



STATE OF MICHIGAN
DEPARTMENT OF COMMUNITY HEALTH
LANSING

RICK SNYDER
GOVERNOR

JAMES K. HAVEMAN
DIRECTOR

May 2, 2014

Colleen Moynihan, Remedial Project Manager
US Environmental Protection Agency, Region V
77 West Jackson Blvd.
Chicago, IL 60604-3590

To Ms. Moynihan,

As requested by the United State Environmental Protection Agency (EPA), the Michigan Department of Community Health (MDCH) has reviewed polychlorinated biphenyls (PCBs) concentrations in residential soil at the Ten-Mile Drain (TMD) Site located in St. Clair Shores, Michigan (Attachments 1 & 2) and provides public health recommendations in this letter.

Background

The TMD Site is located in a residential neighborhood of the city of St. Clair Shores on Lake St. Clair, Macomb County, Michigan. The site is presently known to encompass several blocks where PCBs have been found in the storm sewer system in significant concentrations, including areas where the PCBs are known to have migrated through the storm sewer and discharged into the Lange and Revere Street canals – connected to Lake St. Clair. Several removal actions and associated investigations have taken place since the PCBs were first discovered in the drain in 2001 by Macomb County Drainage Commission. In 2013, EPA began its site-wide remedial investigation field work and discovered elevated concentrations of PCBs in surficial soils of some parcels within the community. EPA continues to investigate the nature and extent of the PCB contamination related to the TMD Site.¹

Discussion

Environmental Contamination

EPA collected representative soil samples from parcels of property within a neighborhood of St. Clair Shores, Michigan. Composite samples of at least eight soil borings were collected in a manner to characterize the surface area of each parcel to a depth up to 3 feet. Attachment 3 demonstrates that PCB contamination, when detected in the soil samples, was most prevalent in the top six inches of soil and concentration declined with increasing depth, with the exception of parcels 43, 48, 54, 64 and 76.

¹ <http://www.epa.gov/region05/cleanup/tenmiledrain/>

Mixtures of PCB congeners were commercially manufactured and marketed in the United States under the trade name Aroclor. Aroclor mixtures ranged in percent chlorination ranging from 10-68 percent, and were named based on the percentage of the product's chlorination, such that Aroclor 1248 had 48% chlorination and Aroclor 1254 had 54% chlorination. There are up to 209 possible PCB congeners in an Aroclor mixture. According to the EPA, "*commercial mixtures with higher percentages of chlorine contained higher proportions of the more heavily chlorinated congeners, but all PCB congeners could be expected to be present at some level in all mixtures*".²

When analyzing environmental samples for PCB Aroclor profiles, a concentration of each profile is determined and the sum of those profile concentrations is the total PCB concentration for the given sample. The TMD Site residential soil samples all have an Aroclor 1248 profile with some samples also having an Aroclor 1254 profile (Attachment 1 & 2). The Aroclor profile of the source material that contaminated TMD site is unknown. The source material may have been a mixture of Aroclor 1248 and 1254, or possibly included Aroclor products of a higher percent chlorination. Environmental weathering (i.e., dechlorination) of Aroclor mixtures is a common occurrence and may account for the variation in Aroclor profiles detected in the TDM Site soil samples.

The Aroclor 1254 profile occurs in 25 samples from 19 parcels, both in the surficial soil (0–0.5 feet) and at depth (1-1.5 feet). Given that the non-homogenous spatial distribution of Aroclor 1254 detections cannot be explained by the conceptual site model, existing data, or by source characterization information, MDCH considered Aroclor 1254 toxicity information in the public health assessment of all PCB sampled parcels.

Exposure Pathway Analysis

An exposure pathway contains five elements: (1) the contaminant source, (2) the contaminated environmental media, (3) an exposure point, (4) a human exposure route, and (5) potentially exposed populations. An exposure pathway is complete if there is a high probability or evidence that all five elements are present. Table 1 describes human exposure to chemicals in the surficial soils on sampled parcels of land in St. Clair Shores, Michigan.

Table 1. Exposure pathway for PCB contaminated surficial soils at St. Clair Shores, Michigan.

