/kg: milligram per kilogram
ng/kg: nanogram per kilogram
PCBs: polychlorinated biphenyls
PCDD/Fs: dioxins and furans
SVOC: semi-volatile organic compound
WHO: World Health Organization
2005 WHO Mammals TEQ: 2,3,7,8-tetrachlorodibenzo-p-dioxin equivalent concentration, based on 2005 toxicity equivalence scheme developed by the World Health Organization for mammals (Van den Berg et al. 2006).

Table 4-4a. Summary of Analytical Results for Chemicals in Surface Water, Lower Saginaw River, Saginaw County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
PCDD/Fs						
2,3,7,8-Tetrachlorodibenzo-p-dioxin	18 / 23	78.3	2.6E-01	3.5E+00	9.4E-01	ng/kg
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	21 / 23	91.3	1.4E-01	2.6E+00	7.8E-01	ng/kg
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	11 / 23	47.8	2.9E-01	1.2E+00	6.2E-01	ng/mg
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	23 / 23	100	4.4E-01	7.1E+00	2.6E+00	ng/kg
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19 / 23	82.6	5.1E-01	3.5E+00	1.3E+00	ng/kg
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	23 / 23	100	5.1E+00	8.2E+01	3.2E+01	ng/kg
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	23 / 23	100	3.7E+01	7.8E+02	2.8E+02	ng/kg
2,3,7,8-Tetrachlorodibenzofuran	23 / 23	100	2.2E+00	1.4E+04	6.5E+02	ng/kg
1,2,3,7,8-Pentachlorodibenzofuran	23 / 23	100	1.3E+00	7.7E+03	3.5E+02	ng/kg
2,3,4,7,8-Pentachlorodibenzofuran	23 / 23	100	1.2E+00	5.6E+03	2.6E+02	ng/kg
1,2,3,4,7,8-Hexachlorodibenzofuran	23 / 23	100	1.2E+00	4.4E+03	2.1E+02	ng/kg
1,2,3,6,7,8-Hexachlorodibenzofuran	23 / 23	100	6.0E-01	9.1E+02	4.3E+01	ng/kg
1,2,3,7,8,9-Hexachlorodibenzofuran	12 / 23	52.2	4.6E-01	6.3E+01	3.9E+00	ng/kg
2,3,4,6,7,8-Hexachlorodibenzofuran	23 / 23	100	4.1E-01	3.6E+02	1.7E+01	ng/kg
1,2,3,4,6,7,8-Heptachlorodibenzofuran	23 / 23	100	9.2E+00	6.0E+02	7.9E+01	ng/kg
1,2,3,4,7,8,9-Heptachlorodibenzofuran	20 / 23	87	4.4E-01	1.7E+02	9.8E+00	ng/kg
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	23 / 23	100	9.0E+00	2.6E+02	7.6E+01	ng/kg
Total Tetrachloro-dibenzodioxin	23 / 23	100	8.4E-01	3.3E+01	9.2E+00	ng/kg
Total Pentachloro-dibenzodioxin	23 / 23	100	4.8E-01	2.1E+01	6.0E+00	ng/kg
Total Hexachloro-dibenzodioxin	23 / 23	100	3.7E+00	7.0E+01	2.3E+01	ng/kg
Total Heptachloro-dibenzodioxin	23 / 23	100	1.1E+01	1.7E+02	6.3E+01	ng/kg
Total Tetrachloro-dibenzofuran	23 / 23	100	7.0E+00	2.7E+04	1.3E+03	ng/kg
Total Pentachloro-dibenzofuran	23 / 23	100	6.0E+00	2.3E+04	1.1E+03	ng/kg
Total Hexachloro-dibenzofuran	23 / 23	100	7.0E+00	7.6E+03	3.8E+02	ng/kg
Total Heptachloro-dibenzofuran	23 / 23	100	1.7E+01	1.0E+03	1.5E+02	ng/kg
2005 WHO Mammals TEQ (PCDD/Fs)	23 / 23	100	1.6E+00	3.9E+03	1.8E+02	ng/kg

Table 4-4a. Summary of Analytical Results for Chemicals in Surface Water, Lower Saginaw River, Saginaw County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
General						
Total Suspended Solids	22 / 22	100	1.6E+04	1.6E+05	5.3E+04	µg/L
Total Solids	8 / 8	100	4.7E+05	7.7E+05	6.5E+05	µg/L
Total Organic Carbon	22 / 22	100	6.6E+03	9.1E+03	7.7E+03	µg/L
Percent Clay	17 / 17	100	0.01	0.45	0.27	%
Percent Silt	17 / 17	100	6.13	86.50	63.70	%
Percent Very Fine Sand	17 / 17	100	8.12	37.52	26.74	%
Percent Fine Sand	17 / 17	100	0.00	15.52	4.24	%
Percent Medium Sand	17 / 17	100	0.00	77.64	5.04	%
Percent Coarse Sand	17 / 17	100	0	0	0	%
Percent Very Coarse Sand	17 / 17	100	0	0	0	%
Percent Gravel	17 / 17	100	0	0	0	%

a. Mean concentration calculation includes one half the reporting limit for all non-detect values.
µg/kg: microgram per kilogram
µg/L: microgram per liter
ng/kg: nanogram per kilogram
PCDD/Fs: dioxins and furans
WHO: World Health Organization
2005 WHO Mammals TEQ: 2,3,7,8-tetrachlorodibenzo-p-dioxin equivalent concentration, based on 2005 toxicity equivalence scheme developed by the World Health Organization for mammals (Van den Berg et al. 2006).

Table 4-4b. Summary of Analytical Results for Chemicals in Surface Water, Lower Saginaw River, Bay County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
Metals						
Cadmium	68 / 68	100	0.00E+00	1.70E-04	2.80E-05	mg/L
Calcium	68 / 68	100	4.43E+01	8.02E+01	6.16E+01	mg/L
Chromium	68 / 68	100	1.40E-04	5.95E-03	1.40E-03	mg/L
Copper	68 / 68	100	1.50E-03	8.10E-03	2.43E-03	mg/L
Lead	68 / 68	100	3.60E-04	7.42E-03	1.49E-03	mg/L
Magnesium	68 / 68	100	1.23E+01	2.41E+01	1.98E+01	mg/L
Nickel	68 / 68	100	2.30E-05	6.38E-03	3.19E-03	mg/L
Potassium	55 / 55	100	2.70E+00	8.10E+00	4.04E+00	mg/L
Sodium	55 / 55	100	1.50E+01	9.31E+01	4.50E+01	mg/L
Zinc	68 / 68	100	2.82E-03	3.48E-02	6.91E-03	mg/L
PCBs						
PCBs, partial sum (congeners)	23 / 23	100	2.3E-03	3.9E-02	1.5E-02	µg/L
Pesticides						
Chlordane	7 / 22	32	0.0E+00	2.1E-01	4.6E-02	µg/L
DDT	7 / 22	32	0.0E+00	1.7E+00	4.5E-01	µg/L
Nutrients						
Nitrogen, ammonia (NH_3)	67 / 67	100	2.9E+01	5.4E+02	2.2E+02	µg/L
Nitrogen, Kjeldahl (NH_3 + Organic N)	68 / 68	100	7.6E+02	1.8E+03	1.2E+03	µg/L
Nitrogen, nitrate (NO_3)	67 / 67	100	4.2E+02	4.5E+03	1.8E+03	µg/L
Nitrogen, nitrite (NO_2) + nitrate (NO_3)	11 / 11	100	6.3E+02	2.8E+03	1.4E+03	µg/L
Nitrogen, nitrite (NO_2)	68 / 68	100	1.7E+01	1.1E+02	4.4E+01	µg/L
Phosphorus, total	68 / 68	100	5.1E+01	4.3E+02	1.2E+02	µg/L
Phosphorus, orthophosphate	68 / 68	100	3.0E+00	7.0E+01	3.3E+01	µg/L

