ATTACHMENT 1
SUPPORTING DATA

Table 1-1 Summary of CARP Fish Tissue Data Used in Assessment

Lower Passaic River Risk Assessment - Focused Feasibility Study

	Parameter							Group								
STUDY_NAME	Sample_ID	river_mile_update	LATITUDE	LONGITUDE	Species_Code	MEDIUM	Datetime_Placed	Aroclor	Chlordane	DDT	Dieldrin	Dioxin/Furan	HMW PAH	LMW PAH	Mercury	PCBs
Harbor Fish Collection	2DMR00162	2.78	40.66333	-74.13528	Mummichog	WHOLE ORGANISM	9/28/1999	1	1	1	1	1	1	1	1	1
	2DMR00193	2.96	40.74117	-74.13333	White perch	W-H/V	9/10/1999	1	1	1	1	1	1	1	1	1
	2DMR00195	2.96	40.74117	-74.13333	White perch	W-H/V	9/10/1999	1	1	1	1	1	1	1	1	1
	2DMR00196	2.96	40.74117	-74.13333	White perch	W-H/V	9/10/1999	1	1	1	1	1	1	1	1	1
	2DMR00197	2.96	40.74117	-74.13333	White perch	W-H/V	9/10/1999	1	1	1	1	1	1	1	1	1
	2DMR00198	2.96	40.74117	-74.13333	White perch	W-H/V	9/10/1999	1	1	1	1				1	1
	2DMR00199	2.96	40.74117	-74.13333	White perch	W-H/V	9/10/1999	1	1	1	1	1	1	1	1	1
	2DMR00200	2.96	40.74117	-74.13333	White perch	W-H/V	9/10/1999	1	1	1	1				1	1
	2DMR00201	2.96	40.74117	-74.13333	White perch	W-H/V	9/10/1999	1	1	1	1				1	1
	2DMR00202	2.96	40.74117	-74.13333	White perch	W-H/V	9/10/1999	1	1	1	1	1	1	1	1	1
	2DMR00203	2.96	40.74117	-74.13333	White perch	W-H/V	9/10/1999	1	1	1	1				1	1
	2DMR00216	2.96	40.7415	-74.13217	American eel	W-H/V	9/10/1999	1	1	1	1	1			1	1
	2DMR00230	3.22	40.74117	-74.135	American eel	W-H/V	9/30/1999	1	1	1	1	1	1	1	1	1
	2DMR00231	3.22	40.74117	-74.135	American eel	W-H/V	9/30/1999	1	1	1	1	1	1	1	1	1
	2DMR00232	3.22	40.74117	-74.135	American eel	W-H/V	9/30/1999	1	1	1	1	1	1	1	1	1
	2DMR00233	3.22	40.74117	-74.135	American eel	W-H/V	9/30/1999	1	1	1	1	1	1	1	1	1
	2DMR00234	3.22	40.74117	-74.135	American eel	W-H/V	9/30/1999	1	1	1	1				1	1
	2DMR00235	3.22	40.74117	-74.135	American eel	W-H/V	9/30/1999	1	1	1	1				1	1
	2DMR00236	3.22	40.74117	-74.135	American eel	W-H/V	9/30/1999	1	1	1	1	1	1	1	1	1
	2DMR00237	3.22	40.74117	-74.135	American eel	W-H/V	9/30/1999	1	1	1	1				1	1
	2DMR00333	2.59	40.7425	-74.12933	Mummichog	WHOLE ORGANISM	11/15/1999	1	1	1	1	1	1	1	1	1
	2DMR00375	3.04	40.74117	-74.13333	White perch	WHOLE ORGANISM	11/15/1999	1	1	1	1				1	1
	2DMR00376	2.59	40.7425	-74.1225	White perch	W-H/V	11/15/1999	1	1	1	1	1	1	1	1	1
	2DMR00377	3.04	40.7425	-74.1225	White perch	W-H/V	11/15/1999	1	1	1	1	1	1	1	1	1
	2DMR00378	2.59	40.7425	-74.1225	White perch	WHOLE ORGANISM	11/15/1999	1	1	1	1				1	1
	2DMR00379	2.59	40.7425	-74.1225	White perch	W-H/V	11/15/1999	1	1	1	1				1	1
	2DMR00380	2.59	40.7425	-74.1225	White perch	W-H/V	11/15/1999	1	1	1	1	1	1	1	1	1
	2DMR00381	2.59	40.7425	-74.1225	White perch	W-H/V	11/15/1999	1	1	1	1	1	1	1	1	1
	2DMR00382	3.97	40.723	-74.12017	White perch	W-H/V	12/21/1999	1	1	1	1				1	1
	2DMR00383	3.97	40.723	-74.12017	White perch	W-H/V	12/21/1999	1	1	1	1	1	1	1	1	1
	2DMR00384	3.97	40.723	-74.12017	White perch	W-H/V	12/21/1999	1	1	1	1	1	1	1	1	1
	2DMR00603	2.71	40.74306	-74.12833	Mummichog	WHOLE ORGANISM	2/18/2000	1	1	1	1	1	1	1	1	1
	2DMR00727	3.07	40.7415	-74.13317	White perch	W-H/V	3/15/2000	1	1	1	1				1	1
	2DMR00728	3.07	40.7415	-74.13317	White perch	W-H/V	3/15/2000	1	1	1	1	1	1	1	1	1
	2DMR00729	3.07	40.7415	-74.13317	White perch	W-H/V	3/15/2000	1	1	1	1	1	1	1	1	1
	2DMR00730	3.07	40.7415	-74.13317	White perch	W-H/V	3/15/2000	1	1	1	1				1	1
	2DMR00731	3.07	40.7415	-74.13317	White perch	W-H/V	3/15/2000	1	1	1	1	1	1	1	1	1
	2DMR00732	3.07	40.7415	-74.13317	White perch	W-H/V	3/15/2000	1	1	1	1				1	1
	2DMR00733	3.07	40.7415	-74.13317	White perch	W-H/V	3/15/2000	1	1	1	1				1	1
	2DMR00734	3.07	40.7415	-74.13317	White perch	W-H/V	3/15/2000	1	1	1	1	1	1	1	1	1
	2DMR00735	3.07	40.7415	-74.13317	White perch	W-H/V	3/15/2000	1	1	1	1				1	1
	2DMR00736	3.07	40.7415	-74.13317	White perch	W-H/V	3/15/2000	1	1	1	1				1	1
	2DMR01365	2.73	40.74306	-74.12861	Mummichog	WHOLE ORG--HOMOGENIZED	5/2/2000					1	1	1	1	
	2DMR01413	2.76	40.74222	-74.12917	White perch	W-H/V	5/2/2000					1	1	1	1	
	2DMR01414	2.76	40.74222	-74.12917	White perch	W-H/V	5/2/2000					1	1	1	1	
	2DMR01415	2.76	40.74222	-74.12917	White perch	W-H/V	5/2/2000					1	1	1	1	
	2DMR01416	2.76	40.74222	-74.12917	White perch	W-H/V	5/2/2000					1	1	1	1	
	2DMR01417	2.76	40.74222	-74.12917	White perch	W-H/V	5/2/2000								1	
	2DMR01418	2.76	40.74222	-74.12917	White perch	W-H/V	5/2/2000					1	1	1	1	
	2DMR01419	2.76	40.74222	-74.12917	White perch	W-H/V	5/2/2000					1	1	1	1	
	2DMR01420	2.76	40.74222	-74.12917	White perch	W-H/V	5/2/2000								1	
	2DMR01421	2.76	40.74222	-74.12917	White perch	W-H/V	5/2/2000								1	
	2DMR01422	2.76	40.74222	-74.12917	White perch	W-H/V	5/2/2000								1	
Grand Total								42	42	42	42	32	31	31	53	42

Table 1-2 Summary of CARP Blue Crab Tissue Data Used in Assessment

Lower Passaic River Risk Assessment - Focused Feasibility Study

	Parameter							Group									
STUDY_NAME	Sample_ID	river_mile_update	LATITUDE	LONGITUDE	Species_Code	Matrix	Datetime_Placed	Aroclor	Chlordane	DDT	Dieldrin	Dioxin/Furan	Mercury	PCBs	Lead	HMW PAH	LMW PAH
Harbor Crustacean Collection	2DMR00958	2.96	40.74117	-74.13333	Blue crab	HEPATOPANCREAS	9/10/1999	1					1	1	1		
	2DMR00959	2.96	40.74117	-74.13333	Blue crab	MUSCLE TISSUE	9/10/1999	1	1	1	1		1	1	1		
	2DMR00960	2.96	40.74117	-74.13333	Blue crab	HEPATOPANCREAS	9/10/1999									1	1
	2DMR00961	2.96	40.74117	-74.13333	Blue crab	MUSCLE TISSUE	9/10/1999									1	1
	2DMR00962	2.96	40.74117	-74.13333	Blue crab	HEPATOPANCREAS	9/10/1999	1	1	1	1		1	1	1		
	2DMR00963	2.96	40.74117	-74.13333	Blue crab	MUSCLE TISSUE	9/10/1999	1	1	1	1		1	1	1		
	2DMR00964	2.96	40.74117	-74.13333	Blue crab	HEPATOPANCREAS	9/10/1999									1	1
	2DMR00965	2.96	40.74117	-74.13333	Blue crab	MUSCLE TISSUE	9/10/1999									1	1
	2DMR00980	2.78	40.74133	-74.13033	Blue crab	HEPATOPANCREAS	9/23/1999						1	1	1		
	2DMR00981	2.78	40.74133	-74.13033	Blue crab	MUSCLE TISSUE	9/23/1999						1	1	1		
	2DMR00983	2.78	40.74133	-74.13033	Blue crab	MUSCLE TISSUE	9/23/1999									1	1
	2DMR00994	2.96	40.74117	-74.13333	Blue crab	ALL EDIBLE TISSUE	9/10/1999		1	1	1	1	1	1	1	1	1
	2DMR00995	2.96	40.74117	-74.13333	Blue crab	ALL EDIBLE TISSUE	9/10/1999	1	1	1	1		1	1	1		
	2DMR00998	2.96	40.74117	-74.13333	Blue crab	ALL EDIBLE TISSUE	9/10/1999	1	1	1	1		1	1	1		
	2DMR00999	2.96	40.74117	-74.13333	Blue crab	ALL EDIBLE TISSUE	9/10/1999	1	1	1	1		1	1	1		
	2DMR01000	2.96	40.74117	-74.13333	Blue crab	ALL EDIBLE TISSUE	9/10/1999	1	1	1	1	1	1	1	1	1	1
	2DMR01001	2.96	40.74117	-74.13333	Blue crab	ALL EDIBLE TISSUE	9/10/1999	1	1	1	1	1	1	1	1	1	1
	2DMR01002	2.78	40.74133	-74.13033	Blue crab	ALL EDIBLE TISSUE	9/23/1999	1	1	1	1	1	1	1	1	1	1
	2DMR01003	2.78	40.74133	-74.13033	Blue crab	ALL EDIBLE TISSUE	9/23/1999	1	1	1	1	1	1	1	1	1	1
Grand Total								11	11	11	11	5	14	14	14	10	10

Table 1-3 Summary of PREmis Tissue Data Used in Assessment

Lower Passaic River Risk Assessment - Focused Feasibility Study

	Parameter							Group											
Study_Name	Sample_ID	river_mile_update	X_Coord	Y_Coord	Species_Code	Matrix	Datetime_Placed	Aroclor	Chlordane	Copper	DDT	Dieldrin	Dioxin/Furan	HMW PAH	Lead	LMW PAH	Mercury	Methyl Mercury	PCBs
93F64HR: HACKENSACK RIVER	DMDAT004674	0.01	598160.4136	683396.7222	MACOMA NASUTA	TISSUE	7/1/1993		1	1	1	1		1	1	1	1		1
	DMDAT004675	0.01	598160.4136	683396.7222	NEREIS VIRENS	TISSUE	7/1/1993		1	1	1	1	1	1	1	1	1		1
NYSDEC 1993	125520_NY085	0.1	599511.1474	685133.0802	BUTFS	SF	10/19/1993	1	1		1	1					1		
	125521_NY085	0.1	599511.1474	685133.0802	BUTFS	SF	10/19/1993	1	1		1	1					1		
	125522_NY085	0.1	599511.1474	685133.0802	BUTFS	SF	10/19/1993	1	1		1	1					1		
	125527A_NY085	0.1	599511.1474	685133.0802	STB	HEP	10/19/1993								1		1		
	125527B_NY085	0.1	599511.1474	685133.0802	STB	MSCL	10/19/1993								1		1		
	125527STB_NY085	0.1	599511.1474	685133.0802	STB	SF	10/19/1993	1	1		1	1					1		
	125528A_NY085	0.1	599511.1474	685133.0802	BCRAB	HEP	10/19/1993	1	1		1	1							
	125528B_NY085	0.1	599511.1474	685133.0802	BCRAB	MSCL	10/19/1993	1	1		1	1							
	125529A_NY085	0.1	599511.1474	685133.0802	BCRAB	HEP	10/19/1993								1		1		
	125529B_NY085	0.1	599511.1474	685133.0802	BCRAB	MSCL	10/19/1993								1		1		
	125530A_NY085	0.1	599511.1474	685133.0802	BCRAB	HEP	10/19/1993						1						
	125530B_NY085	0.1	599511.1474	685133.0802	BCRAB	MSCL	10/19/1993						1						
	125532_NY085	0.1	599511.1474	685133.0802	SCUP	SF	10/19/1993	1	1		1	1					1		
	125534A_NY085	0.1	599511.1474	685133.0802	BCRAB	HEP	10/19/1993						1						
	125534B_NY085	0.1	599511.1474	685133.0802	BCRAB	MSCL	10/19/1993						1						
NYSDEC 1994	129238_NY086	0.85	597003.1844	688182.2936	WP	SF	4/22/1994	1	1		1	1					1		
	129239_NY086	0.85	597003.1844	688182.2936	WP	SF	4/22/1994	1	1		1	1					1		
	129240_NY086	0.85	597003.1844	688182.2936	WP	SF	4/22/1994	1	1		1	1					1		
	129242_NY086	0.85	597003.1844	688182.2936	WP	SF	4/22/1994	1	1		1	1					1		
	129243_NY086	0.85	597003.1844	688182.2936	WP	SF	4/22/1994	1	1		1	1	1				1		
PASSAIC 1995 Biological Sampling Program	BCH1	1.99	598212	694717	Crab	TISSUE	9/14/1995	1	1	1	1	1	1	1	1	1	1	1	1
	BCH2	4.5	586142	692573	Crab	TISSUE	9/14/1995	1	1	1	1	1	1	1	1	1	1	1	1
	BCM1A	1.99	598212	694717	Crab	TISSUE	9/14/1995	1	1	1	1	1	1	1	1	1	1	1	1
	BCM1B	1.83	597808	693258	Crab	TISSUE	9/14/1995	1	1	1	1	1	1	1	1	1	1	1	1
	BCM2A	4.5	586142	692573	Crab	TISSUE	9/14/1995	1	1	1	1	1	1	1	1	1	1	1	1
	BCM2B	4.36	587691	692539	Crab	TISSUE	9/14/1995	1	1	1	1	1	1	1	1	1	1	1	1
	MUM1A	1.99	598212	694717	Mummichog	TISSUE	9/14/1995	1	1	1	1	1	1	1	1	1	1	1	1
	MUM1B	1.83	597808	693258	Mummichog	TISSUE	9/14/1995	1	1	1	1	1	1	1	1	1	1	1	1
	MUM2A	4.5	586142	692573	Mummichog	TISSUE	9/14/1995	1	1	1	1	1	1	1	1	1	1	1	1
	MUM2B	4.36	587691	692539	Mummichog	TISSUE	9/14/1995	1	1	1	1	1	1	1	1	1	1	1	1
	MUM3A	4.36	587691	692539	Mummichog	TISSUE	9/14/1995	1	1	1	1	1	1	1	1	1	1	1	1
	SB1	1.08	597437	689395	Striped Bass	TISSUE	9/14/1995	1	1	1	1	1	1	1	1	1	1	1	1
	SB2	1.41	597665	691072	Striped Bass	TISSUE	9/14/1995	1	1	1	1	1	1	1	1	1	1	1	1
PASSAIC 1999 Late Summer/Early Fall ESP Sampling Program	DTIBV01A	1.37	597422	690947	Transplant Ribbed Mussel	TISSUE	9/7/1999						1						1
	DTIBV01A - DUP-NWB	1.38	597535.1502	690981.5328	Transplanted Ribbed Mussel	TISSUE	9/7/1999						1						1
	DTIBV01B	2.29	597378	695377	Transplant Ribbed Mussel	TISSUE	9/7/1999	1	1	1	1	1		1	1	1	1		
	DTIBV01B - DUP-NWB	2.28	597490.535	695414.2147	Transplanted Ribbed Mussel	TISSUE	9/7/1999	1	1	1	1	1		1	1	1	1		
	DTIBV01C	4.22	588428	692596	Transplant Ribbed Mussel	TISSUE	9/7/1999							1		1			
	DTIBV01C - DUP-NWB	4.2	588541.0401	692631.3764	Transplanted Ribbed Mussel	TISSUE	9/7/1999							1		1			
	DTIBW01	1.8	597839	693098	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	DTIBW01 - DUP-NWB	1.81	597953.1846	693134.5475	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	DTIMW01	4.21	588447	692644	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	DTIMW01 - DUP-NWB	4.19	588559.1292	692679.3379	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	DTIMW02	4.2	588552	692644	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	DTIMW02 - DUP-NWB	4.17	588666.1216	692680.1357	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	DTIMW05	1.8	597839	693098	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	DTIMW05 - DUP-NWB	1.81	597953.1846	693134.5475	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	DTIMW06	2.29	597378	695384	Crab	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	DTIMW06 - DUP-NWB	2.28	597491.5443	695419.2123	Crab	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	DTIMW07	1.48	597844	691422	Adult Striped Bass	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	DTIMW07 - DUP-NWB	1.49	597956.0159	691458.6944	Adult Striped Bass	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIBH1	1.35	597386	690845	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIBH1-NWB	1.36	597499.9643	690881.6084	Crab	TISSUE	10/25/1999						1						
	PR9901TIBM1	1.35	597386	690845	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIBM1-NWB	1.36	597499.9643	690881.6084	Crab	TISSUE	10/22/1999						1						
	PR9901TIBV	1.37	597422	690947	Transplant Ribbed Mussel	TISSUE	9/7/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIBW1	1.35	597386	690845	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIBW1-NWB	1.36	597499.9643	690881.6084	Crab	TISSUE	10/22/1999						1						
	PR9901TIFF13	1.48	597844	691422	Adult Striped Bass	TISSUE	10/28/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIFF13-NWB	1.49	597956.0159	691458.6944	Adult Striped Bass	TISSUE	10/28/1999						1				1		
	PR9901TIFF3	1.48	597844	691422	Adult Striped Bass	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIFF3-NWB	1.49	597956.0159	691458.6944	Adult Striped Bass	TISSUE	10/27/1999												1
	PR9901TIFF4	1.48	597844	691422	Adult Striped Bass	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIFF4-NWB	1.49	597956.0159	691458.6944	Adult Striped Bass	TISSUE	10/27/1999						1						1
	PR9901TIFF8	1.48	597844	691422	Bluefish	TISSUE	10/28/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIFW10	1.48	597844	691422	Atlantic Menhaden	TISSUE	10/28/1999	1	1	1	1	1	1	1	1	1	1		1

Table 1-3 Summary of PREmis Tissue Data Used in Assessment

Lower Passaic River Risk Assessment - Focused Feasibility Study

	Parameter							Group										
Study_Name	Sample_ID	river_mile_update	X_Coord	Y_Coord	Species_Code	Matrix	Datetime_Placed	Aroclor	Chlordane	Copper	DDT	Dieldrin	Dioxin/Furan	HMW PAH	Lead	LMW PAH	Mercury	Methyl Mercury	PCBs
PASSAIC 1999 Late Summer/Early Fall ESP Sampling Program	PR9901TIFW15	1.48	597844	691422	Atlantic Menhaden	TISSUE	10/28/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIFW16	1.48	597844	691422	Adult Striped Bass	TISSUE	10/28/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIFW16-NWB	1.49	597956.0159	691458.6944	Adult Striped Bass	TISSUE	10/28/1999						1						
	PR9901TIFW23	1.48	597844	691422	Bluefish	TISSUE	10/28/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIFW23-NWB	1.49	597956.0159	691458.6944	Bluefish	TISSUE	10/28/1999						1						
	PR9901TIFW24	1.48	597844	691422	Atlantic Menhaden	TISSUE	10/28/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIFW25	1.48	597844	691422	Bluefish	TISSUE	10/28/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIFW5	1.48	597844	691422	Adult Striped Bass	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIFW5-NWB	1.49	597956.0159	691458.6944	Adult Striped Bass	TISSUE	10/27/1999						1						1
	PR9901TIMWL	1.32	597321	690677	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIMWL-NWB	1.33	597433.6546	690714.7488	Mummichog	TISSUE	10/20/1999						1		1				
	PR9901TIMWM	1.34	597339	690826	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIMWM-NWB	1.36	597452.9345	690863.6989	Mummichog	TISSUE	10/20/1999						1		1				
	PR9901TIMWU	1.37	597386	690969	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9901TIMWU-NWB	1.39	597500.1949	691003.5969	Mummichog	TISSUE	10/20/1999						1		1				
	PR9902TIBH1	1.8	597839	693098	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9902TIBM1	1.8	597839	693098	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9902TIBM1-NWB	1.81	597953.1846	693134.5475	Crab	TISSUE	10/25/1999												1
	PR9902TIBV	1.8	597842	693098	Transplant Ribbed Mussel	TISSUE	9/7/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9902TIBW1	1.8	597839	693098	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9902TIMWL	1.78	597804	692989	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9902TIMWL-NWB	1.78	597917.9817	693025.6239	Mummichog	TISSUE	10/20/1999						1		1				
	PR9902TIMWM	1.8	597815	693098	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9902TIMWM-NWB	1.81	597926.1852	693133.5986	Mummichog	TISSUE	10/20/1999						1		1				
	PR9902TIMWU	1.82	597833	693226	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9902TIMWU-NWB	1.83	597947.4271	693262.5468	Mummichog	TISSUE	10/20/1999						1		1				
	PR9903TIBH1	2.29	597378	695384	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9903TIBM1	2.29	597378	695384	Crab	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9903TIBM1-NWB	2.28	597491.5443	695419.2123	Crab	TISSUE	10/26/1999								1				1
	PR9903TIBV	2.29	597378	695377	Transplant Ribbed Mussel	TISSUE	9/7/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9903TIBW1	2.29	597378	695384	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9903TIBW1-NWB	2.28	597491.5443	695419.2123	Crab	TISSUE	10/22/1999						1						
	PR9903TIMWL	2.27	597497	695337	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9903TIMWL-NWB	2.26	597609.4487	695373.9936	Mummichog	TISSUE	10/19/1999						1						
	PR9903TIMWM	2.29	597386	695399	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9903TIMWM-NWB	2.28	597498.572	695434.1977	Mummichog	TISSUE	10/19/1999						1						
	PR9903TIMWU	2.31	597303	695453	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9903TIMWU-NWB	2.3	597414.6854	695490.3511	Mummichog	TISSUE	10/19/1999						1						
	PR9903TISVL	2.27	597497	695337	Silverside	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9903TISVL-NWB	2.26	597609.4487	695373.9936	Silverside	TISSUE	10/26/1999								1				
	PR9903TISVM	2.29	597386	695399	Silverside	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9903TISVM-NWB	2.28	597498.572	695434.1977	Silverside	TISSUE	10/26/1999								1				
	PR9903TISVU	2.31	597303	695453	Silverside	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9903TISVU-NWB	2.3	597414.6854	695490.3511	Silverside	TISSUE	10/26/1999						1		1				
	PR9904TIBH1	2.77	594818	695227	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9904TIBH1-NWB	2.75	594932.4707	695264.0623	Crab	TISSUE	10/25/1999						1						
	PR9904TIBM1	2.77	594818	695227	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9904TIBM1-NWB	2.75	594932.4707	695264.0623	Crab	TISSUE	10/22/1999						1						1
	PR9904TIBV	2.77	594818	695235	Transplant Ribbed Mussel	TISSUE	9/7/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9904TIBW1	2.77	594818	695227	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9904TIFF1	2.72	595066	695516	Adult Striped Bass	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9904TIFF1-NWB	2.7	595178.9913	695550.5705	Adult Striped Bass	TISSUE	10/27/1999						1						1
	PR9904TIFW1	2.72	595066	695516	Adult Striped Bass	TISSUE	10/28/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9904TIFW2	2.72	595066	695516	White Perch	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9904TIFW2-NWB	2.7	595178.9913	695550.5705	White Perch	TISSUE	10/27/1999						1						
	PR9904TIMWL	2.74	594973	695232	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9904TIMWM	2.77	594838	695206	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9904TIMWM-NWB	2.75	594951.4255	695241.0285	Mummichog	TISSUE	10/19/1999						1						
	PR9904TIMWU	2.79	594733	695176	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9904TIMWU-NWB	2.77	594846.3763	695210.2298	Mummichog	TISSUE	10/19/1999						1						
	PR9905TIBH1	3.2	592501	695349	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9905TIBH1-NWB	3.18	592612.8988	695385.4346	Crab	TISSUE	10/25/1999						1						
	PR9905TIBM1	3.2	592501	695349	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9905TIBM1-NWB	3.18	592612.8988	695385.4346	Crab	TISSUE	10/22/1999						1						
	PR9905TIBV	3.2	592507	695341	Transplant Ribbed Mussel	TISSUE	9/7/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9905TIBW1	3.2	592501	695349	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9905TIBW1-NWB	3.18	592612.8988	695385.4346	Crab	TISSUE	10/22/1999						1						
	PR9905TIMWL	3.18	592606	695415	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1

Table 1-3 Summary of PREmis Tissue Data Used in Assessment

Lower Passaic River Risk Assessment - Focused Feasibility Study

	Parameter							Group										
Study_Name	Sample_ID	river_mile_update	X_Coord	Y_Coord	Species_Code	Matrix	Datetime_Placed	Aroclor	Chlordane	Copper	DDT	Dieldrin	Dioxin/Furan	HMW PAH	Lead	LMW PAH	Mercury	Methyl Mercury	PCBs
PASSAIC 1999 Late Summer/Early Fall ESP Sampling Program	PR9905TIMWL-NWB	3.16	592718.0104	695449.2302	Mummichog	TISSUE	10/19/1999						1						
	PR9905TIMWM	3.21	592490	695378	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9905TIMWM-NWB	3.18	592603.9525	695413.449	Mummichog	TISSUE	10/19/1999						1						
	PR9905TIMWU	3.23	592374	695334	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9905TIMWU-NWB	3.21	592486.8779	695368.6743	Mummichog	TISSUE	10/19/1999						1						
	PR9906TIBH1	3.88	590020	692898	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9906TIBH1-NWB	3.86	590132.4751	692933.3424	Crab	TISSUE	10/25/1999						1						
	PR9906TIBM1	3.88	590020	692898	Crab	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9906TIBM1-NWB	3.86	590132.4751	692933.3424	Crab	TISSUE	10/26/1999								1				1
	PR9906TIBV	3.88	590029	692887	Transplant Ribbed Mussel	TISSUE	9/7/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9906TIBV-NWB	3.86	590142.4535	692922.3245	Transplanted Ribbed Mussel	TISSUE	9/7/1999						1						
	PR9906TIBW1	3.88	590020	692898	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9906TIBW1-NWB	3.86	590132.4751	692933.3424	Crab	TISSUE	10/22/1999						1						
	PR9906TIMWL	3.85	590114	693022	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9906TIMWL-NWB	3.83	590227.701	693057.1514	Mummichog	TISSUE	10/19/1999						1						
	PR9906TIMWM	3.88	590012	692934	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9906TIMWM-NWB	3.85	590123.544	692969.356	Mummichog	TISSUE	10/19/1999						1						
	PR9906TIMWU	3.9	589904	692875	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9906TIMWU-NWB	3.88	590015.444	692911.5655	Mummichog	TISSUE	10/19/1999						1						
	PR9907TIBH1	4.07	589145	692158	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9907TIBM1	4.07	589145	692158	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9907TIBM1-NWB	4.06	589256.1507	692193.0646	Crab	TISSUE	10/22/1999						1						1
	PR9907TIBV	4.07	589147	692169	Transplant Ribbed Mussel	TISSUE	9/7/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9907TIBV-NWB	4.06	589260.1711	692204.0561	Transplanted Ribbed Mussel	TISSUE	9/7/1999						1						
	PR9907TIBW1	4.07	589145	692158	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9907TIBW1-NWB	4.06	589256.1507	692193.0646	Crab	TISSUE	10/22/1999						1						
	PR9907TIMWL	4.06	589264	692141	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9907TIMWL-NWB	4.04	589377.1097	692176.8376	Mummichog	TISSUE	10/19/1999						1						
	PR9907TIMWM	4.07	589139	692129	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9907TIMWM-NWB	4.06	589253.0961	692164.073	Mummichog	TISSUE	10/19/1999						1						
	PR9907TIMWU	4.09	589031	692118	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9907TIMWU-NWB	4.07	589145.0868	692154.278	Mummichog	TISSUE	10/19/1999						1						
	PR9908TIBH1	4.22	588428	692607	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9908TIBH1-NWB	4.2	588542.0627	692643.3734	Crab	TISSUE	10/25/1999						1						
	PR9908TIBM1	4.22	588428	692607	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9908TIBM1-NWB	4.2	588542.0627	692643.3734	Crab	TISSUE	10/25/1999												1
	PR9908TIBV	4.22	588428	692596	Transplant Ribbed Mussel	TISSUE	9/7/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9908TIBV-NWB	4.2	588541.0401	692631.3764	Transplanted Ribbed Mussel	TISSUE	9/7/1999						1						
	PR9908TIBW1	4.22	588428	692607	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9908TIBW1-NWB	4.2	588542.0627	692643.3734	Crab	TISSUE	10/22/1999						1						
	PR9908TIFF14	4.23	588368	692396	Adult Striped Bass	TISSUE	10/28/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9908TIFW11	4.23	588368	692396	Atlantic Menhaden	TISSUE	10/28/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9908TIFW11-NWB	4.21	588479.6695	692432.5102	Atlantic Menhaden	TISSUE	10/28/1999						1						
	PR9908TIFW17	4.23	588368	692396	Atlantic Menhaden	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9908TIFW18	4.23	588368	692396	Atlantic Menhaden	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9908TIMWL	4.2	588552	692644	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9908TIMWL-NWB	4.17	588666.1216	692680.1357	Mummichog	TISSUE	10/20/1999						1		1				
	PR9908TIMWM	4.21	588447	692644	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9908TIMWM-NWB	4.19	588559.1292	692679.3379	Mummichog	TISSUE	10/19/1999						1						
	PR9908TIMWU	4.24	588325	692636	Mummichog	TISSUE	10/21/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9908TIMWU-NWB	4.22	588437.123	692670.5692	Mummichog	TISSUE	10/21/1999								1				
	PR9909TIBH1	5	585113	694267	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9909TIBM1	5	585113	694267	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9909TIBM1-NWB	5	585226.4785	694301.4897	Crab	TISSUE	10/25/1999												1
	PR9909TIBV	5	585124	694270	Transplant Ribbed Mussel	TISSUE	9/7/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9909TIBV-NWB	5	585237.487	694306.4685	Transplanted Ribbed Mussel	TISSUE	9/7/1999		1				1						
	PR9909TIBW1	5	585113	694267	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9909TIBW1-NWB	5	585226.4785	694301.4897	Crab	TISSUE	10/22/1999						1						
	PR9909TIMWL	4.97	585141	694132	Mummichog	TISSUE	10/21/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9909TIMWL-NWB	4.97	585253.221	694166.4512	Mummichog	TISSUE	10/21/1999						1		1				
	PR9909TIMWM	5	585102	694270	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9909TIMWM-NWB	5	585213.491	694307.5137	Mummichog	TISSUE	10/20/1999						1		1				
	PR9909TIMWU	5.02	585063	694368	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9909TIMWU-NWB	5.02	585174.6796	694405.5783	Mummichog	TISSUE	10/20/1999						1		1				
	PR9910TIBH1	5.66	584484	697751	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9910TIBH1-NWB	5.66	584597.1172	697785.3679	Crab	TISSUE	10/25/1999						1						
	PR9910TIBM1	5.66	584484	697751	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9910TIBM1-NWB	5.66	584597.1172	697785.3679	Crab	TISSUE	10/25/1999							1		1			1

Table 1-3 Summary of PREmis Tissue Data Used in Assessment

Lower Passaic River Risk Assessment - Focused Feasibility Study

	Parameter							Group										
Study_Name	Sample_ID	river_mile_update	X_Coord	Y_Coord	Species_Code	Matrix	Datetime_Placed	Aroclor	Chlordane	Copper	DDT	Dieldrin	Dioxin/Furan	HMW PAH	Lead	LMW PAH	Mercury	Methyl Mercury	PCBs
PASSAIC 1999 Late Summer/Early Fall ESP Sampling Program	PR9910TIBV	5.66	584507	697751	Transplant Ribbed Mussel	TISSUE	9/7/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9910TIBW1	5.66	584484	697751	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9910TIBW1-NWB	5.66	584597.1172	697785.3679	Crab	TISSUE	10/22/1999						1						
	PR9910TIMWL	5.63	584452	697663	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9910TIMWL-NWB	5.65	584564.9593	697700.4363	Mummichog	TISSUE	10/19/1999						1						
	PR9910TIMWM	5.66	584462	697765	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9910TIMWM-NWB	5.66	584575.1493	697801.408	Mummichog	TISSUE	10/19/1999						1						
	PR9910TIMWU	5.67	584484	697867	Mummichog	TISSUE	10/19/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9910TIMWU-NWB	5.68	584596.3403	697903.3588	Mummichog	TISSUE	10/19/1999						1						
	PR9911TIBH1	6.29	585239	701076	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIBM1	6.29	585239	701076	Crab	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIBM1-NWB	6.31	585352.3527	701110.6587	Crab	TISSUE	10/26/1999								1				1
	PR9911TIBV	6.3	585231	701083	Transplant Ribbed Mussel	TISSUE	9/7/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIBW1	6.29	585239	701076	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIBW1-NWB	6.31	585352.3527	701110.6587	Crab	TISSUE	10/22/1999						1						
	PR9911TIFF2	6.28	585170	701003	Adult Striped Bass	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIFF2-NWB	6.29	585283.2242	701039.7954	Adult Striped Bass	TISSUE	10/27/1999						1						1
	PR9911TIFW13	6.28	585170	701003	White Perch	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIFW13-NWB	6.29	585283.2242	701039.7954	White Perch	TISSUE	10/27/1999						1						
	PR9911TIFW14	6.28	585170	701003	White Perch	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIFW21	6.28	585170	701003	White Perch	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIFW21-NWB	6.29	585283.2242	701039.7954	White Perch	TISSUE	10/27/1999						1						
	PR9911TIFW22	6.28	585170	701003	White Perch	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIFW22-NWB	6.29	585283.2242	701039.7954	White Perch	TISSUE	10/27/1999						1						1
	PR9911TIFW26	6.28	585170	701003	Juvenile Striped Bass	TISSUE	10/28/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIFW26-NWB	6.29	585283.2242	701039.7954	Juvenile Striped Bass	TISSUE	10/28/1999						1						
	PR9911TIFW3	6.28	585170	701003	White Perch	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIFW3-NWB	6.29	585283.2242	701039.7954	White Perch	TISSUE	10/27/1999						1						
	PR9911TIFW4	6.28	585170	701003	Juvenile Striped Bass	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIFW4-NWB	6.29	585283.2242	701039.7954	Juvenile Striped Bass	TISSUE	10/27/1999						1						1
	PR9911TIMWL	6.27	585231	700941	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIMWL-NWB	6.28	585345.0993	700976.6837	Mummichog	TISSUE	10/20/1999						1		1				
	PR9911TIMWM	6.29	585261	701069	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIMWM-NWB	6.31	585374.3394	701104.6177	Mummichog	TISSUE	10/20/1999						1		1				
	PR9911TIMWU	6.32	585297	701182	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TIMWU-NWB	6.33	585408.5524	701218.5434	Mummichog	TISSUE	10/20/1999						1		1				
	PR9911TISVL	6.27	585231	700941	Silverside	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TISVL-NWB	6.28	585345.0993	700976.6837	Silverside	TISSUE	10/26/1999						1		1				
	PR9911TISVM	6.29	585261	701069	Silverside	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TISVM-NWB	6.31	585374.3394	701104.6177	Silverside	TISSUE	10/26/1999								1				
	PR9911TISVU	6.32	585297	701182	Silverside	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9911TISVU-NWB	6.33	585408.5524	701218.5434	Silverside	TISSUE	10/26/1999								1				1
	PR9912TIBH1	6.82	586310	703612	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9912TIBH1-NWB	6.84	586421.0689	703646.4253	Crab	TISSUE	10/25/1999						1						
	PR9912TIBM1	6.82	586310	703612	Crab	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9912TIBM1-NWB	6.84	586421.0689	703646.4253	Crab	TISSUE	10/26/1999								1				1
	PR9912TIBV	6.82	586321	703608	Transplant Ribbed Mussel	TISSUE	9/7/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9912TIBV-NWB	6.84	586433.066	703645.4027	Transplanted Ribbed Mussel	TISSUE	9/7/1999		1										
	PR9912TIBW1	6.82	586310	703612	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9912TIBW1-NWB	6.84	586421.0689	703646.4253	Crab	TISSUE	10/22/1999						1						
	PR9912TIMWL	6.8	586238	703539	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9912TIMWL-NWB	6.82	586350.9386	703574.564	Mummichog	TISSUE	10/20/1999						1		1				
	PR9912TIMWM	6.82	586296	703626	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9912TIMWM-NWB	6.84	586407.1005	703662.4504	Mummichog	TISSUE	10/20/1999						1		1				
	PR9912TIMWU	6.84	586378	703729	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9912TIMWU-NWB	6.86	586491.2883	703765.2826	Mummichog	TISSUE	10/20/1999						1		1				
	PR9913TIBH1	1.07	597049	689419	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9913TIBH1-NWB	1.08	597162.2935	689453.3759	Crab	TISSUE	10/25/1999						1						
	PR9913TIBM1	1.07	597049	689419	Crab	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9913TIBM1-NWB	1.08	597162.2935	689453.3759	Crab	TISSUE	10/26/1999								1				1
	PR9913TIBV	1.04	597013	689291	Transplant Ribbed Mussel	TISSUE	9/8/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9913TIBV-NWB	1.05	597127.0585	689327.4539	Transplanted Ribbed Mussel	TISSUE	9/8/1999						1						
	PR9913TIBW1	1.07	597049	689419	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9913TIMWL	1.04	596980	689291	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9913TIMWL-NWB	1.05	597094.0577	689325.5164	Mummichog	TISSUE	10/20/1999						1		1				
	PR9913TIMWM	1.06	597007	689408	Mummichog	TISSUE	10/21/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9913TIMWM-NWB	1.07	597120.2803	689444.4561	Mummichog	TISSUE	10/21/1999						1		1				
	PR9913TIMWU	1.1	597067	689619	Mummichog	TISSUE	10/20/1999	1	1	1	1	1	1	1	1	1	1		1

Table 1-3 Summary of PREmis Tissue Data Used in Assessment

Lower Passaic River Risk Assessment - Focused Feasibility Study

	Parameter							Group										
Study_Name	Sample_ID	river_mile_update	X_Coord	Y_Coord	Species_Code	Matrix	Datetime_Placed	Aroclor	Chlordane	Copper	DDT	Dieldrin	Dioxin/Furan	HMW PAH	Lead	LMW PAH	Mercury	Methyl Mercury	PCBs
PASSAIC 1999 Late Summer/Early Fall ESP Sampling Program	PR9913TIMWU-NWB	1.12	597180.6718	689654.323	Mummichog	TISSUE	10/20/1999						1		1				
	PR9914TIBH1	3.14	592966	694986	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9914TIBH1-NWB	3.11	593077.1749	695023.5899	Crab	TISSUE	10/25/1999						1						
	PR9914TIBM1	3.14	592966	694986	Crab	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9914TIBM1-NWB	3.11	593077.1749	695023.5899	Crab	TISSUE	10/26/1999								1				
	PR9914TIBV	3.14	592963	694990	Transplant Ribbed Mussel	TISSUE	9/8/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9914TIBW1	3.14	592966	694986	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9914TIBW1-NWB	3.11	593077.1749	695023.5899	Crab	TISSUE	10/22/1999						1						
	PR9914TIMWL	3.11	593076	694994	Mummichog	TISSUE	10/21/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9914TIMWL-NWB	3.09	593188.1745	695028.3797	Mummichog	TISSUE	10/21/1999						1		1				
	PR9914TIMWM	3.14	592957	694983	Mummichog	TISSUE	10/21/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9914TIMWM-NWB	3.11	593071.166	695018.6017	Mummichog	TISSUE	10/21/1999						1		1				
	PR9914TIMWU	3.16	592847	694957	Mummichog	TISSUE	10/21/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9914TIMWU-NWB	3.14	592960.1249	694991.814	Mummichog	TISSUE	10/21/1999						1		1				
	PR9914TISVL	3.11	593076	694994	Silverside	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9914TISVL-NWB	3.09	593188.1745	695028.3797	Silverside	TISSUE	10/26/1999								1				
	PR9914TISVM	3.14	592957	694983	Silverside	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9914TISVM-NWB	3.11	593071.166	695018.6017	Silverside	TISSUE	10/26/1999								1				
	PR9914TISVU	3.16	592847	694957	Silverside	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9914TISVU-NWB	3.14	592960.1249	694991.814	Silverside	TISSUE	10/26/1999								1				
	PR9915TIBH1	4.29	588035	692577	Crab	TISSUE	10/25/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9915TIBM1	4.29	588035	692577	Crab	TISSUE	10/26/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9915TIBM1-NWB	4.27	588148.041	692614.1205	Crab	TISSUE	10/26/1999								1				1
	PR9915TIBV	4.29	588040	692566	Transplant Ribbed Mussel	TISSUE	9/8/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9915TIBV-NWB	4.27	588152.0198	692603.1139	Transplanted Ribbed Mussel	TISSUE	9/8/1999		1										
	PR9915TIBW1	4.29	588035	692577	Crab	TISSUE	10/22/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9915TIBW1-NWB	4.27	588148.041	692614.1205	Crab	TISSUE	10/22/1999						1						
	PR9915TIMWL	4.27	588156	692628	Mummichog	TISSUE	10/21/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9915TIMWL-NWB	4.25	588269.1285	692665.8871	Mummichog	TISSUE	10/21/1999								1				
	PR9915TIMWM	4.29	588051	692617	Mummichog	TISSUE	10/21/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9915TIMWM-NWB	4.27	588163.1115	692652.0886	Mummichog	TISSUE	10/21/1999								1				
	PR9915TIMWU	4.31	587940	692609	Mummichog	TISSUE	10/21/1999	1	1	1	1	1	1	1	1	1	1		1
	PR9915TIMWU-NWB	4.29	588054.1041	692643.2953	Mummichog	TISSUE	10/21/1999								1				
	PR997/15TIFF6	4.23	588368	692396	Adult Striped Bass	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR997/15TIFF6-NWB	4.21	588479.6695	692432.5102	Adult Striped Bass	TISSUE	10/27/1999						1						1
	PR997/15TIFW6	4.23	588368	692396	White Perch	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR997/15TIFW6-NWB	4.21	588479.6695	692432.5102	White Perch	TISSUE	10/27/1999						1						
	PR997/15TIFW7	4.23	588368	692396	White Perch	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR997/15TIFW7-NWB	4.21	588479.6695	692432.5102	White Perch	TISSUE	10/27/1999						1						
	PR997/15TIFW8	4.23	588368	692396	Juvenile Striped Bass	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR997/15TIFW8-NWB	4.21	588479.6695	692432.5102	Juvenile Striped Bass	TISSUE	10/27/1999						1						
	PR997/15TIFW9	4.23	588368	692396	White Perch	TISSUE	10/27/1999	1	1	1	1	1	1	1	1	1	1		1
	PR997/15TIFW9-NWB	4.21	588479.6695	692432.5102	White Perch	TISSUE	10/27/1999						1						
PASSAIC 2000 Spring ESP Sampling Program	DTIFF01	4.24	588315	692385	Adult Striped Bass	TISSUE	5/15/2000	1	1	1	1	1	1	1	1	1	1		1
	DTIFF01 - DUP-NWB	4.22	588426.6496	692419.6115	Adult Striped Bass	TISSUE	5/15/2000	1	1	1	1	1	1	1	1	1	1		1
	DTIFW01	1.51	597871	691594	Adult Striped Bass	TISSUE	5/16/2000	1	1	1	1	1	1	1	1	1	1		1
	DTIFW01 - DUP-NWB	1.52	597985.3347	691628.6236	Adult Striped Bass	TISSUE	5/16/2000	1	1	1	1	1	1	1	1	1	1		1
	DTIFW02	6.35	585257	701367	Adult Striped Bass	TISSUE	5/17/2000	1	1	1	1	1	1	1	1	1	1		1
	DTIFW02 - DUP-NWB	6.36	585369.9045	701402.6011	Adult Striped Bass	TISSUE	5/17/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0001TIBM	1.35	597386	690845	Crab	TISSUE	5/12/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0001TIBM-NWB	1.36	597499.9643	690881.6084	Crab	TISSUE	5/12/2000						1						
	PR0001TIBW	1.35	597386	690845	Crab	TISSUE	5/12/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0001TIBW-NWB	1.36	597499.9643	690881.6084	Crab	TISSUE	5/12/2000						1						
	PR0001TIFF1	1.51	597871	691594	White Perch	TISSUE	5/12/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0001TIFF1-NWB	1.52	597985.3347	691628.6236	White Perch	TISSUE	5/12/2000						1						
	PR0001TIFF2	1.51	597871	691594	White Perch	TISSUE	5/12/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0001TIFF2-NWB	1.52	597985.3347	691628.6236	White Perch	TISSUE	5/12/2000						1						
	PR0001TIFF3	1.51	597871	691594	Adult Striped Bass	TISSUE	5/16/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0001TIFF3-NWB	1.52	597985.3347	691628.6236	Adult Striped Bass	TISSUE	5/16/2000						1		1				
	PR0001TIFW1	1.51	597871	691594	Adult Striped Bass	TISSUE	5/16/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0001TIFW1-NWB	1.52	597985.3347	691628.6236	Adult Striped Bass	TISSUE	5/16/2000						1		1				
	PR0001TIFW2	1.51	597871	691594	White Perch	TISSUE	5/16/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0001TIFW2-NWB	1.52	597985.3347	691628.6236	White Perch	TISSUE	5/16/2000						1		1				
	PR0001TIFW3	1.51	597871	691594	White Perch	TISSUE	5/16/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0001TIFW3-NWB	1.52	597985.3347	691628.6236	White Perch	TISSUE	5/16/2000						1		1				
	PR0001TIFW4	1.51	597871	691594	White Perch	TISSUE	5/16/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0001TIFW4-NWB	1.52	597985.3347	691628.6236	White Perch	TISSUE	5/16/2000						1		1				
	PR0001TIFW5	1.45	597700	691294	American Eel	TISSUE	5/17/2000	1	1	1	1	1	1	1	1	1	1		1

Table 1-3 Summary of PREmis Tissue Data Used in Assessment

Lower Passaic River Risk Assessment - Focused Feasibility Study

	Parameter							Group										
Study_Name	Sample_ID	river_mile_update	X_Coord	Y_Coord	Species_Code	Matrix	Datetime_Placed	Aroclor	Chlordane	Copper	DDT	Dieldrin	Dioxin/Furan	HMW PAH	Lead	LMW PAH	Mercury	Methyl Mercury	PCBs
PASSAIC 2000 Spring ESP Sampling Program	PR0001TIFW5-NWB	1.46	597814.7867	691330.9728	American Eel	TISSUE	5/17/2000	1					1						
	PR0001TIMWM	1.35	597359	690841	Mummichog	TISSUE	5/17/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0001TIMWM-NWB	1.36	597470.9593	690877.6635	Mummichog	TISSUE	5/17/2000						1						
	PR0008TIBM	4.22	588428	692607	Crab	TISSUE	5/12/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0008TIBM-NWB	4.2	588542.0627	692643.3734	Crab	TISSUE	5/12/2000						1						
	PR0008TIBW	4.22	588428	692607	Crab	TISSUE	5/12/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0008TIBW-NWB	4.2	588542.0627	692643.3734	Crab	TISSUE	5/12/2000						1						
	PR0008TIFF1	4.24	588315	692385	White Perch	TISSUE	5/12/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0008TIFF1-NWB	4.22	588426.6496	692419.6115	White Perch	TISSUE	5/12/2000						1						
	PR0008TIFF2	4.24	588315	692385	Adult Striped Bass	TISSUE	5/15/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0008TIFF2-NWB	4.22	588426.6496	692419.6115	Adult Striped Bass	TISSUE	5/15/2000						1						
	PR0008TIFF3	4.24	588315	692385	White Perch	TISSUE	5/12/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0008TIFF3-NWB	4.22	588426.6496	692419.6115	White Perch	TISSUE	5/12/2000						1						
	PR0008TIFF4	4.24	588315	692385	Adult Striped Bass	TISSUE	5/15/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0008TIFF4-NWB	4.22	588426.6496	692419.6115	Adult Striped Bass	TISSUE	5/15/2000						1						
	PR0008TIFW1	4.24	588315	692385	Adult Striped Bass	TISSUE	5/16/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0008TIFW1-NWB	4.22	588426.6496	692419.6115	Adult Striped Bass	TISSUE	5/16/2000								1				
	PR0008TIFW2	4.24	588315	692385	White Perch	TISSUE	5/16/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0008TIFW2-NWB	4.22	588426.6496	692419.6115	White Perch	TISSUE	5/16/2000						1		1				
	PR0008TIFW3	4.24	588315	692385	White Perch	TISSUE	5/16/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0008TIFW3-NWB	4.22	588426.6496	692419.6115	White Perch	TISSUE	5/16/2000						1		1				
	PR0008TIFW4	4.24	588315	692385	White Perch	TISSUE	5/16/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0008TIFW4-NWB	4.22	588426.6496	692419.6115	White Perch	TISSUE	5/16/2000						1		1				
	PR0008TIFW5	4.32	587908	692394	American Eel	TISSUE	5/17/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0008TIFW5-NWB	4.3	588019.7027	692429.3795	American Eel	TISSUE	5/17/2000						1						
	PR0008TIFW6	4.32	587908	692394	American Eel	TISSUE	5/17/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0008TIFW6-NWB	4.3	588019.7027	692429.3795	American Eel	TISSUE	5/17/2000	1					1						
	PR0008TIMWM	4.16	588744	692561	Mummichog	TISSUE	5/17/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0008TIMWM-NWB	4.14	588856.9497	692597.7825	Mummichog	TISSUE	5/17/2000						1						
	PR0011TIBM	6.29	585239	701076	Crab	TISSUE	5/12/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0011TIBW	6.29	585239	701076	Crab	TISSUE	5/12/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0011TIBW-NWB	6.31	585352.3527	701110.6587	Crab	TISSUE	5/12/2000						1						
	PR0011TIFF1	6.35	585257	701367	White Perch	TISSUE	5/12/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0011TIFF1-NWB	6.36	585369.9045	701402.6011	White Perch	TISSUE	5/12/2000						1						
	PR0011TIFF3	6.35	585257	701367	White Perch	TISSUE	5/15/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0011TIFF3-NWB	6.36	585369.9045	701402.6011	White Perch	TISSUE	5/15/2000						1						
	PR0011TIFW1	6.35	585257	701367	White Perch	TISSUE	5/16/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0011TIFW1-NWB	6.36	585369.9045	701402.6011	White Perch	TISSUE	5/16/2000						1		1				
	PR0011TIFW2	6.35	585257	701367	White Perch	TISSUE	5/16/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0011TIFW2-NWB	6.36	585369.9045	701402.6011	White Perch	TISSUE	5/16/2000						1		1				
	PR0011TIFW3	6.35	585257	701367	White Perch	TISSUE	5/16/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0011TIFW3-NWB	6.36	585369.9045	701402.6011	White Perch	TISSUE	5/16/2000						1		1				
	PR0011TIFW4	6.35	585257	701367	Adult Striped Bass	TISSUE	5/17/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0011TIFW4-NWB	6.36	585369.9045	701402.6011	Adult Striped Bass	TISSUE	5/17/2000						1						
	PR0011TIFW5	6.23	584988	700762	American Eel	TISSUE	5/17/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0011TIFW5-NWB	6.24	585099.7798	700797.1625	American Eel	TISSUE	5/17/2000						1						
	PR0011TIFW6	6.23	584988	700762	American Eel	TISSUE	5/17/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0011TIFW6-NWB	6.24	585099.7798	700797.1625	American Eel	TISSUE	5/17/2000	1					1						
	PR0011TIFW7	6.23	584988	700762	American Eel	TISSUE	5/17/2000	1	1	1	1	1	1		1		1		1
	PR0011TIFW7-NWB	6.24	585099.7798	700797.1625	American Eel	TISSUE	5/17/2000	1					1						
	PR0011TIMWM	6.31	585286	701127	Mummichog	TISSUE	5/17/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0011TIMWM-NWB	6.32	585399.4508	701164.5652	Mummichog	TISSUE	5/17/2000						1						
	PR0014TIBW	3.14	592966	694986	Crab	TISSUE	5/12/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0014TIBW-NWB	3.11	593077.1749	695023.5899	Crab	TISSUE	5/12/2000						1						
	PR0014TIMWM	3.12	593043	694965	Mummichog	TISSUE	5/17/2000	1	1	1	1	1	1	1	1	1	1		1
	PR0014TIMWM-NWB	3.1	593157.1262	695001.4408	Mummichog	TISSUE	5/17/2000	1					1						

Table 1-3 Summary of PREmis Tissue Data Used in Assessment

Lower Passaic River Risk Assessment - Focused Feasibility Study

	Parameter							Group											
Study_Name	Sample_ID	river_mile_update	X_Coord	Y_Coord	Species_Code	Matrix	Datetime_Placed	Aroclor	Chlordane	Copper	DDT	Dieldrin	Dioxin/Furan	HMW PAH	Lead	LMW PAH	Mercury	Methyl Mercury	PCBs
PASSAIC 2001 Supplemental ESP Biota Sampling Program	DPRTIFF-1	6.22	585149	700711	American Eel	TISSUE	8/9/2001	1	1	1	1	1	1	1	1	1	1		1
	DPRTIFF-1 - DUP-NWB	6.22	585146.6165	700713.081	American Eel	TISSUE	8/9/2001	1	1	1	1	1	1	1	1	1	1		1
	PR01TIAE-1	6.22	585149	700711	American Eel	TISSUE	8/9/2001	1	1	1	1	1	1	1	1	1	1		1
	PR01TIAE-2	6.51	585590	702126	American Eel	TISSUE	8/6/2001	1	1	1	1	1	1	1	1	1	1		1
	PR01TIAE-3	6.61	585848	702576	American Eel	TISSUE	8/8/2001	1	1	1	1	1	1	1	1	1	1		1
	PR01TIAE-4	6.04	585125	699738	American Eel	TISSUE	8/6/2001	1	1	1	1	1	1	1	1	1	1		1
	PR01TIAE-5	6.46	585455	701896	American Eel	TISSUE	8/7/2001	1	1	1	1	1	1	1	1	1	1		1
	PR01TIAE-6	6.22	585149	700711	American Eel	TISSUE	8/9/2001	1	1	1	1	1	1	1	1	1	1		1
	PR01TICT-1	6.74	586234	703149	Brown Bullhead	TISSUE	8/9/2001	1	1	1	1	1	1	1	1	1	1		1
	PR01TICT-2	6.91	586746	703872	Brown Bullhead	TISSUE	8/9/2001	1	1	1	1	1	1	1	1	1	1		1
	PR01TICT-3	6.49	585443	702111	Brown Bullhead	TISSUE	8/9/2001	1	1	1	1	1	1	1	1	1	1		1
	PR01TICT-4	6.65	585978	702776	Brown Bullhead	TISSUE	8/9/2001	1	1	1	1	1	1	1	1	1	1		1
	PR01TICT-5	6.77	586330	703266	Brown Bullhead	TISSUE	8/9/2001	1	1	1	1	1	1	1	1	1	1		1
	PR01TICT-6	6.74	586234	703149	Brown Bullhead	TISSUE	8/9/2001	1	1	1	1	1	1	1	1	1	1		1
Grand Total								247	247	232	244	244	364	234	290	234	247	13	253

Table 1-4 Summary of Sediment Data Used in Assessment

Lower Passaic River Risk Assessment - Focused Feasibility Study

	Parameter								Group										
STUDY_NAME	SAMPLE_ID	RIVER_MILE	X_COORD	Y_COORD	DEPTH_TOP	DEPTH_BOTTOM	DEPTH_UNIT	DATETIME_PLACED	Aroclor	Chlordane	Copper	DDT	Dieldrin	Dioxin/Furan	HMW PAH	Lead	LMW PAH	Mercury	PCBs
HIGH RES CORE	LPRP-SCSH-PSR-000780	1.4	598078.73	691133.57	0	15	CM	9/20/2005							1		1		
	LPRP-SCSH-PSR-000854	2.2	597588.66	694851.81	0	18	CM	9/21/2005							1		1		
	LPRP-SCSH-PSR-000895	3.5	591083.92	694324.88	0	4	CM	9/27/2005							1		1		
	LPRP-SCSH-PSR-000896	3.5	591083.92	694324.88	4	8	CM	9/27/2005							1		1		
	LPRP-SCSH-PSR-000897	3.5	591083.92	694324.88	8	12	CM	9/27/2005							1		1		
	LPRP-SCSH-PSR-000898	3.5	591083.92	694324.88	12	16	CM	9/27/2005							1		1		
	LPRP-SCSH-PSR-000990	1.4	598078.73	691133.57	0	7.5	CM	9/20/2005			1					1		1	
	LPRP-SCSH-PSR-000991	1.4	598078.73	691133.57	7.5	15	CM	9/20/2005			1					1		1	
	LPRP-SCSH-PSR-001038	2.2	597588.66	694851.81	0	9	CM	9/21/2005			1					1		1	
	LPRP-SCSH-PSR-001039	2.2	597588.66	694851.81	9	18	CM	9/21/2005			1					1		1	
	LPRP-SCSH-PSR-001074	3.5	591083.92	694324.88	0	4	CM	9/27/2005			1					1		1	
	LPRP-SCSH-PSR-001075	3.5	591083.92	694324.88	4	8	CM	9/27/2005			1					1		1	
	LPRP-SCSH-PSR-001076	3.5	591083.92	694324.88	8	12	CM	9/27/2005			1					1		1	
	LPRP-SCSH-PSR-001077	3.5	591083.92	694324.88	12	16	CM	9/27/2005			1					1		1	
	LPRP-SCSH-PSR-001462	3.5	591083.92	694324.88	0	4	CM	9/27/2005		1		1		1					1
	LPRP-SCSH-PSR-001471	1.4	598078.73	691133.57	0	15	CM	9/20/2005		1		1		1					1
	LPRP-SCSH-PSR-001473	2.2	597588.66	694851.81	0	18	CM	9/21/2005		1		1		1					1
LOW RES CORE	LPRP-SCSH-PSR-001262	4.4	692488	587534	0	65	CM	1/12/2006	1		1				1	1	1	1	
	LPRP-SCSH-PSR-001270	4.2	692539	588391	0	70	CM	1/13/2006	1		1				1	1	1	1	
	LPRP-SCSH-PSR-001276	3.2	695065	592921	0	69	CM	1/13/2006	1		1				1	1	1	1	
	LPRP-SCSH-PSR-001283	4.9	693941	585444	0	44	CM	1/17/2006	1						1		1		
	LPRP-SCSH-PSR-001290	3.6	694150	591251	0	64	CM	1/17/2006	1						1		1		
	LPRP-SCSH-PSR-001296	3.8	693178	590521	0	58	CM	1/18/2006	1		1				1	1	1	1	
	LPRP-SCSH-PSR-001297	4.9	693941	585444	0	44	CM	1/17/2006		1		1	1	1					1
	LPRP-SCSH-PSR-001299	3.2	695065	592921	0	69	CM	1/13/2006		1		1	1	1					1
	LPRP-SCSH-PSR-001327	4.4	692488	587534	0	65	CM	1/12/2006		1		1	1	1					1
	LPRP-SCSH-PSR-001338	3.6	694150	591251	0	64	CM	1/17/2006		1		1	1	1					1
	LPRP-SCSH-PSR-001359	4.2	692539	588391	0	70	CM	1/13/2006		1		1	1	1					1
	LPRP-SCSH-PSR-001390	2.9	695644	594356	0	52	CM	1/18/2006	1		1				1	1	1	1	
	LPRP-SCSH-PSR-001397	3.1	695458	593148	0	49	CM	1/19/2006	1		1				1	1	1	1	
	LPRP-SCSH-PSR-001404	5.4	696206	584950	0	35	CM	1/19/2006	1		1				1	1	1	1	
	LPRP-SCSH-PSR-001409	6.7	703070	586317	0	49	CM	1/20/2006	1		1				1	1	1	1	
	LPRP-SCSH-PSR-001433	6.7	703070	586317	0	49	CM	1/20/2006		1		1	1	1					1
	LPRP-SCSH-PSR-001436	2.9	695644	594356	0	52	CM	1/18/2006		1		1	1	1					1
	LPRP-SCSH-PSR-001442	3.8	693178	590521	0	58	CM	1/18/2006		1		1	1	1					1
	LPRP-SCSH-PSR-001448	5.4	696206	584950	0	35	CM	1/19/2006		1		1	1	1					1
	LPRP-SCSH-PSR-001454	3.1	695458	593148	0	49	CM	1/19/2006		1		1	1	1					1
NOAA NS&T Hudson-Raritan Phase II- 1993	Q:1502:9300:27	7.37	587825.3141	706006.2663	0	0	(blank)	1/1/1993						1					
PASSAIC 1990 Surficial Sediment Investigation	R5	7	587167.2675	704316.9622	0	0.5	(blank)	2/21/1990	1		1	1	1	1	1	1	1	1	
PASSAIC 1991 Core Sediment Investigation	09A001	7.96	589394.5551	708774.3794	0	0.17	(blank)	12/3/1991	1	1		1	1	1	1	1	1	1	1
PASSAIC 1994 Surficial Sediment Investigation	HP1	(blank)	586511.5214	703894.2216	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	HP10	(blank)	586501.4678	703864.2441	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	HP2	(blank)	586503.5457	703897.2469	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	HP3	(blank)	586511.5214	703891.2269	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	HP4	(blank)	586519.5276	703886.2154	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	HP5	(blank)	586521.5445	703897.2163	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	HP6	(blank)	586513.5688	703907.2393	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	HP7	(blank)	586514.5161	703883.2207	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	HP8	(blank)	586497.5258	703883.2512	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	HP9	(blank)	586499.4815	703873.2588	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	IS1	(blank)	591528.1211	701795.9197	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	IS10	(blank)	591735.9772	701718.5466	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	IS2	(blank)	591554.126	701790.8776	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	IS3	(blank)	591586.0898	701784.8271	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	IS4	(blank)	591615.0894	701779.7544	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	IS5	(blank)	591657.0762	701771.6871	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	IS6	(blank)	591687.0537	701765.6366	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	IS7	(blank)	591712.0808	701783.5742	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	IS8	(blank)	591706.0609	701762.5808	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	IS9	(blank)	591719.9954	701741.5568	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	SR1	(blank)	588788.2215	708058.5867	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	SR10	(blank)	588794.1497	708019.564	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	SR2	(blank)	588798.214	708051.5583	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1

Table 1-4 Summary of Sediment Data Used in Assessment

Lower Passaic River Risk Assessment - Focused Feasibility Study

	Parameter								Group										
STUDY_NAME	SAMPLE_ID	RIVER_MILE	X_COORD	Y_COORD	DEPTH_TOP	DEPTH_BOTTOM	DEPTH_UNIT	DATETIME_PLACED	Aroclor	Chlordane	Copper	DDT	Dieldrin	Dioxin/Furan	HMW PAH	Lead	LMW PAH	Mercury	PCBs
PASSAIC 1994 Surficial Sediment Investigation	SR3	(blank)	588806.2202	708045.5384	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	SR4	(blank)	588814.1959	708039.5184	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	SR5	(blank)	588798.2445	708060.5729	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	SR6	(blank)	588808.237	708061.5508	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	SR7	(blank)	588789.2299	708049.572	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	SR8	(blank)	588791.1856	708039.5795	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	SR9	(blank)	588792.194	708029.587	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	WA1	(blank)	590674.5114	694559.183	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	WA10	(blank)	590853.0317	694319.852	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	WA2	(blank)	590692.5101	694562.1471	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	WA3	(blank)	590701.3719	694495.1332	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	WA4	(blank)	590718.4539	694535.1032	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	WA5	(blank)	590726.4296	694527.0664	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	WA6	(blank)	590720.3791	694493.0858	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	WA7	(blank)	590756.3154	694467.0198	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	WA8	(blank)	590747.3924	694506.0424	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
	WA9	(blank)	590774.1307	694368.9894	0	0.5	(blank)	9/1/1994	1	1	1	1	1	1	1	1	1	1	1
PASSAIC 1995 RI Sampling Program	20101A	(blank)	597095.6832	689130.538	0	0.5	(blank)	4/11/1995	1	1	1	1	1	1	1	1	1	1	1
	20201B	1	597325.5106	689047.1144	0	0.5	(blank)	4/14/1995			1			1		1		1	1
	20201F	1	597312.5234	689057.1374	0	0.5	(blank)	4/14/1995	1		1	1	1	1	1	1	1	1	1
	20301A	1	597673.2922	688944.4697	0	0.5	(blank)	4/13/1995	1	1	1	1	1	1	1	1	1	1	1
	20401A	1.23	597394.8469	690286.8562	0	0.5	(blank)	4/24/1995	1	1	1	1	1	1	1	1	1	1	1
	20501A	1.23	597664.6748	690203.3714	0	0.5	(blank)	4/24/1995	1	1	1	1	1	1	1	1	1	1	1
	20601A	1.23	598014.4733	690115.7003	0	0.5	(blank)	4/24/1995	1	1	1	1	1	1	1	1	1	1	1
	20701A	(blank)	597700.9779	691423.1894	0	0.5	(blank)	4/18/1995	1	1	1	1	1	1	1	1	1	1	1
	20801A	1.46	597968.8501	691369.6821	0	0.5	(blank)	4/19/1995	1	1	1	1	1	1	1	1	1	1	1
	20901B	1.46	598197.7302	691320.2391	0	0.5	(blank)	4/19/1995	1	1	1	1	1	1	1	1	1	1	1
	21001A	(blank)	597869.2001	692607.7432	0	0.5	(blank)	4/17/1995	1	1	1	1	1	1	1	1	1	1	1
	21101B	1.69	598145.0786	692553.2276	0	0.5	(blank)	4/17/1995	1	1	1	1	1	1	1	1	1	1	1
	21201A	1.69	598362.0105	692525.817	0	0.5	(blank)	4/18/1995	1	1	1	1		1	1	1	1	1	1
	21301A	(blank)	597950.4541	693810.4792	0	0.5	(blank)	4/26/1995	1	1	1	1	1	1	1	1	1	1	1
	21401A	1.94	598323.5073	693854.7884	0	0.5	(blank)	5/10/1995	1	1	1	1	1	1	1	1	1	1	1
	21501B	1.94	598473.5781	693891.4887	0	0.5	(blank)	4/20/1995	1	1	1	1	1	1	1	1	1	1	1
	21601A	(blank)	597458.2549	694743.326	0	0.5	(blank)	4/20/1995	1	1	1	1	1	1	1	1	1	1	1
	21701A	2.21	597718.8849	695072.8034	0	0.5	(blank)	4/27/1995	1	1	1	1	1	1	1	1	1	1	1
	21801A	2.21	597813.0955	695195.6163	0	0.5	(blank)	4/26/1995	1	1	1	1	1	1	1	1	1	1	1
	21901A	2.5	596320.6383	695414.4123	0	0.5	(blank)	6/8/1995	1	1	1	1	1	1	1	1	1		1
	22001A	2.5	596350.9214	695564.3608	0	0.5	(blank)	6/16/1995	1	1	1	1	1	1	1	1	1		1
	22101A	2.5	596377.1402	695689.2823	0	0.5	(blank)	6/16/1995	1	1	1	1	1	1	1	1	1		1
	22201A	2.65	595562.7976	695458.8437	0	0.5	(blank)	4/27/1995	1	1	1	1	1	1	1	1	1	1	1
	22301A	2.65	595560.0168	695588.8379	0	0.5	(blank)	5/1/1995	1	1	1	1	1	1	1	1	1	1	1
	22401A	2.64	595561.3614	695765.8303	0	0.5	(blank)	4/21/1995	1	1	1	1	1	1	1	1	1	1	1
	22501A	2.87	594372.6516	695340.1255	0	0.5	(blank)	5/16/1995	1	1	1	1	1	1	1	1	1	1	1
	22601A	2.88	594355.9058	695466.1471	0	0.5	(blank)	5/10/1995	1	1	1	1	1	1	1	1	1	1	1
	22701A	2.87	594345.241	695639.1365	0	0.5	(blank)	5/16/1995	1		1	1	1	1	1	1	1	1	1
	22801B	3.1	593187.5783	695244.3565	0	0.5	(blank)	5/17/1995	1	1	1	1	1	1	1	1	1	1	1
	22901A	3.1	593169.7323	695328.3912	0	0.5	(blank)	5/1/1995	1	1	1	1	1	1	1	1	1	1	1
	23001A	3.1	593148.9834	695455.4212	0	0.5	(blank)	5/17/1995	1	1	1	1	1	1	1	1	1	1	1
	23101A	3.33	592070.9856	694871.5172	0	0.5	(blank)	5/18/1995	1	1	1	1	1	1	1	1	1	1	1
	23201A	3.33	592028.1737	694971.5644	0	0.5	(blank)	5/2/1995			1			1		1		1	1
	23301C	3.33	591963.4211	695101.6808	0	0.5	(blank)	4/25/1995	1	1	1	1	1	1	1	1	1	1	1
	23401B	3.55	591239.6833	694156.1523	0	0.5	(blank)	4/25/1995	1	1	1	1	1	1	1	1	1	1	1
	23501A	3.55	591150.8203	694213.2959	0	0.5	(blank)	5/18/1995	1	1	1	1	1	1	1	1	1	1	1
	23601A	3.55	591048.9091	694265.4891	0	0.5	(blank)	5/2/1995	1	1	1	1	1	1	1	1	1	1	1
	23701A	3.78	590669.7443	693099.3007	0	0.5	(blank)	5/4/1995	1		1	1	1	1	1	1	1	1	1
	23801A	3.78	590616.8177	693129.4004	0	0.5	(blank)	5/3/1995	1	1	1	1	1	1	1	1	1	1	1
	23901A	3.78	590510.9339	693192.5945	0	0.5	(blank)	5/3/1995	1		1	1	1	1	1	1	1	1	1
	24001A	4.01	589630.433	692361.3533	0	0.5	(blank)	5/15/1995	1		1	1	1	1	1	1	1	1	1
	24101A	4.01	589594.7412	692519.3998	0	0.5	(blank)	5/15/1995	1	1	1	1	1	1	1	1	1	1	1
	24201A	4.02	589569.928	692611.4407	0	0.5	(blank)	5/4/1995	1	1	1	1	1	1	1	1	1	1	1
	24301A	4.24	588403.434	692311.6659	0	0.5	(blank)	5/5/1995	1		1	1	1	1	1	1	1	1	1
	24401A	4.24	588399.6142	692403.6763	0	0.5	(blank)	4/28/1995	1	1	1	1	1	1	1	1	1	1	1
	24501B	4.24	588390.8746	692544.6713	0	0.5	(blank)	5/1/1995	1	1	1	1	1	1	1	1	1	1	1

Table 1-4 Summary of Sediment Data Used in Assessment

Lower Passaic River Risk Assessment - Focused Feasibility Study

	Parameter								Group										
STUDY_NAME	SAMPLE_ID	RIVER_MILE	X_COORD	Y_COORD	DEPTH_TOP	DEPTH_BOTTOM	DEPTH_UNIT	DATETIME_PLACED	Aroclor	Chlordane	Copper	DDT	Dieldrin	Dioxin/Furan	HMW PAH	Lead	LMW PAH	Mercury	PCBs
PASSAIC 1995 RI Sampling Program	24601A	4.47	587173.5319	692295.9896	0	0.5	(blank)	5/8/1995			1	1		1	1	1	1	1	1
	24701A	4.47	587190.6444	692355.9445	0	0.5	(blank)	5/9/1995	1	1	1	1	1	1	1	1	1	1	1
	24801A	4.47	587217.8411	692458.8948	0	0.5	(blank)	5/15/1995	1		1	1	1	1	1	1	1	1	1
	24901B	(blank)	586070.6293	692830.0228	0	0.5	(blank)	5/11/1995	1		1	1		1	1	1	1	1	1
	25001A	4.69	586141.8296	692939.8791	0	0.5	(blank)	5/12/1995	1	1	1	1	1	1	1	1	1	1	1
	25101B	4.7	586181.9524	693012.7907	0	0.5	(blank)	5/19/1995		1	1	1	1	1	1	1	1	1	1
	25201C	4.92	585447.7942	693942.0929	0	0.5	(blank)	5/9/1995	1	1	1	1	1	1	1	1	1	1	1
	25301A	4.92	585541.8215	693973.9344	0	0.5	(blank)	5/8/1995	1		1	1	1	1	1	1	1	1	1
	25401A	4.91	585629.8899	694002.7507	0	0.5	(blank)	5/9/1995	1	1	1	1	1	1	1	1	1	1	1
	25501A	5.16	585045.1303	695170.742	0	0.5	(blank)	5/22/1995	1	1	1	1	1	1	1	1	1	1	1
	25601B	5.16	585177.2023	695208.5118	0	0.5	(blank)	5/22/1995	1	1	1	1	1	1	1	1	1	1	1
	25701C	5.16	585242.1994	695219.3905	0	0.5	(blank)	5/23/1995	1	1	1	1	1	1	1	1	1	1	1
	25801C	5.34	584736.0046	696147.2564	0	0.5	(blank)	5/23/1995	1	1	1	1	1	1	1	1	1	1	1
	25901B	5.35	584824.073	696177.0811	0	0.5	(blank)	5/24/1995	1	1	1	1	1	1	1		1	1	1
	26001B	5.35	584958.1008	696211.8257	0	0.5	(blank)	5/25/1995	1	1	1	1	1	1	1		1	1	1
	26101C	5.51	584652.7033	697033.3189	0	0.5	(blank)	6/6/1995	1		1	1	1	1	1	1	1	1	1
	26201A	5.52	584732.7349	697058.1626	0	0.5	(blank)	5/11/1995	1	1	1	1	1	1	1	1	1	1	1
	26301B	5.51	584807.7245	697060.0266	0	0.5	(blank)	5/23/1995	1	1	1	1	1	1	1	1	1	1	1
	26401A	(blank)	584710.947	698226.1234	0	0.5	(blank)	5/24/1995	1	1	1	1	1	1	1		1	1	1
	26501A	5.73	584772.9188	698215.0003	0	0.5	(blank)	5/25/1995	1	1	1	1	1	1	1	1	1	1	1
	26601A	5.73	584840.9105	698208.8581	0	0.5	(blank)	5/26/1995	1	1	1	1	1	1	1		1	1	1
	26701A	5.95	584856.0368	699331.7457	0	0.5	(blank)	6/5/1995	1		1	1	1	1	1	1	1	1	1
	26801B	5.95	585024.9925	699328.4149	0	0.5	(blank)	6/5/1995	1	1	1	1	1	1	1	1	1	1	1
	26901C	5.95	585058.0258	699334.3737	0	0.5	(blank)	6/6/1995	1	1	1	1	1	1	1	1	1	1	1
	27001A	(blank)	585041.2494	701044.2517	0	0.5	(blank)	5/30/1995	1	1	1	1	1	1	1		1	1	1
	27101A	6.27	585143.1912	701024.0528	0	0.5	(blank)	5/30/1995	1	1	1	1	1	1	1	1	1	1	1
	27201A	6.27	585243.1773	701013.877	0	0.5	(blank)	5/31/1995	1	1	1	1	1	1	1	1	1	1	1
	27301A	6.49	585518.3529	702181.2572	0	0.5	(blank)	6/1/1995	1	1	1	1	1	1	1	1	1	1	1
	27401A	6.49	585602.2654	702137.1008	0	0.5	(blank)	6/5/1995	1	1	1	1	1	1	1	1	1	1	1
	27501A	6.49	585643.2438	702116.0157	0	0.5	(blank)	6/2/1995	1	1	1	1	1	1	1	1	1	1	1
	27601A	6.71	586130.3092	703230.0109	0	0.5	(blank)	6/1/1995	1	1	1	1	1	1	1	1	1	1	1
	27701B	6.72	586236.1624	703162.8137	0	0.5	(blank)	5/31/1995	1		1	1	1	1	1	1	1	1	1
	27801B	6.71	586324.9948	703082.6598	0	0.5	(blank)	5/31/1995	1	1	1	1	1	1	1	1	1	1	1
	28201A	(blank)	597545.0399	694629.1915	0	0.5	(blank)	6/15/1995	1	1	1	1	1	1	1	1	1	1	1
	28301A	(blank)	597284.4099	694805.6645	0	0.5	(blank)	6/9/1995	1	1	1	1	1	1	1	1	1	1	1
	28401B	(blank)	595458.3195	695202.0641	0	0.5	(blank)	6/15/1995	1	1	1	1	1	1	1	1	1	1	1
	28501A	(blank)	592960.0733	694966.8279	0	0.5	(blank)	6/7/1995	1	1	1	1	1	1	1	1	1	1	1
	28601B	(blank)	593249.1528	695021.2519	0	0.5	(blank)	6/7/1995	1		1	1	1	1	1	1	1	1	1
	28701B	3.59	590821.618	694101.9422	0	0.5	(blank)	6/12/1995	1	1	1	1	1	1	1	1	1	1	1
	28801B	3.66	590712.0673	693807.1789	0	0.5	(blank)	6/13/1995			1	1		1	1	1	1	1	1
	28901A	4.19	588676.2261	692728.1115	0	0.5	(blank)	6/13/1995	1	1	1	1	1	1	1	1	1	1	1
	29001B	4.25	588319.1548	692686.797	0	0.5	(blank)	6/13/1995	1	1	1	1	1	1	1	1	1	1	1
	29101A	4.32	587986.0105	692591.4252	0	0.5	(blank)	6/12/1995	1	1	1	1		1	1	1	1	1	1
	29201C	4.39	587589.9776	692548.1855	0	0.5	(blank)	6/14/1995	1	1	1	1	1	1	1	1	1	1	1
	29301A	5.08	585441.4687	694838.0255	0	0.5	(blank)	6/14/1995	1	1	1	1		1	1	1	1	1	1
	29401A	3.15	592895.0151	695462.908	0	0.5	(blank)	6/8/1995	1		1	1	1	1	1	1	1	1	1
	29501B	2	598386.2125	694222.6161	0	0.5	(blank)	6/8/1995	1		1	1	1	1	1	1	1	1	1
	29601B	6.4	585527.337	701638.2705	0	0.5	(blank)	6/14/1995	1	1	1	1	1	1	1	1	1	1	1
	D00595A	1.23	598014.4733	690115.7003	0	0.5	(blank)	4/24/1995	1	1		1	1						1
	D00695A	2.21	597813.0955	695195.6163	0	0.5	(blank)	4/26/1995	1	1		1	1		1		1		1
	D01195A	4.47	587173.5319	692295.9896	0	0.5	(blank)	5/8/1995						1					1
	D03095B	4.39	587589.9776	692548.1855	0	0.5	(blank)	6/14/1995			1					1		1	
	D03295	2.5	596350.9214	695564.3608	0	0.5	(blank)	6/16/1995	1	1		1	1		1		1		1
PASSAIC 1995 Sediment Grab Sampling Program	Grab-1	2.67	595407.4403	695799.1081	0	0.5	(blank)	9/14/1995						1					
	Grab-2	2.67	595407.043	695589.1434	0	0.5	(blank)	9/14/1995						1					
PASSAIC 1995 USACE Minish Park Investigation	WTH-3-A (0-2)	(blank)	587753.28	692187.9056	0	2	(blank)	2/9/1995									1		
	WTH-7-C (0-2)	(blank)	585177.7524	694437.5618	0	2	(blank)	2/1/1995						1					
PASSAIC 1997 Outfall Sampling Program	Location 1	1.23	597394.8469	690286.8562	0	0.5	(blank)	9/18/1997	1										
	Location 2	(blank)	584710.947	698226.1234	0	0.5	(blank)	9/18/1997	1										
	Location 3	4.01	589630.433	692361.3533	0	0.5	(blank)	9/18/1997	1										
PASSAIC 1999 Late Summer/Early Fall ESP Sampling	DSD01-1999	(blank)	586450.283	703763.3719	0	0.5	(blank)	10/6/1999	1	1	1	1	1	1	1	1	1	1	1
	DSD02-1999	4.31	588027.1722	692674.3293	0	0.5	(blank)	10/7/1999	1	1	1	1	1	1	1	1	1	1	1
	DSD03	(blank)	597923.4102	693250.5938	0	0.5	(blank)	10/11/1999	1	1	1	1	1	1	1	1	1	1	1

