APPENDIX A: MODELING INPUT DATA REVIEW

Table A-1. TSS data summary

Primary Station ID	Agency	Begin Date	End Date	Total TSS Samples
01467470	USGS	5/5/1976	2/28/1977	26
01467500	USGS	7/18/1962	6/26/1973	41
01467950	USGS	7/18/1962	7/9/1973	43
01469710	USGS	7/18/1962	9/18/1973	43
01470500	USGS	2/26/1961	9/1/1999	93
01470640	USGS	6/1/2000	6/1/2000	1
01470726	USGS	7/31/1974	5/21/1975	6
01470727	USGS	7/31/1974	5/21/1975	6
01470729	USGS	7/31/1974	5/21/1975	6
01470730	USGS	7/30/1974	5/21/1975	6
01470732	USGS	7/31/1974	5/21/1975	6
01470734	USGS	7/30/1974	5/22/1975	6
01470736	USGS	7/30/1974	5/22/1975	6
01470738	USGS	7/30/1974	5/22/1975	6
01470739	USGS	7/30/1974	5/22/1975	6
01470740	USGS	7/30/1974	5/22/1975	5
01470744	USGS	6/1/2000	6/1/2000	1
01470759	USGS	9/6/1979	9/7/1979	3
01470779	USGS	10/26/1998	8/8/2001	58
01470800	USGS	1/23/1974	9/4/1974	2
01470818	USGS	6/1/2000	6/1/2000	1
01470825	USGS	1/23/1974	9/4/1974	2
01470960	USGS	1/23/1974	9/4/1974	3
01470982	USGS	4/12/1973	4/12/1973	1
01471000	USGS	7/18/1962	9/6/1979	44
01471510	USGS	4/19/1979	9/6/1979	3
01471519	USGS	8/12/1979	9/22/1979	4
01471520	USGS	6/1/2000	9/25/2000	2
01471530	USGS	7/18/1962	2/1/1972	39
01471540	USGS	8/12/1979	9/6/1979	2
01471667	USGS	5/17/2000	9/25/2000	2
01471980	USGS	9/6/1979	9/25/2000	3
01472000	USGS	10/9/1965	8/31/1999	50
01472054	USGS	9/29/1970	9/28/1971	3
01472065	USGS	5/5/1970	9/28/1971	4
01472080	USGS	2/19/1970	9/28/1971	5
01472100	USGS	5/16/2000	10/2/2000	2
01472109	USGS	5/6/1970	9/28/1971	4
01472110	USGS	2/19/1970	9/28/1971	5
01472129	USGS	5/7/1970	10/30/1972	5
01472138	USGS	5/20/1970	10/30/1972	5

Primary Station ID	Agency	Begin Date	End Date	Total TSS Samples
01472140	USGS	5/7/1970	10/30/1972	5
01472154	USGS	5/20/1970	10/30/1972	5
01472157	USGS	7/29/1969	9/1/2004	78
01472161	USGS	9/6/1979	9/6/1979	1
014721612	USGS	10/5/1970	10/4/1971	3
01472170	USGS	5/4/1970	10/3/1972	5
01472174	USGS	10/20/1967	10/3/1972	24
01472175	USGS	12/12/1967	6/19/1968	20
01472182	USGS	3/13/1968	8/15/1968	17
01472183	USGS	10/19/1967	1/18/1968	3
014721854	USGS	5/5/1970	10/3/1972	5
014721884	USGS	5/3/1971	9/18/2000	5
01472190	USGS	10/20/1967	10/3/1972	16
01472820	USGS	1/22/1976	8/1/1977	8
01473000	USGS	7/27/1962	8/31/1999	60
01473120	USGS	12/30/1970	9/6/1979	57
01473140	USGS	1/12/1976	8/3/1977	8
01473170	USGS	7/14/1969	9/6/1979	16
01473193	USGS	9/6/1979	9/6/1979	1
01473470	USGS	9/6/1979	9/19/2000	3
01473800	USGS	12/16/1956	5/4/1985	96
01473895	USGS	8/17/1972	8/24/1976	11
01473900	USGS	10/23/1965	12/14/1968	47
01473950	USGS	10/4/1967	2/7/1973	37
01473980	USGS	10/5/1967	8/20/1968	10
01474000	USGS	7/27/1962	9/13/1999	89
01474010	USGS	2/25/1976	7/27/1976	4
01474500	USGS	9/17/1969	9/2/2004	112
410074	USEPA HQ	2/1/1960	6/29/1964	80
422107	DRBC	6/5/1968	9/14/1992	161
422110	DRBC	11/20/1968	9/17/1997	178
422111	DRBC	5/7/1996	9/17/1997	8
422111	DRBC	7/31/1975	4/7/1977	120
HOFU_BOYER_01	National Park Service	7/9/1991	7/9/1991	1
HOFU_BOYER_02	National Park Service	7/9/1991	7/9/1991	1
HOFU_BOYER_03	National Park Service	7/9/1991	7/9/1991	1
HOFU_BOYER_04	National Park Service	7/9/1991	7/9/1991	1
HOFU_BOYER_05	National Park Service	7/9/1991	7/9/1991	1
HOFU_BOYER_06	National Park Service	7/9/1991	7/9/1991	1
HOFU_BOYER_07	National Park Service	7/9/1991	7/9/1991	1
HOFU_BOYER_08	National Park Service	7/9/1991	7/9/1991	1
HOFU_BOYER_09	National Park Service	7/9/1991	7/9/1991	1
HOFU_BOYER_10	National Park Service	7/9/1991	7/9/1991	1
HOFU_PADEP_01SR	National Park Service	4/28/1995	4/28/1995	1
HOFU_PADEP_02FC	National Park Service	7/9/1991	4/28/1995	2

Primary Station ID	Agency	Begin Date	End Date	Total TSS Samples
HOFU_PADEP_03PC	National Park Service	7/9/1991	5/16/1995	2
HOFU_PADEP_04PC	National Park Service	4/28/1995	4/28/1995	1
HOFU_PADEP_05FC	National Park Service	7/9/1991	4/28/1995	2
HOFU_PADEP_06UN	National Park Service	5/16/1995	5/16/1995	1
HOFU_PADEP_07RR	National Park Service	5/24/1995	5/24/1995	1
HOFU_PADEP_08FC	National Park Service	5/24/1995	5/24/1995	1
HOFU_PADEP_09SB	National Park Service	7/9/1991	5/25/1995	2
HOFU_PADEP_10SB	National Park Service	7/9/1991	5/25/1995	2
HOFU_PADEP_11SB	National Park Service	5/16/1995	5/16/1995	1
HOFU_PADEP_12FC	National Park Service	5/25/1995	5/25/1995	1
HOFU_PADEP_13BE	National Park Service	5/25/1995	5/25/1995	1
HOFU_PADEP_14FC	National Park Service	7/9/1991	5/25/1995	2
HOFU_PADEP_15BI	National Park Service	7/9/1991	5/26/1995	2
HOFU_PADEP_16FC	National Park Service	5/26/1995	5/26/1995	1
OWW04440-0498	EPA National Aquatic Resource Survey Data	8/17/2004	8/17/2004	1
OWW04440-0586	EPA National Aquatic Resource Survey Data	8/16/2004	8/16/2004	1
OWW04440-0626	EPA National Aquatic Resource Survey Data	8/21/2004	8/21/2004	1
OWW04440-PA01	EPA National Aquatic Resource Survey Data	8/19/2004	8/19/2004	1
OWW04440-ST06	EPA National Aquatic Resource Survey Data	8/19/2004	8/19/2004	1
TENS0001	PADEP	3/22/1977	8/29/1977	5
TENS0008	PADEP	3/22/1977	8/29/1977	4
TENS0012	PADEP	8/3/1977	8/3/1977	1
TENS0013	PADEP	3/22/1977	8/29/1977	7
TENS0016	PADEP	2/23/1977	8/29/1977	5
TENS0018	PADEP	8/3/1977	8/3/1977	1
TENS0022	PADEP	3/22/1977	8/29/1977	6
TENS0025	PADEP	2/23/1977	8/29/1977	6
TENS0026	PADEP	8/3/1977	8/3/1977	1
TENS0027	PADEP	3/22/1977	8/29/1977	6
TENS0032	PADEP	4/5/1977	8/29/1977	4
TENS0033	PADEP	4/5/1977	4/5/1977	1
TENS0034	PADEP	4/5/1977	4/5/1977	1
TENS0035	PADEP	4/5/1977	8/3/1977	2
TENS0036	PADEP	3/22/1977	3/22/1977	1
TENS0037	PADEP	8/3/1977	8/29/1977	2
TENS0039	PADEP	2/23/1977	8/29/1977	8
TENS0040	PADEP	8/3/1977	8/3/1977	1
TENS0041	PADEP	3/22/1977	8/3/1977	5
TENS0045	PADEP	8/3/1977	8/3/1977	1
TENS0046	PADEP	3/22/1977	7/8/1977	4
TENS0047	PADEP	2/23/1977	8/29/1977	4
VAFO_ABI_CC	National Park Service	4/29/1993	12/14/1994	16
VAFO_ABI_CS	National Park Service	5/25/1993	11/22/1993	3
VAFO_ABI_IT	National Park Service	4/29/1993	12/14/1994	11
VAFO_ABI_LS	National Park Service	4/29/1993	5/25/1993	2

Primary Station ID	Agency	Begin Date	End Date	Total TSS Samples
VAFO_ABI_LT	National Park Service	4/29/1993	12/14/1994	11
VAFO_ABI_NS	National Park Service	4/29/1993	12/14/1994	10
VAFO_ABI_SS	National Park Service	4/29/1993	5/25/1993	2
VAFO_ABI_UT	National Park Service	4/29/1993	5/25/1993	2
VAFO_ABI_WR	National Park Service	5/25/1993	11/22/1993	5
VAFO_ABI69_01	National Park Service	6/25/1969	6/25/1969	1
VAFO_ABI69_02	National Park Service	6/25/1969	6/25/1969	1
VAFO_ABI69_03	National Park Service	6/25/1969	6/25/1969	1
VAFO_ABI69_04	National Park Service	6/25/1969	6/25/1969	1
VAFO_ABI69_05	National Park Service	6/25/1969	6/25/1969	1
VAFO_ABI69_06	National Park Service	6/25/1969	6/25/1969	1
VAFO_ABI69_07	National Park Service	6/25/1969	6/25/1969	1
VAFO_ABI69_08	National Park Service	6/25/1969	6/25/1969	1
VAFO_ABI69_09	National Park Service	6/25/1969	6/25/1969	1
VAFO_ABI69_10	National Park Service	6/25/1969	6/25/1969	1
VAFO_ABI69_11	National Park Service	6/25/1969	6/25/1969	1
VAFO_ABI74_1	National Park Service	8/19/1974	8/19/1974	1
VAFO_ABI74_2	National Park Service	8/19/1974	8/19/1974	1
VAFO_ABI74_3	National Park Service	8/19/1974	8/19/1974	1
VAFO_ABI74_4	National Park Service	8/19/1974	8/19/1974	1
VAFO_ABI74_5	National Park Service	8/19/1974	8/19/1974	1
VAFO_ABI74_6	National Park Service	8/19/1974	8/19/1974	1
VAFO_ABI74_7	National Park Service	8/19/1974	8/19/1974	1
VAFO_ABI74_8	National Park Service	8/19/1974	8/19/1974	1
VAFO_ABI74_9	National Park Service	8/19/1974	8/19/1974	1
VAFO_ABI75_1	National Park Service	6/19/1975	6/19/1975	1
VAFO_ABI75_2	National Park Service	6/19/1975	6/19/1975	1
VAFO_ABI75_3	National Park Service	6/19/1975	6/19/1975	1
VAFO_ABI75_4	National Park Service	6/19/1975	6/19/1975	1
VAFO_ABI75_5	National Park Service	6/19/1975	6/19/1975	1
VAFO_ABI76_1	National Park Service	3/1/1976	3/1/1976	1
VAFO_ABI76_2	National Park Service	3/1/1976	3/1/1976	1
VAFO_ABI76_3	National Park Service	3/1/1976	3/1/1976	1
VAFO_ABI76_4	National Park Service	3/1/1976	3/1/1976	1
VAFO_ABI76_5	National Park Service	3/1/1976	3/1/1976	1
VAFO_ABI76_6	National Park Service	3/1/1976	3/1/1976	1
VAFO_ABI76_7	National Park Service	3/1/1976	3/1/1976	1
VAFO_ABI76_8	National Park Service	3/1/1976	3/1/1976	1
VAFO_ABI76_9	National Park Service	3/1/1976	3/1/1976	1
VAFO_ABI78_1	National Park Service	7/11/1978	7/11/1978	1
VAFO_ABI78_2	National Park Service	7/11/1978	7/11/1978	1
VAFO_ABI78_3	National Park Service	7/11/1978	7/11/1978	1
VAFO_ABI78_4	National Park Service	7/11/1978	7/11/1978	1
VAFO_ABI78_4A	National Park Service	7/11/1978	7/11/1978	1
VAFO_ABI78_4B	National Park Service	7/11/1978	7/11/1978	1

Primary Station ID	Agency	Begin Date	End Date	Total TSS Samples
VAFO_ABI78_4C	National Park Service	7/11/1978	7/11/1978	1
VAFO_ABI78_4D	National Park Service	7/11/1978	7/11/1978	1
VAFO_ABI78_5	National Park Service	7/11/1978	7/11/1978	1
VAFO_ABI85_1	National Park Service	9/19/1984	11/8/1984	2
VAFO_ABI85_2	National Park Service	9/19/1984	11/8/1984	2
VAFO_ABI85_3	National Park Service	11/8/1984	11/8/1984	1
VAFO_ABI85_4	National Park Service	9/19/1984	11/5/1994	3
VAFO_ABI85_5	National Park Service	9/19/1984	11/8/1984	2
VAFO_ABI85_6	National Park Service	11/8/1984	11/8/1984	1
VAFO_ABI91_0	National Park Service	3/21/1991	3/21/1991	1
VAFO_ABI91_1	National Park Service	3/21/1991	3/21/1991	1
VAFO_ABI91_2	National Park Service	3/21/1991	3/21/1991	1
VAFO_ABI94_01	National Park Service	6/14/1994	6/14/1994	1
VAFO_ABI94_02	National Park Service	6/14/1994	6/14/1994	1
VAFO_ABI94_03	National Park Service	6/14/1994	6/14/1994	1
VAFO_ABI94_20	National Park Service	1/12/1994	1/12/1994	1
VAFO_ABI94_32	National Park Service	1/12/1994	1/12/1994	1
VAFO_ABI95_02	National Park Service	1/31/1994	1/31/1994	1
VAFO_ABI95_03	National Park Service	1/31/1994	1/31/1994	1
VAFO_ABI95_04	National Park Service	1/12/1994	1/12/1994	1
VAFO_ABI95_05	National Park Service	1/12/1994	1/31/1994	2
VAFO_ABI95_07	National Park Service	1/31/1994	1/31/1994	1
VAFO_ABI95_09	National Park Service	1/12/1994	1/12/1994	1
VAFO_ABI96_1	National Park Service	3/1/1994	3/1/1994	1
VAFO_ABI96_2	National Park Service	3/1/1994	3/1/1994	1
VAFO_ABI96_3	National Park Service	3/1/1994	3/1/1994	1
VAFO_ABI98_1	National Park Service	4/14/1998	4/14/1998	1
VAFO_ABI98_1A	National Park Service	4/14/1998	4/14/1998	1
VAFO_ABI98_2	National Park Service	4/14/1998	4/14/1998	1
VAFO_ABI98_2A	National Park Service	4/14/1998	4/14/1998	1
VAFO_CCHD_378	National Park Service	1/27/1981	3/25/1997	33
VAFO_CCHD_393	National Park Service	6/23/1981	3/18/1997	33
VAFO_CCHD_396	National Park Service	6/23/1981	3/18/1997	32
VAFO_CCHD_402	National Park Service	6/23/1981	3/18/1997	34
VAFO_CCHD_409	National Park Service	6/23/1981	3/18/1997	32
VAFO_CCHD_420	National Park Service	6/18/1981	3/17/1997	33
VAFO_CCHD_431	National Park Service	6/18/1981	3/17/1997	36
VAFO_CCHD_434	National Park Service	6/18/1981	3/17/1997	37
VAFO_CCHD_437	National Park Service	6/18/1981	3/17/1997	35
VAFO_CCHD_440	National Park Service	6/18/1981	3/17/1997	38
VAFO_CCHD_446	National Park Service	6/9/1983	3/17/1997	27
VAFO_CCHD_5	National Park Service	3/26/1984	8/30/1984	3
VAFO_NPS_AH1	National Park Service	6/18/1981	10/31/1985	14
VAFO_NPS_AH2	National Park Service	6/18/1981	8/5/1985	13
VAFO_NPS_AH3	National Park Service	6/9/1983	8/5/1985	7