Source	Environmental Medium	Exposure Point	Exposure Route	Exposed Population	Time Frame	Exposure
PCB released to soil	Surficial Soil and Soil up to 1.5 feet	Direct Contact	Ingestion and Dermal Contact	Residents and Visitors	Past Present Future	Potentially Complete

PCB contaminated surficial soil is in publically accessible parkways and in residential properties. The parkways are parcels of land adjacent to the roadway in the neighborhood. A potential completed exposure pathway exists for local residents and visitors in the past, present, and until remediation is complete. All parcels have some amount of vegetation covering the soil.

² <http://www.epa.gov/osw/hazard/tsd/pcbs/pubs/aroclor.htm>

Toxicological Evaluation

The Agency for Toxic Substances and Disease Registry (ATSDR), the EPA, and the Michigan Department of Environmental Quality (DEQ) have developed PCB soil screening values for a residential exposure scenario. Soil screening values are calculated for both cancer risks and non-cancer health effects.

These agencies agree on the oral cancer slope factor that applies to PCB mixtures, regardless of the Aroclor profile. However, the cancer-based soil screening value for residential exposures differs between the agencies due to the exposure assumptions and target risk values used in the calculations. For example, Michigan state law defines the acceptable target cancer risk as one excess cancer in 100,000 exposed people (i.e., 1×10^{-5}); whereas ATSDR and EPA calculate soil screening values using a 1×10^{-6} target risk.

For non-cancer health effects, the agencies calculate residential soil screening values that target a hazard quotient (HQ) of 1. HQ is the ratio of the predicted dose that the public may experience divided by the acceptable dose that represents minimal risk to human health over some period of time. If the predicted dose is greater than the acceptable dose, then the HQ is greater than 1. HQs greater than 1 suggest further evaluation of the potential exposure is recommended. For the PCB residential soil screening values, the agencies use relatively similar exposure assumptions with a few exceptions, described as follows.

ATSDR has derived a chronic minimal risk level (MRL) for non-cancer health effects that applies to PCB mixtures regardless of the Aroclor profile.³ ATSDR uses the chronic MRL to calculate soil Environmental Media Evaluation Guides (EMEGs) that represent a concentration of a substance to which humans may be exposed for more than a year and up to a lifetime without experiencing adverse health effects.⁴ ATSDR calculates both a child-only and an adult EMEG and recommends using the lower EMEG, as it is protective for everyone. Children could be at greater risk as compared to adults from certain hazardous substance exposures. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage.

In 1996, EPA determined that the available data were insufficient to derive an Aroclor-specific reference dose (RfD) for Aroclor 1248⁵, but did calculate an RfD for Aroclor 1254⁶. EPA uses this RfD to calculate a soil Regional Screening Level (RSL) for the Aroclor 1254 profile that is considered by the EPA to be health protective of the public, including sensitive groups, over a lifetime of exposure. The Aroclor 1254 RSL is based on a child-only exposure, similar to ATSDR's EMEG. EPA would not necessarily apply that RSL to other Aroclor profiles. Soil concentrations above an RSL do not necessarily designate an area as contaminated or pre-

³ <http://www.atsdr.cdc.gov/ToxProfiles/tp17-a.pdf>

⁴ <http://www.atsdr.cdc.gov/hac/PHAMannual/appf.html>

⁵ <http://www.epa.gov/iris/subst/0649.htm>

⁶ <http://www.epa.gov/iris/subst/0389.htm>

determine a particular response action. Instead, exceeding a RSL suggests that further evaluation of the public health risks at the site is appropriate.⁷

The DEQ uses the EPA's RfD for Aroclor 1254 to calculate a residential soil screening value that is used to evaluate PCB soil concentrations regardless of the Aroclor profile. DEQ's residential soil screening value is an age-adjusted value that combines child and adult exposures over a 30 year duration. This age-adjusted approach accounts for most of the concentration difference between the EMEG, RSL, and DEQ's residential soil screening value.

Table 2 presents the residential soil screening values protective of cancer and non-cancer health effects that can be calculated for PCBs using the agency approaches described above.

Table 2. Residential soil screening values published by state or federal agencies.

Cancer			
<i>Aroclor</i>	<i>Agency</i>	<i>Target Risk</i>	<i>Residential Soil Screening Value</i>
All Profiles ^a	ATSDR (CREG ^b)	E-6	350 ppb
All Profiles	EPA Regional Screening Levels	E-6	220 ppb
All Profiles	Michigan DEQ Part 201 ^c	E-5	4,000 ppb
Non-Cancer			
<i>Aroclor</i>	<i>Agency</i>	<i>Target Hazard Quotient</i>	<i>Residential Soil Screening Value</i>
All Profiles	ATSDR (EMEG ^d)	1	1,000 ppb
1254	EPA Regional Screening Levels	1	1,100 ppb
All Profiles	Michigan DEQ Part 201 ^c	1	6,800 ppb

^a: All profiles include Aroclor 1254 and 1248.