Table 1-4 Summary of Sediment Data Used in Assessment

Lower Passaic River Risk Assessment - Focused Feasibility Study

	Parameter								Group										
STUDY_NAME	SAMPLE_ID	RIVER_MILE	X_COORD	Y_COORD	DEPTH_TOP	DEPTH_BOTTOM	DEPTH_UNIT	DATETIME_PLACED	Aroclor	Chlordane	Copper	DDT	Dieldrin	Dioxin/Furan	HMW PAH	Lead	LMW PAH	Mercury	PCBs
PASSAIC 1999 Late Summer/Early Fall ESP Sampling	PR9901SDL	(blank)	597431.6999	690736.7629	0	0.5	(blank)	10/11/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9901SDM	(blank)	597454.9852	690883.6862	0	0.5	(blank)	10/11/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9901SDU	(blank)	597482.1819	690996.6289	0	0.5	(blank)	10/11/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9902SDL	(blank)	597882.004	693027.7031	0	0.5	(blank)	10/11/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9902SDM	(blank)	597903.2113	693139.6374	0	0.5	(blank)	10/11/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9902SDU	(blank)	597923.4102	693250.5938	0	0.5	(blank)	10/11/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9903SDL	2.26	597604.4754	695391.0048	0	0.5	(blank)	10/10/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9903SDM	2.28	597506.5978	695449.1874	0	0.5	(blank)	10/15/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9903SDU	2.3	597412.7234	695506.3616	0	0.5	(blank)	10/15/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9904SDL	2.74	595072.3708	695224.7993	0	0.5	(blank)	10/8/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9904SDM	(blank)	594954.3555	695198.0304	0	0.5	(blank)	10/8/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9904SDU	(blank)	594835.3011	695175.2646	0	0.5	(blank)	10/8/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9905SDL	3.18	592711.0248	695454.2295	0	0.5	(blank)	10/10/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9905SDM	3.2	592599.9767	695424.4659	0	0.5	(blank)	10/10/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9905SDU	3.22	592492.9012	695388.6518	0	0.5	(blank)	10/10/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9906SDL	3.85	590203.7028	693064.1894	0	0.5	(blank)	10/7/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9906SDM	3.87	590099.5914	692996.4116	0	0.5	(blank)	10/7/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9906SDU	3.9	590000.4915	692928.6032	0	0.5	(blank)	10/7/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9907SDL	(blank)	589373.0728	692162.848	0	0.5	(blank)	10/5/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9907SDM	(blank)	589261.0774	692154.0472	0	0.5	(blank)	10/6/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9907SDU	(blank)	589147.0651	692145.2771	0	0.5	(blank)	10/5/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9908SDL	4.19	588654.1937	692721.1443	0	0.5	(blank)	10/5/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9908SDM	4.21	588541.1899	692718.3635	0	0.5	(blank)	10/5/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9908SDU	4.23	588426.1998	692713.5964	0	0.5	(blank)	10/5/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9909SDL	(blank)	585235.2322	694173.4787	0	0.5	(blank)	10/13/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9909SDM	(blank)	585204.4602	694296.5362	0	0.5	(blank)	10/13/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9909SDU	(blank)	585140.6854	694406.637	0	0.5	(blank)	10/13/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9910SDL	(blank)	584566.9267	697676.4444	0	0.5	(blank)	10/8/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9910SDM	(blank)	584580.1278	697789.3872	0	0.5	(blank)	10/8/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9910SDU	(blank)	584595.3152	697897.3489	0	0.5	(blank)	10/8/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9911SDL	6.27	585370.1156	700991.6307	0	0.5	(blank)	10/6/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9911SDM	6.29	585393.3397	701102.5871	0	0.5	(blank)	10/7/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9911SDU	6.31	585419.528	701210.5183	0	0.5	(blank)	10/6/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9912SDL	(blank)	586318.9443	703581.6123	0	0.5	(blank)	10/6/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9912SDM	(blank)	586386.111	703670.4753	0	0.5	(blank)	10/6/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9912SDU	(blank)	586450.283	703763.3719	0	0.5	(blank)	10/6/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9913SDL	(blank)	597090.091	689336.5301	0	0.5	(blank)	10/15/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9913SDM	(blank)	597125.3245	689467.4409	0	0.5	(blank)	10/15/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9913SDU	(blank)	597192.6746	689657.2983	0	0.5	(blank)	10/15/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9914SDL	(blank)	593193.1398	695013.3679	0	0.5	(blank)	10/12/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9914SDM	3.13	593082.1223	694991.58	0	0.5	(blank)	10/12/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9914SDU	(blank)	592973.091	694969.792	0	0.5	(blank)	10/12/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9915SDL	4.27	588253.1798	692690.9223	0	0.5	(blank)	10/7/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9915SDM	4.29	588142.1623	692681.1132	0	0.5	(blank)	10/7/1999	1	1	1	1	1	1	1	1	1	1	1
	PR9915SDU	4.31	588027.1722	692674.3293	0	0.5	(blank)	10/7/1999	1	1	1	1	1	1	1	1	1	1	1
PASSAIC 1999 Sediment Sampling Program	PRP-99-04-SD-1	6.21	585356.5478	700683.6968	0	1	(blank)	7/30/1999	1	1	1	1	1	1	1	1	1	1	1
	PRP-99-05-SD-1	(blank)	595663.456	687348.3901	0	1	(blank)	8/3/1999			1			1		1		1	1
	PRP-99-06-SD-1	(blank)	594360.5201	686800.9113	0	1	(blank)	8/3/1999	1	1	1	1	1	1	1	1	1	1	1
PASSAIC 1999/2000 Minish Park Monitoring Program	PR-99-BBD-D-1	(blank)	585101.6322	694370.7312	0	0.5	(blank)	12/2/1999	1	1	1	1	1	1	1	1	1	1	1
	PR-99-BBD-SD-1	(blank)	585236.3017	694215.4655	0	0.5	(blank)	12/2/1999	1	1	1	1	1	1	1	1	1	1	1
	PR-99-BBD-SD-2	(blank)	585203.5434	694328.5305	0	0.5	(blank)	12/2/1999	1	1	1	1	1	1	1	1	1	1	1
	PR-99-BBD-SD-3	(blank)	585101.6322	694370.7312	0	0.5	(blank)	12/2/1999	1	1	1	1	1	1	1	1	1	1	1
	PR-99-BBD-SD-4	(blank)	585098.668	694403.7339	0	0.5	(blank)	12/2/1999	1	1	1	1	1	1	1	1	1	1	1
	PR-99-BBD-SD-5	(blank)	585177.7524	694438.5702	0	0.5	(blank)	12/3/1999	1	1	1	1	1	1	1	1	1	1	1
	PR-99-BBD-SD-6	(blank)	585150.9529	694553.6214	0	0.5	(blank)	12/3/1999	1	1	1	1	1	1	1	1	1	1	1
	PR-99-BBD-SD-7	(blank)	585144.6274	694375.6511	0	0.5	(blank)	12/3/1999	1	1	1	1	1	1	1	1	1	1	1
	PR-99-BBD-SD-8	(blank)	585141.6938	694410.6401	0	0.5	(blank)	12/3/1999	1	1	1	1	1	1	1	1	1	1	1
PASSAIC 2000 Spring ESP Sampling Program	DSD01-2000	(blank)	589261.0774	692154.0472	0	0.5	(blank)	5/22/2000	1	1	1	1	1	1	1	1	1	1	1
	DSD02-2000	(blank)	597454.9852	690883.6862	0	0.5	(blank)	5/23/2000	1	1	1	1	1	1	1	1	1	1	1
	PR0001SDM	(blank)	597454.9852	690883.6862	0	0.5	(blank)	5/23/2000	1	1	1	1	1	1	1	1	1	1	1
	PR0002SDM	(blank)	597903.2113	693139.6374	0	0.5	(blank)	5/24/2000	1	1	1	1	1	1	1	1	1	1	1
	PR0003SDM	2.28	597506.5978	695449.1874	0	0.5	(blank)	5/24/2000	1	1	1	1	1	1	1	1	1	1	1
	PR0004SDM	(blank)	594954.3555	695198.0304	0	0.5	(blank)	5/17/2000	1	1	1	1	1	1	1	1	1	1	1

Table 1-4 Summary of Sediment Data Used in Assessment

Lower Passaic River Risk Assessment - Focused Feasibility Study

	Parameter								Group										
STUDY_NAME	SAMPLE_ID	RIVER_MILE	X_COORD	Y_COORD	DEPTH_TOP	DEPTH_BOTTOM	DEPTH_UNIT	DATETIME_PLACED	Aroclor	Chlordane	Copper	DDT	Dieldrin	Dioxin/Furan	HMW PAH	Lead	LMW PAH	Mercury	PCBs
PASSAIC 2000 Spring ESP Sampling Program	PR0005SDM	3.2	592599.9767	695424.4659	0	0.5	(blank)	5/17/2000	1	1	1	1	1	1	1	1	1	1	1
	PR0006SDM	3.87	590099.5914	692996.4116	0	0.5	(blank)	5/22/2000	1	1	1	1	1	1	1	1	1	1	1
	PR0007SDM	(blank)	589261.0774	692154.0472	0	0.5	(blank)	5/22/2000	1	1	1	1	1	1	1	1	1	1	1
	PR0008SDM	4.21	588541.1899	692718.3635	0	0.5	(blank)	5/22/2000	1	1	1	1	1	1	1	1	1	1	1
	PR0009SDM	(blank)	585204.4602	694296.5362	0	0.5	(blank)	5/24/2000	1	1	1	1	1	1	1	1	1	1	1
	PR0010SDM	(blank)	584580.1278	697789.3872	0	0.5	(blank)	5/18/2000	1	1	1	1	1	1	1	1	1	1	1
	PR0011SDM	6.29	585393.3397	701102.5871	0	0.5	(blank)	5/18/2000	1	1	1	1	1	1	1	1	1	1	1
	PR0012SDM	(blank)	586386.111	703670.4753	0	0.5	(blank)	5/19/2000	1	1	1	1	1	1	1	1	1	1	1
	PR0013SDM	(blank)	597125.3245	689467.4409	0	0.5	(blank)	5/23/2000	1	1	1	1	1	1	1	1	1	1	1
	PR0014SDM	3.13	593082.1223	694991.58	0	0.5	(blank)	5/17/2000	1	1	1	1	1	1	1	1	1	1	1
	PR0015SDM	4.29	588142.1623	692681.1132	0	0.5	(blank)	5/22/2000	1	1	1	1	1	1	1	1	1	1	1
Pirnie Study	LPRP-SCSH-PSR-001162	(blank)	588848.4	708051.8	0	3	CM	10/12/2005							1		1		
	LPRP-SCSH-PSR-001163	(blank)	588848.4	708051.8	3	6	CM	10/12/2005							1		1		
	LPRP-SCSH-PSR-001164	(blank)	588848.4	708051.8	6	9	CM	10/12/2005							1		1		
	LPRP-SCSH-PSR-001165	(blank)	588848.4	708051.8	9	12	CM	10/12/2005							1		1		
	LPRP-SCSH-PSR-001166	(blank)	588848.4	708051.8	12	15	CM	10/12/2005							1		1		
	LPRP-SCSH-PSR-001222	(blank)	588848.4	708051.8	0	3	CM	10/12/2005			1							1	
	LPRP-SCSH-PSR-001223	(blank)	588848.4	708051.8	3	6	CM	10/12/2005			1							1	
	LPRP-SCSH-PSR-001224	(blank)	588848.4	708051.8	6	9	CM	10/12/2005			1							1	
	LPRP-SCSH-PSR-001225	(blank)	588848.4	708051.8	9	12	CM	10/12/2005			1							1	
	LPRP-SCSH-PSR-001226	(blank)	588848.4	708051.8	12	15	CM	10/12/2005			1							1	
	LPRP-SCSH-PSR-001466	(blank)	588848.4	708051.8	0	3	CM	10/12/2005		1		1	1	1					1
	LPRP-SCSH-PSR-001538	(blank)	588848.4	708051.8	3	6	CM	10/12/2005		1		1	1						
	LPRP-SCSH-PSR-001539	(blank)	588848.4	708051.8	6	9	CM	10/12/2005		1		1	1						
	LPRP-SCSH-PSR-001540	(blank)	588848.4	708051.8	9	15	CM	10/12/2005		1		1	1						
	LPRP-SCSS-PSR-000500	(blank)	594252.49	695472.2	0	1	ft	7/12/2004	1	1		1	1						
	LPRP-SCSS-PSR-000508	(blank)	594259.82	695322.2	0	1	ft	7/12/2004	1	1		1	1						
	LPRP-SCSS-PSR-000512	(blank)	594315.31	695481.7	0	1	ft	7/13/2004	1	1		1	1						
	LPRP-SCSS-PSR-000516	(blank)	594325.6	695405.2	0	1	ft	7/13/2004	1	1		1	1						
	LPRP-SCSS-PSR-000520	(blank)	594324.08	695332.1	0	1	ft	7/13/2004	1	1		1	1						
	LPRP-SCSS-PSR-000524	(blank)	594376.25	695485.26	0	1	ft	7/13/2004	1	1		1	1						
	LPRP-SCSS-PSR-000528	(blank)	594379.1	695410.08	0	1	ft	7/13/2004	1	1		1	1						
	LPRP-SCSS-PSR-000532	(blank)	594386.43	695329.55	0	1	ft	7/13/2004	1	1		1	1						
	LPRP-SCSS-PSR-000536	(blank)	594428.8	695478.7	0	1	ft	7/13/2004	1	1		1	1						
	LPRP-SCSS-PSR-000540	(blank)	594440.3	695404.6	0	1	ft	7/13/2004	1	1		1	1						
	LPRP-SCSS-PSR-000544	(blank)	594443.79	695346.31	0	1	ft	7/13/2004	1	1		1	1						
	LPRP-SCSS-PSR-000548	(blank)	594493.5	695497.48	0	1	ft	7/14/2004	1	1		1	1						
	LPRP-SCSS-PSR-000552	(blank)	594506.35	695423.5	0	1	ft	7/14/2004	1	1		1	1						
	LPRP-SCSS-PSR-000556	(blank)	594505.5	695356.6	0	1	ft	7/14/2004	1	1		1	1						
	LPRP-SCSS-PSR-000560	(blank)	594386.35	695329.32	0	1	ft	7/13/2004	1	1		1	1						
Grand Total									238	227	234	245	236	232	233	225	234	232	230

*The X and Y coordinates reported in the PREmis database for locations from studies Passaic 1994 Surficial Sediment Investigation and Passaic 1999 Sediment Sampling Program plotted on land. Samples affected in studies Passaic 1994 Surficial Sediment Investigation were IS1, IS2, IS3, IS4, IS5, IS6, IS7, IS8, IS9, and IS10. Samples affected in Passaic 1999 Sediment Sampling Program were PRP-99-05-SD-1 and PRP-99-06-SD-1. These points were relocated manually into the river in Figure 2-1 after conferring with Malcolm Pirnie and jointly concluding that these were in fact sediment samples with incorrect position coordinates in the PREmis database. The 1994 Surficial Sediment Investigation points were moved due west until they were in the river. The 1999 Sediment Sampling Program points were moved together to the southeast until both points were just in the water, on opposite shores.

ATTACHMENT 2
SCREENING PROCESS FOR COPECS

Technical Memorandum

Technical Approach to Identify Contaminants of Potential Ecological Concern (COPECs) to Support the Focused Feasibility Study – Ecological Risk Assessment
Lower Passaic River Restoration Project
February 21, 2007

This technical memorandum presents the process used to identify Contaminants of Potential Ecological Concern (COPECs) to support the Focused Feasibility Study (FFS) for the Lower Passaic River Restoration Project (LPRRP). The FFS evaluates alternative remedial actions within three target areas for the lower seven miles of the Lower Passaic River. This memorandum identifies those chemicals whose sediment concentrations exceed sediment benchmarks and presents hazard quotients (HQs) to categorize the magnitude of benchmark exceedances. These hazard estimates were developed to provide risk managers a better understanding of which chemicals are likely to pose the greatest ecological concern in the Lower Passaic River. In turn, this will provide a basis for selecting a final set of COPECs for assessment in the FFS.

This analysis is not a screening-level ecological risk assessment (SLERA) but provides the information necessary to develop an early final action prior to the completion of a baseline ecological risk assessment and a full Remedial Investigation/Feasibility Study (RI/FS).

COMPILATION OF AVAILABLE DATA

Surface sediment data from the lower seven miles of the Lower Passaic River, obtained from www.ourPassaic.org, were utilized in this evaluation. Only surface (0-2.3 ft) sediment data collected from 1994 to the present were used. Table 1 provides a list of the specific sampling programs that were utilized for this task and associated QA/QC procedures, if available. The sampling locations are depicted in Figure 1. The full dataset used in this evaluation is provided in Attachment A.

Sediment data for the various studies were loaded into a Microsoft Access database and the data were compiled into one table and loaded into an Oracle database. All queries and summations use the detection limit where qualifiers are reported as "U". Data where the result was reported as 0 and qualified as "ND" were not included in the calculations.

Data queries were performed in the Oracle database for each parameter group of interest. The individual analytical results were summed in Oracle for the following chemicals: Total DDTs (sum of dichlorodiphenyldichloroethylene, dichlorodiphenyldichloroethane, and dichlorodiphenyltrichloroethane isomers); hexachlorocyclohexane (BHC, sum of alpha, beta and gamma isomers); total endosulfan (sum of endosulfan sulfate and alpha and beta isomers); chlordane (sum of alpha and gamma isomers); endrin (sum of endrin aldehyde and endrin ketone); and total polychlorinated biphenyls (PCBs, sum of Aroclors). In addition, low molecular weight (LMW) PAHs (*i.e.*, 2- and 3-ring compounds), high molecular weight (MHW) PAHs (*i.e.*, greater than 3-ring compounds), and total PAHs were summed.

The data set includes analytical results for dioxin and furan congeners as well as data for individual PCB congeners, Only 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), considered the most toxic of this class of compounds was evaluated in this analysis. It should be understood that TCDD is considered to be a surrogate for the class of compounds that can produce "dioxin-like" effects (i.e., dioxins, furans, and coplanar PCBs) and that the potential ecological effects associated with exposure to these compounds will be evaluated using a toxic equivalency (TEQ) approach (Tillitt, 1999) in the baseline risk assessments.

Table 1. Summary of Data Used for the COPEC Selection Process

Name of Study in Database	Depth (ft)	Number of Samples	River Mile Range	QA/QC Procedures[a]
PASSAIC 1994 Surficial Sediment Investigation	0.5	30	3.5-6.9	Quantitative QA/QC[b]
PASSAIC 1995 USACE Minish Park Investigation	0.5	2	3.9-5.4	Not Specified
PASSAIC 1995 Sediment Grab Sampling Program	0.5	7	2.5-2.7	USEPA Region 2 Validation; full validation
PASSAIC 1995 RI Sampling Program	0.5	194	1.0-6.7	USEPA Region 2 Validation; full validation
PASSAIC 1997 Outfall Sampling Program	0.5	3	1.2-5.7	Quantitative QA/QC[b]
PASSAIC 1999 Sediment Sampling Program	1.0	3	0.7-6.2	Quantitative QA/QC[b]
PASSAIC 1999 Late Summer/Early Fall ESP Sampling Program	0.5	48	1.0-6.9	USEPA Region 2 Validation
PASSAIC 1999/2000 Minish Park Monitoring Program	0.5	2	5.0-5.1	Quantitative QA/QC[b]
PASSAIC 2000 Spring ESP Sampling Program	0.5	17	1.0-6.8	USEPA Region 2 Validation
Dredge Pilot Coring Program 2004 – Earth Tech	1.0	15	2.8-2.9	Third Party Full and Partial Data Validation[c]
Low-Res Sediment Coring- Pirnie Study	2.297	21	2.9-6.7	USEPA Region 2 Validation
High Res Core Sampling- Pirnie Study	0.984	79	1.4-7.8	USEPA Region 2 Validation

a. QA/QC procedures from PREmis datasets as described by TSI (2004).
b. Quantitative QA/QC includes the analysis of field and laboratory duplicates, rinsate blanks, matrix spike/matrix spike duplicates, and other quantitative measures of precision and accuracy but without specification of implementing USEPA Region 2 data validation procedures.
c. Data validation activities were performed by Severn-Trent Laboratories (STL) in accordance with the USEPA Method, the Laboratories Standard Operating Procedure (SOP) and the Malcolm Pirnie, Inc. Statement of Work (SOW).
RI = Remedial Investigation
ESP = Ecological Sampling Program

Figure 1. Sampling Locations along the Lower Seven Miles of the Passaic River

IDENTIFICATION OF PRELIMINARY CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPECS)

To support the FFS, sediment COPECs were identified based on a review of historical data that were collected by various agencies including USEPA, USACE, and NOAA NS&T, as well as Tierra Solutions Inc. (TSI), and which are currently stored in an online database at www.ourPassaic.org. Preliminary COPECs were identified using a three-tier screening process that included the following factors:

1. Bioaccumulation screen (indirect toxicological effects to wildlife through the food chain);
2. Essential nutrient screen; and,
3. Effects value screen (direct toxicological effects to benthic invertebrates).

The screening process is described below and is depicted graphically in Figure 2. The sediment screening values used in the analysis are presented in Table 2.

Maximum chemical concentrations were used in the screening evaluation. As noted previously, the reported detection limit was used to represent values reported as nondetect ("U" qualified data). In some instances, values based on detection limits represent the maximum available value for an individual chemical. The detection frequency was considered in the analysis insofar that chemicals that were not reported as detected in any sample are not proposed for further consideration in the FFS.

Bioaccumulation Screen

Any detected bioaccumulative compound, as recognized by USEPA (2000), was evaluated for both direct and indirect toxicological effects. Potential risks to higher trophic level organisms were assessed using Protective Concentration Levels (PCL), which are sediment concentrations derived using conservative exposure assumptions to be protective of bioaccumulative hazards to higher trophic level receptors (Table 2). Maximum concentrations of bioaccumulative compounds were compared to PCLs and available screening values so that the potential toxicity to both wildlife and benthic invertebrates could be considered. Those compounds that exceeded either their PCL or their screening value (*e.g.,* NOAA ER-Ls) were retained as preliminary COPECs. In many cases, wildlife PCLs are lower than marine/estuarine sediment benchmarks because sediment benchmarks are protective of benthic invertebrates without consideration of bioaccumulation, while PCLs are protective of bioaccumulative hazards to higher trophic level receptors.

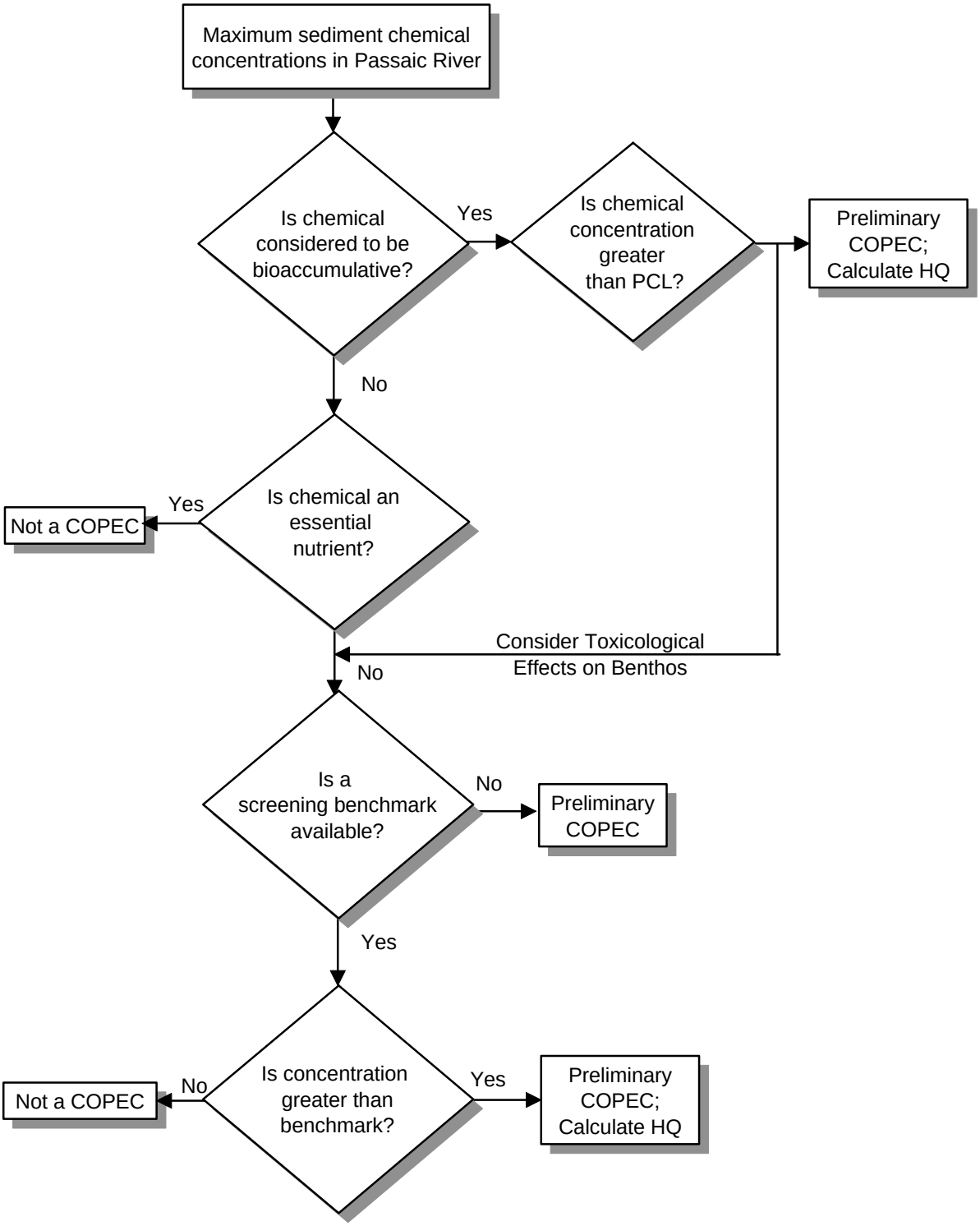

Figure 2. Sediment Preliminary COPEC Decision Diagram to Support the Focused Feasibility Study for the Lower Passaic River Restoration Project

Table 2. Summary of Screening Values Used in the Assessment

CASRN	Units	Chemical	Marine/ Estuarine Values		Lowest Aquatic Benchmark	USEPA List of Bioaccumulators[c]	Wildlife-Based PCL[d]	Basis
			NOAA ER-L[a]	NJDEP[b]				
Inorganics								
7429-90-5	ng/g	Aluminum	-	-	-	N	-	
7664-41-7	ng/g	Ammonia	-	-	-	N	-	
7440-36-0	ng/g	Antimony	-	-	-	N	-	
7440-38-2	ng/g	Arsenic	8,200	8,200	8,200	Y	173,228	NOAA ER-L
7440-39-3	ng/g	Barium	-	-	-	N	-	
7440-41-7	ng/g	Beryllium	-	-	-	N	-	
7440-43-9	ng/g	Cadmium	1,200	1,200	1,200	Y	2,971	NOAA ER-L
7440-70-2	ng/g	Calcium	-	-	-	N	-	
7440-47-3	ng/g	Chromium	81,000	81,000	81,000	Y	41,409	Wildlife PCL
7440-48-4	ng/g	Cobalt	-	-	-	N	-	
7440-50-8	ng/g	Copper	34,000	34,000	34,000	Y	13,318	Wildlife PCL
57-12-5	ng/g	Cyanide	-	-	-	N	-	
7439-89-6	ng/g	Iron	-	-	-	N	-	
7439-92-1	ng/g	Lead	46,700	47,000	46,700	Y	10,606	Wildlife PCL
7439-95-4	ng/g	Magnesium	-	-	-	N	-	
7439-96-5	ng/g	Manganese	-	-	-	N	-	
7439-97-6	ng/g	Mercury	150	150	150	Y	37	Wildlife PCL
7440-02-0	ng/g	Nickel	20,900	21,000	20,900	Y	21,551	NOAA ER-L
7440-09-7	ng/g	Potassium	-	-	-	N	-	
7782-49-2	ng/g	Selenium	-	-	-	Y	925	Wildlife PCL
7440-22-4	ng/g	Silver	1,000	1,000	1,000	Y	1,298,747	NOAA ER-L
7440-21-3	ng/g	Silicon	-	-	-	N	-	
7440-23-5	ng/g	Sodium	-	-	-	N	-	
7440-28-0	ng/g	Thallium	-	-	-	N	-	
7440-31-5	ng/g	Tin	-	-	-	N	-	
7440-32-6	ng/g	Titanium	-	-	-	N	-	
7440-62-2	ng/g	Vanadium	-	-	-	N	-	
7440-66-6	ng/g	Zinc	150,000	150,000	150,000	Y	46,688	Wildlife PCL
Volatile Organic Compounds (VOCs)								
630-20-6	ng/g	1,1,1,2-Tetrachloroethane	-	-		N	-	
71-55-6	ng/g	1,1,1-Trichloroethane	-	-		N	-	
79-34-5	ng/g	1,1,2,2-Tetrachloroethane	-	-		N	-	
76-13-1	ng/g	1,1,2-Trichloro-1,2,2-trifluoroethane	-	-	-	N	-	

CASRN	Units	Chemical	Marine/ Estuarine Values		Lowest Aquatic Benchmark	USEPA List of Bioaccumulators[c]	Wildlife-Based PCL[d]	Basis
			NOAA ER-L[a]	NJDEP[b]				
79-00-5	ng/g	1,1,2-Trichloroethane	-	-	-	N	-	
75-34-3	ng/g	1,1-Dichloroethane	-	-	-	N	-	
75-35-4	ng/g	1,1-Dichloroethene	-	-	-	N	-	
563-58-6	ng/g	1,1-Dichloropropene	-	-	-	N	-	
96-18-4	ng/g	1,2,3-Trichloropropane	-	-	-	N	-	
96-12-8	ng/g	1,2-Dibromo-3-chloropropane	-	-	-	N	-	
106-93-4	ng/g	1,2-Dibromoethane	-	-	-	N	-	
107-06-2	ng/g	1,2-Dichloroethane	-	-	-	N	-	
540-59-0	ng/g	1,2-Dichloroethylene	-	-	-	N	-	
540-59-0	ng/g	1,2-Dichloroethylene	-	-	-	N	-	
78-87-5	ng/g	1,2-Dichloropropane	-	-	-	N	-	
142-28-9	ng/g	1,3-Dichloropropane	-	-	-	N	-	
594-20-7	ng/g	2,2-Dichloropropane	-	-	-	N	-	
591-78-6	ng/g	2-Hexanone	-	-	-	N	-	
59-50-7	ng/g	4-Chloro-3-methylphenol	-	-	-	N	-	
106-43-4	ng/g	4-Chlorotoluene	-	-	-	N	-	
108-10-1	ng/g	4-Methy-2-pentanone	-	-	-	N	-	
67-64-1	ng/g	Acetone	-	-	-	N	-	
98-86-2	ng/g	Acetophenone	-	-	-	N	-	
107-02-8	ng/g	Acrolein	-	-	-	N	-	
107-13-1	ng/g	Acrylonitrile	-	-	-	N	-	
71-43-2	ng/g	Benzene	-	340	340	N	-	NJ Benchmark
74-97-5	ng/g	Bromochloromethane	-	-	-	N	-	
75-25-2	ng/g	Bromoform	-	-	-	N	-	
75-15-0	ng/g	Carbon disulfide	-	-	-	N	-	
56-23-5	ng/g	Carbon Tetrachloride	-	-	-	N	-	
108-90-7	ng/g	Chlorobenzene	-	-	-	N	-	
124-48-1	ng/g	Chlorodibromomethane	-	-	-	N	-	
75-00-3	ng/g	Chloroethane	-	-	-	N	-	
67-66-3	ng/g	Chloroform	-	-	-	N	-	
156-59-2	ng/g	cis-1,2-Dichloroethylene	-	-	-	N	-	
1006-10-15	ng/g	cis-1,3-Dichloropropene	-	-	-	N	-	
110-82-7	ng/g	cyclohexane	-	-	-	N	-	
75-27-4	ng/g	Dichlorobromomethane	-	-	-	N	-	
75-71-8	ng/g	Dichlorodifluoromethane	-	-	-	N	-	

CASRN	Units	Chemical	Marine/ Estuarine Values		Lowest Aquatic Benchmark	USEPA List of Bioaccumulators[c]	Wildlife-Based PCL[d]	Basis
			NOAA ER-L[a]	NJDEP[b]				
100-41-4	ng/g	Ethylbenzene	-	1400	1400	N	-	NJ Benchmark
98-82-8	ng/g	Isopropylbenzene	-	-	-	N	-	
M&PXYLENE	ng/g	m&p-Xylene	-	120	120	N	-	NJ Benchmark
79-20-9	ng/g	methyl acetate	-	-	-	N	-	
74-83-9	ng/g	Methyl bromide	-	-	-	N	-	
74-87-3	ng/g	Methyl Chloride	-	-	-	N	-	
108-87-2	ng/g	Methyl Cyclohexane	-	-	-	N	-	
78-93-3	ng/g	Methyl Ethyl Ketone	-	-	-	N	-	
74-95-3	ng/g	Methylene Bromide	-	-	-	N	-	
75-09-2	ng/g	Methylene Chloride	-	-	-	N	-	
1634-04-4	ng/g	Methyl-t-Butyl Ether	-	-	-	N	-	
104-51-8	ng/g	n-Butylbenzene	-	-	-	N	-	
103-65-1	ng/g	n-Propylbenzene	-	-	-	N	-	
95-47-6	ng/g	O-Xylene	-	120	120	N	-	NJ Benchmark
99-87-6	ng/g	p-Isopropyltoluene	-	-	-	N	-	
100-42-5	ng/g	Styrene	-	-	-	N	-	
127-18-4	ng/g	Tetrachloroethylene	-	450	450	N	-	NJ Benchmark
108-88-3	ng/g	Toluene	-	2500	2500	N	-	NJ Benchmark
BTEX	ng/g	Total BTEX	-	-	-	N	-	
1330-20-7	ng/g	Total Xylenes	-	120	120	N	-	NJ Benchmark
156-60-5	ng/g	trans-1,2-Dichloroethylene	-	-	-	N	-	
10061-02-6	ng/g	Trans-1,3-dichloropropene	-	-	-	N	-	
79-01-6	ng/g	Trichloroethylene	-	1,600	1,600	N	-	NJ Benchmark
75-69-4	ng/g	Trichlorofluoromethane	-	-	-	N	-	
75-01-4	ng/g	Vinyl Chloride	-	-	-	N	-	
Semi-Volatile Organic Compounds (Non-PAHs)								
108-60-1	ng/g	1-Chloropropane	-	-	-	N	-	
95-50-1	ng/g	1,2-Dichlorobenzene	-	-	-	Y	2,746,538	Wildlife PCL
541-73-1	ng/g	1,3-Dichlorobenzene	-	-	-	Y	560,635	Wildlife PCL
106-46-7	ng/g	1,4-Dichlorobenzene	-	-	-	Y	560,635	Wildlife PCL
123-91-1	ng/g	1,4-Dioxane	-	-	-	N	-	
87-61-6	ng/g	1,2,3-Trichlorobenzene	-	-	-	Y	3,845,153	Wildlife PCL
120-82-1	ng/g	1,2,4-Trichlorobenzene	-	-	-	Y	3,845,153	Wildlife PCL
95-63-6	ng/g	1,2,4-Trimethylbenzene	-	-	-	N	-	
108-67-8	ng/g	1,3,5-Trimethylbenzene	-	-	-	N	-	
95-94-3	ng/g	1,2,4,5-Tetrachlorobenzene	-	-	-	Y	13,238	Wildlife PCL

CASRN	Units	Chemical	Marine/ Estuarine Values		Lowest Aquatic Benchmark	USEPA List of Bioaccumulators[c]	Wildlife-Based PCL[d]	Basis
			NOAA ER-L[a]	NJDEP[b]				
95-95-4	ng/g	2,4,5-Trichlorophenol	-	-	-	N	-	
88-06-2	ng/g	2,4,6-Trichlorophenol	-	-	-	N	-	
120-83-2	ng/g	2,4-Dichlorophenol	-	-	-	N	-	
105-67-9	ng/g	2,4-Dimethylphenol	-	-	-	N	-	
51-28-5	ng/g	2,4-Dinitrophenol	-	-	-	N	-	
121-14-2	ng/g	2,4-Dinitrotoluene	-	-	-	N	-	
28804-88-8	ng/g	2,6/2,7-Dimethylnaphthalene	-	-	-	N	-	
606-20-2	ng/g	2,6-Dinitrotoluene	-	-	-	N	-	
91-58-7	ng/g	2-Chloronaphthalene	-	-	-	N	-	
95-57-8	ng/g	2-Chlorophenol	-	-	-	N	-	
95-48-7	ng/g	2-Methylphenol	-	-	-	N	-	
88-74-4	ng/g	2-Nitroanaline	-	-	-	N	-	
88-75-5	ng/g	2-Nitrophenol	-	-	-	N	-	
91-94-1	ng/g	3,3'-Dichlorobenzidine	-	-	-	N	-	
99-09-2	ng/g	3-Nitroaniline	-	-	-	N	-	
101-55-3	ng/g	4-Bromophenyl Phenyl Ether	-	-	-	Y	5,850,214	Wildlife PCL
106-47-8	ng/g	4-Chloroaniline	-	-	-	N	-	
7005-72-3	ng/g	4-Chlorophenyl Phenyl Ether	-	-	-	Y	73,676,722	Wildlife PCL
106-44-5	ng/g	4-Methylphenol	-	-	-	N	-	
100-01-6	ng/g	4-Nitroaniline	-	-	-	N	-	
100-02-7	ng/g	4-Nitrophenol	-	-	-	N	-	
534-52-1	ng/g	4,6-Dinitro-2-Methylphenol	-	-	-	N	-	
95-15-8	ng/g	Benzo(b)thiophene	-		-	N	-	
92-87-5	ng/g	Benzidine	-		-	N	-	
65-85-0	ng/g	Benzoic Acid	-		-	N	-	
100-51-6	ng/g	Benzyl Alcohol	-	-	-	N	-	
111-91-1	ng/g	Bis(2-Chloroethoxy)methane	-	-	-	N	-	
111-44-4	ng/g	Bis(2-Chloroethyl)ether	-	-	-	N	-	
117-81-7	ng/g	Bis(2-Ethylhexyl)phthalate	-	-	-	N	-	
108-86-1	ng/g	Bromobenzene	-	-	-	N	-	
85-68-7	ng/g	Butyl Benzyl Phthalate	-	-	-	N	-	
86-74-8	ng/g	Carbazole	-	-	-	N	-	
1861-32-1	ng/g	Dacthal	-	-	-	N	-	

CASRN	Units	Chemical	Marine/ Estuarine Values		Lowest Aquatic Benchmark	USEPA List of Bioaccumulators[c]	Wildlife-Based PCL[d]	Basis
			NOAA ER-L[a]	NJDEP[b]				
132-64-9	ng/g	Dibenzofuran	-	-	-	N	-	
132-65-0	ng/g	Dibenzothiophene	-	-	-	N	-	
1002-53-5	ng/g	Dibutyltin	-	-	-	N	-	
84-66-2	ng/g	Diethyl Phthalate	-	-	-	N	-	
131-11-3	ng/g	Dimethylphthalate	-	-	-	N	-	
84-74-2	ng/g	Di-n-butyl Phthalate	-	-	-	N	-	
117-84-0	ng/g	Di-n-Octyl Phthalate	-	-	-	N	-	
87-68-3	ng/g	Hexachlorobutadiene	-	-	-	Y	117,004	Wildlife PCL
77-47-4	ng/g	Hexachlorocyclopentadiene	-	-	-	Y	-	
67-72-1	ng/g	Hexachloroethane	-	-	-	Y	-	
78-59-1	ng/g	Isophorone	-	-	-	N	-	
78763-54-9	ng/g	Monobutyltin	-	-	-	N	-	
98-95-3	ng/g	Nitrobenzene	-	-	-	N	-	
621-64-7	ng/g	N-nitrosodipropylamine	-	-	-	N	-	
86-30-6	ng/g	N-Nitroso-diI-phenylamine	-	-	-	N	-	
87-86-5	ng/g	Pentachlorophenol	-	-	-	Y	415,862	Wildlife PCL
108-95-2	ng/g	Phenol	-	-	-	N	-	
1461-25-2	ng/g	Tetrabutyltin	-	-	-	N	-	
56573-85-4	ng/g	Tributyltin	25	-	25	Y	3,583	NOAA ER-L
Semi-Volatile Organic Compounds (PAHs)								
90-12-0	ng/g	1-Methylnaphthalene	-	-	-	N	-	
832-69-9	ng/g	1-Methylphenanthrene	-	-	-	N	-	
91-57-6	ng/g	2-Methylnaphthalene	70	70	70	N	-	NOAA ER-L
2245-38-7	ng/g	2,3,5-Trimethylnaphthalene	-	-	-	N	-	
581-42-0	ng/g	2,6-Dimethylnaphthalene	-	-	-	N	-	
83-32-9	ng/g	Acenaphthene	16	16	16	Y	-	NOAA ER-L
208-96-8	ng/g	Acenaphthylene	44	44	44	Y	-	NOAA ER-L
120-12-7	ng/g	Anthracene	85.3	85	85	Y	-	NJ Benchmark
56-55-3	ng/g	Benzo[a]anthracene	261	261	261	Y	-	NOAA ER-L
50-32-8	ng/g	Benzo[a]pyrene	430	430	430	Y	-	NOAA ER-L
205-99-2	ng/g	Benzo[b]fluoranthene	-	-	-	Y	-	
192-97-2	ng/g	Benzo[e]pyrene	-	-	-	N	-	
191-24-2	ng/g	Benzo[g,h,i]perylene	-	-	-	Y	-	
92-52-4	ng/g	Biphenyl	-	-	-	Y	-	
207-08-9	ng/g	Benzo[k]fluoranthene	-	-	-	Y	-	
218-01-9	ng/g	Chrysene	384	384	384	Y	-	NOAA ER-L

CASRN	Units	Chemical	Marine/ Estuarine Values		Lowest Aquatic Benchmark	USEPA List of Bioaccumulators[c]	Wildlife-Based PCL[d]	Basis
			NOAA ER-L[a]	NJDEP[b]				
53-70-3	ng/g	Dibenz[a,h]anthracene	63.4	63	63	Y	-	NJ Benchmark
206-44-0	ng/g	Fluoranthene	600	600	600	Y	-	NOAA ER-L
86-73-7	ng/g	Fluorene	19	19	19	Y	-	NOAA ER-L
193-39-5	ng/g	Indeno[1,2,3-c,d]-pyrene	-	-	-	Y	-	
91-20-3	ng/g	Naphthalene	160	160	160	N	-	NOAA ER-L
198-55-0	ng/g	Perylene	-	-	-	N	-	
85-01-8	ng/g	Phenanthrene	240	240	240	Y	-	NOAA ER-L
129-00-0	ng/g	Pyrene	665	665	665	Y	-	NOAA ER-L
SUM_HIGH_PAH	ng/g	Low Molecular Weight PAHs	552	552		N	-	NOAA ER-L
SUM_LOW_PAH	ng/g	High Molecular Weight PAHs	1,700	1,700		N	-	NOAA ER-L
SUM_PAH	ng/g	Total PAHs	4,022	4,000	4,000	N	-	NJ Benchmark
PCB Aroclors								
12674-11-2	ng/g	Aroclor 1016	-	-	-	Y	365	Wildlife PCL
11104-28-2	ng/g	Aroclor 1221	-	-	-	Y	365	Wildlife PCL
11141-16-5	ng/g	Aroclor 1232	-	-	-	Y	365	Wildlife PCL
53469-21-9	ng/g	Aroclor 1242	-	-	-	Y	365	Wildlife PCL
12672-29-6	ng/g	Aroclor 1248	-	-	-	Y	365	Wildlife PCL
11097-69-1	ng/g	Aroclor 1254	-	-	-	Y	365	Wildlife PCL
11096-82-5	ng/g	Aroclor 1260	-	-	-	Y	365	Wildlife PCL
37324-23-5	ng/g	Aroclor-1262	-	-	-	Y	365	Wildlife PCL
SUM_PCB	ng/g	Total PCBs	22.7	23	22.7	Y	365	NOAA ER-L
Pesticides/Herbicides								
93-76-5	ng/g	2,4,5-T	-	-	-	N	-	
93-72-1	ng/g	2,4,5-TP	-	-	-	N	-	
94-75-7	ng/g	2,4-D	-	-	-	N	-	
94-82-6	ng/g	2,4-DB	-	-	-	N	-	
53-19-0	ng/g	2,4-DDD	2	-	2	Y	830	NOAA ER-L
3424-82-6	ng/g	2,4-DDE	2.2	-	2.2	Y	19	NOAA ER-L
789-02-6	ng/g	2,4-DDT	1	-	1	Y	139	NOAA ER-L
72-54-8	ng/g	4,4'-DDD	2	-	2	Y	830	NOAA ER-L
72-55-9	ng/g	4,4'-DDE	2.2	2.2	2.2	Y	19	NOAA ER-L
50-29-3	ng/g	4,4'-DDT	1	-	1	Y	139	NOAA ER-L
SUM_TDDT	ng/g	Total DDTs, sum of 6 isomers	1.58	1.6	1.58	Y	19	NOAA ER-L
309-00-2	ng/g	Aldrin	-	-	-	Y	463	Wildlife PCL
319-84-6	ng/g	BHC-alpha	-	-	-	Y	1,247	Wildlife PCL

CASRN	Units	Chemical	Marine/ Estuarine Values		Lowest Aquatic Benchmark	USEPA List of Bioaccumulators[c]	Wildlife-Based PCL[d]	Basis
			NOAA ER-L[a]	NJDEP[b]				
319-85-7	ng/g	BHC-beta	-	-	-	Y	1,247	Wildlife PCL
58-89-9	ng/g	BHC-gamma (Lindane)	-	-	-	Y	1,247	Wildlife PCL
319-86-8	ng/g	BHC, delta	-	-	-	Y	1,247	Wildlife PCL
SUM_BHC	ng/g	SUM_BHC	-	-	-	Y	1,247	Wildlife PCL
5103-71-9	ng/g	Chlordane, alpha (cis)	-	-	-	Y	2,006	Wildlife PCL
5103-74-2	ng/g	Chlordane, gamma (trans)	-	-	-	Y	2,006	Wildlife PCL
SUM_CHLORDANE	ng/g	Total Chlordane	-	-	-	Y	2,006	Wildlife PCL
60-57-1	ng/g	Dieldrin	0.02	-	0.02	Y	271	NOAA ER-L
1031-07-8	ng/g	Endosulfan Sulfate	-	-	-	Y	4,875	Wildlife PCL
959-98-8	ng/g	Endosulfan, alpha	-	-	-	Y	4,875	Wildlife PCL
33213-65-9	ng/g	Endosulfan, beta	-	-	-	Y	4,875	Wildlife PCL
SUM_ENDOSULFAN	ng/g	Total Endosulfan	-	-	-	Y	4,875	Wildlife PCL
7421-93-4	ng/g	Endrin Aldehyde	-	-	-	Y	35	Wildlife PCL
53494-70-5	ng/g	Endrin Ketone	-	-	-	Y	35	Wildlife PCL
SUM_ENDRIN	ng/g	Total Endrin	-	-	-	Y	35	Wildlife PCL
1024-57-3	ng/g	Heptachlor Epoxide	-	-	-	Y	9,663	Wildlife PCL
76-44-8	ng/g	Total Heptachlor	-	-	-	Y	-	
118-74-1	ng/g	Hexachlorobenzene	-	-	-	Y	92,898	Wildlife PCL
72-43-5	ng/g	Methoxychlor	-	-	-	Y	114,909	Wildlife PCL
2385-85-5	ng/g	Mirex	-	-	-	Y	-	
5103-73-1	ng/g	Total Nonachlor	-	-	-	N	-	
8001-35-2	ng/g	Toxaphene	-	-	-	Y	1,398	Wildlife PCL
Dioxins/Furans								
1746-01-6	ng/g	2,3,7,8-TCDD	0.0032	-	0.0032	Y	0.0025	Wildlife PCL

- no value available
a. ER-L = Effects Range-Low from Long and Morgan, 1991 and Long *et al.*, 1995; except where noted.
b NJDEP Guidance For Sediment Quality Evaluations, November 1998. References Long *et al.*, 1995.
c. From USEPA 2000. Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment. USEPA-823-R-00-001.
d. Protective Concentration Levels (PCLs) derived as discussed in the text; see Attachments B and C.

Protective Concentration Levels (PCLs)

Wildlife-protective sediment concentrations for bioaccumulating compounds were calculated to provide a sediment benchmark based on exposures to higher trophic level organisms. Equation 1 was used to estimate PCLs for piscivorous wildlife receptors in the LPRRP study area. The otter (*Lutra canadensis*) and belted kingfisher (*Ceryle alcyon*) were selected as the model receptors due to their relatively large dietary exposures to sediment-associated chemicals that can bioaccumulate in biological tissue.

$$PCL_{sed} = \frac{THQ * TRV * BW}{\left(BAF_{fish} * IR_{fish} * P_{fish} * SFF\right)} \qquad \text{Equation 1}$$

where:

PCL_{sed}	=	Protective Concentration Level for sediment protective of bioaccumulation hazards associated with the fish consumption pathway (µg COPEC/g sediment).
THQ	=	Target Hazard Quotient for the COPEC based on tissue residue effects (dimensionless); a THQ of 1 was used.
TRV	=	Toxicity Reference Value. Receptor-specific literature-based toxicity threshold value. NOAEL and LOAEL-based TRV values are presented in Attachment B. The MATC-based TRV is the geometric mean of the NOAEL- and LOAEL-based values.
BW	=	Receptor body weights (Kg) are summarized in Attachment B.
BAF_{fish}	=	Bioaccumulation Factor between sediment and fish prey consumed by the receptor (g sediment [dry weight]/ g fish [wet weight])
IR_{fish}	=	Daily fish ingestion rate (Kg fish consumed per day).
P_{fish}	=	Percentage of fish in the diet
SFF	=	Site Foraging Frequency (unitless); fraction of time receptor is assumed to forage at the site.

Table 3. Summary of Exposure Parameters Used to Develop the PCLs

Parameter	Value	Units	Reference
PCL_{sed}	Calculated using Equation 1	µg COPEC/g sediment	
THQ	1	unitless	
TRV	Chemical specific	µg COPEC/g-day	See Attachment B and Attachment C
BW	7.4 (otter)	Kg	USEPA, 1993a
	0.136 (kingfisher)		USEPA, 1993a; Brooks and Davis, 1987
BAF_{fish}	Chemical specific		See Attachment B and Attachment C
IR_{fish}	0.4 (otter)	Kg/day	USEPA, 1993a
	0.068 (kingfisher)		USEPA, 1993a; Alexander, 1977
P_{fish}	100	%	Assumption
SFF	1	unitless	Assumption

Chemical-specific TRVs and BAFs are presented in Attachments B and C, and the calculated PCLs for both receptors are provided in Table 2. For each chemical, the lower of the two PCL values was identified as the wildlife PCL and used in the screening evaluation. Note that there are relatively few TRVs for avian receptors and, consequently, for some COPECs, the wildlife value is based solely on the mammalian PCL.

Rather than derive PCLs for TCDD using the above approach, sediment concentrations protective of piscivorous mammals (2.5 picograms/gram [pg/g] or parts per trillion) and birds (21 pg/g) derived by USEPA (1993b) were used. The lower of these values was selected as the wildlife PCL value.

Essential Nutrients

Inorganic constituents considered to be “essential nutrients”, which are not likely to be toxic at anticipated environmental levels, were excluded from consideration in this analysis. These analytes include calcium, magnesium, potassium, and sodium.

Effects Values

The maximum concentrations of all constituents that were detected, including those considered bioaccumulative, and not considered essential nutrients, were screened against a hierarchy of effects-based sediment screening values. Screening values for sediments were obtained from sediment quality guidelines developed for marine and estuarine waters for NOAA by Long *et al.*, 1995; the Effects Range Low (ER-L). The ER-L values represent the low end of a range of levels at which adverse effects were observed in compiled studies and represent values at which toxicity may begin to be observed in sensitive species (Long *et al.*, 1995). Therefore, concentrations below the ER-L are considered to be within the "no effects range.” The ER-L values used in the selection of COPECs are listed in Table 2. Additional sediment quality values for New Jersey Department of Environmental Protection are also used (NJDEP, 1998) in this evaluation. These screening levels were developed specifically for sediment evaluations for use in the ecological risk assessment process. Although the NJDEP sediment guidelines are also based primarily on the Long *et al.*, 1995 study, several VOC benchmarks are also provided that were derived using an equilibrium partitioning approach (NJDEP, 1998).

A NOAA ER-L is not available for TCDD; therefore a site-specific screening benchmark (3.1 pg/g) as presented by Wintermyer and Cooper (2003), was derived by the U.S. Fish and Wildlife Service (USFWS) using Newark Bay sediment and oyster tissue chemistry and ecological effects.

Chemicals for which no effects-based sediment screening value was readily available were retained as preliminary COPECs. These are further addressed in a refinement step. In addition, as part of future risk assessment activities, a literature review will be conducted to identify appropriate screening values for chemicals currently lacking screening values.

Preliminary Sediment COPEC Selection

Inorganic Constituents

Surface sediments were analyzed for 26 inorganic constituents and these were all detected in at least one of the samples. A total of ten inorganic constituents are included on the USEPA list of bioaccumulative compounds (USEPA, 2000) and were compared to appropriate PCLs and sediment effects benchmarks where available. Four essential nutrients (calcium, magnesium, potassium, and sodium) were detected but eliminated from consideration as COPECs.

Sediment screening values were not available for 12 inorganic analytes (Table 4) detected in surface sediment samples. Excluding the essential nutrients, the remaining 12 analytes were retained as preliminary COPECs. Analytes that do not have sediment screening values will be discussed further in the refinement step. Hazard quotients were calculated for each of the analytes retained as preliminary COPECs and range from 8 for selenium to 290 for mercury (Attachment A).

Volatile Organic Compounds (VOCs)

Surface sediment samples were analyzed for a total of 61 VOCs and 21 VOCs were detected at least once among the samples evaluated. Sediment screening levels are available for a total of eight compounds. Only toluene slightly exceeded its screening value (HQ= 1.1) and was retained as a preliminary COPEC. Relevant screening values are not available for 53 VOCs that were retained as preliminary COPECs (Attachment A). Of these, 40 were reported as non-detects; however, in the absence of a screening level, the appropriateness of the detection level could not be fully evaluated. These compounds will be discussed further in the refinement step.

No VOC is included on the USEPA list of bioaccumulative compounds (USEPA, 2000).

Semivolatile Organic Compounds (SVOCs), Excluding PAHs

A total of 56 SVOCs were analyzed in surface sediment and 31 SVOCs were detected. Of the 31 compounds detected, only tributyltin exceeded the available screening level and was retained as a preliminary COPEC. In addition, the detection limit for hexachlorobutadiene was above the screening level and was therefore retained as a preliminary COPEC.

Forty-five additional SVOCs (Table 4) were identified as preliminary COPECs because they lack available sediment screening benchmarks. It should be noted that 26 of these compounds were also reported as non-detected, however, in the absence of a screening level, the appropriateness of the detection level could not be evaluated.

Polycyclic Aromatic Hydrocarbons (PAHs)

A total of 28 individual PAHs were detected in surface sediment samples. Sediment screening values are available for 16 PAHs, including total PAHs, total LMW PAHs, and total HMW PAHs. Nineteen constituents or summed totals were detected at maximum concentrations greater than the available sediment screening value and were retained as preliminary COPECs. No sediment screening value is available for six of the PAHs; therefore these constituents were also retained as preliminary COPECs.

Nineteen individual PAHs or summed totals are considered to be bioaccumulative compounds (USEPA, 2000). Nine were detected at maximum concentrations that exceed their respective PCL sediment screening values and were selected as preliminary COPECs.

Polychlorinated Biphenyls (PCBs)

Total PCBs (sum of Aroclor mixtures) and eight Aroclor mixtures were analyzed in Passaic River sediment samples. All PCBs are considered to be bioaccumulative compounds and were consequently evaluated by comparing maximum concentrations to the conservative wildlife-based PCLs. Four Aroclor mixtures were reported as non-detected (Table 4). The maximum concentrations of Total PCBs and

Aroclor mixtures 1242, 1248, 1254, and 1260 exceed their respective sediment screening values and were retained as preliminary COPECs.

Pesticides/Herbicides

Passaic River sediments were analyzed for 32 individual pesticides and herbicides, and total chlordane, total endosulfan, total endrin, total BHC, and total DDT (sum of six DDT isomers). Screening levels were not available for six of these compounds, including the four herbicides. Fourteen additional individual compounds and summed totals exceeded screening values and were retained as preliminary COPECs.

Dioxins/Furans

For dioxins, 2,3,7,8-TCDD was selected as an indicator for screening PCDDs, PCDFs, and coplanar PCBs for the purpose of this assessment. 2,3,7,8-TCDD was detected in almost all the samples (detection frequency of 99.6%). Dioxin/furan compounds are considered to be bioaccumulative compounds (USEPA, 2000). The maximum concentration substantially exceeds the PCL screening value (HQ=7,800) and TCDD was retained as a preliminary COPEC.

REFINEMENT AND IDENTIFICATION OF COPECS

A conservative screening evaluation was used to develop a list of preliminary COPECs. These compounds were screened based on their maximum concentration and using conservative screening values such as the NOAA ER-Ls. Further refinement of this list of COPECs was conducted to identify those chemicals that provide the best basis for making sediment management decisions in the FFS. Although a category of preliminary COPECs was identified based on the unavailability of sediment screening benchmarks, these are not considered to be likely risk drivers that would provide the primary rationale for a possible early action at the LPRRP site. This is supported by the following arguments:

- Protective screening benchmarks were established for all detected sediment constituents considered to pose a bioaccumulation hazard to wildlife; as a result these risk uncertainties are limited to macroinvertebrate receptors. While lower trophic levels provide important ecosystem functions such as providing a prey base and in cycling nutrients, they are generally not considered to have the same societal relevance as do fish and wildlife species.

- The lack of readily available benchmarks suggests that in at least some cases the particular constituent is not typically bioavailable and/or toxic at environmental concentrations.

- It is unlikely that the potential ecological hazards attributable to constituents that lack screening benchmarks would be of a comparable magnitude to those definitively identified as a result of this screening process. Given the advancements in scientific understanding of ecotoxicological principles made during the last four decades, it is reasonable to conclude that a list of COPCs that include some of the most toxic components of all major chemical classes should provide an adequate basis for proceeding to characterize substantive environmental risks and to facilitate decision making.

Table 4 provides a summary of preliminary COPECs that were identified as non-detect and/or lack of available screening values. It is recommended that these compounds not be considered further in the FFS due to the uncertainty associated with these values.

Table 4. Preliminary COPECs Reported as Non-Detect or Lacking Established Sediment Screening Values

Chemical	Units	Maximum Concentration[a]	Qualifier[b]	Number Samples	Detection Frequency	Non Detect[c]	No Benchmark[d]
Inorganics							
Aluminum	ng/g	2.4E+07	M	320	100%		√
Ammonia	ng/g	2.9E+06		77	97%		√
Antimony	ng/g	3.8E+04		301	38%		√
Barium	ng/g	1.3E+06		315	99%		√
Beryllium	ng/g	3.1E+03		318	69%		√
Calcium	ng/g	3.7E+07	M	320	100%		√
Cobalt	ng/g	4.1E+04		318	93%		√
Cyanide	ng/g	2.7E+05		220	16%		√
Iron	ng/g	4.8E+07		320	100%		√
Magnesium	ng/g	9.8E+06	M	320	100%		√
Manganese	ng/g	8.6E+05	M	315	100%		√
Potassium	ng/g	5.9E+06	NJH	277	99%		√
Sodium	ng/g	1.4E+07	M	320	100%		√
Thallium	ng/g	4.9E+03	M	304	50%		√
Titanium	ng/g	7.4E+05	N*JL	134	100%		√
Vanadium	ng/g	9.9E+04	M	318	100%		√
Volatile Organic Compounds							
1,1,1,2-Tetrachloroethane	ng/g	3.1E+00	U	1	0%	√	√
1,1,1-Trichloroethane	ng/g	6.6E+01	U	162	0%	√	√
1,1,2,2-Tetrachloroethane	ng/g	6.6E+01	U	162	0%	√	√
1,1,2-trichloro-1,2,2-trifluoroethane	ng/g	6.6E+01	U	25	0%	√	√
1,1,2-Trichloroethane	ng/g	6.6E+01	U	162	0%	√	√
1,1-Dichloroethane	ng/g	6.6E+01	U	162	0%	√	√
1,1-Dichloroethane	ng/g	6.6E+01	U	162	0%	√	√
1,1-Dichloroethene	ng/g	6.6E+01	U	162	0%	√	√
1,1-Dichloropropene	ng/g	3.3E+00	U	1	0%	√	√
1,2,3-Trichloropropane	ng/g	5.6E+00	U	1	0%	√	√
1,2-Dibromo-3-chloropropane	ng/g	6.6E+01	U	26	0%	√	√
1,2-Dibromoethane	ng/g	6.6E+01	U	26	0%	√	√
1,2-Dichloroethylene	ng/g	3.8E+01	U, UJL	136	2%		√
1,2-Dichloropropane	ng/g	6.6E+01	U	162	0%	√	√
1,3-Dichloropropane	ng/g	5.6E+00	U	1	0%	√	√
2,2-Dichloropropane	ng/g	1.1E+01	U	1	0%	√	√
2-Hexanone	ng/g	6.6E+01	U	161	0%	√	√
4-Chloro-3-Methylphenol	ng/g	1.2E+04	UM	219	0%	√	√
4-Chlorotoluene	ng/g	2.5E+00	U	1	0%	√	√
4-Methyl-2-Pentanone	ng/g	6.6E+01	U	161	0%	√	√
Acetone	ng/g	4.3E+02	M	161	64%		√
Acetophenone	ng/g	4.2E+02	U	10	20%		√
Bromochloromethane	ng/g	4.6E+00	U	1	0%	√	√
Bromoform	ng/g	6.6E+01	U	162	0%	√	√
Carbon Disulfide	ng/g	6.6E+01	U	161	1%		√
Carbon Tetrachloride	ng/g	6.6E+01	U	162	0%	√	√
Chlorobenzene	ng/g	1.4E+03		162	15%		√
Chlorodibromomethane	ng/g	6.6E+01	U	162	0%	√	√
Chloroethane	ng/g	6.6E+01	U	162	0%	√	√
Chloroform	ng/g	6.6E+01	U	162	0%	√	√
Cis-1,2-Dichloroethylene	ng/g	6.6E+01	U	26	0%	√	√

Chemical	Units	Maximum Concentration[a]	Qualifier[b]	Number Samples	Detection Frequency	Non Detect[c]	No Benchmark[d]
cis-1,3-Dichloropropene	ng/g	6.6E+01	U	162	0%	√	√
Cyclohexane	ng/g	6.6E+01	U	25	0%	√	√
Dichlorobromomethane	ng/g	6.6E+01	U	162	0%	√	√
Dichlorodifluoromethane	ng/g	6.6E+01	U	26	0%	√	√
Isopropylbenzene	ng/g	6.6E+01	U	26	12%		√
Methyl acetate	ng/g	6.6E+01	U	25	0%	√	√
Methyl Bromide	ng/g	6.6E+01	U	162	1%		√
Methyl Chloride	ng/g	6.6E+01	U	162	7%		√
Methyl cyclohexane	ng/g	6.6E+01	U	25	4%		√
Methyl Ethyl Ketone	ng/g	8.3E+01	JL	161	18%		√
Methylene Bromide	ng/g	6.2E+00	U	1	0%	√	√
Methylene Chloride	ng/g	6.6E+01	U	162	6%		√
Methyl-t-Butyl Ether	ng/g	6.6E+01	U	25	0%	√	√
n-Butylbenzene	ng/g	8.7E+00		1	100%		√
n-Propylbenzene	ng/g	7.7E+00		1	100%		√
p-Isopropyltoluene	ng/g	3.7E+00		1	100%		√
Styrene	ng/g	6.6E+01	U	162	0%	√	√
Tetrachloroethylene	ng/g	6.6E+01	U	162	0%	√	
Total BTEX	ng/g	2.8E+03		22	100%		√
Total xylenes	ng/g	6.6E+01	U	15	0%	√	
Trans-1,2-Dichloroethylene	ng/g	6.6E+01	U	26	0%	√	√
Trans-1,3-dichloropropene	ng/g	6.6E+01	U	162	0%	√	√
Trichlorofluoromethane	ng/g	6.6E+01	U	26	0%	√	√
Vinyl Chloride	ng/g	6.6E+01	U	162	0%	√	√
Semi-Volatile Organic Compounds (Non PAHs)							
1,2,3-Trichlorobenzene	ng/g	5.0E+00	U	1	0%	√	
1,2,4,5-Tetrachlorobenzene	ng/g	4.2E+02	U	10	0%	√	
1,2,4-Trimethylbenzene	ng/g	7.1E+00		1	100%		√
1,3,5-Trimethylbenzene	ng/g	1.9E+01		1	100%		√
1,4-Dioxane	ng/g	4.0E+02	U	10	10%		√
1-Chloropropane	ng/g	1.2E+04	UM	219	0%	√	√
2,4,5-Trichlorophenol	ng/g	1.2E+04	U, UM	219	2%		√
2,4,6-Trichlorophenol	ng/g	1.2E+04	UM	219	0%		√
2,4-Dichlorophenol	ng/g	1.2E+04	UM	219	4%		√
2,4-Dimethylphenol	ng/g	1.2E+04	UM	219	0%	√	√
2,4-Dinitrophenol	ng/g	7.1E+04	UM	219	0%	√	√
2,4-Dinitrotoluene	ng/g	1.2E+04	UM	219	0%	√	√
2,6-Dinitrotoluene	ng/g	1.2E+04	UM	219	0%	√	√
2-Chloronaphthalene	ng/g	1.2E+04	UM	219	0%	√	√
2-Chlorophenol	ng/g	1.2E+04	UM	219	0%		√
2-Methylphenol	ng/g	1.2E+04	UM	219	0%		√
2-Nitroanaline	ng/g	1.2E+04	U, UM	219	0%	√	√
2-Nitrophenol	ng/g	1.2E+04	UM	219	0%	√	√
3,3'-Dichlorobenzidine	ng/g	2.4E+04	UM	218	0%		√
3-Nitroaniline	ng/g	1.2E+04	UJ, UM	218	0%	√	√
4,6-Dinitro-2-Methylphenol	ng/g	3.0E+04	UM	219	0%	√	√
4-Bromophenyl Phenyl Ether	ng/g	1.2E+04	UM	219	0%	√	
4-Chloroaniline	ng/g	1.2E+04	UM	219	3%		√
4-Chlorophenyl Phenyl Ether	ng/g	1.2E+04	UM	219	0%	√	
4-Methylphenol	ng/g	1.2E+04	UM	219	2%		√
4-Nitroaniline	ng/g	1.2E+04	U, UM	219	0%	√	√
4-Nitrophenol	ng/g	3.0E+04	UM	219	0%		√
Bis(2-Chloroethoxy)methane	ng/g	1.2E+04	UM	219	0%	√	√
Bis(2-Chloroethyl)ether	ng/g	1.2E+04	UM	219	0%	√	√

Chemical	Units	Maximum Concentration[a]	Qualifier[b]	Number Samples	Detection Frequency	Non Detect[c]	No Benchmark[d]
Bis(2-Ethylhexyl)phthalate	ng/g	2.3E+07	DM	220	97%		√
Bromobenzene	ng/g	3.3E+00	U	1	0%	√	√
Butyl Benzyl Phthalate	ng/g	3.6E+05	J	219	45%		√
Carbazole	ng/g	1.2E+04	UM	219	34%		√
Dibenzofuran	ng/g	7.0E+04		219	22%		√
Dibenzothiophene	ng/g	1.4E+03		103	97%		√
Dibutyltin	ng/g	2.1E+02	M	74	99%		√
Diethyl Phthalate	ng/g	4.5E+04		219	1%		√
Dimethylphthalate	ng/g	1.2E+04	UM	219	1%		√
Di-n-butyl Phthalate	ng/g	1.2E+04	UM	219	15%		√
Di-n-Octyl Phthalate	ng/g	1.2E+04	UM	219	47%		√
Hexachlorobutadiene	ng/g	1.2E+04	UM	220	0%	√	
Hexachlorocyclopentadiene	ng/g	2.4E+04	UM	219	0%	√	√
Hexachloroethane	ng/g	1.2E+04	UM	219	0%	√	√
Isophorone	ng/g	1.2E+04	UM	219	0%	√	√
Monobutyltin	ng/g	2.8E+01	JL	74	57%		√
Nitrobenzene	ng/g	1.2E+04	UM	219	0%	√	√
N-Nitroso-di-phenylamine	ng/g	1.2E+04	UM	219	9%		√
N-nitrosodipropylamine	ng/g	1.2E+04	UJ	219	0%	√	√
Pentachlorophenol	ng/g	3.0E+04	UM	219	0%	√	
Phenol	ng/g	1.2E+04	UM	219	1%		√
Tetrabutyltin	ng/g	1.6E+00	M	74	15%		√
Semi-Volatile Organic Compounds (PAHs)							
1-Methylnaphthalene	ng/g	9.1E+02	M	84	89%		√
1-Methylphenanthrene	ng/g	3.0E+03		103	98%		√
2,3,5-Trimethylnaphthalene	ng/g	2.1E+03		103	92%		√
2,6-Dimethylnaphthalene	ng/g	1.8E+03		103	93%		√
Benzo[b/j]fluoranthene	ng/g	8.4E+03		19	100%		√
Benzo[b]fluoranthene	ng/g	1.0E+05		294	96%		√
Benzo[e]pyrene	ng/g	8.3E+03	NJ	103	100%		√
Benzo[g,h,i]perylene	ng/g	6.3E+04		313	82%		√
Benzo[k]fluoranthene	ng/g	6.3E+04		313	95%		√
Biphenyl	ng/g	4.2E+02	U	84	88%		√
Indeno[1,2,3-c,d]-pyrene	ng/g	5.7E+04		312	83%		√
Perylene	ng/g	2.6E+03		103	99%		√
PCB Aroclors							
Aroclor 1016	ng/g	9.7E+02	UJ	229	0%	√	
Aroclor 1221	ng/g	1.4E+03	UM	229	0%	√	
Aroclor 1232	ng/g	9.7E+02	UJ	229	0%	√	
Aroclor-1262	ng/g	8.2E+00	U	10	0%	√	
Pesticide/Herbicides							
2,4,5-T	ng/g	4.1E+02	U	167	0%	√	√
2,4,5-TP	ng/g	4.1E+02	U	177	6%		√
2,4-D	ng/g	1.0E+03	U	166	0%	√	√
2,4-DB	ng/g	6.9E+02	UM	166	11%		√
Toxaphene	ng/g	3.4E+03	UM	231	0%	√	

Notes:
a. Obtained from query of PREmis database; units in ng/g (ppb).
b. Data qualifiers from PREmis database; metadata not available.
c. Symbol indicates that the chemical parameter was not detected in the evaluated dataset.
d. Symbol indicates that no benchmark was identified for the particular chemical parameter.

As previously stated, future risk assessment activities will include a literature review to identify appropriate screening values for chemicals currently lacking screening values as well as a data usability assessment. Although not considered as part of the FFS, these compounds will be evaluated further in the baseline risk assessment activities.

The refinement step also considers the magnitude of exceedances. The magnitude of exceedances was assessed using a hazard quotient methodology. Table 5 provides a summary of the magnitude HQ of exceedances. The magnitudes of exceedances were categorized in relationship to the chemical-specific HQ. Exceedances were categorized in a range from 1 to 1,000 times the HQ and are summarized in Table 5.

Table 5. Summary of FFS COPECs and Magnitude of Hazard Quotient Exceedances

Chemical[a]	Units	Maximum Concentration	Qualifier[b]	Number Samples	Detection Frequency	Sediment Benchmarks		Hazard Quotient		Hazard Quotient Exceedance Category[c]					
						Aquatic	Wildlife	Aquatic	Wildlife	1	10	50	100	500	1000
Inorganics															
Arsenic	ng/g	1.08E+05		309	98%	8.2E+03	1.7E+05	1.3E+01	6.2E-01	√	√				
Cadmium	ng/g	2.53E+04		321	98%	1.2E+03	3.0E+03	2.1E+01	8.5E+00	√	√				
Chromium	ng/g	6.70E+05		318	100%	8.1E+04	4.1E+04	8.3E+00	1.6E+01	√	√				
Copper	ng/g	2.47E+06		321	100%	3.4E+04	1.3E+04	7.3E+01	1.9E+02	√	√	√	√		
Lead	ng/g	1.55E+06		316	100%	4.7E+04	1.1E+04	3.3E+01	1.5E+02	√	√	√	√		
Mercury	ng/g	1.07E+04	M	260	97%	1.5E+02	3.7E+01	7.1E+01	2.9E+02	√	√	√	√		
Nickel	ng/g	3.69E+05		303	100%	2.1E+04	2.2E+04	1.8E+01	1.7E+01	√	√				
Selenium	ng/g	7.40E+03	U	245	44%		9.2E+02		8.0E+00	√					
Silver	ng/g	3.95E+04		245	88%	1.0E+03	1.3E+06	4.0E+01	3.0E-02	√	√				
Zinc	ng/g	1.62E+06		313	100%	1.5E+05	4.7E+04	1.1E+01	3.5E+01	√	√				
Volatile Organic Compounds															
Toluene	ng/g	2.80E+03	DJL	162	10%	2.5E+03	-	1.1E+00		√					
Semi-Volatile Organic Compounds (Non-PAHs)															
Tributyltin	ng/g	6.90E+02	IM	74	93%	2.5E+01	3.6E+03	2.8E+01	1.9E-01	√	√				
Semi-Volatile Organic Compounds (PAHs)															
2-Methylnaphthalene	ng/g	2.40E+04	M	312	49%	7.0E+01	-	3.4E+02		√	√	√	√		
Acenaphthene	ng/g	4.20E+05		312	58%	1.6E+01	-	2.6E+04		√	√	√	√	√	√
Acenaphthylene	ng/g	1.20E+04	UM	312	62%	4.4E+01	-	2.7E+02		√	√	√	√		
Anthracene	ng/g	2.30E+05	D	312	78%	8.5E+01	-	2.7E+03		√	√	√	√	√	√
Benzo[a]anthracene	ng/g	1.50E+05		313	95%	2.6E+02	-	5.7E+02		√	√	√	√	√	
Benzo[a]pyrene	ng/g	1.30E+05		313	97%	4.3E+02	-	3.0E+02		√	√	√	√		
Chrysene	ng/g	1.50E+05		313	99%	3.8E+02	-	3.9E+02		√	√	√	√		
Dibenz[a,h]anthracene	ng/g	2.50E+04		312	70%	6.3E+01	-	4.0E+02		√	√	√	√		
Fluoranthene	ng/g	3.20E+05	D	313	99%	6.0E+02	-	5.3E+02		√	√	√	√	√	
Fluorene	ng/g	1.40E+05		312	59%	1.9E+01	-	7.4E+03		√	√	√	√	√	√
Naphthalene	ng/g	4.00E+04	D	313	51%	1.6E+02	-	2.5E+02		√	√	√	√		
Phenanthrene	ng/g	5.70E+05	D	313	91%	2.4E+02	-	2.4E+03		√	√	√	√	√	√
Pyrene	ng/g	3.40E+05	D	313	99%	6.7E+02	-	5.1E+02		√	√	√	√	√	
SUM_HIGH_PAH	ng/g	1.40E+06		239	0%	5.5E+02	-	2.5E+03		√	√	√	√	√	√
SUM_LOW_PAH	ng/g	1.41E+06		240	0%	1.7E+03	-	8.3E+02		√	√	√	√	√	
SUM_PAH	ng/g	2.81E+06		240	0%	4.0E+03	-	7.0E+02		√	√	√	√	√	
PCB Aroclors															
Aroclor 1242	ng/g	1.72E+04	D	229	1%		3.7E+02		4.7E+01	√	√				
Aroclor 1248	ng/g	7.45E+03	DM	235	72%		3.7E+02		2.0E+01	√	√				
Aroclor 1254	ng/g	5.80E+03		231	65%		3.7E+02		1.6E+01	√	√				
Aroclor 1260	ng/g	2.16E+03	DM	228	38%		3.7E+02		5.9E+00	√					
SUM_PCB AROCLORS	ng/g	1.75E+04		236	0%	2.3E+01	3.7E+02	7.7E+02	4.8E+01	√	√	√	√	√	
Pesticide/Herbicides															
2,4-DDD	ng/g	6.87E+02	T	22	95%	2.0E+00	8.3E+02	3.4E+02	8.3E-01	√	√	√	√		
2,4-DDE	ng/g	3.03E+02		22	100%	2.2E+00	1.9E+01	1.4E+02	1.6E+01	√	√	√	√		
2,4-DDT	ng/g	1.45E+02	T	22	95%	1.0E+00	1.4E+02	1.5E+02	1.0E+00	√	√	√	√		
4,4'-DDD	ng/g	5.98E+03	DM	236	91%	2.0E+00	8.3E+02	3.0E+03	7.2E+00	√	√	√	√	√	√
4,4'-DDE	ng/g	1.01E+03		237	91%	2.2E+00	1.9E+01	4.6E+02	5.3E+01	√	√	√	√		
4,4'-DDT	ng/g	2.47E+03	DM	234	75%	1.0E+00	1.4E+02	2.5E+03	1.8E+01	√	√	√	√	√	√
SUM_TDDT	ng/g	5.99E+03		248	0%	1.6E+00	1.9E+01	3.8E+03	3.1E+02	√	√	√	√	√	√
Aldrin	ng/g	6.60E+02		236	7%		4.6E+02		1.4E+00	√					
BHC-beta	ng/g	2.00E+03		227	3%		1.2E+03		1.6E+00	√					
SUM_BHC	ng/g	2.01E+03		233	0%		1.2E+03		1.6E+00	√					
Dieldrin	ng/g	1.41E+02	PDJ	236	46%	2.0E-02	2.7E+02	7.1E+03	5.2E-01	√	√	√	√	√	√

Table 5. Summary of FFS COPECs and Magnitude of Hazard Quotient Exceedances (continued)

Chemical[a]	Units	Maximum Concentration	Qualifier[b]	Number Samples	Detection Frequency	Sediment Benchmarks		Hazard Quotient		Hazard Quotient Exceedance Category[e]					
						Aquatic	Wildlife	Aquatic	Wildlife	1	10	50	100	500	1000
Endrin aldehyde	ng/g	6.70E+01		227	7%		3.5E+01		1.9E+00	√					
Endrin ketone	ng/g	2.36E+03	D	229	27%		3.5E+01		6.7E+01	√	√	√			
SUM_ENDRIN	ng/g	2.37E+03		233	0%		3.5E+01		6.7E+01	√	√	√			
Dioxin/Furans															
2,3,7,8-TCDD	ng/g	1.94E+01	BD	230	100%	3.2E-03	2.5E-03	6.1E+03	7.8E+03	√	√	√	√	√	√

Notes:
a. Detected chemicals with maximum concentration exceeding the selected sediment benchmark; units in ng/g (ppb).
b. Data qualifiers from PREmis database; metadata not available.
c. Derivation of sediment benchmarks described in the text.
d. Sediment benchmarks were selected as the lowest of the NOAA Effects Range-Low, the NJDEP sediment screening guidelines, and the estimated wildlife PCL values.
e. Checks indicate that the Hazard Quotient exceeds the indicated HQ exceedance category.

Inorganic Constituents

No sediment screening values were available for 16 inorganic analytes (including the four essential nutrients); it is recommended that these not be retained as COPECs for the FFS. Hazard quotients for the remaining 10 inorganic analytes exceed 1 (Table 5) and are retained for further consideration as COPECs. The highest magnitude of exceedances were associated with copper (HQ=190), lead (HQ = 150, and mercury (HQ = 290).

Volatile Organic Compounds (VOCs)

Sediment screening values were only available for eight VOC compounds. The majority of VOCs were reported as non-detect and lack sediment screening benchmarks (Table 4). Because VOCs have a propensity for rapid dispersion and degradation in environmental media (*e.g.*, surface water, sediment, surface soil, and biota), it is unlikely that these compounds are risk drivers for ecological receptors. Only the HQ for toluene (i.e., 1.1) exceeds 1 and only slightly (Table 5).