Primary Station ID	Agency	Begin Date	End Date	Total TSS Samples
VAFO_NPS_AH4	National Park Service	6/18/1981	10/31/1985	14
VAFO_NPS_AH5	National Park Service	6/18/1981	10/31/1985	14
VAFO_PADEP_VC1	National Park Service	5/14/1996	5/14/1996	1
VAFO_PADEP_VC4	National Park Service	5/14/1996	5/14/1996	1
VAFO_VC1_01	National Park Service	11/7/1996	11/7/1996	1
VAFO_VC1_02	National Park Service	11/7/1996	11/7/1996	1
VAFO_VC1_03	National Park Service	11/7/1996	11/7/1996	1
VAFO_VC1_04	National Park Service	10/30/1996	10/30/1996	0
VAFO_VC1_04A	National Park Service	11/4/1998	12/30/1998	2
VAFO_VC1_05	National Park Service	5/9/1995	1/7/1998	6
VAFO_VC1_06	National Park Service	10/30/1996	10/30/1996	0
VAFO_VC1_07	National Park Service	11/7/1996	11/7/1996	1
VAFO_VC1_08	National Park Service	7/18/1996	9/3/1996	2
VAFO_VC1_09	National Park Service	7/18/1996	9/3/1996	2
VAFO_VC1_10	National Park Service	5/14/1996	1/7/1998	2
VAFO_VC1_11	National Park Service	7/18/1996	9/3/1996	1
VAFO_VC1_12	National Park Service	5/14/1996	9/3/1996	0
VAFO_VC1_13	National Park Service	7/18/1996	12/30/1998	1
VAFO_VC1_14	National Park Service	7/18/1996	9/3/1996	0
VAFO_VC1_15	National Park Service	7/18/1996	1/7/1998	2
VAFO_VC1_16	National Park Service	8/23/1995	9/3/1996	2
VAFO_VC1_17	National Park Service	5/9/1995	9/3/1996	4
VAFO_VC1_18	National Park Service	5/9/1995	1/7/1998	5
VAFO_VC1_19	National Park Service	5/14/1996	12/30/1998	3
VAFO_VC1_20	National Park Service	11/7/1996	11/7/1996	0
VAFO_VC1_21	National Park Service	5/9/1995	5/9/1995	1
VAFO_VC1_ML	National Park Service	1/7/1998	12/30/1998	2
VAFO_VC1_RT	National Park Service	12/30/1998	12/30/1998	1
WQN0110	PADEP	7/27/1962	6/15/2004	278
WQN0111	PADEP	7/27/1962	6/16/2004	279
WQN0112	PADEP	7/18/1962	1/7/1988	44
WQN0113	PADEP	7/18/1962	6/22/2004	291
WQN0114	PADEP	7/18/1962	9/20/1984	104
WQN0115	PADEP	7/27/1962	6/15/2004	226
WQN0116	PADEP	7/27/1962	6/24/2004	200
WQN0117	PADEP	7/18/1962	6/22/2004	181
WQN0118	PADEP	7/18/1962	2/1/1995	78
WQN0119	PADEP	7/18/1962	5/30/1985	107
WQN0120	PADEP	7/18/1962	9/20/1984	47
WQN0143	PADEP	9/28/1972	2/3/1976	5
WQN0144	PADEP	11/15/1977	8/3/1983	2
WQN0154	PADEP	10/15/1975	6/14/2004	102
WQN0155	PADEP	1/22/1976	12/10/1979	20
WQN0156	PADEP	2/22/2000	6/16/2004	53
WQN0160	PADEP	11/6/1975	12/6/1979	42

Primary Station ID	Agency	Begin Date	End Date	Total TSS Samples
WQN0162	PADEP	1/22/1976	11/25/1986	16
WQN0163	PADEP	1/12/1976	11/25/1986	17
WQN0175	PADEP	11/15/1977	8/3/1983	2
WQN0177	PADEP	1/28/1988	7/7/1998	103
WQN0178	PADEP	2/29/1988	7/6/1998	122
WQN0193	PADEP	2/7/2002	6/28/2004	15
WQNL101	PADEP	8/19/1993	9/13/1995	6
WQNL102	PADEP	9/5/1995	9/5/1995	2
WQNL106	PADEP	7/11/1996	7/11/1996	2
WQNL109	PADEP	8/8/1996	8/8/1996	2

Table A-2. USGS continuous flow data summary

Station ID	Start Date	End Date	Min Flow (cfs)	Max Flow (cfs)	Avg Flow (cfs)	% Complete
01467470	2/14/1949	6/30/1978	7	858	62	19
01467500	10/1/1943	9/30/1969	13	3350	99	100
01467950	10/4/1963	9/30/1965	10	690	55	80
01468500	10/1/1947	8/17/2006	21	9650	283	69
01469000	10/14/1947	9/10/1964	42	5380	333	16
01469500	10/1/1919	8/17/2006	3	3600	86	100
01469700	4/1/1950	9/10/1964	39	5630	234	21
01470000	10/1/1947	9/30/1965	32	5450	226	32
01470500	8/1/1947	8/17/2006	40	31900	725	100
01470720	10/1/1965	4/10/1981	0	740	12	100
01470729	10/1/1974	9/30/1977	1	197	11	100
01470736	10/1/1974	9/30/1976	2	293	28	100
01470756	1/19/1973	9/30/1995	11	7010	265	100
01470779	11/22/1974	8/17/2006	15	4240	111	100
01470853	10/1/1982	9/30/2005	0	139	7	100
01470960	5/1/1965	8/17/2006	23	11000	278	100
01471000	10/1/1950	8/17/2006	27	12000	321	100
01471500	10/1/1914	9/30/1930	98	26800	1489	75
01471510	10/1/1914	8/17/2006	98	46900	1600	45
01471700	10/1/1981	9/30/1982	1	210	9	100
01471710	10/1/1981	9/30/1982	1	13	2	100
01471800	10/1/1981	9/30/1982	1	167	13	100
01471835	10/1/1981	9/30/1982	1	425	14	100
01471845	10/1/1981	9/30/1982	2	130	13	100
01471875	10/1/1993	8/17/2006	9	2220	94	100
01471900	10/1/1981	9/30/1982	7	847	74	100
01471980	8/1/1974	8/17/2006	11	4190	133	100
01472000	10/1/1927	8/17/2006	175	71200	1935	100
01472157	10/1/1968	8/17/2006	7	4530	91	100

Station ID	Start Date	End Date	Min Flow (cfs)	Max Flow (cfs)	Avg Flow (cfs)	% Complete
01472174	1/1/1967	10/17/1983	1	500	10	100
01472186	3/1/1974	9/30/1978	0	31	2	100
01472198	8/24/1981	8/17/2006	4	3000	63	100
01472199	10/1/1981	8/17/2006	3	1770	40	100
01472500		12/31/1913	4	8770	251	209
01472620	10/1/1983	8/17/2006	0	528	31	100
01472810	1/18/1991	8/17/2006	4	6020	127	100
01473000	10/1/1914	8/17/2006	4	18600	409	100
01473120	5/1/1966	9/30/1994	0	6600	79	100
01473169	10/1/1982	8/16/2006	7	2020	33	100
01473500	10/1/1927	8/17/2006	179	59300	2861	14
01473870	10/1/1973	9/30/1978	0	85	2	100
01473900	9/1/1961	8/17/2006	5	2490	60	31
01473950	10/1/1965	9/30/1981	8	2390	83	100
01473980	10/1/1965	11/3/1970	9	2060	68	100
01474000	10/1/1965	8/17/2006	9	5560	106	100
01474500	10/1/1931	8/17/2006	1	93400	2786	100

Table A-3. USGS continuous depth data summary

Station ID	Start Date	End Date	Min Depth (ft)	Max Depth (ft)	Avg Depth (ft)	% Complete
01470500	8/1/1947	8/17/2006	4.54	16.69	5.46	12
01470960	5/1/1965	8/17/2006	2.09	8.86	3.10	17
01474500	10/1/1931	8/17/2006	5.53	11.34	6.44	9

Table A-4. USGS instantaneous flow data summary

Station ID	Start Date	End Date	Min Flow (cfs)	Max Flow (cfs)	Avg Flow (cfs)	% Complete
0146742494	4/3/2002	3/15/2005	0	8	3	2.4
0146742496	10/16/1997	2/15/2000	1	1	1	0.6
0146742498	10/16/1997	3/15/2005	1	5	2	1.0
0146742500	4/3/2002	3/15/2005	1	10	5	2.4
01467448	9/24/2002	9/30/2004	6	102	46	0.4
01467455	10/16/1997	10/16/1997	2	2	2	100.0
01467456	10/16/1997	2/15/2000	1	3	2	0.6
01467470	5/5/1976	2/28/1977	41	350	169	8.7
01467471	8/23/2005	8/23/2005	10	10	10	100.0
0146748710	3/14/2005	9/29/2005	0	3	2	1.0
0146748720	11/18/2002	11/18/2002	0	0	0	100.0
01467492	8/23/2005	8/23/2005	12	12	12	100.0
01467500	7/18/1962	11/5/1969	5	510	77	1.2

Station ID	Start Date	End Date	Min Flow (cfs)	Max Flow (cfs)	Avg Flow (cfs)	% Complete
01467688	7/26/2005	9/29/2005	0	7	3	3.1
01467689	7/26/2005	9/29/2005	9	22	16	3.1
01467691	7/26/2005	9/29/2005	4	6	5	3.1
01467692	7/26/2005	9/29/2005	14	34	24	3.1
01467752	8/23/2005	8/23/2005	22	22	22	100.0
0146784338	3/4/2003	9/12/2005	0	7	2	1.6
0146784348	10/16/1997	9/12/2005	2	3	2	0.1
0146784350	10/16/1997	9/12/2005	1	13	4	0.7
0146784354	10/2/2002	9/12/2005	3	14	7	1.6
0146784358	10/2/2002	8/10/2005	4	22	9	1.2
01469270	11/18/2002	11/18/2002	0	0	0	100.0
01469500	10/22/1959	9/27/1978	25	284	108	0.1
01469640	12/28/1977	9/27/1978	3	36	12	1.8
01469645	12/28/1977	9/27/1978	3	68	19	1.8
01469710	7/18/1962	9/27/1978	5	516	74	0.7
01470500	9/11/1947	8/10/2004	0	16000	1255	2.9
01470600	10/25/1967	10/25/1967	1	1	1	100.0
01470620	10/25/1967	10/25/1967	1	1	1	100.0
01470640	10/25/1967	6/1/2000	6	38	22	0.0
01470660	10/25/1967	10/25/1967	1	1	1	100.0
01470726	7/31/1974	5/21/1975	2	25	7	2.4
01470727	7/31/1974	5/21/1975	1	7	3	2.4
01470729	7/31/1974	5/21/1975	3	18	10	2.4
01470730	10/25/1967	5/21/1975	1	14	8	0.3
01470732	7/31/1974	5/21/1975	0	4	2	2.4
01470734	7/30/1974	5/22/1975	4	17	11	2.4
01470736	7/30/1974	5/22/1975	8	34	22	2.4
01470738	7/30/1974	5/22/1975	10	36	23	2.4
01470739	7/30/1974	5/22/1975	12	46	27	2.4
01470740	7/30/1974	5/22/1975	13	44	28	2.4
01470744	6/1/2000	6/1/2000	19	19	19	100.0
01470750	5/20/1968	9/24/1969	9	34	20	0.6
01470758	5/14/1970	10/6/1975	18	32	22	0.3
01470759	9/6/1979	9/7/1979	790	1780	1210	300.0
01470779	8/25/1998	8/24/2004	20	1740	112	3.1
01470780	5/20/1968	9/24/1969	4	8	6	0.6
01470800	6/14/1972	9/21/1977	50	600	185	3.1
0147080755	10/16/2003	10/16/2003	4	4	4	100.0
0147080760	10/16/2003	10/16/2003	5	5	5	100.0
0147080769	10/15/2003	10/15/2003	3	3	3	100.0
0147080781	10/15/2003	10/15/2003	2	2	2	100.0
0147080786	10/15/2003	10/15/2003	7	7	7	100.0
0147080787	10/15/2003	10/15/2003	10	10	10	100.0
0147080789	10/15/2003	10/15/2003	16	16	16	100.0

Station ID	Start Date	End Date	Min Flow (cfs)	Max Flow (cfs)	Avg Flow (cfs)	% Complete
0147080799	10/15/2003	10/15/2003	6	6	6	100.0
01470808	10/15/2003	10/15/2003	22	22	22	100.0
01470809	10/15/2003	10/15/2003	34	34	34	100.0
01470810	10/15/2003	10/15/2003	50	50	50	100.0
01470812	10/15/2003	10/15/2003	2	2	2	100.0
0147081710	10/15/2003	10/15/2003	2	2	2	100.0
0147081719	10/15/2003	10/15/2003	8	8	8	100.0
0147081725	10/15/2003	10/15/2003	3	3	3	100.0
0147081727	10/15/2003	10/15/2003	4	4	4	100.0
0147081729	10/15/2003	10/15/2003	5	5	5	100.0
0147081739	10/15/2003	10/15/2003	18	18	18	100.0
0147081749	10/15/2003	10/15/2003	3	3	3	100.0
0147081759	10/15/2003	10/15/2003	27	27	27	100.0
0147081769	10/15/2003	10/15/2003	10	10	10	100.0
0147081776	10/15/2003	10/15/2003	3	3	3	100.0
01470818	6/1/2000	10/15/2003	56	99	78	0.2
01470825	6/14/1972	10/15/2003	1	630	109	0.5
01470850	6/14/1972	5/22/1973	3	29	7	4.1
01470853	10/11/1984	10/11/1984	1	1	1	100.0
01470860	6/14/1972	6/12/1973	11	326	88	4.1
01470870	3/23/1994	3/23/1994	730	730	730	100.0
01470960	6/14/1972	8/24/2004	48	2610	433	1.0
01470982	2/16/1973	9/21/1973	1	77	22	2.3
01471000	10/22/1959	8/10/2004	1	1070	241	0.5
01471510	4/19/1979	6/26/1980	468	8850	3817	2.8
01471519	8/12/1979	9/22/1979	41	137	90	9.8
01471520	6/1/2000	9/25/2000	12	20	16	1.7
01471540	8/12/1979	9/6/1979	26	48	37	8.0
01471667	5/17/2000	9/25/2000	6	19	12	1.5
01471668	8/25/1998	8/25/1998	5	5	5	100.0
01471700	8/30/1982	8/30/1982	0	0	0	100.0
01471710	8/30/1982	8/30/1982	1	1	1	100.0
01471800	5/14/1970	8/30/1982	5	18	11	0.1
01471835	8/30/1982	8/30/1982	3	3	3	100.0
01471845	8/30/1982	8/30/1982	3	3	3	100.0
01471900	8/30/1982	8/30/1982	18	18	18	100.0
01471980	9/6/1979	9/25/2000	45	1740	496	0.1
01472000	10/1/1944	8/12/2004	233	14500	2056	1.7
01472054	11/14/1969	10/29/1982	1	6	3	0.1
01472065	11/14/1969	10/29/1982	2	12	7	0.2
01472080	11/14/1969	10/7/2004	3	29	10	0.3
01472100	5/16/2000	10/2/2000	8	14	11	1.4
01472109	11/12/1969	11/6/1996	0	7	2	0.3
01472110	11/13/1969	10/19/1982	1	9	5	0.2