^b: ATSDR Cancer Risk Evaluation Guide

^c: Michigan DEQ Part 201 Environmental Remediation of the Natural Resources and Environmental Protection Act 451 of 1994.

^d: Environmental Media Evaluation Guides

Several sampled residential properties have PCB levels in the top 18 inches of soil that exceed the residential soil screening values shown in Table 2 (Attachment 1). Exceeding these screening values means further evaluation is needed to determine what public health actions are appropriate. Exceedance of these values does not mean that public health is being harmed; only that risk exists above a minimal level that is considered acceptable for everyone.

EPA considers soil removal actions to protect the public⁸. Considerations of removal actions are reasonable at the TMD Site given parcel 48 has extremely high PCB contamination in the top 0.5 feet of soil (3,500,000 ppb) and at depth (1-1.5 feet) (6,700,000 ppb). EPA has provided guidance for calculating Regional Removal Management Levels (RML) that can be used to determine when removal actions are warranted⁸. EPA describes RML as follows:

⁷ <http://www.epa.gov/region9/superfund/prg/files/04usersguide.pdf>

⁸ <http://www.epa.gov/region04/superfund/programs/riskassess/rml/rml.html>

“Once again, calculated RMLs are not meant to define protective levels and are not de facto cleanup levels. Thus, generic RMLs correspond to risk levels of approximately 10^{-4} and/or a Hazard Quotient of up to 3 for long-term exposure to **individual** chemicals at a site. A 10^{-4} risk level corresponds to the upper-end of EPA’s generally acceptable risk range of 10^{-6} to 10^{-4} as discussed in the National Contingency Plan (NCP), 40 CFR 300.430. The NCP gives no analogous recommended range for non-carcinogenic risks. However, an HQ of 3 is generally considered a reasonable risk level for RMLs for non-carcinogenic chemicals based on the discussion of uncertainty included in EPA’s definition of the non-carcinogenic Reference Dose (RfD) and Reference Concentration (RfC).”

Based on this RML definition, MDCH calculated PCB soil screening values for determining when expedited remediation should be conducted at the TMD Site (Table 3).

Table 3. Total PCB RML-based soil screening values for evaluating the necessity of expedited remediation.

Cancer		
<i>Source</i> ¹	<i>RML Target Risk</i>	<i>Expedited Remediation Soil Values</i>
ATSDR (CREG)	E-4	35,000 ppb
EPA Regional Screening Levels	E-4	22,000 ppb
MI DEQ Part 201	E-4	40,000 ppb
Non-Cancer		
<i>Source</i> ¹	<i>RML Target Hazard Quotient</i>	<i>Expedited Remediation Soil Values</i>
ATSDR (EMEG)	3	3,000 ppb
EPA Regional Screening Levels	3	3,300 ppb
MI DEQ Part 201	3	20,000 ppb

¹ RML calculation starts with a residential soil screening value as found in Table 3 of this letter.

MDCH recommends the public health protective approach of applying the lowest RML-based screening values (Table 3) to determine which parcels of land should be targeted for expedited remediation. Table 4 lists nineteen parcels of land that have PCB levels that exceed the 3,000 ppb RML-based soil screening value in the top 18 inches of soil (Attachment 1). Exceeding 3,000 ppb does not mean public health is being harmed, but that risks could be well above minimal levels for acceptable residential exposure to PCBs and expedited remediation is recommended for those parcels listed in Table 4.

Table 4. Nineteen parcels recommended for expedited remediation due to elevated PCB soil contamination.