Semivolatile Organic Compounds (SVOCs) Excluding PAHs

A total of 31 SVOCs were detected but only the maximum concentration of tributyltin exceeds the screening value (HQ=28) (Table 5). The remaining compounds were either reported as non-detect and/or lacked an available screening value.

Polycyclic Aromatic Hydrocarbons (PAHs)

Thirteen individual PAH compounds, HMW PAHs, LMW PAHs, and total PAHs are recommended for further consideration as potential COPECs (Table 5). The magnitude of exceedances for these compounds range from 250 (naphthalene) to 26,000 (acenaphthene).

Polychlorinated Biphenyls (PCBs)

Maximum concentrations of four Aroclor mixtures and total PCB exceed the established screening levels (Table 5). The highest HQs are associated with total PCBs (HQ=770) and Aroclor 1242 (HQ=47).

Pesticides/Herbicides

Fourteen pesticide compounds or their summed totals were retained for further consideration as COPECs. The maximum concentrations of total DDTs (HQ=3,800), 4,4'DDD (HQ=3,000) and dieldrin (HQ= 7,100) exceed the screening values by the greatest degree (Table 5).

Dioxins/Furans

As stated previously, 2,3,7,8-TCDD was selected as an indicator for screening individual PCDDs, PCDFs, and coplanar PCBs for the purpose of this assessment. 2,3,7,8-TCDD was retained for further consideration as a COPEC with an HQ of 7,800 based on the maximum detected concentration (Table 5).

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Attachment A
Analytical Data Summary Used in Ecological Screening

Lower Passaic River Restoration Project
Focused Feasibility Study

CASRN	Chemical	Units	Database Query Results[a] Min Value	Qualifier[b]	Max Value	Qualifier[b]	Min MDL[c]	Max MDL	Number of Samples	Number of Detected Results	NOAA ER-L[d]	NJ DEP Benchmark[e]	USEPA[f] List Bioaccumulators	Wildlife Based PCL[g]	Hazard Quotient[h] Aquatic	Hazard Quotient[h] Wildlife	Basis[i]
Inorganics																	
7429-90-5	Aluminum	ng/g	36.7		23,700,000.	M	20,000.	20,000.	320.	320.	-	-	N				
7664-41-7	Ammonia	ng/g	81,000.	G	2,880,000.		190,000.	830,000.	77.	75.			N				
7440-36-0	Antimony	ng/g	0.0017	GJL	38,000.		0.003	21,900.	301.	114.	-		N				
7440-38-2	Arsenic	ng/g	0.0085		108,000.		1,000.	12,300.	309.	303.	8200	8200	Y	1.7E+05	1.3E+01	6.2E-01	NOAA ER-L
7440-39-3	Barium	ng/g	0.191		1,280,000.		10,000.	41,400.	315.	312.	-	-	N				
7440-41-7	Beryllium	ng/g	0.0134	G	3,100.		260.	1,800.	318.	218.	-	-	N				
7440-43-9	Cadmium	ng/g	0.00576	G	25,300.		550.	1,000.	321.	316.	1200	1200	Y	3.0E+03	2.1E+01	8.5E+00	NOAA ER-L
7440-70-2	Calcium	ng/g	58.8		36,500,000.	M	500,000.	549,000.	320.	319.	-	-	N				
7440-47-3	Chromium	ng/g	0.331		670,000.		2,000.	2,000.	318.	318.	81000	81000	Y	4.1E+04	8.3E+00	1.6E+01	Wildlife PCL
7440-48-4	Cobalt	ng/g	0.0192	GJ	41,100.		1,000.	18,300.	318.	296.	-	-	N				
7440-50-8	Copper	ng/g	0.0123		2,470,000.		2,000.	2,000.	321.	321.	34000	34000	Y	1.3E+04	7.3E+01	1.9E+02	Wildlife PCL
57-12-5	Cyanide	ng/g	170.	NUJL	269,000.		170.	2,500.	220.	35.	-	-	N				
7439-89-6	Iron	ng/g	47.1		47,500,000.		10,000.	10,000.	320.	320.	-	-	N				
7439-92-1	Lead	ng/g	0.3		1,550,000.		1,000.	1,000.	316.	316.	46700	47000	Y	1.1E+04	3.3E+01	1.5E+02	Wildlife PCL
7439-95-4	Magnesium	ng/g	51.2		9,820,000.	M	500,000.	500,000.	320.	320.	-	-	N				
7439-96-5	Manganese	ng/g	1.29		861,000.	M	1,000.	1,000.	315.	315.	-	-	N				
7439-97-6	Mercury	ng/g	0.00005		10,700.	M	0.00017	120.	260.	251.	150	150	Y	3.7E+01	7.1E+01	2.9E+02	Wildlife PCL
7440-02-0	Nickel	ng/g	0.068	J	369,000.		1,000.	1,000.	303.	303.	20900	21000	Y	2.2E+04	1.8E+01	1.7E+01	NOAA ER-L
7440-09-7	Potassium	ng/g	6.11		5,860,000.	NJH	500,000.	1,110,000.	277.	274.	-		N				
7782-49-2	Selenium	ng/g	0.0039		7,400.	U	0.0046	7,400.	245.	107.	-	-	Y	9.2E+02		8.0E+00	Wildlife PCL
7440-22-4	Silver	ng/g	0.0019		39,500.		0.0068	3,700.	245.	215.	1000	1000	Y	1.3E+06	4.0E+01	3.0E-02	NOAA ER-L
7440-23-5	Sodium	ng/g	28.6	J	13,900,000.	M	500,000.	563,000.	320.	319.	-		N				
7440-28-0	Thallium	ng/g	0.0017	G	4,900.	M	0.0044	3,200.	304.	152.	-	-	N				
7440-32-6	Titanium	ng/g	141,000.	NJH	735,000.	N*JL	100,000.	100,000.	134.	134.	-	-	N				
7440-62-2	Vanadium	ng/g	0.079		98,800.	M	1,000.	1,000.	318.	318.	-	-	N				
7440-66-6	Zinc	ng/g	1.27		1,620,000.		2,000.	2,000.	313.	313.	150000	150000	Y	4.7E+04	1.1E+01	3.5E+01	Wildlife PCL
Volatile Organic Compounds																	
630-20-6	1,1,1,2-Tetrachloroethane	ng/g	3.1	U	3.1	U	3.1	3.1	1.	0.			N				
71-55-6	1,1,1-Trichloroethane	ng/g	5.	U	66.	U	5.	66.	162.	0.	-	-	N				
79-34-5	1,1,2,2-Tetrachloroethane	ng/g	10.	U	66.	U	10.	66.	162.	0.	-	-	N				
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethan	ng/g	11.	U	66.	U	11.	66.	25.	0.			N				
79-00-5	1,1,2-Trichloroethane	ng/g	7.7	U	66.	U	7.7	66.	162.	0.	-		N				
107-06-2	1,2-Dichloroethane	ng/g	6.4	U	66.	U	6.4	66.	162.	0.	-		N				
75-34-3	1,1-Dichloroethane	ng/g	2.9	U	66.	U	2.9	66.	162.	0.			N				
75-35-4	1,1-Dichloroethene	ng/g	3.5	U	66.	U	3.5	66.	162.	0.	-	-	N				
563-58-6	1,1-Dichloropropene	ng/g	3.3	U	3.3	U	3.3	3.3	1.	0.			N				
96-18-4	1,2,3-Trichloropropane	ng/g	5.6	U	5.6	U	5.6	5.6	1.	0.			N				
96-12-8	1,2-Dibromo-3-chloropropane	ng/g	7.3	U	66.	U	7.3	66.	26.	0.			N				
106-93-4	1,2-Dibromoethane	ng/g	7.7	U	66.	U	7.7	66.	26.	0.			N				
540-59-0	1,2-Dichloroethylene	ng/g	7.		38.	U, UJL	12.	38.	136.	3.	-	-	N				
78-87-5	1,2-Dichloropropane	ng/g	3.7	U	66.	U	3.7	66.	162.	0.	-	-	N				
142-28-9	1,3-Dichloropropane	ng/g	5.6	U	5.6	U	5.6	5.6	1.	0.			N				
594-20-7	2,2-Dichloropropane	ng/g	11.	U	11.	U	11.	11.	1.	0.			N				
591-78-6	2-Hexanone	ng/g	12.	U	66.	U	12.	66.	161.	0.	-	-	N				
59-50-7	4-Chloro-3-Methylphenol	ng/g	290.	U	12,000.	UM	290.	12,000.	219.	0.			N				
106-43-4	4-Chlorotoluene	ng/g	2.5	U	2.5	U	2.5	2.5	1.	0.			N				
108-10-1	4-Methyl-2-Pentanone	ng/g	12.	U	66.	U	12.	66.	161.	0.			N				
67-64-1	Acetone	ng/g	8.		430.	M	12.	240.	161.	103.	-	-	N				
98-86-2	Acetophenone	ng/g	82.	J	420.	U	290.	420.	10.	2.			N				
71-43-2	Benzene	ng/g	7.	J	300.	M	8.	91.	162.	8.	-	340 1	N		8.8E-01		NJ Benchmark
74-97-5	Bromochloromethane	ng/g	4.6	U	4.6	U	4.6	4.6	1.	0.			N				
75-25-2	Bromoform	ng/g	6.8	U	66.	U	6.8	66.	162.	0.	-	-	N				
75-15-0	Carbon Disulfide	ng/g	6.	J	66.	U	6.	66.	161.	2.			N				
56-23-5	Carbon Tetrachloride	ng/g	4.6	U	66.	U	4.6	66.	162.	0.	-	-	N				
108-90-7	Chlorobenzene	ng/g	2.9	U	1,400.		2.9	66.	162.	25.	-	-	N				
124-48-1	Chlorodibromomethane	ng/g	4.8	U	66.	U	4.8	66.	162.	0.	-	-	N				

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			Database Query Results[a]							Number of Detected Results	NOAA ER-L[d]	NJ DEP Benchmark[e]		USEPA[f] List Bioaccumulators	Wildlife Based PCL[g]	Hazard Quotient[h]		
CASRN	Chemical	Units	Min Value	Qualifier[b]	Max Value	Qualifier[b]	Min MDL[c]	Max MDL	Number of Samples							Aquatic	Wildlife	Basis[i]
75-00-3	Chloroethane	ng/g	4.1	U	66.	U	4.1	66.	162.	0.	-	-		N				
67-66-3	Chloroform	ng/g	3.3	U	66.	U	3.3	66.	162.	0.	-	-		N				
156-59-2	Cis-1,2-Dichloroethylene	ng/g	3.3	U	66.	U	3.3	66.	26.	0.				N				
1006-10-15	cis-1,3-Dichloropropene	ng/g	5.2	U	66.	U	5.2	66.	162.	0.	-	-		N				
110-82-7	Cyclohexane	ng/g	11.	U	66.	U	11.	66.	25.	0.				N				
75-27-4	Dichlorobromomethane	ng/g	4.1	U	66.	U	4.1	66.	162.	0.	-	-		N				
75-71-8	Dichlorodifluoromethane	ng/g	11.	U	66.	U	11.	66.	26.	0.	-			N				
100-41-4	Ethylbenzene	ng/g	4.	J	240.	JL	4.	66.	162.	7.	-	1400	1	N		1.7E-01		NJ Benchmark
98-82-8	Isopropylbenzene	ng/g	2.	J	66.	U	2.	66.	26.	3.				N				
M&PXYLENE	m&p-Xylene	ng/g	38.		38.				1.	1.		120	1	N		3.2E-01		NJ Benchmark
79-20-9	Methyl acetate	ng/g	11.	U	66.	U	11.	66.	25.	0.				N				
74-83-9	Methyl Bromide	ng/g	5.6	U	66.	U	5.6	66.	162.	1.				N				
74-87-3	Methyl Chloride	ng/g	3.		66.	U	4.4	66.	162.	11.	-	-		N				
108-87-2	Methyl cyclohexane	ng/g	10.	J	66.	U	10.	66.	25.	1.				N				
78-93-3	Methyl Ethyl Ketone	ng/g	9.		83.	JL	12.	70.	161.	29.	-	-		N				
74-95-3	Methylene Bromide	ng/g	6.2	U	6.2	U	6.2	6.2	1.	0.	-	-		N				
75-09-2	Methylene Chloride	ng/g	7.7		66.	U	5.	66.	162.	10.	-	-		N				
1634-04-4	Methyl-t-Butyl Ether	ng/g	11.	U	66.	U	11.	66.	25.	0.				N				
104-51-8	n-Butylbenzene	ng/g	8.7		8.7				1.	1.				N				
103-65-1	n-Propylbenzene	ng/g	7.7		7.7				1.	1.				N				
95-47-6	O-Xylene	ng/g	13.	U	23.		13.	23.	11.	3.		120	1	N		1.9E-01		NJ Benchmark
99-87-6	p-Isopropyltoluene	ng/g	3.7		3.7				1.	1.				N				
100-42-5	Styrene	ng/g	2.9	U	66.	U	2.9	66.	162.	0.	-	-		N				
127-18-4	Tetrachloroethylene	ng/g	3.1	U	66.	U	3.1	66.	162.	0.	-	450	1	N		1.5E-01		NJ Benchmark
108-88-3	Toluene	ng/g	3.		2,800.	DJL	12.	72.	162.	17.		2500	1	N		1.1E+00		NJ Benchmark
BTEX	Total BTEX	ng/g	5.		2,800.				22.	22.	-	-		N				
1330-20-7	total xylenes	ng/g	40.	U	66.	U	40.	66.	15.	0.	-	120	1	N		5.5E-01		NJ Benchmark
156-60-5	Trans-1,2-Dichloroethylene	ng/g	3.7	U	66.	U	3.7	66.	26.	0.				N				
10061-02-6	Trans-1,3-dichloropropene	ng/g	7.5	U	66.	U	7.5	66.	162.	0.	-	-		N				
79-01-6	Trichloroethylene	ng/g	4.6	U	66.	U	3.	66.	162.	1.	-	1600	1	N		4.1E-02		NJ Benchmark
75-69-4	Trichlorofluoromethane	ng/g	2.3	U	66.	U	2.3	66.	26.	0.	-			N				
75-01-4	Vinyl Chloride	ng/g	2.9	U	66.	U	2.9	66.	162.	0.	-	-		N				

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Lower Passaic River Restoration Project
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Semi-Volatile Organic Compounds (Non PAHs)																	
87-61-6	1,2,3-Trichlorobenzene	ng/g	5.	U	5.	U	5.	5.	1.	0.			N	3.8E+06		1.3E-06	Wildlife PCL
95-94-3	1,2,4,5-Tetrachlorobenzene	ng/g	290.	U	420.	U	290.	420.	10.	0.			N	1.3E+04		3.2E-02	Wildlife PCL
120-82-1	1,2,4-Trichlorobenzene	ng/g	3.9	U	12,000.	UM	3.	12,000.	235.	11.	-	-	Y	3.8E+06		3.1E-03	Wildlife PCL
95-63-6	1,2,4-Trimethylbenzene	ng/g	7.1		7.1				1.	1.			N				
95-50-1	1,2-Dichlorobenzene	ng/g	11.	U	12,000.	UM	11.	12,000.	235.	2.	-	-	Y	2.7E+06		4.4E-03	Wildlife PCL
108-67-8	1,3,5-Trimethylbenzene	ng/g	19.		19.				1.	1.			N				
541-73-1	1,3-Dichlorobenzene	ng/g	11.	U	12,000.	UM	11.	12,000.	235.	2.	-	-	Y	5.6E+05		2.1E-02	Wildlife PCL
106-46-7	1,4-Dichlorobenzene	ng/g	11.	U	12,000.	UM	11.	12,000.	235.	50.			N	5.6E+05		2.1E-02	Wildlife PCL
123-91-1	1,4-Dioxane	ng/g	24.	J	400.	U	24.	400.	10.	1.			N				
108-60-1	1-Chloropropane	ng/g	160.	U	12,000.	UM	160.	12,000.	219.	0.	-	-	N				
95-95-4	2,4,5-Trichlorophenol	ng/g	290.	U	12,000.	U, UM	290.	12,000.	219.	5.	-	-	N				
88-06-2	2,4,6-Trichlorophenol	ng/g	290.	U	12,000.	UM	290.	12,000.	219.	1.	-	-	N				
120-83-2	2,4-Dichlorophenol	ng/g	290.	U	12,000.	UM	290.	12,000.	219.	9.	-	-	N				
105-67-9	2,4-Dimethylphenol	ng/g	290.	U	12,000.	UM	290.	12,000.	219.	0.	-	-	N				
51-28-5	2,4-Dinitrophenol	ng/g	290.	U	71,000.	UM	290.	71,000.	219.	0.	-	-	N				
121-14-2	2,4-Dinitrotoluene	ng/g	160.	U	12,000.	UM	160.	12,000.	219.	0.	-	-	N				
606-20-2	2,6-Dinitrotoluene	ng/g	160.	U	12,000.	UM	160.	12,000.	219.	0.	-	-	N				
91-58-7	2-Chloronaphthalene	ng/g	160.	U	12,000.	UM	160.	12,000.	219.	0.	-	-	N				
95-57-8	2-Chlorophenol	ng/g	160.	U	12,000.	UM	160.	12,000.	219.	1.	-	-	N				
95-48-7	2-Methylphenol	ng/g	160.	U	12,000.	UM	160.	12,000.	219.	1.	-	-	N				
88-74-4	2-Nitroanaline	ng/g	290.	U	12,000.	U, UM	290.	12,000.	219.	0.	-	-	N				
88-75-5	2-Nitrophenol	ng/g	290.	U	12,000.	UM	290.	12,000.	219.	0.	-	-	N				
91-94-1	3,3'-Dichlorobenzidine	ng/g	93.		24,000.	UM	290.	24,000.	218.	1.	-	-	N				
99-09-2	3-Nitroaniline	ng/g	290.	U	12,000.	UJ, UM	290.	12,000.	218.	0.	-	-	N				
534-52-1	4,6-Dinitro-2-Methylphenol	ng/g	290.	U	30,000.	UM	290.	30,000.	219.	0.	-	-	N				
101-55-3	4-Bromophenyl Phenyl Ether	ng/g	160.	U	12,000.	UM	160.	12,000.	219.	0.	-	-	Y	5.9E+06		2.1E-03	Wildlife PCL
106-47-8	4-Chloroaniline	ng/g	78.	J	12,000.	UM	290.	12,000.	219.	6.	-	-	N				
7005-72-3	4-Chlorophenyl Phenyl Ether	ng/g	160.	U	12,000.	UM	160.	12,000.	219.	0.	-	-	Y	7.4E+07		1.6E-04	Wildlife PCL
106-44-5	4-Methylphenol	ng/g	130.	G	12,000.	UM	290.	12,000.	219.	5.	-	-	N				
100-01-6	4-Nitroaniline	ng/g	290.	U	12,000.	U, UM	290.	12,000.	219.	0.	-	-	N				
100-02-7	4-Nitrophenol	ng/g	200.	J	30,000.	UM	290.	30,000.	219.	1.	-	-	N				
111-91-1	Bis(2-Chloroethoxy)methane	ng/g	290.	U	12,000.	UM	290.	12,000.	219.	0.	-	-	N				
111-44-4	Bis(2-Chloroethyl)ether	ng/g	160.	U	12,000.	UM	160.	12,000.	219.	0.	-	-	N				
117-81-7	Bis(2-Ethylhexyl)phthalate	ng/g	410.	U	23,000,000.	DM	290.	28,000.	220.	214.	-	-	N				
108-86-1	Bromobenzene	ng/g	3.3	U	3.3	U	3.3	3.3	1.	0.			N				
85-68-7	Butyl Benzyl Phthalate	ng/g	89.		360,000.	J	230.	12,000.	219.	99.	-	-	N				
86-74-8	Carbazole	ng/g	91.	J	12,000.	UM	160.	12,000.	219.	74.	-	-	N				
132-64-9	Dibenzofuran	ng/g	81.	GM	70,000.		160.	12,000.	219.	49.	-	-	N				
132-65-0	Dibenzothiophene	ng/g	6.4	U	1,390.		0.468	93.7	103.	100.	-	-	N				
1002-53-5	Dibutyltin	ng/g	1.	UJ	212.	M	1.	1.	74.	73.	-	-	N				
84-66-2	Diethyl Phthalate	ng/g	290.	U	45,000.		290.	12,000.	219.	2.	-	-	N				
131-11-3	Dimethylphthalate	ng/g	270.		12,000.	UM	290.	12,000.	219.	3.	-	-	N				
84-74-2	Di-n-butyl Phthalate	ng/g	60.	J	12,000.	UM	290.	12,000.	219.	32.	-	-	N				
117-84-0	Di-n-Octyl Phthalate	ng/g	92.	J	12,000.	UM	290.	12,000.	219.	104.	-	-	N				
87-68-3	Hexachlorobutadiene	ng/g	3.7	U	12,000.	UM	3.7	12,000.	220.	0.	-	-	Y	1.2E+05		1.0E-01	Wildlife PCL
77-47-4	Hexachlorocyclopentadiene	ng/g	290.	U	24,000.	UM	290.	24,000.	219.	0.	-	-	Y	0.0E+00			
67-72-1	Hexachloroethane	ng/g	160.	U	12,000.	UM	160.	12,000.	219.	0.	-	-	Y	0.0E+00			
78-59-1	Isophorone	ng/g	160.	U	12,000.	UM	160.	12,000.	219.	0.	-	-	N				
78763-54-9	Monobutyltin	ng/g	0.233	GJ	28.1	JL	1.	1.	74.	42.	-	-	N				
98-95-3	Nitrobenzene	ng/g	160.	U	12,000.	UM	160.	12,000.	219.	0.	-	-	N				
86-30-6	N-Nitroso-di-phenylamine	ng/g	65.	G	12,000.	UM	160.	12,000.	219.	20.			N				
621-64-7	N-nitrosodipropylamine	ng/g	160.	U	12,000.	UJ	160.	12,000.	219.	0.	-	-	N				
87-86-5	Pentachlorophenol	ng/g	290.	U	30,000.	UM	290.	30,000.	219.	0.	-	-	Y	4.2E+05		7.2E-02	Wildlife PCL
108-95-2	Phenol	ng/g	290.	U	12,000.	UM	290.	12,000.	219.	3.	-	-	N				
1461-25-2	Tetrabutyltin	ng/g	0.508	GM	1.57	M	1.	1.	74.	11.	-	-	N				
56573-85-4	Tributyltin	ng/g	5.81	UM	690.	IM	5.81	10.3	74.	69.	25	-	Y	3.6E+03	2.8E+01	1.9E-01	NOAA ER-L

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Semi-Volatile Organic Compounds (PAHs)[j]																	
90-12-0	1-Methylnaphthalene	ng/g	109.		911.	M	154.	420.	84.	75.	-	-	N				
832-69-9	1-Methylphenanthrene	ng/g	90.7	M	2,960.		0.331	420.	103.	101.	-	-	N				
2245-38-7	2,3,5-Trimethylnaphthalene	ng/g	36.4	NJ	2,130.		1.78	420.	103.	95.	-	-	N				
581-42-0	2,6-Dimethylnaphthalene	ng/g	78.	J	1,830.		1.1	420.	103.	96.	-	-	N				
91-57-6	2-Methylnaphthalene	ng/g	62.	G	24,000.	M	1.06	12,000.	312.	153.	70	70	N		3.4E+02		NOAA ER-L
83-32-9	Acenaphthene	ng/g	62.	J	420,000.		0.597	12,000.	312.	182.	16	16	Y		2.6E+04		NOAA ER-L
208-96-8	Acenaphthylene	ng/g	79.	J	12,000.	UM	0.448	12,000.	312.	192.	44	44	Y		2.7E+02		NOAA ER-L
120-12-7	Anthracene	ng/g	87.		230,000.	D	1.81	12,000.	312.	244.	85.3	85	Y		2.7E+03		NJ Benchmark
56-55-3	Benzo[a]anthracene	ng/g	160.	J	150,000.		1.16	1,200.	313.	297.	261	261	Y		5.7E+02		NOAA ER-L
50-32-8	Benzo[a]pyrene	ng/g	150.	J	130,000.		2.91	1,200.	313.	305.	430	430	Y		3.0E+02		NOAA ER-L
205-99-2	Benzo[b]fluoranthene	ng/g	190.	J	100,000.		290.	1,200.	294.	283.	-	-	Y				
192-97-2	Benzo[e]pyrene	ng/g	110.	J	8,300.	NJ	2.79	420.	103.	103.	-	-	N				
191-24-2	Benzo[g,h,i]perylene	ng/g	100.	J	63,000.		4.66	3,800.	313.	258.	-	-	Y				
207-08-9	Benzo[k]fluoranthene	ng/g	160.	U	63,000.		2.13	3,800.	313.	296.	-	-	Y				
205-82-3	Benzo[b/j]fluoranthene	ng/g	3,040.		8,350.		2.13	22.7	19.	19.			N				
92-52-4	Biphenyl	ng/g	73.4		420.	U	290.	420.	84.	74.			Y				
218-01-9	Chrysene	ng/g	170.	J	150,000.		2.37	1,200.	313.	309.	384	384	Y		3.9E+02		NOAA ER-L
53-70-3	Dibenz[a,h]anthracene	ng/g	82.	J	25,000.		2.98	12,000.	312.	218.	63.4	63	Y		4.0E+02		NJ Benchmark
206-44-0	Fluoranthene	ng/g	320.	J	320,000.	D	1.28	1,200.	313.	310.	600	600	Y		5.3E+02		NOAA ER-L
86-73-7	Fluorene	ng/g	64.		140,000.		0.616	12,000.	312.	185.	19	19	Y		7.4E+03		NOAA ER-L
193-39-5	Indeno[1,2,3-c,d]-pyrene	ng/g	95.	J	57,000.		5.3	3,800.	312.	259.	-	-	Y				
91-20-3	Naphthalene	ng/g	7.1		40,000.	D	1.88	12,000.	313.	159.	160	160	N		2.5E+02		NOAA ER-L
198-55-0	Perylene	ng/g	190.	J	2,630.		2.67	420.	103.	102.	-	-	N				
85-01-8	Phenanthrene	ng/g	140.	J	570,000.	D	1.57	3,800.	313.	284.	240	240	Y		2.4E+03		NOAA ER-L
129-00-0	Pyrene	ng/g	360.		340,000.	D	1.22	1,200.	313.	310.	665	665	Y		5.1E+02		NOAA ER-L
SUM_HIGH_PAH	SUM_HIGH_PAH	ng/g	2,645.		1,398,000.				239.		552	552	Y		2.5E+03		NOAA ER-L
SUM_LOW_PAH	SUM_LOW_PAH	ng/g	7.1		1,413,300.				240.		1700	1700	Y		8.3E+02		NOAA ER-L
SUM_PAH	SUM_PAH	ng/g	7.1		2,811,300.				240.		4022	4000	Y		7.0E+02		NJ Benchmark
PCB Aroclors																	
12674-11-2	Aroclor 1016	ng/g	5.7	U	970.	UJ	5.7	970.	229.	0.	-	-	Y	3.7E+02		2.7E+00	Wildlife PCL
11104-28-2	Aroclor 1221	ng/g	5.7	U	1,350.	UM	5.7	1,350.	229.	0.	-	-	Y	3.7E+02		3.7E+00	Wildlife PCL
11141-16-5	Aroclor 1232	ng/g	5.7	U	970.	UJ	5.7	970.	229.	0.	-	-	Y	3.7E+02		2.7E+00	Wildlife PCL
53469-21-9	Aroclor 1242	ng/g	5.7	U	17,200.	D	5.7	970.	229.	3.	-	-	Y	3.7E+02		4.7E+01	Wildlife PCL
12672-29-6	Aroclor 1248	ng/g	5.7	U	7,450.	DM	5.7	2,890.	235.	169.	-	-	Y	3.7E+02		2.0E+01	Wildlife PCL
11097-69-1	Aroclor 1254	ng/g	38.5	U	5,800.		5.7	2,070.	231.	151.	-	-	Y	3.7E+02		1.6E+01	Wildlife PCL
11096-82-5	Aroclor 1260	ng/g	5.7	U	2,160.	DM	5.7	970.	228.	87.	-	-	Y	3.7E+02		5.9E+00	Wildlife PCL
37324-23-5	Aroclor-1262	ng/g	5.7	U	8.2	U	5.7	8.2	10.	0.		-	N	3.7E+02		2.2E-02	Wildlife PCL
SUM_PCB	SUM_PCB AROCLORS	ng/g	73.2		17,506.5				236.		22.7	23	N	3.7E+02	7.7E+02	4.8E+01	NOAA ER-L
Pesticides/Herbicides																	
93-76-5	2,4,5-T	ng/g	38.	U	410.	U	5.	410.	167.	0.	-	-	N				
93-72-1	2,4,5-TP	ng/g	1.9	GPNJ	410.	U	5.	410.	177.	10.	-	-	N				
94-75-7	2,4-D	ng/g	240.	U	1,000.	U	50.	1,000.	166.	0.	-	-	N				
94-82-6	2,4-DB	ng/g	18.	GPJ	685.	UM	54.3	685.	166.	18.	-	-	N				
53-19-0	2,4-DDD	ng/g	16.7	T	687.	T	1.61	26.1	22.	21.	2	1 -	Y	8.3E+02	3.4E+02	8.3E-01	NOAA ER-L
3424-82-6	2,4-DDE	ng/g	11.8	K	303.		0.956	32.3	22.	22.	2.2	1 -	Y	1.9E+01	1.4E+02	1.6E+01	NOAA ER-L
789-02-6	2,4-DDT	ng/g	5.91	UT	145.	T	2.73	36.7	22.	21.	1	1 -	Y	1.4E+02	1.5E+02	1.0E+00	NOAA ER-L
72-54-8	4,4'-DDD	ng/g	4.07	U	5,980.	DM	2.26	66.5	236.	215.	2	-	Y	8.3E+02	3.0E+03	7.2E+00	NOAA ER-L
72-55-9	4,4'-DDE	ng/g	4.07	U	1,010.		1.26	66.5	237.	215.	2.2	2.2	Y	1.9E+01	4.6E+02	5.3E+01	NOAA ER-L
50-29-3	4,4'-DDT	ng/g	3.85	U	2,470.	DM	2.73	79.2	234.	175.	1	-	Y	1.4E+02	2.5E+03	1.8E+01	NOAA ER-L
SUM_TDDT	SUM_TDDT	ng/g	10.54		5,989				248.		1.58	1.6	N	1.9E+01	3.8E+03	3.1E+02	NOAA ER-L
309-00-2	Aldrin	ng/g	0.619	U	660.		0.576	34.3	236.	17.	-	-	Y	4.6E+02		1.4E+00	Wildlife PCL
319-86-8	BHC, delta	ng/g	0.211	QJB	74.		0.159	37.	231.	11.		-	N	1.2E+03		5.9E-02	Wildlife PCL
319-84-6	BHC-alpha	ng/g	0.34	U	34.3	UM	0.205	34.3	233.	8.	-	-	Y	1.2E+03		2.8E-02	Wildlife PCL
319-85-7	BHC-beta	ng/g	0.776	U	2,000.		0.776	41.9	227.	6.	-	-	Y	1.2E+03		1.6E+00	Wildlife PCL
58-89-9	BHC-gamma (Lindane)	ng/g	0.542	UD	34.3	UM	0.529	34.3	232.	10.	-	-	Y	1.2E+03		2.8E-02	Wildlife PCL
SUM_BHC	SUM_BHC	ng/g	1.132		2,012				233.			-	N	1.2E+03		1.6E+00	Wildlife PCL
5103-71-9	Chlordane,alpha (cis)	ng/g	2.06	U	330.		0.0967	233.	221.	120.		-	N	2.0E+03		1.6E-01	Wildlife PCL
5103-74-2	Chlordane,gamma (trans)	ng/g	2.09	U	125.	PDNJ	0.0815	48.2	212.	120.		-	N	2.0E+03		6.2E-02	Wildlife PCL
SUM_CHLORDANE	SUM_CHLORDANE	ng/g	3.19		335				231.			-	N	2.0E+03		1.7E-01	Wildlife PCL
60-57-1	Dieldrin	ng/g	1.38	DJ	141.	PDJ	0.163	93.5	236.	109.	0.02	-	Y	2.7E+02	7.1E+03	5.2E-01	NOAA ER-L

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1031-07-8	Endosulfan sulfate	ng/g	0.422	UD	71.	UM	0.33	71.	224.	8.			-	N	4.9E+03		1.5E-02	Wildlife PCL
959-98-8	Endosulfan, alpha	ng/g	0.18	U	94.	U	0.18	94.	231.	1.			-	N	4.9E+03		1.9E-02	Wildlife PCL
33213-65-9	Endosulfan, beta	ng/g	0.341	UD	177.	PDJ	0.341	38.	234.	108.			-	N	4.9E+03		3.6E-02	Wildlife PCL
SUM_ENDOSULFAN	SUM_ENDOSULFAN	ng/g	1.331		244.8				240.				-	N	4.9E+03		5.0E-02	Wildlife PCL
7421-93-4	Endrin aldehyde	ng/g	0.501	U	67.		0.442	66.5	227.	15.			-	N	3.5E+01		1.9E+00	Wildlife PCL
53494-70-5	Endrin ketone	ng/g	0.248	QJ	2,360.	D	0.106	93.5	229.	62.			-	N	3.5E+01		6.7E+01	Wildlife PCL
SUM_ENDRIN	SUM_ENDRIN	ng/g	0.947		2,366				233.				-	N	3.5E+01		6.7E+01	Wildlife PCL
1024-57-3	Heptachlor epoxide	ng/g	0.421	UD	87.		0.315	58.	231.	18.	-		-	Y	9.7E+03		9.0E-03	Wildlife PCL
118-74-1	Hexachlorobenzene	ng/g	91.	GM	12,000.	UM	160.	12,000.	219.	2.	-		-	Y	9.3E+04		1.3E-01	Wildlife PCL
72-43-5	Methoxychlor	ng/g	1.63	QJ	7,900.		0.26	343.	231.	21.	-		-	Y	1.1E+05		6.9E-02	Wildlife PCL
8001-35-2	Toxaphene	ng/g	45.3	U	3,430.	UM	45.3	3,430.	231.	0.	-		-	Y	1.4E+03		2.5E+00	Wildlife PCL
Dioxins/Furans																		
1746-01-6	2,3,7,8-TCDD		0.	DJ	19.4	BD	0.00011	0.0044	230.	229.	3.2E-03	2	-	Y	2.5E-03	6.1E+03	7.8E+03	Wildlife PCL

Notes
a. Data obtained from a query of the PREmis database completed on 10 January 2007.
b. Data qualifiers as provided in PREmis.
c. Method Detection Limits (MDLs) as provided in PREmis.
d. ER-L = Effects Range-Low from Long and Morgan, 1991 and Long*et al.* , 1995; except where noted.
1. Based on value for the para position isomer.
2. Derived by USFWS using sediment chemistry for Newark Bay and oyster effect data presented in Wintermyer and Cooper, 2003.
e. Sediment benchmarks from NJDEP, 1998. Guidance for Sediment Quality Evaluations.
1. NJ Volatile Organic Sediment Screening Guidelines derived from MacDonald et al., 1992.
f. From USEPA 2000b. Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment; USEPA 823-R-00-001.
g. Derivation of Wildlife PCLs discussed in the text and summarized in Attachment B.
h. Hazard Quotient is the ratio of the maximum concentration to either the aquatic- or wildlife-based screening benchmark.
i Basis for the lowest benchmark value is indicated.
j. Although a number of PAHs are identified as bioaccumulating compounds, no wildlife PCLs were derived for this class of COPEC because they are generally metabolized quickly in the tissues of higher organisms including aquatic wildife prey.

Attachment B
Derviation of Protective Concentrations (PCLs) for Wildlife

Lower Passaic River Restoration Project
Focused Feasibility Study

CASRN	Chemical Name	Units	TRV[a]		BAF[b]	PCL_{sed}[c]		
			Mammal	Bird		Mammal	Bird	Wildlife
Inorganics								
7440-38-2	Arsenic	ug/g	1.2E+00	1.1E+01	1.3E-01	1.8E+02	1.7E+02	1.7E+02
7440-43-9	Cadmium	ug/g	4.0E-01	9.1E-01	6.1E-01	1.2E+01	3.0E+00	3.0E+00
7440-47-3	Chromium	ug/g	6.6E+00	2.2E+00	1.1E-01	1.1E+03	4.1E+01	4.1E+01
7440-50-8	Copper	ug/g	4.1E+01	1.1E+01	1.6E+00	4.6E+02	1.3E+01	1.3E+01
7439-92-1	Lead	ug/g	1.6E+01	3.5E-01	6.6E-02	4.4E+03	1.1E+01	1.1E+01
7439-97-6	Mercury	ug/g	7.2E-02	2.0E-02	1.1E+00	1.2E+00	3.7E-02	3.7E-02
7440-02-0	Nickel	ug/g	2.1E+00	8.8E+00	8.2E-01	4.6E+01	2.2E+01	2.2E+01
7782-49-2	Selenium	ug/g	2.5E-01	4.6E-01	1.0E+00	4.6E+00	9.2E-01	9.2E-01
7440-22-4	Silver	ug/g	7.0E+01		1.0E+00	1.3E+03		1.3E+03
7440-66-6	Zinc	ug/g	6.3E+01	5.4E+01	2.3E+00	5.0E+02	4.7E+01	4.7E+01
SVOCs (Non PAHs)								
101-55-3	4-Bromophenyl Phenyl Ether	ug/g	3.2E+02	-	1.0E+00	5.9E+03		5.9E+03
7005-72-3	4-Chlorophenyl Phenyl Ether	ug/g	3.2E+02	-	7.9E-02	7.4E+04		7.4E+04
87-68-3	Hexachlorobutadiene	ug/g	6.3E+00		1.0E+00	1.2E+02		1.2E+02
77-47-4	Hexachlorocyclopentadiene	ug/g	-	-	-			0.0E+00
67-72-1	Hexachloroethane	ug/g	-	-	1.0E+00			0.0E+00
87-86-5	Pentachlorophenol	ug/g	7.6E-01	2.4E+01	3.4E-02	4.2E+02	1.4E+03	4.2E+02
56573-85-4	Tributyltin	ug/g	1.9E+00	-	1.0E+01	3.6E+00		3.6E+00
95-50-1	1,2-Dichlorobenzene	ug/g	1.5E+02	-	1.0E+00	2.7E+03		2.7E+03
541-73-1	1,3-Dichlorobenzene	ug/g	3.0E+01	-	1.0E+00	5.6E+02		5.6E+02
120-82-1	1,2,4-Trichlorobenzene	ug/g	2.1E+02	-	1.0E+00	3.8E+03		3.8E+03
106-46-7	1,4-Dichlorobenzene	ug/g	3.0E+01	-	1.0E+00	5.6E+02		5.6E+02
87-61-6	1,2,3-Trichlorobenzene (Historical)	ug/g	2.1E+02	-	1.0E+00	3.8E+03		3.8E+03
120-82-1	1,2,4-Trichlorobenzene	ug/g	2.1E+02	-	1.0E+00	3.8E+03		3.8E+03
95-94-3	1,2,4,5-Tetrachlorobenzene	ug/g	7.2E-01	-	1.0E+00	1.3E+01		1.3E+01
PCB Aroclors								
12674-11-2	Aroclor 1016	ug/g	6.8E-01	3.4E-01	1.9E+00	6.8E+00	3.7E-01	3.7E-01
11104-28-2	Aroclor 1221	ug/g	6.8E-01	3.4E-01	1.9E+00	6.8E+00	3.7E-01	3.7E-01
11141-16-5	Aroclor 1232	ug/g	6.8E-01	3.4E-01	1.9E+00	6.8E+00	3.7E-01	3.7E-01
53469-21-9	Aroclor 1242	ug/g	6.8E-01	3.4E-01	1.9E+00	6.8E+00	3.7E-01	3.7E-01
12672-29-6	Aroclor 1248	ug/g	6.8E-01	3.4E-01	1.9E+00	6.8E+00	3.7E-01	3.7E-01
11097-69-1	Aroclor 1254	ug/g	6.8E-01	3.4E-01	1.9E+00	6.8E+00	3.7E-01	3.7E-01
11096-82-5	Aroclor 1260	ug/g	6.8E-01	3.4E-01	1.9E+00	6.8E+00	3.7E-01	3.7E-01
37324-23-5	Aroclor-1262	ug/g	6.8E-01	3.4E-01	1.9E+00	6.8E+00	3.7E-01	3.7E-01
SUM_PCB	SUM_PCB AROCLORS	ug/g	6.8E-01	3.4E-01	1.9E+00	6.8E+00	3.7E-01	3.7E-01
Pesticides								
53-19-0	2,4-DDD	ug/g	3.6E+00	1.2E-01	2.8E-01	2.4E+02	8.3E-01	8.3E-01
3424-82-6	2,4-DDE	ug/g	3.6E+00	7.3E-02	7.7E+00	8.6E+00	1.9E-02	1.9E-02
789-02-6	2,4-DDT	ug/g	3.6E+00	1.2E-01	1.7E+00	4.0E+01	1.4E-01	1.4E-01
72-54-8	4,4'-DDD	ug/g	3.6E+00	1.2E-01	2.8E-01	2.4E+02	8.3E-01	8.3E-01
72-55-9	4,4'-DDE	ug/g	3.6E+00	7.3E-02	7.7E+00	8.6E+00	1.9E-02	1.9E-02
50-29-3	4,4'-DDT	ug/g	3.6E+00	1.2E-01	1.7E+00	4.0E+01	1.4E-01	1.4E-01
SUM_TDDT	SUM_TDDT	ug/g	3.6E+00	7.3E-02	7.7E+00	8.6E+00	1.9E-02	1.9E-02
309-00-2	Aldrin	ug/g	3.2E-01	4.2E-01	1.8E+00	3.3E+00	4.6E-01	4.6E-01
319-84-6	BHC-alpha	ug/g	4.3E-01	1.1E+00	1.8E+00	4.5E+00	1.2E+00	1.2E+00
319-85-7	BHC-beta	ug/g	4.3E-01	1.1E+00	1.8E+00	4.5E+00	1.2E+00	1.2E+00
58-89-9	BHC-gamma (Lindane)	ug/g	4.3E-01	1.1E+00	1.8E+00	4.5E+00	1.2E+00	1.2E+00
319-86-8	BHC, delta	ug/g	4.3E-01	1.1E+00	1.8E+00	4.5E+00	1.2E+00	1.2E+00
SUM_BHC	SUM_BHC	ug/g	4.3E-01	1.1E+00	1.8E+00	4.5E+00	1.2E+00	1.2E+00
5103-71-9	Chlordane,alpha (cis)	ug/g	6.5E+00	4.8E+00	4.8E+00	2.5E+01	2.0E+00	2.0E+00
5103-74-2	Chlordane,gamma (trans)	ug/g	6.5E+00	4.8E+00	4.8E+00	2.5E+01	2.0E+00	2.0E+00
57-74-9	Total Chlordane	ug/g	6.5E+00	4.8E+00	4.8E+00	2.5E+01	2.0E+00	2.0E+00

Attachment B
Derviation of Protective Concentrations (PCLs) for Wildlife

Lower Passaic River Restoration Project
Focused Feasibility Study

CASRN	Chemical Name	Units	TRV[a]		BAF[b]	PCL_{sed}[c]		
			Mammal	Bird		Mammal	Bird	Wildlife
Inorganics								
SUM_CHLORDANE	SUM_CHLORDANE	ug/g	6.5E+00	4.8E+00	4.8E+00	2.5E+01	2.0E+00	2.0E+00
60-57-1	Dieldrin	ug/g	6.3E-02	2.4E-01	1.8E+00	6.5E-01	2.7E-01	2.7E-01
1031-07-8	Endosulfan sulfate	ug/g	4.7E-01	3.2E+01	1.8E+00	4.9E+00	3.5E+01	4.9E+00
959-98-8	Endosulfan, alpha	ug/g	4.7E-01	3.2E+01	1.8E+00	4.9E+00	3.5E+01	4.9E+00
33213-65-9	Endosulfan, beta	ug/g	4.7E-01	3.2E+01	1.8E+00	4.9E+00	3.5E+01	4.9E+00
115-29-7	Total Endosulfan	ug/g	4.7E-01	3.2E+01	1.8E+00	4.9E+00	3.5E+01	4.9E+00
SUM_ENDOSULFAN	SUM_ENDOSULFAN	ug/g	4.7E-01	3.2E+01	1.8E+00	4.9E+00	3.5E+01	4.9E+00
7421-93-4	Endrin aldehyde	ug/g	2.9E-01	3.2E-02	1.8E+00	3.0E+00	3.5E-02	3.5E-02
53494-70-5	Endrin ketone	ug/g	2.9E-01	3.2E-02	1.8E+00	3.0E+00	3.5E-02	3.5E-02
72-20-8	Total Endrin	ug/g	2.9E-01	3.2E-02	1.8E+00	3.0E+00	3.5E-02	3.5E-02
SUM_ENDRIN	SUM_ENDRIN	ug/g	2.9E-01	3.2E-02	1.8E+00	3.0E+00	3.5E-02	3.5E-02
1024-57-3	Heptachlor epoxide	ug/g	9.4E-01	1.3E+02	1.8E+00	9.7E+00	1.5E+02	9.7E+00
76-44-8	Total Heptachlor	ug/g	9.4E-01	2.1E+00	1.8E+00	9.7E+00	2.4E+00	2.4E+00
SUM_HEPTACHLOR	SUM_HEPTACHLOR	ug/g	9.4E-01	2.1E+00	1.8E+00	9.7E+00	2.4E+00	2.4E+00
118-74-1	Hexachlorobenzene	ug/g		4.2E+00	9.0E-02		9.3E+01	9.3E+01
72-43-5	Methoxychlor	ug/g	1.1E+01	2.5E+02	1.8E+00	1.1E+02	2.8E+02	1.1E+02
2385-85-5	Mirex	ug/g	1.1E+00	1.0E+01	1.3E+00	1.6E+01	1.6E+01	1.6E+01
8001-35-2	Toxaphene	ug/g	2.5E+01	1.3E+00	1.8E+00	2.6E+02	1.4E+00	1.4E+00
Dioxin/Furan Congeners								
1746-01-6	2,3,7,8-TCDD[d]	ug/g	-	-	2.5E-02	2.5E-06	2.1E-05	2.5E-06

a. TRVs presented in Attachment C.
b. Aquatic BAFs presented in Attachment C.
c. Wildife PCLs calculated using the following equation and parameters provided in Table 3.

$$PCL_{sed} = \frac{THQ * TRV * BW}{\left(BAF_{fish} * IR_{fish} * P_{fish} * SFF\right)}$$

d. Wildlife PCLs for 2,3,7,8-TCDD as presented in Table 5-1 (USEPA, 1993) "Low Risk" sediment concentrations for mammalian and avian receptors.

Attachment C
Supporting Data for PCL Derivation

Lower Passaic River Restoration Project
Focused Feasibility Study

			TRVs[a]							MATCs[b]		BAFs[c]		
			Mammals				Birds							
CASRN	Chemical Name	Units	TRV_{low}	TRV_{high}	Source		TRV_{low}	TRV_{high}	Source	Mammal	Bird			
Inorganics														
7440-38-2	Arsenic	ug/g-d	0.32	4.7	DTSC, 2002		5.5	22	DTSC, 2002	1.2E+00	1.1E+01	0.127	1	1998, Bechtel Jacobs Company, LLC
7440-43-9	Cadmium	ug/g-d	0.06	2.64	DTSC, 2002		0.08	10.4	DTSC, 2002	4.0E-01	9.1E-01	0.614	1	1998, Bechtel Jacobs Company, LLC
7440-47-3	Chromium	ug/g-d	3.28	13.4	ORNL, 1996		1	5	ORNL, 1996	6.6E+00	2.2E+00	0.108	1	1998, Bechtel Jacobs Company, LLC
7440-50-8	Copper	ug/g-d	2.67	632	DTSC, 2002		2.3	52.3	DTSC, 2002	4.1E+01	1.1E+01	1.647	1	1998, Bechtel Jacobs Company, LLC
7439-92-1	Lead	ug/g-d	1	241	DTSC, 2002		0.014	8.75	DTSC, 2002	1.6E+01	3.5E-01	0.066	1	1998, Bechtel Jacobs Company, LLC
7439-97-6	Mercury	ug/g-d	0.032	0.16	ORNL, 1996		0.0064	0.064	ORNL, 1996	7.2E-02	2.0E-02	1.081	1	1998, Bechtel Jacobs Company, LLC
7440-02-0	Nickel	ug/g-d	0.133	31.6	DTSC, 2002		1.38	56.3	DTSC, 2002	2.1E+00	8.8E+00	0.818	1	1998, Bechtel Jacobs Company, LLC
7782-49-2	Selenium	ug/g-d	0.05	1.21	DTSC, 2002		0.23	0.93	DTSC, 2002	2.5E-01	4.6E-01	1		Assumption
7440-22-4	Silver	ug/g-d	22.2	222	ATSDR, 1990; Matuk et al., 1981		-	-	-	7.0E+01		1		Assumption
7440-66-6	Zinc	ug/g-d	9.6	411	DTSC, 2002		17.2	172	DTSC, 2002	6.3E+01	5.4E+01	2.33	1	1998, Bechtel Jacobs Company, LLC
SVOCs (Non-PAHs)														
95-50-1	1,2-Dichlorobenzene	ug/g-d	86	257	ATSDR, 1998; NTP, 1985		-	-	-	1.5E+02	-	1		National Quality Sediment Survey
541-73-1	1,3-Dichlorobenzene	ug/g-d	21	43	ATSDR, 1998; NTP, 1987		-	-	-	3.0E+01	-	1		National Quality Sediment Survey
106-46-7	1,4-Dichlorobenzene	ug/g-d	21.4	42.9	ATSDR, 1998; NTP, 1987		-	-	-	3.0E+01	-	1		National Quality Sediment Survey
120-82-1	1,2,4-Trichlorobenzene	ug/g-d	120	360	IRIS, 2002; Kitchin and Ebron, 1980		-	-	-	2.1E+02	-	1		National Quality Sediment Survey
87-61-6	1,2,3-Trichlorobenzene (Historical)	ug/g-d	120	360	IRIS, 2002; Kitchin and Ebron, 1980		-	-	-	2.1E+02	-	1		National Quality Sediment Survey
120-82-1	1,2,4-Trichlorobenzene	ug/g-d	120	360	IRIS, 2002; Kitchin and Ebron, 1980		-	-	-	2.1E+02	-	1		National Quality Sediment Survey
95-94-3	1,2,4,5-Tetrachlorobenzene	ug/g-d	0.32	1.6	ATSDR, 2000; Arnold et al., 1985		-	-	-	7.2E-01	-	1		National Quality Sediment Survey
123-91-1	1,4-DIOXANE	ug/g-d	0.5	1	ORNL, 1996		-	-	-	7.1E-01	-	1		Assumption
101-55-3	4-Bromophenyl Phenyl Ether	ug/g-d	100	1000	INCHEM 1994; Francis, 1989		-	-	-	3.2E+02	-	1		National Quality Sediment Survey
7005-72-3	4-Chlorophenyl Phenyl Ether	ug/g-d	100	1000	INCHEM 1994; Francis, 1989		-	-	-	3.2E+02	-	0.079		National Quality Sediment Survey
87-68-3	Hexachlorobutadiene	ug/g-d	2	20	IRIS, 2002; Kociba, 1977a		-	-	-	6.3E+00		1		National Quality Sediment Survey
77-47-4	Hexachlorocyclopentadiene	ug/g-d	-	-	-		-	-	-	-	-	-		
67-72-1	Hexachloroethane	ug/g-d	-	-	-		-	-	-	-	-	1		National Quality Sediment Survey
87-86-5	Pentachlorophenol	ug/g-d	0.24	2.4	ORNL, 1996		7.6	76	Hudson et al., 1984	7.6E-01	2.4E+01	0.034		National Quality Sediment Survey
56573-85-4	Tributyltin	ug/g-d	0.25	15	DTSC, 2002		-	-	-	1.9E+00	-	10		Meador, 2000
PCB Aroclors														
12674-11-2	Aroclor 1016	ug/g-d	0.36	1.28	DTSC, 2002	2	0.09	1.27	DTSC, 2002	2	6.8E-01	3.4E-01	1.85		National Quality Sediment Survey
11104-28-2	Aroclor 1221	ug/g-d	0.36	1.28	DTSC, 2002	2	0.09	1.27	DTSC, 2002	2	6.8E-01	3.4E-01	1.85		National Quality Sediment Survey
11141-16-5	Aroclor 1232	ug/g-d	0.36	1.28	DTSC, 2002	2	0.09	1.27	DTSC, 2002	2	6.8E-01	3.4E-01	1.85		National Quality Sediment Survey
53469-21-9	Aroclor 1242	ug/g-d	0.36	1.28	DTSC, 2002	2	0.09	1.27	DTSC, 2002	2	6.8E-01	3.4E-01	1.85		National Quality Sediment Survey
12672-29-6	Aroclor 1248	ug/g-d	0.36	1.28	DTSC, 2002	2	0.09	1.27	DTSC, 2002	2	6.8E-01	3.4E-01	1.85		National Quality Sediment Survey
11097-69-1	Aroclor 1254	ug/g-d	0.36	1.28	DTSC, 2002	2	0.09	1.27	DTSC, 2002	2	6.8E-01	3.4E-01	1.85		National Quality Sediment Survey
11096-82-5	Aroclor 1260	ug/g-d	0.36	1.28	DTSC, 2002	2	0.09	1.27	DTSC, 2002	2	6.8E-01	3.4E-01	1.85		National Quality Sediment Survey
37324-23-5	Aroclor-1262	ug/g-d	0.36	1.28	DTSC, 2002	2	0.09	1.27	DTSC, 2002	2	6.8E-01	3.4E-01	1.85		National Quality Sediment Survey
SUM_PCB	SUM_PCB AROCLORS	ug/g-d	0.36	1.28	DTSC, 2002		0.09	1.27	DTSC, 2002		6.8E-01	3.4E-01	1.85		National Quality Sediment Survey
Pesticides														
53-19-0	2,4-DDD	ug/g-d	0.8	16	DTSC, 2002	3	0.009	1.5	DTSC, 2002	3	3.6E+00	1.2E-01	0.28	1	National Quality Sediment Survey
3424-82-6	2,4-DDE	ug/g-d	0.8	16	DTSC, 2002	3	0.009	0.6	DTSC, 2002		3.6E+00	7.3E-02	7.7	1	National Quality Sediment Survey
789-02-6	2,4-DDT	ug/g-d	0.8	16	DTSC, 2002	3	0.009	1.5	DTSC, 2002		3.6E+00	1.2E-01	1.67	1	National Quality Sediment Survey
72-54-8	4,4'-DDD	ug/g-d	0.8	16	DTSC, 2002		0.009	1.5	DTSC, 2002	3	3.6E+00	1.2E-01	0.28		National Quality Sediment Survey
72-55-9	4,4'-DDE	ug/g-d	0.8	16	DTSC, 2002	3	0.009	0.6	DTSC, 2002		3.6E+00	7.3E-02	7.7		National Quality Sediment Survey
50-29-3	4,4'-DDT	ug/g-d	0.8	16	DTSC, 2002	3	0.009	1.5	DTSC, 2002		3.6E+00	1.2E-01	1.67		National Quality Sediment Survey
SUM_TDDT	SUM_TDDT	ug/g-d	0.8	16	DTSC, 2002		0.009	0.6	DTSC, 2002		3.6E+00	7.3E-02	7.7		National Quality Sediment Survey
309-00-2	Aldrin	ug/g-d	0.1	1	DTSC, 2002		0.13	1.3	Hudson et al., 1970		3.2E-01	4.2E-01	1.8		National Quality Sediment Survey
319-84-6	BHC-alpha	ug/g-d	0.05	3.75	DTSC, 2002	4	0.56	2.25	ORNL, 1996	4	4.3E-01	1.1E+00	1.8		National Quality Sediment Survey
319-85-7	BHC-beta	ug/g-d	0.05	3.75	DTSC, 2002	4	0.56	2.25	ORNL, 1996	4	4.3E-01	1.1E+00	1.8		National Quality Sediment Survey
58-89-9	BHC-gamma (Lindane)	ug/g-d	0.05	3.75	DTSC, 2002		0.56	2.25	ORNL, 1996		4.3E-01	1.1E+00	1.8		National Quality Sediment Survey
319-86-8	BHC, delta	ug/g-d	0.05	3.75	DTSC, 2002		0.56	2.25	ORNL, 1996		4.3E-01	1.1E+00	1.8		National Quality Sediment Survey
SUM_BHC	SUM_BHC	ug/g-d	0.05	3.75	DTSC, 2002		0.56	2.25	ORNL, 1996		4.3E-01	1.1E+00	1.8		National Quality Sediment Survey

Attachment C
Supporting Data for PCL Derivation

Lower Passaic River Restoration Project
Focused Feasibility Study

			TRVs[a]								MATCs[b]		BAFs[c]		
			Mammals				Birds								
CASRN	Chemical Name	Units	TRV_{low}	TRV_{high}	Source		TRV_{low}	TRV_{high}	Source		Mammal	Bird			
5103-71-9	Chlordane,alpha (cis)	ug/g-d	4.6	9.2	ORNL, 1996		2.14	10.7	ORNL, 1996		6.5E+00	4.8E+00	4.77		National Quality Sediment Survey
5103-74-2	Chlordane,gamma (trans)	ug/g-d	4.6	9.2	ORNL, 1996		2.14	10.7	ORNL, 1996		6.5E+00	4.8E+00	4.77		National Quality Sediment Survey
57-74-9	Total Chlordane	ug/g-d	4.6	9.2	ORNL, 1996		2.14	10.7	ORNL, 1996		6.5E+00	4.8E+00	4.77		National Quality Sediment Survey
SUM_CHLORDANE	SUM_CHLORDANE	ug/g-d	4.6	9.2	ORNL, 1996		2.14	10.7	ORNL, 1996		6.5E+00	4.8E+00	4.77		National Quality Sediment Survey
60-57-1	Dieldrin	ug/g-d	0.02	0.2	ORNL, 1996		0.077	0.77	ORNL, 1996	5	6.3E-02	2.4E-01	1.8		National Quality Sediment Survey
1031-07-8	Endosulfan sulfate	ug/g-d	0.15	1.5	ORNL, 1996		10	100	ORNL, 1996		4.7E-01	3.2E+01	1.8		National Quality Sediment Survey
959-98-8	Endosulfan, alpha	ug/g-d	0.15	1.5	ORNL, 1996		10	100	ORNL, 1996		4.7E-01	3.2E+01	1.8		National Quality Sediment Survey
33213-65-9	Endosulfan, beta	ug/g-d	0.15	1.5	ORNL, 1996		10	100	ORNL, 1996		4.7E-01	3.2E+01	1.8		National Quality Sediment Survey
115-29-7	Total Endosulfan	ug/g-d	0.15	1.5	ORNL, 1996	5	10	100	ORNL, 1996	5	4.7E-01	3.2E+01	1.8		National Quality Sediment Survey
SUM_ENDOSULFAN	SUM_ENDOSULFAN	ug/g-d	0.15	1.5	ORNL, 1996	5	10	100	ORNL, 1996	5	4.7E-01	3.2E+01	1.8		National Quality Sediment Survey
7421-93-4	Endrin aldehyde	ug/g-d	0.092	0.92	ORNL, 1996		0.01	0.1	ORNL, 1996		2.9E-01	3.2E-02	1.8		National Quality Sediment Survey
53494-70-5	Endrin ketone	ug/g-d	0.092	0.92	ORNL, 1996		0.01	0.1	ORNL, 1996		2.9E-01	3.2E-02	1.8		National Quality Sediment Survey
72-20-8	Total Endrin	ug/g-d	0.092	0.92	ORNL, 1996		0.01	0.1	ORNL, 1996		2.9E-01	3.2E-02	1.8		National Quality Sediment Survey
SUM_ENDRIN	SUM_ENDRIN	ug/g-d	0.092	0.92	ORNL, 1996		0.01	0.1	ORNL, 1996		2.9E-01	3.2E-02	1.8		National Quality Sediment Survey
1024-57-3	Heptachlor epoxide	ug/g-d	0.13	6.8	DTSC, 2002		41.6	416	Hudson et al., 1984		9.4E-01	1.3E+02	1.8		National Quality Sediment Survey
76-44-8	Total Heptachlor	ug/g-d	0.13	6.8	DTSC, 2002		0.7	6.7	Hill et al., 1975		9.4E-01	2.1E+00	1.8		National Quality Sediment Survey
SUM_HEPTACHLOR	SUM_HEPTACHLOR	ug/g-d	0.13	6.8	DTSC, 2002		0.7	6.7	Hill et al., 1975		9.4E-01	2.1E+00	1.8		National Quality Sediment Survey
118-74-1	Hexachlorobenzene	ug/g-d	-	-	-		1.3	13.2	Hill et al., 1975			4.2E+00	0.09		National Quality Sediment Survey
72-43-5	Methoxychlor	ug/g-d	2.5	50	DTSC, 2002		80	800	Hudson et al., 1970		1.1E+01	2.5E+02	1.8		National Quality Sediment Survey
2385-85-5	Mirex	ug/g-d	0.7	1.8	IRIS, 2007		3.3	33.0	Hill et al., 1975		1.1E+00	1.0E+01	1.31		National Quality Sediment Survey
8001-35-2	Toxaphene	ug/g-d	8	80	ORNL, 1996	5	0.398	3.98	Hudson et al., 1970		2.5E+01	1.3E+00	1.8		National Quality Sediment Survey
Dioxin/Furan Congeners															
1746-01-6	2,3,7,8-TCDD[d]	ug/g-d											0.025		National Quality Sediment Survey

Notes

a. Toxicity Reference Values (TRV) - based on dietary doses below which adverse ecological effects are not anticipated ($TRVl_{ow}$) or above which are anticipate (TRV_{high}). The TRV_{low} and TRV_{high} terminology is used in the DTSC, 2002 compilation; comparable values from other reference sources are the No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL).

1. LD50 study result converted to a TRV using the following assumptions:

Parameter	Value	Units	Reference
mouse body weight	0.03	kg	USEPA, 1988a, from ORNL, 1996
mouse ingestion rate	0.0055	kg/day	Calculated using allometric equation from EPA 1988a.
LD_{50}	8.5	mg/kg	NTPChemIDPLus
Equivalent dose	0.0016	ug/g-day	
LD50 - Acute NOAEL	0.2	unitless	
Acute/Chronic	0.1	unitless	
TRV_{low}	3.1E-05	ug/g-day	

2. Based on value for Total PCBs (Aroclors).
3. Based on value for DDT
4. Based on value for gamma-BHC (Lindane).
5. LOAEL estimated using a 10 fold extrapolation factor

b. Maximum Allowable Toxicant Concentration (MATC) - geometric mean of the $TRVl_{ow}$ and TRV_{high}.

1. Value for corresponding para-isomer.

c. Bioaccumulation Factors (BAFs) - literature--derived ratio between aquatic biological tissue and sediment (wet weight/dry weight basis).

1. Values were taken from Table 2, median, non-dep for each analyte.

d. TRVs not calculated for 2,3,7,8-TCDD, instead protective sediment concentrations available in USEPA (1993) used in the screening process.

DTSC, 2002 reference available at http://www.dtsc.ca.gov/AssessingRisk/upload/Eco_Btag-mammal-bird-TRV-table.pdf

*Bechtel Jacobs Company LLC.1998. Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation. Used median literature values for non-depurated literature values (Table 2)

ATTACHMENT 3
ProUCL OUTPUT WORKSHEETS

Attachment 3

Type	HHRE and ERE
Medium	Fish
Chemical	Chlordane
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	77
Number of Unique Samples	61
Minimum	4
Maximum	3773
Mean	728.2083
Median	125
Standard Deviation	945.8552
Variance	894642.1
Coefficient of Variation	1.29888
Skewness	1.387574

Gamma Statistics

k hat	0.449095
k star (bias corrected)	0.440256
Theta hat	1621.502
Theta star	1654.058
nu hat	69.16061
nu star	67.79937
Approx.Chi Square Value (.05)	49.84466
Adjusted Level of Significance	0.046883
Adjusted Chi Square Value	49.55161

Log-transformed Statistics

Minimum of log data	1.386294
Maximum of log data	8.235626
Mean of log data	5.152205
Standard Deviation of log data	2.106326
Variance of log data	4.43661

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Variable: Chlordane

Normal Distribution Test

Lilliefors Test Statisitic	0.259638
Lilliefors 5% Critical Value	0.100969

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	907.6953

Gamma Distribution Test

A-D Test Statistic	1.814783
A-D 5% Critical Value	0.830205
K-S Test Statistic	0.168283
K-S 5% Critical Value	0.108348

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	990.5188
Adjusted Gamma UCL	996.3766

Lognormal Distribution Test

Lilliefors Test Statisitic	0.143329
Lilliefors 5% Critical Value	0.100969

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	3710.364
95% Chebyshev (MVUE) UCL	3852.455
97.5% Chebyshev (MVUE) UCL	4888.853
99% Chebyshev (MVUE) UCL	6924.655

95% Non-parametric UCLs

CLT UCL	905.5074
Adj-CLT UCL (Adjusted for skewness)	923.72
Mod-t UCL (Adjusted for skewness)	910.5361
Jackknife UCL	907.6953
Standard Bootstrap UCL	903.5621
Bootstrap-t UCL	929.0454
Hall's Bootstrap UCL	924.2973
Percentile Bootstrap UCL	902.1575
BCA Bootstrap UCL	931.0065
95% Chebyshev (Mean, Sd) UCL	1198.055
97.5% Chebyshev (Mean, Sd) UCL	1401.358
99% Chebyshev (Mean, Sd) UCL	**1800.707**

Attachment 3

Type	HHRE
Medium	Crab
Chemical	Chlordane
Units	µg/kg

Data File

Variable: Chlordane - crab

Raw Statistics

Number of Valid Samples	139
Number of Unique Samples	38
Minimum	0.38535
Maximum	203.05
Mean	19.21562
Median	4
Standard Deviation	33.56967
Variance	1126.923
Coefficient of Variation	1.746999
Skewness	3.009624

Gamma Statistics

k hat	0.574577
k star (bias corrected)	0.566972
Theta hat	33.44309
Theta star	33.89167
nu hat	159.7323
nu star	157.6182
Approx.Chi Square Value (.05)	129.5888
Adjusted Level of Significance	0.048273
Adjusted Chi Square Value	129.3245

Log-transformed Statistics

Minimum of log data	-0.9536
Maximum of log data	5.313452
Mean of log data	1.873426
Standard Deviation of log data	1.389059
Variance of log data	1.929484

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Normal Distribution Test

Lilliefors Test Statisitic	0.360562
Lilliefors 5% Critical Value	0.07515

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	23.93073

Gamma Distribution Test

A-D Test Statistic	13.14024
A-D 5% Critical Value	0.812264
K-S Test Statistic	0.273276
K-S 5% Critical Value	0.083534

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	23.37185
Adjusted Gamma UCL	23.41961

Lognormal Distribution Test

Lilliefors Test Statisitic	0.21263
Lilliefors 5% Critical Value	0.07515

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	23.08266
95% Chebyshev (MVUE) UCL	28.61985
97.5% Chebyshev (MVUE) UCL	33.70948
99% Chebyshev (MVUE) UCL	43.70706

95% Non-parametric UCLs

CLT UCL	23.89908
Adj-CLT UCL (Adjusted for skewness)	24.67573
Mod-t UCL (Adjusted for skewness)	24.05187
Jackknife UCL	23.93073
Standard Bootstrap UCL	23.83198
Bootstrap-t UCL	24.91228
Hall's Bootstrap UCL	25.27798
Percentile Bootstrap UCL	24.05748
BCA Bootstrap UCL	24.97802
95% Chebyshev (Mean, Sd) UCL	31.6269
97.5% Chebyshev (Mean, Sd) UCL	**36.99727**
99% Chebyshev (Mean, Sd) UCL	47.54632

Attachment 3

Type	HHRE
Medium	Fish
Chemical	DDD
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	77
Number of Unique Samples	56
Minimum	5
Maximum	679.79
Mean	116.2053
Median	70
Standard Deviation	128.7583
Variance	16578.69
Coefficient of Variation	1.108024
Skewness	2.446144

Gamma Statistics

k hat	1.277994
k star (bias corrected)	1.23686
Theta hat	90.92791
Theta star	93.95188
nu hat	196.8111
nu star	190.4764
Approx.Chi Square Value (.05)	159.5425
Adjusted Level of Significance	0.046883
Adjusted Chi Square Value	159.0056

Log-transformed Statistics

Minimum of log data	1.609438
Maximum of log data	6.521784
Mean of log data	4.315621
Standard Deviation of log data	0.946111
Variance of log data	0.895126

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

Variable: DDD

Normal Distribution Test

Lilliefors Test Statisitic	0.246613
Lilliefors 5% Critical Value	0.100969

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	140.6387

Gamma Distribution Test

A-D Test Statistic	1.91655
A-D 5% Critical Value	0.775056
K-S Test Statistic	0.157247
K-S 5% Critical Value	0.104122

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	138.7365
Adjusted Gamma UCL	139.205

Lognormal Distribution Test

Lilliefors Test Statisitic	0.090721
Lilliefors 5% Critical Value	0.100969

Data are lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	**148.5262**
95% Chebyshev (MVUE) UCL	180.2688
97.5% Chebyshev (MVUE) UCL	208.0118
99% Chebyshev (MVUE) UCL	262.5077

95% Non-parametric UCLs

CLT UCL	140.3409
Adj-CLT UCL (Adjusted for skewness)	144.7115
Mod-t UCL (Adjusted for skewness)	141.3204
Jackknife UCL	140.6387
Standard Bootstrap UCL	140.5377
Bootstrap-t UCL	144.9212
Hall's Bootstrap UCL	145.0503
Percentile Bootstrap UCL	141.2753
BCA Bootstrap UCL	145.4869
95% Chebyshev (Mean, Sd) UCL	180.165
97.5% Chebyshev (Mean, Sd) UCL	207.8405
99% Chebyshev (Mean, Sd) UCL	262.2035

Attachment 3

Type	HHRE
Medium	Crab
Chemical	DDD
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	74
Number of Unique Samples	38
Minimum	1.05
Maximum	823
Mean	53.16514
Median	9.8
Standard Deviation	116.9784
Variance	13683.95
Coefficient of Variation	2.200284
Skewness	4.783628

Gamma Statistics

k hat	0.472585
k star (bias corrected)	0.462436
Theta hat	112.4985
Theta star	114.9677
nu hat	69.94263
nu star	68.44045
Approx.Chi Square Value (.05)	50.39508
Adjusted Level of Significance	0.046757
Adjusted Chi Square Value	50.08809

Log-transformed Statistics

Minimum of log data	0.04879
Maximum of log data	6.712956
Mean of log data	2.617466
Standard Deviation of log data	1.638032
Variance of log data	2.683148

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable: DDD - HH crab

Normal Distribution Test

Lilliefors Test Statisitic	0.327975
Lilliefors 5% Critical Value	0.102995

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	75.82012

Gamma Distribution Test

A-D Test Statistic	4.591953
A-D 5% Critical Value	0.824166
K-S Test Statistic	0.202051
K-S 5% Critical Value	0.110148

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	72.20241
Adjusted Gamma UCL	72.64494

Lognormal Distribution Test

Lilliefors Test Statisitic	0.216535
Lilliefors 5% Critical Value	0.102995

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	92.11958
95% Chebyshev (MVUE) UCL	109.3418
97.5% Chebyshev (MVUE) UCL	134.8771
99% Chebyshev (MVUE) UCL	185.0362

95% Non-parametric UCLs

CLT UCL	75.53262
Adj-CLT UCL (Adjusted for skewness)	83.61263
Mod-t UCL (Adjusted for skewness)	77.08044
Jackknife UCL	75.82012
Standard Bootstrap UCL	75.378
Bootstrap-t UCL	96.42714
Hall's Bootstrap UCL	178.6165
Percentile Bootstrap UCL	78.07797
BCA Bootstrap UCL	85.18459
95% Chebyshev (Mean, Sd) UCL	112.4395
97.5% Chebyshev (Mean, Sd) UCL	**138.0875**
99% Chebyshev (Mean, Sd) UCL	188.4681

Attachment 3

Type	HHRE
Medium	Crab
Chemical	DDE
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	74
Number of Unique Samples	59
Minimum	1.45
Maximum	1740
Mean	136.9135
Median	41
Standard Deviation	248.274
Variance	61639.98
Coefficient of Variation	1.813364
Skewness	4.120717

Gamma Statistics

k hat	0.507718
k star (bias corrected)	0.496144
Theta hat	269.6643
Theta star	275.9551
nu hat	75.14232
nu star	73.42934
Approx.Chi Square Value (.05)	54.69258
Adjusted Level of Significance	0.046757
Adjusted Chi Square Value	54.37208

Log-transformed Statistics

Minimum of log data	0.371564
Maximum of log data	7.46164
Mean of log data	3.671263
Standard Deviation of log data	1.670752
Variance of log data	2.791411

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable: DDE - HH crab

Normal Distribution Test

Lilliefors Test Statisitic	0.292663
Lilliefors 5% Critical Value	0.102995

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	184.9963

Gamma Distribution Test

A-D Test Statistic	2.847709
A-D 5% Critical Value	0.816854
K-S Test Statistic	0.149462
K-S 5% Critical Value	0.109683

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	183.8178
Adjusted Gamma UCL	184.9013

Lognormal Distribution Test

Lilliefors Test Statisitic	0.165591
Lilliefors 5% Critical Value	0.102995

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	284.2828
95% Chebyshev (MVUE) UCL	335.273
97.5% Chebyshev (MVUE) UCL	414.57
99% Chebyshev (MVUE) UCL	570.3335

95% Non-parametric UCLs

CLT UCL	184.3861
Adj-CLT UCL (Adjusted for skewness)	199.1585
Mod-t UCL (Adjusted for skewness)	187.3005
Jackknife UCL	184.9963
Standard Bootstrap UCL	184.5245
Bootstrap-t UCL	213.8093
Hall's Bootstrap UCL	360.9452
Percentile Bootstrap UCL	191.8673
BCA Bootstrap UCL	200.5447
95% Chebyshev (Mean, Sd) UCL	262.7169
97.5% Chebyshev (Mean, Sd) UCL	**317.1521**
99% Chebyshev (Mean, Sd) UCL	424.0795

Attachment 3

Type	HHRE
Medium	Fish
Chemical	DDE
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	77
Number of Unique Samples	66
Minimum	14.79
Maximum	1685.65
Mean	248.3113
Median	185
Standard Deviation	243.9676
Variance	59520.21
Coefficient of Variation	0.982507
Skewness	3.322651

Gamma Statistics

k hat	1.68757
k star (bias corrected)	1.630478
Theta hat	147.1413
Theta star	152.2935
nu hat	259.8858
nu star	251.0937
Approx.Chi Square Value (.05)	215.3976
Adjusted Level of Significance	0.046883
Adjusted Chi Square Value	214.771

Log-transformed Statistics

Minimum of log data	2.693951
Maximum of log data	7.429907
Mean of log data	5.190035
Standard Deviation of log data	0.81295
Variance of log data	0.660888

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

Variable: DDE

Normal Distribution Test

Lilliefors Test Statisitic	0.219857
Lilliefors 5% Critical Value	0.100969

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	294.607

Gamma Distribution Test

A-D Test Statistic	1.106821
A-D 5% Critical Value	0.767391
K-S Test Statistic	0.125948
K-S 5% Critical Value	0.103415

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	289.4619
Adjusted Gamma UCL	290.3064

Lognormal Distribution Test

Lilliefors Test Statisitic	0.083187
Lilliefors 5% Critical Value	0.100969

Data are lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	**302.9996**
95% Chebyshev (MVUE) UCL	362.0166
97.5% Chebyshev (MVUE) UCL	411.2003
99% Chebyshev (MVUE) UCL	507.8122

95% Non-parametric UCLs

CLT UCL	294.0427
Adj-CLT UCL (Adjusted for skewness)	305.2915
Mod-t UCL (Adjusted for skewness)	296.3616
Jackknife UCL	294.607
Standard Bootstrap UCL	293.8614
Bootstrap-t UCL	315.6088
Hall's Bootstrap UCL	325.121
Percentile Bootstrap UCL	296.4174
BCA Bootstrap UCL	307.7962
95% Chebyshev (Mean, Sd) UCL	369.5004
97.5% Chebyshev (Mean, Sd) UCL	421.9391
99% Chebyshev (Mean, Sd) UCL	524.9446

Attachment 3

Type	HHRE
Medium	Crab
Chemical	DDT
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	74
Number of Unique Samples	43
Minimum	0.1265
Maximum	480
Mean	77.53997
Median	5.84
Standard Deviation	136.0593
Variance	18512.14
Coefficient of Variation	1.754699
Skewness	1.726344

Gamma Statistics

k hat	0.368439
k star (bias corrected)	0.362512
Theta hat	210.4552
Theta star	213.8965
nu hat	54.52903
nu star	53.65172
Approx.Chi Square Value (.05)	37.82049
Adjusted Level of Significance	0.046757
Adjusted Chi Square Value	37.55671

Log-transformed Statistics

Minimum of log data	-2.06751
Maximum of log data	6.173786
Mean of log data	2.540874
Standard Deviation of log data	2.053976
Variance of log data	4.218819

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Variable: DDT- HH crab

Normal Distribution Test

Lilliefors Test Statisitic	0.369243
Lilliefors 5% Critical Value	0.102995

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	103.8903

Gamma Distribution Test

A-D Test Statistic	5.421298
A-D 5% Critical Value	0.849034
K-S Test Statistic	0.226031
K-S 5% Critical Value	0.111698

Data do not follow gamma distribution
at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	109.9973
Adjusted Gamma UCL	110.7699

Lognormal Distribution Test

Lilliefors Test Statisitic	0.161385
Lilliefors 5% Critical Value	0.102995

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	240.25
95% Chebyshev (MVUE) UCL	251.5671
97.5% Chebyshev (MVUE) UCL	318.7361
99% Chebyshev (MVUE) UCL	450.6766

95% Non-parametric UCLs

CLT UCL	103.5559
Adj-CLT UCL (Adjusted for skewness)	106.9475
Mod-t UCL (Adjusted for skewness)	104.4193
Jackknife UCL	103.8903
Standard Bootstrap UCL	103.5913
Bootstrap-t UCL	108.6983
Hall's Bootstrap UCL	106.3559
Percentile Bootstrap UCL	105.2138
BCA Bootstrap UCL	106.2337
95% Chebyshev (Mean, Sd) UCL	146.4828
97.5% Chebyshev (Mean, Sd) UCL	176.3144
99% Chebyshev (Mean, Sd) UCL	**234.9129**

Attachment 3

Type	HHRE
Medium	Fish
Chemical	DDT
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	77
Number of Unique Samples	53
Minimum	1
Maximum	380
Mean	58.81383
Median	33.2
Standard Deviation	71.29391
Variance	5082.821
Coefficient of Variation	1.212196
Skewness	1.858971

Gamma Statistics

k hat	0.607023
k star (bias corrected)	0.592031
Theta hat	96.88897
Theta star	99.34253
nu hat	93.48153
nu star	91.17273
Approx.Chi Square Value (.05)	70.15105
Adjusted Level of Significance	0.046883
Adjusted Chi Square Value	69.80046

Log-transformed Statistics

Minimum of log data	0
Maximum of log data	5.940171
Mean of log data	3.05824
Standard Deviation of log data	1.749043
Variance of log data	3.059153

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Variable: DDT

Normal Distribution Test

Lilliefors Test Statisitic	0.231949
Lilliefors 5% Critical Value	0.100969

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	72.34268

Gamma Distribution Test

A-D Test Statistic	0.796739
A-D 5% Critical Value	0.807441
K-S Test Statistic	0.086486
K-S 5% Critical Value	0.106835

Data follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	**76.43816**
Adjusted Gamma UCL	76.82209

Lognormal Distribution Test

Lilliefors Test Statisitic	0.115657
Lilliefors 5% Critical Value	0.100969

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	181.7935
95% Chebyshev (MVUE) UCL	212.1786
97.5% Chebyshev (MVUE) UCL	263.4441
99% Chebyshev (MVUE) UCL	364.1451

95% Non-parametric UCLs

CLT UCL	72.17776
Adj-CLT UCL (Adjusted for skewness)	74.0169
Mod-t UCL (Adjusted for skewness)	72.62954
Jackknife UCL	72.34268
Standard Bootstrap UCL	72.51518
Bootstrap-t UCL	75.11264
Hall's Bootstrap UCL	75.27769
Percentile Bootstrap UCL	72.75049
BCA Bootstrap UCL	74.18344
95% Chebyshev (Mean, Sd) UCL	94.22855
97.5% Chebyshev (Mean, Sd) UCL	109.5525
99% Chebyshev (Mean, Sd) UCL	139.6535

Attachment 3

Type	HHRE and ERE
Medium	Fish
Chemical	Dieldrin
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	77
Number of Unique Samples	51
Minimum	0.3
Maximum	140.0891
Mean	21.86835
Median	16.5
Standard Deviation	23.29433
Variance	542.6256
Coefficient of Variation	1.065207
Skewness	2.213871