Station ID	Start Date	End Date	Min Flow (cfs)	Max Flow (cfs)	Avg Flow (cfs)	% Complete
01472126	10/26/1982	10/25/2000	1	4	3	0.0
01472129	12/9/1969	10/26/1982	6	18	13	0.2
014721369	2/9/2005	9/26/2005	0	8	3	3.5
01472138	12/9/1969	10/23/2002	5	32	15	0.2
01472140	12/9/1969	10/23/2002	4	19	9	0.2
01472150	5/15/1968	1/26/2005	4	109	49	0.3
01472154	12/10/1969	10/8/1997	9	61	30	0.2
01472157	2/12/1969	10/7/2004	7	9370	168	1.1
01472161	9/6/1979	9/6/1979	1100	1100	1100	100.0
014721612	10/5/1970	10/2/1997	22	123	47	0.2
01472170	10/22/1969	10/18/2004	1	5	2	0.2
01472174	10/20/1967	10/12/1995	1	207	30	0.5
01472175	12/12/1967	6/19/1968	4	62	36	10.5
01472180	5/15/1968	9/20/1968	5	10	7	1.6
01472182	3/13/1968	8/15/1968	3	100	16	11.0
01472183	10/19/1967	1/18/1968	3	6	4	3.3
014721854	11/10/1969	10/18/2004	6	30	15	0.2
014721884	11/11/1969	9/18/2000	8	49	20	0.2
01472190	10/20/1967	12/17/2004	7	1160	101	0.3
014721986	2/2/2005	9/26/2005	5	55	18	3.4
01472400	5/14/1968	10/2/1968	2	11	7	1.4
01472800	5/14/1968	10/3/1968	1	120	61	1.4
01473000	9/23/1958	8/31/1999	10	13800	1064	1.1
01473030	4/9/2002	9/9/2003	118	1290	318	1.9
01473120	3/11/1969	6/25/1980	2	5820	512	2.4
01473140	9/25/1970	2/17/1976	36	501	269	0.1
01473153	10/11/1984	9/9/1998	1	1	1	0.0
01473154	3/20/1984	10/16/2000	1	12	5	0.2
01473155	10/12/1984	10/19/2000	1	3	2	0.1
01473156	9/9/1998	9/9/1998	2	2	2	100.0
01473157	9/9/1998	9/9/1998	0	0	0	100.0
01473158	9/9/1998	9/9/1998	2	2	2	100.0
01473159	9/9/1998	9/9/1998	3	3	3	100.0
01473160	9/9/1998	10/24/2000	3	4	3	0.3
01473161	10/10/1984	9/9/1998	3	5	4	0.0
01473163	10/24/2000	10/24/2000	9	9	9	100.0
01473167	10/15/1982	10/16/2000	3	19	8	0.4
01473168	10/15/1982	10/16/2000	3	27	13	0.2
01473169	8/22/1984	11/3/2004	6	32	18	0.1
01473170	6/8/1973	8/19/2004	20	14000	728	0.2
01473180	10/23/2000	10/23/2000	21	21	21	100.0
01473193	9/6/1979	9/6/1979	15400	15400	15400	100.0
01473197	11/6/2000	11/6/2000	1	1	1	100.0
01473470	9/6/1979	9/19/2000	8	220	79	0.0

Station ID	Start Date	End Date	Min Flow (cfs)	Max Flow (cfs)	Avg Flow (cfs)	% Complete
01473695	10/10/1979	10/10/1979	69	69	69	100.0
01473800	12/16/1956	5/4/1985	222	73600	17786	1.1
01473900	10/23/1965	8/23/2004	9	2640	236	0.5
01473950	10/4/1967	2/7/1973	4	1350	106	2.3
01473980	10/5/1967	2/19/1970	23	109	56	2.1
01474000	7/27/1962	8/10/2005	6	1650	142	0.8
01474010	2/25/1976	9/3/2003	73	5520	2789	0.1
01474500	10/1/1945	9/2/2004	46	53700	3017	4.4
395908075121500	6/27/1989	9/28/1989	634	5100	2221	4.3
400130075344501	10/11/1984	10/11/1984	0	0	0	100.0
400233075334701	10/11/1984	10/11/1984	1	1	1	100.0
400235075343001	8/22/1984	10/11/1984	0	1	0	4.0
400300075333101	10/11/1984	10/11/1984	1	1	1	100.0
400301075333001	9/2/1987	9/2/1987	0	0	0	100.0
400303075332201	9/2/1987	9/2/1987	1	1	1	100.0
400303075332701	9/2/1987	9/2/1987	1	1	1	100.0
400304075333301	9/2/1987	9/2/1987	0	0	0	100.0
400307075335301	3/13/1985	3/13/1985	0	0	0	100.0
400332075315001	10/12/1984	10/12/1984	5	5	5	100.0
401948076294501	11/10/1971	11/10/1971	1	1	1	100.0
402035076005601	11/10/1971	11/10/1971	1	1	1	100.0
402055076070001	11/10/1971	11/10/1971	6	6	6	100.0
402101076105501	11/10/1971	11/10/1971	0	0	0	100.0
402258075563901	11/9/1971	11/9/1971	2	2	2	100.0
403058075454501	11/8/1971	11/8/1971	2	2	2	100.0
403958076191401	3/22/1965	12/16/2004	1	10	4	0.2
404143076091001	4/23/1975	11/6/1991	0	2	1	0.0
404212076151601	3/22/1965	10/31/1991	5	9	7	0.0
404217076082201	3/22/1965	11/7/1991	0	3	1	0.0
404224076150601	7/28/1964	10/31/1991	6	65	24	0.1
404251076122101	3/22/1965	11/6/1991	1	11	4	0.0
404258076090101	7/28/1964	11/6/1991	0	2	1	0.1
404320076103201	7/28/1964	9/29/2005	2	14	4	0.1
404321076043001	4/22/1975	4/22/1975	0	0	0	100.0
404403076072401	3/22/1965	1/13/2003	0	6	2	0.1
404406076120201	2/17/1965	10/31/1991	0	7	3	0.1
404425076115201	4/23/1975	10/31/1991	0	1	1	0.0
404443076035101	4/22/1975	4/22/1975	0	0	0	100.0
404511076025811	4/15/2004	3/15/2005	0	0	0	4.2
404511076025812	4/15/2004	3/15/2005	0	2	1	3.9
404511076025818	8/16/2004	8/16/2004	0	0	0	100.0
404511076025872	8/16/2004	8/16/2004	0	0	0	100.0
404512076025501	3/22/1965	3/15/2005	0	5	2	0.3
404513076025811	4/15/2004	3/15/2005	0	1	1	4.2

Station ID	Start Date	End Date	Min Flow (cfs)	Max Flow (cfs)	Avg Flow (cfs)	% Complete
404513076025812	4/15/2004	3/15/2005	0	2	1	3.6
404513076025818	8/16/2004	8/16/2004	0	0	0	100.0
404513076025872	8/16/2004	8/16/2004	0	0	0	100.0
404531076025701	4/21/1975	11/1/1991	0	3	1	0.0
404538076063701	3/22/1965	11/6/1991	0	1	1	0.0
404538076063901	4/21/1975	4/21/1975	2	2	2	100.0
404612076015601	3/22/1965	11/1/1991	0	2	1	0.0
404657076105501	3/22/1965	11/6/1991	1	15	7	0.0
404705076003201	3/22/1965	9/29/2005	0	2	1	0.1
404728075590901	7/28/1964	6/4/2003	0	4	1	0.1
404728075590906	11/6/2002	6/11/2003	0	0	0	2.3
404728075590907	6/4/2003	6/4/2003	0	0	0	100.0
404909075560001	4/23/1975	11/1/1991	8	27	17	0.0
405224076001701	4/18/1975	11/26/2002	1	9	6	0.1

Table A-5. USGS instantaneous depth data summary

Station ID	Start Date	End Date	Min Depth (ft)	Max Depth (ft)	Avg Depth (ft)	% Complete
01467470	5/5/1976	5/5/1976	1.2	1.2	1.2	100
01470500	9/10/1974	9/1/1999	4.5	9.6	5.7	1
01470755	12/18/1978	12/18/1978	3.8	3.8	3.8	100
01470759	9/6/1979	6/26/1980	1.9	5.7	3.8	4
01470779	8/25/1998	8/8/2001	1.1	6.2	1.9	6
01470853	10/11/1984	10/11/1984	3.0	3.0	3.0	100
01470870	3/23/1994	3/23/1994	4.2	4.2	4.2	100
01470960	10/17/1972	9/18/1979	1.6	6.1	2.9	1
01471000	12/19/1978	4/28/1980	1.4	3.0	2.2	1
01471510	4/19/1979	6/26/1980	2.7	7.5	4.9	3
01471519	8/12/1979	6/26/1980	0.5	4.2	1.8	4
01471540	8/12/1979	3/25/1980	0.2	0.7	0.5	2
01471625	9/26/1979	9/26/1979	4.1	4.1	4.1	100
01471980	9/6/1979	9/25/2000	2.0	5.4	3.1	0
01472000	12/19/1978	8/31/1999	0.9	7.7	4.2	0
01472080	10/20/1981	10/11/1985	1.2	1.3	1.3	0
01472105	3/21/1980	5/14/1980	5.3	7.4	6.8	24
01472110	10/20/1981	10/20/1981	3.2	3.2	3.2	100
01472157	5/27/1971	10/7/2004	4.0	12.9	4.8	1
01472161	9/6/1979	6/25/1980	2.6	7.9	5.3	4
01472174	10/16/1981	10/12/1995	2.3	2.5	2.3	0
01472190	10/15/1981	12/17/2004	1.4	2.1	1.7	0
01473000	8/18/1971	8/31/1999	1.2	10.4	3.7	0
01473120	9/6/1979	6/25/1980	1.1	8.3	3.9	4

Station ID	Start Date	End Date	Min Depth (ft)	Max Depth (ft)	Avg Depth (ft)	% Complete
01473167	11/7/1994	10/30/1995	0.8	0.9	0.8	1
01473168	10/21/1983	10/30/1995	0.6	3.4	1.6	0
01473169	11/2/1998	11/3/2004	3.1	3.5	3.4	0
01473170	9/6/1979	6/26/1980	1.7	3.2	2.4	2
01473193	9/6/1979	6/25/1980	58.9	67.2	61.6	8
01473470	9/6/1979	6/25/1980	1.1	3.8	2.4	3
01473695	10/10/1979	10/10/1979	6.4	6.4	6.4	100
01473800	12/18/1978	6/26/1980	6.7	20.3	11.5	5
01473900	12/18/1978	12/18/1978	2.2	2.2	2.2	100
01473950	12/18/1978	12/18/1978	3.2	3.2	3.2	100
01474000	8/18/1971	8/10/2005	2.2	4.0	3.0	0
01474010	1/16/2003	3/13/2003	6.5	6.9	6.7	4
01474500	4/26/1973	9/2/2004	5.6	11.8	6.5	1

APPENDIX B: SOURCE INFORMATION

Table B-1. PCS point sources located in tributary watersheds

Seg-ment	Sub-segment	NPDES ID	Facility Name	Facility Type[a]	Flow (MGD)	Permit Limit Avg (ng/L)[b]
A	2	PA0043877	GREATER POTTSVILLE SEWER AUTHORITY STP	POTW	0.50	DELMON
A	2	PA0043885	GREATER POTTSVILLE SEWER AUTHORITY STP	POTW	6.96	DELMON
C	9	PA0021601	HAMBURG BORO STP	POTW	1.55	DELMON
C	12	PA0026549	READING CITY - FRITZ ISLAND WWTP	POTW	66.14	DELMON
D	15	PA0026972	EXETER TOWNSHIP WWTP	POTW	1.20	DELMON
D	17	PA0026786	POTTSTOWN BORO STP	POTW	12.85	ADDMON
D	18	PA0025437	NORTH COVENTRY STP	POTW	2.01	
D	19	PA0051926	LIMERICK GENERATING STATION	INDUSTRIAL WASTE-ESTIMATED STORM WATER	0.39	
E	20	PA0051934	KING ROAD STP	POTW	1.70	
E	21	PA0054526	UNITECH SERVICES GROUP INC	INDUSTRIAL WASTE	0.08	
E	22	PA0021512	ROYERSFORD STP	POTW	0.70	
E	22	PA0028614	SPRING CITY BORO STP	POTW	0.35	
E	22	PAR200018	SPRING CITY ELEC MFG PLT	STORM WATER-INDUSTRIAL	0.001	
E	25	PA0011631	CROMBY GENERATING STATION IWTP	INDUSTRIAL WASTE-ESTIMATED STORM WATER	0.12	
F	26	PA0027154	PHOENIXVILLE BORO STP	POTW	4.00	
G	28	PA0026964	OAKS WWTP	POTW	14.25	2.90
G	29	PA0043974	VALLEY FORGE STP	POTW	9.20	40.00
G	30	PA0026131	TROUT RUN STP	POTW	6.00	DELMON
H	33	PA0027421	NORRISTOWN BORO STP	POTW	9.75	DELMON

Seg-ment	Sub-segment	NPDES ID	Facility Name	Facility Type[a]	Flow (MGD)	Permit Limit Avg (ng/L)[b]
H	33	PAR800121	NORFOLK SOUTHERN ABRAMS YARD	STORM WATER-INDUSTRIAL	0.001	
H	34	PA0026816	EAST NORRITON PLYMOUTH WHITPAIN STP	POTW	8.10	DELMON
H	35	PA0020397	BRIDGEPORT BORO STP	POTW	0.90	
H	36	PA0026085	MATSUNK STP	POTW	6.88	DELMON
H	37	PA0050326	ISG PLATE CONSHOHOCKEN PLANT	INDUSTRIAL WASTE	1.20	
H	38	PA0050377	RIVERSIDE FACTORY	INDUSTRIAL WASTE	0.08	
I	39	PA0011681	PECO W CONSHOHOCKEN GAS PLT	INDUSTRIAL WASTE	0.00	
I	40	PA0026794	CONSHOHOCKEN BORO STP	POTW	2.30	DELMON
I	41	PA0026298	WHITEMARSH STP	POTW	2.00	
K	46	PA0050202	AMTRAK RACE ST PENN COACH YARD	INDUSTRIAL WASTE-ESTIMATED STORM WATER	NA	
K	47	PA0012629	SUNOCO INC. - POINT BREEZE	INDUSTRIAL WASTE	6.40	
K	48	PA0011533	SUNOCO INC. - GIRARD POINT	INDUSTRIAL WASTE	6.40	
K	49	PA0057690	KVAERNER SHIPYARD, INC.	INDUSTRIAL WASTE	0.00	
C	Trib	PA0021075	MYERSTOWN BORO STP	POTW	1.6	DELMON
C	Trib	PA0021636	FLEETWOOD BORO AUTHORITY STP	POTW	0.61	DELMON
C	Trib	PA0031062	ROBESONIA-WERNERSVILLE M/A OF	POTW	1.4	DELMON
C	Trib	PA0070271	MAIDENCREEK TOWNSHIP AUTHORITY STP	POTW	0.8	DELMON
D	Trib	PA0023540	BERKS-MONTGOMERY MA/MORYSVILLE WWTP	POTW	0.32	DELMON
G	Trib	PA0020460	PENN RIDGE WWTP	POTW	4.325	1.00

Seg-ment	Sub-segment	NPDES ID	Facility Name	Facility Type[a]	Flow (MGD)	Permit Limit Avg (ng/L)[b]
G	Trib	PA0024180	BERKS MONTGOMERY MUNICIPAL AUTHORITY STP	POTW	1.9	DELMON
G	Trib	PA0039004	UPPER GWYNEDD-TOWAMENCIN MUNIPIAL AUTHORITY STP	POTW	6.5	0.00
J	Trib	PA0026603	AMBLER WWTP	POTW	6.5	DELMON

[a] Facility type Industrial Waste-Estimated Storm Water identifies facilities that are not specifically permitted for storm water discharges, but are thought to be generating PCB contaminated storm water runoff. Flows for all storm water sites are estimated based on the facility site land area.
[b] Permit limits presented represent PCB concentration limits given in PCS for pretreatment facilities discharging to an associated WWTP/STP. A PCB concentration limit equal to the state water column criteria (0.044 ng/L) was assigned to all other facilities.

