SUMMARY REPORT

Inclusion of Upstream Sources Into the Boundary of the Eighteenmile Creek <u>Area of Concern</u>

April 2007

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SUMMARY REPORT (SR)

INCLUSION OF UPSTREAM SOURCES INTO THE BOUNDARY OF THE EIGHTEENMILE CREEK AREA OF CONCERN (AOC)

1. INTRODUCTION

The Eighteenmile Creek watershed is located along the southern shore of Lake Ontario in Niagara County, New York. Eighteenmile Creek flows generally to the north and discharges into Lake Ontario, through Olcott Harbor, approximately 18 miles east of the mouth of the Niagara River (Figure 1). The watershed has a drainage area of approximately 58,056 acres and includes Eighteenmile Creek; the two main tributaries, the East Branch and the Gulf, and minor tributaries. In addition, much of the flow in the main branch of Eighteenmile Creek comes from water diverted from the New York State Barge Canal. (NYSDEC 1997)

The natural topography of the area can be characterized as two relatively flat plains at different elevations separated by the Niagara Escarpment. The southernmost portion of the watershed is at a higher elevation than the remainder of the watershed and is separated by the Niagara Escarpment along the northern portion of the City of Lockport. The watershed lies entirely within Niagara County and encompasses portions of the Towns of Cambria, Lockport (including a portion of the City of Lockport), Royalton, Hartland, Newfane, and Wilson. The majority of the watershed can be characterized as a rural area comprising agricultural lands, with scattered residences along roadways, and rural villages; including Olcott, Newfane, and Gasport. A portion of one urban area, the City of Lockport, falls within the watershed and is the most densely populated area within the watershed. Commercial and industrial uses are concentrated in the City of Lockport. (Ecology & Environment, Inc. 2004)

The main branch of Eighteenmile Creek originates southeast of the City of Lockport, in the vicinity of Keck and Chestnut Ridge Roads, on the south side of the Niagara Escarpment. It travels northwest through the city and is diverted underground near Vine Street, travels north underground under the Canal to a point near Clinton Street, where it resurfaces. It continues generally north, descending approximately 240 feet over the Niagara Escarpment and flows north through the Town of Newfane before draining into Lake Ontario at Olcott Harbor.

A section of Eighteenmile Creek was designated as an Area of Concern (AOC) by the International Joint Commission because of an existing fish consumption advisory, benthic population decline and restrictions on dredging. Over the years, numerous contaminants have been identified in creek sediments which have a detrimental effect to the AOC and Lake Ontario. These contaminants include but are not limited to; Polychlorinated Biphenyls (PCBs); Mercury; Dioxins and Furans; Dieldrin; Mirex; DDT; Lead; and Copper. Sediments contaminated with these substances have directly contributed to the impairments just mentioned. It is also suspected that these contaminated sediments contribute to a degradation of fish and wildlife populations, the presence of fish tumors, and the prevalence of bird and animal deformities or reproductive problems.

Interestingly enough, the AOC is relatively pristine to the naked eye. This section of Eighteenmile Creek flows through a steep sided, undeveloped wooded gorge, where habitat disturbances are minimal. The extensive beds of emergent and submergent aquatic vegetation in this area account for an estimated 65 acres, comprising one of the largest coastal wetlands in the western portion of Lake Ontario. These wetlands and undisturbed woodlands bordering Eighteen Mile Creek provide valuable habitats for wildlife that are uncommon in Niagara County's coastal area. (NYSDEC 1987)

A variety of bird species inhabit the area, including great blue heron, green-backed heron, mallard, wood duck, belted kingfisher, marsh wren, common yellowthroat, red-winged blackbird, and swamp sparrow.. Eighteen Mile Creek is particularly significant because large concentrations of Coho and Chinook salmon and brown trout migrate from Lake Ontario into the creek each fall. In addition, steelhead migrate into Eighteen Mile Creek during the fall and between late February and April. Due to the importance of this area, NYSDEC has determined that, "Disturbances of wetland vegetation, including submergent beds, through dredging, filling, or bulkheading [excluding Olcott Harbor], would result in a direct loss of valuable habitat area." (NYSDEC 1987)

Since the RAP process began for Eighteenmile Creek, the AOC has been considered as the "impact area" and the upper watershed as the "source area." (RAP; NYSDEC 1997) With the exception of potential impacts from land in agriculture adjacent to the current AOC boundary, there are no documented sources or sources areas of contamination within the AOC. The existence of PCBs, Mercury, Dioxins and Furans, Dieldrin, Lead, and Copper in AOC sediments can not be correlated to any area within the current boundary of the AOC. However, the occurrence of all of these contaminants upstream of the AOC leaves little doubt that the upper watershed is directly relevant to the contamination that exists in the AOC.

The objective of this Summary Report (SR) is to provide documentation that will support the decision to extend the boundary of the AOC to address and remediate contamination in the upper watershed. The underlying purpose of providing this documentation is to secure eligibility for submission of a Legacy Act sediment remediation proposal for upstream source areas. Specifically, this SR will document: the original written description and graphic representation of the AOC boundary; the proposed modifications to the written description and graphic representation of the AOC boundary; the rationale for modifying the AOC boundary; and document what outreach was completed to solicit input from stakeholders.