Table 4-4b. Summary of Analytical Results for Chemicals in Surface Water, Lower Saginaw River, Bay County

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
General						
Alkalinity, Bicarbonate as $CaCO_3$	12 / 12	100	1.4E+05	2.0E+05	1.7E+05	µg/L
Alkalinity, Carbonate as $CaCO_3$	1 / 1	100	1.8E+04	1.8E+04	1.8E+04	µg/L
Alkalinity, Total	60 / 60	100	9.6E+04	2.1E+05	1.6E+05	µg/L
Chloride	68 / 68	100	3.4E+04	1.8E+05	8.6E+04	µg/L
Dissolved oxygen (DO)	1 / 1	100	1.2E+04	1.2E+04	1.2E+04	µg/L
Hardness, carbonate	68 / 68	100	1.6E+05	3.0E+05	2.4E+05	µg/L
Solids, Dissolved	67 / 67	100	2.8E+05	6.1E+05	4.5E+05	µg/L
Specific conductance	67 / 67	100	4.3E+02	9.3E+02	6.9E+02	µmho/cm
Sulfide	1 / 1	100	0.0E+00	0.0E+00	0.0E+00	µg/L
Sulfur, sulfate (SO_4)	68 / 68	100	2.0E+04	5.4E+04	3.6E+04	µg/L
Temperature, water	65 / 65	100	0.0	28.1	14.7	deg C
Total Organic Carbon	87 / 87	100	5.8E+03	1.5E+04	8.4E+03	µg/L
Total Solids	19 / 19	100	4.4E+05	6.9E+05	5.5E+05	µg/L
Total Suspended Solids	87 / 87	100	7.0E+03	1.8E+05	3.5E+04	µg/L
Turbidity	60 / 60	100	7.0E+03	1.5E+05	3.1E+04	µg/L

a. Mean concentration calculation includes one half the reporting limit for all non-detect values where available.
$CaCO_3$: calcium carbonate
deg C: degrees Celsius
µg/L: micrograms per liter
mg/L: milligrams per liter
µmho/cm: microsiemens per centimeter
PCBs: polychlorinated biphenyls

Table 4-4c. Summary of Analytical Results for Chemicals in Surface Water, Saginaw Bay

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
Metals						
Cadmium	104 / 104	100	4.50E-06	2.70E-05	4.50E-06	mg/L
Calcium	263 / 263	100	3.36E+01	6.52E+01	3.36E+01	mg/L
Chromium	104 / 104	100	1.93E-04	1.21E-03	1.93E-04	mg/L
Copper	104 / 104	100	9.08E-04	2.72E-03	9.08E-04	mg/L
Lead	104 / 104	100	2.33E-04	1.19E-03	2.33E-04	mg/L
Magnesium	255 / 255	100	1.01E+01	1.82E+01	1.01E+01	mg/L
Nickel	104 / 104	100	1.18E-03	3.39E-03	1.18E-03	mg/L
Potassium	210 / 210	100	1.55E+00	5.90E+00	1.55E+00	mg/L
Sodium	222 / 222	100	9.21E+00	2.54E+01	9.21E+00	mg/L
Zinc	104 / 104	100	1.33E-03	6.17E-03	1.33E-03	mg/L
Nutrients						
Nitrogen, ammonia (NH_3)	258 / 258	100	1.14E+01	1.30E+02	1.14E+01	µg/L
Nitrogen, Kjeldahl (NH_3 + Organic N)	260 / 260	100	3.83E+02	1.22E+03	3.83E+02	µg/L
Nitrogen, nitrate (NO_3)	237 / 237	100	5.18E+02	7.58E+03	5.18E+02	µg/L
Nitrogen, nitrite (NO_2) + nitrate (NO_3)	36 / 36	100	2.81E+02	1.03E+03	2.81E+02	µg/L
Nitrogen, nitrite (NO_2)	238 / 238	100	5.99E+00	1.20E+02	5.99E+00	µg/L
Phosphorus, total	262 / 262	100	1.89E+01	9.50E+01	1.89E+01	µg/L
Phosphorus, orthophosphate	219 / 219	100	3.69E+00	4.10E+01	3.69E+00	µg/L
VOCs						
Toluene	2 / 2	100	1.40E+00	1.60E+00	1.40E+00	µg/L

Table 4-4c. Summary of Analytical Results for Chemicals in Surface Water, Saginaw Bay

Chemicals	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration[a]	Units
General						
Alkalinity, Bicarbonate as $CaCO_3$	34 / 34	100	8.82E+04	1.29E+05	8.82E+04	µg/L
Alkalinity, Carbonate as $CaCO_3$	4 / 4	100	1.55E+04	2.20E+04	1.55E+04	µg/L
Alkalinity, Total	232 / 232	100	8.89E+04	1.47E+05	8.89E+04	µg/L
Chloride	239 / 239	100	1.88E+04	4.80E+04	1.88E+04	µg/L
Chlorophyll *a*	205 / 205	100	7.19E+00	2.60E+01	7.19E+00	µg/L
Dissolved oxygen (DO)	34 / 34	100	1.02E+04	1.38E+04	1.02E+04	µg/L
Escherichia species	1231 / 1231	100	6.60E+01	2.42E+03	6.60E+01	cfu/100mL
Hardness, carbonate	260 / 260	100	1.25E+05	3.15E+05	1.25E+05	µg/L
Solids, dissolved	237 / 237	100	1.96E+05	3.50E+05	1.96E+05	µg/L
Specific conductance	256 / 256	100	2.99E+02	5.42E+02	2.99E+02	µmho/cm
Sulfide	2 / 2	100	2.00E+01	2.00E+01	2.00E+01	µg/L
Sulfur, sulfate (SO_4)	253 / 253	100	1.89E+04	3.60E+04	1.89E+04	µg/L
Temperature, water	249 / 249	100	1.59E+01	2.61E+01	1.59E+01	deg C
Total Organic Carbon	264 / 264	100	3.64E+03	1.10E+04	3.64E+03	µg/L
Total Solids	7 / 7	100	2.79E+05	3.60E+05	2.79E+05	µg/L
Total Suspended Solids	170 / 170	100	9.21E+03	6.60E+04	9.21E+03	µg/L
Turbidity	213 / 213	100	4.29E+03	2.20E+04	4.29E+03	µg/L

a. Mean concentration calculation includes one half the reporting limit for all non-detect values where available.
$CaCO_3$: calcium carbonate
cfu/100mL: colony-forming units per 100 milliliters
deg C: degrees Celsius
µg/L: micrograms per liter
mg/L: milligrams per liter
µmho/cm: microsiemens per centimeter
VOC: volatile organic compounds

Table 4-5a. Summary of Analytical Results for Chemicals in Fish Tissue, Lower Saginaw River, Saginaw County