Gamma Statistics

k hat	0.889693
k star (bias corrected)	0.863688
Theta hat	24.57966
Theta star	25.31974
nu hat	137.0127
nu star	133.0079
Approx.Chi Square Value (.05)	107.3595
Adjusted Level of Significance	0.046883
Adjusted Chi Square Value	106.9219

Log-transformed Statistics

Minimum of log data	-1.20397
Maximum of log data	4.942279
Mean of log data	2.427005
Standard Deviation of log data	1.333832
Variance of log data	1.779109

RECOMMENDATION

Assuming gamma distribution (0.05)

Use Approximate Gamma UCL

Variable: Dieldrin

Normal Distribution Test

Lilliefors Test Statisitic	0.177248
Lilliefors 5% Critical Value	0.100969

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	26.28871

Gamma Distribution Test

A-D Test Statistic	0.787328
A-D 5% Critical Value	0.786562
K-S Test Statistic	0.10202
K-S 5% Critical Value	0.105217

Data follow approximate gamma distibution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	**27.09275**
Adjusted Gamma UCL	27.20361

Lognormal Distribution Test

Lilliefors Test Statisitic	0.136486
Lilliefors 5% Critical Value	0.100969

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	40.92574
95% Chebyshev (MVUE) UCL	50.37743
97.5% Chebyshev (MVUE) UCL	60.49795
99% Chebyshev (MVUE) UCL	80.37776

95% Non-parametric UCLs

CLT UCL	26.23483
Adj-CLT UCL (Adjusted for skewness)	26.95047
Mod-t UCL (Adjusted for skewness)	26.40034
Jackknife UCL	26.28871
Standard Bootstrap UCL	26.16137
Bootstrap-t UCL	27.36468
Hall's Bootstrap UCL	27.58395
Percentile Bootstrap UCL	26.36148
BCA Bootstrap UCL	26.96494
95% Chebyshev (Mean, Sd) UCL	33.43963
97.5% Chebyshev (Mean, Sd) UCL	38.44654
99% Chebyshev (Mean, Sd) UCL	48.28163

Attachment 3

Type	HHRE
Medium	Crab
Chemical	Dieldrin
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	75
Number of Unique Samples	21
Minimum	0.753
Maximum	33
Mean	9.269307
Median	2.5
Standard Deviation	12.40813
Variance	153.9617
Coefficient of Variation	1.338626
Skewness	1.328876

Gamma Statistics

k hat	0.732375
k star (bias corrected)	0.711969
Theta hat	12.6565
Theta star	13.01926
nu hat	109.8562
nu star	106.7953
Approx.Chi Square Value (.05)	83.94128
Adjusted Level of Significance	0.0468
Adjusted Chi Square Value	83.54575

Log-transformed Statistics

Minimum of log data	-0.28369
Maximum of log data	3.496508
Mean of log data	1.406668
Standard Deviation of log data	1.22869
Variance of log data	1.509679

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable: Dieldrin - HH crab

Normal Distribution Test

Lilliefors Test Statisitic	0.331126
Lilliefors 5% Critical Value	0.102306

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	11.65588

Gamma Distribution Test

A-D Test Statistic	8.205953
A-D 5% Critical Value	0.794616
K-S Test Statistic	0.259913
K-S 5% Critical Value	0.107315

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	11.79299
Adjusted Gamma UCL	11.84882

Lognormal Distribution Test

Lilliefors Test Statisitic	0.209525
Lilliefors 5% Critical Value	0.102306

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	12.36598
95% Chebyshev (MVUE) UCL	15.23676
97.5% Chebyshev (MVUE) UCL	18.13608
99% Chebyshev (MVUE) UCL	23.83121

95% Non-parametric UCLs

CLT UCL	11.626
Adj-CLT UCL (Adjusted for skewness)	11.86091
Mod-t UCL (Adjusted for skewness)	11.69252
Jackknife UCL	11.65588
Standard Bootstrap UCL	11.59448
Bootstrap-t UCL	11.96134
Hall's Bootstrap UCL	11.78995
Percentile Bootstrap UCL	11.7012
BCA Bootstrap UCL	11.72637
95% Chebyshev (Mean, Sd) UCL	15.5146
97.5% Chebyshev (Mean, Sd) UCL	**18.21694**
99% Chebyshev (Mean, Sd) UCL	23.52517

Attachment 3

Type	HHRE and ERE
Medium	Fish
Chemical	Mercury
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	87
Number of Unique Samples	68
Minimum	78.6
Maximum	931
Mean	317.9494
Median	305
Standard Deviation	154.8203
Variance	23969.32
Coefficient of Variation	0.486934
Skewness	1.186466

Gamma Statistics

k hat	4.498614
k star (bias corrected)	4.351152
Theta hat	70.6772
Theta star	73.07247
nu hat	782.7588
nu star	757.1004
Approx.Chi Square Value (.05)	694.2386
Adjusted Level of Significance	0.047241
Adjusted Chi Square Value	693.2341

Log-transformed Statistics

Minimum of log data	4.364372
Maximum of log data	6.836259
Mean of log data	5.646649
Standard Deviation of log data	0.493037
Variance of log data	0.243086

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Variable: Mercury

Normal Distribution Test

Lilliefors Test Statisitic	0.100647
Lilliefors 5% Critical Value	0.094989

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	345.5488

Gamma Distribution Test

A-D Test Statistic	0.428302
A-D 5% Critical Value	0.755176
K-S Test Statistic	0.067579
K-S 5% Critical Value	0.096155

Data follow gamma distribution

at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	**346.7391**
Adjusted Gamma UCL	347.2415

Lognormal Distribution Test

Lilliefors Test Statisitic	0.0996
Lilliefors 5% Critical Value	0.094989

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	352.7346
95% Chebyshev (MVUE) UCL	396.9765
97.5% Chebyshev (MVUE) UCL	430.518
99% Chebyshev (MVUE) UCL	496.4038

95% Non-parametric UCLs

CLT UCL	345.2515
Adj-CLT UCL (Adjusted for skewness)	347.5075
Mod-t UCL (Adjusted for skewness)	345.9007
Jackknife UCL	345.5488
Standard Bootstrap UCL	345.8926
Bootstrap-t UCL	349.4925
Hall's Bootstrap UCL	348.7972
Percentile Bootstrap UCL	346
BCA Bootstrap UCL	347.9425
95% Chebyshev (Mean, Sd) UCL	390.3005
97.5% Chebyshev (Mean, Sd) UCL	421.6069
99% Chebyshev (Mean, Sd) UCL	483.1022

Attachment 3

Type	HHRE
Medium	Crab
Chemical	Mercury
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	82
Number of Unique Samples	60
Minimum	29
Maximum	280
Mean	87.4622
Median	73
Standard Deviation	54.41212
Variance	2960.679
Coefficient of Variation	0.622122
Skewness	1.592654

Gamma Statistics

k hat	3.326303
k star (bias corrected)	3.212739
Theta hat	26.29411
Theta star	27.22356
nu hat	545.5137
nu star	526.8893
Approx.Chi Square Value (.05)	474.6442
Adjusted Level of Significance	0.047073
Adjusted Chi Square Value	473.7646

Log-transformed Statistics

Minimum of log data	3.367296
Maximum of log data	5.63479
Mean of log data	4.313423
Standard Deviation of log data	0.549507
Variance of log data	0.301958

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

Variable: Mercury - HH crab

Normal Distribution Test

Lilliefors Test Statisitic	0.164979
Lilliefors 5% Critical Value	0.097842

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	97.46016

Gamma Distribution Test

A-D Test Statistic	1.402979
A-D 5% Critical Value	0.75801
K-S Test Statistic	0.100658
K-S 5% Critical Value	0.099278

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	97.08933
Adjusted Gamma UCL	97.2696

Lognormal Distribution Test

Lilliefors Test Statisitic	0.08077
Lilliefors 5% Critical Value	0.097842

Data are lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	**97.38705**
95% Chebyshev (MVUE) UCL	111.1048
97.5% Chebyshev (MVUE) UCL	121.6708
99% Chebyshev (MVUE) UCL	142.4255

95% Non-parametric UCLs

CLT UCL	97.34581
Adj-CLT UCL (Adjusted for skewness)	98.47505
Mod-t UCL (Adjusted for skewness)	97.6363
Jackknife UCL	97.46016
Standard Bootstrap UCL	97.49415
Bootstrap-t UCL	99.2656
Hall's Bootstrap UCL	98.58715
Percentile Bootstrap UCL	97.86463
BCA Bootstrap UCL	98.2439
95% Chebyshev (Mean, Sd) UCL	113.654
97.5% Chebyshev (Mean, Sd) UCL	124.9872
99% Chebyshev (Mean, Sd) UCL	147.2491

Attachment 3

Type	HHRE
Medium	Crab
Chemical	TCDD TEQ (D/F) - Mammal
Units	µg/kg

Data File		Variable:	Human Crab Diox TEQ mammal
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	71	Lilliefors Test Statisitic	0.2568253
Number of Unique Samples	70	Lilliefors 5% Critical Value	0.1051489
Minimum	0.002338	Data not normal at 5% significance level	
Maximum	0.752665		
Mean	0.114213	95% UCL (Assuming Normal Distribution)	
Median	0.066466	Student's-t UCL	0.1421278
Standard Deviation	0.14111		
Variance	0.019912	Gamma Distribution Test	
Coefficient of Variation	1.235499	A-D Test Statistic	1.78354
Skewness	2.149888	A-D 5% Critical Value	0.7891368
		K-S Test Statistic	0.1543445
Gamma Statistics		K-S 5% Critical Value	0.1096284
k hat	0.822948	Data do not follow gamma distribution	
k star (bias corrected)	0.797565	at 5% significance level	
Theta hat	0.138785		
Theta star	0.143202	95% UCLs (Assuming Gamma Distribution)	
nu hat	116.8586	Approximate Gamma UCL	0.1442321
nu star	113.2542	Adjusted Gamma UCL	0.1449319
Approx.Chi Square Value (.05)	89.68227		
Adjusted Level of Significance	0.04662	Lognormal Distribution Test	
Adjusted Chi Square Value	89.2492	Lilliefors Test Statisitic	0.1302347
		Lilliefors 5% Critical Value	0.1051489
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-6.0583		
Maximum of log data	-0.28414	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-2.88821	95% H-UCL	0.1835401
Standard Deviation of log data	1.271501	95% Chebyshev (MVUE) UCL	0.2257003
Variance of log data	1.616716	97.5% Chebyshev (MVUE) UCL	0.2703641
		99% Chebyshev (MVUE) UCL	0.3580975
		95% Non-parametric UCLs	
		CLT UCL	0.1417583
		Adj-CLT UCL (Adjusted for skewness)	0.1463239
		Mod-t UCL (Adjusted for skewness)	0.1428399
		Jackknife UCL	0.1421278
		Standard Bootstrap UCL	0.1406257
		Bootstrap-t UCL	0.1486922
RECOMMENDATION		Hall's Bootstrap UCL	0.1477866
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.1436837
		BCA Bootstrap UCL	0.1476682
Use 97.5% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	0.1872094
		97.5% Chebyshev (Mean, Sd) UCL	**0.2187952**
		99% Chebyshev (Mean, Sd) UCL	0.2808394

Attachment 3

Type	HHRE
Medium	Crab
Chemical	TCDD TEQ (PCB) - Mammal
Units	µg/kg

Data File		Variable:	Human Crab PCB TEQ - mammal
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	73	Lilliefors Test Statisitic	0.41347705
Number of Unique Samples	73	Lilliefors 5% Critical Value	0.103698456
Minimum	0.00046	Data not normal at 5% significance level	
Maximum	3.62334		
Mean	0.092967	95% UCL (Assuming Normal Distribution)	
Median	0.028336	Student's-t UCL	0.175494319
Standard Deviation	0.423162		
Variance	0.179066	Gamma Distribution Test	
Coefficient of Variation	4.551737	A-D Test Statistic	3.840993491
Skewness	8.292291	A-D 5% Critical Value	0.841330641
		K-S Test Statistic	0.18058701
Gamma Statistics		K-S 5% Critical Value	0.111944887
k hat	0.400407	Data do not follow gamma distribution	
k star (bias corrected)	0.393085	at 5% significance level	
Theta hat	0.232182		
Theta star	0.236507	95% UCLs (Assuming Gamma Distribution)	
nu hat	58.45946	Approximate Gamma UCL	0.130217927
nu star	57.39035	Adjusted Gamma UCL	0.131110963
Approx.Chi Square Value (.05)	40.973		
Adjusted Level of Significance	0.046712	Lognormal Distribution Test	
Adjusted Chi Square Value	40.69392	Lilliefors Test Statisitic	0.143147822
		Lilliefors 5% Critical Value	0.103698456
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-7.68472		
Maximum of log data	1.287396	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-4.01866	95% H-UCL	0.153137073
Standard Deviation of log data	1.739594	95% Chebyshev (MVUE) UCL	0.177404335
Variance of log data	3.026188	97.5% Chebyshev (MVUE) UCL	0.220547121
		99% Chebyshev (MVUE) UCL	0.305292768
		95% Non-parametric UCLs	
		CLT UCL	0.174432462
		Adj-CLT UCL (Adjusted for skewness)	0.225794101
		Mod-t UCL (Adjusted for skewness)	0.183505696
		Jackknife UCL	0.175494319
		Standard Bootstrap UCL	0.171270265
		Bootstrap-t UCL	0.646637333
RECOMMENDATION		Hall's Bootstrap UCL	0.501530574
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.190860126
		BCA Bootstrap UCL	0.247622414
Use 97.5% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	0.308852009
		97.5% Chebyshev (Mean, Sd) UCL	**0.402265549**
		99% Chebyshev (Mean, Sd) UCL	0.58575836

Attachment 3

Type	HHRE
Medium	Crab
Chemical	Total TEQ - Mammal
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	77
Number of Unique Samples	77
Minimum	0.00046
Maximum	3.928891
Mean	0.193451
Median	0.08249
Standard Deviation	0.473021
Variance	0.223748
Coefficient of Variation	2.445175
Skewness	6.776818

Gamma Statistics

k hat	0.544657
k star (bias corrected)	0.532095
Theta hat	0.355179
Theta star	0.363564
nu hat	83.87719
nu star	81.94258
Approx.Chi Square Value (.05)	62.07848
Adjusted Level of Significance	0.046883
Adjusted Chi Square Value	61.74963

Log-transformed Statistics

Minimum of log data	-7.68472
Maximum of log data	1.368357
Mean of log data	-2.79372
Standard Deviation of log data	1.629381
Variance of log data	2.654884

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

Variable: Human Crab Total TEQ mammal

Normal Distribution Test

Lilliefors Test Statisitic	0.3416381
Lilliefors 5% Critical Value	0.1009691

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	0.2832118

Gamma Distribution Test

A-D Test Statistic	1.9721286
A-D 5% Critical Value	0.8137573
K-S Test Statistic	0.1392631
K-S 5% Critical Value	0.1072865

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	0.2553517
Adjusted Gamma UCL	0.2567116

Lognormal Distribution Test

Lilliefors Test Statisitic	0.0878546
Lilliefors 5% Critical Value	0.1009691

Data are lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	**0.39842**
95% Chebyshev (MVUE) UCL	0.4762235
97.5% Chebyshev (MVUE) UCL	0.5861823
99% Chebyshev (MVUE) UCL	0.802175

95% Non-parametric UCLs

CLT UCL	0.2821176
Adj-CLT UCL (Adjusted for skewness)	0.3266008
Mod-t UCL (Adjusted for skewness)	0.2901502
Jackknife UCL	0.2832118
Standard Bootstrap UCL	0.2797654
Bootstrap-t UCL	0.4190146
Hall's Bootstrap UCL	0.6378384
Percentile Bootstrap UCL	0.2920667
BCA Bootstrap UCL	0.3413734
95% Chebyshev (Mean, Sd) UCL	0.4284201
97.5% Chebyshev (Mean, Sd) UCL	0.5300916
99% Chebyshev (Mean, Sd) UCL	0.7298056

Type	HHRE and ERE
Medium	Fish
Chemical	Total PCB
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	77
Number of Unique Samples	77
Minimum	83
Maximum	13990
Mean	2854.514
Median	1795
Standard Deviation	2649.939
Variance	7022179
Coefficient of Variation	0.928333
Skewness	1.612867

Gamma Statistics

k hat	1.206722
k star (bias corrected)	1.168365
Theta hat	2365.511
Theta star	2443.17
nu hat	185.8352
nu star	179.9282
Approx.Chi Square Value (.05)	149.8972
Adjusted Level of Significance	0.046883
Adjusted Chi Square Value	149.3772

Log-transformed Statistics

Minimum of log data	4.418841
Maximum of log data	9.546098
Mean of log data	7.488195
Standard Deviation of log data	1.084117
Variance of log data	1.175309

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Variable: Total PCBs

Normal Distribution Test

Lilliefors Test Statisitic	0.171094
Lilliefors 5% Critical Value	0.100969

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	3357.37

Gamma Distribution Test

A-D Test Statistic	0.472836
A-D 5% Critical Value	0.77671
K-S Test Statistic	0.074764
K-S 5% Critical Value	0.104284

Data follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	**3426.398**
Adjusted Gamma UCL	3438.325

Lognormal Distribution Test

Lilliefors Test Statisitic	0.103874
Lilliefors 5% Critical Value	0.100969

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	4291.961
95% Chebyshev (MVUE) UCL	5266.362
97.5% Chebyshev (MVUE) UCL	6170.027
99% Chebyshev (MVUE) UCL	7945.101

95% Non-parametric UCLs

CLT UCL	3351.241
Adj-CLT UCL (Adjusted for skewness)	3410.55
Mod-t UCL (Adjusted for skewness)	3366.621
Jackknife UCL	3357.37
Standard Bootstrap UCL	3348.646
Bootstrap-t UCL	3413.527
Hall's Bootstrap UCL	3464.444
Percentile Bootstrap UCL	3375.299
BCA Bootstrap UCL	3403.161
95% Chebyshev (Mean, Sd) UCL	4170.851
97.5% Chebyshev (Mean, Sd) UCL	4740.432
99% Chebyshev (Mean, Sd) UCL	5859.262

Attachment 3

Type	HHRE
Medium	Crab
Chemical	Total PCB
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	75
Number of Unique Samples	54
Minimum	82.37
Maximum	14000
Mean	2427.953
Median	600
Standard Deviation	3817.157
Variance	14570684
Coefficient of Variation	1.572171
Skewness	1.629632

Gamma Statistics

k hat	0.571811
k star (bias corrected)	0.557828
Theta hat	4246.073
Theta star	4352.513
nu hat	85.77171
nu star	83.67418
Approx.Chi Square Value (.05)	63.58811
Adjusted Level of Significance	0.0468
Adjusted Chi Square Value	63.24598

Log-transformed Statistics

Minimum of log data	4.411221
Maximum of log data	9.546813
Mean of log data	6.706487
Standard Deviation of log data	1.414531
Variance of log data	2.000898

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable: Total PCBs - crab

Normal Distribution Test

Lilliefors Test Statisitic	0.370377
Lilliefors 5% Critical Value	0.102306

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	3162.142

Gamma Distribution Test

A-D Test Statistic	7.241358
A-D 5% Critical Value	0.810663
K-S Test Statistic	0.236845
K-S 5% Critical Value	0.1085

Data do not follow gamma distribution
at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	3194.89
Adjusted Gamma UCL	3212.172

Lognormal Distribution Test

Lilliefors Test Statisitic	0.144546
Lilliefors 5% Critical Value	0.102306

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	3454.203
95% Chebyshev (MVUE) UCL	4227.236
97.5% Chebyshev (MVUE) UCL	5118.617
99% Chebyshev (MVUE) UCL	6869.562

95% Non-parametric UCLs

CLT UCL	3152.951
Adj-CLT UCL (Adjusted for skewness)	3241.574
Mod-t UCL (Adjusted for skewness)	3175.966
Jackknife UCL	3162.142
Standard Bootstrap UCL	3156.373
Bootstrap-t UCL	3280.973
Hall's Bootstrap UCL	3255.173
Percentile Bootstrap UCL	3177.28
BCA Bootstrap UCL	3225.525
95% Chebyshev (Mean, Sd) UCL	4349.213
97.5% Chebyshev (Mean, Sd) UCL	**5180.544**
99% Chebyshev (Mean, Sd) UCL	6813.532

Attachment 3

Type	ERE
Medium	Mummichog
Chemical	Chlordane
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	61
Number of Unique Samples	24
Minimum	4
Maximum	335.26
Mean	17.23672
Median	6
Standard Deviation	46.60451
Variance	2171.98
Coefficient of Variation	2.703792
Skewness	5.868271

Gamma Statistics

k hat	0.77292
k star (bias corrected)	0.745837
Theta hat	22.30077
Theta star	23.11058
nu hat	94.29629
nu star	90.9921
Approx.Chi Square Value (.05)	69.9925
Adjusted Level of Significance	0.046066
Adjusted Chi Square Value	69.5476

Log-transformed Statistics

Minimum of log data	1.386294
Maximum of log data	5.814906
Mean of log data	2.075667
Standard Deviation of log data	0.893677
Variance of log data	0.798658

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Variable: Chlordane - Mumm

Normal Distribution Test

Lilliefors Test Statisitic	0.388197
Lilliefors 5% Critical Value	0.113441

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	27.20564

Gamma Distribution Test

A-D Test Statistic	9.288737
A-D 5% Critical Value	0.790936
K-S Test Statistic	0.284591
K-S 5% Critical Value	0.118277

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	22.40819
Adjusted Gamma UCL	22.55154

Lognormal Distribution Test

Lilliefors Test Statisitic	0.220238
Lilliefors 5% Critical Value	0.113441

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	15.26554
95% Chebyshev (MVUE) UCL	18.54009
97.5% Chebyshev (MVUE) UCL	21.46723
99% Chebyshev (MVUE) UCL	27.21704

95% Non-parametric UCLs

CLT UCL	27.05172
Adj-CLT UCL (Adjusted for skewness)	31.84231
Mod-t UCL (Adjusted for skewness)	27.95288
Jackknife UCL	27.20564
Standard Bootstrap UCL	26.87975
Bootstrap-t UCL	45.90513
Hall's Bootstrap UCL	49.19513
Percentile Bootstrap UCL	27.5277
BCA Bootstrap UCL	34.91459
95% Chebyshev (Mean, Sd) UCL	**43.24669**
97.5% Chebyshev (Mean, Sd) UCL	54.50122
99% Chebyshev (Mean, Sd) UCL	76.60858

Attachment 3

Type	ERE
Medium	Mummichog
Chemical	Copper
Units	µg/kg

Data File

Variable: Copper

Raw Statistics	
Number of Valid Samples	58
Number of Unique Samples	29
Minimum	1900
Maximum	7200
Mean	3662.069
Median	3500
Standard Deviation	1022.8662
Variance	1046255.3
Coefficient of Variation	0.2793137
Skewness	1.3062076

Gamma Statistics	
k hat	14.625269
k star (bias corrected)	13.880283
Theta hat	250.39328
Theta star	263.83243
nu hat	1696.5312
nu star	1610.1129
Approx.Chi Square Value (.05)	1517.9036
Adjusted Level of Significance	0.0458621
Adjusted Chi Square Value	1515.6389

Log-transformed Statistics	
Minimum of log data	7.5496092
Maximum of log data	8.8818363
Mean of log data	8.1712067
Standard Deviation of log data	0.2611952
Variance of log data	0.0682229

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.11878
Lilliefors 5% Critical Value	0.116337
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	3886.637

Gamma Distribution Test	
A-D Test Statistic	0.621957
A-D 5% Critical Value	0.749889
K-S Test Statistic	0.088242
K-S 5% Critical Value	0.116665
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	**3884.532**
Adjusted Gamma UCL	3890.336

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.08111
Lilliefors 5% Critical Value	0.116337
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	3887.139
95% Chebyshev (MVUE) UCL	4212.994
97.5% Chebyshev (MVUE) UCL	4453.079
99% Chebyshev (MVUE) UCL	4924.678

95% Non-parametric UCLs	
CLT UCL	3882.987
Adj-CLT UCL (Adjusted for skewness)	3907.602
Mod-t UCL (Adjusted for skewness)	3890.477
Jackknife UCL	3886.637
Standard Bootstrap UCL	3877.258
Bootstrap-t UCL	3933.152
Hall's Bootstrap UCL	3921.145
Percentile Bootstrap UCL	3896.552
BCA Bootstrap UCL	3913.793
95% Chebyshev (Mean, Sd) UCL	4247.508
97.5% Chebyshev (Mean, Sd) UCL	4500.828
99% Chebyshev (Mean, Sd) UCL	4998.426

Attachment 3

Type	ERE
Medium	Mummichog
Chemical	DDx - Sum
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	62
Number of Unique Samples	56
Minimum	0.4644
Maximum	365.41
Mean	74.13622
Median	55.65
Standard Deviation	60.48349
Variance	3658.253
Coefficient of Variation	0.815843
Skewness	2.425711

Gamma Statistics

k hat	1.785201
k star (bias corrected)	1.709573
Theta hat	41.52821
Theta star	43.36534
nu hat	221.365
nu star	211.9871
Approx.Chi Square Value (.05)	179.2865
Adjusted Level of Significance	0.046129
Adjusted Chi Square Value	178.574

Log-transformed Statistics

Minimum of log data	-0.76701
Maximum of log data	5.90102
Mean of log data	4.0004
Standard Deviation of log data	0.92631
Variance of log data	0.85805

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Variable: DDx - Mumm

Normal Distribution Test

Lilliefors Test Statisitic	0.159908
Lilliefors 5% Critical Value	0.112522

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	86.96586

Gamma Distribution Test

A-D Test Statistic	0.594749
A-D 5% Critical Value	0.765523
K-S Test Statistic	0.079804
K-S 5% Critical Value	0.114748

Data follow gamma distribution

at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	**87.65816**
Adjusted Gamma UCL	88.0079

Lognormal Distribution Test

Lilliefors Test Statisitic	0.132703
Lilliefors 5% Critical Value	0.112522

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	108.8998
95% Chebyshev (MVUE) UCL	132.5784
97.5% Chebyshev (MVUE) UCL	153.9992
99% Chebyshev (MVUE) UCL	196.0763

95% Non-parametric UCLs

CLT UCL	86.77101
Adj-CLT UCL (Adjusted for skewness)	89.29952
Mod-t UCL (Adjusted for skewness)	87.36025
Jackknife UCL	86.96586
Standard Bootstrap UCL	86.94134
Bootstrap-t UCL	90.53693
Hall's Bootstrap UCL	92.37471
Percentile Bootstrap UCL	86.87082
BCA Bootstrap UCL	89.30995
95% Chebyshev (Mean, Sd) UCL	107.6187
97.5% Chebyshev (Mean, Sd) UCL	122.1066
99% Chebyshev (Mean, Sd) UCL	150.5653

Attachment 3

Type	ERE
Medium	Mummichog
Chemical	Dieldrin
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	61
Number of Unique Samples	15
Minimum	1.65
Maximum	11.1
Mean	3.069004
Median	2.5
Standard Deviation	2.170103
Variance	4.709347
Coefficient of Variation	0.707103
Skewness	2.442029

Gamma Statistics

k hat	3.267146
k star (bias corrected)	3.117396
Theta hat	0.939353
Theta star	0.984477
nu hat	398.5919
nu star	380.3223
Approx.Chi Square Value (.05)	336.1137
Adjusted Level of Significance	0.046066
Adjusted Chi Square Value	335.1137

Log-transformed Statistics

Minimum of log data	0.500775
Maximum of log data	2.406945
Mean of log data	0.960577
Standard Deviation of log data	0.524713
Variance of log data	0.275323

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Variable: Dieldrin - Mumm

Normal Distribution Test

Lilliefors Test Statisitic	0.256592
Lilliefors 5% Critical Value	0.113441

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	3.533199

Gamma Distribution Test

A-D Test Statistic	4.14192
A-D 5% Critical Value	0.756848
K-S Test Statistic	0.237424
K-S 5% Critical Value	0.114618

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	3.472666
Adjusted Gamma UCL	3.483029

Lognormal Distribution Test

Lilliefors Test Statisitic	0.252188
Lilliefors 5% Critical Value	0.113441

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	3.405478
95% Chebyshev (MVUE) UCL	3.91724
97.5% Chebyshev (MVUE) UCL	4.317921
99% Chebyshev (MVUE) UCL	5.104981

95% Non-parametric UCLs

CLT UCL	3.526032
Adj-CLT UCL (Adjusted for skewness)	3.61886
Mod-t UCL (Adjusted for skewness)	3.547678
Jackknife UCL	3.533199
Standard Bootstrap UCL	3.521184
Bootstrap-t UCL	3.648005
Hall's Bootstrap UCL	3.653233
Percentile Bootstrap UCL	3.558184
BCA Bootstrap UCL	3.620912
95% Chebyshev (Mean, Sd) UCL	**4.280138**
97.5% Chebyshev (Mean, Sd) UCL	4.804197
99% Chebyshev (Mean, Sd) UCL	5.833609

Attachment 3

Type	ERE
Medium	Mummichog
Chemical	Lead
Units	µg/kg

Data File

Variable: Lead

Raw Statistics	
Number of Valid Samples	30
Number of Unique Samples	21
Minimum	125
Maximum	2800
Mean	708.1667
Median	530
Standard Deviation	679.6811
Variance	461966.4
Coefficient of Variation	0.959776
Skewness	2.410436

Gamma Statistics	
k hat	1.715203
k star (bias corrected)	1.565905
Theta hat	412.8764
Theta star	452.2413
nu hat	102.9122
nu star	93.95427
Approx.Chi Square Value (.05)	72.59543
Adjusted Level of Significance	0.041
Adjusted Chi Square Value	71.51306

Log-transformed Statistics	
Minimum of log data	4.828314
Maximum of log data	7.937375
Mean of log data	6.243686
Standard Deviation of log data	0.807942
Variance of log data	0.65277

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.633453
Shapiro-Wilk 5% Critical Value	0.927
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	919.0151

Gamma Distribution Test	
A-D Test Statistic	2.057217
A-D 5% Critical Value	0.761067
K-S Test Statistic	0.223651
K-S 5% Critical Value	0.162556
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	916.5217
Adjusted Gamma UCL	930.3935

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.861497
Shapiro-Wilk 5% Critical Value	0.927
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	995.5323
95% Chebyshev (MVUE) UCL	1203.212
97.5% Chebyshev (MVUE) UCL	1419.44
99% Chebyshev (MVUE) UCL	1844.178

95% Non-parametric UCLs	
CLT UCL	912.2802
Adj-CLT UCL (Adjusted for skewness)	970.6328
Mod-t UCL (Adjusted for skewness)	928.1169
Jackknife UCL	919.0151
Standard Bootstrap UCL	906.0479
Bootstrap-t UCL	1021.053
Hall's Bootstrap UCL	1014.046
Percentile Bootstrap UCL	917.6667
BCA Bootstrap UCL	988.5
95% Chebyshev (Mean, Sd) UCL	**1249.072**
97.5% Chebyshev (Mean, Sd) UCL	1483.122
99% Chebyshev (Mean, Sd) UCL	1942.869

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Type	ERE
Medium	Mummichog
Chemical	Mercury
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	67
Number of Unique Samples	38
Minimum	18.5
Maximum	150
Mean	38.56716
Median	33
Standard Deviation	19.09539
Variance	364.6338
Coefficient of Variation	0.49512
Skewness	3.391077

Gamma Statistics

k hat	6.406648
k star (bias corrected)	6.129733
Theta hat	6.019866
Theta star	6.291817
nu hat	858.4908
nu star	821.3843
Approx.Chi Square Value (.05)	755.8591
Adjusted Level of Significance	0.046418
Adjusted Chi Square Value	754.488

Log-transformed Statistics

Minimum of log data	2.917771
Maximum of log data	5.010635
Mean of log data	3.572332
Standard Deviation of log data	0.377085
Variance of log data	0.142193

RECOMMENDATION

Data are lognormal (0.05)

Use Student's-t UCL
Use Modified-t UCL
Use H-UCL

Variable: Mercury- Mumm

Normal Distribution Test

Lilliefors Test Statisitic	0.160009
Lilliefors 5% Critical Value	0.108242

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	**42.45903**

Gamma Distribution Test

A-D Test Statistic	1.27414
A-D 5% Critical Value	0.753061
K-S Test Statistic	0.121411
K-S 5% Critical Value	0.109091

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	41.91054
Adjusted Gamma UCL	41.9867

Lognormal Distribution Test

Lilliefors Test Statisitic	0.10207
Lilliefors 5% Critical Value	0.108242

Data are lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	**41.52446**
95% Chebyshev (MVUE) UCL	46.08083
97.5% Chebyshev (MVUE) UCL	49.49979
99% Chebyshev (MVUE) UCL	56.21568

95% Non-parametric UCLs

CLT UCL	42.4044
Adj-CLT UCL (Adjusted for skewness)	43.43709
Mod-t UCL (Adjusted for skewness)	**42.62011**
Jackknife UCL	42.45903
Standard Bootstrap UCL	42.40196
Bootstrap-t UCL	44.0377
Hall's Bootstrap UCL	47.28418
Percentile Bootstrap UCL	42.59701
BCA Bootstrap UCL	43.95821
95% Chebyshev (Mean, Sd) UCL	48.73592
97.5% Chebyshev (Mean, Sd) UCL	53.13595
99% Chebyshev (Mean, Sd) UCL	61.77895

Attachment 3

Type	ERE
Medium	Mummichog
Chemical	LPAH
Units	µg/kg

Data File

Variable: LPAH

Raw Statistics	
Number of Valid Samples	61
Number of Unique Samples	58
Minimum	29.561
Maximum	421.7
Mean	128.2723
Median	88
Standard Deviation	78.1926
Variance	6114.082
Coefficient of Variation	0.609583
Skewness	1.532691

Gamma Statistics	
k hat	3.371114
k star (bias corrected)	3.21625
Theta hat	38.05041
Theta star	39.88255
nu hat	411.2759
nu star	392.3825
Approx.Chi Square Value (.05)	347.4597
Adjusted Level of Significance	0.046066
Adjusted Chi Square Value	346.4426

Log-transformed Statistics	
Minimum of log data	3.386456
Maximum of log data	6.044294
Mean of log data	4.698565
Standard Deviation of log data	0.552754
Variance of log data	0.305537

Normal Distribution Test	
Lilliefors Test Statisitic	0.206425
Lilliefors 5% Critical Value	0.113441
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	144.998

Gamma Distribution Test	
A-D Test Statistic	2.295735
A-D 5% Critical Value	0.75641
K-S Test Statistic	0.186631
K-S 5% Critical Value	0.114569
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	144.8565
Adjusted Gamma UCL	145.2818

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.166302
Lilliefors 5% Critical Value	0.113441
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	146.4399
95% Chebyshev (MVUE) UCL	169.3723
97.5% Chebyshev (MVUE) UCL	187.4711
99% Chebyshev (MVUE) UCL	223.0228

95% Non-parametric UCLs	
CLT UCL	144.7398
Adj-CLT UCL (Adjusted for skewness)	146.8391
Mod-t UCL (Adjusted for skewness)	145.3255
Jackknife UCL	144.998
Standard Bootstrap UCL	145.0199
Bootstrap-t UCL	145.623
Hall's Bootstrap UCL	147.7375
Percentile Bootstrap UCL	144.8721
BCA Bootstrap UCL	146.801
95% Chebyshev (Mean, Sd) UCL	**171.9115**
97.5% Chebyshev (Mean, Sd) UCL	190.7943
99% Chebyshev (Mean, Sd) UCL	227.8858

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Attachment 3

Type	ERE
Medium	Mummichog
Chemical	HPAH
Units	µg/kg

Data File

Variable: HPAH

Raw Statistics	
Number of Valid Samples	61
Number of Unique Samples	54
Minimum	9.9
Maximum	110.8
Mean	61.45375
Median	61.5
Standard Deviation	15.39518
Variance	237.0116
Coefficient of Variation	0.250517
Skewness	-0.23615

Gamma Statistics	
k hat	11.103
k star (bias corrected)	10.56788
Theta hat	5.534876
Theta star	5.815143
nu hat	1354.566
nu star	1289.282
Approx.Chi Square Value (.05)	1206.892
Adjusted Level of Significance	0.046066
Adjusted Chi Square Value	1204.977

Log-transformed Statistics	
Minimum of log data	2.292535
Maximum of log data	4.707727
Mean of log data	4.072577
Standard Deviation of log data	0.353249
Variance of log data	0.124785

Normal Distribution Test	
Lilliefors Test Statisitic	0.216217
Lilliefors 5% Critical Value	0.113441
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	**64.74685**

Gamma Distribution Test	
A-D Test Statistic	6.317423
A-D 5% Critical Value	0.750888
K-S Test Statistic	0.276729
K-S 5% Critical Value	0.113827
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	65.64897
Adjusted Gamma UCL	65.75327

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.310238
Lilliefors 5% Critical Value	0.113441
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	67.76397
95% Chebyshev (MVUE) UCL	75.05328
97.5% Chebyshev (MVUE) UCL	80.51972
99% Chebyshev (MVUE) UCL	91.25747

95% Non-parametric UCLs	
CLT UCL	64.69601
Adj-CLT UCL (Adjusted for skewness)	64.63233
Mod-t UCL (Adjusted for skewness)	**64.73692**
Jackknife UCL	64.74685
Standard Bootstrap UCL	64.63656
Bootstrap-t UCL	64.75195
Hall's Bootstrap UCL	64.96825
Percentile Bootstrap UCL	64.72595
BCA Bootstrap UCL	64.43366
95% Chebyshev (Mean, Sd) UCL	70.0458
97.5% Chebyshev (Mean, Sd) UCL	73.76359
99% Chebyshev (Mean, Sd) UCL	81.06646

RECOMMENDATION

Data are Non-parametric (0.05)

Use Student's-t UCL
or Modified-t UCL

Type	ERE
Medium	Mummichog
Chemical	TCDD TEQ (D/F) - Fish
Units	µg/kg

Data File

Variable: - Mummichog Dioxin TEQ

Raw Statistics	
Number of Valid Samples	62
Number of Unique Samples	62
Minimum	0.005489
Maximum	0.838984
Mean	0.078046
Median	0.058716
Standard Deviation	0.120358
Variance	0.014486
Coefficient of Variation	1.542152
Skewness	5.140289

Gamma Statistics	
k hat	1.5863
k star (bias corrected)	1.520296
Theta hat	0.0492
Theta star	0.051336
nu hat	196.7012
nu star	188.5167
Approx.Chi Square Value (.05)	157.7487
Adjusted Level of Significance	0.046129
Adjusted Chi Square Value	157.0816

Log-transformed Statistics	
Minimum of log data	-5.20506
Maximum of log data	-0.17556
Mean of log data	-2.89764
Standard Deviation of log data	0.69348
Variance of log data	0.480915

Normal Distribution Test	
Lilliefors Test Statisitic	0.441129
Lilliefors 5% Critical Value	0.112522
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.103576

Gamma Distribution Test	
A-D Test Statistic	7.491272
A-D 5% Critical Value	0.767875
K-S Test Statistic	0.327241
K-S 5% Critical Value	0.115023
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.093268
Adjusted Gamma UCL	0.093664

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.240057
Lilliefors 5% Critical Value	0.112522
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.083763
95% Chebyshev (MVUE) UCL	0.099201
97.5% Chebyshev (MVUE) UCL	0.111918
99% Chebyshev (MVUE) UCL	0.136897

95% Non-parametric UCLs	
CLT UCL	0.103188
Adj-CLT UCL (Adjusted for skewness)	0.113851
Mod-t UCL (Adjusted for skewness)	0.105239
Jackknife UCL	0.103576
Standard Bootstrap UCL	0.103497
Bootstrap-t UCL	0.231305
Hall's Bootstrap UCL	0.113233
Percentile Bootstrap UCL	0.107275
BCA Bootstrap UCL	0.120597
95% Chebyshev (Mean, Sd) UCL	**0.144674**
97.5% Chebyshev (Mean, Sd) UCL	0.173504
99% Chebyshev (Mean, Sd) UCL	0.230135

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Type	ERE
Medium	Mummichog
Chemical	TCDD TEQ (D/F) - Bird
Units	µg/kg

Data File

Raw Statistics	
Number of Valid Samples	62
Number of Unique Samples	62
Minimum	0.006655
Maximum	0.84293
Mean	0.080749
Median	0.061573
Standard Deviation	0.120612
Variance	0.014547
Coefficient of Variation	1.493678
Skewness	5.133278

Gamma Statistics	
k hat	1.660682
k star (bias corrected)	1.591079
Theta hat	0.048624
Theta star	0.050751
nu hat	205.9245
nu star	197.2938
Approx.Chi Square Value (.05)	165.7896
Adjusted Level of Significance	0.046129
Adjusted Chi Square Value	165.1052

Log-transformed Statistics	
Minimum of log data	-5.01234
Maximum of log data	-0.17087
Mean of log data	-2.84676
Standard Deviation of log data	0.676684
Variance of log data	0.457901

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Variable:	Mummichog Dioxin TEQ
Normal Distribution Test	
Lilliefors Test Statisitic	0.442149
Lilliefors 5% Critical Value	0.112522
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.106333
Gamma Distribution Test	
A-D Test Statistic	7.611742
A-D 5% Critical Value	0.766995
K-S Test Statistic	0.331517
K-S 5% Critical Value	0.11492
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.096093
Adjusted Gamma UCL	0.096491
Lognormal Distribution Test	
Lilliefors Test Statisitic	0.246333
Lilliefors 5% Critical Value	0.112522
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.086655
95% Chebyshev (MVUE) UCL	0.102357
97.5% Chebyshev (MVUE) UCL	0.115217
99% Chebyshev (MVUE) UCL	0.140478
95% Non-parametric UCLs	
CLT UCL	0.105944
Adj-CLT UCL (Adjusted for skewness)	0.116614
Mod-t UCL (Adjusted for skewness)	0.107997
Jackknife UCL	0.106333
Standard Bootstrap UCL	0.106365
Bootstrap-t UCL	0.150889
Hall's Bootstrap UCL	0.115574
Percentile Bootstrap UCL	0.108289
BCA Bootstrap UCL	0.122232
95% Chebyshev (Mean, Sd) UCL	**0.147517**
97.5% Chebyshev (Mean, Sd) UCL	0.176408
99% Chebyshev (Mean, Sd) UCL	0.233159

Attachment 3

Type	ERE
Medium	Mummichog
Chemical	TCDD TEQ (D/F) - Mammal
Units	µg/kg

Data File		Variable:	Mummichog Dioxin TEQ
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	62	Lilliefors Test Statisitic	0.440879
Number of Unique Samples	62	Lilliefors 5% Critical Value	0.112522
Minimum	0.005506	Data not normal at 5% significance level	
Maximum	0.838225		
Mean	0.078014	95% UCL (Assuming Normal Distribution)	
Median	0.058768	Student's-t UCL	0.103529
Standard Deviation	0.120289		
Variance	0.01447	Gamma Distribution Test	
Coefficient of Variation	1.541899	A-D Test Statistic	7.481559
Skewness	5.137015	A-D 5% Critical Value	0.767925
		K-S Test Statistic	0.326692
Gamma Statistics		K-S 5% Critical Value	0.115029
k hat	1.582058	Data do not follow gamma distribution	
k star (bias corrected)	1.51626	at 5% significance level	
Theta hat	0.049312		
Theta star	0.051451	95% UCLs (Assuming Gamma Distribution)	
nu hat	196.1752	Approximate Gamma UCL	0.093253
nu star	188.0162	Adjusted Gamma UCL	0.09365
Approx.Chi Square Value (.05)	157.2906		
Adjusted Level of Significance	0.046129	Lognormal Distribution Test	
Adjusted Chi Square Value	156.6246	Lilliefors Test Statisitic	0.239916
		Lilliefors 5% Critical Value	0.112522
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-5.20192		
Maximum of log data	-0.17647	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-2.89907	95% H-UCL	0.083896
Standard Deviation of log data	0.696426	95% Chebyshev (MVUE) UCL	0.099404
Variance of log data	0.485009	97.5% Chebyshev (MVUE) UCL	0.112191
		99% Chebyshev (MVUE) UCL	0.137308
		95% Non-parametric UCLs	
		CLT UCL	0.103142
		Adj-CLT UCL (Adjusted for skewness)	0.113791
		Mod-t UCL (Adjusted for skewness)	0.10519
		Jackknife UCL	0.103529
		Standard Bootstrap UCL	0.10213
		Bootstrap-t UCL	0.134346
RECOMMENDATION		Hall's Bootstrap UCL	0.112217
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.107619
		BCA Bootstrap UCL	0.115259
Use 95% Chebyshev (Mean, Sd) UCL		**95% Chebyshev (Mean, Sd) UCL**	**0.144604**
		97.5% Chebyshev (Mean, Sd) UCL	0.173417
		99% Chebyshev (Mean, Sd) UCL	0.230016

Type	ERE
Medium	Mummichog
Chemical	TCDD TEQ (PCB) - Fish
Units	µg/kg

Data File	
Raw Statistics	
Number of Valid Samples	61
Number of Unique Samples	61
Minimum	9.45E-05
Maximum	0.003333
Mean	0.00159
Median	0.001498
Standard Deviation	0.000494
Variance	2.44E-07
Coefficient of Variation	0.310611
Skewness	0.47429
Gamma Statistics	
k hat	7.590283
k star (bias corrected)	7.227919
Theta hat	0.000209
Theta star	0.00022
nu hat	926.0145
nu star	881.8061
Approx.Chi Square Value (.05)	813.8712
Adjusted Level of Significance	0.046066
Adjusted Chi Square Value	812.3031
Log-transformed Statistics	
Minimum of log data	-9.2674
Maximum of log data	-5.70398
Mean of log data	-6.51147
Standard Deviation of log data	0.448742
Variance of log data	0.201369

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Variable:	Mummichog PCB TEQ
Normal Distribution Test	
Lilliefors Test Statisitic	0.082318
Lilliefors 5% Critical Value	0.113441
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	**0.001695**
Gamma Distribution Test	
A-D Test Statistic	1.315441
A-D 5% Critical Value	0.752236
K-S Test Statistic	0.116838
K-S 5% Critical Value	0.114016
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.001722
Adjusted Gamma UCL	0.001726
Lognormal Distribution Test	
Lilliefors Test Statisitic	0.164188
Lilliefors 5% Critical Value	0.113441
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.001828
95% Chebyshev (MVUE) UCL	0.002069
97.5% Chebyshev (MVUE) UCL	0.002254
99% Chebyshev (MVUE) UCL	0.002618
95% Non-parametric UCLs	
CLT UCL	0.001694
Adj-CLT UCL (Adjusted for skewness)	0.001698
Mod-t UCL (Adjusted for skewness)	0.001696
Jackknife UCL	0.001695
Standard Bootstrap UCL	0.00169
Bootstrap-t UCL	0.001701
Hall's Bootstrap UCL	0.001711
Percentile Bootstrap UCL	0.001688
BCA Bootstrap UCL	0.001697
95% Chebyshev (Mean, Sd) UCL	0.001865
97.5% Chebyshev (Mean, Sd) UCL	0.001985
99% Chebyshev (Mean, Sd) UCL	0.002219

Attachment 3

Type	ERE
Medium	Mummichog
Chemical	TCDD TEQ (PCB) - Mammal
Units	µg/kg

Data File	
Raw Statistics	
Number of Valid Samples	61
Number of Unique Samples	61
Minimum	0.001861
Maximum	0.043456
Mean	0.025584
Median	0.02476
Standard Deviation	0.007426
Variance	5.52E-05
Coefficient of Variation	0.290278
Skewness	-0.03882
Gamma Statistics	
k hat	8.345927
k star (bias corrected)	7.946401
Theta hat	0.003065
Theta star	0.00322
nu hat	1018.203
nu star	969.4609
Approx.Chi Square Value (.05)	898.1725
Adjusted Level of Significance	0.046066
Adjusted Chi Square Value	896.524
Log-transformed Statistics	
Minimum of log data	-6.28663
Maximum of log data	-3.13602
Mean of log data	-3.7269
Standard Deviation of log data	0.42354
Variance of log data	0.179386

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Variable:	Mummichog PCB TEQ
Normal Distribution Test	
Lilliefors Test Statisitic	0.066611
Lilliefors 5% Critical Value	0.113441
Data are normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	**0.027172**
Gamma Distribution Test	
A-D Test Statistic	1.152409
A-D 5% Critical Value	0.751889
K-S Test Statistic	0.116384
K-S 5% Critical Value	0.113966
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.027614
Adjusted Gamma UCL	0.027665
Lognormal Distribution Test	
Lilliefors Test Statisitic	0.162448
Lilliefors 5% Critical Value	0.113441
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.029073
95% Chebyshev (MVUE) UCL	0.032732
97.5% Chebyshev (MVUE) UCL	0.035522
99% Chebyshev (MVUE) UCL	0.041003
95% Non-parametric UCLs	
CLT UCL	0.027148
Adj-CLT UCL (Adjusted for skewness)	0.027143
Mod-t UCL (Adjusted for skewness)	0.027172
Jackknife UCL	0.027172
Standard Bootstrap UCL	0.027138
Bootstrap-t UCL	0.027098
Hall's Bootstrap UCL	0.027154
Percentile Bootstrap UCL	0.02712
BCA Bootstrap UCL	0.027074
95% Chebyshev (Mean, Sd) UCL	0.029728
97.5% Chebyshev (Mean, Sd) UCL	0.031522
99% Chebyshev (Mean, Sd) UCL	0.035045

Type	ERE
Medium	Mummichog
Chemical	TCDD TEQ (PCB) - Bird
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	61
Number of Unique Samples	61
Minimum	0.004174
Maximum	0.56848
Mean	0.156583
Median	0.142257
Standard Deviation	0.079681
Variance	0.006349
Coefficient of Variation	0.508874
Skewness	2.613471

Gamma Statistics

k hat	4.13768
k star (bias corrected)	3.945117
Theta hat	0.037843
Theta star	0.03969
nu hat	504.797
nu star	481.3042
Approx.Chi Square Value (.05)	431.4229
Adjusted Level of Significance	0.046066
Adjusted Chi Square Value	430.2871

Log-transformed Statistics

Minimum of log data	-5.4789
Maximum of log data	-0.56479
Mean of log data	-1.97985
Standard Deviation of log data	0.598357
Variance of log data	0.358031

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Variable:	Mummichog PCB TEQ

Normal Distribution Test

Lilliefors Test Statisitic	0.181207
Lilliefors 5% Critical Value	0.113441

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	0.173627

Gamma Distribution Test

A-D Test Statistic	2.012804
A-D 5% Critical Value	0.753714
K-S Test Statistic	0.128743
K-S 5% Critical Value	0.114264

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	0.174687
Adjusted Gamma UCL	0.175148

Lognormal Distribution Test

Lilliefors Test Statisitic	0.175342
Lilliefors 5% Critical Value	0.113441

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	0.191682
95% Chebyshev (MVUE) UCL	0.223585
97.5% Chebyshev (MVUE) UCL	0.24911
99% Chebyshev (MVUE) UCL	0.299249

95% Non-parametric UCLs

CLT UCL	0.173364
Adj-CLT UCL (Adjusted for skewness)	0.177011
Mod-t UCL (Adjusted for skewness)	0.174196
Jackknife UCL	0.173627
Standard Bootstrap UCL	0.172892
Bootstrap-t UCL	0.178157
Hall's Bootstrap UCL	0.187403
Percentile Bootstrap UCL	0.173519
BCA Bootstrap UCL	0.179495
95% Chebyshev (Mean, Sd) UCL	**0.201053**
97.5% Chebyshev (Mean, Sd) UCL	0.220295
99% Chebyshev (Mean, Sd) UCL	0.258092

Attachment 3

Type	ERE
Medium	Mummichog
Chemical	Total TEQ - Fish
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	62
Number of Unique Samples	62
Minimum	0.005489
Maximum	0.840348
Mean	0.07961
Median	0.060299
Standard Deviation	0.120284
Variance	0.014468
Coefficient of Variation	1.510919
Skewness	5.141668

Gamma Statistics

k hat	1.635297
k star (bias corrected)	1.566922
Theta hat	0.048682
Theta star	0.050807
nu hat	202.7768
nu star	194.2984
Approx.Chi Square Value (.05)	163.0435
Adjusted Level of Significance	0.046129
Adjusted Chi Square Value	162.365

Log-transformed Statistics

Minimum of log data	-5.20506
Maximum of log data	-0.17394
Mean of log data	-2.86652
Standard Deviation of log data	0.683827
Variance of log data	0.467619

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Variable:	Mummichog Total TEQ
Normal Distribution Test	
Lilliefors Test Statisitic	0.442262
Lilliefors 5% Critical Value	0.112522
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.105124
Gamma Distribution Test	
A-D Test Statistic	7.591827
A-D 5% Critical Value	0.767296
K-S Test Statistic	0.330882
K-S 5% Critical Value	0.114955
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.094871
Adjusted Gamma UCL	0.095267
Lognormal Distribution Test	
Lilliefors Test Statisitic	0.245482
Lilliefors 5% Critical Value	0.112522
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.08557
95% Chebyshev (MVUE) UCL	0.101189
97.5% Chebyshev (MVUE) UCL	0.114012
99% Chebyshev (MVUE) UCL	0.139201
95% Non-parametric UCLs	
CLT UCL	0.104737
Adj-CLT UCL (Adjusted for skewness)	0.115395
Mod-t UCL (Adjusted for skewness)	0.106787
Jackknife UCL	0.105124
Standard Bootstrap UCL	0.104971
Bootstrap-t UCL	0.22436
Hall's Bootstrap UCL	0.120178
Percentile Bootstrap UCL	0.106251
BCA Bootstrap UCL	0.12212
95% Chebyshev (Mean, Sd) UCL	**0.146197**
97.5% Chebyshev (Mean, Sd) UCL	0.175009
99% Chebyshev (Mean, Sd) UCL	0.231605

Type	ERE
Medium	Mummichog
Chemical	Total TEQ - Mammal
Units	µg/kg

Data File		Variable:	Mummichog Total TEQ
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	62	Lilliefors Test Statisitic	0.421266
Number of Unique Samples	62	Lilliefors 5% Critical Value	0.112522
Minimum	0.005506	Data not normal at 5% significance level	
Maximum	0.860873		
Mean	0.103185	95% UCL (Assuming Normal Distribution)	
Median	0.083114	Student's-t UCL	0.128555
Standard Deviation	0.119603		
Variance	0.014305	Gamma Distribution Test	
Coefficient of Variation	1.159111	A-D Test Statistic	7.805189
Skewness	5.106277	A-D 5% Critical Value	0.761565
		K-S Test Statistic	0.323908
Gamma Statistics		K-S 5% Critical Value	0.114296
k hat	2.279732	Data do not follow gamma distribution	
k star (bias corrected)	2.180175	at 5% significance level	
Theta hat	0.045262		
Theta star	0.047329	95% UCLs (Assuming Gamma Distribution)	
nu hat	282.6868	Approximate Gamma UCL	0.11959
nu star	270.3417	Adjusted Gamma UCL	0.120009
Approx.Chi Square Value (.05)	233.2574		
Adjusted Level of Significance	0.046129	Lognormal Distribution Test	
Adjusted Chi Square Value	232.4418	Lilliefors Test Statisitic	0.262695
		Lilliefors 5% Critical Value	0.112522
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-5.20192		
Maximum of log data	-0.14981	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-2.50631	95% H-UCL	0.114866
Standard Deviation of log data	0.615608	95% Chebyshev (MVUE) UCL	0.1343
Variance of log data	0.378973	97.5% Chebyshev (MVUE) UCL	0.149907
		99% Chebyshev (MVUE) UCL	0.180564
		95% Non-parametric UCLs	
		CLT UCL	0.12817
		Adj-CLT UCL (Adjusted for skewness)	0.138695
		Mod-t UCL (Adjusted for skewness)	0.130197
		Jackknife UCL	0.128555
		Standard Bootstrap UCL	0.127286
		Bootstrap-t UCL	0.158343
RECOMMENDATION		Hall's Bootstrap UCL	0.193601
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.130077
		BCA Bootstrap UCL	0.141283
Use 95% Chebyshev (Mean, Sd) UCL		**95% Chebyshev (Mean, Sd) UCL**	**0.169395**
		97.5% Chebyshev (Mean, Sd) UCL	0.198044
		99% Chebyshev (Mean, Sd) UCL	0.254319

Type	ERE
Medium	Mummichog
Chemical	Total TEQ - Bird
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	62
Number of Unique Samples	62
Minimum	0.006655
Maximum	0.964373
Mean	0.234806
Median	0.2087
Standard Deviation	0.136439
Variance	0.018615
Coefficient of Variation	0.58107
Skewness	3.105192

Gamma Statistics

k hat	3.690983
k star (bias corrected)	3.52314
Theta hat	0.063616
Theta star	0.066647
nu hat	457.6819
nu star	436.8693
Approx.Chi Square Value (.05)	389.4025
Adjusted Level of Significance	0.046129
Adjusted Chi Square Value	388.3425

Log-transformed Statistics

Minimum of log data	-5.01234
Maximum of log data	-0.03628
Mean of log data	-1.59054
Standard Deviation of log data	0.612779
Variance of log data	0.375498

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Variable:	Mummichog Total TEQ
Normal Distribution Test	
Lilliefors Test Statisitic	0.228569
Lilliefors 5% Critical Value	0.112522
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.263747
Gamma Distribution Test	
A-D Test Statistic	2.75441
A-D 5% Critical Value	0.75519
K-S Test Statistic	0.157292
K-S 5% Critical Value	0.113589
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.263428
Adjusted Gamma UCL	0.264147
Lognormal Distribution Test	
Lilliefors Test Statisitic	0.177522
Lilliefors 5% Critical Value	0.112522
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.28627
95% Chebyshev (MVUE) UCL	0.334538
97.5% Chebyshev (MVUE) UCL	0.373266
99% Chebyshev (MVUE) UCL	0.449339
95% Non-parametric UCLs	
CLT UCL	0.263307
Adj-CLT UCL (Adjusted for skewness)	0.270609
Mod-t UCL (Adjusted for skewness)	0.264886
Jackknife UCL	0.263747
Standard Bootstrap UCL	0.262852
Bootstrap-t UCL	0.277223
Hall's Bootstrap UCL	0.291417
Percentile Bootstrap UCL	0.265774
BCA Bootstrap UCL	0.274777
95% Chebyshev (Mean, Sd) UCL	**0.310336**
97.5% Chebyshev (Mean, Sd) UCL	0.343017
99% Chebyshev (Mean, Sd) UCL	0.407214

Attachment 3

Type	ERE
Medium	Mummichog
Chemical	Total PCB
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	61
Number of Unique Samples	60
Minimum	121.4
Maximum	1194
Mean	668.5607
Median	669
Standard Deviation	233.4864
Variance	54515.92
Coefficient of Variation	0.349237
Skewness	-0.08324

Gamma Statistics

k hat	6.467469
k star (bias corrected)	6.160326
Theta hat	103.3728
Theta star	108.5268
nu hat	789.0313
nu star	751.5598
Approx.Chi Square Value (.05)	688.9327
Adjusted Level of Significance	0.046066
Adjusted Chi Square Value	687.4917

Log-transformed Statistics

Minimum of log data	4.799091
Maximum of log data	7.085064
Mean of log data	6.42583
Standard Deviation of log data	0.445077
Variance of log data	0.198093

RECOMMENDATION

Data are normal (0.05)

Use Student's-t UCL

Variable: Total PCBs - Mumm

Normal Distribution Test

Lilliefors Test Statisitic	0.047868
Lilliefors 5% Critical Value	0.113441

Data are normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	**718.5045**

Gamma Distribution Test

A-D Test Statistic	0.876495
A-D 5% Critical Value	0.752751
K-S Test Statistic	0.096409
K-S 5% Critical Value	0.114089

Data follow approximate gamma distibution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	729.3358
Adjusted Gamma UCL	730.8646

Lognormal Distribution Test

Lilliefors Test Statisitic	0.126691
Lilliefors 5% Critical Value	0.113441

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	757.3925
95% Chebyshev (MVUE) UCL	856.8107
97.5% Chebyshev (MVUE) UCL	933.0203
99% Chebyshev (MVUE) UCL	1082.719

95% Non-parametric UCLs

CLT UCL	717.7334
Adj-CLT UCL (Adjusted for skewness)	717.3929
Mod-t UCL (Adjusted for skewness)	718.4514
Jackknife UCL	718.5045
Standard Bootstrap UCL	715.5446
Bootstrap-t UCL	718.7863
Hall's Bootstrap UCL	718.7782
Percentile Bootstrap UCL	717.9672
BCA Bootstrap UCL	716.959
95% Chebyshev (Mean, Sd) UCL	798.8694
97.5% Chebyshev (Mean, Sd) UCL	855.2541
99% Chebyshev (Mean, Sd) UCL	966.0109

Attachment 3

Type	ERE
Medium	Crab
Chemical	Chlordane
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	142
Number of Unique Samples	41
Minimum	0.38535
Maximum	203.05
Mean	19.79332
Median	4
Standard Deviation	33.56385
Variance	1126.532
Coefficient of Variation	1.695716
Skewness	2.919435

Gamma Statistics

k hat	0.576897
k star (bias corrected)	0.569404
Theta hat	34.30998
Theta star	34.76148
nu hat	163.8387
nu star	161.7106
Approx.Chi Square Value (.05)	133.3039
Adjusted Level of Significance	0.04831
Adjusted Chi Square Value	133.0416

Log-transformed Statistics

Minimum of log data	-0.9536
Maximum of log data	5.313452
Mean of log data	1.908049
Standard Deviation of log data	1.40701
Variance of log data	1.979677

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable: Chlordane

Normal Distribution Test

Lilliefors Test Statisitic	0.351465
Lilliefors 5% Critical Value	0.074351

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	24.45688

Gamma Distribution Test

A-D Test Statistic	12.48797
A-D 5% Critical Value	0.812105
K-S Test Statistic	0.265327
K-S 5% Critical Value	0.082707

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	24.01122
Adjusted Gamma UCL	24.05857

Lognormal Distribution Test

Lilliefors Test Statisitic	0.207996
Lilliefors 5% Critical Value	0.074351

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	24.56363
95% Chebyshev (MVUE) UCL	30.47778
97.5% Chebyshev (MVUE) UCL	35.92422
99% Chebyshev (MVUE) UCL	46.6227

95% Non-parametric UCLs

CLT UCL	24.42624
Adj-CLT UCL (Adjusted for skewness)	25.16357
Mod-t UCL (Adjusted for skewness)	24.57188
Jackknife UCL	24.45688
Standard Bootstrap UCL	24.54995
Bootstrap-t UCL	25.518
Hall's Bootstrap UCL	25.76892
Percentile Bootstrap UCL	24.65808
BCA Bootstrap UCL	25.2743
95% Chebyshev (Mean, Sd) UCL	32.07066
97.5% Chebyshev (Mean, Sd) UCL	**37.38307**
99% Chebyshev (Mean, Sd) UCL	47.81829

Attachment 3

Type	ERE
Medium	Crab
Chemical	Copper
Units	µg/kg

Data File

Variable: Copper

Raw Statistics

Number of Valid Samples	64
Number of Unique Samples	56
Minimum	8400
Maximum	78500
Mean	30362.5
Median	23200
Standard Deviation	19563.2511
Variance	382720793.7
Coefficient of Variation	0.644322803
Skewness	0.974501413

Gamma Statistics

k hat	2.773030739
k star (bias corrected)	2.653461589
Theta hat	10949.21148
Theta star	11442.60016
nu hat	354.9479345
nu star	339.6430834
Approx.Chi Square Value (.05)	297.9312931
Adjusted Level of Significance	0.04625
Adjusted Chi Square Value	297.0365361

Log-transformed Statistics

Minimum of log data	9.035986985
Maximum of log data	11.2708539
Mean of log data	10.12995161
Standard Deviation of log data	0.616363062
Variance of log data	0.379903424

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

Normal Distribution Test

Lilliefors Test Statisitic	0.182607
Lilliefors 5% Critical Value	0.11075

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	34444.87

Gamma Distribution Test

A-D Test Statistic	1.843919
A-D 5% Critical Value	0.759004
K-S Test Statistic	0.116009
K-S 5% Critical Value	0.112331

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	34613.39
Adjusted Gamma UCL	34717.66

Lognormal Distribution Test

Lilliefors Test Statisitic	0.110405
Lilliefors 5% Critical Value	0.11075

Data are lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	**35253.06**
95% Chebyshev (MVUE) UCL	41166.33
97.5% Chebyshev (MVUE) UCL	45900.96
99% Chebyshev (MVUE) UCL	55201.22

95% Non-parametric UCLs

CLT UCL	34384.84
Adj-CLT UCL (Adjusted for skewness)	34703.13
Mod-t UCL (Adjusted for skewness)	34494.51
Jackknife UCL	34444.87
Standard Bootstrap UCL	34358.44
Bootstrap-t UCL	34861.1
Hall's Bootstrap UCL	34510.44
Percentile Bootstrap UCL	34365.63
BCA Bootstrap UCL	34817.19
95% Chebyshev (Mean, Sd) UCL	41021.78
97.5% Chebyshev (Mean, Sd) UCL	45634.06
99% Chebyshev (Mean, Sd) UCL	54693.99

Type	ERE
Medium	Crab
Chemical	DDx - Sum
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	80
Number of Unique Samples	64
Minimum	3.41
Maximum	2564.515
Mean	259.9749
Median	63.358
Standard Deviation	433.1621
Variance	187629.4
Coefficient of Variation	1.666169
Skewness	2.720577

Gamma Statistics

k hat	0.507912
k star (bias corrected)	0.497198
Theta hat	511.8507
Theta star	522.8798
nu hat	81.26585
nu star	79.55172
Approx.Chi Square Value (.05)	59.99802
Adjusted Level of Significance	0.047
Adjusted Chi Square Value	59.68738

Log-transformed Statistics

Minimum of log data	1.226712
Maximum of log data	7.849525
Mean of log data	4.313046
Standard Deviation of log data	1.63675
Variance of log data	2.678952

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable: DDx sum

Normal Distribution Test

Lilliefors Test Statisitic	0.307194
Lilliefors 5% Critical Value	0.099058

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	340.5787

Gamma Distribution Test

A-D Test Statistic	3.993932
A-D 5% Critical Value	0.818123
K-S Test Statistic	0.182166
K-S 5% Critical Value	0.105424

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	344.7022
Adjusted Gamma UCL	346.4962

Lognormal Distribution Test

Lilliefors Test Statisitic	0.145868
Lilliefors 5% Critical Value	0.099058

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	487.9531
95% Chebyshev (MVUE) UCL	585.4545
97.5% Chebyshev (MVUE) UCL	719.9935
99% Chebyshev (MVUE) UCL	984.2693

95% Non-parametric UCLs

CLT UCL	339.6335
Adj-CLT UCL (Adjusted for skewness)	355.3734
Mod-t UCL (Adjusted for skewness)	343.0338
Jackknife UCL	340.5787
Standard Bootstrap UCL	340.6798
Bootstrap-t UCL	357.3623
Hall's Bootstrap UCL	369.5855
Percentile Bootstrap UCL	341.1111
BCA Bootstrap UCL	356.3883
95% Chebyshev (Mean, Sd) UCL	471.072
97.5% Chebyshev (Mean, Sd) UCL	**562.4139**
99% Chebyshev (Mean, Sd) UCL	741.8373

Attachment 3

Type	ERE
Medium	Crab
Chemical	Dieldrin
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	77
Number of Unique Samples	23
Minimum	0.753
Maximum	100
Mean	10.79088
Median	2.5
Standard Deviation	16.28106
Variance	265.0729
Coefficient of Variation	1.508779
Skewness	2.679379

Gamma Statistics

k hat	0.673414
k star (bias corrected)	0.655835
Theta hat	16.02414
Theta star	16.45365
nu hat	103.7058
nu star	100.9986
Approx.Chi Square Value (.05)	78.80766
Adjusted Level of Significance	0.046883
Adjusted Chi Square Value	78.43511

Log-transformed Statistics

Minimum of log data	-0.28369
Maximum of log data	4.60517
Mean of log data	1.476369
Standard Deviation of log data	1.288996
Variance of log data	1.661512

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable: Dieldrin

Normal Distribution Test

Lilliefors Test Statisitic	0.319642
Lilliefors 5% Critical Value	0.100969

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	13.8804

Gamma Distribution Test

A-D Test Statistic	7.805107
A-D 5% Critical Value	0.800717
K-S Test Statistic	0.258354
K-S 5% Critical Value	0.106354

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	13.82942
Adjusted Gamma UCL	13.89511

Lognormal Distribution Test

Lilliefors Test Statisitic	0.204005
Lilliefors 5% Critical Value	0.100969

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	14.61197
95% Chebyshev (MVUE) UCL	18.00695
97.5% Chebyshev (MVUE) UCL	21.53446
99% Chebyshev (MVUE) UCL	28.46357

95% Non-parametric UCLs

CLT UCL	13.84274
Adj-CLT UCL (Adjusted for skewness)	14.44809
Mod-t UCL (Adjusted for skewness)	13.97482
Jackknife UCL	13.8804
Standard Bootstrap UCL	13.90621
Bootstrap-t UCL	14.60703
Hall's Bootstrap UCL	15.38842
Percentile Bootstrap UCL	13.83466
BCA Bootstrap UCL	14.214
95% Chebyshev (Mean, Sd) UCL	18.87838
97.5% Chebyshev (Mean, Sd) UCL	**22.37785**
99% Chebyshev (Mean, Sd) UCL	29.25187

Attachment 3

Type	ERE
Medium	Crab
Chemical	Lead
Units	µg/kg

Data File

Variable: Lead

Raw Statistics

Number of Valid Samples	71
Number of Unique Samples	56
Minimum	55
Maximum	2400
Mean	464.8355
Median	410
Standard Deviation	412.4835
Variance	170142.7
Coefficient of Variation	0.887375
Skewness	2.466842

Gamma Statistics

k hat	1.643858
k star (bias corrected)	1.583789
Theta hat	282.7711
Theta star	293.4958
nu hat	233.4279
nu star	224.898
Approx.Chi Square Value (.05)	191.18
Adjusted Level of Significance	0.04662
Adjusted Chi Square Value	190.5395

Log-transformed Statistics

Minimum of log data	4.007333
Maximum of log data	7.783224
Mean of log data	5.807673
Standard Deviation of log data	0.849704
Variance of log data	0.721996

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test

Lilliefors Test Statisitic	0.160214
Lilliefors 5% Critical Value	0.105149

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	546.4356

Gamma Distribution Test

A-D Test Statistic	0.563363
A-D 5% Critical Value	0.767397
K-S Test Statistic	0.074362
K-S 5% Critical Value	0.10756

Data follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	**546.8176**
Adjusted Gamma UCL	548.6558

Lognormal Distribution Test

Lilliefors Test Statisitic	0.10675
Lilliefors 5% Critical Value	0.105149

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	591.8266
95% Chebyshev (MVUE) UCL	712.522
97.5% Chebyshev (MVUE) UCL	815.599
99% Chebyshev (MVUE) UCL	1018.074

95% Non-parametric UCLs

CLT UCL	545.3557
Adj-CLT UCL (Adjusted for skewness)	560.669
Mod-t UCL (Adjusted for skewness)	548.8242
Jackknife UCL	546.4356
Standard Bootstrap UCL	544.8819
Bootstrap-t UCL	573.229
Hall's Bootstrap UCL	582.2578
Percentile Bootstrap UCL	546.1679
BCA Bootstrap UCL	562.7614
95% Chebyshev (Mean, Sd) UCL	678.2157
97.5% Chebyshev (Mean, Sd) UCL	770.5456
99% Chebyshev (Mean, Sd) UCL	951.9096

Attachment 3

Type	ERE
Medium	Crab
Chemical	Mercury
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	86
Number of Unique Samples	64
Minimum	25
Maximum	280
Mean	87.70349
Median	74.5
Standard Deviation	53.85081
Variance	2899.909
Coefficient of Variation	0.61401
Skewness	1.538957

Gamma Statistics

k hat	3.314502
k star (bias corrected)	3.206632
Theta hat	26.46053
Theta star	27.35066
nu hat	570.0943
nu star	551.5407
Approx.Chi Square Value (.05)	498.06
Adjusted Level of Significance	0.047209
Adjusted Chi Square Value	497.2014

Log-transformed Statistics

Minimum of log data	3.218876
Maximum of log data	5.63479
Mean of log data	4.31559
Standard Deviation of log data	0.555633
Variance of log data	0.308728

RECOMMENDATION

Assuming gamma distribution (0.05)

Use Approximate Gamma UCL

Variable: Mercury

Normal Distribution Test

Lilliefors Test Statisitic	0.153875
Lilliefors 5% Critical Value	0.09554

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	97.36021

Gamma Distribution Test

A-D Test Statistic	1.126889
A-D 5% Critical Value	0.758014
K-S Test Statistic	0.09401
K-S 5% Critical Value	0.097021

Data follow approximate gamma distibution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	**97.12091**
Adjusted Gamma UCL	97.28862

Lognormal Distribution Test

Lilliefors Test Statisitic	0.07281
Lilliefors 5% Critical Value	0.09554

Data are lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	97.79176
95% Chebyshev (MVUE) UCL	111.4578
97.5% Chebyshev (MVUE) UCL	121.9659
99% Chebyshev (MVUE) UCL	142.607

95% Non-parametric UCLs

CLT UCL	97.25496
Adj-CLT UCL (Adjusted for skewness)	98.28463
Mod-t UCL (Adjusted for skewness)	97.52081
Jackknife UCL	97.36021
Standard Bootstrap UCL	97.1688
Bootstrap-t UCL	98.73079
Hall's Bootstrap UCL	99.16866
Percentile Bootstrap UCL	97.33023
BCA Bootstrap UCL	98.16163
95% Chebyshev (Mean, Sd) UCL	113.0151
97.5% Chebyshev (Mean, Sd) UCL	123.9675
99% Chebyshev (Mean, Sd) UCL	145.4812

Type	ERE
Medium	Crab
Chemical	LPAH
Units	µg/kg

Data File

Variable: LPAH

Raw Statistics	
Number of Valid Samples	74
Number of Unique Samples	71
Minimum	8.2
Maximum	835
Mean	102.028
Median	82.55
Standard Deviation	98.26711
Variance	9656.425
Coefficient of Variation	0.963138
Skewness	5.86084

Gamma Statistics	
k hat	2.220212
k star (bias corrected)	2.139213
Theta hat	45.95419
Theta star	47.6942
nu hat	328.5914
nu star	316.6035
Approx.Chi Square Value (.05)	276.3726
Adjusted Level of Significance	0.046757
Adjusted Chi Square Value	275.631

Log-transformed Statistics	
Minimum of log data	2.104134
Maximum of log data	6.727432
Mean of log data	4.383454
Standard Deviation of log data	0.723766
Variance of log data	0.523837

Normal Distribution Test	
Lilliefors Test Statisitic	0.222834
Lilliefors 5% Critical Value	0.102995
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	121.0592

Gamma Distribution Test	
A-D Test Statistic	3.293892
A-D 5% Critical Value	0.762128
K-S Test Statistic	0.208025
K-S 5% Critical Value	0.104957
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	116.88
Adjusted Gamma UCL	117.1945

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.251783
Lilliefors 5% Critical Value	0.102995
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	123.3607
95% Chebyshev (MVUE) UCL	145.7334
97.5% Chebyshev (MVUE) UCL	163.9461
99% Chebyshev (MVUE) UCL	199.7213

95% Non-parametric UCLs	
CLT UCL	120.8177
Adj-CLT UCL (Adjusted for skewness)	129.1338
Mod-t UCL (Adjusted for skewness)	122.3564
Jackknife UCL	121.0592
Standard Bootstrap UCL	120.3681
Bootstrap-t UCL	140.1528
Hall's Bootstrap UCL	202.8794
Percentile Bootstrap UCL	123.1675
BCA Bootstrap UCL	133.1176
95% Chebyshev (Mean, Sd) UCL	**151.8211**
97.5% Chebyshev (Mean, Sd) UCL	173.3666
99% Chebyshev (Mean, Sd) UCL	215.6886

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Type	ERE
Medium	Crab
Chemical	HPAH
Units	µg/kg

Data File

Variable: HPAH

Raw Statistics

Number of Valid Samples	73
Number of Unique Samples	67
Minimum	11.75
Maximum	761
Mean	109.2359
Median	75.1
Standard Deviation	104.3947
Variance	10898.25
Coefficient of Variation	0.955681
Skewness	3.90221

Gamma Statistics

k hat	1.90173
k star (bias corrected)	1.832709
Theta hat	57.44028
Theta star	59.60351
nu hat	277.6526
nu star	267.5755
Approx.Chi Square Value (.05)	230.6876
Adjusted Level of Significance	0.046712
Adjusted Chi Square Value	230.002

Log-transformed Statistics

Minimum of log data	2.463853
Maximum of log data	6.634633
Mean of log data	4.408119
Standard Deviation of log data	0.757637
Variance of log data	0.574014

Normal Distribution Test

Lilliefors Test Statisitic	0.186215
Lilliefors 5% Critical Value	0.103698

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	129.5955

Gamma Distribution Test

A-D Test Statistic	1.306061
A-D 5% Critical Value	0.764492
K-S Test Statistic	0.125018
K-S 5% Critical Value	0.105885

Data do not follow gamma distribution
at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	126.7032
Adjusted Gamma UCL	127.0808

Lognormal Distribution Test

Lilliefors Test Statisitic	0.14522
Lilliefors 5% Critical Value	0.103698

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	131.1796
95% Chebyshev (MVUE) UCL	155.848
97.5% Chebyshev (MVUE) UCL	176.177
99% Chebyshev (MVUE) UCL	216.1093

95% Non-parametric UCLs

CLT UCL	129.3335
Adj-CLT UCL (Adjusted for skewness)	135.2962
Mod-t UCL (Adjusted for skewness)	130.5255
Jackknife UCL	129.5955
Standard Bootstrap UCL	129.6286
Bootstrap-t UCL	140.9162
Hall's Bootstrap UCL	205.2007
Percentile Bootstrap UCL	130.2318
BCA Bootstrap UCL	135.5666
95% Chebyshev (Mean, Sd) UCL	**162.495**
97.5% Chebyshev (Mean, Sd) UCL	185.5402
99% Chebyshev (Mean, Sd) UCL	230.8082

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Type	ERE
Medium	Crab
Chemical	TCDD TEQ (D/F) - Bird
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	75
Number of Unique Samples	72
Minimum	0.003614
Maximum	0.933819
Mean	0.147555
Median	0.094616
Standard Deviation	0.173772
Variance	0.030197
Coefficient of Variation	1.177679
Skewness	2.023753

Gamma Statistics

k hat	0.832964
k star (bias corrected)	0.808535
Theta hat	0.177144
Theta star	0.182497
nu hat	124.9447
nu star	121.2802
Approx.Chi Square Value (.05)	96.84423
Adjusted Level of Significance	0.0468
Adjusted Chi Square Value	96.41816

Log-transformed Statistics

Minimum of log data	-5.62307
Maximum of log data	-0.06847
Mean of log data	-2.62232
Standard Deviation of log data	1.283685
Variance of log data	1.647846

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable: Crab Diox TEQ bird

Normal Distribution Test

Lilliefors Test Statisitic	0.251739
Lilliefors 5% Critical Value	0.102306

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	0.180978

Gamma Distribution Test

A-D Test Statistic	1.681257
A-D 5% Critical Value	0.788992
K-S Test Statistic	0.145131
K-S 5% Critical Value	0.10683

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	0.184786
Adjusted Gamma UCL	0.185603

Lognormal Distribution Test

Lilliefors Test Statisitic	0.1257
Lilliefors 5% Critical Value	0.102306

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	0.241636
95% Chebyshev (MVUE) UCL	0.297569
97.5% Chebyshev (MVUE) UCL	0.356067
99% Chebyshev (MVUE) UCL	0.470976

95% Non-parametric UCLs

CLT UCL	0.18056
Adj-CLT UCL (Adjusted for skewness)	0.18557
Mod-t UCL (Adjusted for skewness)	0.18176
Jackknife UCL	0.180978
Standard Bootstrap UCL	0.180103
Bootstrap-t UCL	0.187073
Hall's Bootstrap UCL	0.18993
Percentile Bootstrap UCL	0.181552
BCA Bootstrap UCL	0.185064
95% Chebyshev (Mean, Sd) UCL	0.235018
97.5% Chebyshev (Mean, Sd) UCL	**0.272864**
99% Chebyshev (Mean, Sd) UCL	0.347204

Type	ERE
Medium	Crab
Chemical	TCDD TEQ (D/F) – Fish
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	75
Number of Unique Samples	72
Minimum	0.002294
Maximum	0.744832
Mean	0.117984
Median	0.07182
Standard Deviation	0.137917
Variance	0.019021
Coefficient of Variation	1.168951
Skewness	2.032284