2. EIGHTEENMILE CREEK AOC (CURRENT BOUNDARY)

According to the Eighteenmile Creek Remedial Action Plan (RAP), the Eighteenmile Creek basin can be subdivided into two components, "the Eighteenmile Creek Area of Concern (AOC) (the impact area) and the Eighteenmile Creek watershed (the source area)." (NYSDEC 1997) The RAP also documents a general description for the AOC, documenting location and a general extent of the originally intended boundary:

The Eighteenmile Creek Area of Concern is located in the Town of Newfane, Niagara County, in Western New York State. The creek flows from the south and discharges into Lake Ontario approximately 18 miles east of the mouth of the Niagara River.

The Eighteenmile Creek Area of Concern extends from the mouth of the creek to the farthest point upstream at which backwater conditions exist during Lake Ontario's highest monthly average lake level. This point is located just downstream of a dam about two miles upstream from the mouth, in Burt, New York. (Figure 2) (NYSDEC 1997)



FIGURE 2 - EIGHTEENMILE CREEK AOC BOUNDARY

The most current sediment data available that can assist in characterizing contaminated sediment within the AOC was collected by U.S. Army Corps of Engineers' Buffalo District in 2003. USACE collected surface sediment samples from 15 locations within lower Eighteenmile Creek. These discrete samples were composited to represent five separate reaches within the AOC: moving upstream from approximately upper Olcott Harbor to Burt Dam, these were Reaches EBU1, EBU2, EBU3, EBU4 and EBU5 (See Figure 3). Chemical testing of the sediment included various heavy metals, and organic contaminants including chlorinated pesticides, PCBs and Polychlorinated p-dibenzo dioxins and polychlorinated p-dibenzo furans (PCDD/Fs).

USACE results show that total PCB concentrations (congener summation) in the reach sediments ranged from 77.9 to 279 μ g/kg at Reaches EBU5 and EBU4, respectively (Table 1), and were quite consistent throughout the AOC. Across the AOC, PCB congeners 31, 44, 49 and 52 were always the four most dominant congeners in the reach samples, comprising between about 34 to 58%. The congener composition of the PCBs generally denoted the Aroclor 1248 mixture. (Pickard 2006)

AOC reach	Total PCB	
	concentration	
	(µg/kg)	
EBU1	236	
EBU2	229	
EBU3	279	
EBU4	278	
EBU5	77.9	

TABLE 1 - Concentrations of PCBs in AOC Reach Surficial Composite Sediment Samples

Heavy metals were also detected in the majority of the sediment samples. The heavy metals data on the sediment samples were compared to four separate sets of non-site specific criteria and are summarized in Reference Table R1:

- Sediment Quality Guideline (SQG) freshwater probable effect levels (PELs) (Environment Ca. 2003)
- Severe effect levels (SELs) (NYSDEC 1999)
- Consensus-based freshwater sediment probable effect concentrations (PECs) (MacDonald et al. 2000)
- Lake Ontario reference area (background levels) (Engineering and Environment 1997)

With respect to the metals data on the reach sediments (Table 2), chromium exceeded the PEL at Reaches EBU3 and EBU5. The SEL and/or PEC for copper was exceeded at Reaches EBU2 and EBU3. Lead exceeded the PEL at Reaches EBU1 through EBU4, and the SEL and/or PEC at Reaches EBU2 through EBU4. The SEL for nickel was exceeded at Reach EBU2. In addition, the PEL, and SEL and/or PEC for zinc were exceeded at Reaches EBU1 through EBU4.

Heavy	AOC Reach				
Metal	EBU1	EBU2	EBU3	EBU4 EBU5	
	Sediment	Sediment	Sediment	Sediment	Sediment
Aluminum	10,800	12,800	11,600	12,800	10,700
Antimony	0.35	0.45	0.56	2.97	0.33
Arsenic	3.4	4.13	3.75	3.38	2.78
Barium	113	137	122	122	65.8
Beryllium	0.52	0.68	0.60	0.63	0.60
Cadmium	0.75	1.25	1.52	0.90	0.36
Calcium	20,000	14,300	10,400	19,200	12,900
Chromium	41	74.1	109	52.5	102
Cobalt	8.77	12.1	13.9	12.3	11.8
Copper	64.7	123	157	73.5	31.7
Iron	21,200	25,900	25,400	27,600	23,400
Lead	102	146	203	153	69.9
Magnesium	6,270	6,820	6,380	6,410	6,770
Manganese	535	409	475	517	440
Mercury	0.17	0.33	0.37	0.17	0.04
Nickel	31.2	56.9	20.5	47.9	39.9
Selenium	0.50	0.45	3.53	0.32	0.10
Silver	0.47	0.62	0.62	0.34	0.18
Sodium	187	180	158	186	463
Thallium	0.20	0.29	0.29	0.24	0.13
Vanadium	20.8	25.3	24.5	23.5	20.5
Zinc	328	536	800	444	238