Sample Type	Species	Parameter Group	Chemical	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration [a]	Units
Caged Fish									
Whole Body	**Channel Catfish**	**PCDD/Fs**	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	2 / 4	50	6.8E-01	7.7E-01	4.5E-01	ng/kg
			2,3,7,8-Tetrachlorodibenzo-p-dioxin	4 / 4	100	5.2E-01	6.5E-01	5.6E-01	ng/kg
			1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	2 / 4	50	3.0E-01	6.1E-01	2.9E-01	ng/kg
			1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	3 / 4	75	4.5E-01	9.6E-01	5.7E-01	ng/kg
			1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	3 / 4	75	2.8E-01	6.6E-01	3.6E-01	ng/kg
			1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	4 / 4	100	8.8E-01	2.4E+00	1.6E+00	ng/kg
			Octachlorodibenzo-p-dioxin	4 / 4	100	3.4E+00	9.4E+00	7.2E+00	ng/kg
			2,3,7,8-Tetrachlorodibenzofuran	4 / 4	100	2.5E+00	5.9E+00	3.7E+00	ng/kg
			2,3,4,7,8-Pentachlorodibenzofuran	4 / 4	100	2.3E+00	2.9E+00	2.5E+00	ng/kg
			1,2,3,4,7,8-Hexachlorodibenzofuran	4 / 4	100	5.7E-01	1.1E+00	8.7E-01	ng/kg
			1,2,3,6,7,8-Hexachlorodibenzofuran	3 / 4	75	2.3E-01	3.2E-01	2.4E-01	ng/kg
			2,3,4,6,7,8-Hexachlorodibenzofuran	2 / 4	50	1.5E-01	2.4E-01	1.2E-01	ng/kg
			1,2,3,4,6,7,8-Heptachlorodibenzofuran	4 / 4	100	4.9E-01	8.3E-01	7.2E-01	ng/kg
			Octachlorodibenzofuran	3 / 4	75	5.0E-01	5.9E-01	4.4E-01	ng/kg
			2005 WHO Mammals TEQ (PCDD/Fs)	4 / 4	100	1.7E+00	3.3E+00	2.4E+00	ng/kg
		Metals	Mercury	11 / 12	92	7.5E-03	2.0E-02	1.1E-02	mg/kg
		PCBs	PCB - 1254 (Aroclor 1254)	4 / 8	50	3.2E+01	4.7E+01	2.5E+01	ug/kg
			Sum PCB Aroclors	4 / 8	50	3.2E+01	4.7E+01	2.5E+01	ug/kg
			PCBs, partial sum (congeners)	4 / 4	100	3.0E+00	1.0E+01	6.5E+00	ug/kg

Table 4-5a. Summary of Analytical Results for Chemicals in Fish Tissue, Lower Saginaw River, Saginaw County

Sample Type	Species	Parameter Group	Chemical	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration [a]	Units
Caged Fish									
Whole Body	**Channel Catfish (cont'd)**								
		Pesticides	2,4'-DDD	4 / 4	100	3.0E+00	8.0E+00	5.0E+00	ug/kg
			4,4'-DDD	12 / 12	100	1.0E+01	9.0E+01	3.1E+01	ug/kg
			4,4'-DDE	12 / 12	100	9.0E+00	3.9E+01	2.5E+01	ug/kg
			4,4'-DDT	5 / 12	42	5.0E+00	6.0E+00	3.5E+00	ug/kg
			Total DDT	12 / 12	100	2.2E+01	1.3E+02	6.0E+01	ug/kg
			alpha-Chlordane	6 / 12	50	2.0E+00	4.0E+00	2.1E+00	ug/kg
			gamma-Chlordane	1 / 12	8	2.0E+00	2.0E+00	1.4E+00	ug/kg
			Total Chlordane	9 / 12	75	2.0E+00	8.0E+00	4.5E+00	ug/kg
			cis-Nonachlor	3 / 12	25	3.0E+00	5.0E+00	2.2E+00	ug/kg
			trans-Nonachlor	6 / 12	50	3.0E+00	4.0E+00	2.2E+00	ug/kg
			Dieldrin	6 / 12	50	5.0E+00	1.8E+01	6.8E+00	ug/kg
			Heptachlorostyrene	4 / 12	33	1.0E+00	2.5E+00	1.6E+00	ug/kg
			Hexachlorobenzene	6 / 12	50	2.0E+00	5.0E+00	1.8E+00	ug/kg
			Octachlorostyrene	4 / 12	33	1.0E+00	1.0E+00	6.7E-01	ug/kg
			Pentachlorostyrene	4 / 12	33	3.0E+00	4.0E+00	6.9E+00	ug/kg
		General	Fat content	16 / 16	100	1.4E+00	4.8E+00	2.8E+00	%

a. Mean concentration calculation includes one half the reported detection limit for all non-detect values.
µg/kg: microgram per kilogram
mg/kg: milligram per kilogram
ng/kg: nanogram per kilogram
PCBs: polychlorinated biphenyls
PCDD/F: dioxin and furan
WHO: World Health Organization
2005 WHO Mammals TEQ: 2,3,7,8 -tetrachlodibenzo-p-dioxin equivalent concentration, based on 2005 toxicity equivalence scheme developed by the World Health Organization for mammals (Van den Berg 2006).

Table 4-5b. Summary of Analytical Results for Chemicals in Fish Tissue, Lower Saginaw River, Bay County

Sample Type	Species	Parameter Group	Chemical	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration [a]	Units
Resident, Wild Fish									
Fillet (w/ skin)	**Carp**	**Metals**	Mercury	10 / 10	100	3.0E-02	2.3E-01	1.4E-01	mg/kg
		PCBs	PCBs, partial sum (congeners)	10 / 10	100	1.9E+01	3.6E+03	8.2E+02	ug/kg
		Pesticides	2,4'-DDD	10 / 10	100	1.0E+00	3.2E+01	7.9E+00	ug/kg
			4,4'-DDD	10 / 10	100	5.0E+00	1.3E+02	3.2E+01	ug/kg
			4,4'-DDE	10 / 10	100	6.0E+00	2.4E+02	7.0E+01	ug/kg
			4,4'-DDT	1 / 9	11	2.5E+00	2.5E+00	7.2E-01	ug/kg
			Total DDT	10 / 10	100	1.2E+01	4.1E+02	1.1E+02	ug/kg
			alpha-Chlordane	5 / 10	50	1.0E+00	7.5E+00	1.7E+00	ug/kg
			gamma-Chlordane	3 / 10	30	1.0E+00	3.5E+00	1.0E+00	ug/kg
			Total Chlordane	7 / 10	70	1.0E+00	3.7E+01	8.3E+00	ug/kg
			Beta-BHC	1 / 7	14	2.0E+00	2.0E+00	7.1E-01	ug/kg
			cis-Nonachlor	3 / 8	38	2.0E+00	8.5E+00	2.1E+00	ug/kg
			trans-Nonachlor	7 / 10	70	1.0E+00	1.7E+01	4.8E+00	ug/kg
			gamma-BHC (Lindane)	1 / 10	10	3.0E+00	3.0E+00	7.5E-01	ug/kg
			Heptachlor	1 / 10	10	1.0E+00	1.0E+00	5.5E-01	ug/kg
			Heptachlor Epoxide	1 / 10	10	1.0E+00	1.0E+00	5.5E-01	ug/kg
			Hexachlorobenzene	3 / 10	30	1.0E+00	3.0E+00	9.5E-01	ug/kg
			Mirex	1 / 10	10	7.5E-01	7.5E-01	5.3E-01	ug/kg
			Octachlorostyrene	10 / 10	100	1.0E+00	1.4E+01	6.5E+00	ug/kg
		General	Fat content	10 / 10	100	5.0E-01	7.8E+00	1.8E+00	%

Table 4-5b. Summary of Analytical Results for Chemicals in Fish Tissue, Lower Saginaw River, Bay County