Table B-3. PCB CERCLA sites in Schuylkill River watershed

EPA ID	Site Name	Address	City	Zip Code	Description	Date of Discovery	NPL Status
PAD987349123	AMTRAK 30TH STREET	30TH & MARKET STREET STATION	PHILADELPHIA	19104	UNDERGROUND CONDUITS, STANDING POOLS OF POLYCHLORINATED BIPHENYL (PCB) CONTAMINATED WATER.	4/26/1990	NOT ON NPL
PA0000093385	ELLSWORTH STREET PCB SITE	2901-37 ELLSWORTH STREET	PHILADELPHIA	19146	ABANDONED TRANSFORMERS	12/2/1993	NOT ON NPL
PAD987277175	OLD BARRETT BUILDING	36TH AND WHARTON STREETS	PHILADELPHIA	19146	ABANDONED FACTORY; TRANSFORMER OIL CONTAINING PCB'S LEAKING	10/2/1989	NOT ON NPL

Table B-4. PCB spill sites in Schuylkill River watershed

Name	County	Municipality	Closure Date
LIPPINCOTTS GARAGE	BERKS	SINKING SPRING BORO	9/26/1995
U HAUL SHILLINGTON	BERKS	CUMRU TWP.	
MRS PAULS KITCHEN	BUCKS	TELFORD BORO	7/16/1997
VILLAGE WOOD SHOP	BUCKS	RICHLAND TWP.	
ALLEN ENVELOPE	CHESTER	TREDYFFRIN TWP.	
ALLEN RESIDENCE	CHESTER	SOUTH COVENTRY TWP.	
FRIENDLY CHEVROLET FORMERLY TIM SMITH CHEVROLET	LEBANON	JACKSON TWP.	3/5/1996

Name	County	Municipality	Closure Date
EXXON RS 2 6374	LEHIGH	WEISENBERG TWP.	3/28/1995
ELM TERRACE GARDENS APTS	MONTGOMERY	LANSDALE BORO	10/29/1993
EXXON RS 2 8251	MONTGOMERY	HATFIELD TWP.	8/1/1994
GUY M COOPER INC.	MONTGOMERY	UPPER MORELAND TWP.	
INDIAN CREST MID SCH	MONTGOMERY	FRANCONIA TWP.	
NELSONS ICE CREAM	MONTGOMERY	ROYERSFORD BORO	5/5/1994
NEW AGE IND	MONTGOMERY	UPPER MORELAND TWP.	
TROOPER MOBILE HOME PARK	MONTGOMERY	LOWER PROVIDENCE TWP	
VAGNONI RESIDENCE	MONTGOMERY	EAST NORRITON TWP.	
WEST SIDE LAWNMOWER	MONTGOMERY	HATFIELD TWP.	10/27/1992
BELL FUELS INC	PHILADELPHIA	PHILADELPHIA	10/10/1991
CONTINENTAL BANKING CO	PHILADELPHIA	PHILADELPHIA	
FAULKNER INTL SITE	PHILADELPHIA	PHILADELPHIA	12/6/1994
FIRESTONE MASTERCARE CTR	PHILADELPHIA	PHILADELPHIA	11/8/1993
FLEET MGMT SITE 015	PHILADELPHIA	PHILADELPHIA	
PENN FISHING TACKLE MFG CO	PHILADELPHIA	PHILADELPHIA	
PENNYPACK AQUATIC & FITNESS CTR	PHILADELPHIA	PHILADELPHIA	7/9/1993
SUDBURY INC	PHILADELPHIA	PHILADELPHIA	
SUNOCO 0363 1322	PHILADELPHIA	PHILADELPHIA	

APPENDIX C: PLUG FLOW REACTOR MODEL

Water Balance for Critical Condition

Because of the direct discharges of PCBs are continuous, a long-term balance and a harmonic flow condition (Q), was represented as follows:

$$Q = Q_{PCB} + Q_{NPS} + Q_{PS} \qquad \text{(C-1)}$$

where Q_{NPS} = flow due to any non point sources [L^3/T]
Q_{PS} = flow due to any point sources [L^3/T]
Q_{PCB} = flow due to PCB discharge [L^3/T]

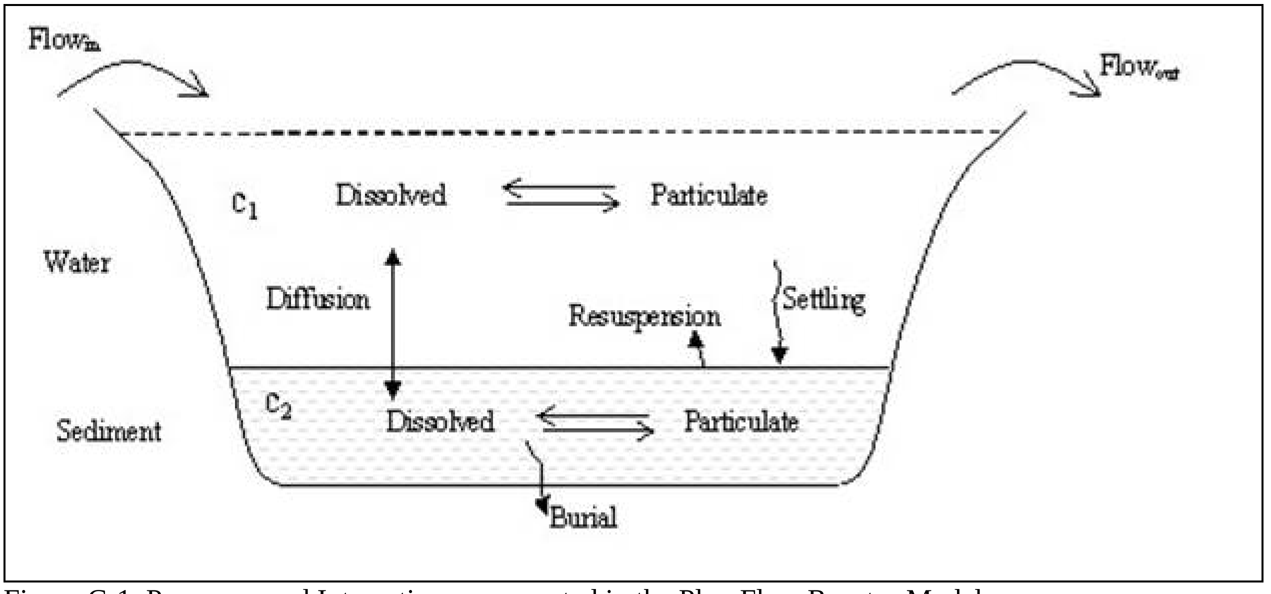

Figure C-1. Processes and Interactions represented in the Plug Flow Reactor Model

Contaminant Budget

A mass balance of PCBs can be developed for the stream-segments assuming that the PCBs partition into the dissolved and particulate forms and considering the various interactions between the sediment layer and the water column (Figure C-1). (Note: subscript 1 refers to the water column and subscript 2 refers to the sediment layer).

A steady-state contaminant budget can be written for a plug-flow system with constant hydro-geometric characteristics with respect to the water column as (Thomman and Mueller 1987, EPA, 1984 and Chapra, 1997):

$$U\frac{dC_1}{dx} = k_1 C_1 - \frac{v_v}{H_1}F_{d1}C_1 - \frac{v_s}{H_1}F_{p1}C_1 + \frac{v_d}{H_1}(F_{d2}C_2 - F_{d1}C_1) + \frac{v_r}{H_1}C_2 \qquad \text{(C-2)}$$

where:
k_1 = first order decomposition rate [1/T] (assumed to be negligible i.e. zero)

v_v = volatilization rate [L/T] (assumed to be negligible i.e. zero)
U = stream velocity {L/T]
H_1 = depth of water column [L]
C_1 = PCB concentration in the water column [M/L^3]
C_2 = PCB concentration in the sediment layer [M/L^3]
K_{d1} = PCB partitioning coefficient in water column [L^3/M]
K_{d2} = PCB partitioning coefficient in sediment layer [L^3/M]

The water column partition coefficient (K_{d1}) for PCBs range from 10^5 to 10^6 L/kg (Thomman and Mueller 1987) and suggest that the sediment partition coefficient (K_{d2}) may be lower than the water column partition coefficient. For this study the partition coefficient was taken as the mean of this range i.e. $5.5x10^5$ L/Kg.

m_1 = suspended solids in the water column [M/L^3]
F_{p1} = fraction of the total PCB that is in water

$$F_{p1} = \frac{K_{d1}m_1}{1+K_{d1}m_1} \quad \text{(C-3)}$$

F_{d1} = fraction of total PCBs dissolved in water

$$F_{d1} = \frac{1}{1+K_{d1}m_1} \text{ or } (1-F_{p1}) \quad \text{(C-4)}$$

F_{d2} = fraction of total PCBs dissolved in sediment

$$F_{d2} = \frac{1}{\phi + K_{d2}(1-\phi)\rho} \quad \text{(C-5)}$$

v_d = diffusive mixing velocity [L/T].

$$v_d = 69.35\phi M^{-2/3} \text{ (Di Toro et al., 1981)} \quad \text{(C-6)}$$

ϕ = sediment porosity (taken as 0.8)
ρ = sediment density [M/L^3]
M = mean PCB molecular weight velocity [L/T] (taken as 305.6 gmole for high molecular weight PCBs)
v_s = settling velocity [L/T] (from literature Fox River, WDNR, 2000, suggests a typical value of 0.05-2.5 m/day)
v_r = re-suspension velocity

$$v_r = v_s \frac{m_1}{(1-\phi)\rho} - v_b \quad \text{(C-7)}$$

v_b refers to the burial velocity [L/T] (assumed to be negligible or zero for free flowing streams)

The mass balance given in equation [C-2] can be further rearranged to give:

$$U\frac{dC_1}{dx} = -C_1\left(\frac{v_s}{H_1}F_{p1} + \frac{v_d}{H_1}F_{d1}\right) + C_2\left(\frac{v_d}{H_1}F_{d2} + \frac{v_r}{H_1}\right) \quad \text{(C-8)}$$

Or

$$U\frac{dC_1}{dx} = -C_1L_1 + C_2L_2 \quad \text{(C-8a)}$$

where:

$$L_1 = \left(\frac{v_s}{H_1} F_{p1} + \frac{v_d}{H_1} F_{d1} \right) \qquad \text{(C-9)}$$

and

$$L_2 = \left(\frac{v_d}{H_1} F_{d2} + \frac{v_r}{H_1} \right) \qquad \text{(C-10)}$$

Then for spatially constant sediment layer, equations C-8 or C-8a have the following solution:

$$C_1 = C_1(0) \cdot \exp\left(-\frac{L_1}{U} x \right) + C_2 \frac{L_2}{L_1} \left(1 - \exp\left(-\frac{L_1}{U} x \right) \right) \qquad \text{(C-11)}$$

It can be seen that the for the riverine portion the water column concentration C_1 is a function of the travel time downstream (x/U), the settling velocity (v_s), the net diffusion and the amount of re-suspension (v_r). Also, note that the steam segment takes into account observed sediment data (C_2) as source to compute the water column concentrations.

The contributions due to MS4s along the length of the Schuylkill River were included in as a distributed source at the top of the segment (x=0) and added then added to the resulting predicted concentration from equation C-11. The water quality response due to the distributed source is a follows ((Thomman and Mueller 1987):

$$s = s_d \cdot \left(1 - \exp\left(-\frac{L_1}{U} x \right) \right) \qquad \text{(C-12)}$$

s = predicted concentration due to the distributed source [M/L^3]
s_d = concentration of the distributed source [M/L^3]

C-3: Baseline Condition Computation – Stream Segments

The Schuylkill River was segmented into a series of plug-flow reactors defined within the entire length of the impaired segment to simulate the steady-state distribution of PCBs. This was necessary to accurately account for the water balance between each segment and the impact of point sources, and tributaries in the main stem of the Schuylkill River. Each of the plug-flow reactor, defines a mass balance for PCBs for the sediment-water system.

PCBs are man-made compounds and there are no natural sources, however a background concentration of 2 ng/L was attributed at the headwaters of the Schuylkill River. This upstream boundary condition at the headwaters was set based on the water column concentration estimated from the post 90s fish tissue data and a bio-concentration factor (BCF). This PCBs concentration incorporates historical spills, atmospheric deposition, and unknown contributing sources of PCBs from surrounding minor tributaries. Using this upstream boundary condition of $C_1 = C_1(0)$ the water column concentration of PCBs was calculated using equation [C-11]. At each confluence where there is a point source or tributary, a mass balance of the load just upstream and the load from the point source or tributary was performed to determine the change in concentration (equation [C-13]). The concentration calculated using equation [C-13] was then used as the initial concentration in equation [C-11] for the next segment.

$$C_1(0) = \frac{Q_r C_{1r} + Q_w C_{1w}}{Q_r + Q_w} \quad \text{(C-13)}$$

where Q_r and C_{1r} refer to the flow and concentration of the receiving river and Q_w and C_{1w} refers to the flow and concentration from the point source or tributary.

C-4 Existing Condition Computation – Reservoir Segments behind dam

The reservoir portions behind the dam required taking into account the burial process and was handled differently. For a constant daily load coming in to the reservoir (based on the computed stream segment concentration (C_{in}) just upstream of the reservoir segment) a time variable (daily) concentration was calculated, taking into account settling, diffusion, re-suspension, burial and sediment data as a source. With time, the concentration in the reservoir achieves equilibrium and this equilibrium concentration was used as $C_1(0)$ for the segment downstream of the dam.

The following mass balance equations with respect to the water column (C-14) and the sediment layer (C-15) were used for the analysis:

$$V_1 \frac{dC_1}{dt} = QC_{in} - QC_1 - v_s AF_{p1}C_1 + v_d A(F_{d2}C_2 - F_{d1}C_1) + v_r AC_2 \quad \text{(C-14)}$$

$$V_2 \frac{dC_2}{dt} = v_s AF_{p1}C_1 + v_d A(F_{d2}C_2 - F_{d1}C_1) - v_r AC_2 - v_b AC_2 \quad \text{(C-15)}$$

Where A and V refer to the surface area and volume of the reservoir portion behind the dam.

The burial rate v_b was estimated using the following formula:

$$v_b = \frac{Q}{A} \cdot \frac{m_1}{(1-\phi)\rho} \quad \text{(C-16)}$$

All other terms have been defined previously in this section.