Count of Parcels	Parcel ID	Location	Sample Depth <i>feet</i>	Total PCBs <i>µg/kg</i>
1	43	Yard	0-0.5'	4,800
	43	Yard	1-1.5'	8,000
2	44	Parkway	0-0.5'	14,000
3	48	Parkway	0-0.5'	3,500,000
	48	Parkway	1-1.5'	6,700,000
4	50	Parkway	0-0.5'	3,300
	50	Parkway	1-1.5'	3,000
5	51	Parkway	0-0.5'	8,700
	51	Parkway	1-1.5'	3,300*
6	52	Yard	0-0.5'	7,600
7	53	Parkway	0-0.5'	26,000
8	54	Yard	1-1.5'	3,100
9	55	Parkway	0-0.5'	11,000
10	57	Parkway	0-0.5'	13,300*
11	63	Parkway	0-0.5'	23,000*
12	65	Parkway	0-0.5'	36,000*
13	68	Parkway	0-0.5'	13,400*
14	69	Parkway	0-0.5'	77,000*
	69	Parkway	1-1.5'	5,510*
15	71	Parkway	0-0.5'	5,600*
16	76	Back Yard	0-0.5'	8,000*
	76	Back Yard	1-1.5'	130,000
17	77	Back Yard	0-0.5'	9,400
18	78	Back Yard	0-0.5'	3,900
19	85	Parkway	0-0.5'	5,600

* Total PCB concentration has an Aroclor 1248 and 1254 profile (see Attachment 2).

Conclusions

MDCH concludes that PCBs concentrations in surficial soils pose a risk to public health. Nineteen parcels of land are recommended for expedited remediation based on their PCB concentrations (Table 4). MDCH recommends that soil on the properties in Table 4 be remediated to a PCB concentration that does not pose a public health risk.

Recommendations

MDCH recommends that expedited remediation take place during the 2014 calendar year on parcels of land with PCB levels exceeding 3,000 ppb. MDCH recommends that the properties listed in Table 4 be remediated to below a PCB concentration that does not pose a public health risk.

Public Health Action Plan

MDCH will continue to work with EPA Superfund to communicate appropriate health protective measures that the public can use to limit their personal PCB exposure while the EPA addresses the PCB soil contamination in this St. Clair Shores community.

Sincerely,

A handwritten signature in black ink, appearing to read "Kory Groetsch". The signature is written in a cursive style with a large initial "K".

Kory Groetsch, MS

Toxicologist

Michigan Department of Community Health

Attachement 1. Ten-Mile Drain Site total PCB soil concentrations by parcel of land and soil depth (St. Clair Shores, Michigan).

Parcel Number	Parcel Type	Soil Depth feet	Total PCB Concentration $\mu\text{g}/\text{kg}$
43	Yard	0-0.5'	4,800
43	Yard	1-1.5'	8,000
43	Yard	1.5-2'	7,000
44	Parkway	0-0.5'	14,000
44	Parkway	1-1.5'	2,400
44	Parkway	1.5-2'	1,100
45	Yard	0-0.5'	920
45	Yard	1-1.5'	<390
46	Parkway and Yard	0-0.5'	2,200
46	Parkway and Yard	1-1.5'	1,200
48	Parkway	0-0.5'	3,500,000
48	Parkway	1-1.5'	6,700,000
49	Yard	0-0.5'	2,000
49	Yard	1-1.5'	1,800
50	Parkway	0-0.5'	3,300
50	Parkway	1-1.5'	3,000
50	Parkway	1.5-2'	840
51	Parkway	0-0.5'	8,700
51	Parkway	1-1.5'	3,300*
52	Yard	0-0.5'	7,600
52	Yard	1-1.5'	<380
53	Parkway	0-0.5'	26,000
53	Parkway	1-1.5'	2,600
54	Yard	0-0.5'	2,800
54	Yard	1-1.5'	3,100

* Total PCB concentration has an Aroclor 1248 and 1254 profile (see Attachment 2).

Parcel Number	Parcel Type	Soil Depth feet	Total PCB Concentration $\mu\text{g}/\text{kg}$
55	Parkway	0-0.5'	11,000
55	Parkway	1-1.5'	2,400
56	Yard	0-0.5'	950
56	Yard	1-1.5'	440
57	Parkway	0-0.5'	13,300*
57	Parkway	1-1.5'	380
57	Parkway	2.5-3'	<260
58	Front Yard	0-0.5'	700
58	Front Yard	1-1.5'	<340
58	Front Yard	2.5-3'	<370
59	Parkway	0-0.5'	1,700*
59	Parkway	1-1.5'	<280
59	Parkway	2.5-3'	<310
60	Front Yard	0-0.5'	960*
60	Front Yard	1-1.5'	<300
60	Front Yard	2.5-3'	<310
61	Parkway	0-0.5'	2,700*
61	Parkway	1-1.5'	530*
61	Parkway	2.5-3'	<370
62	Front Yard	0-0.5'	<300
62	Front Yard	1-1.5'	<300
62	Front Yard	2.5-3'	<300
63	Parkway	0-0.5'	23,000*
63	Parkway	1-1.5'	1,500
63	Parkway	2.5-3'	<260
64	Front Yard	0-0.5'	<550
64	Front Yard	1-1.5'	1,600*
64	Front Yard	2.5-3'	<340

* Total PCB concentration has an Aroclor 1248 and 1254 profile (see Attachment 2).