TABLE 2 - Concentrations of Heavy Metals in AOC Reach Surficial Composite Sediment Samples (mg/kg)

 Table R1 - Summary of Metal Freshwater Sediment Quality Criteria

 * An asterisk denotes that the criterion was not determined

The asterisk denotes that the effection was not determined						
Heavy	Sediment Threshold Value			Lake Reference Level		
Metal	(mg	ng/kg, dry weight)		Range (mg/kg, dry		
	PEL	SEL	PEC	weight)		
Aluminum	_*	-	-	9,350-15,800		
Antimony	-	25	-	0.81-1.37		
Arsenic	17	33	33	5.24-8.8		
Barium	-	-	-	62.8-101		
Beryllium	-	-	-	0.49-0.90		
Cadmium	3.5	9.0	4.98	0.87-1.20		
Calcium	-	-	-	23,800-40,700		
Chromium	90	110	111	26.2-33.6		
Cobalt	-	-	-	7.29-11.4		
Copper	197	110	149	25.6-41.3		
Iron	-	40,000	-	18,200-28,800		
Lead	91.3	110	128	24.5-32.2		
Magnesium	-	-	-	9,440-16,200		
Manganese	-	1100	-	499-767		
Mercury	0.49	1.3	1.06	0.10-0.19		
Nickel	-	50	48.6	23.1-35.0		
Selenium	-	-	-	1.34-2.27		
Silver	-	2.2	-	0.42-0.62		
Sodium	-	-	-	229-265		
Thallium	-	-	-	<0.51-<0.71		
Vanadium	-	-	-	21.8-32.3		
Zinc	315	270	459	109-152		

The following is an excerpt from Pickard 2006 which eloquently deciphers the metals analysis:

- **Reach EBU1**—All listed metal concentrations in these sediments, except for mercury, significantly exceeded lake reference levels. Copper, lead, nickel and zinc concentrations often appear to be chronically toxic.
- **Reach EBU2**—All listed metal concentrations in these sediments, except for selenium, notably exceeded lake reference levels. Copper, lead, nickel and zinc concentrations often appear to be chronically toxic. Some of the zinc concentrations were over twice the SEL and/or PEC.
- **Reach EBU3**—All listed metal concentrations in these sediments, except for cobalt and mercury, notably exceeded lake reference levels. Chromium, copper, lead, nickel and zinc concentrations often appear to be chronically toxic. Mercury may be chronically toxic in some instances. Some of the copper, lead and zinc concentrations were over twice the SEL and/or PEC.
- **Reach EBU4**—All listed metal concentrations in these sediments, except for silver, significantly exceeded lake reference levels. Lead and zinc concentrations often appear to be chronically toxic. Silver may be chronically toxic in some instances.
- **Reach EBU5**—All listed metal concentrations in these sediments, except for selenium, significantly exceeded lake reference levels. Chromium, copper, iron, lead and zinc often appear to be chronically toxic. Some of the chromium, iron, lead and zinc concentrations were over twice the SEL and/or PEC.

The concentrations of 2378-tetrachlorodibenzo-*p*-dioxin (TCDD), viewed as the most toxic PCDD/F congener, and PCDD/F toxic equivalents (TEQs) for each discrete sediment sample from the AOC are summarized in Table 3. With respect to TCDD, concentrations ranged from non-detectable at most of the sites, to two detected concentrations of 0.6 and 0.72 pg/g at Sites EMC-8 and EMC-10, respectively. PCDD/F TEQs ranged from 0.21 to 16.2 pg/g at Sites EMC-13 and EMC-16, respectively. The relatively higher congener concentrations and maximum TEQ at Site EMC-15 indicate an upstream source of PCDD/Fs above Burt Dam. In addition, there is a general downward trend in the TEQs, downstream of Burt Dam to just upstream of the harbor. Smaller peaks are noted at Sites EMC-12, 10, 8 and 4. (Pickard 2006)

TABLE 3 - Concentrations of TCDD and PCDD/F TEQs in AOC Discrete Surficial Composite Sediment

Site	TCDD	PCDD/F
	Concentration	TEQ
	(pg/g)	(pg/g)
EMC-1	< 0.50	0.88
EMC-2	< 0.87	2.41
EMC-3	< 0.75	1.27
EMC-4	< 0.55	6.76
EMC-5	< 0.65	2.28
EMC-6	< 0.36	1.54
EMC-7	< 0.63	0.63
EMC-8	0.6	14.2
EMC-9	< 0.42	3.96
EMC-10	0.72	9.28
EMC-11	< 0.55	1.97
EMC-12	< 0.73	7.64
EMC-13	< 0.56	0.21
EMC-14	< 0.54	0.79
EMC-15	<1.7	16.2