APPENDIX D: INDIVIDUAL WASTELOAD ALLOCATIONS FOR NPDES DISCHARGERS

Table B-1. PCB WLAs for Individual Point Source Facilities (excludes MS4s)

Model Segment	Point Source Facility Name	Permit Number	WLA (g/day)
A	GREATER POTTSVILLE SEWER AUTHORITY STP	PA0043885	1.16E-03
A	GREATER POTTSVILLE SEWER AUTHORITY STP	PA0043877	8.28E-05
C	HAMBURG BORO STP	PA0021601	2.57E-04
C	READING CITY - FRITZ ISLAND WWTP	PA0026549	1.10E-02
D	EXETER TOWNSHIP WWTP	PA0026972	2.00E-04
D	POTTSTOWN BORO STP	PA0026786	2.14E-03
D	NORTH COVENTRY STP	PA0025437	3.34E-04
D	LIMERICK GENERATING STATION*	PA0051926	6.54E-05
E	KING ROAD STP	PA0051934	2.83E-04
E	UNITECH SERVICES GROUP INC	PA0054526	1.33E-05
E	ROYERSFORD STP	PA0021512	1.16E-04
E	SPRING CITY BORO STP	PA0028614	5.74E-05
E	SPRING CITY ELEC MFG PLT*	PAR200018	1.38E-07
E	CROMBY GENERATING STATION IWTP*	PA0011631	2.03E-05
F	PHOENIXVILLE BORO STP	PA0027154	6.66E-04
G	OAKS WWTP	PA0026964	2.37E-03
G	VALLEY FORGE STP	PA0043974	1.82E-03
G	TROUT RUN STP	PA0026131	9.99E-04
H	NORRISTOWN BORO STP	PA0027421	1.62E-03
H	NORFOLK SOUTHERN ABRAMS YARD*	PAR800121	2.23E-07
H	EAST NORRITON PLYMOUTH WHITPAIN STP	PA0026816	1.35E-03
H	BRIDGEPORT BORO STP	PA0020397	1.50E-04
H	MATSUNK STP	PA0026085	1.15E-03
H	ISG PLATE CONSHOHOCKEN PLANT	PA0050326	2.00E-04
H	RIVERSIDE FACTORY	PA0050377	1.33E-05
I	CONSHOHOCKEN BORO STP	PA0026794	3.83E-04
I	WHITEMARSH STP	PA0026298	3.33E-04

* Identifies facilities modeled as storm water discharges

APPENDIX E:

DEVELOPING AN ADAPTIVE MANAGEMENT NPDES PERMITTING STRATEGY: INCORPORATING SCHUYLKILL RIVER PCB TMDL REQUIREMENTS

I. Introduction

An adaptive strategy is being suggested here to provide for the developing and issuing National Pollutant Discharge Elimination System (NPDES) permits to point sources subject to assigned waste load allocations (WLAs) under the Schuylkill River Polychlorinated Biphenyl (PCB) Total Maximum Daily Load (TMDL), with guidance for permitting options for regulating the discharge of PCBs. This strategy is guidance to use in developing and/or modification of NPDES permits. The stratgey is not a law or regulation. The intent of the strategy suggested here is to build upon the effort that was done under the Delaware Estuary PCB TMDL for point source permitting and to help articulate a defensible plan to implement the Schuylkill River PCB TMDL via the NPDES permits. While the regulatory framework in the Schuylkill River is not identical to that of the Delaware Estuary, there are similarities which would provide concepts useful for implementation. The strategy should be designed to ensure that point source dischargers achieve and maintain their prescribed PCB loading levels to restore and protect the Schuylkill River while providing opportunities for reducing costs and improving efficiencies by allowing the use of non-numeric effluent limitations while additional information is gathered to verify point source PCB loadings.

The utilization of a collaborative problem-solving approach that accommodates diverging viewpoints of how to limit PCB discharges will be the focus of the strategy and will support an adaptive approach to reducing PCBs in the Schuylkill River. As was done for the Delaware Estuary, it will support a process by which an initial set of reduction strategies are accompanied by measurement and analysis to determine the resulting benefits, and strategies and goals are adjusted on the basis of the results achieved.

II. Background

The Schuylkill River is an important component of the Delaware River Basin and has been identified as an upstream source of PCBs to the Delaware Estuary. In December 2003, EPA Regions II and III, in collaboration with the Delaware River Basin Commission (DRBC), and the States of Delaware, New Jersey, and Pennsylvania, established TMDLs for PCBs in Zones 2 through 5 of the Estuary. In December 2006, the water quality model was recalibrated to include Zone 6 (Delaware Bay), yielding TMDLs for the Delaware Estuary Zones 2 through 6. Other boundary sources to the Delaware Estuary include the Delaware River above Trenton, ocean, and atmospheric sources. DRBC and the States have been actively implementing the Delaware Estuary TMDLs in the NPDES program. An Implementation Advisory Committee was convened by DRBC to identify and implementation plan for the Estuary. Additional information on PCBs in the Delaware Estuary can be found at http://www.nj.gov/drbc/toxics_info.htm.

III. Permitting Authority

The NPDES program in Pennsylvania is implemented by the Pennsylvania Department of Environmental Protection (PADEP) with oversight by the U.S. Environmental Protection Agency. EPA retains the authority to implement the pretreatment provisions of the program in Pennsylvania.

IV. PCB Strategy for the Delaware Estuary

Following establishment of the TMDL for the Schuylkill River, the water quality-based effluent limitations (WQBELs) in NPDES permits that are issued, reissued or modified after the approval date must be consistent with the wasteload allocations. EPA's NPDES regulations at 40 CFR 122.44(k) allow permit writers to use non-numeric, Best Management Practice (BMP)-based WQBELs under certain conditions. A BMP approach is acceptable where it is the reasonably necessary means to control pollutants to achieve the goals of the Clean Water Act or where it is may be infeasible to precisely calculate effluent limits, such as in the case of storm water discharges. The Delaware River TMDL process recognized the uncertainty associated with several elements of the TMDL development process including the PCB loading calculations. Therefore, EPA and the States recommended the use of non-numeric WQBELs following completion of the Stage 1 TMDLs. This approach allowed time for additional collection of more precise monitoring data on point source discharges and refined quantification of loads to the Estuary. The Delaware River TMDL suggests that dischargers be required to develop and implement "waste minimization and reduction programs" (WMRP), also known as Pollution Minimization Plans (PMPs), along with conducting additional monitoring using analytical Method 1668A.

In addition, several concepts played a major role in advocating the use of PMPs as part of the TMDL WLA implementation tool.

- Since PCBs are no longer purposefully manufactured in the US, the available mass of PCBs is declining over time. Unlike traditional pollutants, such as nutrients and oxygen depleting substances, PCBs in the environment are not renewed. Once a mass of PCB is removed from the watershed or made unavailable, a permanent load reduction is realized.
- For nutrients and oxygen depleting substances, end-of-pipe controls are necessary because these substances are an unavoidable by-product of human habitation and the state of the technology is generally sufficient to achieve water quality criteria. By contrast, PCBs can in theory be completely removed from the watershed / sewershed and end-of-pipe controls are not currently sufficient to achieve water quality criteria.
- For nutrients and oxygen depleting substances, short term disruptions to end-of-pipe controls may lead to short term minor water quality impacts. For PCBs, short term disruptions to end-of-pipe controls can lead to very long term water quality impacts due to system memory.
- PCBs are often associated with "legacy sources" where modification of process controls may be insufficient to yield necessary load reductions. Municipalities in the Delaware Estuary are conducting "track-down" studies to locate these sources to the system.

To address the requirement for a WMRP identified in the TMDL, the Delaware River Basin Commission (DRBC) on May 18, 2005, unanimously adopted a rule to establish pollutant minimization plan (PMP) requirements for point and non-point discharges of PCBs in the Delaware Estuary. DRBC's Compact affords unique regulatory authority for water resources within the basin. DRBC Resolution No. 2005-9 amended the *Water Quality Regulations* and *Comprehensive Plan* by adding a new Section 4.30.9 establishing PMP requirements for point and non-point discharges of toxic pollutants following issuance of a TMDL or assimilative capacity determination. PMP requirements were imposed on 42 of the 94 NDDES permittees included in the Stage 1 TMDL, with additional PMPs being required dependent on the outcome of additional monitoring. Dischargers must report annually on their progress in implementing the PMPs and load reductions achieved. DRBC is developing guidance on the required content and format of these annual reports. As NPDES permits are being issued in the Delaware Estuary, the States are incorporating these requirements directly into individual NPDES permits.

DRBC plans to use peer review advisory committee to evaluate PMPs submitted to the Commission. This committee would advise the Executive Director, the Basin States and the dischargers of the anticipated effectiveness of the pollutant minimization measures proposed and identify additional pollutant minimization measures that may be practicable. DRBC and the States are optimistic that significant load reductions can be achieved through this process over the long term. Additional controls will be needed to manage other source categories.

V. Permit Reissuance after Schuylkill River TMDL Approval

Based in part on the issues identified in Section IV above, non-numeric rather than numeric WQBELs can be used in NPDES permits to ensure, in accordance with Clean Water Act requirements, that the permits would be consistent with the TMDL.

Given that data are limited in the Schuylkill River, PADEP should require NPDES permit holders to collect additional data. Based on experiences in the Delaware Estuary, Method 1668A is recommended in order to obtain more precise information. However, since Method 1668A has yet to be adopted into 40 CFR Part 136 as an approved method, the use of the less sensitive but approved methods may be used.

EPA recommends in particular that when reissued or renewed, the NPDES permits for the non-storm water discharges should be required to develop and implement PMPs and to perform PCB monitoring. When a permitting authority issues an NPDES permit that requires development and/or implementation of a PMP, the authority should establish a method for review and approval of the PMP. These PMPs should be developed and applied to all loading categories, where appropriate, in order to achieve PCB reductions. PMPs must be tailored to the particular source and will vary from source to source depending on the PCBs determined to be present. PMPs should generally require:

- inventory and source description;
- trackdown;
- requirement to implement PMP;
- monitoring of compliance with PMP and PCB reductions achieved;
- enforceability and ramifications for failure to implement;
- review and approval of the PMP by an agency with opportunity for public input;
- milestones; and
- termination criteria.

1.1. NPDES permit holders

NPDES permits will contain non-numeric water quality based effluent limits in the form of BMPs provided the PMPs are being implemented in good faith in accordance with terms of the PMP and other applicable regulations. Suggested requirements include the following:

- *NPDES Non-Stormwater Permit Holders* – Require PMPs tailored to the amount/concentration of PCBs measured in the discharge. When NPDES permits come up for renewal, a condition will be included requiring the development (or continued development) and implementation of the PMPs, as appropriate.

- *NPDES Individual Phase I MS4 Permit Holders* – NPDES permit renewals will require monitoring to determine the presence of PCBs and require tailored PMPs. (Note:

Philadelphia is the only MS4 Phase I permit holder in the Schuylkill Basin and the permit already requires development of a PMP consistent with the Delaware Estuary Program requirements.)

- *NPDES Phase II MS4 Permit Holders* – Develop screening/prioritization process to determine need for PMP development. These facilities are new to the NPDES program and permits do not expire for the most part until 2008. The General Permit (GP) issued by the states for these dischargers will be reissued upon expiration with a requirement for MS4s in the Delaware River Basin to develop a PMP wherever PCB contamination is suspected and confirmed in the discharge. A PMP outline/template that addresses small MS4s will be need to be developed by the permitting authorities and the DRBC prior to expiration of the GPs. In cases where small MS4s have individual permits, the same requirement will be added to their permit upon reissuance using the same PMP outline/template.

- *NPDES Construction Stormwater Permit Holders* – Develop screening/prioritization process to determine need for PMP development. Similar to Phase II MS4s, existing permits do not have any requirements for PCB monitoring or control. The GP, or any individual permit, for construction storm water will be reissued upon expiration to require facilities in the Delaware River Basin to develop a PMP wherever PCB contamination is suspected and confirmed in the discharge. A PMP outline/template that addresses construction sites will be developed by the permitting authorities and the DRBC.

- *NPDES Industrial Stormwater Permit Holders* - The permitting authority shall ensure Storm Water Pollution Prevention Plans (SWPPPs) include management practices for PCBs, as appropriate, and ensure that facilities at risk of discharging PCBs in stormwater are covered by PCB SWPPP or a PMP. Assure that stormwater controls are in place and permits are issued for facilities subject to the applicable stormwater requirements. For example, make sure all industries with a reasonable expectation of discharging PCBs have stormwater permits with PMPs tailored to the amount/concentration of the PCBs measured in the discharge.

- *NPDES Pretreatment Programs* – The National Pretreatment Program at 40 CFR Part 403 provides the regulatory basis to require indirect dischargers to public-owned treatment works (POTWs) to meet pretreatment standards. The objectives of the Program are to prevent introduction of pollutants into POTWs that will interfere with the operation of the plant, be “passed through” the treatment works, and improve opportunities to recycle and reclaim municipal and industrial wastewaters and sludges. EPA Region III implements the pretreatment programs in Delaware and Pennsylvania.

VI. Permit Reissuance after results from PMPs and monitoring

Adaptive management could employ an iterative approach in NPDES permitting. After NPDES permits go through one permit cycle with the requirement to conduct PCB monitoring of their effluent and to develop and implement a PMP, the next round of permits may need to include additional requirements. Review of the PMP and monitoring information could be used to modify the TMDL. For those facilities that do not detect PCBs in their system, applicable WLAs could be converted to LAs. For those facilities that show reasonable potential for their discharge(s) to exceed the TMDL requirements for meeting WLAs, additional requirements will be incorporated into the renewed permit, including the potential for numeric PCB limitations.

APPENDIX F: RESPONSIVENESS SUMMARY

Appendix F: Responsiveness Summary - Schuylkill River PCB TMDL

Letter ID	Comment	Response
	Comments were received by: 1 Sohan Garg, PADEP Southeast Regional Office 2 Orest Kolodij, PADEP Southeast Regional Office 3 Marc Gold, Delaware Estuary TMDL Coalition 4 Carol Collier, DRBC 5 Jennifer Murphy, Mid-Atlantic Environmental Law Center 6 Diana Hart, Exelon Power 7 David Densmore, Fish and Wildlife Service	
1-01	Section 2.3.1 Fish Tissue results Page 28: BCF relates the lipid normalized chemical residue concentration in fish tissue to the chemical concentration in the water column. It is often developed for a region. Did the consultant develop BCF value for each sub segment or did he use a general value based on DRBC PCB for Delaware River?	A general value developed for the entire Deleware Estuary was used (Toaspern, 2003).
1-02	Page 29: Middle of the page it is written that an average log BCF 7.0 was found to be applicable to the entire Delaware River Estuary. Please explain this statement. Also, explain through an example using water column data for Schuylkill River how the data were compiled, converted to water column concentrations using fish tissue results.	Text was added to include additional discussion of applicability. The study only presents biota and sediment sampling data taken for the Delaware mainstem. There was no presentation of water column concentrations from which BCF and BSAF could be evaluated.
1-03	Page 56: Qm stands for harmonic mean. We use Qhm for harmonic mean.	Text was updated.
1-04	Table 3.2 page 61: For Pottstown Boro Segment Area MS4 Flow D 0.3 0 D 0.3 0 Is it possible to use some number such as 0.01 cfs or the model does not accept any flow <0.1 cfs?	MS4 flows have been re-estimated using a different methodology, see updated report for an explanation. If flows are less than 0.1 cfs they will be presented in the table as "<0.1".
1-05	Page 63 Section 3.2.1 last paragraph: Did the consultant contact waste Management section for information on CERCLA sites and PCB spill events?	CERCLA sites and spill events were identified in the Schuylkill River Time of Travel Database (PADEP, PWD Office of Watersheds).
1-06	Page 65 Section 4.1 Modeling Framework: How does Qhm relate to Plug Flow reactor?	Plug Flow reactor is a steady-state representation of the Schuylkill. Qhm was determined to be a steady-state flow representative of critical conditions in the Schuylkill.