Parcel Number	Parcel Type	Soil Depth feet	Total PCB Concentration $\mu\text{g}/\text{kg}$
65	Parkway	0-0.5'	36,000*
65	Parkway	1-1.5'	1,170*
65	Parkway	2.5-3'	230
66	Front Yard	0-0.5'	1,110*
66	Front Yard	1-1.5'	1,500*
66	Front Yard	2.5-3'	<330
67	Back Yard	0-0.5'	1,730*
67	Back Yard	1-1.5'	740*
67	Back Yard	2.5-3'	<330
68	Parkway	0-0.5'	13,400*
68	Parkway	1-1.5'	1,030*
68	Parkway	2.5-3'	230
69	Parkway	0-0.5'	77,000*
69	Parkway	1-1.5'	5,510*
69	Parkway	2.5-3'	<360
70	Front Yard	0-0.5'	<370
70	Front Yard	1-1.5'	810*
70	Front Yard	2.5-3'	370
71	Parkway	0-0.5'	5,600*
71	Parkway	1-1.5'	<310
71	Parkway	2.5-3'	<310
72	Front Yard	0-0.5'	<340
72	Front Yard	1-1.5'	<280
72	Front Yard	2-2.5'	<290
73	Front Yard	0-0.5'	<300
73	Front Yard	1-1.5'	<340
73	Front Yard	2.5-3'	<270

* Total PCB concentration has an Aroclor 1248 and 1254 profile (see Attachment 2).

Parcel Number	Parcel Type	Soil Depth feet	Total PCB Concentration $\mu\text{g}/\text{kg}$
74	Back Yard	0-0.5'	2,180*
74	Back Yard	1-1.5'	500*
74	Back Yard	2.5-3'	<270
75	Back Yard	0-0.5'	<330
75	Back Yard	1-1.5'	750
76	Back Yard	0-0.5'	8,000*
76	Back Yard	1-1.5'	130,000
77	Back Yard	0-0.5'	9,400
77	Back Yard	1-1.5'	180
77	Back Yard	2.5-3'	<310
78	Back Yard	0-0.5'	3,900*
78	Back Yard	1-1.5'	1,530*
78	Back Yard	2.5-3'	<340
79	Parkway	0-0.5'	<360
79	Parkway	1-1.5'	<280
80	Front Yard	0-0.5'	<290
80	Front Yard	1-1.5'	<330
81	Parkway	0-0.5'	470*
81	Parkway	1-1.5'	<290
82	Front Yard	0-0.5'	<380
82	Front Yard	1-1.5'	<290
83	Parkway	0-0.5'	<390
83	Parkway	1-1.5'	<260
84	Front Yard	0-0.5'	<380
84	Front Yard	1-1.5'	<330
85	Parkway	0-0.5'	5,600
86	Parkway	0-0.5'	1,500
87	Parkway	0-0.5'	1,590

* Total PCB concentration has an Aroclor 1248 and 1254 profile (see Attachment 2).

Attachement 2. Ten-Mile Drain Site total PCB soil concentrations that have an Aroclor 1248 and 1254 profile by parcel of land and soil depth (St. Clair Shores, Michigan).