Samples

FIGURE 3 EIGHTEENMILE CREEK AOC SEDIMENT SAMPLING SITES AND REACHES



3. PROPOSED INCLUSIONS

A number of identified source areas of contamination within the upstream reach of Eighteenmile Creek are planned to be included into the recognized boundary of the AOC. The upstream reach of Eighteenmile Creek starts at Burt Dam and ends at the Erie Canal. Burt Dam is approximately 328 feet wide and has a maximum height of 54.5 feet. Normally, the dam holds an impoundment that is up to about 35 feet deep, between 325 to 400 feet wide and 8000 feet long. A riverine/palustrine wetlands complex is located just upstream of the dam's impoundment near Ide Road. The abandoned, essentially submerged Newfane Dam is situated approximately 3 miles upstream of the Burt Dam near the intersection of Lockport-Olcott Road and Ewings Road. The dam is approximately 260 feet wide and has a maximum height of approximately 15 feet. The East Branch and The Gulf confluences are approximately 4 and 7 miles upstream of the Gulf; however, the canal drains into the creek via an outlet. The Flintkote Plant Site (or Williams Street Site), a site currently being investigated by the NYSDEC, is situated approximately ¹/₂ mile downstream of the point at which the Erie Canal discharges to Eighteenmile Creek. (USACE 2006)

The following identified source areas will be included into the boundary of the AOC:

BURT DAM IMPOUNDMENT - INCLUSION #1

<u>Proposed Modification</u> - The Burt Dam impoundment extends from the south side of Burt Dam to a point upstream where a riverine/palustrine wetlands complex begins near Ide Road. (Figure 4) This point is located approximately 8,000 feet upstream of Burt Dam and 3,000 feet downstream of Ide Road.

NEWFANE DAM AREA – INCLUSION # 2

<u>Proposed Modification</u> - The Newfane Dam area extends from the east side of the remains of the Newfane Dam to a point upstream where a riverine/palustrine wetlands complex ends near the intersection of Lockport-Olcott Road and McKee Road. (Figure 5) This point is located approximately 2,200 upstream of the remains of the Newfane Dam.

PLANK ROAD "HOT SPOT" - INCLUSION #3

<u>Proposed Modification</u> - The Plank Road "hot spot" begins 100 feet east of the point where Eighteenmile Creek intersects Plank Road and extends downstream to a point approximately 300 feet west of the point where Eighteenmile Creek intersects Plank Road. (Figure 6)

EIGHTEENMILE CREEK CORRIDOR – INCLUSION #4

<u>Proposed Modification</u> - The Eighteenmile Creek Corridor is located between the New York State Barge Canal and Harwood Street in the City of Lockport, Niagara County, New York. (Figure 7) The Site consists of approximately 4,000 linear feet of the creek, adjacent banks and the millrace adjacent to the Former Flintkote Plant Site.

ERIE BARGE CANAL – INCLUSION #5

<u>Proposed Modification</u> – The section of the Erie Barge Canal to be annexed into the boundary of the AOC is located in the City of Lockport, Niagara County. The site begins at the downstream end of the double lock structure (locks 34 &35) in Lockport and continues downstream to a point where Exchange Street intersects the Erie Barge Canal. (Figure 8) This section of the Canal consists of approximately 2,600 linear feet.

FIGURE 4 - BURT DAM IMPOUNDMENT



FIGURE 5 – NEWFANE DAM AREA



FIGURE 6 – PLANK ROAD HOT SPOT



FIGURE 7 – EIGHTEENMILE CREEK CORRIDOR





4. RATIONALE FOR INCLUSIONS

Burt Dam Impoundment

In 1994, New York State Department of Environmental Conservation (NYSDEC) collected surficial samples and sediment core samples from behind Burt Dam. These samples analyzed for metals, pesticides, polychlorinated bi-phenyls (PCBs), dioxins and furans, and Polycyclic Aromatic Hydrocarbons (PAHs). Maximum concentrations of the sediment analytes measured are summarized in Table 4, as compared to the following criteria summarized in Reference Table R2:

- Long & Morgan's (1990) Effects Range Low & Effects Range Median (ERL & ERM)
- NYSDEC 1999a Lowest Effect Level & Severe Effect Level (LEL & SEL)
- NYSDEC Fish & Wildlife Criteria Wildlife & Human Health Bioaccumulation Criteria (HH & W)
- Persaud et al.'s (1993) Lowest Effect Level & Severe Effect Level (LEL & SEL)

Analyte	Units	Long & Morgan		Persaud et al		NYSDEC	
		ERL	ERM	LEL	SEL	LEL	SEL
Arsenic	ppm	33	85	6	33	6	33
Cadmium	ppm	5	9	0.6	10	0.6	9
Chromium	ppm	80	145	26	110	26	110
Copper	ppm	70	390	16	110	16	110
Iron	%	-	-	2	4	2	4
Lead	ppm	35	110	31	250	31	110
Mercury	ppm	0.15	1.3	0.2	2	0.15	1.3
Nickel	ppm	30	50	16	75	16	50
Silver	ppm	1	2.2	-	-	1	2.2
Zinc	ppm	120	270	120	820	120	270
Analyte	Units	Long & Mo	organ	Persaud		NYSDEC	
		EDI	EDM		et al.	<u>19</u>	99a
		ERL	EKM		SEL	ПП	W
Total PCB	ppm	0.05	0.4	0.07	5.3	0.008	1.4
Total PAHs	ppb	4,000	35,000	4,000	100,000	-	-
Total DDT	ppb	3	350	7	120	10	1,000
Analyte	Units	Long & Mo	organ	Persaud		NYSDEC	
		1990		et al.		1999a	
		ERL	ERM	LEL	SEL	HH	W
Dioxin/Furan	ppt						
TEQ - fish		-	-	-	-	-	-
2,3,7,8- TCDD	µg/g OC	-	-	-	-	0.01	0.0002