Gamma Statistics

k hat	0.852278
k star (bias corrected)	0.827076
Theta hat	0.138434
Theta star	0.142652
nu hat	127.8417
nu star	124.0614
Approx.Chi Square Value (.05)	99.33276
Adjusted Level of Significance	0.0468
Adjusted Chi Square Value	98.90103

Log-transformed Statistics

Minimum of log data	-6.07744
Maximum of log data	-0.2946
Mean of log data	-2.82787
Standard Deviation of log data	1.26956
Variance of log data	1.611783

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable: Crab Diox TEQ Fish

Normal Distribution Test

Lilliefors Test Statisitic	0.231374
Lilliefors 5% Critical Value	0.102306

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	0.144511

Gamma Distribution Test

A-D Test Statistic	1.563381
A-D 5% Critical Value	0.788093
K-S Test Statistic	0.148216
K-S 5% Critical Value	0.106747

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	0.147356
Adjusted Gamma UCL	0.147999

Lognormal Distribution Test

Lilliefors Test Statisitic	0.126432
Lilliefors 5% Critical Value	0.102306

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	0.19199
95% Chebyshev (MVUE) UCL	0.236489
97.5% Chebyshev (MVUE) UCL	0.282601
99% Chebyshev (MVUE) UCL	0.373179

95% Non-parametric UCLs

CLT UCL	0.144179
Adj-CLT UCL (Adjusted for skewness)	0.148172
Mod-t UCL (Adjusted for skewness)	0.145134
Jackknife UCL	0.144511
Standard Bootstrap UCL	0.143915
Bootstrap-t UCL	0.150603
Hall's Bootstrap UCL	0.148659
Percentile Bootstrap UCL	0.145785
BCA Bootstrap UCL	0.147643
95% Chebyshev (Mean, Sd) UCL	0.187401
97.5% Chebyshev (Mean, Sd) UCL	**0.217438**
99% Chebyshev (Mean, Sd) UCL	0.276439

Attachment 3

Type	ERE
Medium	Crab
Chemical	TCDD TEQ (D/F)– Mammal
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	75
Number of Unique Samples	72
Minimum	0.002338
Maximum	0.752665
Mean	0.119212
Median	0.07279
Standard Deviation	0.139346
Variance	0.019417
Coefficient of Variation	1.168894
Skewness	2.028979

Gamma Statistics

k hat	0.850133
k star (bias corrected)	0.825017
Theta hat	0.140228
Theta star	0.144497
nu hat	127.52
nu star	123.7525
Approx.Chi Square Value (.05)	99.05624
Adjusted Level of Significance	0.0468
Adjusted Chi Square Value	98.62514

Log-transformed Statistics

Minimum of log data	-6.0583
Maximum of log data	-0.28414
Mean of log data	-2.81948
Standard Deviation of log data	1.271803
Variance of log data	1.617482

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable:	Eco Crab Diox TEQ mammal
Normal Distribution Test	
Lilliefors Test Statisitic	0.23234
Lilliefors 5% Critical Value	0.102306
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.146014
Gamma Distribution Test	
A-D Test Statistic	1.578906
A-D 5% Critical Value	0.788193
K-S Test Statistic	0.148311
K-S 5% Critical Value	0.106756
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.148934
Adjusted Gamma UCL	0.149585
Lognormal Distribution Test	
Lilliefors Test Statisitic	0.12652
Lilliefors 5% Critical Value	0.102306
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.194357
95% Chebyshev (MVUE) UCL	0.239397
97.5% Chebyshev (MVUE) UCL	0.286137
99% Chebyshev (MVUE) UCL	0.377948
95% Non-parametric UCLs	
CLT UCL	0.145679
Adj-CLT UCL (Adjusted for skewness)	0.149707
Mod-t UCL (Adjusted for skewness)	0.146642
Jackknife UCL	0.146014
Standard Bootstrap UCL	0.144937
Bootstrap-t UCL	0.151402
Hall's Bootstrap UCL	0.151379
Percentile Bootstrap UCL	0.145903
BCA Bootstrap UCL	0.148798
95% Chebyshev (Mean, Sd) UCL	0.189348
97.5% Chebyshev (Mean, Sd) UCL	**0.219696**
99% Chebyshev (Mean, Sd) UCL	0.279309

Type	ERE
Medium	Crab
Chemical	TCDD TEQ (PCB)– Mammal
Units	µg/kg

Data File		Variable:	Ecolog Crab PCB TEQ mammal
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	76	Lilliefors Test Statisitic	0.415071
Number of Unique Samples	76	Lilliefors 5% Critical Value	0.101631
Minimum	0.00046	Data not normal at 5% significance level	
Maximum	3.62334		
Mean	0.112918	95% UCL (Assuming Normal Distribution)	
Median	0.029222	Student's-t UCL	0.199801
Standard Deviation	0.454792		
Variance	0.206836	Gamma Distribution Test	
Coefficient of Variation	4.027613	A-D Test Statistic	4.837882
Skewness	6.895852	A-D 5% Critical Value	0.846946
		K-S Test Statistic	0.206112
Gamma Statistics		K-S 5% Critical Value	0.110111
k hat	0.377482	Data do not follow gamma distribution	
k star (bias corrected)	0.371354	at 5% significance level	
Theta hat	0.299136		
Theta star	0.304073	95% UCLs (Assuming Gamma Distribution)	
nu hat	57.37732	Approximate Gamma UCL	0.158652
nu star	56.44576	Adjusted Gamma UCL	0.159705
Approx.Chi Square Value (.05)	40.17463		
Adjusted Level of Significance	0.046842	Lognormal Distribution Test	
Adjusted Chi Square Value	39.90961	Lilliefors Test Statisitic	0.140916
		Lilliefors 5% Critical Value	0.101631
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-7.68472		
Maximum of log data	1.287396	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-3.94072	95% H-UCL	0.182369
Standard Deviation of log data	1.786759	95% Chebyshev (MVUE) UCL	0.210403
Variance of log data	3.192506	97.5% Chebyshev (MVUE) UCL	0.262037
		99% Chebyshev (MVUE) UCL	0.363462
		95% Non-parametric UCLs	
		CLT UCL	0.198728
		Adj-CLT UCL (Adjusted for skewness)	0.24282
		Mod-t UCL (Adjusted for skewness)	0.206678
		Jackknife UCL	0.199801
		Standard Bootstrap UCL	0.196304
		Bootstrap-t UCL	0.716291
RECOMMENDATION		Hall's Bootstrap UCL	0.563392
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.206371
		BCA Bootstrap UCL	0.256618
Use 97.5% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	0.340314
		97.5% Chebyshev (Mean, Sd) UCL	**0.438709**
		99% Chebyshev (Mean, Sd) UCL	0.631986

Type	ERE
Medium	Crab
Chemical	TCDD TEQ (PCB)– Fish
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	76
Number of Unique Samples	76
Minimum	2.22E-05
Maximum	0.210475
Mean	0.006401
Median	0.001725
Standard Deviation	0.025887
Variance	0.00067
Coefficient of Variation	4.044524
Skewness	7.12721

Gamma Statistics

k hat	0.385668
k star (bias corrected)	0.379216
Theta hat	0.016596
Theta star	0.016878
nu hat	58.62158
nu star	57.64091
Approx.Chi Square Value (.05)	41.18497
Adjusted Level of Significance	0.046842
Adjusted Chi Square Value	40.91644

Log-transformed Statistics

Minimum of log data	-10.717
Maximum of log data	-1.55839
Mean of log data	-6.76767
Standard Deviation of log data	1.747509
Variance of log data	3.053788

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable: Crab PCB TEQ fish

Normal Distribution Test

Lilliefors Test Statisitic	0.420215
Lilliefors 5% Critical Value	0.101631

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	0.011346

Gamma Distribution Test

A-D Test Statistic	4.886462
A-D 5% Critical Value	0.845016
K-S Test Statistic	0.202503
K-S 5% Critical Value	0.109992

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	0.008958
Adjusted Gamma UCL	0.009017

Lognormal Distribution Test

Lilliefors Test Statisitic	0.12052
Lilliefors 5% Critical Value	0.101631

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	0.009835
95% Chebyshev (MVUE) UCL	0.011456
97.5% Chebyshev (MVUE) UCL	0.014229
99% Chebyshev (MVUE) UCL	0.019676

95% Non-parametric UCLs

CLT UCL	0.011285
Adj-CLT UCL (Adjusted for skewness)	0.013879
Mod-t UCL (Adjusted for skewness)	0.011751
Jackknife UCL	0.011346
Standard Bootstrap UCL	0.011337
Bootstrap-t UCL	0.038151
Hall's Bootstrap UCL	0.029782
Percentile Bootstrap UCL	0.011716
BCA Bootstrap UCL	0.01601
95% Chebyshev (Mean, Sd) UCL	0.019344
97.5% Chebyshev (Mean, Sd) UCL	**0.024945**
99% Chebyshev (Mean, Sd) UCL	0.035947

Type	ERE
Medium	Crab
Chemical	TCDD TEQ (PCB)– Bird
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	76
Number of Unique Samples	76
Minimum	0.00203
Maximum	25.46595
Mean	0.7006
Median	0.198613
Standard Deviation	2.951071
Variance	8.708822
Coefficient of Variation	4.212204
Skewness	8.118283

Gamma Statistics

k hat	0.425901
k star (bias corrected)	0.417861
Theta hat	1.644985
Theta star	1.676635
nu hat	64.73692
nu star	63.51485
Approx.Chi Square Value (.05)	46.17745
Adjusted Level of Significance	0.046842
Adjusted Chi Square Value	45.89218

Log-transformed Statistics

Minimum of log data	-6.19949
Maximum of log data	3.237342
Mean of log data	-1.88539
Standard Deviation of log data	1.609541
Variance of log data	2.590621

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable: Crab PCB TEQ bird

Normal Distribution Test

Lilliefors Test Statisitic	0.411837
Lilliefors 5% Critical Value	0.101631

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	1.264365

Gamma Distribution Test

A-D Test Statistic	4.859616
A-D 5% Critical Value	0.83553
K-S Test Statistic	0.204732
K-S 5% Critical Value	0.109403

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	0.963642
Adjusted Gamma UCL	0.969632

Lognormal Distribution Test

Lilliefors Test Statisitic	0.12894
Lilliefors 5% Critical Value	0.101631

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	0.950422
95% Chebyshev (MVUE) UCL	1.13783
97.5% Chebyshev (MVUE) UCL	1.399135
99% Chebyshev (MVUE) UCL	1.912418

95% Non-parametric UCLs

CLT UCL	1.257402
Adj-CLT UCL (Adjusted for skewness)	1.594231
Mod-t UCL (Adjusted for skewness)	1.316904
Jackknife UCL	1.264365
Standard Bootstrap UCL	1.250201
Bootstrap-t UCL	3.355504
Hall's Bootstrap UCL	3.056983
Percentile Bootstrap UCL	1.336213
BCA Bootstrap UCL	1.989167
95% Chebyshev (Mean, Sd) UCL	2.176136
97.5% Chebyshev (Mean, Sd) UCL	**2.814601**
99% Chebyshev (Mean, Sd) UCL	4.068743

Type	ERE
Medium	Crab
Chemical	Total TEQ – Bird
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	84
Number of Unique Samples	82
Minimum	2.22E-05
Maximum	25.84094
Mean	0.690495
Median	0.184071
Standard Deviation	2.856913
Variance	8.161949
Coefficient of Variation	4.137484
Skewness	8.456347

Gamma Statistics

k hat	0.354777
k star (bias corrected)	0.350043
Theta hat	1.946277
Theta star	1.972599
nu hat	59.60262
nu star	58.80729
Approx.Chi Square Value (.05)	42.17284
Adjusted Level of Significance	0.047143
Adjusted Chi Square Value	41.92739

Log-transformed Statistics

Minimum of log data	-10.717
Maximum of log data	3.25196
Mean of log data	-2.26154
Standard Deviation of log data	2.380359
Variance of log data	5.66611

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Variable: Crab Total TEQ Bird

Normal Distribution Test

Lilliefors Test Statisitic	0.404512
Lilliefors 5% Critical Value	0.096671

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	1.209008

Gamma Distribution Test

A-D Test Statistic	2.869557
A-D 5% Critical Value	0.853133
K-S Test Statistic	0.147952
K-S 5% Critical Value	0.105134

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	0.962851
Adjusted Gamma UCL	0.968487

Lognormal Distribution Test

Lilliefors Test Statisitic	0.157492
Lilliefors 5% Critical Value	0.096671

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	4.821691
95% Chebyshev (MVUE) UCL	4.539114
97.5% Chebyshev (MVUE) UCL	5.822761
99% Chebyshev (MVUE) UCL	8.344238

95% Non-parametric UCLs

CLT UCL	1.20322
Adj-CLT UCL (Adjusted for skewness)	1.510533
Mod-t UCL (Adjusted for skewness)	1.256942
Jackknife UCL	1.209008
Standard Bootstrap UCL	1.206803
Bootstrap-t UCL	3.050194
Hall's Bootstrap UCL	3.014608
Percentile Bootstrap UCL	1.273988
BCA Bootstrap UCL	1.65503
95% Chebyshev (Mean, Sd) UCL	2.049228
97.5% Chebyshev (Mean, Sd) UCL	2.637153
99% Chebyshev (Mean, Sd) UCL	**3.792017**

Type	ERE
Medium	Crab
Chemical	Total TEQ – Fish
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	84
Number of Unique Samples	82
Minimum	0.00203
Maximum	3.591548
Mean	0.186261
Median	0.082646
Standard Deviation	0.410101
Variance	0.168183
Coefficient of Variation	2.201757
Skewness	7.120127

Gamma Statistics

k hat	0.623778
k star (bias corrected)	0.609437
Theta hat	0.298601
Theta star	0.305627
nu hat	104.7948
nu star	102.3854
Approx.Chi Square Value (.05)	80.03414
Adjusted Level of Significance	0.047143
Adjusted Chi Square Value	79.69059

Log-transformed Statistics

Minimum of log data	-6.19949
Maximum of log data	1.278583
Mean of log data	-2.66552
Standard Deviation of log data	1.478403
Variance of log data	2.185677

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable: Crab Total TEQ fish

Normal Distribution Test

Lilliefors Test Statisitic	0.326632
Lilliefors 5% Critical Value	0.096671

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	0.260691

Gamma Distribution Test

A-D Test Statistic	1.693578
A-D 5% Critical Value	0.806142
K-S Test Statistic	0.137431
K-S 5% Critical Value	0.102276

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	0.238278
Adjusted Gamma UCL	0.239305

Lognormal Distribution Test

Lilliefors Test Statisitic	0.122149
Lilliefors 5% Critical Value	0.096671

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	0.322966
95% Chebyshev (MVUE) UCL	0.396262
97.5% Chebyshev (MVUE) UCL	0.480275
99% Chebyshev (MVUE) UCL	0.645301

95% Non-parametric UCLs

CLT UCL	0.259861
Adj-CLT UCL (Adjusted for skewness)	0.297004
Mod-t UCL (Adjusted for skewness)	0.266485
Jackknife UCL	0.260691
Standard Bootstrap UCL	0.259921
Bootstrap-t UCL	0.357823
Hall's Bootstrap UCL	0.552465
Percentile Bootstrap UCL	0.269256
BCA Bootstrap UCL	0.324471
95% Chebyshev (Mean, Sd) UCL	0.381302
97.5% Chebyshev (Mean, Sd) UCL	**0.465697**
99% Chebyshev (Mean, Sd) UCL	0.631474

Type	ERE
Medium	Crab
Chemical	Total TEQ – Mammal
Units	µg/kg

Data File

Variable: Eco Crab Total TEQ mammal

Raw Statistics	
Number of Valid Samples	84
Number of Unique Samples	82
Minimum	0.00046
Maximum	3.928891
Mean	0.208604
Median	0.088806
Standard Deviation	0.483112
Variance	0.233397
Coefficient of Variation	2.315929
Skewness	6.102938

Gamma Statistics	
k hat	0.548059
k star (bias corrected)	0.536422
Theta hat	0.380623
Theta star	0.38888
nu hat	92.07395
nu star	90.11893
Approx.Chi Square Value (.05)	69.22634
Adjusted Level of Significance	0.047143
Adjusted Chi Square Value	68.90784

Log-transformed Statistics	
Minimum of log data	-7.68472
Maximum of log data	1.368357
Mean of log data	-2.71008
Standard Deviation of log data	1.62483
Variance of log data	2.640074

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.333292
Lilliefors 5% Critical Value	0.096671
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.296286
Gamma Distribution Test	
A-D Test Statistic	2.054503
A-D 5% Critical Value	0.813849
K-S Test Statistic	0.13276
K-S 5% Critical Value	0.102802
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.271561
Adjusted Gamma UCL	0.272816
Lognormal Distribution Test	
Lilliefors Test Statisitic	0.090324
Lilliefors 5% Critical Value	0.096671
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	**0.417389**
95% Chebyshev (MVUE) UCL	0.504439
97.5% Chebyshev (MVUE) UCL	0.618643
99% Chebyshev (MVUE) UCL	0.842976
95% Non-parametric UCLs	
CLT UCL	0.295307
Adj-CLT UCL (Adjusted for skewness)	0.332812
Mod-t UCL (Adjusted for skewness)	0.302136
Jackknife UCL	0.296286
Standard Bootstrap UCL	0.297098
Bootstrap-t UCL	0.410302
Hall's Bootstrap UCL	0.661687
Percentile Bootstrap UCL	0.3084
BCA Bootstrap UCL	0.354466
95% Chebyshev (Mean, Sd) UCL	0.438369
97.5% Chebyshev (Mean, Sd) UCL	0.537789
99% Chebyshev (Mean, Sd) UCL	0.73308

Type	ERE
Medium	Crab
Chemical	Total PCB
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	79
Number of Unique Samples	58
Minimum	82.37
Maximum	14000
Mean	2681.425
Median	625
Standard Deviation	3961.776
Variance	15695671
Coefficient of Variation	1.477489
Skewness	1.492731

Gamma Statistics

k hat	0.575331
k star (bias corrected)	0.561922
Theta hat	4660.661
Theta star	4771.879
nu hat	90.90237
nu star	88.78371
Approx.Chi Square Value (.05)	68.05577
Adjusted Level of Significance	0.046962
Adjusted Chi Square Value	67.71964

Log-transformed Statistics

Minimum of log data	4.411221
Maximum of log data	9.546813
Mean of log data	6.813438
Standard Deviation of log data	1.457489
Variance of log data	2.124273

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable: Total PCB

Normal Distribution Test

Lilliefors Test Statisitic	0.352347
Lilliefors 5% Critical Value	0.099683

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	3423.405

Gamma Distribution Test

A-D Test Statistic	6.514867
A-D 5% Critical Value	0.81099
K-S Test Statistic	0.223282
K-S 5% Critical Value	0.105655

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	3498.114
Adjusted Gamma UCL	3515.477

Lognormal Distribution Test

Lilliefors Test Statisitic	0.141141
Lilliefors 5% Critical Value	0.099683

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	4120.397
95% Chebyshev (MVUE) UCL	5043.417
97.5% Chebyshev (MVUE) UCL	6116.809
99% Chebyshev (MVUE) UCL	8225.281

95% Non-parametric UCLs

CLT UCL	3414.593
Adj-CLT UCL (Adjusted for skewness)	3494.581
Mod-t UCL (Adjusted for skewness)	3435.882
Jackknife UCL	3423.405
Standard Bootstrap UCL	3421.02
Bootstrap-t UCL	3504.164
Hall's Bootstrap UCL	3508.368
Percentile Bootstrap UCL	3469.733
BCA Bootstrap UCL	3458.265
95% Chebyshev (Mean, Sd) UCL	4624.337
97.5% Chebyshev (Mean, Sd) UCL	**5465.037**
99% Chebyshev (Mean, Sd) UCL	7116.428

Type	ERE
Medium	Fish
Chemical	DDx - Sum
Units	µg/kg

Data File

Raw Statistics

Number of Valid Samples	77
Number of Unique Samples	75
Minimum	22.68
Maximum	2466.39
Mean	423.3305
Median	343.15
Standard Deviation	364.932
Variance	133175.4
Coefficient of Variation	0.86205
Skewness	2.857989

Gamma Statistics

k hat	1.909522
k star (bias corrected)	1.843783
Theta hat	221.6945
Theta star	229.5989
nu hat	294.0663
nu star	283.9425
Approx.Chi Square Value (.05)	245.9069
Adjusted Level of Significance	0.046883
Adjusted Chi Square Value	245.2363

Log-transformed Statistics

Minimum of log data	3.121483
Maximum of log data	7.810511
Mean of log data	5.764014
Standard Deviation of log data	0.780489
Variance of log data	0.609163

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

Variable: DDx sum WP AE

Normal Distribution Test

Lilliefors Test Statisitic	0.213033
Lilliefors 5% Critical Value	0.100969

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	492.5805

Gamma Distribution Test

A-D Test Statistic	0.835753
A-D 5% Critical Value	0.764419
K-S Test Statistic	0.113413
K-S 5% Critical Value	0.103179

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	488.8091
Adjusted Gamma UCL	490.1458

Lognormal Distribution Test

Lilliefors Test Statisitic	0.079892
Lilliefors 5% Critical Value	0.100969

Data are lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	**518.9032**
95% Chebyshev (MVUE) UCL	617.1879
97.5% Chebyshev (MVUE) UCL	698.2385
99% Chebyshev (MVUE) UCL	857.4468

95% Non-parametric UCLs

CLT UCL	491.7364
Adj-CLT UCL (Adjusted for skewness)	506.2095
Mod-t UCL (Adjusted for skewness)	494.838
Jackknife UCL	492.5805
Standard Bootstrap UCL	493.0449
Bootstrap-t UCL	519.3554
Hall's Bootstrap UCL	532.4099
Percentile Bootstrap UCL	494.3802
BCA Bootstrap UCL	498.8046
95% Chebyshev (Mean, Sd) UCL	604.6077
97.5% Chebyshev (Mean, Sd) UCL	683.0466
99% Chebyshev (Mean, Sd) UCL	837.1245

Attachment 3

Type	ERE
Medium	Fish (American eel/White perch)
Chemical	Copper
Units	µg/kg

Data File

Variable: Copper

Raw Statistics

Number of Valid Samples	38
Number of Unique Samples	32
Minimum	310
Maximum	36700
Mean	8814.73684
Median	4700
Standard Deviation	9917.44647
Variance	98355744.5
Coefficient of Variation	1.12509842
Skewness	1.37153707

Gamma Statistics

k hat	0.75789298
k star (bias corrected)	0.71560318
Theta hat	11630.5825
Theta star	12317.9118
nu hat	57.5998664
nu star	54.3858418
Approx.Chi Square Value (.05)	38.4379356
Adjusted Level of Significance	0.0434
Adjusted Chi Square Value	37.8818903

Log-transformed Statistics

Minimum of log data	5.7365723
Maximum of log data	10.510532
Mean of log data	8.29543188
Standard Deviation of log data	1.41087694
Variance of log data	1.99057373

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Normal Distribution Test

Shapiro-Wilk Test Statisitic	0.792928
Shapiro-Wilk 5% Critical Value	0.938

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	11528.97

Gamma Distribution Test

A-D Test Statistic	1.158951
A-D 5% Critical Value	0.788184
K-S Test Statistic	0.189909
K-S 5% Critical Value	0.148741

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	12471.97
Adjusted Gamma UCL	12655.04

Lognormal Distribution Test

Shapiro-Wilk Test Statisitic	0.920006
Shapiro-Wilk 5% Critical Value	0.938

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	21180.18
95% Chebyshev (MVUE) UCL	23417.75
97.5% Chebyshev (MVUE) UCL	29085.12
99% Chebyshev (MVUE) UCL	40217.58

95% Non-parametric UCLs

CLT UCL	11461.01
Adj-CLT UCL (Adjusted for skewness)	11843.49
Mod-t UCL (Adjusted for skewness)	11588.63
Jackknife UCL	11528.97
Standard Bootstrap UCL	11473.25
Bootstrap-t UCL	12187.16
Hall's Bootstrap UCL	11782.32
Percentile Bootstrap UCL	11473.42
BCA Bootstrap UCL	11763.42
95% Chebyshev (Mean, Sd) UCL	15827.43
97.5% Chebyshev (Mean, Sd) UCL	18861.83
99% Chebyshev (Mean, Sd) UCL	**24822.32**

Attachment 3

Type	ERE
Medium	Fish (American eel/White perch)
Chemical	Lead
Units	µg/kg

Data File

Variable: Lead

Raw Statistics

Number of Valid Samples	29
Number of Unique Samples	19
Minimum	55
Maximum	1600
Mean	396.2069
Median	400
Standard Deviation	293.6338
Variance	86220.81
Coefficient of Variation	0.741112
Skewness	2.455774

Gamma Statistics

k hat	1.903402
k star (bias corrected)	1.729486
Theta hat	208.1573
Theta star	229.0893
nu hat	110.3973
nu star	100.3102
Approx.Chi Square Value (.05)	78.19927
Adjusted Level of Significance	0.0407
Adjusted Chi Square Value	77.03331

Log-transformed Statistics

Minimum of log data	4.007333
Maximum of log data	7.377759
Mean of log data	5.696816
Standard Deviation of log data	0.869528
Variance of log data	0.756078

Normal Distribution Test

Shapiro-Wilk Test Statisitic	0.756591
Shapiro-Wilk 5% Critical Value	0.926

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	488.9635

Gamma Distribution Test

A-D Test Statistic	1.725932
A-D 5% Critical Value	0.758309
K-S Test Statistic	0.190593
K-S 5% Critical Value	0.164889

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	508.2349
Adjusted Gamma UCL	515.9274

Lognormal Distribution Test

Shapiro-Wilk Test Statisitic	0.813044
Shapiro-Wilk 5% Critical Value	0.926

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	634.435
95% Chebyshev (MVUE) UCL	763.2342
97.5% Chebyshev (MVUE) UCL	908.5892
99% Chebyshev (MVUE) UCL	1194.111

95% Non-parametric UCLs

CLT UCL	485.8949
Adj-CLT UCL (Adjusted for skewness)	512.464
Mod-t UCL (Adjusted for skewness)	493.1077
Jackknife UCL	488.9635
Standard Bootstrap UCL	482.6225
Bootstrap-t UCL	522.9014
Hall's Bootstrap UCL	971.1481
Percentile Bootstrap UCL	491.3793
BCA Bootstrap UCL	516.3793
95% Chebyshev (Mean, Sd) UCL	**633.8821**
97.5% Chebyshev (Mean, Sd) UCL	736.7243
99% Chebyshev (Mean, Sd) UCL	938.738

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Attachment 3

Type	ERE
Medium	Fish (American eel/White perch)
Chemical	LPAH
Units	µg/kg

Data File

Variable: LPAH

Raw Statistics

Number of Valid Samples	64
Number of Unique Samples	64
Minimum	22.649
Maximum	804.5
Mean	151.4141
Median	121.805
Standard Deviation	109.2235
Variance	11929.76
Coefficient of Variation	0.721356
Skewness	3.541971

Gamma Statistics

k hat	2.948661
k star (bias corrected)	2.820859
Theta hat	51.35013
Theta star	53.6766
nu hat	377.4286
nu star	361.07
Approx.Chi Square Value (.05)	318.0254
Adjusted Level of Significance	0.04625
Adjusted Chi Square Value	317.1003

Log-transformed Statistics

Minimum of log data	3.120116
Maximum of log data	6.690221
Mean of log data	4.84097
Standard Deviation of log data	0.594129
Variance of log data	0.352989

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test

Lilliefors Test Statisitic	0.150804
Lilliefors 5% Critical Value	0.11075

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	174.2064

Gamma Distribution Test

A-D Test Statistic	0.58709
A-D 5% Critical Value	0.758077
K-S Test Statistic	0.090109
K-S 5% Critical Value	0.112228

Data follow gamma distribution

at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	**171.9079**
Adjusted Gamma UCL	172.4095

Lognormal Distribution Test

Lilliefors Test Statisitic	0.077295
Lilliefors 5% Critical Value	0.11075

Data are lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	174.3826
95% Chebyshev (MVUE) UCL	202.824
97.5% Chebyshev (MVUE) UCL	225.4462
99% Chebyshev (MVUE) UCL	269.8832

95% Non-parametric UCLs

CLT UCL	173.8712
Adj-CLT UCL (Adjusted for skewness)	180.3301
Mod-t UCL (Adjusted for skewness)	175.2138
Jackknife UCL	174.2064
Standard Bootstrap UCL	174.4526
Bootstrap-t UCL	183.6947
Hall's Bootstrap UCL	223.4092
Percentile Bootstrap UCL	176.1945
BCA Bootstrap UCL	180.1218
95% Chebyshev (Mean, Sd) UCL	210.9259
97.5% Chebyshev (Mean, Sd) UCL	236.6767
99% Chebyshev (Mean, Sd) UCL	287.2591

Type	ERE
Medium	Fish (American eel/White perch)
Chemical	HPAH - Bird
Units	µg/kg

Data File

Variable: HPAH

Raw Statistics	
Number of Valid Samples	64
Number of Unique Samples	64
Minimum	11.17
Maximum	352.7
Mean	86.789
Median	65.135
Standard Deviation	65.226
Variance	4254.4
Coefficient of Variation	0.7515
Skewness	1.6841

Gamma Statistics	
k hat	2.1217
k star (bias corrected)	2.0326
Theta hat	40.906
Theta star	42.698
nu hat	271.57
nu star	260.18
Approx.Chi Square Value (.05)	223.82
Adjusted Level of Significance	0.0463
Adjusted Chi Square Value	223.05

Log-transformed Statistics	
Minimum of log data	2.4132
Maximum of log data	5.8656
Mean of log data	4.2097
Standard Deviation of log data	0.7371
Variance of log data	0.5433

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.1701
Lilliefors 5% Critical Value	0.1108
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	100.4

Gamma Distribution Test	
A-D Test Statistic	0.5226
A-D 5% Critical Value	0.7624
K-S Test Statistic	0.0841
K-S 5% Critical Value	0.1127
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	100.89
Adjusted Gamma UCL	101.24

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.058
Lilliefors 5% Critical Value	0.1108
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	106.68
95% Chebyshev (MVUE) UCL	127
97.5% Chebyshev (MVUE) UCL	143.93
99% Chebyshev (MVUE) UCL	177.19

95% Non-parametric UCLs	
CLT UCL	100.2
Adj-CLT UCL (Adjusted for skewness)	102.03
Mod-t UCL (Adjusted for skewness)	100.69
Jackknife UCL	100.4
Standard Bootstrap UCL	100.36
Bootstrap-t UCL	102.99
Hall's Bootstrap UCL	103.18
Percentile Bootstrap UCL	100.25
BCA Bootstrap UCL	100.92
95% Chebyshev (Mean, Sd) UCL	122.33
97.5% Chebyshev (Mean, Sd) UCL	137.71
99% Chebyshev (Mean, Sd) UCL	167.91

Attachment 3

Type	ERE
Medium	Fish (American eel/White perch)
Chemical	TCDD TEQ (D/F) - Bird
Units	µg/kg

Data File		Variable:	WP/AE Dioxin TEQ
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	66	Lilliefors Test Statisitic	0.126118
Number of Unique Samples	66	Lilliefors 5% Critical Value	0.109059
Minimum	0.005144	Data not normal at 5% significance level	
Maximum	0.515196		
Mean	0.174619	95% UCL (Assuming Normal Distribution)	
Median	0.169099	Student's-t UCL	0.202749
Standard Deviation	0.136953		
Variance	0.018756	Gamma Distribution Test	
Coefficient of Variation	0.784292	A-D Test Statistic	1.589533
Skewness	0.441079	A-D 5% Critical Value	0.778043
		K-S Test Statistic	0.136476
Gamma Statistics		K-S 5% Critical Value	0.112717
k hat	1.085958	Data do not follow gamma distribution	
k star (bias corrected)	1.046697	at 5% significance level	
Theta hat	0.160798		
Theta star	0.166829	95% UCLs (Assuming Gamma Distribution)	
nu hat	143.3464	Approximate Gamma UCL	0.215413
nu star	138.164	Adjusted Gamma UCL	0.216425
Approx.Chi Square Value (.05)	111.9996		
Adjusted Level of Significance	0.046364	Lognormal Distribution Test	
Adjusted Chi Square Value	111.4756	Lilliefors Test Statisitic	0.171495
		Lilliefors 5% Critical Value	0.109059
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-5.27002		
Maximum of log data	-0.66321	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-2.27168	95% H-UCL	0.328187
Standard Deviation of log data	1.241406	95% Chebyshev (MVUE) UCL	0.402785
Variance of log data	1.541088	97.5% Chebyshev (MVUE) UCL	0.482544
		99% Chebyshev (MVUE) UCL	0.639214
		95% Non-parametric UCLs	
		CLT UCL	0.202348
		Adj-CLT UCL (Adjusted for skewness)	0.203326
		Mod-t UCL (Adjusted for skewness)	0.202901
		Jackknife UCL	0.202749
		Standard Bootstrap UCL	0.201879
		Bootstrap-t UCL	0.20315
RECOMMENDATION		Hall's Bootstrap UCL	0.204106
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.203457
		BCA Bootstrap UCL	0.204342
Use 97.5% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	0.248101
		97.5% Chebyshev (Mean, Sd) UCL	**0.279896**
		99% Chebyshev (Mean, Sd) UCL	0.342352

Attachment 3

Type	ERE
Medium	Fish (American eel/White perch)
Chemical	TCDD TEQ (D/F) - Fish
Units	µg/kg

Data File

Variable: WP AE Dioxin TEQ - fish

Raw Statistics	
Number of Valid Samples	66
Number of Unique Samples	66
Minimum	0.005119
Maximum	0.481149
Mean	0.155368
Median	0.145646
Standard Deviation	0.123952
Variance	0.015364
Coefficient of Variation	0.797793
Skewness	0.532118

Gamma Statistics	
k hat	1.106887
k star (bias corrected)	1.066675
Theta hat	0.140365
Theta star	0.145657
nu hat	146.1091
nu star	140.8011
Approx.Chi Square Value (.05)	114.3764
Adjusted Level of Significance	0.046364
Adjusted Chi Square Value	113.8467

Log-transformed Statistics	
Minimum of log data	-5.27481
Maximum of log data	-0.73158
Mean of log data	-2.37744
Standard Deviation of log data	1.210756
Variance of log data	1.465931

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.142716
Lilliefors 5% Critical Value	0.109059
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.180827

Gamma Distribution Test	
A-D Test Statistic	1.408087
A-D 5% Critical Value	0.777581
K-S Test Statistic	0.132953
K-S 5% Critical Value	0.11267
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.191263
Adjusted Gamma UCL	0.192153

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.163015
Lilliefors 5% Critical Value	0.109059
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.280253
95% Chebyshev (MVUE) UCL	0.344247
97.5% Chebyshev (MVUE) UCL	0.411188
99% Chebyshev (MVUE) UCL	0.542681

95% Non-parametric UCLs	
CLT UCL	0.180464
Adj-CLT UCL (Adjusted for skewness)	0.181532
Mod-t UCL (Adjusted for skewness)	0.180994
Jackknife UCL	0.180827
Standard Bootstrap UCL	0.179948
Bootstrap-t UCL	0.183853
Hall's Bootstrap UCL	0.181358
Percentile Bootstrap UCL	0.180311
BCA Bootstrap UCL	0.181371
95% Chebyshev (Mean, Sd) UCL	0.221874
97.5% Chebyshev (Mean, Sd) UCL	**0.250651**
99% Chebyshev (Mean, Sd) UCL	0.307177

Type	ERE and HHRE
Medium	Fish (American eel/White perch)
Chemical	TCDD TEQ (D/F) - Mammal
Units	µg/kg

Data File		Variable:	Mammal - WP AE Dioxin TEQ
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	66	Lilliefors Test Statisitic	0.140753
Number of Unique Samples	66	Lilliefors 5% Critical Value	0.109059
Minimum	0.005169	Data not normal at 5% significance level	
Maximum	0.482614		
Mean	0.156011	95% UCL (Assuming Normal Distribution)	
Median	0.146547	Student's-t UCL	0.18158
Standard Deviation	0.124489		
Variance	0.015498	Gamma Distribution Test	
Coefficient of Variation	0.797954	A-D Test Statistic	1.410214
Skewness	0.529935	A-D 5% Critical Value	0.777634
		K-S Test Statistic	0.133856
Gamma Statistics		K-S 5% Critical Value	0.112675
k hat	1.104473	Data do not follow gamma distribution	
k star (bias corrected)	1.064371	at 5% significance level	
Theta hat	0.141254		
Theta star	0.146576	95% UCLs (Assuming Gamma Distribution)	
nu hat	145.7905	Approximate Gamma UCL	0.1921
nu star	140.497	Adjusted Gamma UCL	0.192995
Approx.Chi Square Value (.05)	114.1022		
Adjusted Level of Significance	0.046364	Lognormal Distribution Test	
Adjusted Chi Square Value	113.5732	Lilliefors Test Statisitic	0.163708
		Lilliefors 5% Critical Value	0.109059
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-5.26512		
Maximum of log data	-0.72854	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-2.37456	95% H-UCL	0.281962
Standard Deviation of log data	1.212663	95% Chebyshev (MVUE) UCL	0.346333
Variance of log data	1.470552	97.5% Chebyshev (MVUE) UCL	0.413757
		99% Chebyshev (MVUE) UCL	0.546198
		95% Non-parametric UCLs	
		CLT UCL	0.181216
		Adj-CLT UCL (Adjusted for skewness)	0.182284
		Mod-t UCL (Adjusted for skewness)	0.181747
		Jackknife UCL	0.18158
		Standard Bootstrap UCL	0.181661
		Bootstrap-t UCL	0.184577
RECOMMENDATION		Hall's Bootstrap UCL	0.182329
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.182293
		BCA Bootstrap UCL	0.182339
Use 97.5% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	0.222805
		97.5% Chebyshev (Mean, Sd) UCL	**0.251707**
		99% Chebyshev (Mean, Sd) UCL	0.308479

Type	ERE and HHRE
Medium	Fish (American eel/White perch)
Chemical	TCDD TEQ (PCB) - Mammal
Units	µg/kg

Data File	
Raw Statistics	
Number of Valid Samples	77
Number of Unique Samples	77
Minimum	0.012503
Maximum	0.219331
Mean	0.064516
Median	0.047801
Standard Deviation	0.04804
Variance	0.002308
Coefficient of Variation	0.744624
Skewness	1.370958
Gamma Statistics	
k hat	2.188654
k star (bias corrected)	2.11204
Theta hat	0.029478
Theta star	0.030547
nu hat	337.0528
nu star	325.2542
Approx.Chi Square Value (.05)	284.4612
Adjusted Level of Significance	0.046883
Adjusted Chi Square Value	283.7386
Log-transformed Statistics	
Minimum of log data	-4.38182
Maximum of log data	-1.51717
Mean of log data	-2.98635
Standard Deviation of log data	0.698956
Variance of log data	0.48854

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

Variable:	mammal-WP AE
Normal Distribution Test	
Lilliefors Test Statisitic	0.158545
Lilliefors 5% Critical Value	0.100969
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.073632
Gamma Distribution Test	
A-D Test Statistic	1.487189
A-D 5% Critical Value	0.762309
K-S Test Statistic	0.115692
K-S 5% Critical Value	0.10297
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.073768
Adjusted Gamma UCL	0.073956
Lognormal Distribution Test	
Lilliefors Test Statisitic	0.098245
Lilliefors 5% Critical Value	0.100969
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	**0.075528**
95% Chebyshev (MVUE) UCL	0.088725
97.5% Chebyshev (MVUE) UCL	0.099344
99% Chebyshev (MVUE) UCL	0.120203
95% Non-parametric UCLs	
CLT UCL	0.073521
Adj-CLT UCL (Adjusted for skewness)	0.074435
Mod-t UCL (Adjusted for skewness)	0.073775
Jackknife UCL	0.073632
Standard Bootstrap UCL	0.073426
Bootstrap-t UCL	0.074824
Hall's Bootstrap UCL	0.074459
Percentile Bootstrap UCL	0.073461
BCA Bootstrap UCL	0.07428
95% Chebyshev (Mean, Sd) UCL	0.08838
97.5% Chebyshev (Mean, Sd) UCL	0.098706
99% Chebyshev (Mean, Sd) UCL	0.118989

Type	ERE
Medium	Fish (American eel/White perch)
Chemical	TCDD TEQ (PCB) - Bird
Units	µg/kg

Data File		Variable:	SumOfBird_TEF - WP AE PCB TEQ
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	77	Lilliefors Test Statisitic	0.122376
Number of Unique Samples	77	Lilliefors 5% Critical Value	0.100969
Minimum	0.030044	Data not normal at 5% significance level	
Maximum	1.512824		
Mean	0.578114	95% UCL (Assuming Normal Distribution)	
Median	0.558286	Student's-t UCL	0.653852
Standard Deviation	0.399125		
Variance	0.159301	Gamma Distribution Test	
Coefficient of Variation	0.690391	A-D Test Statistic	2.534641
Skewness	0.241728	A-D 5% Critical Value	0.773708
		K-S Test Statistic	0.134872
Gamma Statistics		K-S 5% Critical Value	0.103989
k hat	1.336031	Data do not follow gamma distribution	
k star (bias corrected)	1.292636	at 5% significance level	
Theta hat	0.43271		
Theta star	0.447237	95% UCLs (Assuming Gamma Distribution)	
nu hat	205.7488	Approximate Gamma UCL	0.68741
nu star	199.0659	Adjusted Gamma UCL	0.689677
Approx.Chi Square Value (.05)	167.4151		
Adjusted Level of Significance	0.046883	Lognormal Distribution Test	
Adjusted Chi Square Value	166.8647	Lilliefors Test Statisitic	0.178631
		Lilliefors 5% Critical Value	0.100969
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-3.50509		
Maximum of log data	0.413978	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-0.96677	95% H-UCL	0.940142
Standard Deviation of log data	1.103457	95% Chebyshev (MVUE) UCL	1.154793
Variance of log data	1.217618	97.5% Chebyshev (MVUE) UCL	1.355712
		99% Chebyshev (MVUE) UCL	1.750381
		95% Non-parametric UCLs	
		CLT UCL	0.652929
		Adj-CLT UCL (Adjusted for skewness)	0.654268
		Mod-t UCL (Adjusted for skewness)	0.654061
		Jackknife UCL	0.653852
		Standard Bootstrap UCL	0.652392
		Bootstrap-t UCL	0.654836
RECOMMENDATION		Hall's Bootstrap UCL	0.652871
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.650435
		BCA Bootstrap UCL	0.647554
Use 97.5% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	0.776376
		97.5% Chebyshev (Mean, Sd) UCL	**0.862164**
		99% Chebyshev (Mean, Sd) UCL	1.030679

Attachment 3

Type	ERE
Medium	Fish (American eel/White perch)
Chemical	TCDD TEQ (PCB) - Fish
Units	µg/kg

Data File		Variable:	SumOfFish_TEF - WP AE PCB TEQ
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	77	Lilliefors Test Statisitic	0.133623
Number of Unique Samples	77	Lilliefors 5% Critical Value	0.100969
Minimum	0.000809	Data not normal at 5% significance level	
Maximum	0.016414		
Mean	0.004516	95% UCL (Assuming Normal Distribution)	
Median	0.003637	Student's-t UCL	0.005068
Standard Deviation	0.002907		
Variance	8.45E-06	Gamma Distribution Test	
Coefficient of Variation	0.643742	A-D Test Statistic	0.299785
Skewness	1.420229	A-D 5% Critical Value	0.760331
		K-S Test Statistic	0.06088
Gamma Statistics		K-S 5% Critical Value	0.102721
k hat	2.603678	Data follow gamma distribution	
k star (bias corrected)	2.510894	at 5% significance level	
Theta hat	0.001735		
Theta star	0.001799	95% UCLs (Assuming Gamma Distribution)	
nu hat	400.9664	**Approximate Gamma UCL**	**0.005105**
nu star	386.6777	Adjusted Gamma UCL	0.005117
Approx.Chi Square Value (.05)	342.0912		
Adjusted Level of Significance	0.046883	Lognormal Distribution Test	
Adjusted Chi Square Value	341.2973	Lilliefors Test Statisitic	0.067048
		Lilliefors 5% Critical Value	0.100969
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	-7.1197		
Maximum of log data	-4.1096	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-5.60418	95% H-UCL	0.00536
Standard Deviation of log data	0.670438	95% Chebyshev (MVUE) UCL	0.006267
Variance of log data	0.449488	97.5% Chebyshev (MVUE) UCL	0.006992
		99% Chebyshev (MVUE) UCL	0.008414
		95% Non-parametric UCLs	
		CLT UCL	0.005061
		Adj-CLT UCL (Adjusted for skewness)	0.005119
		Mod-t UCL (Adjusted for skewness)	0.005077
		Jackknife UCL	0.005068
		Standard Bootstrap UCL	0.005051
		Bootstrap-t UCL	0.005129
RECOMMENDATION		Hall's Bootstrap UCL	0.00516
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	0.005064
		BCA Bootstrap UCL	0.00513
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	0.005961
		97.5% Chebyshev (Mean, Sd) UCL	0.006586
		99% Chebyshev (Mean, Sd) UCL	0.007813

Attachment 3

Type	ERE
Medium	Fish (American eel/White perch)
Chemical	Total TEQ - Fish
Units	µg/kg

Data File		Variable:	SumOfFish_TEF - WP AE Total TEQ
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	83	Lilliefors Test Statisitic	0.171418
Number of Unique Samples	83	Lilliefors 5% Critical Value	0.097251
Minimum	0.000841	Data not normal at 5% significance level	
Maximum	0.892268		
Mean	0.175061	95% UCL (Assuming Normal Distribution)	
Median	0.151681	Student's-t UCL	0.2086
Standard Deviation	0.183665		
Variance	0.033733	Gamma Distribution Test	
Coefficient of Variation	1.049148	A-D Test Statistic	1.527582
Skewness	1.642034	A-D 5% Critical Value	0.803972
		K-S Test Statistic	0.128126
Gamma Statistics		K-S 5% Critical Value	0.102711
k hat	0.645057	Data do not follow gamma distribution	
k star (bias corrected)	0.629774	at 5% significance level	
Theta hat	0.271389		
Theta star	0.277975	95% UCLs (Assuming Gamma Distribution)	
nu hat	107.0794	Approximate Gamma UCL	0.22334
nu star	104.5424	Adjusted Gamma UCL	0.224304
Approx.Chi Square Value (.05)	81.94388		
Adjusted Level of Significance	0.047108	Lognormal Distribution Test	
Adjusted Chi Square Value	81.59179	Lilliefors Test Statisitic	0.17862
		Lilliefors 5% Critical Value	0.097251
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-7.08139		
Maximum of log data	-0.11399	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	-2.69043	95% H-UCL	0.634721
Standard Deviation of log data	1.799296	95% Chebyshev (MVUE) UCL	0.742233
Variance of log data	3.237466	97.5% Chebyshev (MVUE) UCL	0.922248
		99% Chebyshev (MVUE) UCL	1.275853
		95% Non-parametric UCLs	
		CLT UCL	0.208221
		Adj-CLT UCL (Adjusted for skewness)	0.212104
		Mod-t UCL (Adjusted for skewness)	0.209206
		Jackknife UCL	0.2086
		Standard Bootstrap UCL	0.207941
		Bootstrap-t UCL	0.211832
RECOMMENDATION		Hall's Bootstrap UCL	0.213341
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	0.209767
		BCA Bootstrap UCL	0.210565
Use 97.5% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	0.262936
		97.5% Chebyshev (Mean, Sd) UCL	**0.30096**
		99% Chebyshev (Mean, Sd) UCL	0.375649

Type	ERE
Medium	Fish (American eel/White perch)
Chemical	Total TEQ - Bird
Units	µg/kg

Data File	
Raw Statistics	
Number of Valid Samples	83
Number of Unique Samples	83
Minimum	0.002277
Maximum	1.983476
Mean	0.627851
Median	0.560639
Standard Deviation	0.519649
Variance	0.270035
Coefficient of Variation	0.827663
Skewness	0.470899
Gamma Statistics	
k hat	0.88075
k star (bias corrected)	0.856947
Theta hat	0.71286
Theta star	0.73266
nu hat	146.2044
nu star	142.2533
Approx.Chi Square Value (.05)	115.6864
Adjusted Level of Significance	0.047108
Adjusted Chi Square Value	115.2652
Log-transformed Statistics	
Minimum of log data	-6.08472
Maximum of log data	0.684851
Mean of log data	-1.13101
Standard Deviation of log data	1.499322
Variance of log data	2.247967

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Variable:	SumOfBird_TEF - WP AE TOTAL TEQ
Normal Distribution Test	
Lilliefors Test Statisitic	0.152392
Lilliefors 5% Critical Value	0.097251
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.722744
Gamma Distribution Test	
A-D Test Statistic	1.993275
A-D 5% Critical Value	0.787481
K-S Test Statistic	0.125539
K-S 5% Critical Value	0.101468
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.772034
Adjusted Gamma UCL	0.774855
Lognormal Distribution Test	
Lilliefors Test Statisitic	0.160734
Lilliefors 5% Critical Value	0.097251
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.566348
95% Chebyshev (MVUE) UCL	1.9172
97.5% Chebyshev (MVUE) UCL	2.328859
99% Chebyshev (MVUE) UCL	3.137482
95% Non-parametric UCLs	
CLT UCL	0.721672
Adj-CLT UCL (Adjusted for skewness)	0.724822
Mod-t UCL (Adjusted for skewness)	0.723235
Jackknife UCL	0.722744
Standard Bootstrap UCL	0.720211
Bootstrap-t UCL	0.72388
Hall's Bootstrap UCL	0.72503
Percentile Bootstrap UCL	0.726101
BCA Bootstrap UCL	0.721317
95% Chebyshev (Mean, Sd) UCL	0.876478
97.5% Chebyshev (Mean, Sd) UCL	**0.984059**
99% Chebyshev (Mean, Sd) UCL	1.195381

Attachment 3

Type	ERE and HHRE
Medium	Fish (American eel/White perch)
Chemical	Total TEQ - Mammal
Units	µg/kg

Data File	
Raw Statistics	
Number of Valid Samples	83
Number of Unique Samples	83
Minimum	0.012503
Maximum	0.561028
Mean	0.183909
Median	0.136946
Standard Deviation	0.146876
Variance	0.021573
Coefficient of Variation	0.798633
Skewness	0.738949
Gamma Statistics	
k hat	1.349681
k star (bias corrected)	1.30893
Theta hat	0.136261
Theta star	0.140503
nu hat	224.0471
nu star	217.2823
Approx.Chi Square Value (.05)	184.1608
Adjusted Level of Significance	0.047108
Adjusted Chi Square Value	183.6254
Log-transformed Statistics	
Minimum of log data	-4.38182
Maximum of log data	-0.57798
Mean of log data	-2.10745
Standard Deviation of log data	1.011276
Variance of log data	1.022679

RECOMMENDATION

Assuming gamma distribution (0.05)

Use Approximate Gamma UCL

Variable:	SumOfMammal_TEF - WP AE TOTAL TEQ
Normal Distribution Test	
Lilliefors Test Statisitic	0.160552
Lilliefors 5% Critical Value	0.097251
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.21073
Gamma Distribution Test	
A-D Test Statistic	0.976542
A-D 5% Critical Value	0.774146
K-S Test Statistic	0.083876
K-S 5% Critical Value	0.10021
Data follow approximate gamma distibution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	**0.216985**
Adjusted Gamma UCL	0.217618
Lognormal Distribution Test	
Lilliefors Test Statisitic	0.126589
Lilliefors 5% Critical Value	0.097251
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.260286
95% Chebyshev (MVUE) UCL	0.317258
97.5% Chebyshev (MVUE) UCL	0.367634
99% Chebyshev (MVUE) UCL	0.466587
95% Non-parametric UCLs	
CLT UCL	0.210427
Adj-CLT UCL (Adjusted for skewness)	0.211824
Mod-t UCL (Adjusted for skewness)	0.210948
Jackknife UCL	0.21073
Standard Bootstrap UCL	0.210337
Bootstrap-t UCL	0.21224
Hall's Bootstrap UCL	0.211192
Percentile Bootstrap UCL	0.208298
BCA Bootstrap UCL	0.212483
95% Chebyshev (Mean, Sd) UCL	0.254182
97.5% Chebyshev (Mean, Sd) UCL	0.284589
99% Chebyshev (Mean, Sd) UCL	0.344318

Type	ERE
Medium	Sediment
Chemical	Chlordane
Units	µg/kg

Data File

Variable: Chlordane

Raw Statistics

Number of Valid Samples	227
Number of Unique Samples	200
Minimum	1.595
Maximum	332.25
Mean	37.17414
Median	27
Standard Deviation	37.88185
Variance	1435.035
Coefficient of Variation	1.019038
Skewness	3.222988

Gamma Statistics

k hat	1.267464
k star (bias corrected)	1.25365
Theta hat	29.32954
Theta star	29.65272
nu hat	575.4288
nu star	569.1573
Approx.Chi Square Value (.05)	514.8105
Adjusted Level of Significance	0.048943
Adjusted Chi Square Value	514.4843

Log-transformed Statistics

Minimum of log data	0.466874
Maximum of log data	5.805888
Mean of log data	3.171852
Standard Deviation of log data	1.017539
Variance of log data	1.035385

RECOMMENDATION

Data follow gamma distribution (0.05)

Use Approximate Gamma UCL

Normal Distribution Test

Lilliefors Test Statisitic	0.173811
Lilliefors 5% Critical Value	0.058806
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)

Student's-t UCL	41.32683

Gamma Distribution Test

A-D Test Statistic	0.432581
A-D 5% Critical Value	0.777311
K-S Test Statistic	0.036746
K-S 5% Critical Value	0.061956
Data follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	**41.09849**
Adjusted Gamma UCL	41.12455

Lognormal Distribution Test

Lilliefors Test Statisitic	0.072353
Lilliefors 5% Critical Value	0.058806
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	46.29554
95% Chebyshev (MVUE) UCL	54.2133
97.5% Chebyshev (MVUE) UCL	60.41135
99% Chebyshev (MVUE) UCL	72.58621

95% Non-parametric UCLs

CLT UCL	41.30981
Adj-CLT UCL (Adjusted for skewness)	41.88451
Mod-t UCL (Adjusted for skewness)	41.41647
Jackknife UCL	41.32683
Standard Bootstrap UCL	41.36496
Bootstrap-t UCL	42.19656
Hall's Bootstrap UCL	42.34805
Percentile Bootstrap UCL	41.34022
BCA Bootstrap UCL	41.68573
95% Chebyshev (Mean, Sd) UCL	48.13375
97.5% Chebyshev (Mean, Sd) UCL	52.87598
99% Chebyshev (Mean, Sd) UCL	62.19118

Type	ERE
Medium	Sediment
Chemical	Copper
Units	µg/kg

Data File

Variable: Copper

Raw Statistics	
Number of Valid Samples	234
Number of Unique Samples	152
Minimum	11500
Maximum	2470000
Mean	217265
Median	195500
Standard Deviation	169088.8
Variance	2.86E+10
Coefficient of Variation	0.778261
Skewness	10.40631

Gamma Statistics	
k hat	4.351721
k star (bias corrected)	4.298778
Theta hat	49926.22
Theta star	50541.09
nu hat	2036.605
nu star	2011.828
Approx.Chi Square Value (.05)	1908.619
Adjusted Level of Significance	0.048974
Adjusted Chi Square Value	1908.005

Log-transformed Statistics	
Minimum of log data	9.350102
Maximum of log data	14.71973
Mean of log data	12.1696
Standard Deviation of log data	0.487203
Variance of log data	0.237367

RECOMMENDATION

Data are Non-parametric (0.05)

Use Student's-t UCL
or Modified-t UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.241762
Lilliefors 5% Critical Value	0.05792
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	**235519.2**

Gamma Distribution Test	
A-D Test Statistic	1.8E+308
A-D 5% Critical Value	0.756897
K-S Test Statistic	0.14947
K-S 5% Critical Value	0.059945
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	229013.7
Adjusted Gamma UCL	229087.4

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.170834
Lilliefors 5% Critical Value	0.05792
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	229910.4
95% Chebyshev (MVUE) UCL	248813.2
97.5% Chebyshev (MVUE) UCL	262573
99% Chebyshev (MVUE) UCL	289601.4

95% Non-parametric UCLs	
CLT UCL	235446.6
Adj-CLT UCL (Adjusted for skewness)	243481.5
Mod-t UCL (Adjusted for skewness)	**236772.5**
Jackknife UCL	235519.2
Standard Bootstrap UCL	235747.9
Bootstrap-t UCL	251293.5
Hall's Bootstrap UCL	316671.9
Percentile Bootstrap UCL	238529.5
BCA Bootstrap UCL	245688
95% Chebyshev (Mean, Sd) UCL	265446.8
97.5% Chebyshev (Mean, Sd) UCL	286295.2
99% Chebyshev (Mean, Sd) UCL	327247.7

Type	ERE
Medium	Sediment
Chemical	DDD

Data File 4-10-07

Variable: DDD

Raw Statistics	
Number of Valid Samples	233
Number of Unique Samples	193
Minimum	2.035
Maximum	5980
Mean	96.38414
Median	47.3
Standard Deviation	399.8312
Variance	159865
Coefficient of Variation	4.148309
Skewness	13.91201

Gamma Statistics	
k hat	0.80174
k star (bias corrected)	0.794279
Theta hat	120.2187
Theta star	121.348
nu hat	373.6109
nu star	370.1338
Approx.Chi Square Value (.05)	326.5374
Adjusted Level of Significance	0.04897
Adjusted Chi Square Value	326.2854

Log-transformed Statistics	
Minimum of log data	0.710496
Maximum of log data	8.696176
Mean of log data	3.828299
Standard Deviation of log data	0.96922
Variance of log data	0.939388

Normal Distribution Test	
Lilliefors Test Statisitic	0.406727
Lilliefors 5% Critical Value	0.058044
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	139.6419

Gamma Distribution Test	
A-D Test Statistic	1.8E+308
A-D 5% Critical Value	0.793853
K-S Test Statistic	0.211417
K-S 5% Critical Value	0.06211
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	109.2525
Adjusted Gamma UCL	109.3369

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.081374
Lilliefors 5% Critical Value	0.058044
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	84.11136
95% Chebyshev (MVUE) UCL	97.72933
97.5% Chebyshev (MVUE) UCL	108.2845
99% Chebyshev (MVUE) UCL	129.0181

95% Non-parametric UCLs	
CLT UCL	139.4691
Adj-CLT UCL (Adjusted for skewness)	164.978
Mod-t UCL (Adjusted for skewness)	143.6207
Jackknife UCL	139.6419
Standard Bootstrap UCL	140.3512
Bootstrap-t UCL	258.5963
Hall's Bootstrap UCL	289.7358
Percentile Bootstrap UCL	146.9846
BCA Bootstrap UCL	178.0051
95% Chebyshev (Mean, Sd) UCL	**210.5603**
97.5% Chebyshev (Mean, Sd) UCL	259.9645
99% Chebyshev (Mean, Sd) UCL	357.0093

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Type	HHRE
Medium	Sediment
Chemical	DDE
Units	µg/kg

Data File 4-10-07

Variable: DDE

Raw Statistics

Number of Valid Samples	234
Number of Unique Samples	195
Minimum	2.035
Maximum	1010
Mean	58.44669
Median	40.75
Standard Deviation	90.12724
Variance	8122.919
Coefficient of Variation	1.542042
Skewness	7.379838

Gamma Statistics

k hat	1.340952
k star (bias corrected)	1.32661
Theta hat	43.58595
Theta star	44.05718
nu hat	627.5658
nu star	620.8534
Approx.Chi Square Value (.05)	564.0395
Adjusted Level of Significance	0.048974
Adjusted Chi Square Value	563.7081

Log-transformed Statistics

Minimum of log data	0.710496
Maximum of log data	6.917706
Mean of log data	3.651016
Standard Deviation of log data	0.88708
Variance of log data	0.78691

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test

Lilliefors Test Statisitic	0.271283
Lilliefors 5% Critical Value	0.05792
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)

Student's-t UCL	68.17652

Gamma Distribution Test

A-D Test Statistic	5.757971
A-D 5% Critical Value	0.775518
K-S Test Statistic	0.124722
K-S 5% Critical Value	0.061039
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	64.33383
Adjusted Gamma UCL	64.37166

Lognormal Distribution Test

Lilliefors Test Statisitic	0.094995
Lilliefors 5% Critical Value	0.05792
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	64.27917
95% Chebyshev (MVUE) UCL	73.8192
97.5% Chebyshev (MVUE) UCL	81.11935
99% Chebyshev (MVUE) UCL	95.45909

95% Non-parametric UCLs

CLT UCL	68.13784
Adj-CLT UCL (Adjusted for skewness)	71.175
Mod-t UCL (Adjusted for skewness)	68.65026
Jackknife UCL	68.17652
Standard Bootstrap UCL	68.19334
Bootstrap-t UCL	74.68715
Hall's Bootstrap UCL	111.0965
Percentile Bootstrap UCL	68.68829
BCA Bootstrap UCL	72.25355
95% Chebyshev (Mean, Sd) UCL	**84.12846**
97.5% Chebyshev (Mean, Sd) UCL	95.24098
99% Chebyshev (Mean, Sd) UCL	117.0694

Type	HHRE
Medium	Sediment
Chemical	DDT
Units	µg/kg

Data File 4-10-07

Variable: DDT

Raw Statistics	
Number of Valid Samples	231
Number of Unique Samples	200
Minimum	1.5
Maximum	2470
Mean	90.25517
Median	24
Standard Deviation	270.3807
Variance	73105.72
Coefficient of Variation	2.995736
Skewness	6.273821

Gamma Statistics	
k hat	0.508099
k star (bias corrected)	0.504386
Theta hat	177.633
Theta star	178.9405
nu hat	234.7418
nu star	233.0265
Approx.Chi Square Value (.05)	198.6829
Adjusted Level of Significance	0.048961
Adjusted Chi Square Value	198.4858

Log-transformed Statistics	
Minimum of log data	0.405465
Maximum of log data	7.811973
Mean of log data	3.255634
Standard Deviation of log data	1.383405
Variance of log data	1.913809

RECOMMENDATION

Data are lognormal (0.05)

Use H-UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.371358
Lilliefors 5% Critical Value	0.058295
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	119.635

Gamma Distribution Test	
A-D Test Statistic	15.92044
A-D 5% Critical Value	0.820354
K-S Test Statistic	0.197715
K-S 5% Critical Value	0.063495
Data do not follow gamma distribution	
at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	105.8564
Adjusted Gamma UCL	105.9615

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.054296
Lilliefors 5% Critical Value	0.058295
Data are lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	**84.65568**
95% Chebyshev (MVUE) UCL	103.4703
97.5% Chebyshev (MVUE) UCL	119.2558
99% Chebyshev (MVUE) UCL	150.2636
95% Non-parametric UCLs	
CLT UCL	119.5167
Adj-CLT UCL (Adjusted for skewness)	127.3632
Mod-t UCL (Adjusted for skewness)	120.8589
Jackknife UCL	119.635
Standard Bootstrap UCL	119.3921
Bootstrap-t UCL	135.0838
Hall's Bootstrap UCL	131.8052
Percentile Bootstrap UCL	121.1472
BCA Bootstrap UCL	126.9552
95% Chebyshev (Mean, Sd) UCL	167.7989
97.5% Chebyshev (Mean, Sd) UCL	201.3521
99% Chebyshev (Mean, Sd) UCL	267.2609

Type	ERE
Medium	Sediment
Chemical	DDx - Sum
Units	µg/kg

Data File

Variable: Total DDx

Raw Statistics	
Number of Valid Samples	245
Number of Unique Samples	233
Minimum	6.105
Maximum	5984.52
Mean	232.5836
Median	123
Standard Deviation	521.5207
Variance	271983.8
Coefficient of Variation	2.242294
Skewness	7.550755

Gamma Statistics	
k hat	0.949494
k star (bias corrected)	0.940588
Theta hat	244.9554
Theta star	247.2746
nu hat	465.2519
nu star	460.8883
Approx.Chi Square Value (.05)	412.1018
Adjusted Level of Significance	0.04902
Adjusted Chi Square Value	411.832

Log-transformed Statistics	
Minimum of log data	1.809108
Maximum of log data	8.696931
Mean of log data	4.837568
Standard Deviation of log data	0.951846
Variance of log data	0.906011

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.332048
Lilliefors 5% Critical Value	0.056604
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	287.5969

Gamma Distribution Test	
A-D Test Statistic	14.48874
A-D 5% Critical Value	0.786506
K-S Test Statistic	0.182076
K-S 5% Critical Value	0.060298
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	260.1179
Adjusted Gamma UCL	260.2883

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.082525
Lilliefors 5% Critical Value	0.056604
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	225.4239
95% Chebyshev (MVUE) UCL	260.6675
97.5% Chebyshev (MVUE) UCL	287.8152
99% Chebyshev (MVUE) UCL	341.1415

95% Non-parametric UCLs	
CLT UCL	287.388
Adj-CLT UCL (Adjusted for skewness)	304.5622
Mod-t UCL (Adjusted for skewness)	290.2757
Jackknife UCL	287.5969
Standard Bootstrap UCL	286.6447
Bootstrap-t UCL	321.7829
Hall's Bootstrap UCL	329.4934
Percentile Bootstrap UCL	292.434
BCA Bootstrap UCL	304.2273
95% Chebyshev (Mean, Sd) UCL	**377.8166**
97.5% Chebyshev (Mean, Sd) UCL	440.659
99% Chebyshev (Mean, Sd) UCL	564.1008

Type	ERE
Medium	Sediment
Chemical	Dieldrin
Units	µg/kg

Data File

Variable: Dieldrin

Raw Statistics	
Number of Valid Samples	236
Number of Unique Samples	165
Minimum	1.38
Maximum	141
Mean	13.74949
Median	8
Standard Deviation	17.497
Variance	306.1449
Coefficient of Variation	1.272556
Skewness	4.267641

Gamma Statistics	
k hat	1.258406
k star (bias corrected)	1.245235
Theta hat	10.92611
Theta star	11.04169
nu hat	593.9678
nu star	587.7507
Approx.Chi Square Value (.05)	532.5042
Adjusted Level of Significance	0.048983
Adjusted Chi Square Value	532.185

Log-transformed Statistics	
Minimum of log data	0.322083
Maximum of log data	4.94876
Mean of log data	2.173721
Standard Deviation of log data	0.896949
Variance of log data	0.804518

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.239799
Lilliefors 5% Critical Value	0.057674
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	15.63032

Gamma Distribution Test	
A-D Test Statistic	6.535495
A-D 5% Critical Value	0.77757
K-S Test Statistic	0.127507
K-S 5% Critical Value	0.060907
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	15.17598
Adjusted Gamma UCL	15.18508

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.1046
Lilliefors 5% Critical Value	0.057674
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	14.81974
95% Chebyshev (MVUE) UCL	17.03619
97.5% Chebyshev (MVUE) UCL	18.73378
99% Chebyshev (MVUE) UCL	22.06835

95% Non-parametric UCLs	
CLT UCL	15.62291
Adj-CLT UCL (Adjusted for skewness)	15.96099
Mod-t UCL (Adjusted for skewness)	15.68306
Jackknife UCL	15.63032
Standard Bootstrap UCL	15.63521
Bootstrap-t UCL	16.03974
Hall's Bootstrap UCL	16.22045
Percentile Bootstrap UCL	15.69025
BCA Bootstrap UCL	15.90769
95% Chebyshev (Mean, Sd) UCL	**18.71409**
97.5% Chebyshev (Mean, Sd) UCL	20.86228
99% Chebyshev (Mean, Sd) UCL	25.08198

Type	ERE
Medium	Sediment
Chemical	Lead
Units	µg/kg

Data File

Variable: Lead

Raw Statistics	
Number of Valid Samples	225
Number of Unique Samples	157
Minimum	4400
Maximum	1550000
Mean	328047.1
Median	287000
Standard Deviation	160309
Variance	2.57E+10
Coefficient of Variation	0.488677
Skewness	2.663771

Gamma Statistics	
k hat	4.272078
k star (bias corrected)	4.21808
Theta hat	76788.65
Theta star	77771.66
nu hat	1922.435
nu star	1898.136
Approx.Chi Square Value (.05)	1797.919
Adjusted Level of Significance	0.048933
Adjusted Chi Square Value	1797.299

Log-transformed Statistics	
Minimum of log data	8.38936
Maximum of log data	14.25377
Mean of log data	12.57933
Standard Deviation of log data	0.587178
Variance of log data	0.344778

Normal Distribution Test	
Lilliefors Test Statisitic	0.165669
Lilliefors 5% Critical Value	0.059067
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	345699.1

Gamma Distribution Test	
A-D Test Statistic	6.654842
A-D 5% Critical Value	0.756791
K-S Test Statistic	0.133404
K-S 5% Critical Value	0.060997
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	346332.7
Adjusted Gamma UCL	346452.2

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.178599
Lilliefors 5% Critical Value	0.059067
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	371065.2
95% Chebyshev (MVUE) UCL	408345.3
97.5% Chebyshev (MVUE) UCL	435825.8
99% Chebyshev (MVUE) UCL	489805.9

95% Non-parametric UCLs	
CLT UCL	345626.1
Adj-CLT UCL (Adjusted for skewness)	347654
Mod-t UCL (Adjusted for skewness)	346015.4
Jackknife UCL	345699.1
Standard Bootstrap UCL	345859.2
Bootstrap-t UCL	347701.7
Hall's Bootstrap UCL	349747.6
Percentile Bootstrap UCL	346230.2
BCA Bootstrap UCL	347004.9
95% Chebyshev (Mean, Sd) UCL	**374631.8**
97.5% Chebyshev (Mean, Sd) UCL	394789.1
99% Chebyshev (Mean, Sd) UCL	434384.1

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Type	ERE
Medium	Sediment
Chemical	Mercury
Units	µg/kg

Data File

Variable: Mercury

Raw Statistics	
Number of Valid Samples	232
Number of Unique Samples	77
Minimum	50
Maximum	10700
Mean	3128.448
Median	2800
Standard Deviation	1807.957
Variance	3268710
Coefficient of Variation	0.577909
Skewness	1.490197

Gamma Statistics	
k hat	2.788324
k star (bias corrected)	2.755141
Theta hat	1121.982
Theta star	1135.495
nu hat	1293.782
nu star	1278.386
Approx.Chi Square Value (.05)	1196.35
Adjusted Level of Significance	0.048966
Adjusted Chi Square Value	1195.86

Log-transformed Statistics	
Minimum of log data	3.912023
Maximum of log data	9.277999
Mean of log data	7.858385
Standard Deviation of log data	0.716282
Variance of log data	0.513061

Normal Distribution Test	
Lilliefors Test Statisitic	0.164357
Lilliefors 5% Critical Value	0.058169
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	3324.476

Gamma Distribution Test	
A-D Test Statistic	3.532914
A-D 5% Critical Value	0.761369
K-S Test Statistic	0.109185
K-S 5% Critical Value	0.060424
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	3342.972
Adjusted Gamma UCL	3344.34

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.156132
Lilliefors 5% Critical Value	0.058169
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	3661.247
95% Chebyshev (MVUE) UCL	4103.117
97.5% Chebyshev (MVUE) UCL	4433.601
99% Chebyshev (MVUE) UCL	5082.772

95% Non-parametric UCLs	
CLT UCL	3323.689
Adj-CLT UCL (Adjusted for skewness)	3336.098
Mod-t UCL (Adjusted for skewness)	3326.411
Jackknife UCL	3324.476
Standard Bootstrap UCL	3320.235
Bootstrap-t UCL	3349.824
Hall's Bootstrap UCL	3333.813
Percentile Bootstrap UCL	3331.897
BCA Bootstrap UCL	3330.733
95% Chebyshev (Mean, Sd) UCL	**3645.842**
97.5% Chebyshev (Mean, Sd) UCL	3869.718
99% Chebyshev (Mean, Sd) UCL	4309.481

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Type	ERE
Medium	Sediment
Chemical	LPAH
Units	µg/kg

Data File

Variable: LPAH

Raw Statistics	
Number of Valid Samples	232
Number of Unique Samples	213
Minimum	7.1
Maximum	1410750
Mean	13709.5
Median	4781.8
Standard Deviation	94750.83
Variance	8.98E+09
Coefficient of Variation	6.911327
Skewness	14.13738

Gamma Statistics	
k hat	0.616504
k star (bias corrected)	0.611406
Theta hat	22237.47
Theta star	22422.91
nu hat	286.058
nu star	283.6923
Approx.Chi Square Value (.05)	245.6739
Adjusted Level of Significance	0.048966
Adjusted Chi Square Value	245.4551

Log-transformed Statistics	
Minimum of log data	1.960095
Maximum of log data	14.15963
Mean of log data	8.527606
Standard Deviation of log data	0.851424
Variance of log data	0.724922

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.457075
Lilliefors 5% Critical Value	0.058169
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	23982.83

Gamma Distribution Test	
A-D Test Statistic	1.8E+308
A-D 5% Critical Value	0.809636
K-S Test Statistic	0.359833
K-S 5% Critical Value	0.062922
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	15831.06
Adjusted Gamma UCL	15845.17

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.161668
Lilliefors 5% Critical Value	0.058169
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	8128.173
95% Chebyshev (MVUE) UCL	9290.814
97.5% Chebyshev (MVUE) UCL	10176.41
99% Chebyshev (MVUE) UCL	11916

95% Non-parametric UCLs	
CLT UCL	23941.63
Adj-CLT UCL (Adjusted for skewness)	30111.05
Mod-t UCL (Adjusted for skewness)	24945.14
Jackknife UCL	23982.83
Standard Bootstrap UCL	24131.47
Bootstrap-t UCL	122338.4
Hall's Bootstrap UCL	77529.73
Percentile Bootstrap UCL	25366.41
BCA Bootstrap UCL	34540.61
95% Chebyshev (Mean, Sd) UCL	**40824.89**
97.5% Chebyshev (Mean, Sd) UCL	52557.74
99% Chebyshev (Mean, Sd) UCL	75604.65

Type	ERE
Medium	Sediment
Chemical	HPAH
Units	µg/kg

Data File

Variable: HPAH

Raw Statistics	
Number of Valid Samples	231
Number of Unique Samples	222
Minimum	1845
Maximum	1373000
Mean	34372.12
Median	23530
Standard Deviation	93097.23
Variance	8.67E+09
Coefficient of Variation	2.70851
Skewness	13.2524

Gamma Statistics	
k hat	1.333327
k star (bias corrected)	1.318897
Theta hat	25779.22
Theta star	26061.27
nu hat	615.997
nu star	609.3303
Approx.Chi Square Value (.05)	553.0572
Adjusted Level of Significance	0.048961
Adjusted Chi Square Value	552.7248

Log-transformed Statistics	
Minimum of log data	7.520235
Maximum of log data	14.13251
Mean of log data	10.02528
Standard Deviation of log data	0.760085
Variance of log data	0.57773

Normal Distribution Test	
Lilliefors Test Statisitic	0.363399
Lilliefors 5% Critical Value	0.058295
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	44488.17

Gamma Distribution Test	
A-D Test Statistic	1.8E+308
A-D 5% Critical Value	0.775693
K-S Test Statistic	0.162462
K-S 5% Critical Value	0.061402
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	37869.46
Adjusted Gamma UCL	37892.23

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.074775
Lilliefors 5% Critical Value	0.058295
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	33257.12
95% Chebyshev (MVUE) UCL	37519.95
97.5% Chebyshev (MVUE) UCL	40727.16
99% Chebyshev (MVUE) UCL	47027.11

95% Non-parametric UCLs	
CLT UCL	44447.42
Adj-CLT UCL (Adjusted for skewness)	50154.31
Mod-t UCL (Adjusted for skewness)	45378.33
Jackknife UCL	44488.17
Standard Bootstrap UCL	44642.65
Bootstrap-t UCL	76289.83
Hall's Bootstrap UCL	86690.05
Percentile Bootstrap UCL	46076.44
BCA Bootstrap UCL	55530.05
95% Chebyshev (Mean, Sd) UCL	**61071.9**
97.5% Chebyshev (Mean, Sd) UCL	72624.91
99% Chebyshev (Mean, Sd) UCL	95318.57

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Attachment 3

Type	ERE
Medium	Sediment
Chemical	Total PCB
Units	µg/kg

Data File

Variable: Total Aroclor

Raw Statistics

Number of Valid Samples	238
Number of Unique Samples	230
Minimum	56.1
Maximum	17353.25
Mean	1318
Median	1026
Standard Deviation	1713.726
Variance	2936855
Coefficient of Variation	1.300247
Skewness	5.707205

Gamma Statistics

k hat	1.406906
k star (bias corrected)	1.391973
Theta hat	936.8077
Theta star	946.8577
nu hat	669.6871
nu star	662.579
Approx.Chi Square Value (.05)	603.848
Adjusted Level of Significance	0.048992
Adjusted Chi Square Value	603.5107

Log-transformed Statistics

Minimum of log data	4.027136
Maximum of log data	9.761535
Mean of log data	6.788151
Standard Deviation of log data	0.869717
Variance of log data	0.756408

Normal Distribution Test

Lilliefors Test Statisitic	0.24695
Lilliefors 5% Critical Value	0.057431

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	1501.434

Gamma Distribution Test

A-D Test Statistic	3.676559
A-D 5% Critical Value	0.773906
K-S Test Statistic	0.118218
K-S 5% Critical Value	0.060484

Data do not follow gamma distribution
at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	1446.19
Adjusted Gamma UCL	1446.999

Lognormal Distribution Test

Lilliefors Test Statisitic	0.07512
Lilliefors 5% Critical Value	0.057431

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	1452.462
95% Chebyshev (MVUE) UCL	1662.591
97.5% Chebyshev (MVUE) UCL	1822.819
99% Chebyshev (MVUE) UCL	2137.554

95% Non-parametric UCLs

CLT UCL	1500.717
Adj-CLT UCL (Adjusted for skewness)	1544.628
Mod-t UCL (Adjusted for skewness)	1508.284
Jackknife UCL	1501.434
Standard Bootstrap UCL	1504.92
Bootstrap-t UCL	1564.752
Hall's Bootstrap UCL	1609.707
Percentile Bootstrap UCL	1518.767
BCA Bootstrap UCL	1554.841
95% Chebyshev (Mean, Sd) UCL	**1802.205**
97.5% Chebyshev (Mean, Sd) UCL	2011.721
99% Chebyshev (Mean, Sd) UCL	2423.275

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Type	ERE
Medium	Sediment
Chemical	TCDD TEQ (D/F)- Bird
Units	µg/kg

Data File

Variable: D/F TEQ Bird

Raw Statistics

Number of Valid Samples	232
Number of Unique Samples	232
Minimum	0.00158
Maximum	24.54737
Mean	0.86964
Median	0.418419
Standard Deviation	2.182494
Variance	4.763282
Coefficient of Variation	2.509653
Skewness	7.348661

Gamma Statistics

k hat	0.749603
k star (bias corrected)	0.742783
Theta hat	1.160134
Theta star	1.170785
nu hat	347.8158
nu star	344.6515
Approx.Chi Square Value (.05)	302.6245
Adjusted Level of Significance	0.048966
Adjusted Chi Square Value	302.3811

Log-transformed Statistics

Minimum of log data	-6.45033
Maximum of log data	3.200605
Mean of log data	-0.93834
Standard Deviation of log data	1.23686
Variance of log data	1.529822

Normal Distribution Test

Lilliefors Test Statisitic	0.371733
Lilliefors 5% Critical Value	0.058169

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	1.106276

Gamma Distribution Test

A-D Test Statistic	18.83666
A-D 5% Critical Value	0.796467
K-S Test Statistic	0.229911
K-S 5% Critical Value	0.062368

Data do not follow gamma distribution
at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	0.990411
Adjusted Gamma UCL	0.991208

Lognormal Distribution Test

Lilliefors Test Statisitic	0.207303
Lilliefors 5% Critical Value	0.058169

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	1.017107
95% Chebyshev (MVUE) UCL	1.223278
97.5% Chebyshev (MVUE) UCL	1.390877
99% Chebyshev (MVUE) UCL	1.720091

95% Non-parametric UCLs

CLT UCL	1.105327
Adj-CLT UCL (Adjusted for skewness)	1.179195
Mod-t UCL (Adjusted for skewness)	1.117798
Jackknife UCL	1.106276
Standard Bootstrap UCL	1.110866
Bootstrap-t UCL	1.23323
Hall's Bootstrap UCL	1.316972
Percentile Bootstrap UCL	1.116332
BCA Bootstrap UCL	1.17822
95% Chebyshev (Mean, Sd) UCL	1.494217
97.5% Chebyshev (Mean, Sd) UCL	**1.764472**
99% Chebyshev (Mean, Sd) UCL	2.295335

RECOMMENDATION
Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Type	ERE
Medium	Sediment
Chemical	TCDD TEQ (D/F) - Fish
Units	µg/kg

Data File

Variable: D/F TEQ FISH

Raw Statistics

Number of Valid Samples	232
Number of Unique Samples	232
Minimum	0.00158
Maximum	19.92561
Mean	0.777074
Median	0.373605
Standard Deviation	1.92869
Variance	3.719844
Coefficient of Variation	2.481988
Skewness	6.674086