Appendix F: Responsiveness Summary - Schuylkill River PCB TMDL

Letter ID	Comment	Response
1-07	Page 67 second paragraph: If dam is removed in the future, what changes should be made to the WLA?	Such analysis is beyond the scope of this TMDL. Should dam removals or other changes occur, there is always the oppportunity for the TMDL to be revised and refined based on the collection of additional data and changes in management scenarios.
1-08	Table 4-2 Page 69 Point source flows: Segment Subsegment Fac Flow Mgd D 19 PA0051926 Limerick Gen. Sta. 10.7 E 22 PA0021512 Royersford Boro 0.70 E 25 PA0011631 Cromby Gen sta. 1.83 from IWWTP (application for expansion)	The text has been updated for Royersford Borough. For the two others, the value presented is an estimated storm flow. Values have been updated based on a new MS4 flow estimation methodology, see report text.
2-01	The river segments or nodes in the Schuylkill River TMDL are identified by "River Miles", referenced to the headwaters in the Schuylkill River. The Department has historically referenced stream segments or nodes by "River Miles", referenced to the mouth of the river.	The "River Mile" values were changed to reflect historical convention.
2-02	Section 3.1, page 57 et al. Point Sources. This section implies that there are 40 known or potential point sources of PCBs that were obtained thru PCS, DRBC, PADEP and other sources. It should be noted that there was no comprehensive survey (or sampling) conducted to determine the PCB concentrations of effluent from most of these facilities. Therefore, the TMDL should mention that "Figure and Table 3.1, lists all of the public owned sewage treatment works (POTWs) that discharge to the main stem of the Schuylkill River. Since there was no comprehensive PCB monitoring of the effluent from these facilities in the preparation of this TMDL, these facilities are listed in this TMDL as 'potential' sources of PCBs only." Table 3-1 describes the POTWs as POWTPs. Should we use the more common acronym POTW? Table 3-2 lists many smaller MS4s with a flow of 0.0-cfs. This implies no stormwater flow, or no WLA. Could you use the value "<0.1" or "0.0x" instead?	Designation of known source of PCBs is based on the review of pretreatment facilities for those POTWs that include permit limits and DMR data for PCB concentrations. Text updated. See response to Comment 1-4
2-03	Section 4.1.1, page 68. Source Representation. The design flows of many of the facilities were corrected by the PADEP based on the latest Pennsylvania Bulletin public notices.	Text updated to acknowledge information in the latest Pennsylvania Bulletin notices.

Appendix F: Responsiveness Summary - Schuylkill River PCB TMDL

Letter ID	Comment	Response
2-04	Section 4.1.2, page 71. Analytical Assumptions. The use of the harmonic mean flow in modeling for human carcinogens is also supported in the PA regulations.	Text updated to include this statement.
2-05	Section 5.3, page 76. Wasteload Allocations. Section 6, Page 78. Reasonable Assurance. Federal TMDL regulations allow for the use of best management practices for implementation? Since effluent concentrations of PCBs have not been characterized for most permitted point sources, it would make sense to first require some sort of effluent monitoring to determine if individual facilities (and MS4s) discharge PCBs above trigger levels. Facilities that discharge PCBs above trigger levels should be required to prepare, submit, and implement PMPs (pollution minimization plans). This would make the Schuylkill River TMDL consistent with the Delaware River TMDL.	Comment noted, see Appendix E.
2-06	Section 6.1. Point Source Implementation. We generally agree with the implementation approach outlined in this addendum to the TMDL. PCBs are not generally associated with normal household sanitary wastewater. PCBs are most likely introduced into the Schuylkill River through the stormwater runoff of PCB contaminated sites, industrial sources, and atmospheric deposition. If significant amounts of PCBs are detected in effluent from NPDES permitted facilities and MS4s, the source can usually be traced back through the sewer collection system to an industry, or a site contaminated by PCBs.	Comment noted.
2-07	Section 6.1. Point Source Implementation. The first phase in implementation should be identifying the sources of PCBs. The second phase in implementation should be the minimization of PCBs from the identified sources. This implementation approach is similar to the approach used for NPDES permitted facilities for whole effluent toxicity (WET) and toxicity reduction evaluations (TRE). The first phase of implementation may be the screening of effluent from NPDES permitted facilities and MS4s using appropriated test methods for PCBs. The second phase of implementation may target facilities that are confirmed discharging PCBs in significant amounts. Facilities targeted in the second phase may be required to prepare and implement pollution minimization plans (PMPs) for PCBs. A model implementation plan for PCBs has already been developed for the Delaware River TMDL.	Comment noted, see Appendix E.
3-01	The Coalition believes that the information gathered by the IAC and the general conclusions it reached should inform the approach taken by EPA in establishing the Schuylkill River PCB TMDL.	Comment noted. The final report refers to the process and goals of the Delaware River IAC.

Letter ID	Comment	Response
3-02	As part of the process for finalizing the Schuylkill River PCB TMDL, the Coalition recommends that EPA consider some of the implementation concepts included in its PCB TMDL for Zones 2-5 of the Tidal Delaware River ("Delaware Estuary PCB TMDL") established in December 2003.	Comment noted, see Appendix E.
3-03	While recounting the history of PCB usage, the TMDL Report ignores the many current uses of PCBs expressly authorized by EPA under the Toxic Substances Control Act, 15 U.S.C. § 2601 et seq., which have the potential to preclude the attainment of water quality standards at the extraordinarily low concentrations specified in the Schuylkill River PCB TMDL.	Text was updated to reference the use of certain products containing PCBs under TSCA.
3-04	As indicated above, the surface water quality standard for PCBs of 0.044 ng/l used by EPA as the TMDL target was taken from Zone 4 of the Delaware Estuary. The TMDL Report confirms that the selected target was developed by DRBC for the Delaware Estuary using an EPA methodology from 1980 without review or reassessment in any respect. All assumptions built into EPA's decades old methodology are simply carried forward in this analysis to establish the water quality target in the Schuylkill River. There was no independent determination by EPA or PADEP as to an appropriate PCB water quality target (i.e., based on the most scientifically defensible methods and site-specific assumptions) for the Schuylkill River or this TMDL, and no consideration of the latest methodologies for establishing appropriate water quality standards that are recommended to incorporate risk-based approaches and models. Moreover, EPA did not consider the appropriateness of using an ambient water quality target rather than a fish tissue target for a hydrophobic compound such as PCBs.	Reevaluation of EPA-recommended or state-adopted criteria is beyond the scope of this TMDL. The TMDL was based on the applicable water quality criterion, as required by regulation.
3-05	According to the TMDL Report, due to concerns regarding data quality and reliability, these water column samples were not used to develop the Schuylkill River PCB TMDL. Instead, EPA estimated water column concentrations as the product of measured fish tissue concentrations and a bioconcentration factor ("BCF") (TMDL Report, p. 49.) Thus, the concentration of PCBs in the water column relative to the water quality target was estimated without the benefit of either reliable surface water quality data or confirmation that the BCF generated from a different waterbody is predictive in the Schuylkill River despite differences in salinity, fish species and their feeding preferences, and the mixtures of PCBs present.	See response to Comment 4-1.

Letter ID	Comment	Response
3-06	The basis of EPA's decision to choose these 27 dischargers and to exclude the nine dischargers located on the tributaries is not explained in the TMDL Report.	Text included to explain the selection of point sources explicitly represented in the modeling framework.
3-07	With respect to nonpoint sources, the TMDL Report concludes that no contaminated sites were included in the model "because of lack of sufficient information to generate loading estimates" (TMDL Report, p. 63).	See response to Comment 4-4.
3-08	Airborne deposition of PCBs, another identified non-point source, is assumed by EPA's analysis to be included in tributary and MS4 loadings, although no explanation of the basis for this assumption is provided.	Text updated to include discussion on atmospheric deposition of PCBs included in MS4 and tributary loads.
3-09	The only non-point source reflected in the modeling associated with the Schuylkill River PCB TMDL is sediment, based on data that are as much as 25 years old.	Nonpoint sources also included in MS4 and tributary loads (land area based estimation). Sediment data was QA/QC'd and includes recent data.
3-10	The numeric WLAs are indefensible. It is inappropriate to identify point sources as subject to WLAs in the absence of any data or information confirming that PCBs are present in or have the reasonable potential to be present in the discharge. The Schuylkill River PCB TMDL appears to select a subset of the universe of NPDES permittees for coverage within the TMDL without explanation and regardless of the location or volume of the permitted discharges. Compounding the uncertainty inherent in this approach is EPA's decision to arbitrarily assign the chosen water quality target (0.044 ng/L) as the applicable WLA, effectively allocating to all covered point sources a combined zero allocation of the permissible PCB load above the water quality target. This practice is not consistent with the methodology prescribed in EPA's TMDL regulations or guidance.	Text updated to acknowledge assumptions made in identifying likely or known PCB point source dischargers. Suspected facilities were identified by PADEP permitting staff, and also based on a review of PCS, which indicated past PCBs monitoring activities and the presence of PCB concentrations at associated pretreatment facilities. An assignment of water quality criteria as the applicable WLA is consistent with past TMDLs. See Appendix E regarding suggested WLA implementation.

Letter ID	Comment	Response
3-11	Specific excerpts of the TMDL Report illustrate the basis of the Coalition's concern on this point. First, EPA claims that a water column concentration can be calculated using a variety of enumerated source loadings including "known values of discrete point source contributions entering the Schuylkill River" (TM DL Report p. 67). Table 5-4 of the TMDL Report (TMDL Report p. 7(l) lists the 27 point source discharges that "contribute directly to the Schuylkill River mainstem," each with a numeric WLA based on an assigned PCB limit of 0.044 ng/L (the water quality target). EPA states "that these particular point sources were explicitly modeled based on their known or suspected PCB contributions" (emphasis added) (TMDL Report, p. 76). These statements cannot be reconciled with the language of the TMDL Report set forth below that the Coalition believes most accurately reflects the facts: "The point source facilities along the Schuylkill River also did not have any measured water column data. All point sources were therefore assigned a concentration equal to the PCB water column criteria of 0.044 ng/L for the baseline and TMDL condition (TMDL Report, p. 68)."	See response to Comment 3-10.
3-12	The decision to use an arbitrary value to represent individual point source contributions is certainly questionable from a modeling standpoint; doing so also conflicts directly with the TMDL program given that the arbitrary value is assigned as the WLA for each point source discharge. This practice is even more egregious, since WLAs are important drivers for the development of enforceable NPDES permit conditions. Moreover, this determination results in an allocated PCB load of zero for each covered point source above the water quality target without a shred of relevant data to substantiate the appropriateness of that conclusion.	See response to Comment 3-10.

Letter ID	Comment	Response
3-13	In addition to using a flawed approach in setting the WLAs, EPA failed to recognize and acknowledge the fact that the selected water quality target of 0.044 ng/L is not achievable within a reasonable timeframe, if at all. EPA expressly acknowledged that decades of effort will be necessary to meet the same PCB water quality target in the Delaware Estuary (Delaware Estuary TMDL p. i). The likelihood and timing of achieving this target is even less certain for the Schuylkill River than for the Delaware Estuary, given the dearth of data available to adequately begin to assess current - let alone future - conditions. The Coalition believes that the Schuylkill River TMDL needs to expressly acknowledge EPA's conclusion in the Delaware Estuary PCB TMDL - that progress should be achieved through an adaptive implementation framework, rather than through the imposition of infeasible requirements. Perhaps EPA's consultant should consider the body of work developed by the IAC on PCB reduction strategies in order to reexamine the Schuylkill River TMDL in light of adaptive management principles.	TMDLs must be based on the applicable water quality standard, irregardless to the timeframe of when those standards can be attained. Comment noted, see Appendix E.
3-14	Only categorical or segment by segment WLAs are suitable for point sources because of the absence of any effluent data. The TMDL regulations set forth at 40 C.F.R. Part 130, as interpreted and applied by EPA, allow for the establishment of cumulative or categorical WLAs in lieu of individual allocations and EPA has implemented its regulations in that manner. In a November 22, 2002 memorandum, EPA, citing to the regulatory definition of "total maximum daily load," indicated that allocations for stormwater discharges from multiple point sources can be expressed as "a single categorical wasteload allocation when data and information are insufficient to assign each source or outfall individual WLAs." Although this recommendation was made in a policy memorandum addressing stormwater discharges," its legal and policy underpinnings apply equally to any WLA where significant uncertainty surrounds the TMDL development process. In fact, EPA has approved several TMDLs in recent years that involve aggregate allocations for multiple point sources - stormwater discharges and process water discharges alike. In May 2003, for example, EPA approved a Nickel TMDL for the Houston Ship Channel that set a gross WLA for more than 530 permitted point sources.	The assignment of point source allocations as a categorical WLA versus individual WLAs is determined on a case-by-case basis. For the Schuylkill River TMDL, EPA found it appropriate to assign a categorical WLA by model segment to the MS4s. For point source facilities, WLAs are presented in Section 5.3 as well as in Appendix D.

Letter ID	Comment	Response
3-15	While the Coalition recognizes that the definition of "wasteload allocation" in 40 C.F.R. §130.2(h) may authorize the development of individual WLAs for individual point sources, that provision when read in light of the full text of the TMDL regulations as implemented by EPA does not mandate that WLAs be so structured. "Decision about allocations of pollutant loads within a TMDL are driven by the quantity and quality of existing and readily available water quality information." Here, the development of cumulative or categorical WLAs would be consistent with EPA's recommended approach for WLAs when existing data and relevant information are not detailed enough to calculate individual WLAs. Moreover, the current point source contribution is very small. Based on Table ES- l (TMDL Report p. i), the current point source PCB contribution (WLA) is less than 1% of the total allowable PCB load to the Schuylkill River.	See responses to Comments 3-14 and 3-16.
3-16	EPA should remove from the Schuylkill River PCB TMDL point source dischargers with de minimis flows. The flow rates of the 27 mainstem point source dischargers are listed in Table 3·1 (TMDL Report, pp. 58-59). Flow rates for these dischargers range from 0.002 million gallons per day ("mgd") to 66.14 mgd. With a total WLA of 0.0523 grams per day for all point source and MS4 dischargers combined, it would be appropriate to exclude from the Schuylkill River PCB TMDL those dischargers with de minimis flows. This recommendation is particularly important because the WLA for each discharger is set at the water quality target. Accordingly, the Coalition requests that EPA consider eliminating those point sources with flow rates at the lower end of the range - perhaps a cut-off of dischargers with flow rates below 0.5 mgd would be appropriate in this instance especially when there is no evidence to suggest that these de minimis dischargers, or any others for that matter, discharge PCBs at all. This change would eliminate eight de minimis point source dischargers representing a combined allowable contribution of approximately 0.0003 grams of PCBs per day.	EPA disagrees with the approach to eliminate "de minimus" dischargers given the very low levels of PCB allowable by the applicable water quality criterion. Also, by regulation, NPDES point sources cannot cause or contribute to an exceedance of applicable water quality standards. Unless monitoring results can show that these dischargers do not contribute PCBs loads to the Schuylkill River, they are addressed by the WLA portion of the TMDL.