Sample Type	Species	Parameter Group	Chemical	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration [a]	Units
Caged Fish									
Whole Body	**Channel Catfish**	**PCDD/Fs**	2,3,7,8-Tetrachlorodibenzo-p-dioxin	31 / 31	100	5.0E-01	1.3E+00	8.1E-01	ng/kg
			1,2,3,7,8-Pentachlorodibenzo-p-dioxin	31 / 31	100	3.3E-01	9.0E-01	5.8E-01	ng/kg
			1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	21 / 31	68	1.2E-01	3.8E-01	1.9E-01	ng/kg
			1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	29 / 30	97	3.9E-01	1.0E+00	6.5E-01	ng/kg
			1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	28 / 29	97	1.5E-01	9.0E+00	6.7E-01	ng/kg
			1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	31 / 31	100	5.8E-01	2.1E+00	1.2E+00	ng/kg
			Octachlorodibenzofuran	26 / 28	93	1.0E-01	2.6E+00	5.1E-01	ng/kg
			2,3,7,8-Tetrachlorodibenzofuran	31 / 31	100	9.3E-01	6.4E+00	2.6E+00	ng/kg
			1,2,3,7,8-Pentachlorodibenzofuran	23 / 31	74	6.0E-01	1.3E+00	7.1E-01	ng/kg
			2,3,4,7,8-Pentachlorodibenzofuran	31 / 31	100	1.5E+00	3.1E+00	2.3E+00	ng/kg
			1,2,3,4,7,8-Hexachlorodibenzofuran	29 / 31	94	3.0E-01	1.2E+00	5.2E-01	ng/kg
			1,2,3,6,7,8-Hexachlorodibenzofuran	26 / 27	96	1.6E-01	3.4E-01	2.2E-01	ng/kg
			2,3,4,6,7,8-Hexachlorodibenzofuran	25 / 28	89	1.0E-01	5.4E-01	1.4E-01	ng/kg
			1,2,3,4,6,7,8-Heptachlorodibenzofuran	14 / 15	93	3.5E-01	2.5E+00	7.5E-01	ng/kg
			1,2,3,4,7,8,9-Heptachlorodibenzofuran	1 / 31	3	1.0E-01	1.0E-01	6.2E-02	ng/kg
			Octachlorodibenzofuran	26 / 28	93	1.0E-01	2.6E+00	5.1E-01	ng/kg
			2005 WHO Mammals TEQ (PCDD/Fs)	11 / 11	100	1.7E+00	3.7E+00	2.8E+00	ng/kg
		Metals	Mercury	45 / 47	96	1.0E-02	3.0E-02	1.6E-02	mg/kg
		PCBs	2005 WHO Mammals TEQ (PCBs)	23 / 23	100	6.2E+01	1.8E+02	1.0E+02	ng/kg
			PCB - 1016 (Aroclor 1016)	3 / 23	13	2.0E+03	3.0E+03	1.2E+03	ug/kg
			PCB - 1248 (Aroclor 1248)	4 / 4	100	1.9E+02	2.7E+02	2.4E+02	ug/kg
			PCB - 1254 (Aroclor 1254)	7 / 16	44	3.3E+01	5.0E+01	2.5E+01	ug/kg
			Sum PCB Aroclors	7 / 16	44	3.3E+01	3.1E+02	8.5E+01	ug/kg
			PCBs, partial sum (congeners)	30 / 31	97	5.0E+00	3.1E+02	1.6E+02	ug/kg

Table 4-5b. Summary of Analytical Results for Chemicals in Fish Tissue, Lower Saginaw River, Bay County

Sample Type	Species	Parameter Group	Chemical	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration [a]	Units
Caged Fish									
Whole Body	**Channel Catfish (cont'd)**								
		Pesticides	2,4'-DDD	8 / 8	100	3.0E+00	1.1E+01	7.3E+00	ug/kg
			4,4'-DDD	47 / 47	100	1.4E+01	9.0E+01	3.5E+01	ug/kg
			4,4'-DDE	47 / 47	100	1.4E+01	4.5E+01	2.9E+01	ug/kg
			4,4'-DDT	35 / 47	74	4.0E+00	1.2E+01	5.8E+00	ug/kg
			Total DDT	47 / 47	100	2.8E+01	1.3E+02	7.0E+01	ug/kg
			alpha-Chlordane	36 / 47	77	2.0E+00	6.0E+00	3.1E+00	ug/kg
			gamma-Chlordane	25 / 47	53	3.0E+00	6.0E+00	2.7E+00	ug/kg
			Total Chlordane	44 / 47	94	2.0E+00	1.6E+01	7.3E+00	ug/kg
			cis-Nonachlor	10 / 47	21	3.0E+00	5.0E+00	2.0E+00	ug/kg
			trans-Nonachlor	23 / 47	49	2.0E+00	8.0E+00	2.1E+00	ug/kg
			Dieldrin	38 / 47	81	2.0E+00	1.8E+01	9.0E+00	ug/kg
			Heptachlor	3 / 47	6	3.0E+00	4.0E+00	1.7E+00	ug/kg
			Heptachlor Epoxide	15 / 47	32	2.0E+00	5.0E+00	1.9E+00	ug/kg
			Heptachlorostyrene	1 / 24	4	5.0E+00	5.0E+00	1.5E+00	ug/kg
			Hexachlorobenzene	34 / 47	72	1.0E+00	4.0E+00	2.1E+00	ug/kg
			Octachlorostyrene	13 / 24	54	1.0E+00	2.0E+00	9.8E-01	ug/kg
			Pentachlorostyrene	1 / 24	4	3.0E+00	3.0E+00	6.1E+00	ug/kg
		General	Fat content	55 / 55	100	1.2E+00	5.0E+00	3.2E+00	%

a. Mean concentration calculation includes one half the reported limit for all non-detect values.
µg/kg: microgram per kilogram
mg/kg: milligram per kilogram
ng/kg: nanogram per kilogram
PCBs: polychlorinated biphenyls
PCDD/Fs: Dioxins and Furans
WHO: World Health Organization
2005 WHO Mammals TEQ: 2,3,7,8 -tetrachlodibenzo-p-dioxin equivalent concentration, based on 2005 toxicity equivalence scheme developed by the World Health Organization for mammals (Van den Berg 2006).

Table 4-5c. Summary of Analytical Results for Chemicals in Fish Tissue, Saginaw Bay

Sample Type	Species	Parameter Group	Chemical	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration [a]	Units
Resident, Wild Fish									
Fillet	**Walleye**	**Metals**	Mercury	22 / 22	100	7.0E-02	6.7E-01	2.6E-01	mg/kg
		PCBs	PCB - 1254 (Aroclor 1254)	12 / 12	100	8.3E+01	8.6E+02	3.6E+02	ug/kg
			Sum PCB Aroclors	12 / 12	100	8.3E+01	8.6E+02	3.6E+02	ug/kg
			PCBs, partial sum (congeners)	10 / 10	100	1.1E+01	6.2E+02	1.2E+02	ug/kg
		Pesticides	2,4'-DDD	1 / 10	10	4.0E+00	4.0E+00	8.5E-01	ug/kg
			2,4'-DDT	1 / 10	10	2.0E+00	2.0E+00	6.5E-01	ug/kg
			4,4'-DDD	17 / 22	77	1.0E+00	2.4E+01	7.0E+00	ug/kg
			4,4'-DDE	22 / 22	100	3.0E+00	2.2E+02	4.9E+01	ug/kg
			4,4'-DDT	9 / 22	41	1.0E+00	2.0E+01	4.0E+00	ug/kg
			Total DDT	22 / 22	100	3.0E+00	2.6E+02	5.9E+01	ug/kg
			alpha-Chlordane	14 / 22	64	2.0E+00	1.2E+01	3.3E+00	ug/kg
			gamma-Chlordane	1 / 22	5	3.0E+00	3.0E+00	1.1E+00	ug/kg
			Oxychlordane	1 / 22	5	4.0E+00	4.0E+00	1.2E+00	ug/kg
			Total Chlordane	14 / 22	64	6.0E+00	6.8E+01	1.6E+01	ug/kg
			cis-Nonachlor	13 / 22	59	2.0E+00	1.9E+01	4.0E+00	ug/kg
			trans-Nonachlor	14 / 22	64	2.0E+00	3.0E+01	8.4E+00	ug/kg
			Dieldrin	4 / 22	18	6.0E+00	8.0E+00	2.4E+00	ug/kg
			Heptachlor Epoxide	1 / 22	5	5.0E+00	5.0E+00	1.2E+00	ug/kg
			Hexachlorobenzene	11 / 22	50	1.0E+00	1.0E+00	7.5E-01	ug/kg
			Octachlorostyrene	13 / 22	59	1.0E+00	5.0E+00	1.3E+00	ug/kg
			Toxaphene	11 / 22	50	5.0E+01	2.2E+02	6.9E+01	ug/kg
		General	Fat content	22 / 22	100	4.0E-01	3.0E+00	1.6E+00	%
	White Bass	**Metals**	Mercury	10 / 10	100	6.0E-02	3.4E-01	1.4E-01	mg/kg
		PCBs	PCBs, partial sum (congeners)	10 / 10	100	1.0E+02	1.5E+03	4.2E+02	ug/kg
		Pesticides	2,4'-DDD	2 / 2	100	2.0E+00	2.0E+00	2.0E+00	ug/kg
			4,4'-DDD	10 / 10	100	4.0E+00	3.2E+01	1.2E+01	ug/kg
			4,4'-DDE	10 / 10	100	1.3E+01	1.3E+02	3.7E+01	ug/kg
			4,4'-DDT	9 / 10	90	1.0E+00	7.0E+00	2.2E+00	ug/kg
			Total DDT	10 / 10	100	1.8E+01	1.7E+02	5.2E+01	ug/kg
			alpha-Chlordane	5 / 7	71	1.0E+00	4.0E+00	1.6E+00	ug/kg
			Total Chlordane	9 / 10	90	1.0E+00	2.0E+01	5.5E+00	ug/kg
			cis-Nonachlor	5 / 8	63	1.0E+00	8.0E+00	2.4E+00	ug/kg