 TABLE R2 – Sediment Quality Guidelines for All Analytes

NYSDEC results show that chromium, copper and lead exceed 10x the severe effect levels (SELs), and cadmium, nickel, silver, zinc, and total PCB concentrations that exceed the SEL upstream of Burt Dam. Also, PCDD/F TEQs and Σ 4,4' – dichlorodiphenyldichloroethane (DDT) concentrations above the Dam exceed the wildlife bioaccumulation criteria. (NYSDEC 1999)

	1	Analyte	Upstro	eam of Burt Dam	
		Arsenic	14.5		
		Cadmium	26.0		
	$\overline{\mathbf{C}}$	Chromium	1,910		
	Md	Copper	2.340		
	(J)	Iron	32.900		
	als	Lead	4,500		
	Met	Mercury	1.1		
		Nickel	523		
		Silver	5.7		
		Zinc	16,500		
	DF TEQ (ppt)		1,305.3		
	Tot	al PCBs (ppm)	27.720		
	To	otal DDT (ppb)	301		
>LEL o	r>ERL	>SEL or >ERM	>10SEL	> NYSDEC FW H Bioaccumulation Gu	uman idance

 TABLE 4

 Maximum Concentrations of Analytes Behind Burt Dam (1994)

In 1998, NYSDEC collected additional surficial and sediment core samples from behind Burt Dam. These samples analyzed for metals, PCBs, dioxins and furans, and PAHs. Maximum concentrations of the sediment analytes measured are summarized in Table 5, as compared to the criteria identified during the 1994 NYSDEC study. NYSDEC results show that chromium, copper, lead and zinc exceed 10x the severe effect levels (SELs), and cadmium, mercury, silver and total PCB concentrations that exceed the SEL upstream of Burt Dam. Also, PCDD/F TEQ concentrations above the Dam exceed the wildlife bioaccumulation criteria. (NYSDEC 1999)

	A	nalyte	Upstre	am of Burt Dam
		Arsenic	12.5	
		Cadmium	20.1	
Ģ	Ì	Chromium	1,490	
L L L L L L L L L L L L L L L L L L L		Copper	2,450	
s (]	stals (1	Lead	4,490	
stal		Mercury	3.31	
Ň		Nickel	997	
		Silver	8.0	
		Zinc	15,100	
	DF TEQ (ppt)		258.1	
,	Total PCBs (ppm)		25.85	
	Total PAHs (ppb) Total DDT (ppb)		24,110	
			116.2	
EL or >E	RL	>SEL or >ERM	>10SEL	> NYSDEC FW Hu Bioaccumulation Gui

 TABLE 5

 Maximum Concentrations of Analytes Behind Burt Dam (1998)

Upstream of the current AOC, the Burt Dam serves to detain or accrue contaminated sediments on its upstream side, eventually releasing some of these contaminated sediments downstream toward the AOC. In this way, the dam has incidentally become a "subsidiary source" of sediment contamination.

To support this conclusion, water quality sampling was conducted by NYSDEC upstream (impoundment) and downstream (turbine pool) of the Burt Dam. The sampling utilized a device called the Trace Organic Platform Sampler (TOPS). This instrument provides a highly sensitive method of sampling and quantifying extremely low concentrations in both the aqueous and adsorbed phase. Total PCB concentrations upstream of the Burt Dam were calculated as 9.4 ng/L (ppt), while downstream calculations were calculated as 44 ng/L (ppt). Total PAH concentrations upstream of the Dam were calculated as 15.75 ng/L (ppt), while downstream concentrations were calculated as 34.38 ng/L (ppt). (NYSDEC 1997) The higher contaminant concentrations in the suspended sediments from the water at the base of the Dam (downstream) than that from behind the dam (upstream) would indicate that sediment transport is occurring through the dam. (NYSDEC 2001) Furthermore, as identified in Pickard 2006, the relatively higher PCDD/F congener concentrations just downstream of the dam as compared to further downstream indicate a source upstream of the Burt Dam.

Based on the above information, the weight-of-the-evidence indicates that there are significant sources of contamination upstream of the Burt Dam which have a direct link to the contamination that exists above and below the Burt Dam (AOC).