Gamma Statistics

k hat	0.722273
k star (bias corrected)	0.715807
Theta hat	1.075873
Theta star	1.085592
nu hat	335.1347
nu star	332.1344
Approx.Chi Square Value (.05)	290.8996
Adjusted Level of Significance	0.048966
Adjusted Chi Square Value	290.661

Log-transformed Statistics

Minimum of log data	-6.45033
Maximum of log data	2.992006
Mean of log data	-1.08532
Standard Deviation of log data	1.279938
Variance of log data	1.638241

Normal Distribution Test

Lilliefors Test Statisitic	0.375805
Lilliefors 5% Critical Value	0.058169

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	0.986192

Gamma Distribution Test

A-D Test Statistic	18.25974
A-D 5% Critical Value	0.799171
K-S Test Statistic	0.225111
K-S 5% Critical Value	0.062482

Data do not follow gamma distribution
at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	0.887224
Adjusted Gamma UCL	0.887952

Lognormal Distribution Test

Lilliefors Test Statisitic	0.21693
Lilliefors 5% Critical Value	0.058169

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	0.936293
95% Chebyshev (MVUE) UCL	1.131661
97.5% Chebyshev (MVUE) UCL	1.29186
99% Chebyshev (MVUE) UCL	1.60654

95% Non-parametric UCLs

CLT UCL	0.985353
Adj-CLT UCL (Adjusted for skewness)	1.044639
Mod-t UCL (Adjusted for skewness)	0.995439
Jackknife UCL	0.986192
Standard Bootstrap UCL	0.992188
Bootstrap-t UCL	1.080374
Hall's Bootstrap UCL	1.116874
Percentile Bootstrap UCL	1.003401
BCA Bootstrap UCL	1.056041
95% Chebyshev (Mean, Sd) UCL	1.329019
97.5% Chebyshev (Mean, Sd) UCL	**1.567845**
99% Chebyshev (Mean, Sd) UCL	2.036974

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Type	ERE
Medium	Sediment
Chemical	TCDD TEQ (D/F) - Mammal
Units	µg/kg

Data File

Variable: D/F TEQ MAMMAL

Raw Statistics	
Number of Valid Samples	232
Number of Unique Samples	232
Minimum	0.003621
Maximum	20.1618
Mean	0.779584
Median	0.372
Standard Deviation	1.937958
Variance	3.755682
Coefficient of Variation	2.485886
Skewness	6.725411

Gamma Statistics	
k hat	0.724505
k star (bias corrected)	0.71801
Theta hat	1.076023
Theta star	1.085757
nu hat	336.1704
nu star	333.1567
Approx.Chi Square Value (.05)	291.8566
Adjusted Level of Significance	0.048966
Adjusted Chi Square Value	291.6176

Log-transformed Statistics	
Minimum of log data	-5.6209
Maximum of log data	3.00379
Mean of log data	-1.07917
Standard Deviation of log data	1.266248
Variance of log data	1.603383

Normal Distribution Test	
Lilliefors Test Statisitic	0.377
Lilliefors 5% Critical Value	0.058169
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.989707

Gamma Distribution Test	
A-D Test Statistic	18.1581
A-D 5% Critical Value	0.79895
K-S Test Statistic	0.221427
K-S 5% Critical Value	0.062473
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.889902
Adjusted Gamma UCL	0.890631

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.211779
Lilliefors 5% Critical Value	0.058169
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.922826
95% Chebyshev (MVUE) UCL	1.113657
97.5% Chebyshev (MVUE) UCL	1.269699
99% Chebyshev (MVUE) UCL	1.576215

95% Non-parametric UCLs	
CLT UCL	0.988864
Adj-CLT UCL (Adjusted for skewness)	1.048893
Mod-t UCL (Adjusted for skewness)	0.99907
Jackknife UCL	0.989707
Standard Bootstrap UCL	0.983773
Bootstrap-t UCL	1.110095
Hall's Bootstrap UCL	1.129555
Percentile Bootstrap UCL	0.999381
BCA Bootstrap UCL	1.060535
95% Chebyshev (Mean, Sd) UCL	1.334181
97.5% Chebyshev (Mean, Sd) UCL	**1.574155**
99% Chebyshev (Mean, Sd) UCL	2.045539

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Type	ERE
Medium	Sediment
Chemical	TCDD TEQ (PCB) - Bird
Units	µg/kg

Data File

Variable: PCB TEQ BIRD

Raw Statistics

Number of Valid Samples	230
Number of Unique Samples	230
Minimum	0.000271
Maximum	3.639277
Mean	0.536318
Median	0.443117
Standard Deviation	0.519076
Variance	0.269439
Coefficient of Variation	0.96785
Skewness	3.461421

Gamma Statistics

k hat	1.284005
k star (bias corrected)	1.270156
Theta hat	0.417691
Theta star	0.422246
nu hat	590.6423
nu star	584.2716
Approx.Chi Square Value (.05)	529.1924
Adjusted Level of Significance	0.048957
Adjusted Chi Square Value	528.8659

Log-transformed Statistics

Minimum of log data	-8.21339
Maximum of log data	1.291785
Mean of log data	-1.0605
Standard Deviation of log data	1.245806
Variance of log data	1.552032

Normal Distribution Test

Lilliefors Test Statisitic	0.238504
Lilliefors 5% Critical Value	0.058421

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	0.592845

Gamma Distribution Test

A-D Test Statistic	8.82919
A-D 5% Critical Value	0.776912
K-S Test Statistic	0.153745
K-S 5% Critical Value	0.061582

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	0.592139
Adjusted Gamma UCL	0.592504

Lognormal Distribution Test

Lilliefors Test Statisitic	0.221722
Lilliefors 5% Critical Value	0.058421

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	0.912888
95% Chebyshev (MVUE) UCL	1.099502
97.5% Chebyshev (MVUE) UCL	1.251619
99% Chebyshev (MVUE) UCL	1.550424

95% Non-parametric UCLs

CLT UCL	0.592616
Adj-CLT UCL (Adjusted for skewness)	0.600963
Mod-t UCL (Adjusted for skewness)	0.594147
Jackknife UCL	0.592845
Standard Bootstrap UCL	0.592156
Bootstrap-t UCL	0.604682
Hall's Bootstrap UCL	0.605042
Percentile Bootstrap UCL	0.593136
BCA Bootstrap UCL	0.606958
95% Chebyshev (Mean, Sd) UCL	0.685509
97.5% Chebyshev (Mean, Sd) UCL	**0.750064**
99% Chebyshev (Mean, Sd) UCL	0.876871

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Type	ERE
Medium	Sediment
Chemical	TCDD TEQ (PCB) - Fish
Units	µg/kg

Data File

Variable: PCB TEQ FISH

Raw Statistics

Number of Valid Samples	230
Number of Unique Samples	230
Minimum	0.000136
Maximum	0.016773
Mean	0.003083
Median	0.002578
Standard Deviation	0.002536
Variance	6.43E-06
Coefficient of Variation	0.822675
Skewness	2.729145

Gamma Statistics

k hat	2.011127
k star (bias corrected)	1.987794
Theta hat	0.001533
Theta star	0.001551
nu hat	925.1186
nu star	914.3852
Approx.Chi Square Value (.05)	845.1852
Adjusted Level of Significance	0.048957
Adjusted Chi Square Value	844.7711

Log-transformed Statistics

Minimum of log data	-8.90654
Maximum of log data	-4.08797
Mean of log data	-6.05068
Standard Deviation of log data	0.781335
Variance of log data	0.610484

Normal Distribution Test

Lilliefors Test Statisitic	0.223257
Lilliefors 5% Critical Value	0.058421

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	0.003359

Gamma Distribution Test

A-D Test Statistic	4.904809
A-D 5% Critical Value	0.766176
K-S Test Statistic	0.126251
K-S 5% Critical Value	0.06096

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	0.003335
Adjusted Gamma UCL	0.003337

Lognormal Distribution Test

Lilliefors Test Statisitic	0.138851
Lilliefors 5% Critical Value	0.058421

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	0.003539
95% Chebyshev (MVUE) UCL	0.004006
97.5% Chebyshev (MVUE) UCL	0.004359
99% Chebyshev (MVUE) UCL	0.005051

95% Non-parametric UCLs

CLT UCL	0.003358
Adj-CLT UCL (Adjusted for skewness)	0.00339
Mod-t UCL (Adjusted for skewness)	0.003364
Jackknife UCL	0.003359
Standard Bootstrap UCL	0.003356
Bootstrap-t UCL	0.003401
Hall's Bootstrap UCL	0.003399
Percentile Bootstrap UCL	0.003357
BCA Bootstrap UCL	0.003376
95% Chebyshev (Mean, Sd) UCL	**0.003812**
97.5% Chebyshev (Mean, Sd) UCL	0.004127
99% Chebyshev (Mean, Sd) UCL	0.004747

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Type	ERE
Medium	Sediment
Chemical	TCDD TEQ (PCB) - Mammal
Units	µg/kg

Data File

Variable: PCB TEQ MAMMAL

Raw Statistics	
Number of Valid Samples	230
Number of Unique Samples	230
Minimum	0.000813
Maximum	0.169053
Mean	0.036352
Median	0.033603
Standard Deviation	0.03008
Variance	0.000905
Coefficient of Variation	0.827479
Skewness	2.625943

Gamma Statistics	
k hat	1.949818
k star (bias corrected)	1.927284
Theta hat	0.018644
Theta star	0.018862
nu hat	896.9163
nu star	886.5507
Approx.Chi Square Value (.05)	818.4301
Adjusted Level of Significance	0.048957
Adjusted Chi Square Value	818.0227

Log-transformed Statistics	
Minimum of log data	-7.11478
Maximum of log data	-1.77754
Mean of log data	-3.59235
Standard Deviation of log data	0.815678
Variance of log data	0.66533

RECOMMENDATION

Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.232768
Lilliefors 5% Critical Value	0.058421
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.039627

Gamma Distribution Test	
A-D Test Statistic	6.208409
A-D 5% Critical Value	0.766778
K-S Test Statistic	0.136736
K-S 5% Critical Value	0.060999
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.039377
Adjusted Gamma UCL	0.039397

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.142258
Lilliefors 5% Critical Value	0.058421
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.042753
95% Chebyshev (MVUE) UCL	0.048636
97.5% Chebyshev (MVUE) UCL	0.053097
99% Chebyshev (MVUE) UCL	0.06186

95% Non-parametric UCLs	
CLT UCL	0.039614
Adj-CLT UCL (Adjusted for skewness)	0.039981
Mod-t UCL (Adjusted for skewness)	0.039685
Jackknife UCL	0.039627
Standard Bootstrap UCL	0.039653
Bootstrap-t UCL	0.040103
Hall's Bootstrap UCL	0.039926
Percentile Bootstrap UCL	0.039886
BCA Bootstrap UCL	0.040033
95% Chebyshev (Mean, Sd) UCL	**0.044997**
97.5% Chebyshev (Mean, Sd) UCL	0.048738
99% Chebyshev (Mean, Sd) UCL	0.056086

Attachment 3

Type	ERE
Medium	Sediment
Chemical	Total TEQ - Bird
Units	µg/kg

Data File

Variable: Total TEQ Bird

Raw Statistics

Number of Valid Samples	235
Number of Unique Samples	235
Minimum	0.000271
Maximum	25.97012
Mean	1.383445
Median	0.898256
Standard Deviation	2.482584
Variance	6.163224
Coefficient of Variation	1.794494
Skewness	6.208038

Gamma Statistics

k hat	0.881062
k star (bias corrected)	0.872651
Theta hat	1.570202
Theta star	1.585336
nu hat	414.0991
nu star	410.146
Approx.Chi Square Value (.05)	364.1909
Adjusted Level of Significance	0.048979
Adjusted Chi Square Value	363.9267

Log-transformed Statistics

Minimum of log data	-8.21339
Maximum of log data	3.256947
Mean of log data	-0.34072
Standard Deviation of log data	1.430486
Variance of log data	2.046291

Normal Distribution Test

Lilliefors Test Statisitic	0.340867
Lilliefors 5% Critical Value	0.057796

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	1.650881

Gamma Distribution Test

A-D Test Statistic	14.53473
A-D 5% Critical Value	0.789904
K-S Test Statistic	0.188813
K-S 5% Critical Value	0.061662

Data do not follow gamma distribution
at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	1.558014
Adjusted Gamma UCL	1.559145

Lognormal Distribution Test

Lilliefors Test Statisitic	0.252788
Lilliefors 5% Critical Value	0.057796

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	2.505049
95% Chebyshev (MVUE) UCL	3.073811
97.5% Chebyshev (MVUE) UCL	3.555096
99% Chebyshev (MVUE) UCL	4.500486

95% Non-parametric UCLs

CLT UCL	1.649822
Adj-CLT UCL (Adjusted for skewness)	1.719899
Mod-t UCL (Adjusted for skewness)	1.661811
Jackknife UCL	1.650881
Standard Bootstrap UCL	1.636676
Bootstrap-t UCL	1.794995
Hall's Bootstrap UCL	1.798697
Percentile Bootstrap UCL	1.676747
BCA Bootstrap UCL	1.722898
95% Chebyshev (Mean, Sd) UCL	2.089351
97.5% Chebyshev (Mean, Sd) UCL	**2.394797**
99% Chebyshev (Mean, Sd) UCL	2.994787

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Type	ERE
Medium	Sediment
Chemical	Total TEQ - Fish
Units	µg/kg

Data File

Variable: Total TEQ Fish

Raw Statistics	
Number of Valid Samples	235
Number of Unique Samples	235
Minimum	0.000136
Maximum	19.93251
Mean	0.770172
Median	0.374163
Standard Deviation	1.919463
Variance	3.684337
Coefficient of Variation	2.492253
Skewness	6.70569

Gamma Statistics	
k hat	0.667784
k star (bias corrected)	0.662096
Theta hat	1.153324
Theta star	1.163232
nu hat	313.8585
nu star	311.1852
Approx.Chi Square Value (.05)	271.3104
Adjusted Level of Significance	0.048979
Adjusted Chi Square Value	271.0831

Log-transformed Statistics	
Minimum of log data	-8.90654
Maximum of log data	2.992352
Mean of log data	-1.17217
Standard Deviation of log data	1.524581
Variance of log data	2.324347

Normal Distribution Test	
Lilliefors Test Statisitic	0.373071
Lilliefors 5% Critical Value	0.057796
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	0.976945

Gamma Distribution Test	
A-D Test Statistic	17.4285
A-D 5% Critical Value	0.804583
K-S Test Statistic	0.215853
K-S 5% Critical Value	0.062346
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	0.883365
Adjusted Gamma UCL	0.884105

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.247321
Lilliefors 5% Critical Value	0.057796
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	1.285057
95% Chebyshev (MVUE) UCL	1.589861
97.5% Chebyshev (MVUE) UCL	1.853892
99% Chebyshev (MVUE) UCL	2.37253

95% Non-parametric UCLs	
CLT UCL	0.976127
Adj-CLT UCL (Adjusted for skewness)	1.034651
Mod-t UCL (Adjusted for skewness)	0.986074
Jackknife UCL	0.976945
Standard Bootstrap UCL	0.979387
Bootstrap-t UCL	1.086925
Hall's Bootstrap UCL	1.128922
Percentile Bootstrap UCL	0.991961
BCA Bootstrap UCL	1.046193
95% Chebyshev (Mean, Sd) UCL	1.315958
97.5% Chebyshev (Mean, Sd) UCL	**1.55212**
99% Chebyshev (Mean, Sd) UCL	2.016015

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Type	ERE
Medium	Sediment
Chemical	Total TEQ - Mammal
Units	µg/kg

Data File

Variable: Total TEQ Mammal

Raw Statistics

Number of Valid Samples	235
Number of Unique Samples	235
Minimum	0.000813
Maximum	20.22292
Mean	0.80521
Median	0.412016
Standard Deviation	1.936447
Variance	3.749828
Coefficient of Variation	2.404896
Skewness	6.722162

Gamma Statistics

k hat	0.734201
k star (bias corrected)	0.727665
Theta hat	1.096716
Theta star	1.106567
nu hat	345.0746
nu star	342.0027
Approx.Chi Square Value (.05)	300.1421
Adjusted Level of Significance	0.048979
Adjusted Chi Square Value	299.9028

Log-transformed Statistics

Minimum of log data	-7.11478
Maximum of log data	3.006817
Mean of log data	-1.03437
Standard Deviation of log data	1.33297
Variance of log data	1.77681

Normal Distribution Test

Lilliefors Test Statisitic	0.373182
Lilliefors 5% Critical Value	0.057796

Data not normal at 5% significance level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	1.013814

Gamma Distribution Test

A-D Test Statistic	17.30526
A-D 5% Critical Value	0.798011
K-S Test Statistic	0.216747
K-S 5% Critical Value	0.062072

Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribution)

Approximate Gamma UCL	0.917513
Adjusted Gamma UCL	0.918245

Lognormal Distribution Test

Lilliefors Test Statisitic	0.212584
Lilliefors 5% Critical Value	0.057796

Data not lognormal at 5% significance level

95% UCLs (Assuming Lognormal Distribution)

95% H-UCL	1.067797
95% Chebyshev (MVUE) UCL	1.297429
97.5% Chebyshev (MVUE) UCL	1.487527
99% Chebyshev (MVUE) UCL	1.860937

95% Non-parametric UCLs

CLT UCL	1.012988
Adj-CLT UCL (Adjusted for skewness)	1.072175
Mod-t UCL (Adjusted for skewness)	1.023046
Jackknife UCL	1.013814
Standard Bootstrap UCL	1.016282
Bootstrap-t UCL	1.105282
Hall's Bootstrap UCL	1.146396
Percentile Bootstrap UCL	1.024532
BCA Bootstrap UCL	1.108996
95% Chebyshev (Mean, Sd) UCL	1.355826
97.5% Chebyshev (Mean, Sd) UCL	**1.594078**
99% Chebyshev (Mean, Sd) UCL	2.062078

RECOMMENDATION

Data are Non-parametric (0.05)

Use 97.5% Chebyshev (Mean, Sd) UCL

Attachment 3

ATTACHMENT 4
HUMAN HEALTH RISK – CURRENT CONDITIONS

TABLE 4-1 (RAGS PT. D TABLE 3.1 RME)
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
Lower Passaic River

Scenario Timeframe: Current
Medium: Fish
Exposure Medium: Fish

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Fish	TCDD-TEQ (D/F)	mg/kg	0.000200	NA	0.0005000	0.00025	mg/kg	97.5% Chebyshev	Nonparametric
	TCDD-TEQ (PCBs)	mg/kg	0.000060	Log	0.0002200	0.00008	m/gkg	H-UCL	Lognormal
	Total PCBs	mg/kg	2.85	Gamma	13.99	3.42	mg/kg	Approximate Gamma	Gamma Distribution
	4,4'-DDD	mg/kg	0.12	Log	0.68	0.15	mg/kg	H-UCL	Lognormal
	4,4'-DDE	mg/kg	0.25	Log	1.69	0.303	mg/kg	H-UCL	Lognormal
	4,4'-DDT	mg/kg	0.06	Gamma	0.38	0.076	mg/kg	Approximate Gamma	Gamma Distribution
	Total Chlordane	mg/kg	0.73	NA	3.77	1.8	mg/kg	99% Chebyshev	Nonparametric
	Dieldrin	mg/kg	0.02	Gamma	0.14	0.027	mg/kg	Approximate Gamma	Gamma Distribution
	Methyl mercury	mg/kg	0.32	Gamma	0.93	0.347	mg/kg	Approximate Gamma	Gamma Distribution

(1) NA - distribution not determined; Log - lognormal distribution; Gamma - gamma distribution.

TABLE 4-2 (RAGS PT. D TABLE 3.1 RME)
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
Lower Passaic River

Scenario Timeframe: Current
Medium: Crab
Exposure Medium: Crab

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Crab	TCDD TEQ (D/F)	mg/kg	0.0001	NA	0.000750	0.0002	mg/kg	97.5% Chebyshev	Nonparametric
	TCDD TEQ (PCBs)	mg/kg	0.00009	NA	0.004000	0.0004	mg/kg	97.5% Chebyshev	Nonparametric
	Total PCBs	mg/kg	2.4	NA	14	5.2	mg/kg	97.5% Chebyshev	Nonparametric
	4,4'-DDD	mg/kg	0.053	NA	0.82	0.138	mg/kg	97.5% Chebyshev	Nonparametric
	4,4'-DDE	mg/kg	0.137	NA	1.74	0.317	mg/kg	97.5% Chebyshev	Nonparametric
	4,4'-DDT	mg/kg	0.078	NA	0.48	0.235	mg/kg	99% Chebyshev	Nonparametric
	Total Chlordane	mg/kg	0.019	NA	0.20	0.037	mg/kg	97.5% Chebyshev	Nonparametric
	Dieldrin	mg/kg	0.009	NA	0.03	0.018	mg/kg	97.5% Chebyshev	Nonparametric
	Methyl mercury	mg/kg	0.087	Log	0.28	0.097	mg/kg	H-UCL	Lognormal

(1) NA - distribution not determined; Log - lognormal.

TABLE 4-2 (RAGS PT. D TABLE 3.1 RME)
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
Lower Passaic River

Scenario Timeframe: Current
Medium: Crab
Exposure Medium: Crab

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Crab	TCDD TEQ (D/F)	mg/kg	0.0001	NA	0.000750	0.0002	mg/kg	97.5% Chebyshev	Nonparametric
	TCDD TEQ (PCBs)	mg/kg	0.00009	NA	0.004000	0.0004	mg/kg	97.5% Chebyshev	Nonparametric
	Total PCBs	mg/kg	2.4	NA	14	5.2	mg/kg	97.5% Chebyshev	Nonparametric
	4,4'-DDD	mg/kg	0.053	NA	0.82	0.138	mg/kg	97.5% Chebyshev	Nonparametric
	4,4'-DDE	mg/kg	0.137	NA	1.74	0.317	mg/kg	97.5% Chebyshev	Nonparametric
	4,4'-DDT	mg/kg	0.078	NA	0.48	0.235	mg/kg	99% Chebyshev	Nonparametric
	Total Chlordane	mg/kg	0.019	NA	0.20	0.037	mg/kg	97.5% Chebyshev	Nonparametric
	Dieldrin	mg/kg	0.009	NA	0.03	0.018	mg/kg	97.5% Chebyshev	Nonparametric
	Methyl mercury	mg/kg	0.087	Log	0.28	0.097	mg/kg	H-UCL	Lognormal

(1) NA - distribution not determined; Log - lognormal.

TABLE 4-3 (RAGS PT. D TABLE 3.1 CT)
EXPOSURE POINT CONCENTRATION SUMMARY
CENTRAL TENDENCY
Lower Passaic River

Scenario Timeframe: Current
Medium: Fish
Exposure Medium: Fish

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Fish	TCDD-TEQ (D/F)	mg/kg	0.000200	NA	0.0005000	0.00025	mg/kg	97.5% Chebyshev	Nonparametric
	TCDD-TEQ (PCBs)	mg/kg	0.000060	Log	0.0002200	0.00008	m/gkg	H-UCL	Lognormal
	Total PCBs	mg/kg	2.85	Gamma	13.99	3.42	mg/kg	Approximate Gamma	Gamma Distribution
	4,4'-DDD	mg/kg	0.12	Log	0.68	0.15	mg/kg	H-UCL	Lognormal
	4,4'-DDE	mg/kg	0.25	Log	1.69	0.303	mg/kg	H-UCL	Lognormal
	4,4'-DDT	mg/kg	0.06	Gamma	0.38	0.076	mg/kg	Approximate Gamma	Gamma Distribution
	Total Chlordane	mg/kg	0.73	NA	3.77	1.8	mg/kg	99% Chebyshev	Nonparametric
	Dieldrin	mg/kg	0.02	Gamma	0.14	0.027	mg/kg	Approximate Gamma	Gamma Distribution
	Methyl mercury	mg/kg	0.32	Gamma	0.93	0.347	mg/kg	Approximate Gamma	Gamma Distribution

(1) log - lognormal; N - normal; NA - not normal or lognormal

TABLE 4-4 (RAGS PT. D TABLE 3.1 CT)
EXPOSURE POINT CONCENTRATION SUMMARY
CENTRAL TENDENCY
Lower Passaic River

Scenario Timeframe: Current
Medium: Crab
Exposure Medium: Crab

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (2)	Rationale
Crab	TCDD TEQ (D/F)	mg/kg	0.0001	NA	0.000750	0.0002	mg/kg	97.5% Chebyshev	Nonparametric
	TCDD TEQ (PCBs)	mg/kg	0.00009	NA	0.004000	0.0004	mg/kg	97.5% Chebyshev	Nonparametric
	Total PCBs	mg/kg	2.4	NA	14	5.2	mg/kg	97.5% Chebyshev	Nonparametric
	4,4'-DDD	mg/kg	0.053	NA	0.82	0.138	mg/kg	97.5% Chebyshev	Nonparametric
	4,4'-DDE	mg/kg	0.137	NA	1.74	0.317	mg/kg	97.5% Chebyshev	Nonparametric
	4,4'-DDT	mg/kg	0.078	NA	0.48	0.235	mg/kg	99% Chebyshev	Nonparametric
	Total Chlordane	mg/kg	0.019	NA	0.20	0.037	mg/kg	97.5% Chebyshev	Nonparametric
	Dieldrin	mg/kg	0.009	NA	0.03	0.018	mg/kg	97.5% Chebyshev	Nonparametric
	Methyl mercury	mg/kg	0.087	Log	0.28	0.097	mg/kg	H-UCL	Lognormal

(1) log - lognormal; N - normal; NA - not normal or lognormal

TABLE 4-3 (RAGS PT. D TABLE 3.1 CT)
EXPOSURE POINT CONCENTRATION SUMMARY
CENTRAL TENDENCY
Lower Passaic River

Scenario Timeframe: Current
Medium: Fish
Exposure Medium: Fish

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Fish	TCDD-TEQ (D/F)	mg/kg	0.000200	NA	0.0005000	0.00025	mg/kg	97.5% Chebyshev	Nonparametric
	TCDD-TEQ (PCBs)	mg/kg	0.000060	Log	0.0002200	0.00008	m/gkg	H-UCL	Lognormal
	Total PCBs	mg/kg	2.85	Gamma	13.99	3.42	mg/kg	Approximate Gamma	Gamma Distribution
	4,4'-DDD	mg/kg	0.12	Log	0.68	0.15	mg/kg	H-UCL	Lognormal
	4,4'-DDE	mg/kg	0.25	Log	1.69	0.303	mg/kg	H-UCL	Lognormal
	4,4'-DDT	mg/kg	0.06	Gamma	0.38	0.076	mg/kg	Approximate Gamma	Gamma Distribution
	Total Chlordane	mg/kg	0.73	NA	3.77	1.8	mg/kg	99% Chebyshev	Nonparametric
	Dieldrin	mg/kg	0.02	Gamma	0.14	0.027	mg/kg	Approximate Gamma	Gamma Distribution
	Methyl mercury	mg/kg	0.32	Gamma	0.93	0.347	mg/kg	Approximate Gamma	Gamma Distribution

(1) log - lognormal; N - normal; NA - not normal or lognormal

TABLE 4-5 (RAGS PT.D TABLE 4.1)
VALUES USED FOR DAILY INTAKE CALCULATIONS
Lower Passaic River

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Fish
Receptor Population: Angler (Adult)
Receptor Age: >18 Years

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C_f	Chemical Concentration in Fish	mg/kg wet weight	Site-specific		Site-specific		
	IR_f	Ingestion rate of Fish	g/day	25	USEPA, 1997	8	USEPA, 1997	$Intake = \frac{C_f \times IR_f \times EF \times FI \times (1-Loss) \times ED \times CF}{BW \times AT}$
	FI	Fraction from Source	unitless	1	Assumes 100% exposure is from Passaic River	1	Assumes 100% exposure is from Passaic River	
	EF	Exposure Frequency	days/year	365	USEPA, 1989	365	Assumed to be one-half RME	
	ED	Exposure Duration [(2)]	years	24	USEPA, 1989	9	USEPA, 1989	
	Loss	Cooking Loss	g/g	0	Assumes 100% chemical remains in fish	Chemical-specific	--	
	CF	Conversion Factor	kg/g	1.00E-03	--	1.00E-03	--	
	BW	Body Weight	kg	70	Mean adult body weight, males and females (USEPA, 1989)	70	Mean adult body weight, makes and females (USEPA, 1989)	
	AT-C	Averaging Time (Cancer)	days	25550	70-year lifetime exposure x 365 days/year (USEPA, 1989)	25550	70-year lifetime exposure x 365 days/year (USEPA, 1989)	
	AT-NC	Averaging Time (Noncancer)	days	8760	ED (years) x 365 days/year	3285	ED (years) x 365 days/year	

TABLE 4-6 (RAGS PT.D TABLE 4.1)
VALUES FOR DAILY INTAKE CALCULATIONS
Lower Passaic River

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Fish
Receptor Population: Angler (Adolescent)
Receptor Age: 10- 18 Years

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C_f	Chemical Concentration in Fish	mg/kg wet weight	Site-specific		Site-specific		$Intake = \frac{C_f \times IR_f \times EF \times FI \times (1 - Loss) \times ED \times CF}{BW \times AT}$
	IR_f	Ingestion rate of Fish	g/day	17	2/3 the adult ingestion rate (USEPA, 1997)	5	2/3 the adult ingestion rate (USEPA, 1997)	
	FI	Fraction from Source	unitless	1	Assumes 100% exposure is from Passaic River	1	Assumes 100% exposure is from Passaic River	
	EF	Exposure Frequency	days/year	365	USEPA, 1989	365	Based on an annualized ingestion rate	
	ED	Exposure Duration	years	9	Assumed	6	EPA default (USEPA, 1991)	
	Loss	Cooking Loss	g/g	0	Assumes 100% chemical remains in fish	Chemical-specific	--	
	CF	Conversion Factor	kg/g	1.00E-03	--	1.00E-03	--	
	BW	Body Weight	kg	54.5	Mean weight, males and females age 10-17 (USEPA, 2002c)	54.5	Mean weight, males and females age 10-17 (USEPA, 2002c)	
	AT-C	Averaging Time (Cancer)	days	25550	70-year lifetime exposure x 365 days/year (USEPA, 1989)	25550	70-year lifetime exposure x 365 days/year (USEPA, 1989)	
	AT-NC	Averaging Time (Noncancer)	days	3285	ED (years) x 365 days/year	1825	ED (years) x 365 days/year	

TABLE 4-7 (RAGS PT. D TABLE 4.1)
VALUES FOR DAILY INTAKE CALCULATIONS
Lower Passaic River

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Fish
Receptor Population: Angler (Child)
Receptor Age: 0 - 6 Years

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C_f	Chemical Concentration in Fish	mg/kg wet weight	Site-specific		Site-specific		$Intake = \frac{C_f \times IR_f \times EF \times FI \times (1 - Loss) \times ED \times CF}{BW \times AT}$
	IR_f	Ingestion rate of Fish	g/day	8	1/3 of the adult ingestion rate (USEPA, 1997)	3	1/3 of the adult ingestion rate (USEPA, 1997)	
	FI	Fraction from Source	unitless	1	Assumes 100% exposure is from Passaic River	1	Assumes 100% exposure is from Passaic River	
	EF	Exposure Frequency	days/year	365	USEPA, 1989	365	Based on an annualized ingestion rate	
	ED	Exposure Duration	years	6	EPA default (USEPA, 1991)	3	Assumed	
	Loss	Cooking Loss	g/g	0	Assumes 100% chemical remains in fish	Chemical-specific	--	
	CF	Conversion Factor	kg/g	1.00E-03	--	1.00E-03	--	
	BW	Body Weight	kg	15	Mean child weight (USEPA, 1989)	15	Mean child weight (USEPA, 1989)	
	AT-C	Averaging Time (Cancer)	days	25550	70-year lifetime exposure x 365 days/year (USEPA, 1989)	25550	70-year lifetime exposure x 365 days/year (USEPA, 1989)	
	AT-NC	Averaging Time (Noncancer)	days	2190	ED (years) x 365 days/year	1095	ED (years) x 365 days/year	

TABLE 4-8 (RAGS PT. D TABLE 4.1)
VALUES USED FOR DAILY INTAKE CALCULATIONS
Lower Passaic River

Scenario Timeframe: Current/Future
Medium: Crab
Exposure Medium: Crab
Receptor Population: Angler (Adult)
Receptor Age: >18 Years

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C_b	Chemical Concentration in Crab	mg/kg wet weight	Site-specific		Site-specific		$Intake = \frac{C_b \times IR_b \times EF \times FI \times (1-Loss) \times ED \times CF}{BW \times AT}$
	IR_b	Ingestion rate of Crab	g/day	23	Burger, 2002	16	Burger, 2002	
	FI	Fraction from Source	unitless	1	Assumes 100% exposure is from Passaic River	1	Assumes 100% exposure is from Passaic River	
	EF	Exposure Frequency	days/year	365	USEPA, 1989	365	Based on an annualized ingestion rate	
	ED	Exposure Duration [(2)]	years	24	USEPA, 1989	9	USEPA, 1989	
	Loss	Cooking Loss	g/g	0	Assumes 100% chemical remains in crab	0	No data available	
	CF	Conversion Factor	kg/g	1.00E-03	--	1.00E-03	--	
	BW	Body Weight	kg	70	Mean adult body weight, males and females (USEPA, 1989)	70	Mean adult body weight, males and females (USEPA, 1989)	
	AT-C	Averaging Time (Cancer)	days	25550	70-year lifetime exposure x 365 days/year (USEPA, 1989)	25550	70-year lifetime exposure x 365 days/year (USEPA, 1989)	
	AT-NC	Averaging Time (Noncancer)	days	8760	ED (years) x 365 days/year	3285	ED (years) x 365 days/year	

TABLE 4-9 (RAGS PT. D TABLE 4.1)
VALUES FOR DAILY INTAKE CALCULATIONS
Lower Passaic River

Scenario Timeframe: Current/Future
Medium: Crab
Exposure Medium: Crab
Receptor Population: Angler (Adolescent)
Receptor Age: 10 - 18 Years

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C_b	Chemical Concentration in Crab	mg/kg wet weight	Site-specific		Site-specific		$\text{Intake} = \frac{C_b \times IR_b \times EF \times FI \times (1 - Loss) \times ED \times CF}{BW \times AT}$
	IR_b	Ingestion rate of Crab	g/day	15	2/3 the adult ingestion rate (USEPA, 1997)	11	2/3 the adult ingestion rate (USEPA, 1997)	
	FI	Fraction from Source	unitless	1	Assumes 100% exposure is from Passaic River	1	Assumes 100% exposure is from Passaic River	
	EF	Exposure Frequency	days/year	365	USEPA, 1989	365	Based on an annualized ingestion rate	
	ED	Exposure Duration	years	9	Assumed (from age 10 through 18)	6	Standard EPA default (USEPA, 1991)	
	Loss	Cooking Loss	g/g	0	Assumes 100% chemical remains in fish	Chemical-specific	--	
	CF	Conversion Factor	kg/g	1.00E-03	--	1.00E-03	--	
	BW	Body Weight	kg	54.5	Mean weight, males and females age 10-17 (USEPA, 2002c)	54.5	Mean weight, males and females age 10-17 (USEPA, 2002c)	
	AT-C	Averaging Time (Cancer)	days	25550	70-year lifetime exposure x 365 days/year (USEPA, 1989)	25550	70-year lifetime exposure x 365 days/year (USEPA, 1989)	
	AT-NC	Averaging Time (Noncancer)	days	3285	ED (years) x 365 days/year	1825	ED (years) x 365 days/year	

TABLE 4-10 (RAGS PT. D TABLE 4.1)
VALUES FOR DAILY INTAKE CALCULATIONS
Lower Passaic River

Scenario Timeframe: Current/Future
Medium: Crab
Exposure Medium: Crab
Receptor Population: Angler (Child)
Receptor Age: 0 - 6 Years

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C_b	Chemical Concentration in Crab	mg/kg wet weight	Site-specific		Site-specific		$Intake = \frac{C_b \times IR_b \times EF \times FI \times (1-Loss) \times ED \times CF}{BW \times AT}$
	IR_b	Ingestion rate of Crab	g/day	8	1/3 of the adult ingestion rate (USEPA, 1997)	5	1/3 of the adult ingestion rate (USEPA, 1997)	
	FI	Fraction from Source	unitless	1	Assumes 100% exposure is from Passaic River	1	Assumes 100% exposure is from Passaic River	
	EF	Exposure Frequency	days/year	365	USEPA, 1989	365	Based on an annualized ingestion rate	
	ED	Exposure Duration	years	6	Standard EPA default (USEPA, 1991)	3	Assumed	
	Loss	Cooking Loss	g/g	0	Assumes 100% chemical remains in crab	0	No data available	
	CF	Conversion Factor	kg/g	1.00E-03	--	1.00E-03	--	
	BW	Body Weight	kg	15	Standard EPA default (USEPA, 1991)	15	Standard EPA default (USEPA, 1991)	
	AT-C	Averaging Time (Cancer)	days	25550	70-year lifetime exposure x 365 days/year (USEPA, 1989)	25550	70-year lifetime exposure x 365 days/year (USEPA, 1989)	
	AT-NC	Averaging Time (Noncancer)	days	2190	ED (years) x 365 days/year	1095	ED (years) x 365 days/year	

TABLE 4-11 (RAGS PT. D TABLE 5.1)
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
Lower Passaic River

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
TCDD TEQ	--	--	--	--	--	--	--	--	IRIS	8/23/2006
Total PCBs (2)	Chronic	2.0E-05	mg/kg-day	1.0E+00	2.0E-05	mg/kg-day	Immune System, eye	300	IRIS	8/23/2006
4,4'-DDD	--	--	--	--	--	--	--	--	IRIS	8/23/2006
4,4'-DDE	--	--	--	--	--	--	--	--	IRIS	8/23/2006
4,4'-DDT	Chronic	5.0E-04	mg/kg-day	1.0E+00	5.0E-04	mg/kg-day	liver	100	IRIS	8/23/2006
Chlordane	Chronic	5.0E-04	mg/kg-day	1.0E+00	5.0E-04	mg/kg-day	liver	300	IRIS	8/23/2006
Dieldrin	Chronic	5.0E-05	mg/kg-day	1.0E+00	5.0E-05	mg/kg-day	liver	100	IRIS	8/23/2006
Methylmercury	Chronic	1.0E-04	mg/kg-day	1.0E+00	1.0E-04	mg/kg-day	central nervous system	10	IRIS	8/23/2006

Footnote Instructions:

(1) Per USEPA's Dermal Guidance Document (USEPA, 2004), Exhibit 4-1,

(2) Based on the noncancer toxicity values for Aroclor 1254.

TABLE 4-12 (RAGS PT D TABLE 6.1)
CANCER TOXICITY DATA -- ORAL/DERMAL
Lower Passaic River

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units	(1)	Value	Units	(2)	Source(s)	Date(s) (MM/DD/YYYY)
TCDD TEQ	1.50E+05	$(mg/kg\text{-}day)^{-1}$	100%	1.50E+05	$(mg/kg\text{-}day)^{-1}$	B2	HEAST	07/31/97
Total PCBs	2.00E+00	$(mg/kg\text{-}day)^{-1}$	100%	2.00E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	8/23/2006
Total PCBs (3)	1.00E+00	$(mg/kg\text{-}day)^{-1}$	100%	1.00E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	8/23/2006
4,4'-DDD	2.40E-01	$(mg/kg\text{-}day)^{-1}$	100%	2.40E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	8/23/2006
4,4'-DDE	3.40E-01	$(mg/kg\text{-}day)^{-1}$	100%	3.40E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	8/23/2006
4,4'-DDT	3.40E-01	$(mg/kg\text{-}day)^{-1}$	100%	3.40E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	8/23/2006
Chlordane	3.50E-01	$(mg/kg\text{-}day)^{-1}$	100%	3.50E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	8/23/2006
Dieldrin	1.60E+01	$(mg/kg\text{-}day)^{-1}$	100%	1.60E+01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	8/23/2006
Methylmercury	--	--	100%	--	--	C	IRIS	8/23/2006

(1) Per USEPA's Dermal Guidance Document (USEPA, 2004a), Exhibit 4-1.

(2) Weight of eveidence: B2 - probable human carcinogen; C- possible human carcinogen

(3) Central estimate slope factor for exposures to PCBs via ingestion of fish

IRIS - Integrated Risk Information System

HEAST - Health Effects Assessment Summary Tables

TABLE 4-13 (RAGS PT D TABLE 7a.1 RME)
CALCULATION OF CHEMICAL CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Lower Passaic River

Scenario Timeframe: Current/Future
Receptor Population: Angler (Adult)
Receptor Age: >18 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk
							Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	3E-04	mg/kg	3.1E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	5.E-03
				TCDD TEQ (PCBs)	8E-05	mg/kg	9.8E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-03
				Total PCBs	3E+00	mg/kg	4.2E-04	mg/kg-day	2.0E+00	(mg/kg-day)-1	8.E-04
				4,4'-DDD	2E-01	mg/kg	1.8E-05	mg/kg-day	2.4E-01	(mg/kg-day)-1	4.E-06
				4,4'-DDE	3E-01	mg/kg	3.7E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-05
				4,4'-DDT	8E-02	mg/kg	9.3E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.E-06
				Total Chlordane	2E+00	mg/kg	2.2E-04	mg/kg-day	3.5E-01	(mg/kg-day)-1	8.E-05
				Dieldrin	3E-02	mg/kg	3.3E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	5.E-05
				Methyl mercury	3E-01	mg/kg	4.2E-05	mg/kg-day	--	--	ND
			Exp. Route Total								7.E-03
		Exposure Point Total									7.E-03
	Exposure Medium Total										7.E-03
Medium Total											
Crab				TCDD TEQ (D/F)	2E-04	mg/kg	2.3E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	3.E-03
				TCDD TEQ (PCBs)	4E-04	mg/kg	4.5E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	7.E-03
				Total PCBs	5E+00	mg/kg	5.9E-04	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.E-03
				4,4'-DDD	1E-01	mg/kg	1.6E-05	mg/kg-day	2.4E-01	(mg/kg-day)-1	4.E-06
				4,4'-DDE	3E-01	mg/kg	3.6E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-05
				4,4'-DDT	2E-01	mg/kg	2.6E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	9.E-06
				Total Chlordane	4E-02	mg/kg	4.2E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.E-06
				Dieldrin	2E-02	mg/kg	2.0E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	3.E-05
				Methyl mercury	1E-01	mg/kg	1.1E-05	mg/kg-day	--	--	ND
			Exp. Route Total								1.E-02
		Exposure Point Total									1.E-02
	Exposure Medium Total										1.E-02
Medium Total											

ND - not determined because toxicity values are not available for this exposure route.
mg/kg - milligram per kilogram

TABLE 4-14 (RAGS PT D TABLE 7a.1 RME)
CALCULATION OF CHEMICAL CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Lower Passaic River

Scenario Timeframe: Current/Future
Receptor Population: Angler (Adolescent)
Receptor Age: 10 - 18 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk
							Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	3E-04	mg/kg	9.8E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-03
				TCDD TEQ (PCBs)	8E-05	mg/kg	3.1E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	5.E-04
				Total PCBs	3E+00	mg/kg	1.3E-04	mg/kg-day	2.0E+00	(mg/kg-day)-1	3.E-04
				4,4'-DDD	2E-01	mg/kg	5.9E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.E-06
				4,4'-DDE	3E-01	mg/kg	1.2E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.E-06
				4,4'-DDT	8E-02	mg/kg	3.0E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-06
				Total Chlordane	2E+00	mg/kg	7.1E-05	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.E-05
				Dieldrin	3E-02	mg/kg	1.1E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.E-05
				Methyl mercury	3E-01	mg/kg	1.4E-05	mg/kg-day	--	--	ND
			Exp. Route Total								2.E-03
		Exposure Point Total									2.E-03
	Exposure Medium Total										2.E-03
Medium Total											
Crab				TCDD TEQ	2E-04	mg/kg	7.1E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-03
					4E-04	mg/kg	1.4E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-03
				Total PCBs	5E+00	mg/kg	1.8E-04	mg/kg-day	2.0E+00	(mg/kg-day)-1	4.E-04
				4,4'-DDD	1E-01	mg/kg	4.9E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.E-06
				4,4'-DDE	3E-01	mg/kg	1.1E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.E-06
				4,4'-DDT	2E-01	mg/kg	8.3E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.E-06
				Total Chlordane	4E-02	mg/kg	1.3E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.E-07
				Dieldrin	2E-02	mg/kg	6.4E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	1.E-05
				Methyl mercury	1E-01	mg/kg	3.4E-06	mg/kg-day	--	--	ND
			Exp. Route Total								4.E-03
		Exposure Point Total									4.E-03
	Exposure Medium Total										4.E-03
Medium Total											

ND - not determined because a toxicity value is not available for this exposure route.
mg/kg - milligram per kilogram

TABLE 4-15 (RAGS PT D TABLE 7a.1 RME)
CALCULATION OF CHEMICAL CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Lower Passaic River

Scenario Timeframe: Current/Future
Receptor Population: Angler (Child)
Receptor Age: 0 - 6 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk
							Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	3E-04	mg/kg	1.2E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-03
				TCDD TEQ (PCBs)	8E-05	mg/kg	3.8E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	6.E-04
				Total PCBs	3E+00	mg/kg	1.6E-04	mg/kg-day	2.0E+00	(mg/kg-day)-1	3.E-04
				4,4'-DDD	2E-01	mg/kg	7.1E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.E-06
				4,4'-DDE	3E-01	mg/kg	1.4E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	5.E-06
				4,4'-DDT	8E-02	mg/kg	3.6E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-06
				Total Chlordane	2E+00	mg/kg	8.6E-05	mg/kg-day	3.5E-01	(mg/kg-day)-1	3.E-05
				Dieldrin	3E-02	mg/kg	1.3E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.E-05
				Methyl mercury	3E-01	mg/kg	1.7E-05	mg/kg-day	--	--	ND
			Exp. Route Total								3.E-03
		Exposure Point Total									3.E-03
	Exposure Medium Total										3.E-03
Medium Total											
Crab				TCDD TEQ (D/F)	2E-04	mg/kg	9.1E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-03
				TCDD TEQ (PCBs)	4E-04	mg/kg	1.8E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	3.E-03
				Total PCBs	5E+00	mg/kg	2.4E-04	mg/kg-day	2.0E+00	(mg/kg-day)-1	5.E-04
				4,4'-DDD	1E-01	mg/kg	6.3E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.E-06
				4,4'-DDE	3E-01	mg/kg	1.4E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	5.E-06
				4,4'-DDT	2E-01	mg/kg	1.1E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.E-06
				Total Chlordane	4E-02	mg/kg	1.7E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	6.E-07
				Dieldrin	2E-02	mg/kg	8.2E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	1.E-05
				Methyl mercury	1E-01	mg/kg	4.4E-06	mg/kg-day	--	--	ND
			Exp. Route Total								5.E-03
		Exposure Point Total									5.E-03
	Exposure Medium Total										5.E-03
Medium Total											

ND - not determined because a toxicity value is unavailable for this exposure route.
mg/kg - milligram per kilogram

TABLE 4-16 (RAGS PT D TABLE 7b.1 RME)
CALCULATION OF CHEMICAL NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Lower Passaic River

Scenario Timeframe: Current/Future
Receptor Population: Angler (Adult)
Receptor Age: >18 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	3E-04	mg/kg	8.93E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	8E-05	mg/kg	2.86E-08	mg/kg-day	--	--	ND
				Total PCBs	3E+00	mg/kg	1.22E-03	mg/kg-day	2.0E-05	mg/kg-day	61
				4,4'-DDD	2E-01	mg/kg	5.36E-05	mg/kg-day	--	--	ND
				4,4'-DDE	3E-01	mg/kg	1.08E-04	mg/kg-day	--	--	ND
				4,4'-DDT	8E-02	mg/kg	2.71E-05	mg/kg-day	5.0E-04	mg/kg-day	0.05
				Total Chlordane	2E+00	mg/kg	6.43E-04	mg/kg-day	5.0E-04	mg/kg-day	1
				Dieldrin	3E-02	mg/kg	9.64E-06	mg/kg-day	5.0E-05	mg/kg-day	0.2
				Methyl mercury	3E-01	mg/kg	1.24E-04	mg/kg-day	1.0E-04	mg/kg-day	1
			Exp. Route Total								64
		Exposure Point Total									64
	Exposure Medium Total										64
Medium Total											
Crab				TCDD TEQ (D/F)	2E-04	mg/kg	6.6E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	4E-04	mg/kg	4.5E-08	mg/kg-day	--	--	ND
				Total PCBs	5E+00	mg/kg	1.7E-03	mg/kg-day	2.0E-05	mg/kg-day	85
				4,4'-DDD	1E-01	mg/kg	4.5E-05	mg/kg-day	--	--	ND
				4,4'-DDE	3E-01	mg/kg	1.0E-04	mg/kg-day	--	--	ND
				4,4'-DDT	2E-01	mg/kg	7.7E-05	mg/kg-day	5.0E-04	mg/kg-day	0.2
				Total Chlordane	4E-02	mg/kg	1.2E-05	mg/kg-day	5.0E-04	mg/kg-day	0.02
				Dieldrin	2E-02	mg/kg	5.9E-06	mg/kg-day	5.0E-05	mg/kg-day	0.1
				Methyl mercury	1E-01	mg/kg	3.2E-05	mg/kg-day	1.0E-04	mg/kg-day	0.3
			Exp. Route Total								86
		Exposure Point Total									86
	Exposure Medium Total										86
Medium Total											

ND - not determined because toxicity values are not available for this exposure route.
mg/kg - milligram per kilogram

TABLE 4-17 (RAGS PT D TABLE 7b.1 RME)
CALCULATION OF CHEMICAL NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Lower Passaic River

Scenario Timeframe: Current/Future
Receptor Population: Angler (Adolescent)
Receptor Age: 10 - 18 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	3E-04	mg/kg	7.65E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	8E-05	mg/kg	2.45E-08	mg/kg-day	--	--	ND
				Total PCBs	3E+00	mg/kg	1.05E-03	mg/kg-day	2.0E-05	mg/kg-day	52
				4,4'-DDD	2E-01	mg/kg	4.59E-05	mg/kg-day	--	--	ND
				4,4'-DDE	3E-01	mg/kg	9.27E-05	mg/kg-day	--	--	ND
				4,4'-DDT	8E-02	mg/kg	2.32E-05	mg/kg-day	5.0E-04	mg/kg-day	0.05
				Total Chlordane	2E+00	mg/kg	5.50E-04	mg/kg-day	5.0E-04	mg/kg-day	1
				Dieldrin	3E-02	mg/kg	8.26E-06	mg/kg-day	5.0E-05	mg/kg-day	0.2
				Methyl mercury	3E-01	mg/kg	1.06E-04	mg/kg-day	1.0E-04	mg/kg-day	1
			Exp. Route Total								55
		Exposure Point Total									55
	Exposure Medium Total										55
Medium Total											
Crab				TCDD TEQ (D/F)	2E-04	mg/kg	5.5E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	4E-04	mg/kg	1.1E-07	mg/kg-day	--	--	ND
				Total PCBs	5E+00	mg/kg	1.4E-03	mg/kg-day	2.0E-05	mg/kg-day	72
				4,4'-DDD	1E-01	mg/kg	3.8E-05	mg/kg-day	--	--	ND
				4,4'-DDE	3E-01	mg/kg	8.7E-05	mg/kg-day	--	--	ND
				4,4'-DDT	2E-01	mg/kg	6.5E-05	mg/kg-day	5.0E-04	mg/kg-day	0.1
				Total Chlordane	4E-02	mg/kg	1.0E-05	mg/kg-day	5.0E-04	mg/kg-day	0.02
				Dieldrin	2E-02	mg/kg	5.0E-06	mg/kg-day	5.0E-05	mg/kg-day	0.1
				Methyl mercury	1E-01	mg/kg	2.7E-05	mg/kg-day	1.0E-04	mg/kg-day	0.3
			Exp. Route Total								72
		Exposure Point Total									72
	Exposure Medium Total										72
Medium Total											

ND - not determined because a toxicity value is not available for this exposure route.
mg/kg - milligram per kilogram

TABLE 4-18 (RAGS PT D TABLE 7.b.1 RME)
CALCULATION OF CHEMICAL NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Lower Passaic River

Scenario Timeframe: Current/Future
Receptor Population: Angler (Child)
Receptor Age: 0 - 6 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	3E-04	mg/kg	1.39E-07	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	8E-05	mg/kg	4.44E-08	mg/kg-day	--	--	ND
				Total PCBs	3E+00	mg/kg	1.90E-03	mg/kg-day	2.0E-05	mg/kg-day	95
				4,4'-DDD	2E-01	mg/kg	8.33E-05	mg/kg-day	--	--	ND
				4,4'-DDE	3E-01	mg/kg	1.68E-04	mg/kg-day	--	--	ND
				4,4'-DDT	8E-02	mg/kg	4.22E-05	mg/kg-day	5.0E-04	mg/kg-day	0.1
				Total Chlordane	2E+00	mg/kg	1.00E-03	mg/kg-day	5.0E-04	mg/kg-day	2
				Dieldrin	3E-02	mg/kg	1.50E-05	mg/kg-day	5.0E-05	mg/kg-day	0.3
				Methyl mercury	3E-01	mg/kg	1.93E-04	mg/kg-day	1.0E-04	mg/kg-day	2
			Exp. Route Total								99
		Exposure Point Total									99
	Exposure Medium Total										99
Medium Total											
Crab				TCDD TEQ (D/F)	2E-04	mg/kg	1.1E-07	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	4E-04	mg/kg	2.1E-07	mg/kg-day	--	--	ND
				Total PCBs	5E+00	mg/kg	2.8E-03	mg/kg-day	2.0E-05	mg/kg-day	139
				4,4'-DDD	1E-01	mg/kg	7.4E-05	mg/kg-day	--	--	ND
				4,4'-DDE	3E-01	mg/kg	1.7E-04	mg/kg-day	--	--	ND
				4,4'-DDT	2E-01	mg/kg	1.3E-04	mg/kg-day	5.0E-04	mg/kg-day	0.3
				Total Chlordane	4E-02	mg/kg	2.0E-05	mg/kg-day	5.0E-04	mg/kg-day	0.04
				Dieldrin	2E-02	mg/kg	9.6E-06	mg/kg-day	5.0E-05	mg/kg-day	0.2
				Methyl mercury	1E-01	mg/kg	5.2E-05	mg/kg-day	1.0E-04	mg/kg-day	0.5
			Exp. Route Total								140
		Exposure Point Total									140
	Exposure Medium Total										140
Medium Total											

ND - not determined because a toxicity value is unavailable for this exposure route.
mg/kg - milligram per kilogram

TABLE 4-19 (RAGS PT D TABLE 7a.1 CT)
CALCULATION OF CHEMICAL CANCER RISKS
CENTRAL TENDENCY
Lower Passaic River

Scenario Timeframe: Current/Future
Receptor Population: Angler (Adult)
Receptor Age: >18 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk
							Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	3E-04	mg/kg	1.9E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	3.E-04
				TCDD TEQ (PCBs)	8E-05	mg/kg	6.0E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	9.E-05
				Total PCBs	3E+00	mg/kg	4.0E-05	mg/kg-day	1.0E+00	(mg/kg-day)-1	4.E-05
				4,4'-DDD	2E-01	mg/kg	1.5E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	4.E-07
				4,4'-DDE	3E-01	mg/kg	2.9E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-06
				4,4'-DDT	8E-02	mg/kg	7.8E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.E-07
				Total Chlordane	2E+00	mg/kg	1.8E-05	mg/kg-day	3.5E-01	(mg/kg-day)-1	6.E-06
				Dieldrin	3E-02	mg/kg	2.8E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	4.E-06
				Methyl mercury	3E-01	mg/kg	5.1E-06	mg/kg-day	--	--	ND
			Exp. Route Total								4.E-04
		Exposure Point Total									4.E-04
	Exposure Medium Total										4.E-04
Medium Total											
Crab				TCDD TEQ (D/F)	2E-04	mg/kg	5.9E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	9.E-04
				TCDD TEQ (PCBs)	4E-04	mg/kg	1.2E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-03
				Total PCBs	5E+00	mg/kg	1.5E-04	mg/kg-day	1.0E+00	(mg/kg-day)-1	2.E-04
				4,4'-DDD	1E-01	mg/kg	4.1E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.E-06
				4,4'-DDE	3E-01	mg/kg	9.3E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.E-06
				4,4'-DDT	2E-01	mg/kg	6.9E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-06
				Total Chlordane	4E-02	mg/kg	1.1E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	4.E-07
				Dieldrin	2E-02	mg/kg	5.3E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	8.E-06
				Methyl mercury	1E-01	mg/kg	2.9E-06	mg/kg-day	--	--	ND
			Exp. Route Total								3.E-03
		Exposure Point Total									3.E-03
	Exposure Medium Total										3.E-03
Medium Total											

ND - not determined because a toxicity value is not available for this exposure route.
mg/kg - milligram per kilogram

TABLE 4-20 (RAGS PT D TABLE 7a.1 CT)
CALCULATION OF CHEMICAL CANCER RISKS
CENTRAL TENDENCY
Lower Passaic River

Scenario Timeframe: Current/Future
Receptor Population: Angler (Adolescent)
Receptor Age: 10 - 18 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk
							Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	3E-04	mg/kg	1.1E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-04
				TCDD TEQ (PCBs)	8E-05	mg/kg	3.4E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	5.E-05
				Total PCBs	3E+00	mg/kg	2.3E-05	mg/kg-day	1.0E+00	(mg/kg-day)-1	2.E-05
				4,4'-DDD	2E-01	mg/kg	8.8E-07	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.E-07
				4,4'-DDE	3E-01	mg/kg	1.7E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	6.E-07
				4,4'-DDT	8E-02	mg/kg	4.5E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-07
				Total Chlordane	2E+00	mg/kg	1.0E-05	mg/kg-day	3.5E-01	(mg/kg-day)-1	4.E-06
				Dieldrin	3E-02	mg/kg	1.6E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	3.E-06
				Methyl mercury	3E-01	mg/kg	2.9E-06	mg/kg-day	--	(mg/kg-day)-1	ND
			Exp. Route Total								2.E-04
		Exposure Point Total									2.E-04
	Exposure Medium Total										2.E-04
Medium Total											
Crab				TCDD TEQ (D/F)	2E-04	mg/kg	3.5E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	5.E-04
				TCDD TEQ (PCBs)	4E-04	mg/kg	6.9E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-03
				Total PCBs	5E+00	mg/kg	9.0E-05	mg/kg-day	1.0E+00	(mg/kg-day)-1	9.E-05
				4,4'-DDD	1E-01	mg/kg	2.4E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	6.E-07
				4,4'-DDE	3E-01	mg/kg	5.5E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-06
				4,4'-DDT	2E-01	mg/kg	4.1E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-06
				Total Chlordane	4E-02	mg/kg	6.4E-07	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.E-07
				Dieldrin	2E-02	mg/kg	3.1E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	5.E-06
				Methyl mercury	1E-01	mg/kg	1.7E-06	mg/kg-day	--	(mg/kg-day)-1	ND
			Exp. Route Total								2.E-03
		Exposure Point Total									2.E-03
	Exposure Medium Total										2.E-03
Medium Total											

ND - not determined because a toxicity value is not available for this exposure route.
mg/kg - milligram per kilogram

TABLE 4-21 (RAGS PT D TABLE 7a.1 CT)
CALCULATION OF CHEMICAL CANCER RISKS
CENTRAL TENDENCY
Lower Passaic River

Scenario Timeframe: Current/Future
Receptor Population: Angler (Child)
Receptor Age: 0 - 6 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk
							Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	3E-04	mg/kg	9.7E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-04
				TCDD TEQ (PCBs)	8E-05	mg/kg	3.1E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	5.E-05
				Total PCBs	3E+00	mg/kg	2.1E-05	mg/kg-day	1.0E+00	(mg/kg-day)-1	2.E-05
				4,4'-DDD	2E-01	mg/kg	8.0E-07	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.E-07
				4,4'-DDE	3E-01	mg/kg	1.5E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	5.E-07
				4,4'-DDT	8E-02	mg/kg	4.1E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-07
				Total Chlordane	2E+00	mg/kg	9.2E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	3.E-06
				Dieldrin	3E-02	mg/kg	1.4E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.E-06
				Methyl mercury	3E-01	mg/kg	2.6E-06	mg/kg-day	--	(mg/kg-day)-1	ND
			Exp. Route Total								2.E-04
		Exposure Point Total									2.E-04
	Exposure Medium Total										2.E-04
Medium Total											
Crab				TCDD TEQ (D/F)	2E-04	mg/kg	2.9E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	4.E-04
				TCDD TEQ (PCBs)	4E-04	mg/kg	5.7E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	9.E-04
				Total PCBs	5E+00	mg/kg	7.4E-05	mg/kg-day	1.0E+00	(mg/kg-day)-1	7.E-05
				4,4'-DDD	1E-01	mg/kg	2.0E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	5.E-07
				4,4'-DDE	3E-01	mg/kg	4.5E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-06
				4,4'-DDT	2E-01	mg/kg	3.4E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-06
				Total Chlordane	4E-02	mg/kg	5.3E-07	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.E-07
				Dieldrin	2E-02	mg/kg	2.6E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	4.E-06
				Methyl mercury	1E-01	mg/kg	1.4E-06	mg/kg-day	--	(mg/kg-day)-1	ND
			Exp. Route Total								1.E-03
		Exposure Point Total									1.E-03
	Exposure Medium Total										1.E-03
Medium Total											

ND - not determined because a toxicity value is not available for this exposure route.
mg/kg - milligram per kilogram

TABLE 4-22 (RAGS PT D TABLE 7b.1 CT)
CALCULATION OF CHEMICAL NON-CANCER HAZARDS
CENTRAL TENDENCY
Lower Passaic River

Scenario Timeframe: Current/Future
Receptor Population: Angler (Adult)
Receptor Age: >18 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	3E-04	mg/kg	1.46E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	8E-05	mg/kg	4.66E-09	mg/kg-day	--	--	ND
				Total PCBs	3E+00	mg/kg	3.13E-04	mg/kg-day	2.0E-05	mg/kg-day	16
				4,4'-DDD	2E-01	mg/kg	1.20E-05	mg/kg-day	--	--	ND
				4,4'-DDE	3E-01	mg/kg	2.25E-05	mg/kg-day	--	--	ND
				4,4'-DDT	8E-02	mg/kg	6.08E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Total Chlordane	2E+00	mg/kg	1.38E-04	mg/kg-day	5.0E-04	mg/kg-day	0.3
				Dieldrin	3E-02	mg/kg	2.16E-06	mg/kg-day	5.0E-05	mg/kg-day	0.04
				Methyl mercury	3E-01	mg/kg	3.97E-05	mg/kg-day	1.0E-04	mg/kg-day	0.4
			Exp. Route Total								16
		Exposure Point Total									16
	Exposure Medium Total										16
Medium Total											
Crab				TCDD TEQ (D/F)	2E-04	mg/kg	4.6E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	4E-04	mg/kg	9.1E-08	mg/kg-day	--	--	ND
				Total PCBs	5E+00	mg/kg	1.2E-03	mg/kg-day	2.0E-05	mg/kg-day	59
				4,4'-DDD	1E-01	mg/kg	3.2E-05	mg/kg-day	--	--	ND
				4,4'-DDE	3E-01	mg/kg	7.2E-05	mg/kg-day	--	--	ND
				4,4'-DDT	2E-01	mg/kg	5.4E-05	mg/kg-day	5.0E-04	mg/kg-day	0.1
				Total Chlordane	4E-02	mg/kg	8.5E-06	mg/kg-day	5.0E-04	mg/kg-day	0.02
				Dieldrin	2E-02	mg/kg	4.1E-06	mg/kg-day	5.0E-05	mg/kg-day	0.1
				Methyl mercury	1E-01	mg/kg	2.2E-05	mg/kg-day	1.0E-04	mg/kg-day	0.2
			Exp. Route Total								60
		Exposure Point Total									60
	Exposure Medium Total										60
Medium Total											

ND - not determined because a toxicity value is not available for this exposure route.
mg/kg - milligram per kilogram

TABLE 4-23 (RAGS PT D TABLE 7b.1 CT)
CALCULATION OF CHEMICAL NON-CANCER HAZARDS
CENTRAL TENDENCY
Lower Passaic River

Scenario Timeframe: Current/Future
Receptor Population: Angler (Adolescent)
Receptor Age: 10 - 18 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	3E-04	mg/kg	1.2E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	8E-05	mg/kg	4.0E-09	mg/kg-day	--	--	ND
				Total PCBs	3E+00	mg/kg	2.7E-04	mg/kg-day	2.0E-05	mg/kg-day	13
				4,4'-DDD	2E-01	mg/kg	1.0E-05	mg/kg-day	--	--	ND
				4,4'-DDE	3E-01	mg/kg	1.9E-05	mg/kg-day	--	--	ND
				4,4'-DDT	8E-02	mg/kg	5.2E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Total Chlordane	2E+00	mg/kg	1.2E-04	mg/kg-day	5.0E-04	mg/kg-day	0.2
				Dieldrin	3E-02	mg/kg	1.8E-06	mg/kg-day	5.0E-05	mg/kg-day	0.04
				Methyl mercury	3E-01	mg/kg	3.4E-05	mg/kg-day	1.0E-04	mg/kg-day	0.3
			Exp. Route Total								14
		Exposure Point Total									14
	Exposure Medium Total										14
Medium Total											
Crab				TCDD TEQ (D/F)	2E-04	mg/kg	4.0E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	4E-04	mg/kg	8.1E-08	mg/kg-day	--	--	ND
				Total PCBs	5E+00	mg/kg	1.0E-03	mg/kg-day	2.0E-05	mg/kg-day	52
				4,4'-DDD	1E-01	mg/kg	2.8E-05	mg/kg-day	--	--	ND
				4,4'-DDE	3E-01	mg/kg	6.4E-05	mg/kg-day	--	--	ND
				4,4'-DDT	2E-01	mg/kg	4.7E-05	mg/kg-day	5.0E-04	mg/kg-day	0.1
				Total Chlordane	4E-02	mg/kg	7.5E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Dieldrin	2E-02	mg/kg	3.6E-06	mg/kg-day	5.0E-05	mg/kg-day	0.1
				Methyl mercury	1E-01	mg/kg	2.0E-05	mg/kg-day	1.0E-04	mg/kg-day	0.2
			Exp. Route Total								53
		Exposure Point Total									53
	Exposure Medium Total										53
Medium Total											

ND - not determined because a toxicity value is not available for this exposure route.
mg/kg - milligram per kilogram

TABLE 4-24 (RAGS PT D TABLE 7b.1 CT)
CALCULATION OF CHEMICAL NON-CANCER HAZARDS
CENTRAL TENDENCY
Lower Passaic River

Scenario Timeframe: Current/Future
Receptor Population: Angler (Child)
Receptor Age: 0 - 6 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	3E-04	mg/kg	2.27E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	8E-05	mg/kg	7.25E-09	mg/kg-day	--	--	ND
				Total PCBs	3E+00	mg/kg	4.86E-04	mg/kg-day	2.0E-05	mg/kg-day	24
				4,4'-DDD	2E-01	mg/kg	1.87E-05	mg/kg-day	--	--	ND
				4,4'-DDE	3E-01	mg/kg	3.50E-05	mg/kg-day	--	--	ND
				4,4'-DDT	8E-02	mg/kg	9.46E-06	mg/kg-day	5.0E-04	mg/kg-day	0.02
				Total Chlordane	2E+00	mg/kg	2.14E-04	mg/kg-day	5.0E-04	mg/kg-day	0.4
				Dieldrin	3E-02	mg/kg	3.36E-06	mg/kg-day	5.0E-05	mg/kg-day	0.1
				Methyl mercury	3E-01	mg/kg	6.17E-05	mg/kg-day	1.0E-04	mg/kg-day	0.6
			Exp. Route Total								25
		Exposure Point Total									25
	Exposure Medium Total										25
Medium Total											
Crab				TCDD TEQ (D/F)	2E-04	mg/kg	6.7E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	4E-04	mg/kg	1.3E-07	mg/kg-day	--	--	ND
				Total PCBs	5E+00	mg/kg	1.7E-03	mg/kg-day	2.0E-05	mg/kg-day	87
				4,4'-DDD	1E-01	mg/kg	4.6E-05	mg/kg-day	--	--	ND
				4,4'-DDE	3E-01	mg/kg	1.1E-04	mg/kg-day	--	--	ND
				4,4'-DDT	2E-01	mg/kg	7.8E-05	mg/kg-day	5.0E-04	mg/kg-day	0.2
				Total Chlordane	4E-02	mg/kg	1.2E-05	mg/kg-day	5.0E-04	mg/kg-day	0.02
				Dieldrin	2E-02	mg/kg	6.0E-06	mg/kg-day	5.0E-05	mg/kg-day	0.1
				Methyl mercury	1E-01	mg/kg	3.2E-05	mg/kg-day	1.0E-04	mg/kg-day	0.3
			Exp. Route Total								87
		Exposure Point Total									87
	Exposure Medium Total										87
Medium Total											

ND - not determined because a toxicity value is not available for this exposure route.
mg/kg - milligram per kilogram

PCB ENHANCEMENT ASSESSMENT

Potential for Enhancement of Risk from Dioxin-Like PCBs in Fish

As described in USEPA's 1996 document "PCBs: Cancer Dose Response Assessment and Application to Environmental Mixtures" (USEPA, 1996) the potential exists that the relative concentrations of dioxin-like PCBs may be enhanced in environmental mixtures, particularly in fish due to bioaccumulation of more persistent congeners. In the risk assessment, where congener data are available it is possible to determine the fraction that each dioxin-like congener represents of the total PCB concentration and whether the dioxin-like PCB congeners (non-ortho substituted PCBs and mono-ortho substituted PCBs) (Van den Berg *et al.*, 2005) enhance the overall risk. In application, the analysis of potential PCB congeners requires special consideration regarding the dioxin-like and non-dioxin like congeners and their relative percentage in the total PCB concentration.

Risk Assessment.
To evaluate the percentage of dioxin-like congeners in the total PCB concentration PCB data from White perch and crab from the USEPA 1999 Late Summer/Early Fall Ecological Sampling Plan Program were reviewed to:

- Determine the likelihood of enhancement of the risk from dioxin-like congeners in the total PCB concentration and the potential overestimation of risks from dioxin-like and total PCBs are combined
- Understand the PCB composition of the samples, and from that estimate the proportion of the total PCB that may include dioxin-like PCBs in the risk assessment

Data Comparisons. The data used for these comparisons are a subset of the historical dataset that were collected by Chemical Land Holdings (CLH), Inc. in 1999/2000 in accordance with an USEPA-approved Ecological Sampling Plan (CLH, 1999). The CLH data were chosen since these data offer a more complete set of data from which to evaluate the potential PCB enhancement. The CLH sample analyses were conducted for Aroclors (Aroclor 1260, Aroclor 1254, Aroclor 1221, Aroclor 1232, Aroclor 1248, Aroclor 1016, and Aroclor 1242) and 33 PCB congeners, including the World Health Organization (WHO) list of 12 dioxin-like congeners (Van den Berg *et al.*, 2005). As explained in Section 3.0 of the risk assessment, Aroclor data were combined and used to represent the total PCB concentration in the risk assessment, whereas the 12 dioxin-like congeners were used to determine the concentration for the dioxin-like TCDD TEQ (PCBs).

Human Health Risk Assessment. The human heath risk estimated risks for adult anglers consuming fish and crab. Risks to young children and adolescent fish consumers were also evaluated but the results for the adult are only present for this analysis. The PCB-related risk was estimated based on concentrations of both the WHO list of 12 dioxin-like PCB congeners and, separately, based on the total PCB (as the sum of Aroclors) concentration. Theoretically, it is possible to have a total of 209 different PCB congeners (individual PCB congeners), but more than 95% of the PCB in Aroclor formulations and in environmental PCB contamination is typically comprised of a little more that 100 PCB congeners; close to 100 PCB congeners were never found in any commercial Aroclor formulations or are not detected in environmental samples at all or to any notable degree (need reference). As described in PCB cancer toxicity reassessment (USEPA, 1996), in the environment, PCBs occur as mixtures of congeners where their composition differs from commercial mixtures. The differences in environmental mixtures from commercial mixtures changes through partitioning, chemical transformation, and preferential bioaccumulation.

The Aroclor-based total PCB analysis is intended to capture all the PCB congeners in the sample based on the individual Aroclors and provides one method for determining potential risk from PCB exposure. The 12 dioxin-like WHO PCB congeners are a subset of congeners in the total PCB mixture and are of interest

and concern for assessing risk since the presence of a higher percentage of these congeners may significantly increase the risks when compared to total PCBs. These two methods provided individual estimates of PCB risk that were then combined for an overall measure of total PCB risk. The total PCB calculated risk including the sum of the Aroclors and the 12 WHO congeners did not account for the fact that the 12 WHO congeners are a subset of the Total PCB calculated by summing the Aroclors.

PCB Composition

To determine the degree to which the WHO dioxin-like congeners are present in the total PCB mixtures the following analysis was performed.

Background In general, most environmental PCB contamination typically consists of a little more than 100 PCB congeners. This includes the PCB congeners that comprise the various commercial Aroclor formulations, and a relatively small set of additional congeners that are formed through environmental abiotic and biotic processes (*e.g*., dechlorination of some congeners under anaerobic conditions).

A literature review found studies where some of the 12 WHO PCB congeners are present at relatively high proportions in some Aroclors and environmental PCB contamination (*e.g*., PCB105, PCB118, and PCB156), while other congeners are less abundant. Table 1 presents the concentrations of the 12 WHO PCB congeners in the nine different Aroclor formulations, as determined by high-resolution gas chromatography/high-resolution mass spectrometry (HRGC/HRMS) using EPA Method 1668a (Rushneck *et al.*, 2004). Method 1668a is currently the most accurate standard method for PCB congener analysis. Table 1 also includes data for three Aroclors from an earlier gas chromatography/electron capture detection (GC/ECD) based study conducted by Frame *et al.* (1996). The data for both analytical approaches and by both investigators are presented for Aroclor 1242, 1254, and 1260. This analysis indicates that there is very good agreement between these two studies, which were conducted using different techniques and almost 10 years apart. For instance, Rushneck *et al.* (2004) determined the sum of the 12 WHO dioxin-like PCB congeners comprise 13% of the PCB in Aroclor 1254 and 1.45% in Aroclor 1260, while Frame *et al.* (1996) determined the concentrations to comprise 12% and 1.53%, respectively. This excellent agreement lends credibility to and confidence in the data in Table 1.

Analysis of PCB Enhancement Based on White Perch and Crab Data. In the absence of data on all congeners in the white perch and crab ESP data, we evaluated the literature reported percentages of dioxin-like PCBs in the commercial Aroclor mixtures. Based on a literature review, it was found that the 12 WHO dioxin-like PCB congeners comprise from 0.02% to 13% of the total PCB in the individual unweathered commercial Aroclor formulations (Table 1). These dioxin-like congeners are least abundant in Aroclors 1221 (0.02%), 1016 (0.02%), 1268 (0.03%), and 1262 (0.46%). The dioxin-like congeners comprise between 1% and 2% of the total PCB in Aroclors 1232, 1242, and 1260, and are most abundant in Aroclors 1248 (4.9%) and 1254 (12%). As shown on Table 1, the 12 WHO dioxin-like congeners comprise between 1.5% and 13% of the total PCB in Aroclors 1248, 1254, and 1260, and a 1:2:1 mixture of Aroclors 1248:1254:1260 has a PCB composition that is comprised of about 8% of the 12 WHO dioxin-like PCB congeners. This 1:2:1 mixture of Aroclors 1248:1254:1260 appears to be the approximate PCB composition in the white perch and crab samples analyzed from the USEPA 1999 Late Summer/Early fall ESP Sampling Program, based on the percentage of the specific Aroclors with dioxin-like PCBs found from the data analyses of the fish samples.

Table 2 presents the total PCB (as Aroclor) and the sum of the dioxin-like (WHO) PCB congener data from the analysis of white perch samples from the USEPA 1999 Late Summer/Early fall ESP Sampling Program. Table 2 also includes the relationship between the total PCB (as Aroclor) concentration and the sum of the dioxin-like PCB congener concentrations for the white perch samples. The sum of the dioxin-like congener concentrations averaged 3.5% (range from 3.1% to 3.9%) of the total PCB concentration.

The PCB concentration and composition data were more variable for the crab samples than for white perch; the total PCB (as Aroclor) concentrations ranged from less than 1,000 to more than 10,000 ppb. The dioxin-like PCB congeners comprised an average of 9.8% of total PCB concentration in the data reported for the crab samples, and it ranged from 3.1 to 93% (most were in the 3% to 13% range). Aroclors 1248, 1254, and 1260 were, as with white perch, the widely detected Aroclors in the crab samples, and Aroclor 1254 was again consistently the most abundant Aroclor.

Potential Double-Counting of Dioxin-Like Congeners in Total PCB Risk.
To evaluate the potential for double-counting the PCB concentrations when the two risk determinations (*i.e*., total PCBs and dioxin-like PCBs individually) are combined we performed additional calculations. The calculation involved subtracting the concentrations of the 12 dioxin-like WHO PCB congeners from the initially determined total PCB concentration, and then using the "corrected" total PCB value for the total PCB-based risk determination. The calculation provides a mechanism by which the TCDD TEQ PCB risk would be based on the concentrations of the 12 dioxin-like congeners, and the total PCB risk would be based on the concentration of all other PCBs.

Table 3 provides example risk calculations for total PCB-adjusted concentrations following this method. In order to provide a risk range, the total PCB concentration was reduced by the lower and upper percentages approximated by Rushneck *et al*. (2004) for the contribution of the 12 dioxin-like PCB congeners (*i.e*., 1.5% and 13% for the three most abundant Aroclors: 1248, 1254, and 1260 in the samples), even though the approximate contribution is more likely closer to some average of the 1248, 1254, and 1260 composition of these congeners (*e.g*., 8%). The first set of risk calculations presented in Table 3 are those presented in the risk assessment for the adult angler ingesting fish and are provided for comparison purposes. The second set of risk calculations assumes that the total PCB concentration is reduced by 1.5% (*i.e*., the approximate contribution of the 12 dioxin-like PCB congeners to the total PCB) and the third set of calculations assumes that the total PCB concentration is reduced by 13%. The adjusted total PCB concentrations result in relative reductions of total risk by 0.2% and 1.5% for the second and third set of calculations, respectively. As shown on Table 3, the total cancer risk values for both sets of calculations using an adjusted total PCB concentration would still be reported as 7.0E-03 which exceeds the risk range of 10^{-4} to 10^{-6} identified in the National Contingency Plan (USEPA, 1990).

Based on the evaluation of the site-specific white perch and crab data that determined the sums of the dioxin-like congener concentrations ranged from 3.1% to 3.9% for the fish and were mostly 3% to 13% for the crab, current total PCB risks estimated for ingestion of fish and crab in the risk assessment may be over estimated by 3 to 13%; however, the overall total cancer risk for ingestion of fish and crab is not significantly impacted by the total PCB risk over-estimation as demonstrated in the example calculations provided in Table 3.

Conclusion.

Based on an application of data from the literature on the relative percentages of dioxin-like PCBs in specific Aroclor mixtures, combined with results from the 1999 ESP samples and risk calculations, additional calculations of the risks from ingestion of white perch and crabs were conducted. The evaluation included an assessment of the relative difference in calculated risks when dioxin-like congers were evaluated and compared to non-dioxin like congeners. The results of this analysis found that the resulting risks calculated using different methods remain above the risk range of 10^{-4} to 10^{-6}. The results of this PCB enhancement assessment indicate that double counting the dioxin-like PCB congeners does not notably impact the conclusions from this risk assessment.