Parcel Number	Parcel Type	Aroclor Profile	Soil Depth feet	Aroclor Concentration ug/kg	Total PCBs Concentration ug/kg
51	Parkway	1254	1-1.5'	1,900	3,300
51	Parkway	1248	1-1.5'	1,400	
57	Parkway	1254	0-0.5'	5,900	13,300
57	Parkway	1248	0-0.5'	7,400	
59	Parkway	1254	0-0.5'	780	1,700
59	Parkway	1248	0-0.5'	920	
60	Yard	1254	0-0.5'	340	960
60	Yard	1248	0-0.5'	620	
61	Parkway	1254	0-0.5'	1,300	2,700
61	Parkway	1248	0-0.5'	1,400	
61	Parkway	1254	1-1.5'	240	530
61	Parkway	1248	1-1.5'	290	
63	Parkway	1254	0-0.5'	6,120	23,020
63	Parkway	1248	0-0.5'	16,900	
64	Yard	1254	1-1.5'	750	1,600
64	Yard	1248	1-1.5'	850	
65	Parkway	1254	0-0.5'	13,000	36,000
65	Parkway	1248	0-0.5'	23,000	
65	Parkway	1254	1-1.5'	390	1,170
65	Parkway	1248	1-1.5'	780	
66	Yard	1254	0-0.5'	470	1,110
66	Yard	1248	0-0.5'	640	
66	Yard	1254	1-1.5'	540	1,500
66	Yard	1248	1-1.5'	960	
67	Yard	1254	0-0.5'	630	1,730
67	Yard	1248	0-0.5'	1,100	
67	Yard	1254	1-1.5'	330	740
67	Yard	1248	1-1.5'	410	
68	Parkway	1254	0-0.5'	5,100	13,400
68	Parkway	1248	0-0.5'	8,300	
68	Parkway	1254	1-1.5'	370	1,030
68	Parkway	1248	1-1.5'	660	
69	Parkway	1254	0-0.5'	27,000	77,000
69	Parkway	1248	0-0.5'	50,000	
69	Parkway	1254	1-1.5'	1,770	5,510
69	Parkway	1248	1-1.5'	3,740	
70	Yard	1254	1-1.5'	280	810
70	Yard	1248	1-1.5'	530	

Parcel Number	Parcel Type	Aroclor Profile	Soil Depth feet	Aroclor Concentration ug/kg	Total PCBs Concentration ug/kg
71	Parkway	1254	0-0.5'	2,600	5,600
71	Parkway	1248	0-0.5'	3,000	
74	Yard	1254	0-0.5'	900	2,180
74	Yard	1248	0-0.5'	1,280	
74	Yard	1254	1-1.5'	220	500
74	Yard	1248	1-1.5'	280	
76	Yard	1254	0-0.5'	2,800	8,000
76	Yard	1248	0-0.5'	5,200	
78	Yard	1254	0-0.5'	1,500	3,900
78	Yard	1248	0-0.5'	2,400	
78	Yard	1254	1-1.5'	550	1,530
78	Yard	1248	1-1.5'	980	
81	Parkway	1254	0-0.5'	270	470
81	Parkway	1248	0-0.5'	200	

Attachment 3.

Bar graphs of PCB soil concentrations for yards (Figure 3-1) and parkways (Figure 3-2).