Newfane Dam Area

In 1994, New York State Department of Environmental Conservation (NYSDEC) collected surficial samples and sediment core samples from behind Newfane Dam. These samples analyzed for metals, pesticides, polychlorinated bi-phenyls (PCBs), dioxins and furans, and Polycyclic Aromatic Hydrocarbons (PAHs). Maximum concentrations of the sediment analytes measured are summarized in Table 6, as compared to the following criteria summarized in Table R2:

- Long & Morgan's (1990) Effects Range Low & Effects Range Median (ERL & ERM)
- NYSDEC 1999a Lowest Effect Level & Severe Effect Level (LEL & SEL)
- NYSDEC Fish & Wildlife Criteria Wildlife & Human Health Bioaccumulation Criteria (HH & W)
- Persaud et al.'s (1993) Lowest Effect Level & Severe Effect Level (LEL & SEL)

NYSDEC results show that chromium, copper and lead exceed 10x the severe effect levels (SELs), and cadmium, mercury, nickel, silver, zinc, and total PCB concentrations that exceed the SEL upstream of Newfane Dam. Also, PCDD/F TEQs and Σ 4,4' – dichlorodiphenyldichloroethane (DDT) concentrations above the Dam

exceed the wildlife bioaccumulation criteria and the human bioaccumulation criteria, respectively. (NYSDEC 1999)

	Analyte			Upstream of Newfane	Dam	
		Arse	enic	12.7		
	(Mc	Cadm	ium	22.3		
		Chrom	ium	1,470		
		Cop	oper	2.130		
	[] []	Iron 30,600				
	als		lead	7,850		
	Meti	Mercury 2.2				
		Nie	ckel	383		
		Silver		4.4		
		2	Zinc	24,000		
		DF TEQ (ppt)		713.3		
Total PCBs (ppm)		23.930				
Total DDT (ppb)		52				
SEL or FRI SEL	or >FRM	>10SEI	>	NYSDEC FW Human	> N Y	SDEC FW Wildlif
			Bio	accumulation Guidance	Bioac	cumulation Guidan

 TABLE 6

 Maximum Concentrations of Analytes Behind Newfane Dam (1994)

In 1998, NYSDEC collected additional surficial and sediment core samples near Newfane Dam. These samples analyzed for metals, PCBs, dioxins and furans, and PAHs. Maximum concentrations of the sediment analytes measured are summarized in Table 7, as compared to the criteria identified during the 1994 NYSDEC study.

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NYSDEC results show that lead and zinc exceed 10x the severe effect levels (SELs), and cadmium, chromium, copper, mercury, nickel and silver concentrations that exceed the SEL upstream of Newfane Dam. Also, PCDD/F TEQs concentrations above the Newfane Dam exceed the wildlife bioaccumulation criteria. (NYSDEC 1999)

	Analyte		Near Newfane Dam		
		Arsenic	12.5		
		Cadmium	9.5		
	M)	Chromium	380		
	Idd	Copper	130		
	() S	Lead	2,840		
	etal	Mercury	10.1		
	Ŭ	Nickel	178		
		Silver	4.6		
		Zinc	8,640		
	DF TEQ (ppt)		218.3		
	Total PCBs (ppm)		0.42		
	Total PAHs (ppb)		18,180		
	Te	otal DDT (ppb)	23.6		
>LEL o	r>ERL	>SEL or >ERM	>10SEL	> NYSDEC FW Wi Bioaccumulation Gu	ildlife idance

 TABLE 7

 Maximum Concentrations of Analytes Behind Newfane Dam (1998)

Upstream of the current AOC, the Newfane Dam serves to detain or accrue contaminated sediments on its upstream side, eventually releasing these contaminated sediments downstream toward the Burt Dam and the AOC. In this way, the dam has incidentally become a "subsidiary source" of sediment contamination.

The similarity of contaminants and concentrations present behind the Newfane Dam as compared to behind the Burt Dam indicate that these two "subsidiary sources" of sediment contamination are linked. Based upon these apparent similarities, the weight-of-the-evidence indicates that there are significant sources of contamination upstream of the Newfane Dam which has a direct link to the contamination that exists above the Newfane Dam, above the Burt Dam and within the AOC.

Plank Road Hot Spot

In 2006, sediment core sampling in Eighteenmile Creek was conducted from Harwood Street to Stone Road. Sampling was conducted in a historically industrial area of the City of Lockport and downstream of the Former Flintkote Plant Site. The first phases of the sampling effort included collection of surface sediment grab samples for analysis of PCBs using a modified laboratory screening procedure. A total of 80 samples were collected for PCB screening at a detection limit of 0.25 mg/kg. Collection was conducted around source areas, areas of deposition and at defined intervals along the route. The screening results were used to determine locations for sediment core samples. A total of 12 cores and 36 sediment core samples were collected and analyzed for low level PCBs, select metals (i.e., arsenic, chromium, copper, lead, zinc, and mercury) and TOC. PCBs were analyzed at approximately 1 foot intervals.