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Table 1. WHO Congener Concentrations in Aroclor Formulations
(Rushneck *et al.* 2004, unless otherwise specified)

			Aroclor Formulation												
			1221	**1232**	**1016**	**1242**	**1242**	**1248**	**1254**	**1254**	**1260**	**1260**	**1262**	**1268**	**1248:1254:1260**
							(Frame et al.)			(Frame et al.)		(Frame et al.)			(1:2:1)
			Congener Concentration (ppm)												
PCB Congener	**IUPAC #**	**WHO TEF**													
3,3',4,4' - TeCB	77	0.0001	12.6	2,150	40.9	2,590	3,100	4,440	174	283	33.8	0.00	84.6	36.1	1,205
3,4,4',5 - TeCB	81	0.0001	0.51	111	1.96	156	108	221	16.4	0.00	3.33	0.00	4.63	1.35	64.3
2,3,3',4,4' - PeCB	105	0.0001	55.9	3,030	69.5	4,840	4,700	17,300	33,800	29,900	434	2,200	764	107	21,334
2,3,4,4',5 - PeCB	114	0.0005	4.04	248	6.03	443	401	1,320	1,930	1,830	17.0	0.00	46.0	5.86	1,299
2,3',4,4',5 - PeCB	118	0.0001	88.1	4,460	110	6,980	6,620	24,200	78,900	73,800	5,610	4,840	1,980	101	46,903
2',3,4,4',5 - PeCB	123	0.0001	3.33	164	4.72	277	267	806	1,150	1,500	5.02	0.00	27.8	3.24	778
3,3',4,4',5 - PeCB	126	0.1	0.28	21.0	0.56	33.6	0.00	98.0	37.3	17.0	2.13	0.00	2.28	1.76	43.7
2,3,3',4,4',5 - HxCB	156	0.0005	7.49	90.7	3.72	255	72.3	6.54	8,440	8,180	4,860	5,200	946	17.6	5,437
2,3,3',4,4',5' - HxCB	157	0.0005	1.46	22.0	1.03	70.9	0.00	171	1,870	1,910	252	190	63.8	7.92	1,041
2,3',4,4',5,5' - HxCB	167	0.00001	2.52	32.4	1.10	80.7	0.00	207	3,100	2,720	1,990	1,880	278	4.96	2,099
3,3',4,4',5,5' - HxCB	169	0.01	0.08	0.17	0.13	0.11	0.00	0.21	0.81	0.00	0.82	0.00	0.40	0.32	0.66
2,3,3',4,4',5,5' - HpCB	189	0.0001	1.17	4.36	0.12	4.53	0.00	11.0	246	106	1,290	1,020	451	4.40	448
Sum (ppm)			177	10,334	240	15,731	15,268	48,781	129,665	120,246	14,498	15,330	4,649	292	80,652
Sum (% of Total PCB)			0.02	1.03	0.02	1.57	1.53	4.88	13.0	12.0	1.45	1.53	0.46	0.03	8.07
TOTAL TEQ			**0.051**	**3.27**	**0.085**	**5.23**		**15.5**	**21.3**		**3.54**		**1.09**	**0.21**	

Table 2. Total Aroclor and Sum of WHO Congener Concentrations (ppb) in White Perch Tissue Samples (USEPA 1999 Late Summer/Early Fall ESP Sampling Program)

Sample ID	Total Aroclors	Sum of Dioxin-like (WHO) PCB Congeners	Dioxin-like (WHO) Congeners % of Total Aroclors
PR9904TIFW2	6,920	256	3.7
PR9911TIFW13	7,940	275	3.5
PR9911TIFW14	8,390	324	3.9
PR9911TIFW21	8,220	263	3.2
PR9911TIFW22	6,970	258	3.7
PR9911TIFW3	8,600	294	3.4
PR997/15TIFW6	8,200	281	3.4
PR997/15TIFW7	7,820	268	3.4
PR997/15TIFW9	13,990	427	3.1
		Average	3.5

Table 3: Example Calculations of Chemical Cancer Risk for Adjusted Total PCB Concentrations

Scenario Timeframe: Current/Future
Receptor Population: Angler (Adult)
Receptor Age: >18 Years

Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
			Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk
					Value	Units	Value	Units	
Fish	Ingestion	TCDD TEQ (D/F)	2.50E-04	mg/kg	3.1E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	4.59E-03
		TCDD TEQ (PCBs)	8.00E-05	mg/kg	9.8E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.47E-03
		Total PCBs (unadjusted)	3.42E+00	mg/kg	4.2E-04	mg/kg-day	2.0E+00	(mg/kg-day)-1	8.38E-04
		4,4'-DDD	1.50E-01	mg/kg	1.8E-05	mg/kg-day	2.4E-01	(mg/kg-day)-1	4.41E-06
		4,4'-DDE	3.03E-01	mg/kg	3.7E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.26E-05
		4,4'-DDT	7.60E-02	mg/kg	9.3E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.16E-06
		Total Chlordane	1.80E+00	mg/kg	2.2E-04	mg/kg-day	3.5E-01	(mg/kg-day)-1	7.71E-05
		Dieldrin	2.70E-02	mg/kg	3.3E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	5.29E-05
		Methyl mercury	3.47E-01	mg/kg	4.2E-05	mg/kg-day	--	--	ND
	Exp. Route Total								7.05E-03

Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
			Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk
					Value	Units	Value	Units	
Fish	Ingestion	TCDD TEQ (D/F)	2.50E-04	mg/kg	3.1E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	4.59E-03
		TCDD TEQ (PCBs)	8.00E-05	mg/kg	9.8E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.47E-03
		Total PCBs (adusted 1.5%)	3.37E+00	mg/kg	4.1E-04	mg/kg-day	2.0E+00	(mg/kg-day)-1	8.25E-04
		4,4'-DDD	1.50E-01	mg/kg	1.8E-05	mg/kg-day	2.4E-01	(mg/kg-day)-1	4.41E-06
		4,4'-DDE	3.03E-01	mg/kg	3.7E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.26E-05
		4,4'-DDT	7.60E-02	mg/kg	9.3E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.16E-06
		Total Chlordane	1.80E+00	mg/kg	2.2E-04	mg/kg-day	3.5E-01	(mg/kg-day)-1	7.71E-05
		Dieldrin	2.70E-02	mg/kg	3.3E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	5.29E-05
		Methyl mercury	3.47E-01	mg/kg	4.2E-05	mg/kg-day	--	--	ND
	Exp. Route Total								7.04E-03

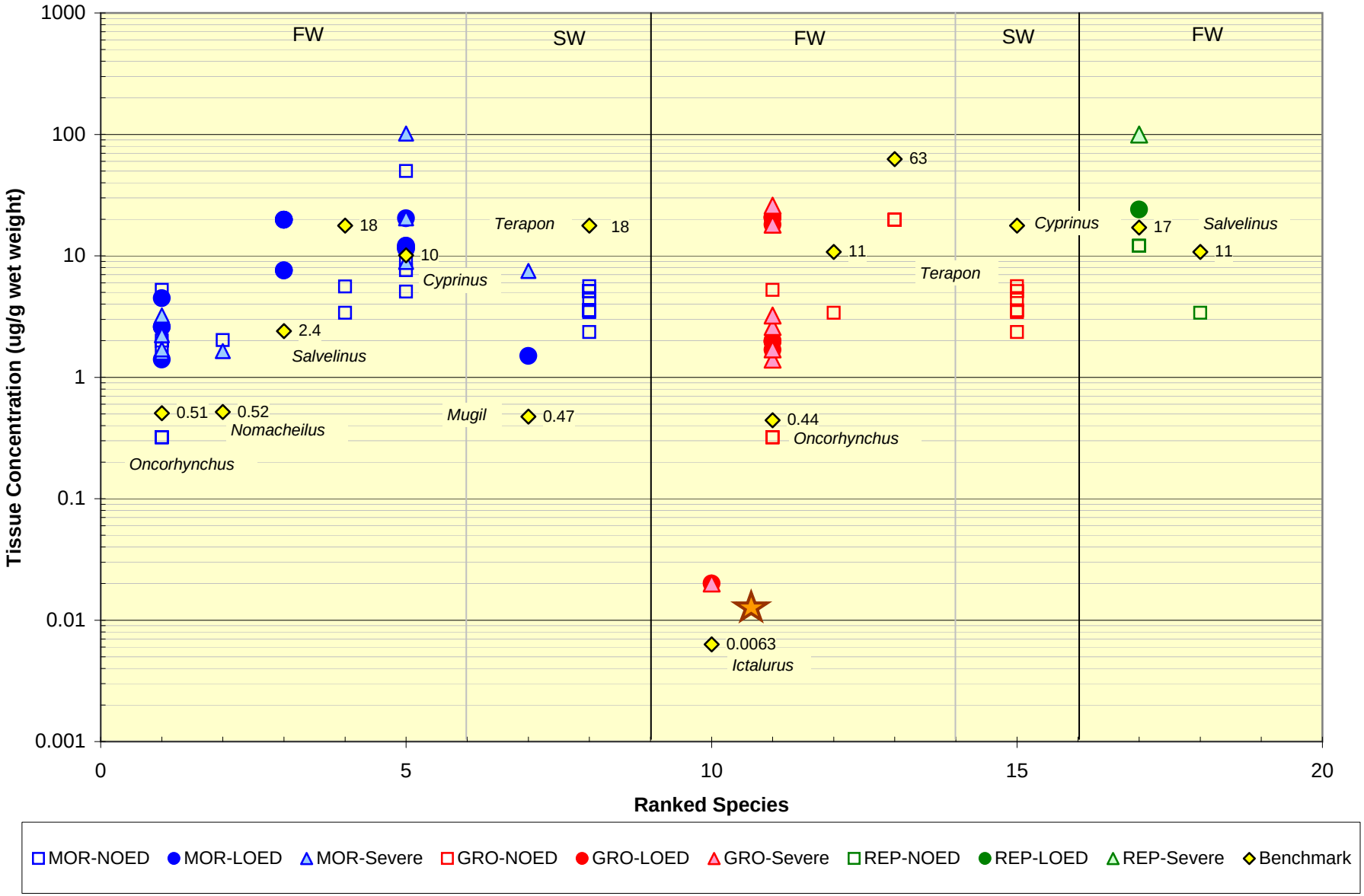
Medium	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
			Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk
					Value	Units	Value	Units	
Fish	Ingestion	TCDD TEQ (D/F)	2.50E-04	mg/kg	3.1E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	4.59E-03
		TCDD TEQ (PCBs)	8.00E-05	mg/kg	9.8E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.47E-03
		Total PCBs (adusted 13%)	2.98E+00	mg/kg	3.6E-04	mg/kg-day	2.0E+00	(mg/kg-day)-1	7.29E-04
		4,4'-DDD	1.50E-01	mg/kg	1.8E-05	mg/kg-day	2.4E-01	(mg/kg-day)-1	4.41E-06
		4,4'-DDE	3.03E-01	mg/kg	3.7E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.26E-05
		4,4'-DDT	7.60E-02	mg/kg	9.3E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.16E-06
		Total Chlordane	1.80E+00	mg/kg	2.2E-04	mg/kg-day	3.5E-01	(mg/kg-day)-1	7.71E-05
		Dieldrin	2.70E-02	mg/kg	3.3E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	5.29E-05
		Methyl mercury	3.47E-01	mg/kg	4.2E-05	mg/kg-day	--	--	ND
	Exp. Route Total								6.94E-03

ND - not determined because toxicity values are not available for this exposure route.
mg/kg - milligram per kilogram
Intake/Exposure Concentration = 0.00012245 x EPC Value
Cancer Risk = Intake/Exposure Concentration x CSF/Unit Risk Value

ATTACHMENT 5
CRITICAL BODY RESIDUES
FOR INVERTEBRATES AND FISH

Attachment 5

Figure 5-1
Summary of Copper Concentrations in Freshwater and Saltwater Fish Tissue Associated with Toxicity



Attachment 5

Figure 5-2
Summary of Lead Concentrations in Freshwater Fish Tissue Associated with Toxicity

Attachment 5

Figure 5-3
Summary of Mercury Concentrations in Freshwater and Saltwater Fish Tissue Associated with Toxicity

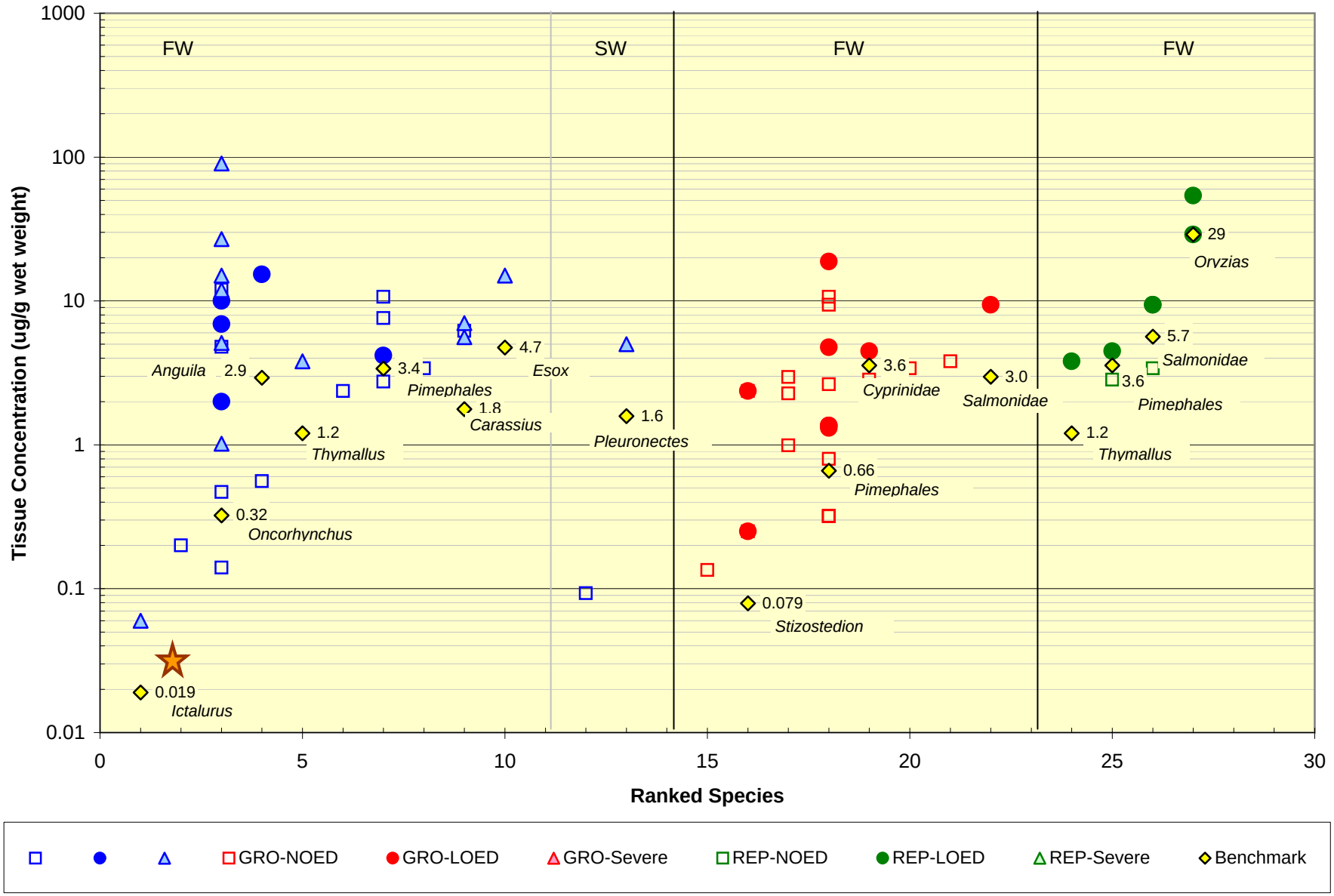
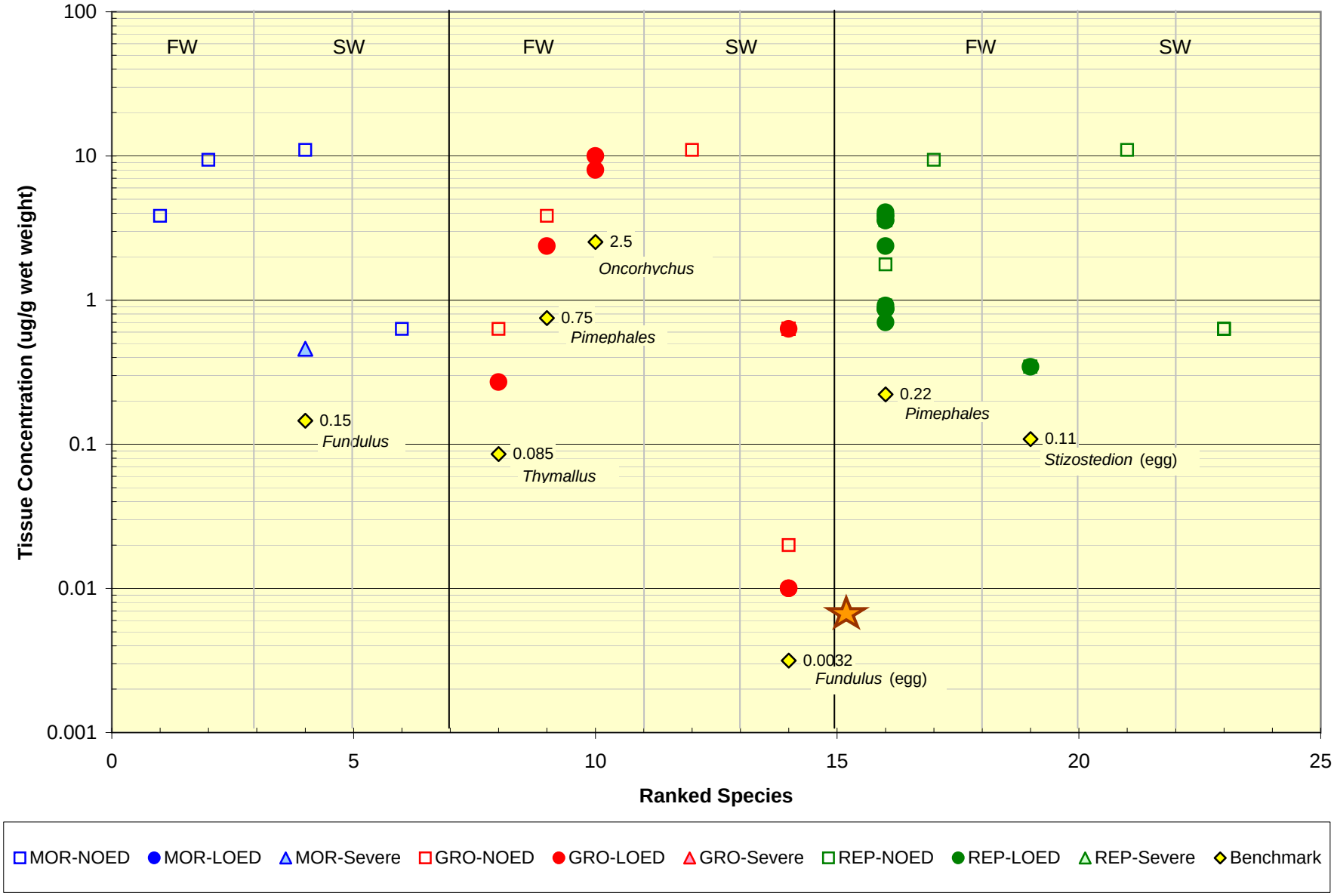
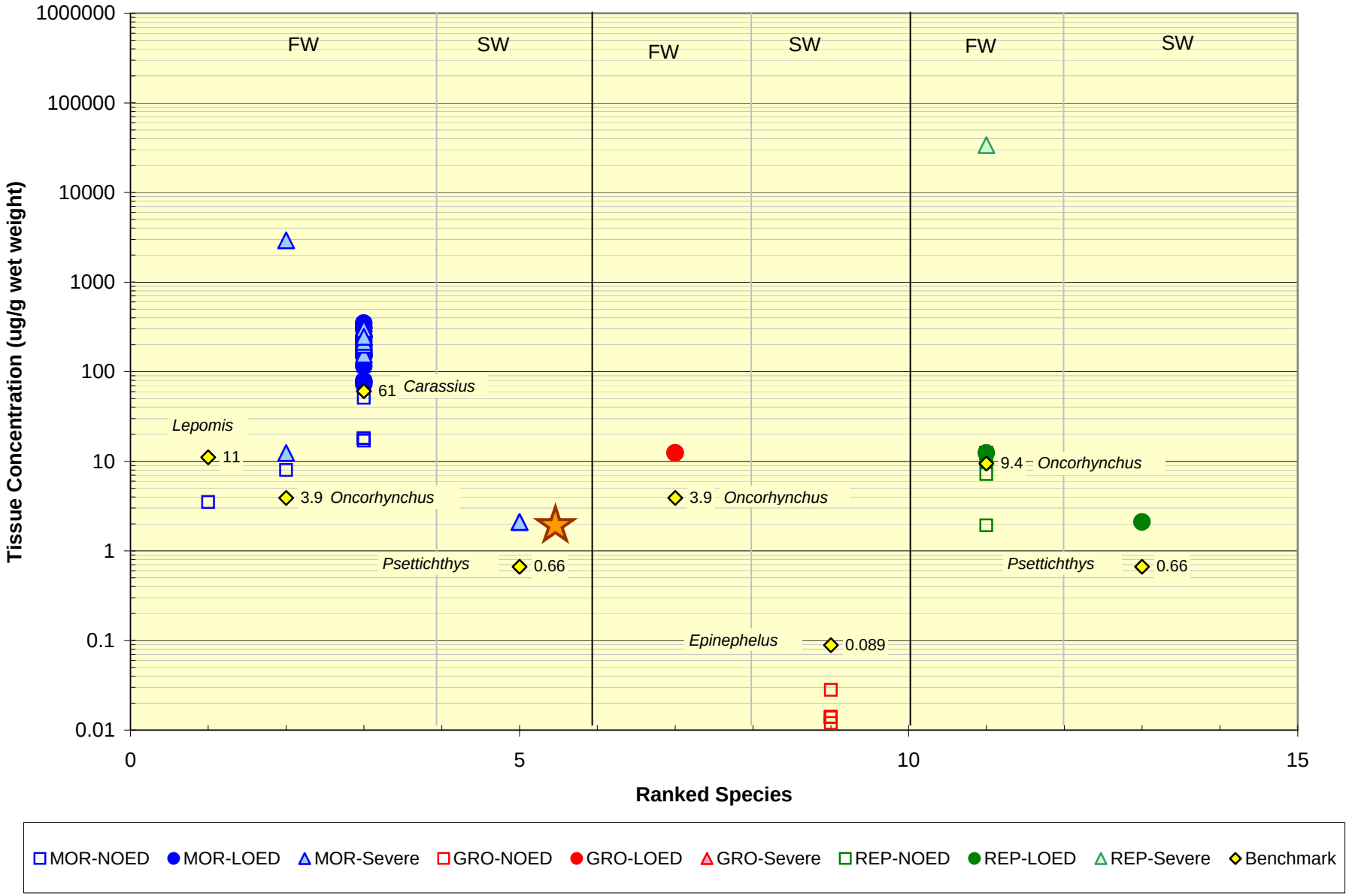


Figure 5-4
Summary of Methylmercury Concentrations in Freshwater and Saltwater Fish Tissue Associated with Toxicity



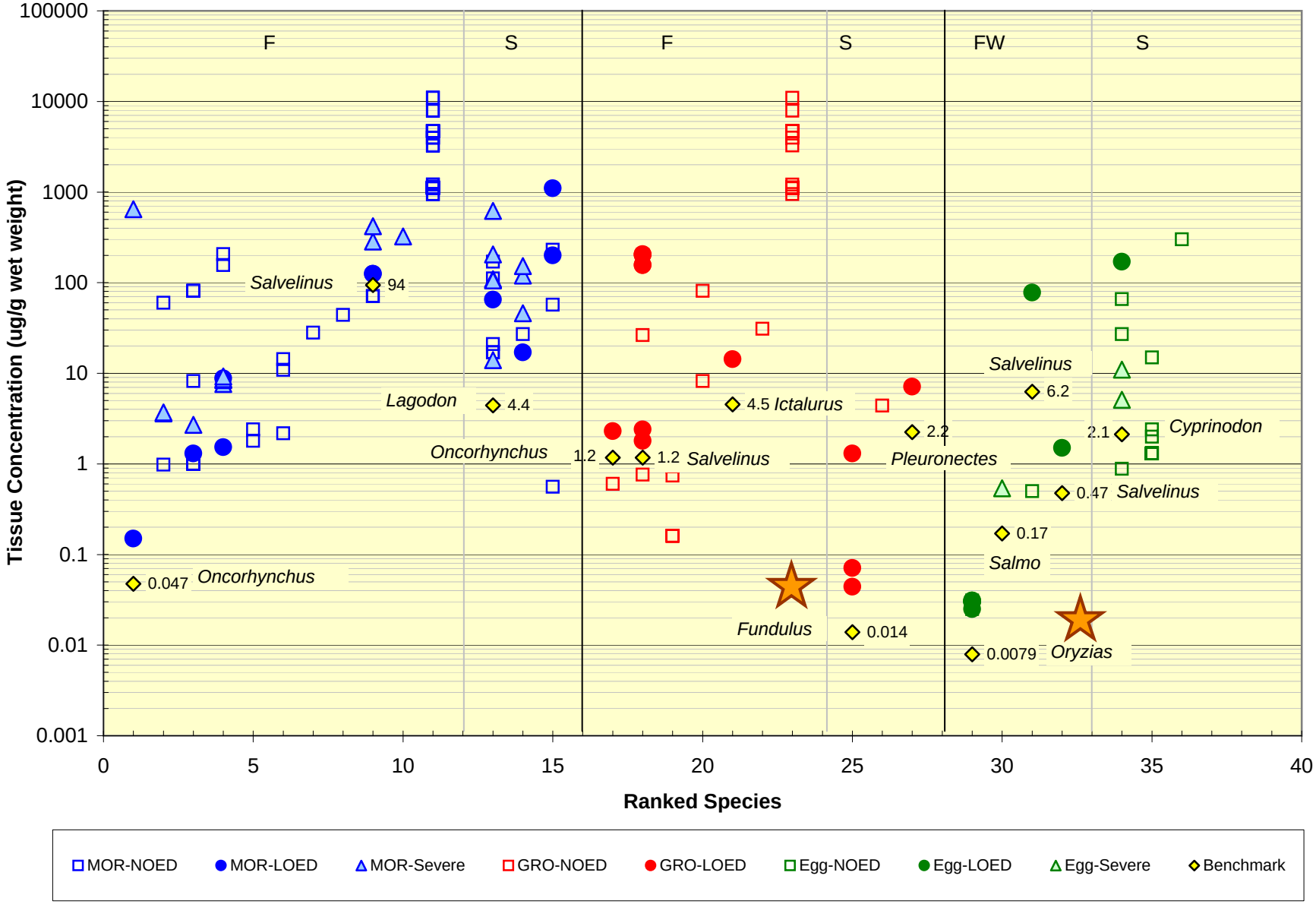
Attachment 5

Figure 5-5
Summary of PAH Concentrations in Freshwater and Saltwater Fish Tissue Associated with Toxicity



Attachment 5

Figure 5-6
Summary of PCB Concentrations in Freshwater and Saltwater Fish Early Life Stage Tissue Associated with Toxicity



Attachment 1

Figure 5-7
Summary of Dieldrin/Aldrin Concentrations in Freshwater and Saltwater Fish Tissue Associated with Toxicity

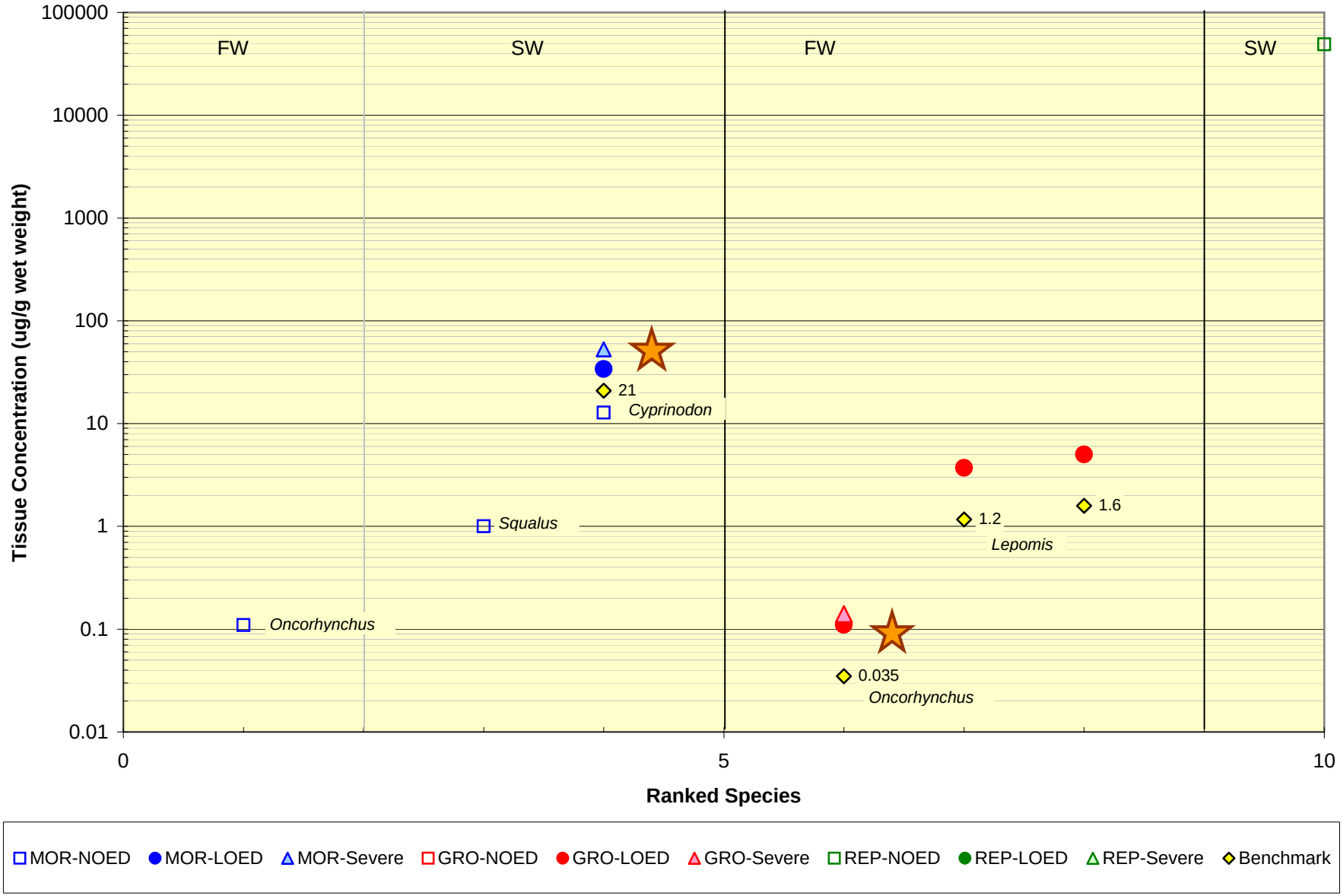
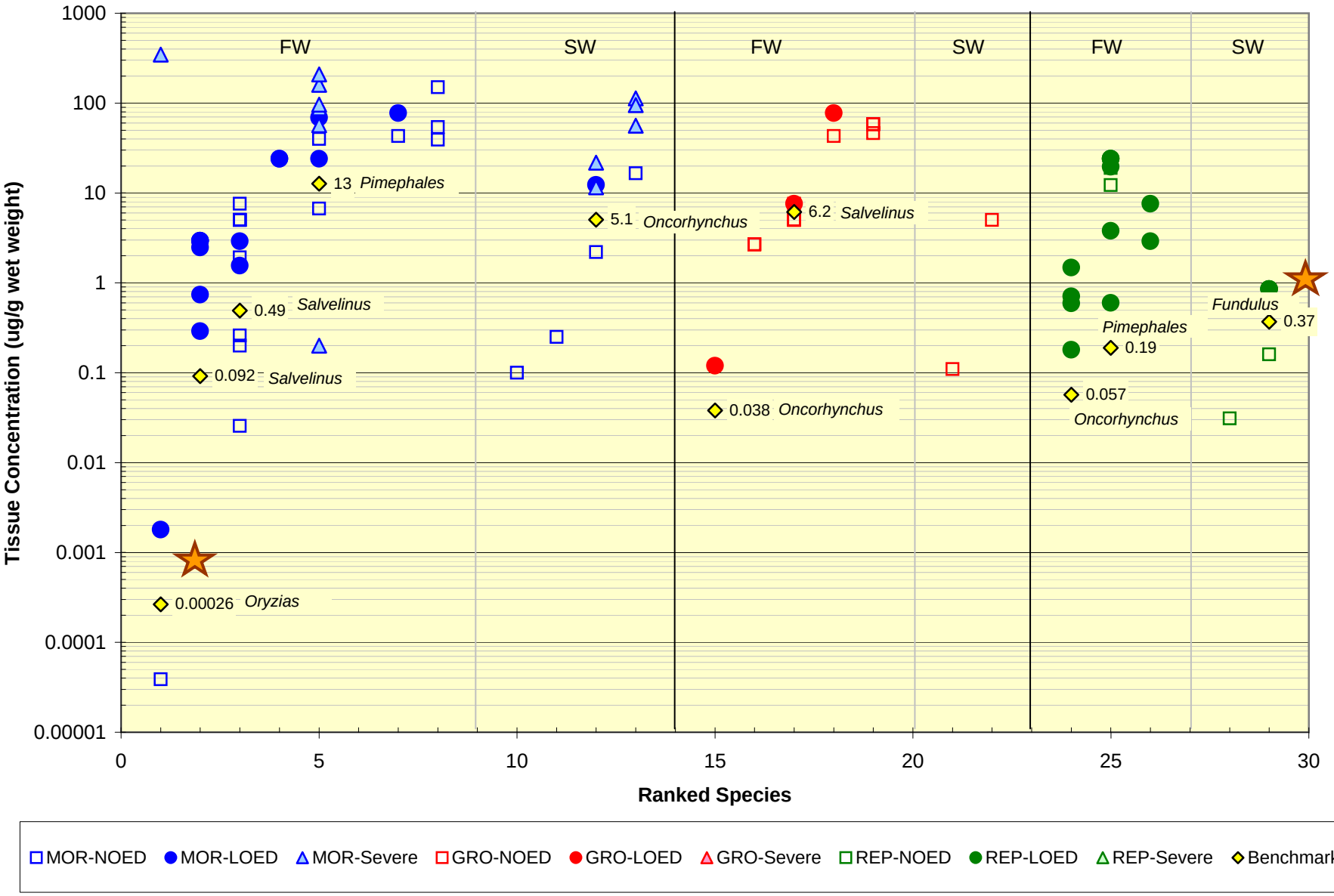
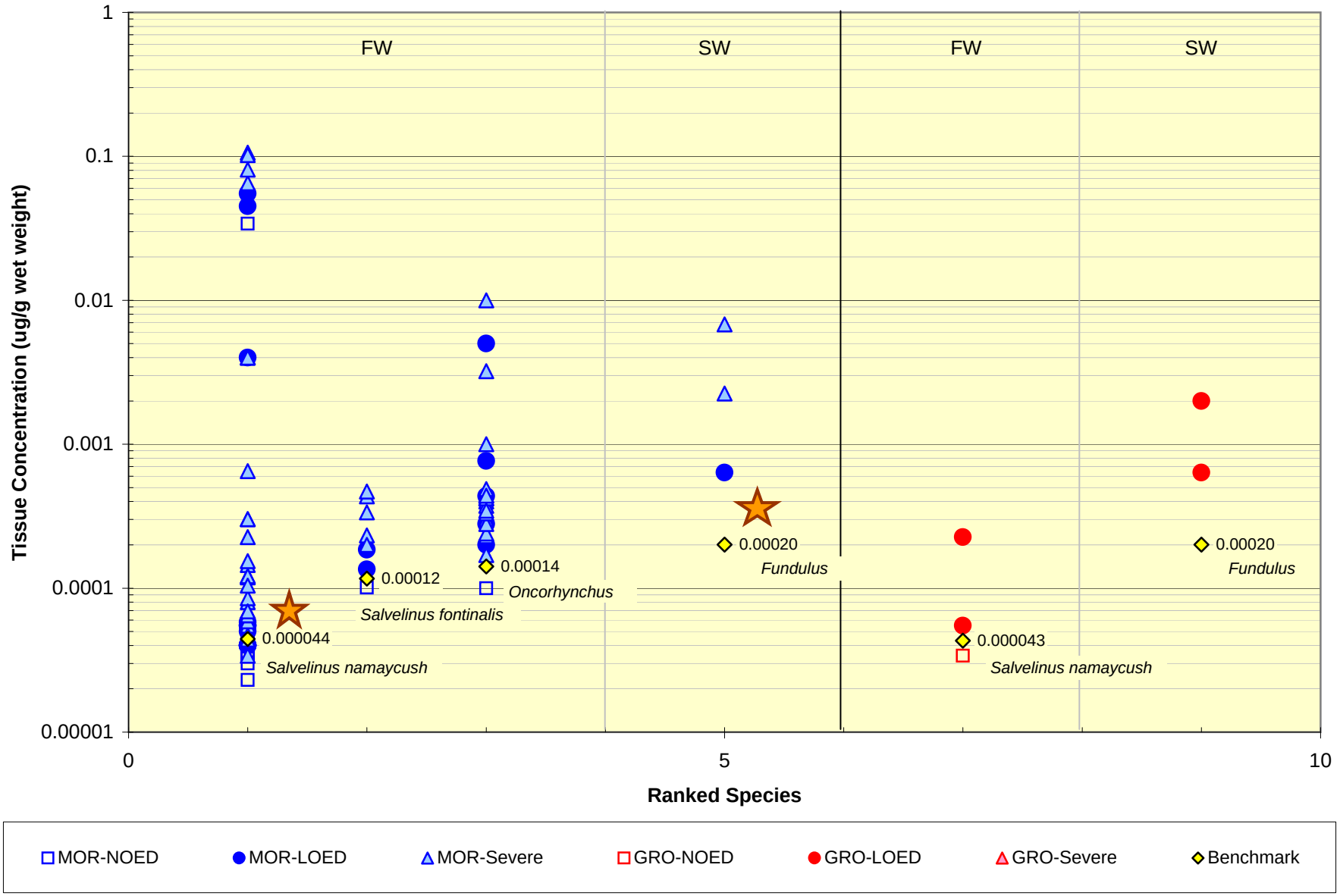


Figure 5-8
Summary of DDT, DDE, and DDD Concentrations in Freshwater and Saltwater Fish Tissue Associated with Toxicity



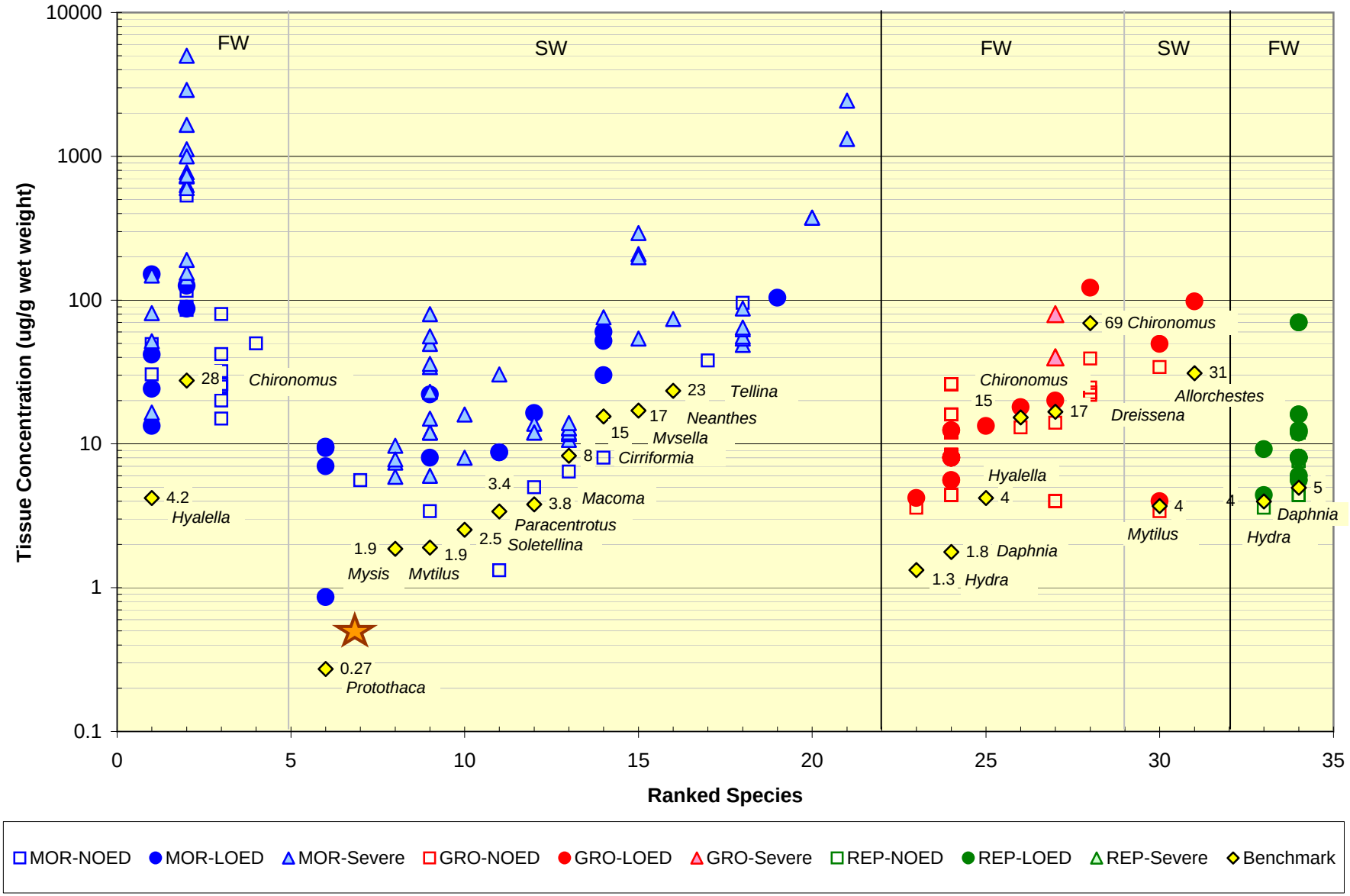
Attachment 5

Figure 5-9
Summary of 2,3,7,8-TCDD Concentrations in Freshwater and Saltwater Fish Egg Tissue Associated with Toxicity



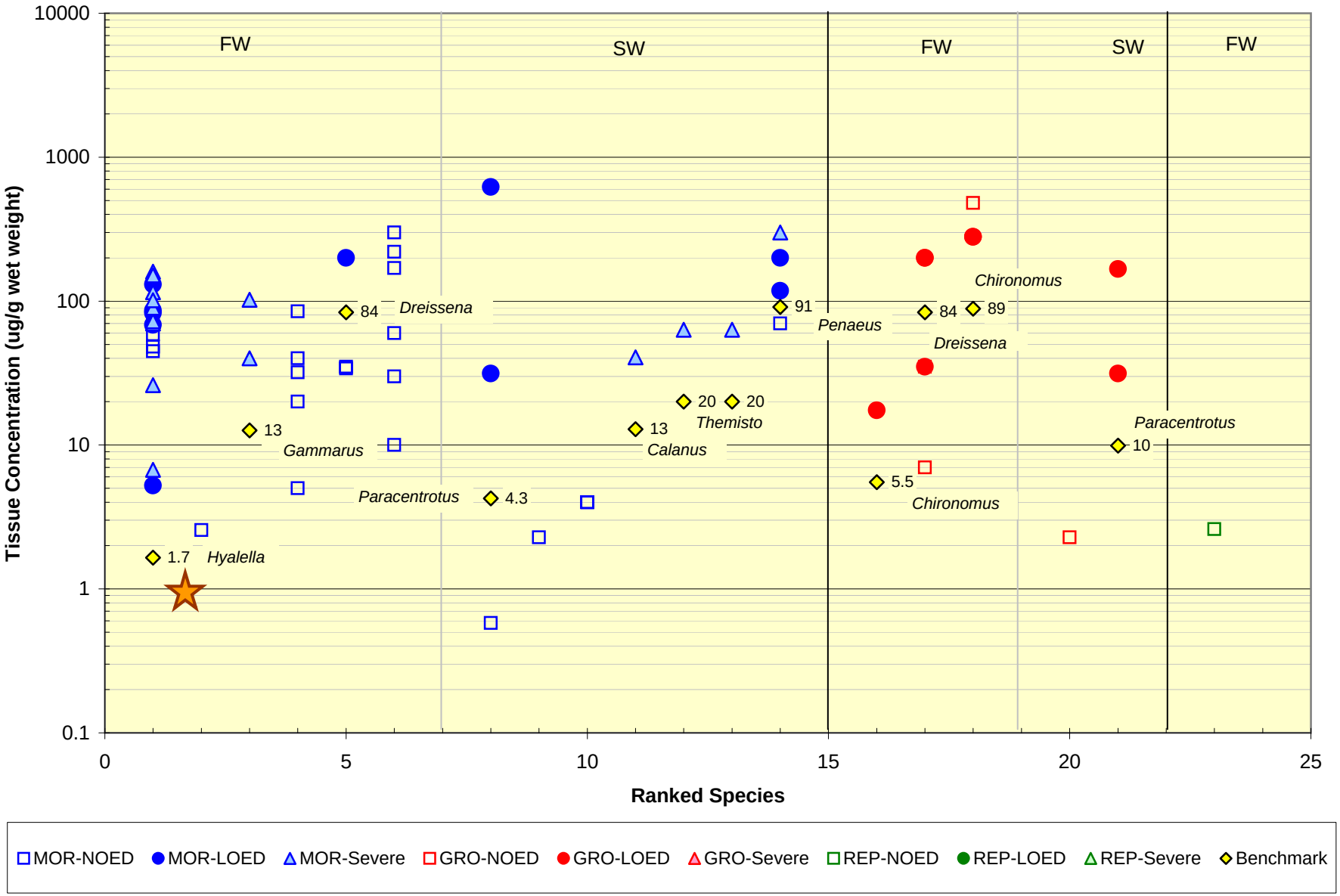
Attachment 5

Figure 5-10
Summary of Copper Concentrations in Freshwater and Saltwater Invertebrate Tissue Associated with Toxicity



Attachment 5

Figure 5-11
Summary of Lead Concentrations in Freshwater and Saltwater Invertebrate Tissue Associated with Toxicity



Attachment 5

Figure 5-12
Summary of Mercury Concentrations in Freshwater and Saltwater Invertebrate Tissue Associated with Toxicity

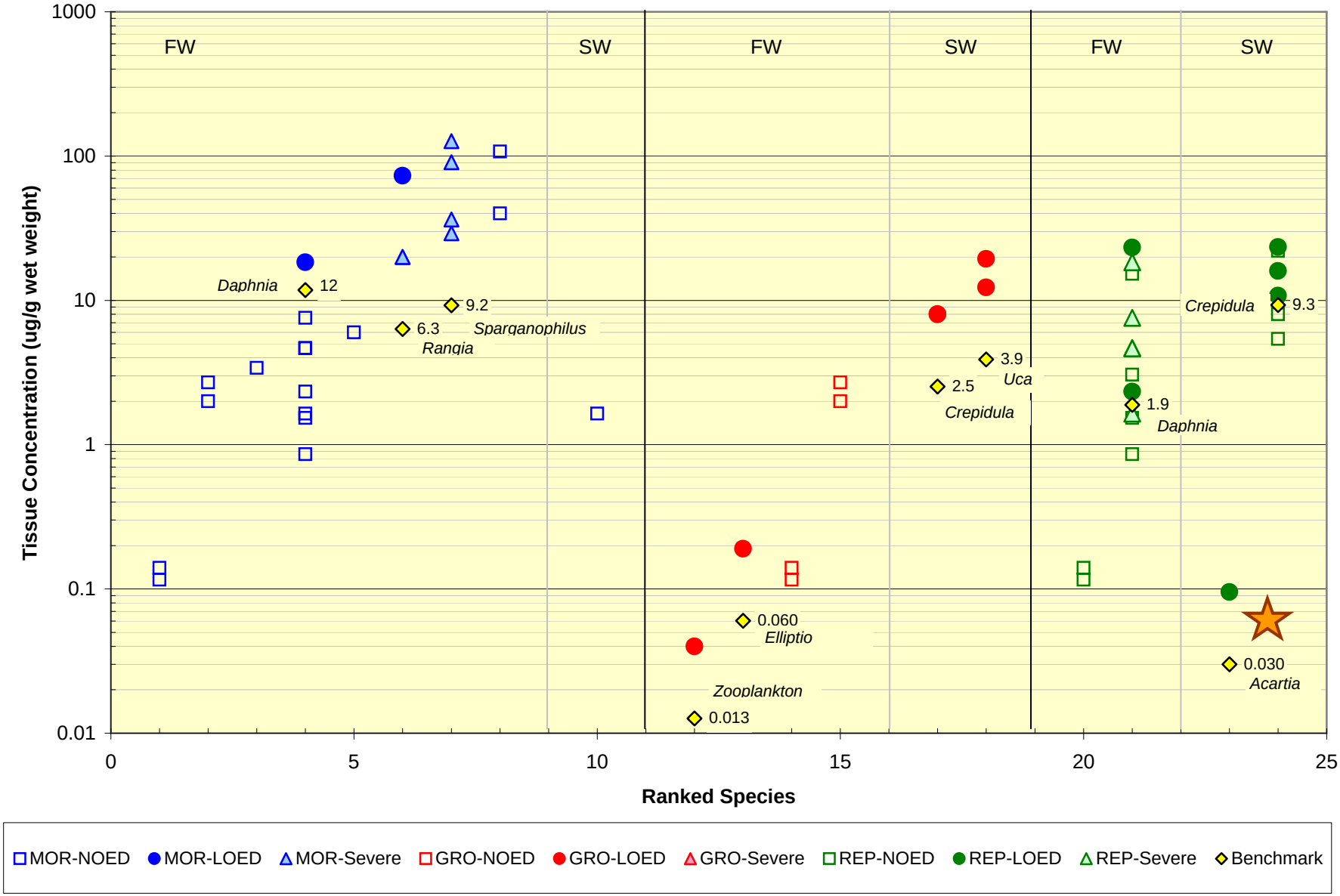
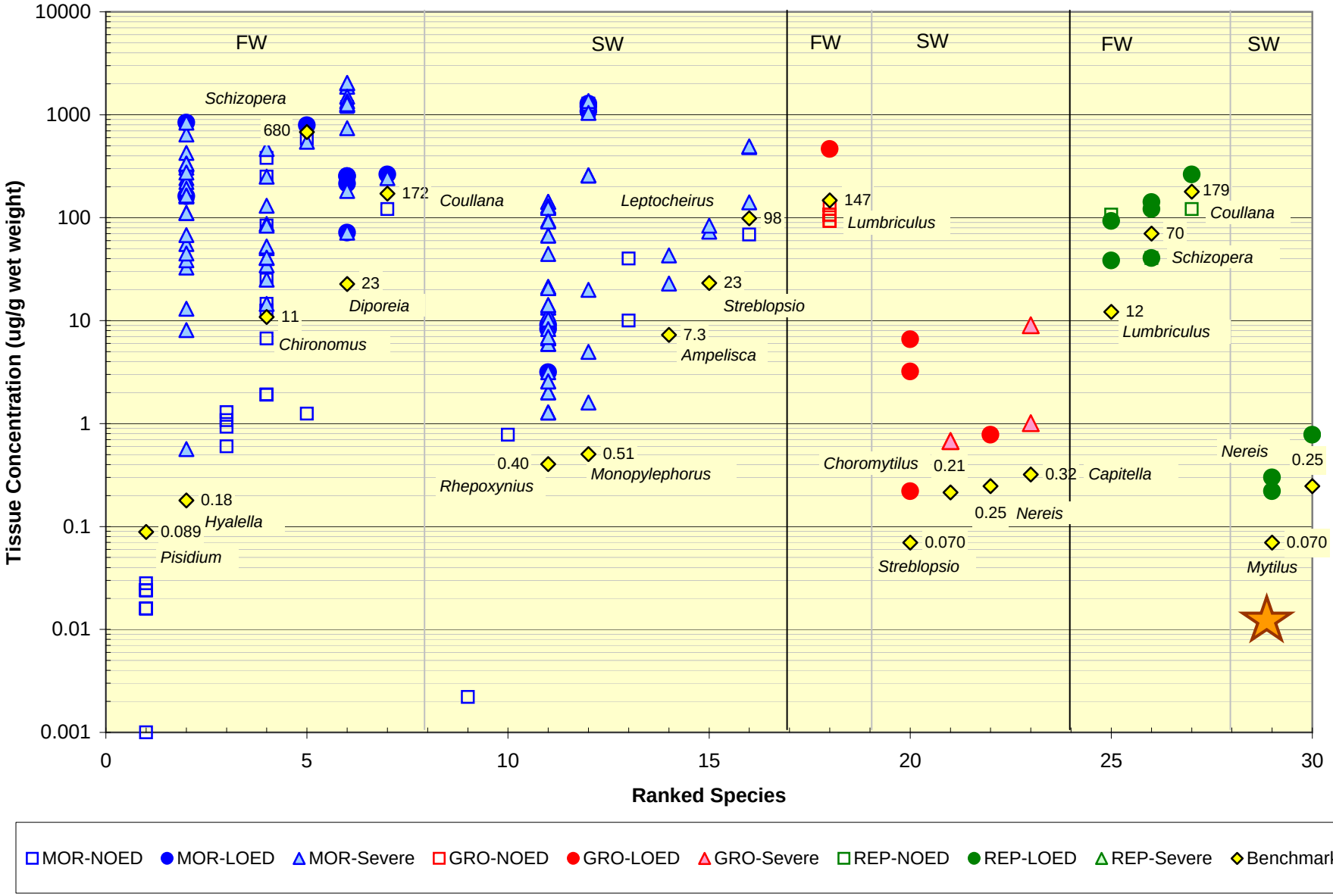


Figure 5-13
Summary of PAH Concentrations in Freshwater and Saltwater Aquatic Invertebrate Tissue Associated with Toxicity



Attachment 5

Figure 5-14
Summary of PCB Concentrations in Freshwater and Saltwater Aquatic Invertebrate Tissue Associated with Toxicity

Figure 5-15
Summary of Dieldrin/Aldrin Concentrations in Freshwater and Saltwater Invertebrate Tissue Associated with Toxicity

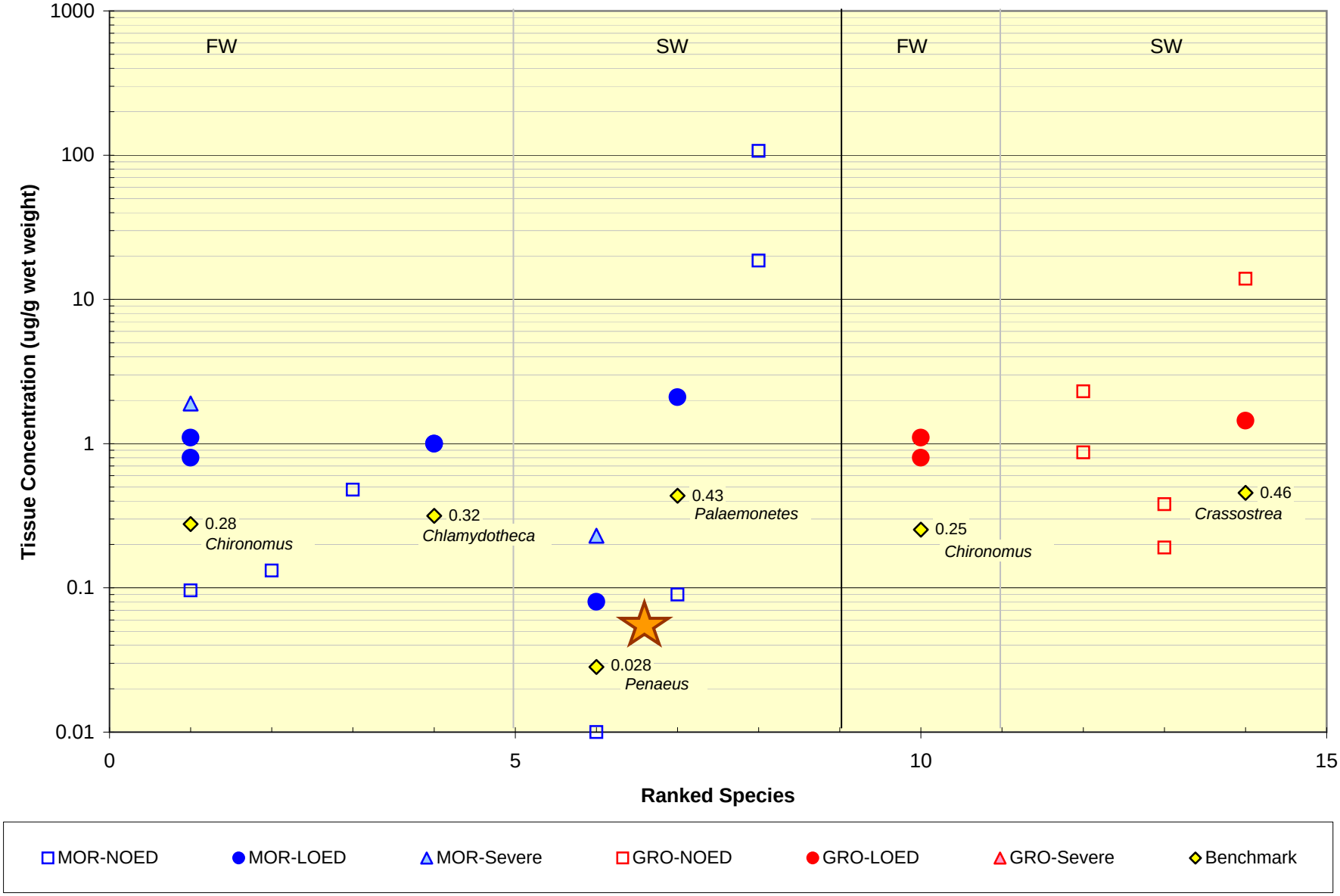
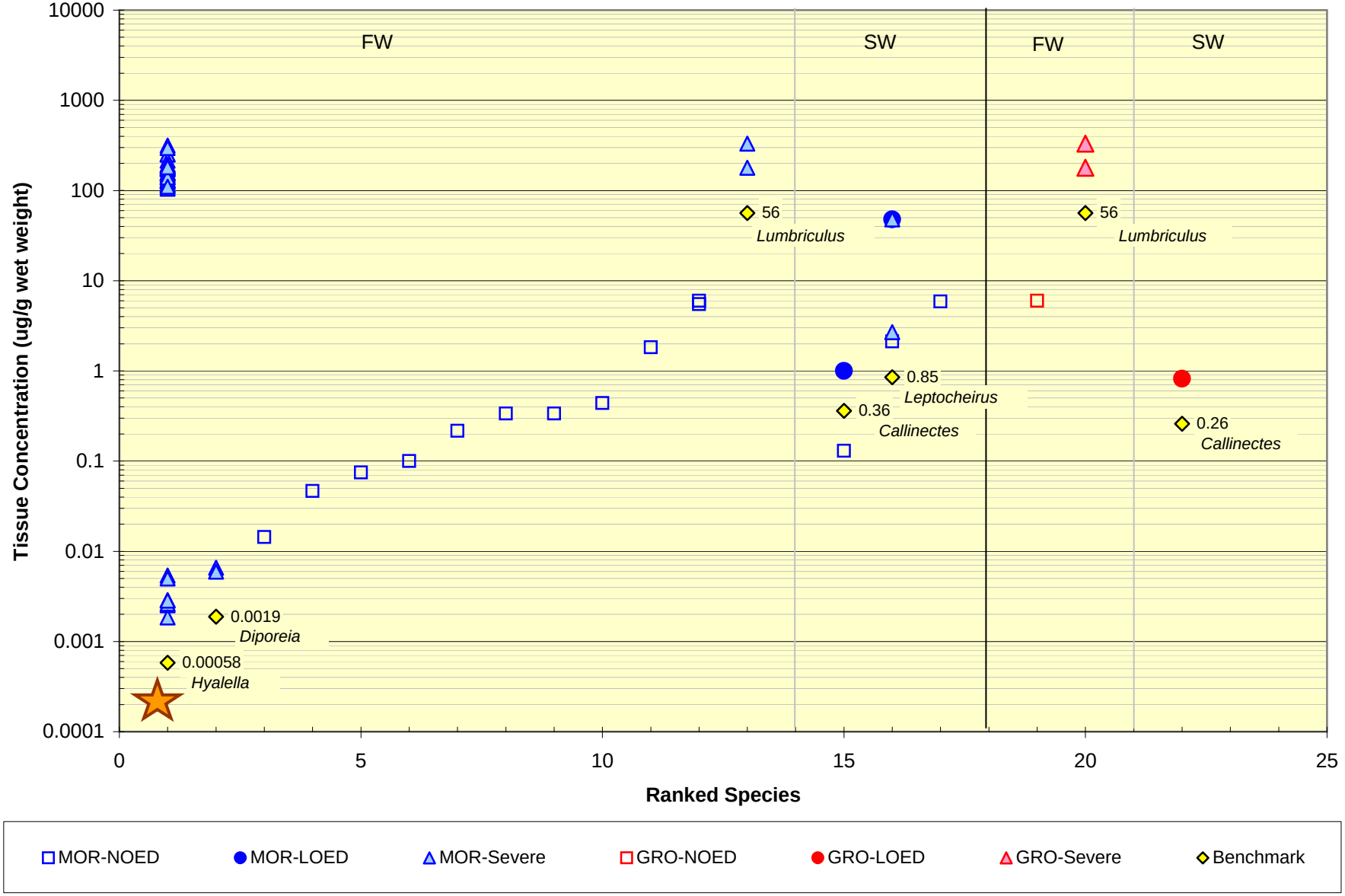


Figure 5-16
Summary of DDT, DDE, and DDD Concentrations in Freshwater and Saltwater Invertebrate Tissue Associated with Toxicity



Attachment 5

TABLE 5-1
SUMMARY OF SELECTED STUDIES OBTAINED FROM ENVIRONMENTAL RESIDUE EFFECTS DATABASE QUERY

Species Scientific Name	Species Common Name	FW/ SW	Analyte Name	CAS No	Conc (mg/kg)	Effect Class	Toxicity Measure	Exposure Route	Body Part Analyzed	Age of Species Studied	Comments	Year	Author	Species Habitat	Species Feeding Behavior	Ref ID	Publication Source
Ictalurus punctatus	Catfish-Channel	FW	Copper	7440-50-8	0.02	Growth	LOED	Ingestion	Muscle	Juvenile		1981	Murai T, JW Andrews, RG Smith Jr.	Rapid water streams	Omnivore	JA317	Aquaculture 22:353-357
Protothaca staminea	Pacific littleneck clam	SW	Copper	7440-50-8	0.86	Mortality	LD11	Water	Muscle	Adult		1980	Roesijadi G	Not Specified	Not Specified	JA377	Biol. Bull 158:233-247
Oncorhynchus mykiss	Trout - Rainbow	FW	Lead	7439-92-1	0.278	Growth	ED11	Ingestion	Whole Body	Fry	growth=length Fed trout oligochaetes reared in contaminated sediments. Exposed to As and/or Pb. Concluded As was primarily responsible for the toxicity exhibited. Histopathic measurements were taken but were not quantified.	2004	Hansen JA; J Lipton; PG Welsh; D Cacela; B MacConnell	Cool streams	Carnivore-juv fish, inverts	Weston05-031	Environ Tox & Chem 23:1902-1911
Hyalella azteca	Amphipod - Freshwater	FW	Lead	7439-92-1	5.22	Mortality	LD25	Absorption	Whole Body	Immature	Field-collected sediment	1999	Borgmann U, WP Norwood	Widely distributed in North America in permanent bodies of water with submerged vegetation	Detritivore	MEC04-063	Can J Fish Aquat Sci 56:1494-1503
Ictalurus punctatus	Catfish-Channel	FW	Mercury	7439-97-6	0.06	Mortality	LD50	Water	Whole Body	Embryo	Duration = 4d posthatch	1979	Birge WJ, JA Black, AG Westerman, JE Hudson	Rapid water streams	Omnivore	JA33	The Biogeochemistry of Mercury, pg 629-655
Acartia tonsa		#N/A	Mercury	7439-97-6	0.095	Reproduction	ED50	Combined	Whole Body	Adult	Used the kinetic modeling concentration of metal. Modeled concentration was approximately 1.4 fold higher than measured for the few measured values. Effect was 50% reduction in egg production 1 week after exposure. Food concentration=6.8 ug/g dry.	2002	Hook, Sharon and Nicholas Fisher	NS	NS	MEC03-211	Mar Environ Res 53: 161-174
Fundulus heteroclitus	Mummichog	SW	Methyl Mercury	22967-92-6	0.01	Growth	ED146	NA	Eggs	Egg	Resd measurement basis not given, assumed to be wet weight, Exposure in food of P1 generation, tissue concentration in F1 eggs, effect is juvenile weight	2001	Matta MB, J Linse, C Cairncross, L Francendese, RM Kocan	Sheltered shores, tidal creeks, brackish water at mouths of streams and estuaries	Omnivore-diatoms, small crustaceans, mollusks, sometimes small fish	MEC03-135	Environ Tox & Chem 20(2):327-335
Psettichthys melanostictus	Sand Sole	SW	Benzo[a]pyrene	50-32-8	2.1	Mortality	LD51	Water	Whole Body	Egg	Hatching mortality	1982	Hose JE, JB Hannah, D DiJulio, ML Landholt, BS miller, WT Iwaoka, SP Felton	Northern California to Bering Sea in sandy bottoms	Feeds on crustaceans, worms, small mollusks	JA212	Arch Environ Contam Toxicol 11:167-171
Mytilus edulis	Mussel	SW	Fluoranthene	206-44-0	0.22	Reproduction	LOED	Absorption	Whole Body	NA	Abnormal Gametogenesis	1995	Eertman, R.H.M., C.L. Groenink, B. Sandee and H. Hummel	Intertidal zone on rocks, pilings and flats; may extend to depths over 40 ft.	Filter plankton, diatoms, bottom vegetation	URS75	Mar. Environ. Res. 39:169-173.
Oryzias latipes	Japanese medaka	FW	PCBs	1336-36-3	0.025	Reproduction	ED11	Ingestion	Eggs	Adult	1ug/g TBT + 25ug/g PCB % decrease in swimup	2005	Nakayama, K; Y Oshima; K Nagafuchi; T Hano; Y Shimasaki; T Honjo	Not Specified	Not Specified	Weston05-046	Environ Tox & Chem 24:591-596
Fundulus heteroclitus	Mummichog	SW	Aroclor 1268	11100-14-4	0.044	Growth	ED149	Ingestion	Eggs	Egg	Resd measurement basis not given, assumed to be wet weight, Exposure in food of F0 generation, effects on F1 generation, tissue concentration for F1 eggs, effect is juvenile weight	2001	Matta MB, J Linse, C Cairncross, L Francendese, RM Kocan	Sheltered shores, tidal creeks, brackish water at mouths of streams and estuaries	Omnivore-diatoms, small crustaceans, mollusks, sometimes small fish	MEC03-135	Environ Tox & Chem 20(2):327-335
Palaemonetes pugio	Shrimp - Grass	SW	PCBs	1336-36-3	1.1	Mortality	LOED	Absorption	Whole Body	Adult	33% Mortality In 96 Hours	1974	Hansen, D.J., P.R. Parrish and J. Forester	Nova Scotia south to Corpus Christi, TX; estuaries on beds of submerged vegetation	Detritus with associated bacteria, diatoms	URS102	Environ. Res. 7:363-373.

TABLE 5-1
SUMMARY OF SELECTED STUDIES OBTAINED FROM ENVIRONMENTAL RESIDUE EFFECTS DATABASE QUERY

Species Scientific Name	Species Common Name	FW/ SW	Analyte Name	CAS No	Conc (mg/kg)	Effect Class	Toxicity Measure	Exposure Route	Body Part Analyzed	Age of Species Studied	Comments	Year	Author	Species Habitat	Species Feeding Behavior	Ref ID	Publication Source
Palaemonetes pugio	Shrimp - Grass	SW	Aroclor 1254	11097-69-1	0.42	Mortality	NOED	Absorption	Whole Body	NA	No significant increase in mortality in 90 days in field	1974	Nimmo, D.R., J. Forester, P.T. Heitmuller, and G.H. Cook.	Nova Scotia south to Corpus Christi, TX; estuaries on beds of submerged vegetation	Detritus with associated bacteria, diatoms	JA329	Bull. Environ. Contam. Toxicol. 11(4):303-308.
Oncorhynchus mykiss	Trout - Rainbow	FW	Dieldrin	60-57-1	0.11	Growth	LOED				Poels et al., 1980, Rhine River Water	1984	Dillon TM	Cool streams	Carnivore-juv fish, inverts	MEC04-070	Army Corps of Engineers Report Technical Report, D-84-2
Cyprinodon variegatus	Sheepshead minnow	SW	Dieldrin	60-57-1	34	Mortality	LOED	Combined	Whole Body	Immature	Estimated Noed - No Statistical Summary In Text	NS	Parrish, P.P., J.A. Couch, J. Forester, J.M. Patrick, and G.H. Cook	Shallow brackish waters, Cape Cod to Mexico	Wide variety of small aquatic animals and plants	SEQ97-2	Contribution No. 178, Gulf Breeze Environmental Research Laboratory, Sabine Island, Gulf Breeze, FL. 32561
Cyprinodon variegatus	Sheepshead minnow	SW	Dieldrin	60-57-1	12.8	Mortality	NOED	Combined	Whole Body	Immature	Estimated Noed - No Statistical Summary In Text	NS	Parrish, P.P., J.A. Couch, J. Forester, J.M. Patrick, and G.H. Cook	Shallow brackish waters, Cape Cod to Mexico	Wide variety of small aquatic animals and plants	SEQ97-2	Contribution No. 178, Gulf Breeze Environmental Research Laboratory, Sabine Island, Gulf Breeze, FL. 32561
Penaeus duorarum	Shrimp - Pink	SW	Dieldrin	60-57-1	0.08	Mortality	LOED	Combined	Whole Body	Adult	Estimated Loed - No Statistical Summary In Text	NS	Parrish, P.P., J.A. Couch, J. Forester, J.M. Patrick, and G.H. Cook	Lower Chesapeake through Florida Straits, around to Yucatan; estuaries and inner oceanic, to 35 m, on sand, shell-sand, coral mud	Opportunistic omnivore; small invertebrates, benthic diatoms, vascular plant material	SEQ97-2	Contribution No. 178, Gulf Breeze Environmental Research Laboratory, Sabine Island, Gulf Breeze, FL. 32561
Penaeus duorarum	Shrimp - Pink	SW	Dieldrin	60-57-1	0.01	Mortality	NOED	Combined	Whole Body	Adult	Estimated Noed - No Statistical Summary In Text	NS	Parrish, P.P., J.A. Couch, J. Forester, J.M. Patrick, and G.H. Cook	Lower Chesapeake through Florida Straits, around to Yucatan; estuaries and inner oceanic, to 35 m, on sand, shell-sand, coral mud	Opportunistic omnivore; small invertebrates, benthic diatoms, vascular plant material	SEQ97-2	Contribution No. 178, Gulf Breeze Environmental Research Laboratory, Sabine Island, Gulf Breeze, FL. 32561
Oryzias latipes	Japanese medaka	FW	4,4`-DDE	72-55-9	0.0018	Mortality	LOED	Injection	Eggs	Egg		2003	Villalobos SA, DM papoulias, SD Pastva, AL Blankenship, J Meadow, DE Tillitt JP Giesy	Not Specified	Not Specified	MEC04-293	Chemosphere 53 819-826
Oryzias latipes	Japanese medaka	FW	4,4`-DDE	72-55-9	3.88E-05	Mortality	NOED	Injection	Eggs	Egg		2003	Villalobos SA, DM papoulias, SD Pastva, AL Blankenship, J Meadow, DE Tillitt JP Giesy	Not Specified	Not Specified	MEC04-293	Chemosphere 53 819-826

Attachment 5

TABLE 5-1
SUMMARY OF SELECTED STUDIES OBTAINED FROM ENVIRONMENTAL RESIDUE EFFECTS DATABASE QUERY

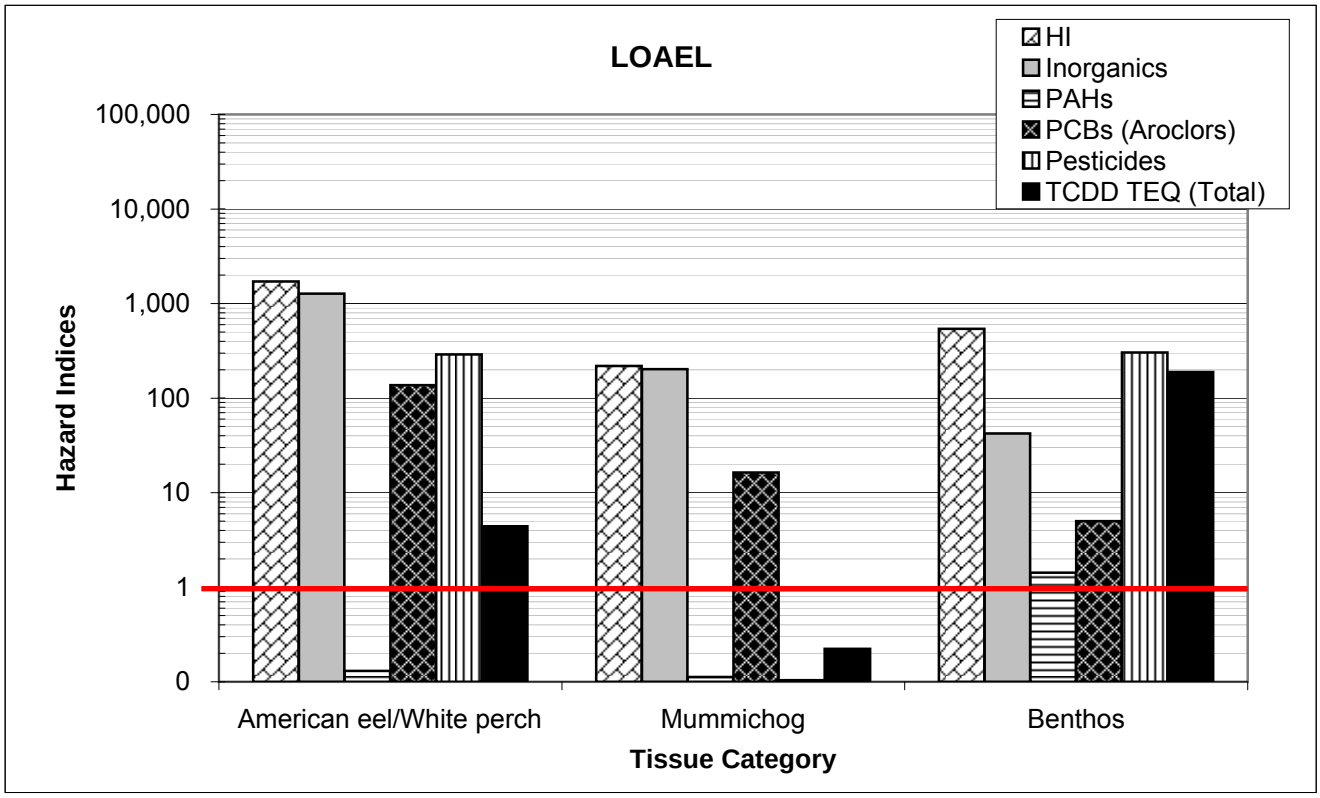
Species Scientific Name	Species Common Name	FW/ SW	Analyte Name	CAS No	Conc (mg/kg)	Effect Class	Toxicity Measure	Exposure Route	Body Part Analyzed	Age of Species Studied	Comments	Year	Author	Species Habitat	Species Feeding Behavior	Ref ID	Publication Source
Fundulus heteroclitus	Mummichog	SW	4,4`-DDT	50-29-3	0.85	Reproduction	ED20	Water	Eggs	Adult	% Fertilization	1976	Crawford RB, AM Guarino	Sheltered shores, tidal creeks, brackish water at mouths of streams and estuaries	Omnivore-diatoms, small crustaceans, mollusks, sometimes small fish	JA96	Arch Environ Contam Toxicol 4:334-348
Fundulus heteroclitus	Mummichog	SW	4,4`-DDT	50-29-3	0.16	Reproduction	NOED	Water	Eggs	Adult	% Fertilization 2 doses to maternal fish at @0.1 mg/l Some delay to late stages of organogenesis; development normal through hatching	1976	Crawford RB, AM Guarino	Sheltered shores, tidal creeks, brackish water at mouths of streams and estuaries	Omnivore-diatoms, small crustaceans, mollusks, sometimes small fish	JA96	Arch Environ Contam Toxicol 4:334-348
Hyalella azteca	Amphipod - Freshwater	FW	4,4`-DDT	50-29-3	0.0018	Mortality	LD50	Combined	Whole Body	Juvenile		2001	Lotufo GR, PF Landrum, ML Gedeon	Widely distributed in North America in permanent bodies of water with submerged vegetation	Detritivore	MEC03-102	Environ Tox & Chem 20(4):810-825
Salvelinus namaycush	Trout -Lake	FW	2,3,7,8-TCDD	1746-01-6	5.50E-05	Growth	LOED	Water	Whole Body	Egg	Significant increase in sac fry weight at this TCDD concentration	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Deep waters of cold northern lakes	Carnivore-adults piscivorous	JA474	Can. J. Fish. Aquat. Sci.
Salvelinus namaycush	Trout -Lake	FW	2,3,7,8-TCDD	1746-01-6	3.40E-05	Growth	NOED	Water	Whole Body	Egg	No significant sac fry wet weight change at this TCDD concentration.	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Deep waters of cold northern lakes	Carnivore-adults piscivorous	JA474	Can. J. Fish. Aquat. Sci.
Fundulus heteroclitus	Mummichog	SW	TCDD	1746-01-6	0.000635	Mortality	LOED	Absorption	Whole Body	Embryo	28% Decrease in hatchability.	1995	Prince, R. and K.R. Cooper	Sheltered shores, tidal creeks, brackish water at mouths of streams and estuaries	Omnivore-diatoms, small crustaceans, mollusks, sometimes small fish	JA368	Environmental Toxicology and Chemistry, 14(4):579-587.