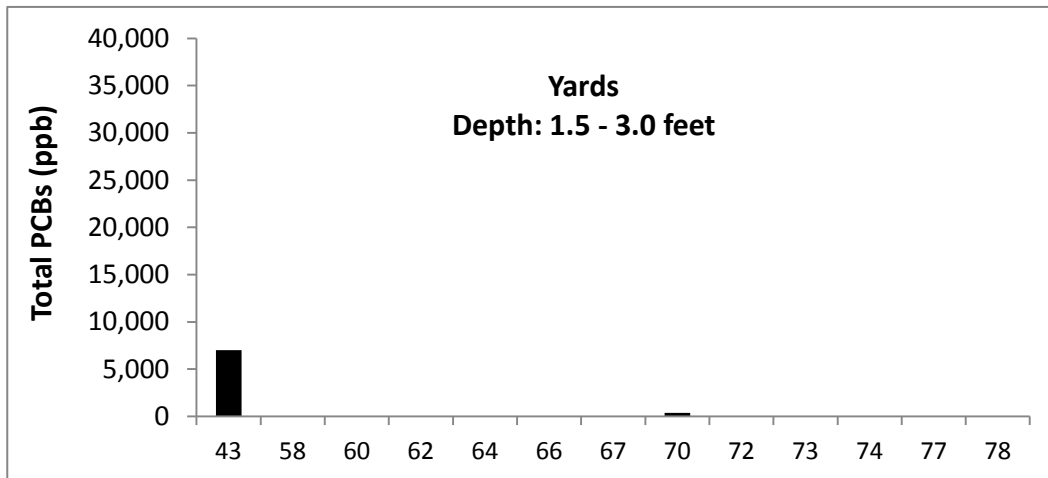
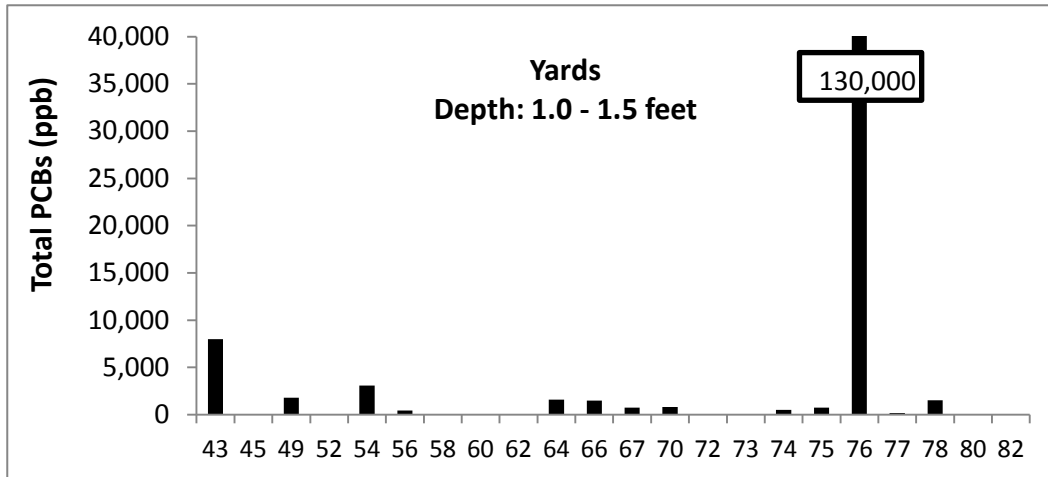
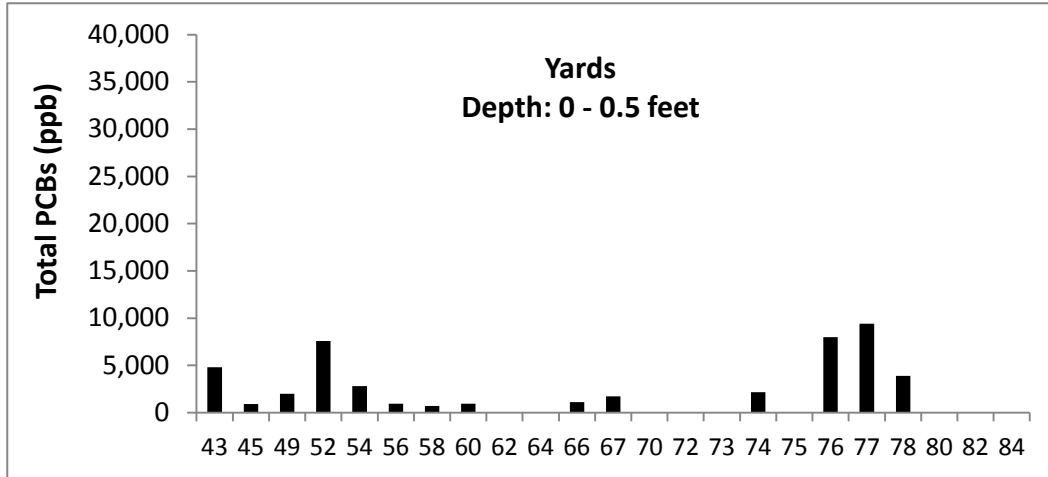


Figure 3-1. Average total PCB concentrations by depth in front yards or backyards of properties sampled for the Ten-Mile Drain remedial investigation.