Table 4-5c. Summary of Analytical Results for Chemicals in Fish Tissue, Saginaw Bay

Sample Type	Species	Parameter Group	Chemical	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration [a]	Units
Resident, Wild Fish									
Fillet	**White Bass (cont'd)**	**Pesticides (cont'd)**	trans-Nonachlor	9 / 10	90	1.0E+00	8.0E+00	2.8E+00	ug/kg
			Dieldrin	8 / 10	80	1.0E+00	2.5E+00	1.3E+00	ug/kg
			Octachlorostyrene	7 / 10	70	1.0E+00	4.0E+00	1.4E+00	ug/kg
		General	Fat content	10 / 10	100	3.3E+00	7.9E+00	5.1E+00	%
	White Sucker	**Metals**	Mercury	10 / 10	100	1.0E-02	1.7E-01	4.1E-02	mg/kg
		PCBs	PCBs, partial sum (congeners)	10 / 10	100	1.1E+01	1.5E+02	6.0E+01	ug/kg
		Pesticides	2,4'-DDD	2 / 10	20	1.0E+00	1.0E+00	6.0E-01	ug/kg
			4,4'-DDD	9 / 10	90	1.5E+00	3.0E+00	2.1E+00	ug/kg
			4,4'-DDE	10 / 10	100	2.0E+00	1.0E+01	4.8E+00	ug/kg
			Total DDT	10 / 10	100	2.0E+00	1.4E+01	7.1E+00	ug/kg
			Total Chlordane	1 / 10	10	1.0E+00	1.0E+00	5.5E-01	ug/kg
			trans-Nonachlor	1 / 10	10	1.0E+00	1.0E+00	5.5E-01	ug/kg
		General	Fat content	10 / 10	100	5.0E-01	2.0E+00	1.2E+00	%
	Yellow Perch	**Metals**	Mercury	10 / 10	100	5.0E-02	1.3E-01	8.8E-02	mg/kg
		PCBs	PCBs, partial sum (congeners)	9 / 10	90	3.0E+00	3.7E+01	9.6E+00	ug/kg
		Pesticides	4,4'-DDD	2 / 10	20	1.0E+00	2.0E+00	7.0E-01	ug/kg
			4,4'-DDE	10 / 10	100	1.0E+00	3.0E+00	1.5E+00	ug/kg
			Total DDT	10 / 10	100	1.0E+00	4.0E+00	1.8E+00	ug/kg
		General	Fat content	10 / 10	100	1.0E-01	5.0E-01	2.6E-01	%
Fillet (w/ skin)	**Channel Catfish**	**PCDD/Fs**	2,3,7,8-Tetrachlorodibenzo-p-dioxin	10 / 10	100	1.4E+00	6.3E+00	2.8E+00	ng/kg
			1,2,3,7,8-Pentachlorodibenzo-p-dioxin	10 / 10	100	1.8E+00	9.7E+00	4.3E+00	ng/kg
			1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	3 / 10	30	5.3E-01	1.8E+00	4.4E-01	ng/kg
			1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	10 / 10	100	5.0E-01	8.3E+00	3.6E+00	ng/kg

Table 4-5c. Summary of Analytical Results for Chemicals in Fish Tissue, Saginaw Bay

Sample Type	Species	Parameter Group	Chemical	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration [a]	Units
Resident, Wild Fish									
Fillet (w/ skin)	**Channel Catfish**	**PCDD/Fs (cont'd)**							
			1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	5 / 10	50	5.2E-01	1.3E+00	7.7E-01	ng/kg
			Octachlorodibenzofuran	2 / 10	20	2.6E-01	8.5E-01	3.7E-01	ng/kg
			2,3,7,8-Tetrachlorodibenzofuran	7 / 10	70	2.3E+00	9.5E+00	2.8E+00	ng/kg
			2,3,4,7,8-Pentachlorodibenzofuran	10 / 10	100	2.9E+00	1.1E+01	6.6E+00	ng/kg
			1,2,3,4,7,8-Hexachlorodibenzofuran	9 / 10	90	1.2E+00	6.0E+00	2.4E+00	ng/kg
			1,2,3,6,7,8-Hexachlorodibenzofuran	7 / 10	70	5.6E-01	1.7E+00	7.6E-01	ng/kg
			1,2,3,4,6,7,8-Heptachlorodibenzofuran	2 / 10	20	7.0E-01	1.9E+00	5.2E-01	ng/kg
			2,3,4,6,7,8-Hexachlorodibenzofuran	9 / 10	90	1.5E+00	1.0E+01	3.6E+00	ng/kg
			Octachlorodibenzofuran	2 / 10	20	2.6E-01	8.5E-01	3.7E-01	ng/kg
			2005 WHO Mammals TEQ (PCDD/Fs)	10 / 10	100	5.1E+00	2.2E+01	1.0E+01	ng/kg
		Metals	Mercury	26 / 26	100	3.0E-02	5.6E-01	1.3E-01	mg/kg
		PCBs	PCB - 1254 (Aroclor 1254)	16 / 16	100	1.3E+02	3.0E+03	7.6E+02	ug/kg
			Sum PCB Aroclors	16 / 16	100	1.3E+02	3.0E+03	7.6E+02	ug/kg
			PCBs, partial sum (congeners)	10 / 10	100	1.1E+02	4.2E+02	2.8E+02	ug/kg
		Pesticides	2,4'-DDD	10 / 10	100	1.0E+00	5.0E+00	3.2E+00	ug/kg
			4,4'-DDD	26 / 26	100	6.0E+00	1.5E+02	2.5E+01	ug/kg
			4,4'-DDE	26 / 26	100	1.3E+01	5.6E+02	1.3E+02	ug/kg
			4,4'-DDT	20 / 26	77	7.5E-01	2.3E+01	6.1E+00	ug/kg
			Total DDT	26 / 26	100	2.5E+01	7.2E+02	1.6E+02	ug/kg
			alpha-Chlordane	19 / 26	73	1.0E+00	2.4E+01	5.0E+00	ug/kg
			gamma-Chlordane	11 / 22	50	1.0E+00	8.0E+00	2.4E+00	ug/kg
			Oxychlordane	7 / 24	29	3.0E+00	9.0E+00	2.1E+00	ug/kg
			Total Chlordane	25 / 26	96	1.5E+00	1.2E+02	2.5E+01	ug/kg
			cis-Nonachlor	21 / 26	81	1.0E+00	3.0E+01	6.6E+00	ug/kg
			trans-Nonachlor	25 / 26	96	1.5E+00	5.5E+01	1.1E+01	ug/kg
			Dieldrin	12 / 26	46	1.0E+00	2.2E+01	3.7E+00	ug/kg
			Heptachlor Epoxide	2 / 26	8	3.0E+00	1.1E+01	1.5E+00	ug/kg
			Hexachlorobenzene	14 / 26	54	1.0E+00	4.0E+00	1.2E+00	ug/kg
			Octachlorostyrene	22 / 26	85	1.0E+00	1.7E+01	2.9E+00	ug/kg
			Oxychlordane	7 / 24	29	3.0E+00	9.0E+00	2.1E+00	ug/kg
			Toxaphene	1 / 26	4	3.8E+02	3.8E+02	3.8E+01	ug/kg
		General	Fat content	26 / 26	100	1.9E+00	2.0E+01	5.2E+00	%