Letter ID	Comment	Response
3-17	EPA should include an explanation as to the manner by which the WLAs will be implemented through the NPDES permitting process. The facts presented in the TMDL Report provide a text book basis for expressly recognizing that non-numeric water quality-based effluent limitations should be app lied in accordance with 40 C.F.R. § I22.44(k). This approach was adopted by EPA in the Delaware Estuary PCB TMDL and is appropriate here for the following reasons: o There are no surface water data to support the development of any WLAs; o The WLAs assigned are arbitrary, merely reflecting the water quality target; o The WLAs are not capable of being measured by any approved or draft analytical methods; and o The WLAs cannot be achieved through any known technology.	Comment noted, see Appendix E.
3-18	Any description of the NPDES permitting process also must consider the timeframes anticipated for compliance with the WLAs and the TMDL Report should acknowledge that meeting the water quality objectives through the implementation of the TMDLs could take decades. The interplay between NPDES permitting cycles and the enforceability or TMDL requirements should be explained in the context of the overall TMDL approach. Permitting issues such as "net" effluent limitations, interim effluent limitations, monitoring requirements and compliance schedules are not discussed at all in the TMDL Report, thereby precluding more extensive comments regarding NPDES implementation.	Comment noted, see Appendix E.
3-19	The surface water quality target is inappropriate and unattainable. EPA cannot reasonably expect the water quality target to be achieved in the Schuylkill River, especially where there are no reliable surface water quality data to use in the analysis. The water quality target o f 0.044 ng/L (or 44 ppq) is less than concentrations of PCBs in surface water and rainwater sampled in remote and other nonurban areas as presented in the table below. [Table entitled, "Means and Ranges of PCB Concentrations in Surface Water and Rain Water in Remote and Nonurban Areas," not presented here.] In addition, recent DRBC PCB sampling at the mouth of Delaware Bay in the Atlantic Ocean (2006) indicate total PCB levels of approximately 0.5 ng/L (500 ppq). Given the persistent nature of PCBs in the environment and the PCB uses that are currently authorized by EPA, the selected water quality target is not achievable.	Federal regulations require that TMDLs be based on applicable water quality criteria. Discussion of whether these targets are appropriate or attainable are outside the scope of the TMDL.

Appendix F: Responsiveness Summary - Schuylkill River PCB TMDL

Letter ID	Comment	Response
3-20	The modeling analysis is unsupportable. Due to data gaps and the simplistic modeling framework, the model employed several assumptions that do not appear to have adequate scientific basis and may yield overly conservative results, such as:	See responses to following comments.
3-21	The extrapolation of surface water concentrations from fish tissue data based on a regional BCF (i.e., lack of water column PCB data to calibrate the model), as previously discussed;	See response to Comment 4-1.
3-22	The integration of data from multiple sources and time periods without apparent confirmation of the comparability of analytical methods in addition to the model output comparison to this data that may or may not represent the modeled harmonic mean flow condition;	All PCB media data were QA/QC'd for applicablity to TMDL development. Data deemed insufficient were not used in the analysis. Summary statistics derived from this data were found to be appropriate for the model application.
3-23	The assumption that discharges from point sources are at the water quality target is inappropriate and highlights the importance of obtaining data before characterizing sources in the watershed, as previously discussed;	See response to Comment 3-10.
3-24	The use of median sediment concentrations instead of spatially weighted mean concentrations, which would account for geospatial variations in concentrations and a nonrandom sampling program;	The use of median sediment concentrations is not overly conservative given the availability of data for analysis. A median of the sediment concentrations gives a value representative of the entire data set and eliminates outliers. It was not possible to estimate the geospatial variations in concentration since these are point samples and the area of contamination associated with each sample is unknown.
3-25	The assumption of no sediment burial in the river, except immediately upstream of dams, in addition to not including any longitudinal movement o f sediments in the river. (It is very likely that high flow events mobilize sediments in this river, not to mention causing bank erosion. that can significantly alter the spatial distribution of PCB laden sediments.);	Assumptioin of no burial in a free-flowing riverine system is reasonable. Longitudinal movement of sediment is dynamic process that cannot be accurately represented in a steady-state model.
3-26	The sediment LA (TMDL Report p. 76) comprises approximately 95% of the total LA and, therefore, future focus of model development should improve on the assumptions relating to sediment dynamics;	Due to the simplistic model approach used to develop this TMDL, detailed sediment transport and dynamics were not represented. There is always the option to refine the TMDL to include a more detailed representation of the Schuylkill River.
3-27	The failure to consider bio accumulation interactions between organisms and PCB volatilization; and	See response to Comment 4-5.

Letter ID	Comment	Response
3-28	The inability to fully calibrate the model, in light of the absence of useable surface water data. In addition, the limited model calibration either under- or over-predicts the data between mile 0-60 and then generally under-predicts the data from mil 60-120.	Model is steady-state so no true calibration is possible (i.e. there are no adjustable input parameters). A harmonic mean flow condition was used in this steady flow analysis, which gives an estimate of the magnitude of the PCBs that existed historically.
3-29	Given the incomplete quantification of sources and PCB dynamics (both in the water column/sediment and biota) due to extremely limited data, the TMDL model should be considered very preliminary and be part of the adaptive management framework discussed earlier where the model can be improved as more knowledge is gained and results refined. For these reasons, the Coalition believes that the modeling exercise was inappropriate.	EPA respectually disagrees that the modeling framework was inappropriate. See Appedix E regarding adaptive managment.
3-30	A ten percent margin of safety is unreasonable, given the many sources of conservatism used to develop the TMDL. In light of all of the factors discussed above, a substantial MOS is already inherent in the calculations used to develop the TMDL, LAs, and WLAs, and the additional 10% MOS is not warranted. For example, the MOS implicit in utilizing a target incremental lifetime cancer risk of one-in-one mill ion (1x10-6) is as high as 100-fold, given that one in ten thousand (1x10-4) is within the range o f acceptable risks established in the National Contingency Plan. The apparent use of an outdated cancer slope factor (7.7 (mg/kg-day)-1) to support the driving water quality criterion of 0.044 ng/L may contribute another approximate four-fold MOS. Such compounding conservatism yields a highly stringent TMDL and eliminates the need to apply an additional 10%, MOS.	A ten percent MOS is reasonable because of the lack of loading data, which is probably greater than estimated (all unknowns set at criteria).
3-31	Given that federal regulations require that a portion of the TMDL be set aside as a MOS, the Coalition encourages EPA to consider reducing the Ma S because of the many sources of compounding conservatism already inherent in the TMDL. This was among the reasons EPA applied a 5% MOS in establishing the Delaware Estuary TMDL and Delaware River Zone 6 PCB TMDL.	See response to Comment 3-30.

Letter ID	Comment	Response
3-32	The Coalition believes that the considerable effort devoted to the IAC process by all stakeholders should lead to a wholly different approach for the Schuylkill River PCB TMDL an approach predicated on adaptive implementation including feasible measures, goals and targets. In light of the considerable deficiencies in the development of the Schuylkill River PCB TMDL and the significant uncertainties raised by the extraordinarily limited data and analysis, it is inappropriate for EPA to (1) establish WLAs for point sources, and (2) include de minimis point sources. If EPA finalizes the Schuylkill River PCB TMDL Report as drafted, despite the weaknesses identified by the Coalition in these comments, the Coalition recommends that the final TMDL should contain categorical WLAs and expressly apply 40 C.F.R. § I22.44(k) (as EPA did in the Delaware Estuary PCB TMDL) to authorize the use of non-numeric water quality-based effluent limits. There is clearly sufficient uncertainty associated with the methodology and the calculated values for EPA to conclude that it is infeasible to establish a defensible water quality-based numeric effluent limit for any point source discharger.	Text updated to reference the process and goals of the Delaware River IAC. EPA respectfully disagrees that it is inappropriate to establish WLAs for point sources including those considered "de minimus." See responses to Comments 3-14 and 3-16 and Appendix E.
3-33	The Coalition is pleased that EPA reached the conclusions regarding point source implementation strategies that are set forth in the plan and supports the proposed approach. The Coalition's TMDL Comments urged EPA both to adopt the approaches from EPA's PCB TMDL for Zones 2-5 of the Delaware Estuary, and to provide guidance to PADEP to allow for greater flexibility in the application of the point source requirements of the Schuylkill River PCB TMDL. We believe that EPA's rationale for this added flexibility, in the form of non-numeric water quality based effluent limits, is fully justified for the reasons set forth in the Plan and the Coalition's TMDL Comments.	Comment noted.

Appendix F: Responsiveness Summary - Schuylkill River PCB TMDL

Letter ID	Comment	Response
3-34	The Coalition particularly appreciates and endorses EPA's proposition that the identification of "significant discharges is a dynamic process" that includes consideration of, among other things, the extent of data availiable and the flows for each discharge. It was for these reasons and others that the Coalition's TMDL Comments included a request to establish categorical WLAs at this juncture and to eliminate de minimis discharges from the Schuylkill River PCB TMDL. The Plan provides added support for these two recommendations since it acknowledges that the TMDL is not static and can be modified over time as more data becomes available. Moreover, the Plan recognizes that "the list of relevant point source dischargers is subject to change during the development of a more refined TMDL." Because of the dearth of available data at this time regarding PCBs in the Schuylkill River and their sources, the Coalition believes the Schuylkill River PCB TMDL should be structured to give PADEP the greatest degree of latitude - this would be best accomplished by categorical WLAs and the elimination of de minimus dischargers.	Comment noted, see responses to Comments 3-14 and 3-16.

Appendix F: Responsiveness Summary - Schuylkill River PCB TMDL

Letter ID	Comment	Response
4-01	Inappropriate application of a bioconcentration factor to estimate ambient water PCB concentrations. Section 2.3.1 Bioconcentration factors were utilized to convert fish tissue data to ambient water concentrations of PCBs using a formula obtained from Toaspern (2003). Although Toaspern uses the term BCF, the formula presented in the thesis is essentially the same formula the U.S. EPA uses for the term bioaccumulation factor or BAF. This is acknowledged on page 77 of the Toaspern report. The report does not indicate whether the PCB fish tissue data presented is the sum of Aroclors or the sum of congeners. It should be noted, however, that the factors presented in Toaspern (2003) are based upon the sum of 124 congeners in both the fish tissue and the DRBC ambient water data used in the BCF calculations. Toaspern (2003) also presented the relationships (Figures 4.1 and 4.2) between the calculated BCF and log Kow for the two species (channel catfish and white perch) that were the subject of the studies. These relationships demonstrate a range of BCFs between 106 and 108 about the calculated mean BCF of 107. In refining the calculation of ambient water concentrations of total PCBs, this uncertainty needs to be discussed as it effects the calculated ambient water concentrations. The PCB fish tissue data undoubtedly includes much Aroclor based data. Since the log Kow changes significantly depending upon the homolog,, the actual Aroclor composition of the fish tissue data needs to be discussed and an appropriate BCF used for each model segment to estimate the ambient PCB concentrations. Toaspern (2003) reported that the distribution of homolog groups in both channel catfish and white perch collected from the Delaware Estuary were dominated by four homologs (terta, penta, hexa and hepta). Median log Kow values for these homologs range between 6.05 and 6.85, significantly less than the 7.0 used to calculate the ambient water PCB concentrations.	Given the lack of water column data for the Schuylkill River watershed, this application was determined to be the most appropriate approach. Toaspern (2003) indicates that the difference between BCF and BAF is largely semantic and refers to differences in terminology in the application of a BCF/BAF for the purpose of developing water quality criteria. The compiled data supporting the TMDL is for TPCBs calculated from the sum of Aroclors. The discrepency between Toaspern (2003) data and report data have been noted in the text as well as uncertainty of 10^7 value. BCF-converted values for mainstem fish tissue results were only used to verify agreement between the magnitude of modeled and observed concentrations. Small variations in the BCF values would not appreciably improve the accuracy of this comparison. BCF converted values were used to estimate tributary concentrations. Given the gross nature of the model and the paucity of tributary fish tissue data, tributary specific-BCF values are not appropriate.

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4-02	Water column PCB concentrations presented in the TMDL report using the BCF will account only for a truly dissolved portion of PCBs. Toaspern (2003) stated that the truly dissolved portion of PCBs was only ~18% of the dissolved PCBs reported in the water column data used in her calculation of the BCFs. No adjustment is provided to adjust the truly dissolved concentrations to total PCB concentrations. Water concentrations derived from fish tissue sample in this report are therefore an underestimation of total PCBs. Consequently the TMDL derived in this report is not scientifically justifiable.	See response to Comment 4-1.
4-03	Section 4.2 (page 72). The statement that there is no reliable water column PCB data available along the mainstem Schuylkill River is incorrect. Under contract to DRBC, USGS collected 6 samples over various flows from the Girard Avenue Bridge, where were analyzed for PCB congeners. These samples were described in the Delaware Estuary PCB TMDL and the data is available from DRBC. At a minimum, the model results should be compared to this data set. This data may also be useful in evaluating the partitioning of PCBs between truly dissolved, dissolved organic carbon bound and particulate bound phases, and the subsequent estimation of total PCB from fish tissue data.	These data were not made available during the TMDL development and therefore were not incorporated into analysis of the representativeness of BCF converted water column concentrations. Use of this information is not precluded in future revisions to the TMDL.
4-04	Exclusion of specific loading estimates and allocations for contaminated sites, Section 3.2.1 (page 63). Contaminated sites were found to be one of the most important PCB loading source categories in the Delaware Estuary PCB TMDL. Therefore, it raises great concern that this source category was excluded from the draft Schuylkill TMDL. Furthermore, we disagree that there is not sufficient information to develop preliminary loading estimates. DRBC's Delaware Toxics Reduction Program (DelTRiP), to which EPA 3 was a participant, painstakingly assembled site information from a variety of state and federal databases. The DelTRiP descriptions (http://www.state.nj.us/drbc/DelTRiP/index.htm) for many sites include surface soil concentrations, which along with a soil loss estimate, should form the bases of a contaminated site load estimate.	The Schuylkill River Time of Travel Database was reviewed for purposes of developing information related to loading from contaminated sites. Three contaminated sites and 26 storage tank PCB releases were identified. No data useful for loadings estimation was presented, however. Regarding information through the DelTRiP program, such data were not made available in the timeframe during which the TMDL analysis was being conducted and therefore were not included in the TMDL. Text was updated to include referece to DelTRiP. Use of this information is not precluded in future revisions to the TMDL. EPA agrees that contaminated sites may be a signficant contributor of PCBs in the Schuylkill River, and such loadings are captured under the LA portion of the TMDL.

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4-05	Failure to include or validate significant fate mechanisms for PCBs. Section 4.3. Given that this effort excluded loading from contaminated sites (see Issue 2 above), did not include volatilization of PCBs, and demonstrably under-estimated the contribution from point discharges, the apparent agreement between model predicted water column concentrations and water column concentrations estimated from fish tissue data strongly suggests that PCB dynamics have been incorrectly incorporated into the model framework. It would appear that the model assigns an inappropriately high weight to the sediment flux to mitigate for the underestimated external loads. This imbalance probably leads to an unnecessarily restrictive wasteload allocation, depriving dischargers of existing assimilative capacity. The model needs to be recalibrated after addressing these and other issues raised in our comments.	Source contributions were estimated using the best-available information. Given the gross nature of the model, inclusion of specifc volitization model routine would add a layer of detail that is not warranted. Model physical dynamics were represented using established water quality model engineering principals (Chapra, 1997).
4-06	Application of discharge data from the Wissahickon watershed on a unit area basis to develop flows for MS4 areas. Section 2.3.5. This section states that no USGS flow data are available for model segments E, F, G, J. and I, therefore, regional flow regressions developed by Stuckey (2006) were utilized to calculate harmonic mean flows. Model segment J contains USGS gage station 01474000 on the Wissahickon Creek at the confluence of the Schuylkill River, which has a forty-two year discharge record. A review of the Stuckey report does not include the Wissahickon gage data for use in the development of regression equations. In the development section of the report regarding regression equations, it states that "regression equations were developed… from data at streamflow-gaging station unaffected by regulation, diversion or mining." Sloto and Buxton (2005) calculated a water budget for the Wissahickon watershed and concluded that flows in the Wissahickon were materially impacted by dischargers from sewage-treatment plant, industries and a quarry, substantially elevating the flows at the gaging station. Flow data from the Wissahickon watershed was used, however, to generated estimated discharges from areas identified as containing MS4s. Therefore, we suggest that the use of discharge data from the Wissahickon watershed should not be applied on a unit area basis to the MS4 areas and that alternative reference streams be identified for this purpose.	MS4 flows have been re-estimated using USGS regression equations for stream flow for the state of Pennsylvania. See text of the report.