PCBs were detected in 31 of the 36 samples with concentrations ranging from 12 ppb to 69000 ppb. The core samples indicate that PCBs are present in sediments at all depths, and only reach background concentrations when native material in the creek bed was reached. The data indicate a potential continual re-suspension and movement of contaminated sediments downstream of the suspected source areas near the former Flintkote site. One significant hotspot of PCB contamination was identified in an area north of where Plank Road crosses the creek. The concentrations in these cores exceeded hazardous levels of PCBs. (Ecology & Environment, Inc. 2006)

Four different mixtures of PCB Aroclors were detected (i.e., Aroclor 1242, Aroclor 1248, Aroclor 1254 and Aroclor 1260). Aroclor 1248 was the most frequently detected, appearing in 24 of 36 samples, followed by Aroclor 1254, which was detected in 16 of 36 samples. Aroclors 1242 and 1260 were detected in 8 and 6 of 36 samples, respectively. The similarity of PCB concentrations and aroclors detected in this area and in areas

upstream (Eighteenmile Creek Corridor & Erie Barge Canal), compared to concentrations and aroclors detected within the AOC, leave little doubt that these upstream source areas affect the AOC.

Metals and TOC were detected in all core samples. The metals data show consistent elevated concentrations in all areas of the creek. The metals concentrations exceeded screening criteria, indicating that their presence could be an ongoing impairment to the AOC. Metals and TOC data is summarized below (Table 8).

Analyte	Minimum Concentration (mg/Kg)	Maximum Concentration (mg/Kg)	
Arsenic - Total	5.6	31.3	
Chromium - Total	21.1	612	
Copper - Total	80	1720	
Lead - Total	246	1630	
Zinc - Total	198	4540	
Mercury - Total	0.29	18.4	
Total Organic Carbon	8630	86400	

 Table 8

 Maximum Concentrations of Analytes (2006)

Eighteenmile Creek Corridor

During 2002 the NYSDEC conducted three separate sampling events within the Eighteenmile Creek Corridor. The objective of the three sampling events was to obtain information sufficient to determine if the properties along Water Street are being impacted by the Former Flintkote Plant Site and/or contaminated Eighteenmile Creek sediment. This objective was evaluated through the analysis of waste, surface soil and sediment samples obtained from Water Street properties, Eighteenmile Creek and wooded property south of the Former Flintkote Plant Site. (NYSDEC 2004)

The results from these sampling events were presented in two NYSDEC publications entitled: (1) "*Sampling Report, Former Flintkote Plant Site, 143 Water Street, City of Lockport, Niagara County, New York*", Division of Environmental Remediation, June 2002 and (2) "*Sampling Report, Water Street Properties, City of Lockport, Niagara County, New York*", Division of Environmental Remediation, March 2003. These publications recommended the collection of additional surface soil samples from residential properties along Water Street and sediment samples from Eighteenmile Creek to further evaluate the extent of PCB and metals contamination. (NYSDEC 2006) In 2005, NYSDEC collected those additional samples to better define the nature and extent of sediment contamination. The 2005 investigation yielded the following results:

PCBs were detected in fifty-eight of sixty-one Eighteenmile Creek and Millrace sediment samples at concentrations ranging from 7.0J to 1,400,000 μ g/kg. The principal aroclors detected were 1248, 1254 and 1260. Aroclor 1242 was also detected in several samples. Thirty-eight of the samples contained PCBs at concentrations that exceeded the NYSDEC sediment criterion (606.0 μ g/kg) for chronic toxicity to benthic aquatic life. The majority of these samples (31) also exceeded the NYSDEC TAGM 4046 surface soil cleanup objective (1,000 μ g/kg). Additionally, 7 samples at 4 locations contained PCBs at concentrations that exceeded the 50 mg/kg hazardous waste criterion.

Copper was detected in all fifty-seven sediment samples analyzed for copper at concentrations ranging from 20.5 to 7,900 mg/kg. Thirty-six of these samples contained copper at concentrations that exceeded the NYSDEC sediment criterion (110.0 mg/kg) for the severe effect level. Copper was also detected in sediment from the New York State Barge Canal immediately upstream of Eighteenmile Creek, and in fill material from Upson Park, the White Transportation property, the former United Paperboard Company property and the Former Flintkote Plant Site. The concentrations of copper at all of these sites are higher than the NYSDEC sediment criterion for the severe effect level, suggesting that these sites have the potential to adversely impact Eighteenmile Creek.

Lead was detected in all sixty-one sediment samples analyzed for lead at concentrations ranging from 15.3 to 25,400 mg/kg. Fifty-six of these samples contained lead at concentrations that exceeded the NYSDEC sediment criterion (110.0 mg/kg) for the severe effect level. Lead was also detected in sediment from the New York State Barge Canal immediately upstream of Eighteenmile Creek, and in fill material from Upson Park, the White Transportation property, the former United Paperboard Company property and the Former Flintkote Plant Site. The concentrations of lead at all of these sites are higher than the NYSDEC sediment criterion for the severe effect level, suggesting that these sites have the potential to adversely impact Eighteenmile Creek.