Table 4-5c. Summary of Analytical Results for Chemicals in Fish Tissue, Saginaw Bay

Sample Type	Species	Parameter Group	Chemical	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration [a]	Units
Resident, Wild Fish									
Fillet (w/ skin)									
	Carp	**Metals**	Mercury	11 / 11	100	1.1E-01	2.7E-01	1.6E-01	mg/kg
		PCBs	PCB - 1254 (Aroclor 1254)	2 / 2	100	5.3E+02	4.3E+03	2.4E+03	ug/kg
			Sum PCB Aroclors	2 / 2	100	5.3E+02	4.3E+03	2.4E+03	ug/kg
			PCBs, partial sum (congeners)	9 / 9	100	1.5E+02	2.3E+03	1.1E+03	ug/kg
		Pesticides	2,4'-DDD	6 / 6	100	1.0E+00	2.8E+01	7.8E+00	ug/kg
			2,4'-DDT	2 / 2	100	1.0E+00	4.0E+00	2.5E+00	ug/kg
			4,4'-DDD	11 / 11	100	6.0E+00	1.6E+02	3.0E+01	ug/kg
			4,4'-DDE	11 / 11	100	1.3E+01	4.8E+02	1.3E+02	ug/kg
			4,4'-DDT	2 / 3	67	5.0E+00	1.0E+01	5.2E+00	ug/kg
			Total DDT	11 / 11	100	2.0E+01	6.4E+02	1.6E+02	ug/kg
			alpha-Chlordane	3 / 4	75	3.0E+00	2.0E+01	8.6E+00	ug/kg
			gamma-Chlordane	2 / 10	20	1.0E+00	3.0E+00	1.0E+00	ug/kg
			Oxychlordane	1 / 11	9	1.0E+00	1.0E+00	7.3E-01	ug/kg
			Total Chlordane	11 / 11	100	1.0E+00	4.7E+01	1.4E+01	ug/kg
			cis-Nonachlor	6 / 6	100	2.0E+00	1.3E+01	6.5E+00	ug/kg
			trans-Nonachlor	10 / 10	100	1.0E+00	1.7E+01	7.9E+00	ug/kg
			Dieldrin	5 / 11	45	3.0E+00	1.4E+01	3.0E+00	ug/kg
			Heptachlor Epoxide	4 / 9	44	1.0E+00	2.0E+00	1.2E+00	ug/kg
			Hexachlorobenzene	4 / 11	36	1.0E+00	4.0E+00	1.1E+00	ug/kg
			Mirex	1 / 11	9	1.0E+00	1.0E+00	9.1E-01	ug/kg
			Octachlorostyrene	8 / 11	73	1.0E+00	2.2E+01	6.0E+00	ug/kg
		General	Fat content	11 / 11	100	9.0E-01	2.0E+01	7.2E+00	%
Whole Body	**Alewife**	**Metals**	Mercury	3 / 3	100	1.0E-02	1.0E-02	1.0E-02	mg/kg
		PCBs	PCBs, partial sum (congeners)	3 / 3	100	2.6E+02	2.7E+02	2.6E+02	ug/kg
		Pesticides	2,4'-DDD	3 / 3	100	1.0E+00	1.0E+00	1.0E+00	ug/kg
			4,4'-DDD	3 / 3	100	4.0E+00	5.0E+00	4.7E+00	ug/kg
			4,4'-DDE	3 / 3	100	1.3E+01	1.4E+01	1.4E+01	ug/kg
			Total DDT	3 / 3	100	1.8E+01	2.0E+01	1.9E+01	ug/kg
			Dieldrin	3 / 3	100	1.0E+00	4.0E+00	2.0E+00	ug/kg

Table 4-5c. Summary of Analytical Results for Chemicals in Fish Tissue, Saginaw Bay

Sample Type	Species	Parameter Group	Chemical	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration [a]	Units
Resident, Wild Fish									
Whole Body	**Alewife (cont'd)**	**Pesticides (cont'd)**	Total Chlordane	1 / 3	33	1.0E+00	1.0E+00	6.7E-01	ug/kg
			trans-Nonachlor	1 / 3	33	1.0E+00	1.0E+00	6.7E-01	ug/kg
		General	Fat content	3 / 3	100	3.9E+00	3.9E+00	3.9E+00	%
	Carp	**PCDD/Fs**	2,3,7,8-Tetrachlorodibenzo-p-dioxin	26 / 26	100	1.2E+00	1.3E+01	5.3E+00	ng/kg
			1,2,3,7,8-Pentachlorodibenzo-p-dioxin	26 / 26	100	9.4E-01	1.1E+01	4.5E+00	ng/kg
			1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	23 / 26	88	5.6E-01	4.3E+00	1.5E+00	ng/kg
			1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	26 / 26	100	7.0E-01	1.4E+01	5.2E+00	ng/kg
			1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	20 / 26	77	3.1E-01	3.1E+00	9.3E-01	ng/kg
			1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	25 / 26	96	1.5E+00	2.4E+01	7.1E+00	ng/kg
			Octachlorodibenzo-p-dioxin	24 / 25	96	1.2E+00	3.1E+01	8.5E+00	ng/kg
			2,3,7,8-Tetrachlorodibenzofuran	26 / 26	100	1.1E+00	5.9E+01	1.8E+01	ng/kg
			1,2,3,7,8-Pentachlorodibenzofuran	13 / 26	50	1.6E+00	2.3E+01	7.1E+00	ng/kg
			2,3,4,7,8-Pentachlorodibenzofuran	26 / 26	100	2.7E+00	6.5E+01	1.9E+01	ng/kg
			1,2,3,4,7,8-Hexachlorodibenzofuran	21 / 21	100	4.9E-01	2.4E+01	5.7E+00	ng/kg
			1,2,3,6,7,8-Hexachlorodibenzofuran	20 / 21	95	6.0E-01	6.9E+00	3.4E+00	ng/kg
			1,2,3,7,8,9-Hexachlorodibenzofuran	11 / 26	42	6.0E-01	6.4E+01	1.3E+01	ng/kg
			2,3,4,6,7,8-Hexachlorodibenzofuran	25 / 26	96	4.3E-01	5.8E+00	2.4E+00	ng/kg
			1,2,3,4,6,7,8-Heptachlorodibenzofuran	26 / 26	100	6.1E-01	2.0E+01	5.1E+00	ng/kg
			1,2,3,4,7,8,9-Heptachlorodibenzofuran	3 / 26	12	3.1E-01	4.2E-01	1.4E-01	ng/kg
			2005 WHO Mammals TEQ (PCDD/Fs)	19 / 19	100	5.0E+00	5.3E+01	2.5E+01	ng/kg
		Metals	Mercury	36 / 36	100	3.0E-02	1.9E-01	8.8E-02	mg/kg
		PCBs	2005 WHO Mammals TEQ (PCBs)	6 / 6	100	1.5E+01	4.1E+01	2.8E+01	ng/kg
			PCB - 1254 (Aroclor 1254)	10 / 10	100	1.0E+03	4.5E+03	2.7E+03	ug/kg
			Sum PCB Aroclors	10 / 10	100	1.0E+03	4.5E+03	2.7E+03	ug/kg
			PCBs, partial sum (congeners)	36 / 36	100	2.9E+02	5.5E+03	2.2E+03	ug/kg
		Pesticides	2,4'-DDD	23 / 24	96	2.0E+00	4.6E+01	1.6E+01	ug/kg
			2,4'-DDT	3 / 21	14	1.0E+00	2.0E+00	6.2E-01	ug/kg
			4,4'-DDD	36 / 36	100	5.0E+00	3.1E+02	8.5E+01	ug/kg
			4,4'-DDE	36 / 36	100	3.4E+01	1.2E+03	3.6E+02	ug/kg
			4,4'-DDT	9 / 32	28	7.5E-01	1.2E+01	2.2E+00	ug/kg
			Total DDT	36 / 36	100	3.9E+01	1.4E+03	4.5E+02	ug/kg
			alpha-Chlordane	33 / 36	92	1.0E+00	3.0E+01	7.4E+00	ug/kg