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4-07	Failure to ensure that the TMDL will not result in exceedances of applicable water quality criteria in the Delaware Estuary. Based on TMDLs established by EPA for the Delaware Estuary in 2003, the Schuylkill River has to meet a concentration of 9.68 pg/L at the downstream end of Fairmont Dam to prevent exceedances of applicable water quality criteria in the Delaware Estuary. This will result in lower TMDLs and allocations, particularly in the lower portions of the Schuylkill River.	Based on model results, there is a deposition of PCB loads behind the dams along the Schuylkill River. Additionally, a TMDL addressing the Schuylkill River Estuary, looking downstream of the Fairmont Dam to the confluence with the Delaware River, is expected to provide the linkage between the two PCB TMDLs. In the absence of a Schuylkill Estuary TMDL, EPA used the applicable water quality criterion. This endpoint and its resulting allocations can always be modified as appropriate during or after development of the Schuylkill Estuary TMDL.
4-08	Lack of any implementation mechanisms that will provide reasonable assurance that the TMDLs will be achieved. Section 6. The statement that “Natural attenuation [of PCBs] is usually considered to be an appropriate action alternative to ensure that TMDL targets are met and water quality standards are achieved” is unsupported by either technical citations or references to other TMDLs. It was not considered an appropriate action alternative for the Delaware Estuary TMDLs that were established by EPA Region III. Furthermore, at the Schuylkill Watershed Congress held on March 3, 2007, the U.S. Geological Survey presented preliminary results from sediment core samples collected and analyzed (but unavailable) for the Schuylkill PCB TMDL. These results showed that the highest concentrations of PCBs in the sediment cores were found at the sediment surface, not buried deeply within the core. These results were consistent with elevated cesium concentrations also found at the surface, suggesting that dam removals and recent large scale storm events have mobilized more highly contaminated legacy sediments and made them once again available to the ecosystem. Combined with Pennsylvania's active efforts to breach and remove existing low head dams, this information strongly contradicts the concept that contaminated sediment, if left in place, will bury out of the system and become biounavailable.	Text was updated to present natural attenuation as a possible component of an appropriate action alternative. As the USGS and other data become available, this could help to inform Pennsylvania on whether to continue its efforts in removing dams.

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4-09	Other active remedial approaches are dismissed as not feasible or incurring too high a cost. The proposed passive approach of relying on natural attenuation through sediment burial behind dams has not been verified through an evaluation of sedimentation rates. A review of a USGS report (York et al, 1985), not referenced in the report, states that approximately onethird of sediment discharge by the river is stored behind the dams on the Schuylkill River between Pottstown and Philadelphia. The study included identification of PCBs in different sediment size fractions and concluded that PCB had fractionated to the silt-sized sediments. Furthermore, large storm events, which give rise to high flows typically, scour accumulated sediment from the pools behind the dams. Information provided in the report indicated that a storm flow of 10,000 cfs, with a 5% probability of occurrence, would create water velocities in the pools behind dams, and mobilize the clay and silt size fractions and associated PCBs. Since the assumptions made in the Schuylkill TMDL document regarding the assimilative capacity provided by sedimentation behind dams are not supported by the literature, a more active approach to achieving the TMDL should be implemented such as the Pollutant Minimization Plan (PMP) approach developed by for the Delaware Estuary PCB TMDLs.	Comment noted, see Appendix E.
4-10	Section 6. It is wholly inappropriate to state that dredging is not viable, when no assessment is presented in the document. - There is no basis for stating that dredging to remove contaminated sediment is unjustified due to habitat destruction, when there has been no consultation with either the USFWS or the PA Fish and Boat Commission. - There is no basis for stating that dredging is unjustified due to resuspension of PCBs, when dams are actively being removed from the Schuylkill. Dam removals liberate far more sediment than dredging, yet these actions are still presumed to be justified. Dredging could allow for the removal of substantial PCB mass from the system within a relatively short time frame. The authors of this TMDL have absolutely no basis for recommending against this course of action, and have offered no other implementation recommendations in its place. This alternative needs to be reevaluated.	Report text has been altered to remove the statement that dredging in not viable. Text now includes a discussion of dredging pros and cons.
4-11	Specific implementation requirements need to be included in this TMDL as was done in the Delaware Estuary TMDLs so that point and non-point sources understand the implications of the establishment of the TMDLs. It is recommended that the implementation requirements be patterned after those specified in the Delaware Estuary TMDLs established by EPA in December 2003 and December 2006.	Comment noted, see Appendix E.

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4-12	Section 4.1.1. All point sources were assigned wasteload allocations based upon an effluent concentration equal to the applicable water quality criterion of 44 picograms per liter. No data is presented demonstrating that this concentration is representative or achievable. Monitoring of point sources using analytical methods that can achieve these levels must be required as part of the implementation of these TMDLs.	This was assumed in the absence of effluent data. TMDLs are not required to demonstrate whether criteria are achievable. See Appendix E regarding suggested TMDL implementation.
4-13	Section 1.2, last paragraph (page 6). This paragraph should be amended to state that Pennsylvania also issues waterbody-specific advisories, which may be more restrictive than the blanket advisory, and that Pennsylvania has issued more restrictive advisories for several segments of the Schuylkill River and several of its tributaries, as shown in Table 1-3.	Text has been updated as suggested.
4-14	Section 2.3.5. This section states that no USGS flow data are available for model segments E, F, G, J. and I, therefore, regional flow regressions developed by Stuckey (2006) were utilized to calculate harmonic mean flows. These regression equations were developed for the entire state of Pennsylvania and applied to five regions encompassing thousands of square miles. They require the input of basin specific characteristics. A review of Figure 2-16 in the TMDL report, depicts USGS stream gages in the Schuylkill watershed, and indicates gages on tributaries located in model segments F, G and J. Model segments F and G are drained by the French Creek and Perikomen tributaries, respectively. These streams are also cited in the Stuckey report and observed and predicated harmonic mean flow values are provided. The predicted harmonic mean flow value in the French creek is 65% of the observed harmonic mean flow. Whereas the predicted harmonic mean flow value in the Perikomen creek is 12% greater than the observed harmonic mean flow. The standard error of prediction was determined to be 38% for harmonic mean flow. Furthermore, the report suggests that flow values derived from regression equation equations should be checked against stream gage data. Therefore, we suggest that actual flow values be utilized, when available, and an extrapolation be made on a unit area basis to extend the gage data from the gaging station to the confluence of the Schuylkill River.	Observed flows were used when available. All tributary flows were summarized using observed data and extended based on unit area. Regressions were used for mainstem segments only and for MS4 areas per Comment 5-6.
4-15	TSS concentrations for each model subsegment and source under the model calibration condition must be presented. The solid mass balance through the model segments must be provided (i.e., loadings, water column TSS concentrations, and net burial rates in the pool) because net burial in pools provides the major portion of the assimilative capacity in the Schuylkill TMDL.	Due to the screening level nature of the TMDL methodology, presentation of this level of detail is not deemed warranted. Model spreadsheets that include model calculations are available through EPA.

Letter ID	Comment	Response
5-01	The purpose of establishing TMDLs is to ensure that the water quality standards in the water body can be met after implementation of the TMDL. To ensure that the water quality standards are met a conservative approach to all aspects of the TMDL, including waste load allocations ("WLA"), load allocations ("LA"), and margin of safety ("MOS") must be utilized.	EPA agrees that a TMDL is established to ensure that a waterbody will attain and maintain applicable water quality standards. Federal regulations require that TMDLs include a total allowable load, individual WLAs and LAs, and a MOS, among other considerations.
5-02	The Source Assessment is incomplete and inadequate. Although the source assessment identifies 23 known point sources, there are however approximately 14 facilities that are asserted as potential PCB point sources. EPA should have conducted some investigation to determine whether and how much each of these "potential" point sources is discharging into the Schuylkill River. See TMDL at 57.	EPA respectfully disagrees and finds the source assessment appropriate given what data and information were readily available. Additional monitoring to determine PCB dischargers and the load contribution from each discharger was not possible given time and resource constraints. As the TMDL is implemented, the verification of PCB point sources is expected through monitoring and other activities.
5-03	It is not clear why EPA chose to consider "4 facilities suspected of PCB contaminated stormwater discharges as a component of the PCB loadings attributed to MS4s." TMDL at 57-58 (emphasis added). The MS4s are point sources and are required to be explicitly accounted for in the WLA. Therefore, if the 4 facilities with stormwater runoff are to be considered explicitly so to must the 4 facilities. Additionally, § 402(p) of the Clean Water Act requires a NPDES permit for stormwater discharges associated with industrial activity-as is the case. Therefore, the 4 facilities are point sources and require to be explicitly accounted for by the steady-state model.	Text was updated. The methodology used to calculate loads for the MS4s is based on flow generated by total land area. Loads for these stormwater sites were calculated using the same methodology. WLAs for the facilities were determined based on an estimate of the facilities' land area and flows estimated for the MS4 in which the facility is located. The allowable loading for these facilities are identified in the WLA portion of the TMDL, separate from the WLA assigned by segment to MS4 loadings, in Section 5.3 of the report.
5-04	There is no reason why EPA could not and should not have verified the accuracy of the PCB effluent limitation for the 2 two pretreatment facilities (PA0026964 and PA0043974). It would only make sense for EPA to verify such numbers with DEP and the facilities prior to using such numbers in the modeling process and to establish the TMDL.	Text was updated. Consultation with EPA's pretreatment program revealed that these two POTWs currently do not have PCB limits, nor do they have local limits for PCBs that would apply to the industries that discharge to their systems. Additionally, PADEP was consulted during development of the TMDL in an effort to acquire all relevant facility permit limits and discharge data. PADEP was also given the opportunity to review the draft report including all facility data. A concerted effort was made to use the most accurate and up to date information possible for all facilities.

Letter ID	Comment	Response
5-05	It disturbs MAELC that EPA stated, "Achievement of the TMDL was not possible using the available permit limits, thus these facilities were ultimately assigned a concentration equal to the water column criteria for the TMDL condition." This statement seems to imply that WLA & LA allocations should be set in such a way as to strive to allow point source permitholders to keep their current limits. TMDLs are only established for waters that are already impaired for certain pollutants and reductions of discharges of those pollutants are expected and required to be reduced for both WLA and LA.	The proposed TMDL required that the existing PCB permit limits of these two facilities be reduced to a concentration consistent with water quality criteria. EPA is not implying that WLA and LA allocations be assigned so as to allow point sources permittees to maintain their current limits, since maintaining these point sources at their currently permitted PCB limit would not allow for the attainment of water quality standards.
5-06	The flow generated from the MS4s was estimated using the unit area flow of the Wissahickon watershed. This suggests that none of the MS4s addressed in this TMDL have permits for their stormwater discharges nor any information related to the amount of flow. See TMDL at 59.	MS4 flows have been re-estimated using USGS regression equations for stream flow for the state of Pennsylvania. See text of the report. This does not suggest that the MS4s do not have permits for their stormwater discharges. By March 2003, such MS4s should have already applied for coverage under Pennsylvania's Phase II MS4 Stormwater Permit.
5-07	The estimated flow generated for each of the MS4s is insufficient to use to assess the amount of PCBs contributed by each of the MS4s. EPA fails to look into other factors that may be predictors of the amount of PCBs contributed by the MS4s.	The estimation of flows to generate a stormwater-type load is widely used and is acceptable for TMDL purposes. In the absence of detailed soil and site contamination data, this gross level of estimation was deemed to be appropriate.
5-08	MAELC is encouraged by the use of an explicit MOS set at 10%.	Comment noted.
5-09	The TMDL fails to meet the basic requirements of a TMDL. A required component of a TMDL is Wasteload Allocation ("WLA"). The WLA is the portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. This TMDL fails to meet that definition by assigning a categorical WLA to the MS4s within the individual model segments. It is not clear from the TMDL, without performing our own calculation, whether the MS4s in a specific segment are each given the specified WLA in Table 5-5 or whether as a total of the MS4s in that segment must meet the specifed WLA. If the answer is each MS4 is entitled to the WLA then the WLA does not make sense given the varying estimated flow (mgd) for each of the MS4s. If the answer is all of the MS4s in a given segment have to share the WLA then the TMDL is inadequate for failing to meet the definition of WLA. Each MS4 should have a separate and individual calculation.	EPA respectfully disagrees and finds that this TMDL meets all statutory and regulatory requirements. The TMDL sets a categorical WLA for MS4s for each modeled segment, so that the combined load for MS4s within a given segment would meet the WLA. This is allowable under 40 CFR Part 130.2(i). It may be reasonable to express allocations for NPDES-regulated stormwater discharges from multiple point sources as a single categorical WLA when data and information are insufficient to assign each source or outfall individual WLA. This is the case for the Schuylkill River, as MS4 flow data, information on individual outfalls, and other pertinent data are currently not available.

Appendix F: Responsiveness Summary - Schuylkill River PCB TMDL

Letter ID	Comment	Response
6-01	The numeric WLAs are indefensible. It is inappropriate to identify point sources as subject to WLAs in the absence of any data or information confirming that PCBs are present in or have the reasonable potential to be present in the discharge. The Schuylkill River PCB TMDL appears to select a subset of the universe of NPDES permittees for coverage within the TMDL without explanation and regardless of the location or volume of the permitted discharges. This includes point source discharges that are owned or operated by Exelon. This practice is not consistent with the methodology prescribed in EPA's TMDL regulations or guidance.	See response to Comment 3-10.
6-02	In addition to using a flawed approach in setting the WLAs, EPA failed to recognize and acknowledge the fact that the selected water quality target of 0.044 ng/L is not achievable within a reasonable timeframe, if at all. EPA expressly acknowledged that decades of effort will be necessary to meet the same PCB water quality target in the Delaware Estuary (Delaware Estuary TMDL). The likelihood and timing of achieving this target is even less certain for the Schuylkill River than for the Delaware Estuary, given the dearth of data available to adequately begin to assess current - let alone future - conditions. Exelon believes that the Schuylkill River TMDL needs to expressly acknowledge EPA's conclusion in the Delaware Estuary PCB TMDL - namely that progress should be achieved through an adaptive implementation framework, rather than through the imposition of infeasible requirements. Perhaps EPA's consultant should consider the body of work developed by the IAC on PCB reduction strategies in order to reexamine the Schuylkill River TMDL in light of adaptive management principles.	See response to Comment 3-13.
6-03	In light of the considerable deficiencies in the development of the Schuylkill River PCB TMDL and the significant uncertainties raised by the extraordinarily limited data and analysis, it is inappropriate for EPA to establish WLAs for point sources. If EPA finalizes the Schuylkill River PCB TMDL Report as drafted, despite the weaknesses identified by the Coalition in these comments, the Coalition recommends that the final TMDL should contain categorical WLAs and expressly apply 40 C.F.R. § I22.44(k) (as EPA did in the Delaware Estuary PCB TMDL) to authorize the use of non-numeric water quality-based effluent limits. There is clearly sufficient uncertainty associated with the methodology and the calculated values for EPA to conclude that it is infeasible to establish a defensible water quality-based numeric effluent limit for any point source discharger.	See response to Comment 3-32.

Letter ID	Comment	Response
7-1	Note that EPA received written comments from FWS after the public comment period. FWS provided comments as part of an informal consultation process between both agencies to ensure the protection of endangered and threatened species that may be affected by the Schuylkill River PCB TMDL. FWS pointed out the possible or known effects of PCBs on federally-listed threatened nesting bald eagles and endangered shortnose sturgeon species, both of which reside in the Delaware River, into which the Schuylkill River flows. Other specific comments on the modeling and data used to support the TMDL, scope of the TMDL, and lack of PCB fate and transport description, were mentioned as well.	Based on verbal conversations between EPA and FWS staff, EPA explained the reasons for moving forward with this TMDL action. As with all TMDLs, the Schuylkill River PCB TMDL can always be refined as more data and information are collected, or as TMDLs are developed for the tributaries or downstream waters. Although this TMDL has been established, EPA agrees to continue discussions over these and other concerns expressed by FWS and to coordinate on ESA issues in future TMDL actions.