Zinc was detected in all fifty-seven sediment samples analyzed for zinc at concentrations ranging from 37.1 to 23,600 mg/kg. Thirty-seven of these samples

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contained zinc at concentrations that exceeded the NYSDEC sediment criterion (270.0 mg/kg) for the severe effect level. Zinc was also detected in sediment from the New York State Barge Canal immediately upstream of Eighteenmile Creek, and in fill material from Upson Park, the White Transportation property, the former United Paperboard Company property and the Former Flintkote Plant Site. The concentrations of zinc at all of these sites are higher than the NYSDEC sediment criterion for the severe effect level, suggesting that these sites have the potential to adversely impact Eighteenmile Creek. (NYSDEC 2006)

In late 2006, NYSDEC began preparations to conduct a Supplemental Remedial Investigation/ Feasibility Study (RI/FS) of the Eighteenmile Creek Corridor. The RI/FS will further define the nature and extent of sediment contamination in Eighteenmile Creek and the millrace, and evaluate, to the extent possible, the source areas adjacent to the creek (i.e., the Former Flintkote Plant Site, the White Transportation property, the former United Paperboard Company property and Upson Park).

Erie Barge Canal

In 2005, New York State Electric & Gas (NYSEG) investigated PCB concentrations present in a reach of the Erie Barge Canal sediments in Lockport, NY. A total of 53 sediment samples were collected within the New York Barge Canal and analyzed for PCB's. PCB's were detected in all sediment samples collected. Four different mixtures of PCB Aroclors were detected (i.e., Aroclor 1242, Aroclor 1248, Aroclor 1254 and Aroclor 1260). Aroclor 1248 was the most frequently detected, appearing in 48 of 53 samples, followed by Aroclor 1254, which was detected in 38 of 53 samples. Aroclors 1242 and 1260 were detected in 6 and 4 out of 53 samples, respectively.

The four locations in which Aroclor 1260 was detected are all upstream from the Lockport locks. Aroclor 1260 concentrations ranged from 13 to 600 micrograms per kilogram (ug/kg). The highest concentrations of Aroclor 1242 were detected in sediments downstream and below of the Lockport Locks, approximately 1,500 feet upstream of the Erie Barge Canal discharge to Eighteenmile Creek. Concentrations below the locks ranged from 21,000 ug/kg to 220,000 ug/kg. Aroclor 1242 was also detected upstream of the Lockport locks with levels ranging from 84 ug/kg to 4,600 ug/kg.

Detections of Aroclor 1248 and Aroclor 1254 were widespread throughout the New York Barge Canal sediments. The highest detected Aroclor 1248 concentration of 40,000 ug/kg was detected at the furthest downstream sampling location. Concentrations ranged from 7 to 20,000 ug/kg at the 47 other locations where Aroclor 1248 was detected. The highest concentration of Aroclor 1254 were detected in sediments downstream of the locks. Those concentrations range from 16,000 and 90,000 ug/kg. The remaining 36 detections of Aroclor 1254 were spread throughout the sampling area and ranged from 22 to 11,000 ug/kg. (URS Corporation 2006)

This investigation plainly characterizes that extensive PCB contamination exists within the New York Barge Canal upstream and downstream of the Lockport locks. It also characterizes that the highest concentrations of PCBs were detected at the sampling locations closest to the Canal discharge to Eighteenmile Creek. According to the New York State Canal Corporation (NYSCC):

The Canal Corporation operates a waste weir and a drain which discharge directly into Eighteenmile Creek. Some of the contaminated sediments in the canal will enter Eighteenmile Creek through these structures...(NYSCC 2005)

As noted previously, the 2005 Erie Barge Canal sediment investigation identified four different mixtures of PCB Aroclors (i.e., Aroclor 1242, Aroclor 1248, Aroclor 1254 and Aroclor 1260.) The principal Aroclors detected during NYSDECs numerous studies within the Eighteenmile Creek Corridor were 1242, 1248, 1254 and 1260. During the 2004 USACE study in the AOC, PCB congeners 31, 44, 49 and 52 were always the four most dominant congeners in the reach samples. This congener composition of PCBs generally denoted the Aroclor 1248 mixture. (Pickard 2006)

Based upon the similarity of PCB concentrations and Aroclors discovered during the numerous investigations in Eighteenmile Creek and the Erie Barge Canal, the weight-of-the-evidence indicates that there are significant sources of contamination upstream of the AOC which have a direct link to the contamination that exists within the AOC.

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APPENDIX A



Picture 1 - Erie Barge Canal: Looking Upstream Towards Locks 34 & 35



Picture 2 – Erie Barge Canal: Looking Downstream Towards Exchange Street



Picture 3 – Eighteenmile Creek Corridor: Remnants of Clinton Street Dam, Upstream of Flintkote Site



Picture 4 – Eighteenmile Creek Corridor: Looking Downstream Towards Flintkote Site



Picture 5 – Eighteenmile Creek Corridor: Millrace Adjacent to Flintkote Site



Picture 6 – Plank Road Hot Spot: Looking Downstream, West of Plank Road



Picture 7 – Newfane Dam



Picture 8 – Burt Dam Impoundment Upstream of Wilson-Burt Road 30



Picture 9 – Upstream of Burt Dam



Picture 10 – Downstream of Burt Dam 31