Table 4-5c. Summary of Analytical Results for Chemicals in Fish Tissue, Saginaw Bay

Sample Type	Species	Parameter Group	Chemical	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration [a]	Units
Resident, Wild Fish									
Whole Body	**Carp (cont'd)**	**Pesticides (cont'd)**							
			gamma-Chlordane	29 / 35	83	6.7E-01	1.2E+01	3.4E+00	ug/kg
			Oxychlordane	7 / 34	21	1.5E+00	4.0E+00	1.2E+00	ug/kg
			Total Chlordane	36 / 36	100	4.0E+00	1.1E+02	3.6E+01	ug/kg
			cis-Nonachlor	33 / 34	97	1.0E+00	3.1E+01	7.8E+00	ug/kg
			trans-Nonachlor	36 / 36	100	3.0E+00	6.3E+01	1.8E+01	ug/kg
			Dieldrin	28 / 36	78	2.0E+00	2.3E+01	5.7E+00	ug/kg
			Heptachlor Epoxide	5 / 33	15	1.0E+00	4.0E+00	1.0E+00	ug/kg
			Hexachlorobenzene	20 / 35	57	7.5E-01	8.0E+00	2.0E+00	ug/kg
			Mirex	3 / 36	8	1.0E+00	2.0E+00	1.1E+00	ug/kg
			Octachlorostyrene	35 / 36	97	1.0E+00	3.3E+01	9.8E+00	ug/kg
			Pentachlorostyrene	2 / 36	6	2.3E+01	2.3E+01	1.8E+00	ug/kg
		General	Fat content	36 / 36	100	3.6E+00	2.4E+01	1.1E+01	%
	Spottail Shiner	**Metals**	Mercury	3 / 3	100	2.0E-02	2.0E-02	2.0E-02	mg/kg
		PCBs	PCBs, partial sum (congeners)	3 / 3	100	1.4E+02	2.2E+02	1.8E+02	ug/kg
		Pesticides	4,4'-DDD	3 / 3	100	2.0E+00	3.0E+00	2.3E+00	ug/kg
			4,4'-DDE	3 / 3	100	6.0E+00	1.1E+01	9.0E+00	ug/kg
			Total DDT	3 / 3	100	8.0E+00	1.4E+01	1.1E+01	ug/kg
			Dieldrin	1 / 3	33	1.0E+00	1.0E+00	6.7E-01	ug/kg
		General	Fat content	3 / 3	100	1.4E+00	2.2E+00	1.8E+00	%
	Walleye	**Metals**	Mercury	30 / 30	100	1.0E-01	6.4E-01	3.0E-01	mg/kg
		PCBs	PCB - 1254 (Aroclor 1254)	10 / 10	100	9.2E+02	4.0E+03	2.0E+03	ug/kg
			Sum PCB Aroclors	10 / 10	100	9.2E+02	4.0E+03	2.0E+03	ug/kg
			PCBs, partial sum (congeners)	20 / 20	100	2.8E+02	2.7E+03	1.2E+03	ug/kg
		Pesticides	2,4'-DDD	11 / 11	100	1.0E+00	8.0E+00	2.5E+00	ug/kg
			2,4'-DDT	4 / 9	44	8.0E+00	2.1E+01	5.6E+00	ug/kg
			4,4'-DDD	30 / 30	100	3.0E+00	1.4E+02	3.2E+01	ug/kg
			4,4'-DDE	30 / 30	100	2.9E+01	1.1E+03	2.7E+02	ug/kg
			4,4'-DDT	30 / 30	100	2.0E+00	7.8E+01	2.2E+01	ug/kg

Table 4-5c. Summary of Analytical Results for Chemicals in Fish Tissue, Saginaw Bay

Sample Type	Species	Parameter Group	Chemical	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration [a]	Units
Resident, Wild Fish									
Whole Body	**Walleye (cont'd)**	**Pesticides (cont'd)**							
			Total DDT	30 / 30	100	3.4E+01	1.3E+03	3.2E+02	ug/kg
			alpha-Chlordane	29 / 30	97	2.0E+00	5.0E+01	1.3E+01	ug/kg
			gamma-Chlordane	23 / 30	77	1.0E+00	2.8E+01	4.6E+00	ug/kg
			Oxychlordane	21 / 30	70	1.0E+00	1.4E+01	3.4E+00	ug/kg
			Total Chlordane	30 / 30	100	6.0E+00	2.7E+02	7.8E+01	ug/kg
			cis-Nonachlor	29 / 29	100	3.0E+00	8.2E+01	2.3E+01	ug/kg
			trans-Nonachlor	30 / 30	100	3.0E+00	1.2E+02	3.5E+01	ug/kg
			Dieldrin	30 / 30	100	2.0E+00	2.7E+01	7.7E+00	ug/kg
			Heptachlor Epoxide	4 / 30	13	1.0E+00	4.0E+00	1.1E+00	ug/kg
			Hexachlorobenzene	20 / 30	67	1.0E+00	6.0E+00	1.7E+00	ug/kg
			Mirex	6 / 21	29	2.0E+00	5.0E+00	2.1E+00	ug/kg
			Octachlorostyrene	29 / 30	97	1.0E+00	2.2E+01	4.8E+00	ug/kg
			Toxaphene	10 / 30	33	1.5E+02	1.0E+03	1.6E+02	ug/kg
		Others	PBB	6 / 30	20	2.0E+00	7.0E+00	1.8E+00	ug/kg
		General	Fat content	30 / 30	100	2.1E+00	1.0E+01	6.2E+00	%
Caged Fish									
Whole Body	**Channel Catfish**	**PCDD/Fs**	2,3,7,8-Tetrachlorodibenzo-p-dioxin	2 / 2	100	6.0E-01	8.0E-01	7.0E-01	ng/kg
			1,2,3,7,8-Pentachlorodibenzo-p-dioxin	2 / 2	100	5.0E-01	8.0E-01	6.5E-01	ng/kg
			1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	2 / 2	100	2.0E-01	5.0E-01	3.5E-01	ng/kg
			1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	2 / 2	100	6.0E-01	1.1E+00	8.5E-01	ng/kg
			1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	2 / 2	100	2.0E-01	5.0E-01	3.5E-01	ng/kg
			1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	2 / 2	100	7.0E-01	2.6E+00	1.6E+00	ng/kg
			Octachlorodibenzofuran	1 / 2	50	2.0E-01	2.0E-01	1.3E-01	ng/kg
			2,3,7,8-Tetrachlorodibenzofuran	2 / 2	100	1.6E+00	2.1E+00	1.8E+00	ng/kg
			1,2,3,7,8-Pentachlorodibenzofuran	2 / 2	100	9.0E-01	1.0E+00	9.5E-01	ng/kg
			2,3,4,7,8-Pentachlorodibenzofuran	2 / 2	100	1.8E+00	2.0E+00	1.9E+00	ng/kg
			1,2,3,4,7,8-Hexachlorodibenzofuran	1 / 1	100	3.0E-01	3.0E-01	3.0E-01	ng/kg
			1,2,3,6,7,8-Hexachlorodibenzofuran	2 / 2	100	2.0E-01	3.0E-01	2.5E-01	ng/kg
			2,3,4,6,7,8-Hexachlorodibenzofuran	2 / 2	100	1.0E-01	1.0E-01	1.0E-01	ng/kg
			Octachlorodibenzofuran	1 / 2	50	2.0E-01	2.0E-01	1.3E-01	ng/kg
			2005 WHO Mammals TEQ' (PCDD/Fs)	2 / 2	100	2.1E+00	2.7E+00	2.4E+00	ng/kg
		Metals	Mercury	2 / 2	100	1.2E-02	1.6E-02	1.4E-02	mg/kg