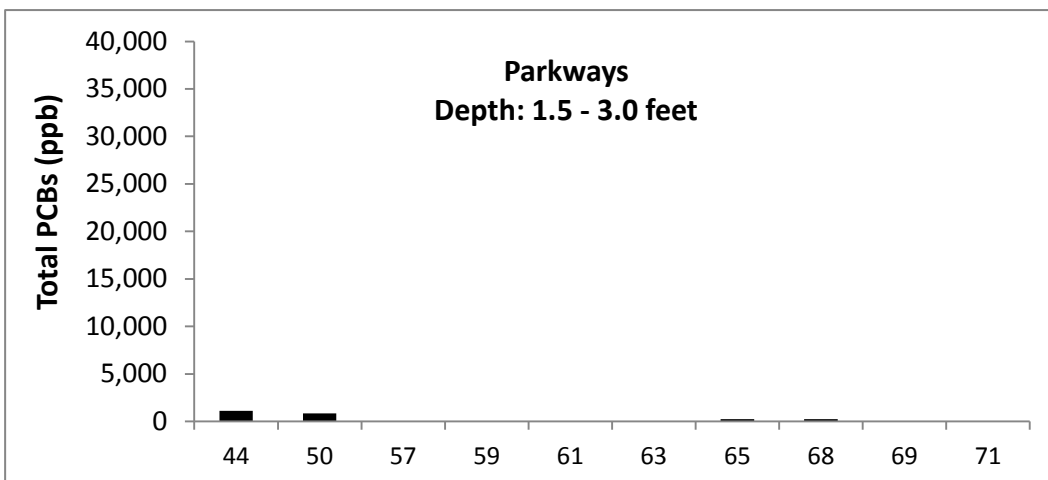
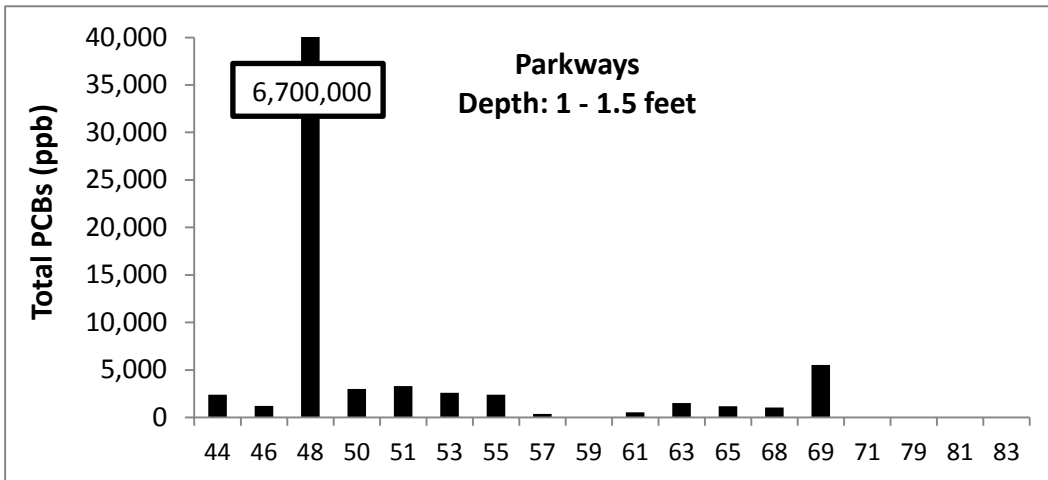
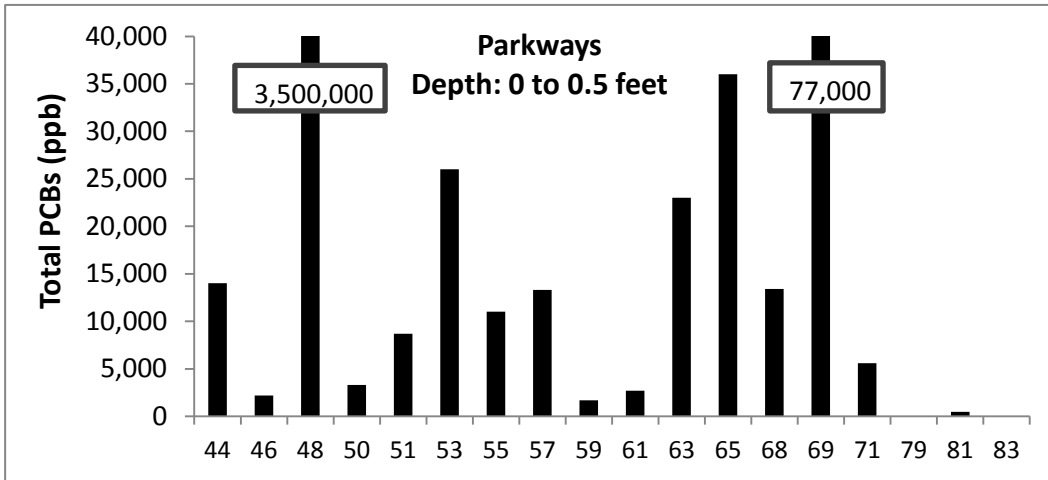


Figure 3-2. Average total PCB concentrations by depth in parkways of properties sampled for the Ten-Mile Drain remedial investigation.