Table 4-5c. Summary of Analytical Results for Chemicals in Fish Tissue, Saginaw Bay

Sample Type	Species	Parameter Group	Chemical	Frequency of Detection	Percent Detection	Minimum Detected Concentration	Maximum Detected Concentration	Mean Concentration [a]	Units
Caged Fish									
Whole Body	**Channel Catfish (cont'd)**								
		PCBs	2005 WHO Mammals TEQ (PCBs)	2 / 2	100	8.0E+01	8.7E+01	8.3E+01	ng/kg
			PCBs, partial sum (congeners)	2 / 2	100	1.4E+02	1.5E+02	1.5E+02	ug/kg
		Pesticides	4,4'-DDD	2 / 2	100	3.7E+01	4.3E+01	4.0E+01	ug/kg
			4,4'-DDE	2 / 2	100	3.2E+01	3.9E+01	3.6E+01	ug/kg
			4,4'-DDT	2 / 2	100	8.0E+00	1.1E+01	9.5E+00	ug/kg
			Total DDT	2 / 2	100	7.7E+01	9.3E+01	8.5E+01	ug/kg
			alpha-Chlordane	2 / 2	100	3.0E+00	4.0E+00	3.5E+00	ug/kg
			gamma-Chlordane	1 / 2	50	3.0E+00	3.0E+00	2.0E+00	ug/kg
			Total Chlordane	2 / 2	100	3.0E+00	7.0E+00	5.0E+00	ug/kg
			Dieldrin	2 / 2	100	1.0E+01	1.1E+01	1.0E+01	ug/kg
		General	Fat content	2 / 2	100	3.0E+00	3.0E+00	3.0E+00	%

a. Mean concentration calculation includes one half the reported limit for all non-detect values.
µg/kg: microgram per kilogram
mg/kg: milligram per kilogram
ng/kg: nanogram per kilogram
PCBs: polychlorinated biphenyls
PCDD/Fs: Dioxins and Furans
WHO: World Health Organization
2005 WHO Mammals TEQ: 2,3,7,8 -tetrachlodibenzo-p-dioxin equivalent concentration, based on 2005 toxicity equivalent factors for 17 PCDD/F congeners developed by the World Health Organization for mammals (Van den Berg 2006).
2005 WHO Mammals TEQ': partial TEQ based on concentrations of 15 or 16 of the PCDD/F congeners that contribute to the TEQ

Table 4-6. Analytical Results for Chemicals Detected in Saginaw Bay Nestling Bald Eagle Feathers (Mercury) and Plasma (1999 - 2002)[a]

Sample Year	County	Breeding Area Name	Mercury Concentration Feathers (mg/kg)	DDE+DDD+DDT Plasma (µg/kg wet weight)	Total PCBs Plasma (mg/kg)	Pesticides Plasma (µg/kg wet weight)[b]
1999	Arenac	Santiago	5.07	8.028	29.37	Heptachlor Epoxide – 1 a-Chlordane -1 Dieldrin - 1
1999	Arenac	Big Charity Is.	10.09	9.466	35.22	α-Chlordane -1 Dieldrin - 1
1999	Bay	Skull/ Stoney Is	2.1	24.286	85.96	Heptachlor Epoxide – 1 a-Chlordane -2.222 Dieldrin - 1
1999	Ogemaw	Rifle River Rec Area	2.94	2.738	4.41	ND
1999	Ogemaw	Rifle River Rec Area	3.79	ND	10.28	ND
2000	Arenac	Big Charity Is.	13.6	33.58	107.85	Hexachlorobenzene -0.94 Dieldrin – 3.07
2000	Ogemaw	Rifle River Rec Area	4.23	6.07	16.07	ND
2000	Ogemaw	Stylus Lake	7.02	3.67	10.93	ND
2000	Bay	Nayanquina Point	4.33	10.64	37.01	ND
2001	Arenac	Santiago	not reported	7.35	25.47	α-Chlordane -1.46
2001	Arenac	Big Charity Is	not reported	20	75.56	α-Chlordane -1.46
2001	Bay	Quianicassee	not reported	10.84	60.17	α-Chlordane -2.12
2001	Tuscola	Dinsmoore	not reported	48.05	72.72	α-Chlordane -2.58 Dieldrin – 1.03
2001	Tuscola	Dinsmoore	not reported	31.98	51.66	α-Chlordane -0.89 Dieldrin – 1.33

Table 4-6. Analytical Results for Chemicals Detected in Saginaw Bay Nestling Bald Eagle Feathers (Mercury) and Plasma (1999 - 2002)[a]

Sample Year	County	Breeding Area Name	Mercury Concentration Feathers (mg/kg)	DDE+DDD+DDT Plasma (µg/kg wet weight)	Total PCBs Plasma (mg/kg)	Pesticides Plasma (µg/kg wet weight)[b]
2001	Tuscola	Fish Pt.	not reported	13.38	50.61	α-Chlordane -2.11
2001	Tuscola	Fish Pt.	not reported	10.84	38.25	Dieldrin – 1.00
2002	Arenac	Big Charity Is	not reported	46.49	182.95	α-Chlordane -2.42 Dieldrin – 3.54
2002	Arenac	Big Charity Is	not reported	48.77	182.51	α-Chlordane -2.04 Dieldrin – 3.68
2002	Arenac	Augres	not reported	21.16	61.69	α-Chlordane -2.00 Dieldrin – 1.11
2002	Arenac	Augres	not reported	30.2	90.8	α-Chlordane -3.35 Dieldrin – 1.34
2002	Ogemaw	Rifle River Rec Area	not reported	8.44	16.39	ND

Source: PSC 2002

a Each row represents analytical results from a single nestling.

b Pesticides Sampled – Hexachlorobenzene, α-HCH, γ -HCH, Heptachlor, Heptachlor Epoxide, γ -Chlordane, α-Chlordane, Dieldrin, Toxaphene. Only pesticides detected are included on the table.
µg/kg: microgram per kilogram
mg/kg: millilgram per kilogram
ND: not detected