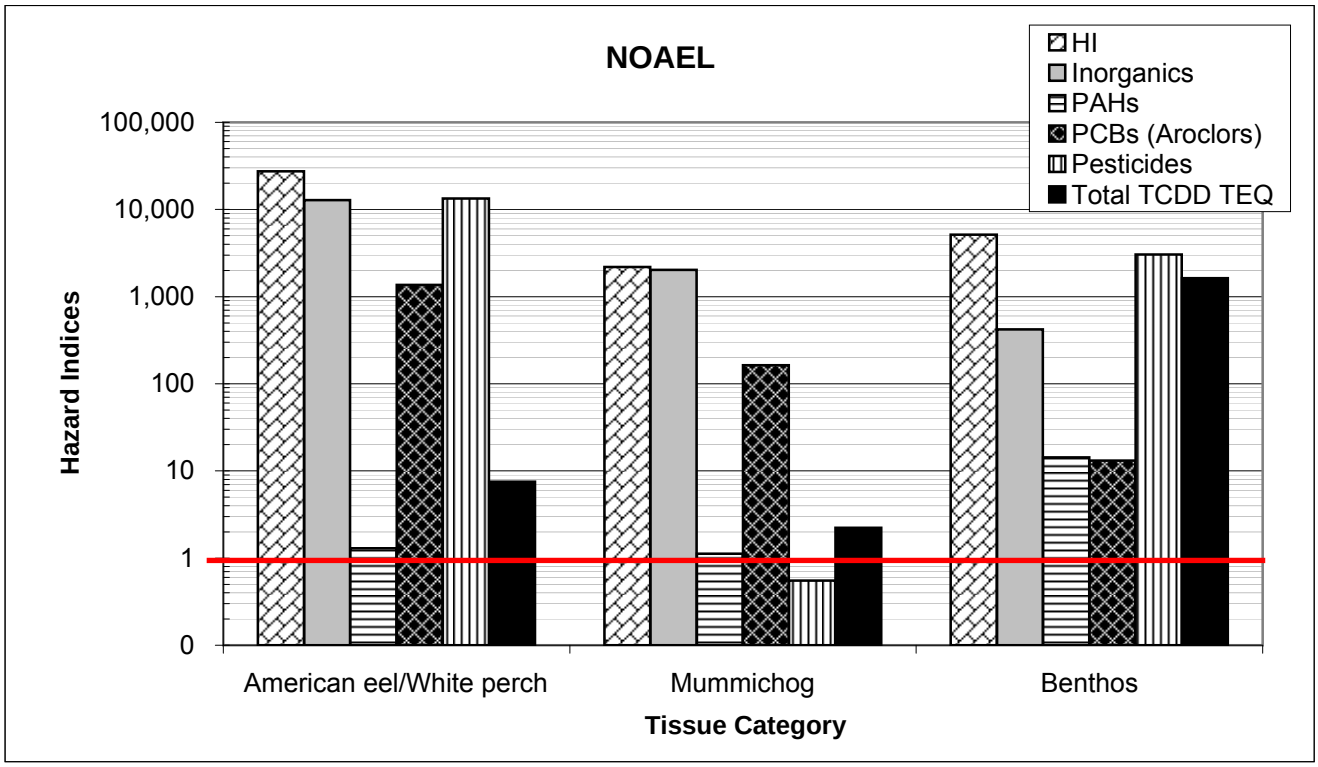
Data extracted from the U.S. Army Corps of Engineers Environmental Residue-Effects Database; queried on 10 January 2006. Database available at the following link:
http://el.erdc.usace.army.mil/ered/

ATTACHMENT 6
ECOLOGICAL RISK – CURRENT CONDITIONS

Attachment 6

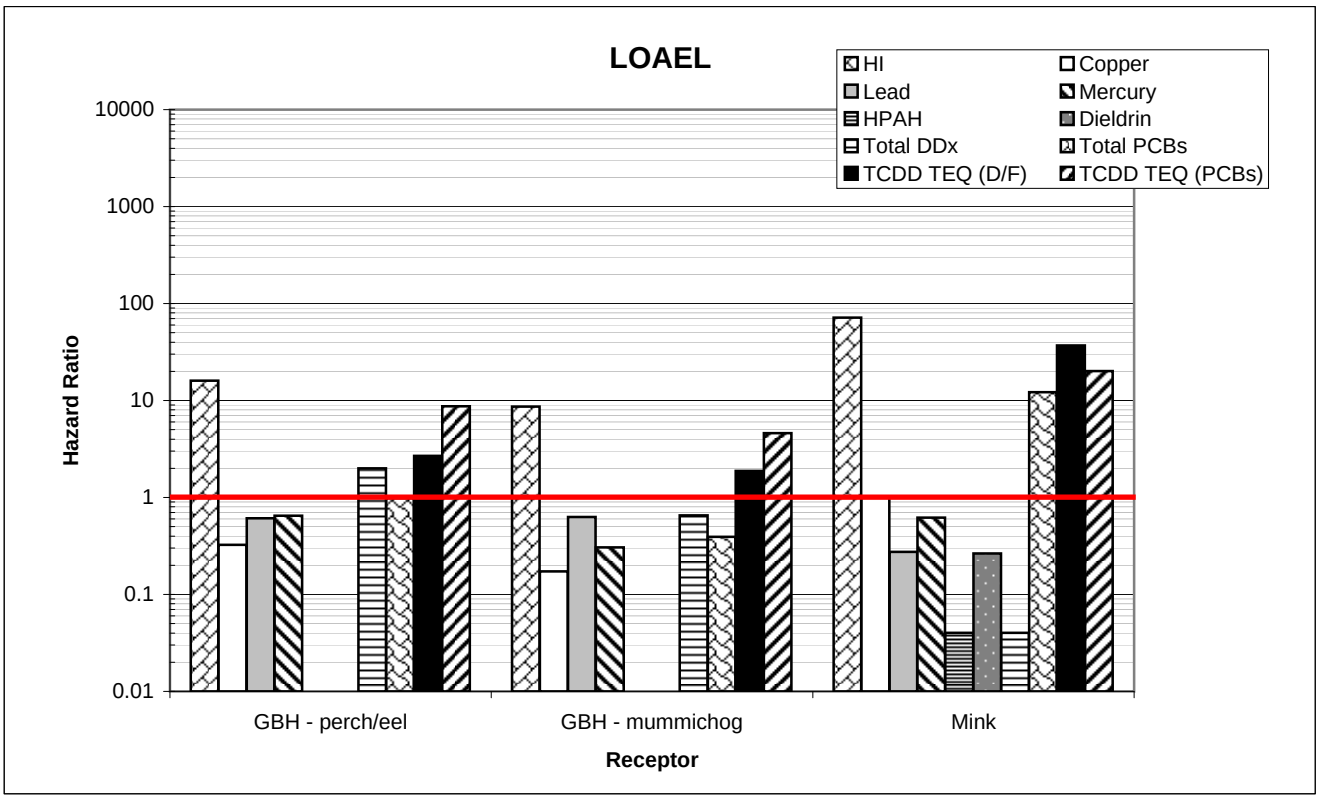
FIGURE 6-1
CBR-BASED HAZARD RATIOS FOR BIOLOGICAL TISSUE SAMPLES
Current Conditions

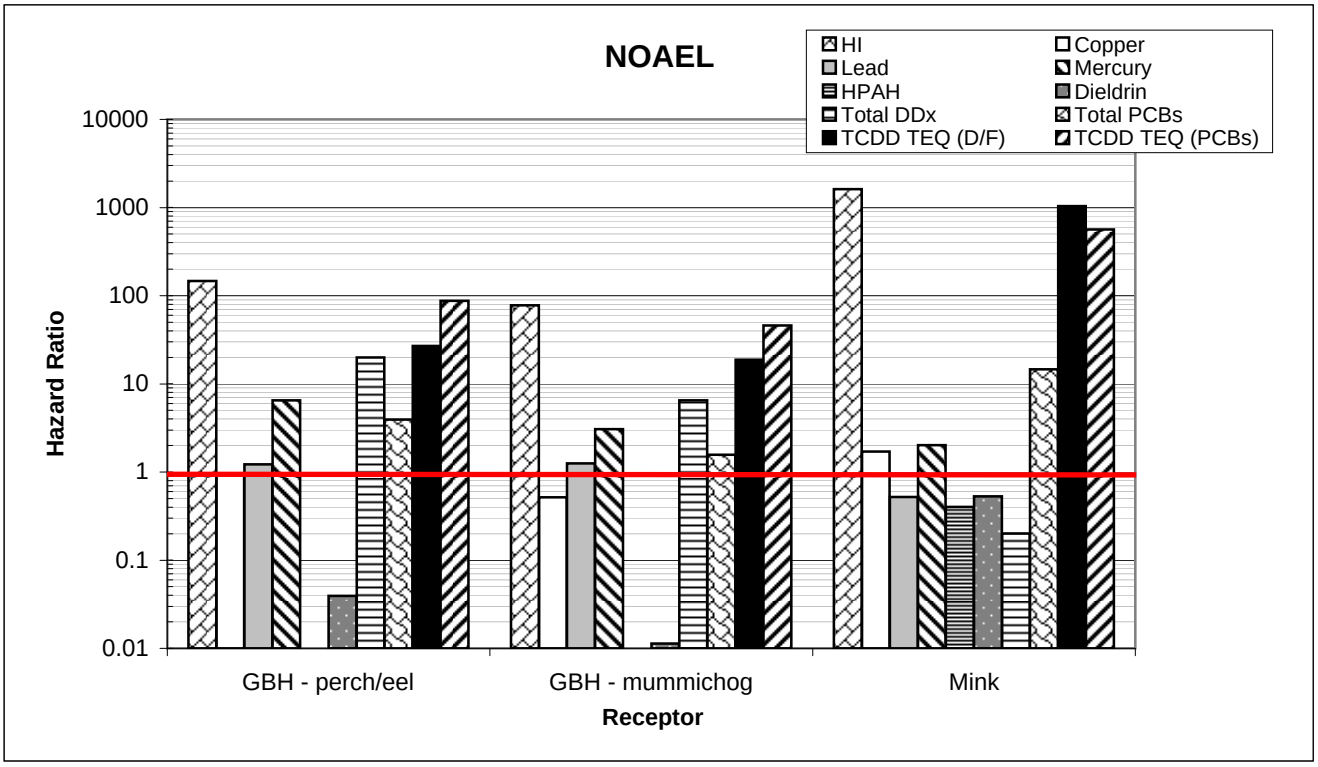




Attachment 6

FIGURE 6-2
SUMMARY OF WILDLIFE EXPOSURE DOSE MODELING
Current Conditions





Attachment 6

TABLE 6-1
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN WHITE PERCH/AMERICAN EEL TISSUE
Current Conditions

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	25	0.002	**0.02**	*Ictalurus punctatus*	Growth - LOED	1	**1.2E+04**	**1.2E+03**
Lead	µg/g	0.63	0.028	**0.28**	*Oncorhynchus mykiss*	Growth - ED_{11}	2	**2.3E+01**	**2.3E+00**
Mercury[1]	µg/g	0.35	0.006	**0.06**	*Ictalurus punctatus*	Mortality - LD_{50}	3	**5.8E+01**	**5.8E+00**
Mercury (methyl)	µg/g	0.35	0.001	**0.01**	*Fundulus heteroclitus*	Growth - ED_{146}	4	**3.5E+02**	**3.5E+01**
						Total Inorganics/Metals		**1.3E+04**	**1.3E+03**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.17	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	8.2E-01	8.2E-02
High Weight PAHs	µg/g	0.10	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	4.8E-01	4.8E-02
						Total PAHs		**1.3E+00**	1.3E-01
PCBs (Aroclors)									
Aroclor, Total	µg/g	3.4	0.0025	**0.025**	*Oryzias latipes*	Reproduction - ED_{11}	6	**1.4E+03**	**1.4E+02**
						Total PCBs		**1.4E+03**	**1.4E+02**
Pesticides									
Dieldrin	µg/g	0.027	0.011	**0.11**	*Oncorhynchus mykiss*	Growth - LOED	7	**2.5E+00**	2.5E-01
Total DDx	µg/g	0.52	**0.000039**	**0.0018**	*Oryzias latipes*	Mortality - LOED	8	**1.3E+04**	**2.9E+02**
						Total Pesticides		**1.3E+04**	**2.9E+02**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.00025	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	**7.4E+00**	**4.3E+00**
TCDD TEQ (PCBs)	µg/g	0.0000051	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	1.5E-01	8.8E-02
						Total TCDD TEQ		**7.5E+00**	**4.4E+00**
						Total		**2.8E+04**	**1.7E+03**

Notes:

[a] Exposure Point Concentration (95% UCLs) presented in Table 4-1. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on white perch and American eel tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

Attachment 6

TABLE 6-1
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN WHITE PERCH/AMERICAN EEL TISSUE
Current Conditions

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Murai, T., J.W. Andrews, and R.G. Smith, Jr., 1981. Aquaculture 22:353-357; ERED Ref ID JA317.
2. Hansen, J.A., J. Lipton, P.G., Welsh, D. Cacela, and B. MacConnell, 2004. Environ. Tox. & Chem. 23:1902-1911; ERED Ref ID Weston05-031.
3. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson, 1979. The Biogeochemistry of Mercury, pg. 629-655; ERED Ref ID JA33.
4. Matta, M.B., J. Linse, C. Cairncross, L. Francendese, and R.M. Kocan, 2001. Environ. Tox. & Chem. 20(2)L327-335; ERED Ref ID MECO3-135.
5. Hose, J.E., J.B. Hannah, D. DiJulio, M.L. Landholt, B.S. Miller, W.T. Iwaoka, and S.P. Felton, 1982. Arch. Environ. Contam. Toxicol. 11:167-171; ERED Ref ID JA212
6. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo, 2005. Environ. Tox. Chem. 24:591-596; ERED Ref ID Weston05-046.
7. Dillon, T.M., 1984. Army Corps of Engineers Technical Report, D-84-2; ERED Ref ID MEC04-070.
8. Villalobos, S.B., D.M. Papoulias, S.D. Pastva, A.L. Blankenship, J. Meadow, D.E. Tillitt, and J.P. Giesy, 2003. Chemosphere 53:819-826; ERED Ref ID MEC04-293.
9. Walker, M.K., J.M. Spitsbergen, J.R. Olson, and R.E. Peterson, 1991. Can. J. Fish. Aquat. Sci.; ERED Ref ID JA474.

Attachment 6

TABLE 6-2
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN MUMMICHOG TISSUE
Current Conditions

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	3.9	0.002	**0.02**	*Ictalurus punctatus*	Growth - LOED	1	**1.9E+03**	**1.9E+02**
Lead	µg/g	1.2	0.028	**0.28**	*Oncorhynchus mykiss*	Growth - ED_{11}	2	**4.5E+01**	**4.5E+00**
Mercury[1]	µg/g	0.041	0.006	**0.06**	*Ictalurus punctatus*	Mortality - LD_{50}	3	**6.8E+00**	6.8E-01
Mercury (methyl)	µg/g	0.041	0.001	**0.01**	*Fundulus heteroclitus*	Growth - ED_{146}	4	**4.1E+01**	**4.1E+00**
						Total Inorganics/Metals		**2.0E+03**	**2.0E+02**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.17	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	8.2E-01	8.2E-02
High Weight PAHs	µg/g	0.065	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	3.1E-01	3.1E-02
						Total PAHs		**1.1E+00**	1.1E-01
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.72	0.0044	**0.044**	*Fundulus heteroclitus*	Growth - ED_{149}	4	**1.6E+02**	**1.6E+01**
						Total PCBs		**1.6E+02**	**1.6E+01**
Pesticides									
Dieldrin	µg/g	0.0042	**12.8**	**34**	*Cyprinodon variegatus*	Mortality - LOED	6	3.3E-04	1.2E-04
Total DDx	µg/g	0.088	**0.16**	**0.85**	*Fundulus heteroclitus*	Reproduction - ED_{20}	7	5.5E-01	1.0E-01
						Total Pesticides		5.5E-01	1.0E-01
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.00014	0.000064	**0.00064**	*Fundulus heteroclitus*	Mortality - LOED	8	**2.2E+00**	2.2E-01
TCDD TEQ (PCBs)	µg/g	0.0000017	0.000064	**0.00064**	*Fundulus heteroclitus*	Mortality - LOED	8	2.7E-02	2.7E-03
						Total TCDD TEQ		**2.2E+00**	2.2E-01
						Total		**2.2E+03**	**2.2E+02**

Notes:

[a] Exposure Point Concentration (95% UCLs) presented in Table 4-1. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on mummichog tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

TABLE 6-2
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN MUMMICHOG TISSUE
Current Conditions

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Murai, T., J.W. Andrews, and R.G. Smith, Jr., 1981. Aquaculture 22:353-357; ERED Ref ID JA317.
2. Hansen, J.A., J. Lipton, P.G., Welsh, D. Cacela, and B. MacConnell, 2004. Environ. Tox. & Chem. 23:1902-1911; ERED Ref ID Weston05-031.
3. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson, 1979. The Biogeochemistry of Mercury, pg. 629-655; ERED Ref ID JA33.
4. Matta, M.B., J. Linse, C. Cairncross, L. Francendese, and R.M. Kocan, 2001. Environ. Tox. & Chem. 20(2)L327-335; ERED Ref ID MECO3-135.
5. Hose, J.E., J.B. Hannah, D. DiJulio, M.L. Landholt, B.S. Miller, W.T. Iwaoka, and S.P. Felton, 1982. Arch. Environ. Contam. Toxicol. 11:167-171; ERED Ref ID JA212
6. Parrish, P.P., J.A. Couch, J. Forester, J.M. Patrick, and G.H. Cook, NS, Contribution No. 178, Gulf Breeze Environmental Research Laboratory, Sabine Island, Gulf Breeze, FL. 32561; ERED R
7. Crawford, R.B., and A.M. Guarino, 1976. Arch. Environ. Contam. Toxicol. 4:334-348; ERED Ref ID JA96.
8. Prince, R., and K.R. Cooper, 1995. Environ. Toxicol. Chem. 14(4):579-587; ERED Ref ID JA368.

TABLE 6-3
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN BLUE CRAB TISSUE
Current Conditions

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	35	0.086	**0.86**	*Protothaca staminea*	Mortality - LD_{11}	1	**4.1E+02**	**4.1E+01**
Lead	µg/g	0.55	0.52	**5.2**	*Hyalella azteca*	Mortality - LD_{25}	2	**1.0E+00**	1.0E-01
Mercury[1]	µg/g	0.10	0.0095	**0.095**	*Acartia tonsa*	Reproduction - ED_{50}	3	**1.0E+01**	**1.0E+00**
Mercury (methyl)	µg/g	0.10	0.0095	**0.095**	*Acartia tonsa*	Reproduction - ED_{50}	3	**1.0E+01**	**1.0E+00**
						Total Inorganics/Metals		**4.2E+02**	**4.2E+01**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.15	0.022	**0.22**	*Mytilus edulis*	Reproduction - LOED	4	**6.9E+00**	6.9E-01
High Weight PAHs	µg/g	0.16	0.022	**0.22**	*Mytilus edulis*	Reproduction - LOED	4	**7.4E+00**	7.4E-01
						Total PAHs		**1.4E+01**	**1.4E+00**
PCBs (Aroclors)									
Aroclor, Total	µg/g	5.5	**0.42**	**1.1**	*Palaemonetes pugio*	Mortality - LOED	5	**1.3E+01**	**5.0E+00**
						Total PCBs		**1.3E+01**	**5.0E+00**
Pesticides									
Dieldrin	µg/g	0.022	**0.01**	**0.08**	*Penaeus duorarum*	Mortality - LOED	6	**2.2E+00**	2.8E-01
Total DDx	µg/g	0.56	0.00018	**0.0018**	*Hyalella azteca*	Mortality - LD_{50}	7	**3.0E+03**	**3.0E+02**
						Total Pesticides		**3.0E+03**	**3.0E+02**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.00022	**0.00000015**	**0.0000013**	*Crassostrea virginica*	Reproduction - LOED	8	**1.5E+03**	**1.7E+02**
TCDD TEQ (PCBs)	µg/g	0.000025	**0.00000015**	**0.0000013**	*Crassostrea virginica*	Reproduction - LOED	8	**1.7E+02**	**1.9E+01**
						Total TCDD TEQ		**1.6E+03**	**1.9E+02**
						Total		**5.1E+03**	**5.4E+02**

Notes:

[a] Exposure Point Concentrations (95% UCLs) presented in Table 4-1. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on blue crab tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

References:

1. Roesijadi, G., 1980. Biol.Bull. 158:233-247; ERED Ref ID JA377.
2. Borgmann, U., and W.P. Norwood, 1999. Can. J. Fish. Aquat. Sci. 56; ERED Ref ID MEC04-063.

TABLE 6-3
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN BLUE CRAB TISSUE
Current Conditions

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

3. Hook, S., and N. Fisher, 2002. Marine Environ. Res. 53: 161-174; ERED Ref ID MEC03-211.

4. Eertman, R.H.M., C.L. Groenink, B. Sandee, and H. Hummel, 1995; ERED Ref ID URS75.

5. (NOAEL) Nimmo, D.R., J. Forester, P.T. Heitmuller, and G.H. Cook, 1974. Bull. Environ. Contam. Toxicol. 11(4):303-308; ERED Ref ID JA329
(LOAEL) Hansen, D.J., P.R. Parrish, and J. Forester, 1974. Environ. Res. 7:363-373; ERED Ref ID URS102.

6. Parrish, P.P., J.A. Couch, J. Forester, J.M. Patrick, and G.H. Cook, NS. Contribution No. 178, Gulf Breeze Environmental Research Laboratory, Sabine Island, Gulf Breeze, FL 32561; ERED Ref ID SEQ97-2.

7. Lotufo, G.R., P.F. Landrum, and M.L. Gedeon, 2001. Environ. Tox. Chem. 20(4):810-825; ERED Ref ID MEC03-102.

8. Wintermyer, M.L., and K.R. Cooper, 2003. Dioxin/Furan and Polychlorinated Biphenyl Concentrations in Eastern Oyster (Crassostrea virginica, Gmelin) Tissues and the Effects on Egg-Fertilization and Development; J. Shellfish Res. 22(3):737-746.

Attachment 6

TABLE 6-4
SUMMARY OF TOXICITY REFERENCE VALUES FOR AQUATIC WILDLIFE RECEPTORS

Chemical Name	Large Bird		Large Mammal		Reference
	NOAEL	LOAEL	NOAEL	LOAEL	
TCDD TEQ (D/F) - bird	1.4E-06	1.4E-05			Nosek *et al.* , 1992a, b
TCDD TEQ (D/F) - mammal			8.0E-08	2.2E-06	Tillet *et al.* , 1996
TCDD TEQ (PCBs) - bird	1.4E-06	1.4E-05			Nosek *et al.* , 1992a, b
TCDD TEQ (PCBs) - mammal			8.0E-08	2.2E-06	Tillet *et al.* , 1996
Total TCDD TEQ - bird	1.4E-06	1.4E-05			Nosek *et al.* , 1992a, b
Total TCDD TEQ - mammal			8.0E-08	2.2E-06	Tillet *et al.* , 1996
Total PCBs (Aroclors) -birds	1.0E-01	4.0E-01			Chapman, 2003
Total PCBs (Aroclors) -mammals			8.0E-02	9.6E-02	Chapman, 2003
Total DDT-birds	2.8E-03	2.8E-02			Anderson *et al.* , 1975
Total DDT-mammals			8.0E-01	4.0E+00	Sample *et al.* , 1996
Dieldrin-birds	7.1E-02	3.8E+00			Nebeker *et al.* , 1992
Dieldrin-mammals			1.5E-02	3.0E-02	Harr *et al.* , 1970
LPAH-birds	-	-			Not necessary
LPAH-mammals			-	-	Not necessary
HPAH-birds	-	-			Not available
HPAH-mammals			1.0E+00	1.0E+01	Sample *et al.* , 1996
Copper-birds	4.1E+00	1.2E+01			USEPA, 2007
Copper-mammals			5.6E+00	9.3E+00	USEPA, 2007
Lead-birds	1.6E+00	3.3E+00			USEPA, 2005
Lead-mammals			4.7E+00	8.9E+00	USEPA, 2005
Mercury-birds	7.8E-03	7.8E-02			Heinz, 1979
Mercury-mammals			5.5E-02	1.8E-01	Wobeser *et al.,* 1976a,b

Notes:
Units in ug/g-day
The TRV selection process and review of relevant toxicological data are discussed in the document text.

References:
Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Prepared for the U.S. Department of Energy. ES/ER/TM-86/R3. June.
USEPA. 2005. Ecological Screening Levels for Lead: Interim Final. OSWER Directive 9285.7-70. March.
USEPA. 2007. Ecological Screening Levels for Copper: Interim Final. OSWER Directive 9285.7-68. February.

TABLE 6-5
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / MINK

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0034	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 6-6
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / MINK

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	2.4E+02	mg/kg	1.4E+00	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	2.5E-01	1.5E-01
Lead	3.7E+02	mg/kg	2.3E+00	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	4.8E-01	2.5E-01
Mercury	3.6E+00	mg/kg	2.2E-02	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	4.0E-01	1.2E-01
LPAH	4.1E+01	mg/kg	2.5E-01	mg/kg-d	-	-			
HPAH	6.1E+01	mg/kg	3.7E-01	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	3.7E-01	3.7E-02
Total PCBs	1.8E+00	mg/kg	1.1E-02	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	1.4E-01	1.1E-01
Dieldrin	1.9E-02	mg/kg	1.1E-04	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	7.5E-03	3.8E-03
Total DDx	3.8E-01	mg/kg	2.3E-03	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	2.8E-03	5.7E-04
TCDD TEQ (D/F)	1.6E-03	mg/kg	9.5E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**1.2E+02**	**4.2E+00**
TCDD TEQ (PCBs)	4.5E-05	mg/kg	2.7E-07	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**3.4E+00**	1.2E-01
							HAZARD INDICES:	**1.2E+02**	**5.0E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 6-5.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 6-7
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / MINK

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.17	USEPA, 1993	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	20%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 6-8
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / MINK

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	3.5E+01	mg/kg	2.1E+00	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	3.8E-01	2.3E-01
Lead	5.5E-01	mg/kg	3.3E-02	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	7.0E-03	3.7E-03
Mercury	9.7E-02	mg/kg	5.8E-03	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	1.1E-01	3.2E-02
LPAH	1.5E-01	mg/kg	9.1E-03	mg/kg-d	-	-			
HPAH	1.6E-01	mg/kg	9.8E-03	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	9.8E-03	9.8E-04
Total PCBs	5.5E+00	mg/kg	3.3E-01	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	**4.1E+00**	**3.5E+00**
Dieldrin	2.2E-02	mg/kg	1.3E-03	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	8.8E-02	4.4E-02
Total DDx	5.6E-01	mg/kg	3.4E-02	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	4.2E-02	8.4E-03
TCDD TEQ (D/F)	2.2E-04	mg/kg	1.3E-05	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**1.7E+02**	**5.9E+00**
TCDD TEQ (PCBs)	4.4E-04	mg/kg	2.7E-05	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**3.3E+02**	**1.2E+01**
							HAZARD INDICES:	**5.0E+02**	**2.2E+01**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 6-7.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 6-9
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : White perch/American eel / MINK

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.17	USEPA, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	80%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 6-10
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : White perch/American eel / MINK

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	2.5E+01	mg/kg	6.0E+00	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	**1.1E+00**	6.4E-01
Lead	6.3E-01	mg/kg	1.5E-01	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	3.2E-02	1.7E-02
Mercury	3.5E-01	mg/kg	8.4E-02	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	**1.5E+00**	4.6E-01
LPAH	1.7E-01	mg/kg	4.1E-02	mg/kg-d	-	-			
HPAH	1.0E-01	mg/kg	2.4E-02	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	2.4E-02	2.4E-03
Total PCBs	3.4E+00	mg/kg	8.2E-01	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	**1.0E+01**	**8.6E+00**
Dieldrin	2.7E-02	mg/kg	6.5E-03	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	4.3E-01	2.2E-01
Total DDx	5.2E-01	mg/kg	1.3E-01	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	1.6E-01	3.1E-02
TCDD TEQ (D/F)	2.5E-04	mg/kg	6.0E-05	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**7.5E+02**	**2.7E+01**
TCDD TEQ (PCBs)	7.6E-05	mg/kg	1.8E-05	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**2.3E+02**	**8.2E+00**
							HAZARD INDICES:	**1.0E+03**	**4.5E+01**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 6-9.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 6-11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : MINK

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: RME
RECEPTOR: MINK
TOTAL RISK (HI): 1.6E+03

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		1.2E+02		1.7E+02	7.5E+02	***1.0E+03***	***64%***
TCDD TEQ (PCBs)		3.4E+00		3.3E+02	2.3E+02	***5.6E+02***	***35%***
Total PCBs		1.4E-01		4.1E+00	1.0E+01	***1.5E+01***	1%
Mercury		4.0E-01		1.1E-01	1.5E+00	***2.0E+00***	0%
Copper		2.5E-01		3.8E-01	1.1E+00	***1.7E+00***	0%
Dieldrin		7.5E-03		8.8E-02	4.3E-01	5.3E-01	0%
Lead		4.8E-01		7.0E-03	3.2E-02	5.2E-01	0%
HPAH		3.7E-01		9.8E-03	2.4E-02	4.0E-01	0%
Total DDx		2.8E-03		4.2E-02	1.6E-01	2.0E-01	0%
LPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.2E+02**	**-**	**5.0E+02**	**1.0E+03**	**1.6E+03**	
PERCENTAGE OF TOTAL RISK		**8%**		**31%**	**61%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 6-12
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : MINK

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: RME
RECEPTOR: MINK
TOTAL RISK (HI): 7.2E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		4.2E+00		5.9E+00	2.7E+01	***3.7E+01***	***52%***
TCDD TEQ (PCBs)		1.2E-01		1.2E+01	8.2E+00	***2.0E+01***	***28%***
Total PCBs		1.1E-01		3.5E+00	8.6E+00	***1.2E+01***	***17%***
Copper		1.5E-01		2.3E-01	6.4E-01	***1.0E+00***	1%
Mercury		1.2E-01		3.2E-02	4.6E-01	6.2E-01	1%
Lead		2.5E-01		3.7E-03	1.7E-02	2.7E-01	0%
Dieldrin		3.8E-03		4.4E-02	2.2E-01	2.6E-01	0%
Total DDx		5.7E-04		8.4E-03	3.1E-02	4.0E-02	0%
HPAH		3.7E-02		9.8E-04	2.4E-03	4.0E-02	0%
LPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**5.0E+00**	**-**	**2.2E+01**	**4.5E+01**	**7.2E+01**	
PERCENTAGE OF TOTAL RISK		**7%**		**30%**	**63%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 6-13
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME (with WP/AE diet)
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 6-14
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME (with WP/AE diet)
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	2.4E+02	mg/kg	1.2E+00	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	3.0E-01	1.0E-01
Lead	3.7E+02	mg/kg	1.9E+00	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	**1.2E+00**	5.9E-01
Mercury	3.6E+00	mg/kg	1.9E-02	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	**2.4E+00**	2.4E-01
LPAH	4.1E+01	mg/kg	2.1E-01	mg/kg-d	-	-			
HPAH	6.1E+01	mg/kg	3.1E-01	mg/kg-d	-	-			
Total PCBs	1.8E+00	mg/kg	9.3E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	9.3E-02	2.3E-02
Dieldrin	1.9E-02	mg/kg	9.6E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	1.4E-03	2.5E-05
Total DDx	3.8E-01	mg/kg	1.9E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	6.9E-01	6.9E-02
TCDD TEQ (D/F)	1.8E-03	mg/kg	9.1E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**6.5E+00**	6.5E-01
TCDD TEQ (PCBs)	7.5E-04	mg/kg	3.9E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**2.8E+00**	2.8E-01
							HAZARD INDICES:	**1.4E+01**	**1.9E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 6-13.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 6-15
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME (with WP/AE diet)
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	15%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 6-16
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME (with WP/AE diet)
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	3.5E+01	mg/kg	5.4E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.3E-01	4.5E-02
Lead	5.5E-01	mg/kg	8.4E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	5.2E-03	2.6E-03
Mercury	9.7E-02	mg/kg	1.5E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	1.9E-01	1.9E-02
LPAH	1.5E-01	mg/kg	2.3E-03	mg/kg-d	-	-			
HPAH	1.6E-01	mg/kg	2.5E-03	mg/kg-d	-	-			
Total PCBs	5.5E+00	mg/kg	8.5E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	8.5E-01	2.1E-01
Dieldrin	2.2E-02	mg/kg	3.4E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	4.8E-03	8.9E-05
Total DDx	5.6E-01	mg/kg	8.6E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**3.1E+00**	3.1E-01
TCDD TEQ (D/F)	2.7E-04	mg/kg	4.2E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**3.0E+00**	3.0E-01
TCDD TEQ (PCBs)	2.8E-03	mg/kg	4.3E-05	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**3.1E+01**	**3.1E+00**
							HAZARD INDICES:	**3.8E+01**	**4.0E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 6-15.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 6-17
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : White perch/American eel / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME (with WP/AE diet)
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{fish}	PERCENT FISH IN DIET	unitless	85%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 6-18
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : White perch/American eel / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME (with WP/AE diet)
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	2.5E+01	mg/kg	2.2E+00	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	5.4E-01	1.8E-01
Lead	6.3E-01	mg/kg	5.5E-02	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	3.4E-02	1.7E-02
Mercury	3.5E-01	mg/kg	3.0E-02	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	**3.9E+00**	3.9E-01
LPAH	1.7E-01	mg/kg	1.5E-02	mg/kg-d	-	-			
HPAH	1.0E-01	mg/kg	8.8E-03	mg/kg-d	-	-			
Total PCBs	3.4E+00	mg/kg	3.0E-01	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	**3.0E+00**	7.5E-01
Dieldrin	2.7E-02	mg/kg	2.4E-03	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	3.3E-02	6.2E-04
Total DDx	5.2E-01	mg/kg	4.5E-02	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**1.6E+01**	**1.6E+00**
TCDD TEQ (D/F)	2.8E-04	mg/kg	2.4E-05	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.7E+01**	**1.7E+00**
TCDD TEQ (PCBs)	8.6E-04	mg/kg	7.5E-05	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**5.4E+01**	**5.4E+00**
							HAZARD INDICES:	**9.5E+01**	**1.0E+01**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 6-17.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 6-19
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: RME (with WP/AE diet)
RECEPTOR: HERON
TOTAL RISK (HI): 1.5E+02

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (PCBs)		2.8E+00		3.1E+01	5.4E+01	***8.7E+01***	***59%***
TCDD TEQ (D/F)		6.5E+00		3.0E+00	1.7E+01	***2.7E+01***	***18%***
Total DDx		6.9E-01		3.1E+00	1.6E+01	***2.0E+01***	***14%***
Mercury		2.4E+00	-	1.9E-01	3.9E+00	***6.5E+00***	4%
Total PCBs		9.3E-02	-	8.5E-01	3.0E+00	***3.9E+00***	3%
Lead		1.2E+00	-	5.2E-03	3.4E-02	***1.2E+00***	1%
Copper		3.0E-01	-	1.3E-01	5.4E-01	9.7E-01	1%
Dieldrin		1.4E-03		4.8E-03	3.3E-02	3.9E-02	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.4E+01**	**-**	**3.8E+01**	**9.5E+01**	**1.5E+02**	
PERCENTAGE OF TOTAL RISK		**9%**		**26%**	**65%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 6-20
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: RME (with WP/AE diet)
RECEPTOR: HERON
TOTAL RISK (HI): 1.6E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (PCBs)		2.8E-01		3.1E+00	5.4E+00	***8.7E+00***	***55%***
TCDD TEQ (D/F)		6.5E-01		3.0E-01	1.7E+00	***2.7E+00***	***17%***
Total DDx		6.9E-02		3.1E-01	1.6E+00	***2.0E+00***	***12%***
Total PCBs		2.3E-02	-	2.1E-01	7.5E-01	9.8E-01	6%
Mercury		2.4E-01	-	1.9E-02	3.9E-01	6.5E-01	4%
Lead		5.9E-01	-	2.6E-03	1.7E-02	6.1E-01	4%
Copper		1.0E-01	-	4.5E-02	1.8E-01	3.2E-01	2%
Dieldrin		2.5E-05		8.9E-05	6.2E-04	7.4E-04	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.9E+00**	**-**	**4.0E+00**	**1.0E+01**	**1.6E+01**	
PERCENTAGE OF TOTAL RISK		**12%**		**25%**	**63%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

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TABLE 6-21
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME (with mummichog diet)
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

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TABLE 6-22
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME (with mummichog diet)
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	2.4E+02	mg/kg	1.2E+00	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	3.0E-01	1.0E-01
Lead	3.7E+02	mg/kg	1.9E+00	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	**1.2E+00**	5.9E-01
Mercury	3.6E+00	mg/kg	1.9E-02	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	**2.4E+00**	2.4E-01
LPAH	4.1E+01	mg/kg	2.1E-01	mg/kg-d	-	-			
HPAH	6.1E+01	mg/kg	3.1E-01	mg/kg-d	-	-			
Total PCBs	1.8E+00	mg/kg	9.3E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	9.3E-02	2.3E-02
Dieldrin	1.9E-02	mg/kg	9.6E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	1.4E-03	2.5E-05
Total DDx	3.8E-01	mg/kg	1.9E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	6.9E-01	6.9E-02
TCDD TEQ (D/F)	1.8E-03	mg/kg	9.1E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**6.5E+00**	6.5E-01
TCDD TEQ (PCBs)	7.5E-04	mg/kg	3.9E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**2.8E+00**	2.8E-01
							HAZARD INDICES:	**1.4E+01**	**1.9E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 6-21.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

Attachment 6

TABLE 6-23
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME (with mummichog diet)
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	15%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

Attachment 6

TABLE 6-24
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME (with mummichog diet)
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	3.5E+01	mg/kg	5.4E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.3E-01	4.5E-02
Lead	5.5E-01	mg/kg	8.4E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	5.2E-03	2.6E-03
Mercury	9.7E-02	mg/kg	1.5E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	1.9E-01	1.9E-02
LPAH	1.5E-01	mg/kg	2.3E-03	mg/kg-d	-	-			
HPAH	1.6E-01	mg/kg	2.5E-03	mg/kg-d	-	-			
Total PCBs	5.5E+00	mg/kg	8.5E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	8.5E-01	2.1E-01
Dieldrin	2.2E-02	mg/kg	3.4E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	4.8E-03	8.9E-05
Total DDx	5.6E-01	mg/kg	8.6E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**3.1E+00**	3.1E-01
TCDD TEQ (D/F)	2.7E-04	mg/kg	4.2E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**3.0E+00**	3.0E-01
TCDD TEQ (PCBs)	2.8E-03	mg/kg	4.3E-05	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**3.1E+01**	**3.1E+00**
							HAZARD INDICES:	**3.8E+01**	**4.0E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 6-23.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

Attachment 6

TABLE 6-25
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Mummichog / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: FISH
EXPOSURE MEDIUM: Mummichog
EXPOSURE POINT: RME (with mummichog diet)
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{fish}	PERCENT FISH IN DIET	unitless	85%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

Attachment 6

TABLE 6-26
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Mummichog / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: FISH
EXPOSURE MEDIUM: Mummichog
EXPOSURE POINT: RME (with mummichog diet)
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	3.9E+00	mg/kg	3.4E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	8.4E-02	2.8E-02
Lead	1.2E+00	mg/kg	1.1E-01	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	6.7E-02	3.3E-02
Mercury	4.1E-02	mg/kg	3.6E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	4.6E-01	4.6E-02
LPAH	1.7E-01	mg/kg	1.5E-02	mg/kg-d	-	-			
HPAH	6.5E-02	mg/kg	5.7E-03	mg/kg-d	-	-			
Total PCBs	7.2E-01	mg/kg	6.3E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	6.3E-01	1.6E-01
Dieldrin	4.2E-03	mg/kg	3.7E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	5.2E-03	9.7E-05
Total DDx	8.8E-02	mg/kg	7.7E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**2.7E+00**	2.7E-01
TCDD TEQ (D/F)	1.5E-04	mg/kg	1.3E-05	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**9.4E+00**	9.4E-01
TCDD TEQ (PCBs)	2.0E-04	mg/kg	1.7E-05	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.2E+01**	**1.2E+00**
							HAZARD INDICES:	**2.6E+01**	**2.7E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 6-25.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

Attachment 6

TABLE 6-27
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: RME (with mummichog diet)
RECEPTOR: HERON
TOTAL RISK (HI): 7.8E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (PCBs)		2.8E+00		3.1E+01	1.2E+01	***4.6E+01***	***59%***
TCDD TEQ (D/F)		6.5E+00		3.0E+00	9.4E+00	***1.9E+01***	***24%***
Total DDx		6.9E-01		3.1E+00	2.7E+00	***6.5E+00***	8%
Mercury		2.4E+00		1.9E-01	4.6E-01	***3.1E+00***	4%
Total PCBs		9.3E-02		8.5E-01	6.3E-01	***1.6E+00***	2%
Lead		1.2E+00		5.2E-03	6.7E-02	***1.3E+00***	2%
Copper		3.0E-01		1.3E-01	8.4E-02	5.2E-01	1%
Dieldrin		1.4E-03		4.8E-03	5.2E-03	1.1E-02	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.4E+01**	**-**	**3.8E+01**	**2.6E+01**	**7.8E+01**	
PERCENTAGE OF TOTAL RISK		**18%**		**49%**	**33%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

Attachment 6

TABLE 6-28
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: RME (with mummichog diet)
RECEPTOR: HERON
TOTAL RISK (HI): 8.6E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (PCBs)		2.8E-01		3.1E+00	1.2E+00	***4.6E+00***	***53%***
TCDD TEQ (D/F)		6.5E-01		3.0E-01	9.4E-01	***1.9E+00***	***22%***
Total DDx		6.9E-02		3.1E-01	2.7E-01	6.5E-01	8%
Lead		5.9E-01		2.6E-03	3.3E-02	6.3E-01	7%
Total PCBs		2.3E-02		2.1E-01	1.6E-01	3.9E-01	5%
Mercury		2.4E-01		1.9E-02	4.6E-02	3.1E-01	4%
Copper		1.0E-01		4.5E-02	2.8E-02	1.7E-01	2%
Dieldrin		2.5E-05		8.9E-05	9.7E-05	2.1E-04	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.9E+00**	**-**	**4.0E+00**	**2.7E+00**	**8.6E+00**	
PERCENTAGE OF TOTAL RISK		**23%**		**46%**	**32%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

ATTACHMENT 7
HUMAN HEALTH RISK – FUTURE CONDITIONS

TABLE 7-1
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
MONITORED NATURAL ATTENUATION - YEAR=2018
Lower Passaic River

Scenario Timeframe: Future
Receptor Population: Angler (Adult)
Receptor Age: >18 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	2.E-04	mg/kg	2.3E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	3.E-03	6.70E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	2.E-05	mg/kg	2.0E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	3.E-04	5.81E-09	mg/kg-day	--	--	ND
				Total PCBs	1.E+00	mg/kg	1.5E-04	mg/kg-day	2.0E+00	(mg/kg-day)-1	3.E-04	4.39E-04	mg/kg-day	2.0E-05	mg/kg-day	22
				4,4'-DDD	2.E-01	mg/kg	2.0E-05	mg/kg-day	2.4E-01	(mg/kg-day)-1	5.E-06	5.95E-05	mg/kg-day	--	--	ND
				4,4'-DDE	3.E-01	mg/kg	3.2E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-05	9.40E-05	mg/kg-day	--	--	ND
				4,4'-DDT	8.E-03	mg/kg	1.0E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.E-07	3.00E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Total Chlordane	1.E+00	mg/kg	1.4E-04	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.E-05	4.18E-04	mg/kg-day	5.0E-04	mg/kg-day	0.84
				Dieldrin	3.E-02	mg/kg	4.0E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	6.E-05	1.16E-05	mg/kg-day	5.0E-05	mg/kg-day	0.23
				Methyl mercury	2.E-01	mg/kg	1.9E-05	mg/kg-day	--	--	ND	5.61E-05	mg/kg-day	1.0E-04	mg/kg-day	0.6
			Exp. Route Total								4.E-03					24
		Exposure Point Total									4.E-03					24
	Exposure Medium Total										4.E-03					24
Medium Total																
Crab				TCDD TEQ (D/F)	1E-04	mg/kg	1.6E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-03	4.7E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	2E-05	mg/kg	2.6E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	4.E-04	7.7E-09	mg/kg-day	--	--	ND
				Total PCBs	1E+00	mg/kg	1.3E-04	mg/kg-day	2.0E+00	(mg/kg-day)-1	3.E-04	3.8E-04	mg/kg-day	2.0E-05	mg/kg-day	19
				4,4'-DDD	8E-02	mg/kg	8.6E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.E-06	2.5E-05	mg/kg-day	--	--	ND
				4,4'-DDE	1E-01	mg/kg	1.6E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	6.E-06	4.8E-05	mg/kg-day	--	--	ND
				4,4'-DDT	1E-02	mg/kg	1.2E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.E-07	3.6E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Total Chlordane	3E-02	mg/kg	3.6E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.E-06	1.0E-05	mg/kg-day	5.0E-04	mg/kg-day	0.02
				Dieldrin	1E-02	mg/kg	1.5E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.E-05	4.5E-06	mg/kg-day	5.0E-05	mg/kg-day	0.09
				Methyl mercury	4E-02	mg/kg	4.9E-06	mg/kg-day	--	--	ND	1.4E-05	mg/kg-day	1.0E-04	mg/kg-day	0.1
			Exp. Route Total								3.E-03					19
		Exposure Point Total									3.E-03					19
	Exposure Medium Total										3.E-03					19
Medium Total																

ND - not determined because toxicity values are not available for this exposure route.
mg/kg - milligram per kilogram

TABLE 7-2
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
MONITORED NATURAL ATTENUATION - YEAR=2048
Lower Passaic River Restoration Project

Scenario Timeframe: Future
Receptor Population: Angler (Adult)
Receptor Age: >18 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration (a)		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	9.E-05	mg/kg	1.1E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-03	5.44E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	7.E-06	mg/kg	8.1E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-04	7.85E-09	mg/kg-day	--	--	ND
				Total PCBs	5.E-01	mg/kg	6.4E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.E-04	3.62E-04	mg/kg-day	2.0E-05	mg/kg-day	18
				4,4'-DDD	9.E-02	mg/kg	1.1E-05	mg/kg-day	2.4E-01	(mg/kg-day)-1	3.E-06	5.15E-05	mg/kg-day	--	--	ND
				4,4'-DDE	1.E-01	mg/kg	1.7E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	6.E-06	8.31E-05	mg/kg-day	--	--	ND
				4,4'-DDT	4.E-03	mg/kg	5.5E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-07	2.62E-06	mg/kg-day	5.0E-04	mg/kg-day	0.005
				Total Chlordane	9.E-01	mg/kg	1.1E-04	mg/kg-day	3.5E-01	(mg/kg-day)-1	4.E-05	3.96E-04	mg/kg-day	5.0E-04	mg/kg-day	0.79
				Dieldrin	3.E-02	mg/kg	4.0E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	6.E-05	1.15E-05	mg/kg-day	5.0E-05	mg/kg-day	0.23
				Methyl mercury	8.E-02	mg/kg	9.8E-06	mg/kg-day	--	--	ND	4.84E-05	mg/kg-day	1.0E-04	mg/kg-day	0.5
			Exp. Route Total								2.E-03					20
		Exposure Point Total									2.E-03					20
	Exposure Medium Total										2.E-03					20
Medium Total																
Crab				TCDD TEQ (D/F)	7E-05	mg/kg	8.1E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-03	3.8E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	1E-05	mg/kg	1.1E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-04	1.0E-08	mg/kg-day	--	--	ND
				Total PCBs	5E-01	mg/kg	5.6E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.E-04	3.1E-04	mg/kg-day	2.0E-05	mg/kg-day	16
				4,4'-DDD	4E-02	mg/kg	4.6E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.E-06	2.2E-05	mg/kg-day	--	--	ND
				4,4'-DDE	8E-02	mg/kg	8.8E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.E-06	4.2E-05	mg/kg-day	--	--	ND
				4,4'-DDT	6E-03	mg/kg	6.6E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-07	3.2E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Total Chlordane	2E-02	mg/kg	2.8E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.E-06	9.9E-06	mg/kg-day	5.0E-04	mg/kg-day	0.02
				Dieldrin	1E-02	mg/kg	1.5E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.E-05	4.5E-06	mg/kg-day	5.0E-05	mg/kg-day	0.09
				Methyl mercury	2E-02	mg/kg	2.5E-06	mg/kg-day	--	--	ND	1.2E-05	mg/kg-day	1.0E-04	mg/kg-day	0.1
			Exp. Route Total								2.E-03					16
		Exposure Point Total									2.E-03					16
	Exposure Medium Total										2.E-03					16
Medium Total																

ND - not determined because toxicity values are not available for this exposure route.
mg/kg - milligram per kilogram
(a) Intake/Exposure concentration based on the EPC value derived from the 7-year average sediment concentration and an average daily dose for ingestion of fish of 3.57E-04 and 3.29E-04 for crab.

TABLE 7-3
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
MONITORED NATURAL ATTENUATION - YEAR=2018
Lower Passaic River Restoration Project

Scenario Timeframe: Future
Receptor Population: Angler (Child)
Receptor Age: 0 - 6 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	2E-04	mg/kg	8.9E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-03	1.04E-07	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	2E-05	mg/kg	7.7E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-04	9.03E-09	mg/kg-day	--	--	ND
				Total PCBs	1E+00	mg/kg	5.9E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.E-04	6.83E-04	mg/kg-day	2.0E-05	mg/kg-day	34
				4,4'-DDD	2E-01	mg/kg	7.9E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.E-06	9.26E-05	mg/kg-day	--	--	ND
				4,4'-DDE	3E-01	mg/kg	1.3E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.E-06	1.46E-04	mg/kg-day	--	--	ND
				4,4'-DDT	8E-03	mg/kg	4.0E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-07	4.66E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Total Chlordane	1E+00	mg/kg	5.6E-05	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.E-05	6.50E-04	mg/kg-day	5.0E-04	mg/kg-day	1
				Dieldrin	3E-02	mg/kg	1.5E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.E-05	1.80E-05	mg/kg-day	5.0E-05	mg/kg-day	0
				Methyl mercury	2E-01	mg/kg	7.5E-06	mg/kg-day	--	--	ND	8.73E-05	mg/kg-day	1.0E-04	mg/kg-day	1
			Exp. Route Total								2.E-03					37
		Exposure Point Total									2.E-03					37
	Exposure Medium Total										2.E-03					37
Medium Total																
Crab				TCDD TEQ (D/F)	1E-04	mg/kg	6.5E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-03	7.6E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	2E-05	mg/kg	1.1E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-04	1.3E-08	mg/kg-day	--	--	ND
				Total PCBs	1E+00	mg/kg	5.3E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.E-04	6.2E-04	mg/kg-day	2.0E-05	mg/kg-day	31
				4,4'-DDD	8E-02	mg/kg	3.5E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	8.E-07	4.1E-05	mg/kg-day	--	--	ND
				4,4'-DDE	1E-01	mg/kg	6.6E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-06	7.8E-05	mg/kg-day	--	--	ND
				4,4'-DDT	1E-02	mg/kg	5.1E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-07	5.9E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Total Chlordane	3E-02	mg/kg	1.5E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.E-07	1.7E-05	mg/kg-day	5.0E-04	mg/kg-day	0.03
				Dieldrin	1E-02	mg/kg	6.3E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	1.E-05	7.3E-06	mg/kg-day	5.0E-05	mg/kg-day	0.15
				Methyl mercury	4E-02	mg/kg	2.0E-06	mg/kg-day	--	--	ND	2.3E-05	mg/kg-day	1.0E-04	mg/kg-day	0.23
			Exp. Route Total								1.E-03					31
		Exposure Point Total									1.E-03					31
	Exposure Medium Total										1.E-03					31
Medium Total																

ND - not determined because a toxicity value is unavailable for this exposure route.
mg/kg - milligram per kilogram

TABLE 7-4
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
MONITORED NATURAL ATTENUATION - YEAR=2048
Lower Passaic River Restoration Project

Scenario Timeframe: Future
Receptor Population: Angler (Child)
Receptor Age: 0 - 6 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	2E-04	mg/kg	7.8E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-03	9.11E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	2E-05	mg/kg	1.0E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-04	1.22E-08	mg/kg-day	--	--	ND
				Total PCBs	1E+00	mg/kg	4.9E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.E-04	5.76E-04	mg/kg-day	2.0E-05	mg/kg-day	29
				4,4'-DDD	1E-01	mg/kg	7.0E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.E-06	8.13E-05	mg/kg-day	--	--	ND
				4,4'-DDE	2E-01	mg/kg	1.1E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.E-06	1.29E-04	mg/kg-day	--	--	ND
				4,4'-DDT	7E-03	mg/kg	3.5E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-07	4.05E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Total Chlordane	1E+00	mg/kg	5.3E-05	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.E-05	6.14E-04	mg/kg-day	5.0E-04	mg/kg-day	1
				Dieldrin	3E-02	mg/kg	1.5E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.E-05	1.79E-05	mg/kg-day	5.0E-05	mg/kg-day	0
				Methyl mercury	1E-01	mg/kg	6.6E-06	mg/kg-day	--	--	ND	7.67E-05	mg/kg-day	1.0E-04	mg/kg-day	1
			Exp. Route Total								1.E-03					31
		Exposure Point Total									1.E-03					31
	Exposure Medium Total										1.E-03					31
Medium Total																
Crab				TCDD TEQ (D/F)	1E-04	mg/kg	5.7E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	9.E-04	6.7E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	3E-05	mg/kg	1.4E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-04	1.7E-08	mg/kg-day	--	--	ND
				Total PCBs	1E+00	mg/kg	4.5E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	9.E-05	5.2E-04	mg/kg-day	2.0E-05	mg/kg-day	26
				4,4'-DDD	7E-02	mg/kg	3.1E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	7.E-07	3.6E-05	mg/kg-day	--	--	ND
				4,4'-DDE	1E-01	mg/kg	5.9E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-06	6.9E-05	mg/kg-day	--	--	ND
				4,4'-DDT	1E-02	mg/kg	4.4E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-07	5.1E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Total Chlordane	3E-02	mg/kg	1.4E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.E-07	1.6E-05	mg/kg-day	5.0E-04	mg/kg-day	0.03
				Dieldrin	1E-02	mg/kg	6.2E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	1.E-05	7.3E-06	mg/kg-day	5.0E-05	mg/kg-day	0.15
				Methyl mercury	4E-02	mg/kg	1.7E-06	mg/kg-day	--	--	ND	2.0E-05	mg/kg-day	1.0E-04	mg/kg-day	0.20
			Exp. Route Total								1.E-03					27
		Exposure Point Total									1.E-03					27
	Exposure Medium Total										1.E-03					27
Medium Total																

ND - not determined because a toxicity value is unavailable for this exposure route.
mg/kg - milligram per kilogram

TABLE 7-5
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
PRIMARY EROSIONAL ZONE/PRIMARY INVENTORY ZONE - YEAR=2018
Lower Passaic River Restoration Project

Scenario Timeframe: Future
Receptor Population: Angler (Adult)
Receptor Age: >18 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	1.E-04	mg/kg	1.6E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-03	4.60E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	2.E-05	mg/kg	1.9E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	3.E-04	5.49E-09	mg/kg-day	--	--	ND
				Total PCBs	1.E+00	mg/kg	1.3E-04	mg/kg-day	2.0E+00	(mg/kg-day)-1	3.E-04	3.90E-04	mg/kg-day	2.0E-05	mg/kg-day	20
				4,4'-DDD	1.E-01	mg/kg	1.8E-05	mg/kg-day	2.4E-01	(mg/kg-day)-1	4.E-06	5.15E-05	mg/kg-day	--	--	ND
				4,4'-DDE	2.E-01	mg/kg	2.8E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-05	8.31E-05	mg/kg-day	--	--	ND
				4,4'-DDT	7.E-03	mg/kg	9.0E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.E-07	2.62E-06	mg/kg-day	5.0E-04	mg/kg-day	0.005
				Total Chlordane	1.E+00	mg/kg	1.4E-04	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.E-05	4.18E-04	mg/kg-day	5.0E-04	mg/kg-day	0.84
				Dieldrin	3.E-02	mg/kg	3.7E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	6.E-05	1.07E-05	mg/kg-day	5.0E-05	mg/kg-day	0.21
				Methyl mercury	1.E-01	mg/kg	1.7E-05	mg/kg-day	--	--	ND	4.96E-05	mg/kg-day	1.0E-04	mg/kg-day	0.5
			Exp. Route Total								3.E-03					21
		Exposure Point Total									3.E-03					21
	Exposure Medium Total										3.E-03					21
Medium Total																
Crab				TCDD TEQ (D/F)	1E-04	mg/kg	1.1E-08	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-03	3.2E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	2E-05	mg/kg	2.5E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	4.E-04	7.3E-09	mg/kg-day	--	--	ND
				Total PCBs	1E+00	mg/kg	1.2E-04	mg/kg-day	2.0E+00	(mg/kg-day)-1	2.E-04	3.4E-04	mg/kg-day	2.0E-05	mg/kg-day	17
				4,4'-DDD	7E-02	mg/kg	7.4E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.E-06	2.2E-05	mg/kg-day	--	--	ND
				4,4'-DDE	1E-01	mg/kg	1.4E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	5.E-06	4.2E-05	mg/kg-day	--	--	ND
				4,4'-DDT	1E-02	mg/kg	1.1E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.E-07	3.2E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Total Chlordane	3E-02	mg/kg	3.6E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.E-06	1.0E-05	mg/kg-day	5.0E-04	mg/kg-day	0.02
				Dieldrin	1E-02	mg/kg	1.4E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.E-05	4.2E-06	mg/kg-day	5.0E-05	mg/kg-day	0.08
				Methyl mercury	4E-02	mg/kg	4.3E-06	mg/kg-day	--	--	ND	1.3E-05	mg/kg-day	1.0E-04	mg/kg-day	0.1
			Exp. Route Total								2.E-03					17
		Exposure Point Total									2.E-03					17
	Exposure Medium Total										2.E-03					17
Medium Total																

ND - not determined because toxicity values are not available for this exposure route.
mg/kg - milligram per kilogram

TABLE 7-6
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
PRIMARY EROSIONAL ZONE/PRIMARY INVENTORY ZONE - YEAR=2048
Lower Passaic River Restoration Project

Scenario Timeframe: Future
Receptor Population: Angler (Adult)
Receptor Age: >18 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration (a		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	6.E-05	mg/kg	7.2E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-03	4.18E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	7.E-06	mg/kg	8.1E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-04	4.71E-09	mg/kg-day	--	--	ND
				Total PCBs	5.E-01	mg/kg	5.7E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.E-04	3.27E-04	mg/kg-day	2.0E-05	mg/kg-day	16
				4,4'-DDD	8.E-02	mg/kg	9.4E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.E-06	4.51E-05	mg/kg-day	--	--	ND
				4,4'-DDE	1.E-01	mg/kg	1.5E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	5.E-06	7.23E-05	mg/kg-day	--	--	ND
				4,4'-DDT	4.E-03	mg/kg	5.1E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-07	2.25E-06	mg/kg-day	5.0E-04	mg/kg-day	0.004
				Total Chlordane	9.E-01	mg/kg	1.1E-04	mg/kg-day	3.5E-01	(mg/kg-day)-1	4.E-05	4.02E-04	mg/kg-day	5.0E-04	mg/kg-day	0.80
				Dieldrin	3.E-02	mg/kg	3.7E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	6.E-05	1.07E-05	mg/kg-day	5.0E-05	mg/kg-day	0.21
				Methyl mercury	7.E-02	mg/kg	8.7E-06	mg/kg-day	--	--	ND	4.41E-05	mg/kg-day	1.0E-04	mg/kg-day	0.4
			Exp. Route Total								1.E-03					18
		Exposure Point Total									1.E-03					18
	Exposure Medium Total										1.E-03					18
Medium Total																
Crab				TCDD TEQ (D/F)	4E-05	mg/kg	5.0E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	8.E-04	2.9E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	1E-05	mg/kg	1.1E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-04	6.2E-09	mg/kg-day	--	--	ND
				Total PCBs	4E-01	mg/kg	5.0E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.E-04	2.8E-04	mg/kg-day	2.0E-05	mg/kg-day	14
				4,4'-DDD	3E-02	mg/kg	3.9E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	9.E-07	1.9E-05	mg/kg-day	--	--	ND
				4,4'-DDE	7E-02	mg/kg	7.6E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.E-06	3.7E-05	mg/kg-day	--	--	ND
				4,4'-DDT	6E-03	mg/kg	6.2E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-07	2.7E-06	mg/kg-day	5.0E-04	mg/kg-day	0.005
				Total Chlordane	2E-02	mg/kg	2.8E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.E-06	1.0E-05	mg/kg-day	5.0E-04	mg/kg-day	0.02
				Dieldrin	1E-02	mg/kg	1.4E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.E-05	4.2E-06	mg/kg-day	5.0E-05	mg/kg-day	0.08
				Methyl mercury	2E-02	mg/kg	2.2E-06	mg/kg-day	--	--	ND	1.1E-05	mg/kg-day	1.0E-04	mg/kg-day	0.1
			Exp. Route Total								1.E-03					14
		Exposure Point Total									1.E-03					14
	Exposure Medium Total										1.E-03					14
Medium Total																

ND - not determined because toxicity values are not available for this exposure route.
mg/kg - milligram per kilogram
(a) Intake/Exposure concentration based on the EPC value derived from the 7-year average sediment concentration and an average daily dose for ingestion of fish of 3.57E-04 and 3.29E-04 for crab.

TABLE 7-7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
PRIMARY EROSIONAL ZONE/PRIMARY INVENTORY ZONE - YEAR=2018
Lower Passaic River Restoration Project

Scenario Timeframe: Future
Receptor Population: Angler (Child)
Receptor Age: 0 - 6 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	1E-04	mg/kg	6.1E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	9.E-04	7.16E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	2E-05	mg/kg	7.3E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-04	8.54E-09	mg/kg-day	--	--	ND
				Total PCBs	1E+00	mg/kg	5.2E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.E-04	6.07E-04	mg/kg-day	2.0E-05	mg/kg-day	30
				4,4'-DDD	1E-01	mg/kg	6.9E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.E-06	8.01E-05	mg/kg-day	--	--	ND
				4,4'-DDE	2E-01	mg/kg	1.1E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.E-06	1.29E-04	mg/kg-day	--	--	ND
				4,4'-DDT	7E-03	mg/kg	3.5E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-07	4.08E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Total Chlordane	1E+00	mg/kg	5.6E-05	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.E-05	6.50E-04	mg/kg-day	5.0E-04	mg/kg-day	1
				Dieldrin	3E-02	mg/kg	1.4E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.E-05	1.67E-05	mg/kg-day	5.0E-05	mg/kg-day	0.3
				Methyl mercury	1E-01	mg/kg	6.6E-06	mg/kg-day	--	--	ND	7.72E-05	mg/kg-day	1.0E-04	mg/kg-day	0.8
			Exp. Route Total								1.E-03					33
		Exposure Point Total									1.E-03					33
	Exposure Medium Total										1.E-03					33
Medium Total																
Crab				TCDD TEQ (D/F)	1E-04	mg/kg	4.5E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	7.E-04	5.2E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	2E-05	mg/kg	1.0E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-04	1.2E-08	mg/kg-day	--	--	ND
				Total PCBs	1E+00	mg/kg	4.7E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	9.E-05	5.5E-04	mg/kg-day	2.0E-05	mg/kg-day	28
				4,4'-DDD	7E-02	mg/kg	3.0E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	7.E-07	3.5E-05	mg/kg-day	--	--	ND
				4,4'-DDE	1E-01	mg/kg	5.9E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-06	6.9E-05	mg/kg-day	--	--	ND
				4,4'-DDT	1E-02	mg/kg	4.4E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-07	5.2E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Total Chlordane	3E-02	mg/kg	1.5E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.E-07	1.7E-05	mg/kg-day	5.0E-04	mg/kg-day	0.03
				Dieldrin	1E-02	mg/kg	5.8E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	9.E-06	6.8E-06	mg/kg-day	5.0E-05	mg/kg-day	0.14
				Methyl mercury	4E-02	mg/kg	1.7E-06	mg/kg-day	--	--	ND	2.0E-05	mg/kg-day	1.0E-04	mg/kg-day	0.20
			Exp. Route Total								9.E-04					28
		Exposure Point Total									9.E-04					28
	Exposure Medium Total										9.E-04					28
Medium Total																

ND - not determined because a toxicity value is unavailable for this exposure route.
mg/kg - milligram per kilogram

TABLE 7-8
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
PRIMARY EROSIONAL ZONE/PRIMARY INVENTORY ZONE - YEAR=2048
Lower Passaic River Restoration Project

Scenario Timeframe: Future
Receptor Population: Angler (Child)
Receptor Age: 0 - 6 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	1E-04	mg/kg	5.6E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	8.E-04	6.51E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	1E-05	mg/kg	6.3E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	9.E-05	7.32E-09	mg/kg-day	--	--	ND
				Total PCBs	1E+00	mg/kg	4.5E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	9.E-05	5.30E-04	mg/kg-day	2.0E-05	mg/kg-day	26
				4,4'-DDD	1E-01	mg/kg	6.2E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.E-06	7.26E-05	mg/kg-day	--	--	ND
				4,4'-DDE	2E-01	mg/kg	9.9E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.E-06	1.15E-04	mg/kg-day	--	--	ND
				4,4'-DDT	7E-03	mg/kg	3.1E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-07	3.61E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Total Chlordane	1E+00	mg/kg	5.4E-05	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.E-05	6.26E-04	mg/kg-day	5.0E-04	mg/kg-day	1
				Dieldrin	3E-02	mg/kg	1.4E-06	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.E-05	1.67E-05	mg/kg-day	5.0E-05	mg/kg-day	0.3
				Methyl mercury	1E-01	mg/kg	6.0E-06	mg/kg-day	--	--	ND	6.97E-05	mg/kg-day	1.0E-04	mg/kg-day	0.7
			Exp. Route Total								1.E-03					29
		Exposure Point Total									1.E-03					29
	Exposure Medium Total										1.E-03					29
Medium Total																
Crab				TCDD TEQ (D/F)	9E-05	mg/kg	4.1E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	6.E-04	4.8E-08	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	2E-05	mg/kg	8.7E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-04	1.0E-08	mg/kg-day	--	--	ND
				Total PCBs	9E-01	mg/kg	4.1E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	8.E-05	4.8E-04	mg/kg-day	2.0E-05	mg/kg-day	24
				4,4'-DDD	6E-02	mg/kg	2.7E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	7.E-07	3.2E-05	mg/kg-day	--	--	ND
				4,4'-DDE	1E-01	mg/kg	5.2E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-06	6.1E-05	mg/kg-day	--	--	ND
				4,4'-DDT	9E-03	mg/kg	3.9E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-07	4.6E-06	mg/kg-day	5.0E-04	mg/kg-day	0.01
				Total Chlordane	3E-02	mg/kg	1.4E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.E-07	1.6E-05	mg/kg-day	5.0E-04	mg/kg-day	0.03
				Dieldrin	1E-02	mg/kg	5.8E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	9.E-06	6.8E-06	mg/kg-day	5.0E-05	mg/kg-day	0.14
				Methyl mercury	3E-02	mg/kg	1.6E-06	mg/kg-day	--	--	ND	1.8E-05	mg/kg-day	1.0E-04	mg/kg-day	0.18
			Exp. Route Total								8.E-04					24
		Exposure Point Total									8.E-04					24
	Exposure Medium Total										8.E-04					24
Medium Total																

ND - not determined because a toxicity value is unavailable for this exposure route.
mg/kg - milligram per kilogram

TABLE 7-9
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
AREA OF FOCUS - YEAR=2018
Lower Passaic River Restoration Project

Scenario Timeframe: Future
Receptor Population: Angler (Adult)
Receptor Age: >18 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	9.E-06	mg/kg	1.1E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-04	3.17E-09	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	1.E-05	mg/kg	1.3E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	2.E-04	3.92E-09	mg/kg-day	--	--	ND
				Total PCBs	8.E-01	mg/kg	1.0E-04	mg/kg-day	2.0E+00	(mg/kg-day)-1	2.E-04	2.99E-04	mg/kg-day	2.0E-05	mg/kg-day	15
				4,4'-DDD	6.E-02	mg/kg	7.1E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.E-06	2.08E-05	mg/kg-day	--	--	ND
				4,4'-DDE	1.E-01	mg/kg	1.2E-05	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.E-06	3.40E-05	mg/kg-day	--	--	ND
				4,4'-DDT	3.E-03	mg/kg	3.8E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-07	1.10E-06	mg/kg-day	5.0E-04	mg/kg-day	0.002
				Total Chlordane	1.E+00	mg/kg	1.4E-04	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.E-05	4.18E-04	mg/kg-day	5.0E-04	mg/kg-day	0.84
				Dieldrin	7.E-03	mg/kg	9.2E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	1.E-05	2.67E-06	mg/kg-day	5.0E-05	mg/kg-day	0.05
				Methyl mercury	6.E-02	mg/kg	7.7E-06	mg/kg-day	--	--	ND	2.24E-05	mg/kg-day	1.0E-04	mg/kg-day	0.2
			Exp. Route Total								6.E-04					16
		Exposure Point Total									6.E-04					16
	Exposure Medium Total										6.E-04					16
Medium Total																
Crab				TCDD TEQ (D/F)	7E-06	mg/kg	7.6E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-04	2.2E-09	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	2E-05	mg/kg	1.8E-09	mg/kg-day	1.5E+05	(mg/kg-day)-1	3.E-04	5.2E-09	mg/kg-day	--	--	ND
				Total PCBs	8E-01	mg/kg	8.9E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	2.E-04	2.6E-04	mg/kg-day	2.0E-05	mg/kg-day	13
				4,4'-DDD	3E-02	mg/kg	3.0E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	7.E-07	8.8E-06	mg/kg-day	--	--	ND
				4,4'-DDE	5E-02	mg/kg	5.9E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-06	1.7E-05	mg/kg-day	--	--	ND
				4,4'-DDT	4E-03	mg/kg	4.6E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-07	1.3E-06	mg/kg-day	5.0E-04	mg/kg-day	0.003
				Total Chlordane	3E-02	mg/kg	3.6E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.E-06	1.0E-05	mg/kg-day	5.0E-04	mg/kg-day	0.02
				Dieldrin	3E-03	mg/kg	3.6E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	6.E-06	1.0E-06	mg/kg-day	5.0E-05	mg/kg-day	0.02
				Methyl mercury	2E-02	mg/kg	1.9E-06	mg/kg-day	--	--	ND	5.7E-06	mg/kg-day	1.0E-04	mg/kg-day	0.1
			Exp. Route Total								6.E-04					13
		Exposure Point Total									6.E-04					13
	Exposure Medium Total										6.E-04					13
Medium Total																

ND - not determined because toxicity values are not available for this exposure route.
mg/kg - milligram per kilogram

TABLE 7-10
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
AREA OF FOCUS - YEAR=2048
Lower Passaic River Restoration Project

Scenario Timeframe: Future
Receptor Population: Angler (Adult)
Receptor Age: >18 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration(a)		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	4.E-06	mg/kg	4.9E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	7.E-05	2.89E-09	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	4.E-06	mg/kg	5.4E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	8.E-05	3.14E-09	mg/kg-day	--	--	ND
				Total PCBs	4.E-01	mg/kg	4.4E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	9.E-05	2.51E-04	mg/kg-day	2.0E-05	mg/kg-day	13
				4,4'-DDD	3.E-02	mg/kg	3.9E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	9.E-07	1.86E-05	mg/kg-day	--	--	ND
				4,4'-DDE	5.E-02	mg/kg	6.6E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-06	2.98E-05	mg/kg-day	--	--	ND
				4,4'-DDT	2.E-03	mg/kg	2.0E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	7.E-08	8.81E-07	mg/kg-day	5.0E-04	mg/kg-day	0.002
				Total Chlordane	9.E-01	mg/kg	1.1E-04	mg/kg-day	3.5E-01	(mg/kg-day)-1	4.E-05	4.02E-04	mg/kg-day	5.0E-04	mg/kg-day	0.80
				Dieldrin	7.E-03	mg/kg	9.0E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	1.E-05	2.67E-06	mg/kg-day	5.0E-05	mg/kg-day	0.05
				Methyl mercury	3.E-02	mg/kg	3.9E-06	mg/kg-day	--	--	ND	1.96E-05	mg/kg-day	1.0E-04	mg/kg-day	0.2
			Exp. Route Total								3.E-04					14
		Exposure Point Total									3.E-04					14
	Exposure Medium Total										3.E-04					14
Medium Total																
Crab				TCDD TEQ (D/F)	3E-06	mg/kg	3.5E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	5.E-05	2.0E-09	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	6E-06	mg/kg	7.1E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-04	4.2E-09	mg/kg-day	--	--	ND
				Total PCBs	3E-01	mg/kg	3.8E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	8.E-05	2.2E-04	mg/kg-day	2.0E-05	mg/kg-day	11
				4,4'-DDD	1E-02	mg/kg	1.6E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	4.E-07	7.8E-06	mg/kg-day	--	--	ND
				4,4'-DDE	3E-02	mg/kg	3.3E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-06	1.5E-05	mg/kg-day	--	--	ND
				4,4'-DDT	2E-03	mg/kg	2.4E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	8.E-08	1.1E-06	mg/kg-day	5.0E-04	mg/kg-day	0.002
				Total Chlordane	2E-02	mg/kg	2.8E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.E-06	1.0E-05	mg/kg-day	5.0E-04	mg/kg-day	0.02
				Dieldrin	3E-03	mg/kg	3.5E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	6.E-06	1.0E-06	mg/kg-day	5.0E-05	mg/kg-day	0.02
				Methyl mercury	9E-03	mg/kg	9.8E-07	mg/kg-day	--	--	ND	5.0E-06	mg/kg-day	1.0E-04	mg/kg-day	0.05
			Exp. Route Total								2.E-04					11
		Exposure Point Total									2.E-04					11
	Exposure Medium Total										2.E-04					11

ND - not determined because toxicity values are not available for this exposure route.
mg/kg - milligram per kilogram
(a) Intake/Exposure concentration based on the EPC value derived from the 7-year average sediment concentration and an average daily dose for ingestion of fish of 3.57E-04 and 3.29E-04 for crab.

TABLE 7-11
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
AREA OF FOCUS - YEAR=2018
Lower Passaic River Restoration Project

Scenario Timeframe: Future
Receptor Population: Angler (Child)
Receptor Age: 0 - 6 Years

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	9E-06	mg/kg	4.2E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	6.E-05	4.94E-09	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	1E-05	mg/kg	5.2E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	8.E-05	6.10E-09	mg/kg-day	--	--	ND
				Total PCBs	8E-01	mg/kg	4.0E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	8.E-05	4.66E-04	mg/kg-day	2.0E-05	mg/kg-day	23
				4,4'-DDD	6E-02	mg/kg	2.8E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	7.E-07	3.24E-05	mg/kg-day	--	--	ND
				4,4'-DDE	1E-01	mg/kg	4.5E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.E-06	5.29E-05	mg/kg-day	--	--	ND
				4,4'-DDT	3E-03	mg/kg	1.5E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	5.E-08	1.71E-06	mg/kg-day	5.0E-04	mg/kg-day	0.003
				Total Chlordane	1E+00	mg/kg	5.6E-05	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.E-05	6.50E-04	mg/kg-day	5.0E-04	mg/kg-day	1
				Dieldrin	7E-03	mg/kg	3.6E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	6.E-06	4.16E-06	mg/kg-day	5.0E-05	mg/kg-day	0.1
				Methyl mercury	6E-02	mg/kg	3.0E-06	mg/kg-day	--	--	ND	3.49E-05	mg/kg-day	1.0E-04	mg/kg-day	0.3
			Exp. Route Total								2.E-04					25
		Exposure Point Total									2.E-04					25
	Exposure Medium Total										2.E-04					25
Medium Total																
Crab				TCDD TEQ (D/F)	7E-06	mg/kg	3.1E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	5.E-05	3.6E-09	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	2E-05	mg/kg	7.2E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	1.E-04	8.4E-09	mg/kg-day	--	--	ND
				Total PCBs	8E-01	mg/kg	3.6E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	7.E-05	4.2E-04	mg/kg-day	2.0E-05	mg/kg-day	21
				4,4'-DDD	3E-02	mg/kg	1.2E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	3.E-07	1.4E-05	mg/kg-day	--	--	ND
				4,4'-DDE	5E-02	mg/kg	2.4E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	8.E-07	2.8E-05	mg/kg-day	--	--	ND
				4,4'-DDT	4E-03	mg/kg	1.9E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	6.E-08	2.2E-06	mg/kg-day	5.0E-04	mg/kg-day	0.004
				Total Chlordane	3E-02	mg/kg	1.5E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.E-07	1.7E-05	mg/kg-day	5.0E-04	mg/kg-day	0.03
				Dieldrin	3E-03	mg/kg	1.4E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.E-06	1.7E-06	mg/kg-day	5.0E-05	mg/kg-day	0.03
				Methyl mercury	2E-02	mg/kg	7.9E-07	mg/kg-day	--	--	ND	9.2E-06	mg/kg-day	1.0E-04	mg/kg-day	0.09
			Exp. Route Total								2.E-04					21
		Exposure Point Total									2.E-04					21
	Exposure Medium Total										2.E-04					21
Medium Total																

ND - not determined because a toxicity value is unavailable for this exposure route.
mg/kg - milligram per kilogram

TABLE 7-12
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
AREA OF FOCUS - YEAR=2048
Lower Passaic River Restoration Project

Scenario Timeframe: Future
Receptor Population: Angler (Child)
Receptor Age: 0 - 6 Years

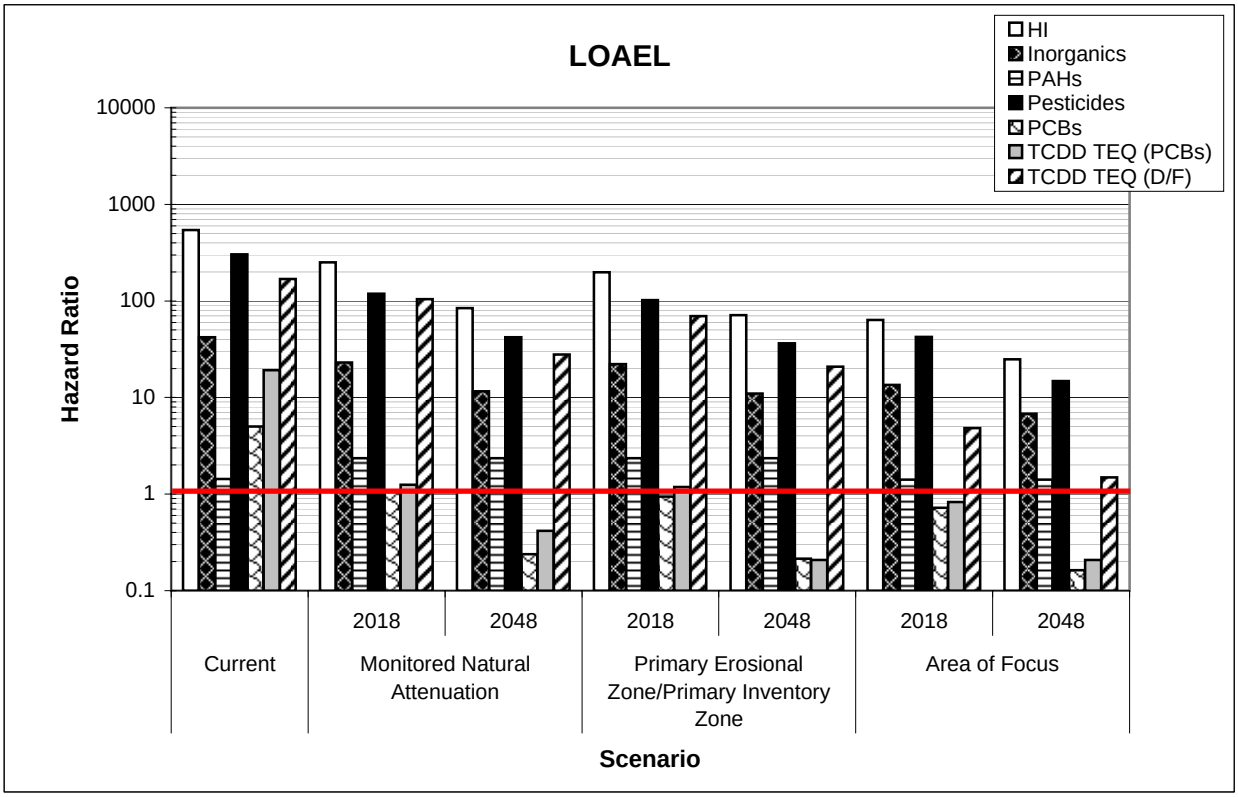
Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish			Ingestion	TCDD TEQ (D/F)	8E-06	mg/kg	3.8E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	6.E-05	4.49E-09	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	9E-06	mg/kg	4.2E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	6.E-05	4.88E-09	mg/kg-day	--	--	ND
				Total PCBs	7E-01	mg/kg	3.5E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	7.E-05	4.05E-04	mg/kg-day	2.0E-05	mg/kg-day	20
				4,4'-DDD	5E-02	mg/kg	2.5E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	6.E-07	2.94E-05	mg/kg-day	--	--	ND
				4,4'-DDE	8E-02	mg/kg	4.0E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.E-06	4.63E-05	mg/kg-day	--	--	ND
				4,4'-DDT	2E-03	mg/kg	1.2E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.E-08	1.37E-06	mg/kg-day	5.0E-04	mg/kg-day	0.003
				Total Chlordane	1E+00	mg/kg	5.4E-05	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.E-05	6.26E-04	mg/kg-day	5.0E-04	mg/kg-day	1
				Dieldrin	7E-03	mg/kg	3.5E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	6.E-06	4.11E-06	mg/kg-day	5.0E-05	mg/kg-day	0.1
				Methyl mercury	6E-02	mg/kg	2.7E-06	mg/kg-day	--	--	ND	3.11E-05	mg/kg-day	1.0E-04	mg/kg-day	0.3
			Exp. Route Total								2.E-04					22
		Exposure Point Total									2.E-04					22
	Exposure Medium Total										2.E-04					22
Medium Total																
Crab				TCDD TEQ (D/F)	6E-06	mg/kg	2.8E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	4.E-05	3.3E-09	mg/kg-day	--	--	ND
				TCDD TEQ (PCBs)	1E-05	mg/kg	5.8E-10	mg/kg-day	1.5E+05	(mg/kg-day)-1	9.E-05	6.8E-09	mg/kg-day	--	--	ND
				Total PCBs	7E-01	mg/kg	3.2E-05	mg/kg-day	2.0E+00	(mg/kg-day)-1	6.E-05	3.7E-04	mg/kg-day	2.0E-05	mg/kg-day	18
				4,4'-DDD	2E-02	mg/kg	1.1E-06	mg/kg-day	2.4E-01	(mg/kg-day)-1	3.E-07	1.3E-05	mg/kg-day	--	--	ND
				4,4'-DDE	5E-02	mg/kg	2.1E-06	mg/kg-day	3.4E-01	(mg/kg-day)-1	7.E-07	2.5E-05	mg/kg-day	--	--	ND
				4,4'-DDT	3E-03	mg/kg	1.5E-07	mg/kg-day	3.4E-01	(mg/kg-day)-1	5.E-08	1.7E-06	mg/kg-day	5.0E-04	mg/kg-day	0.003
				Total Chlordane	3E-02	mg/kg	1.4E-06	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.E-07	1.6E-05	mg/kg-day	5.0E-04	mg/kg-day	0.03
				Dieldrin	3E-03	mg/kg	1.4E-07	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.E-06	1.7E-06	mg/kg-day	5.0E-05	mg/kg-day	0.03
				Methyl mercury	2E-02	mg/kg	7.0E-07	mg/kg-day	--	--	ND	8.2E-06	mg/kg-day	1.0E-04	mg/kg-day	0.08
			Exp. Route Total								2.E-04					19
		Exposure Point Total									2.E-04					19
	Exposure Medium Total										2.E-04					19
Medium Total																

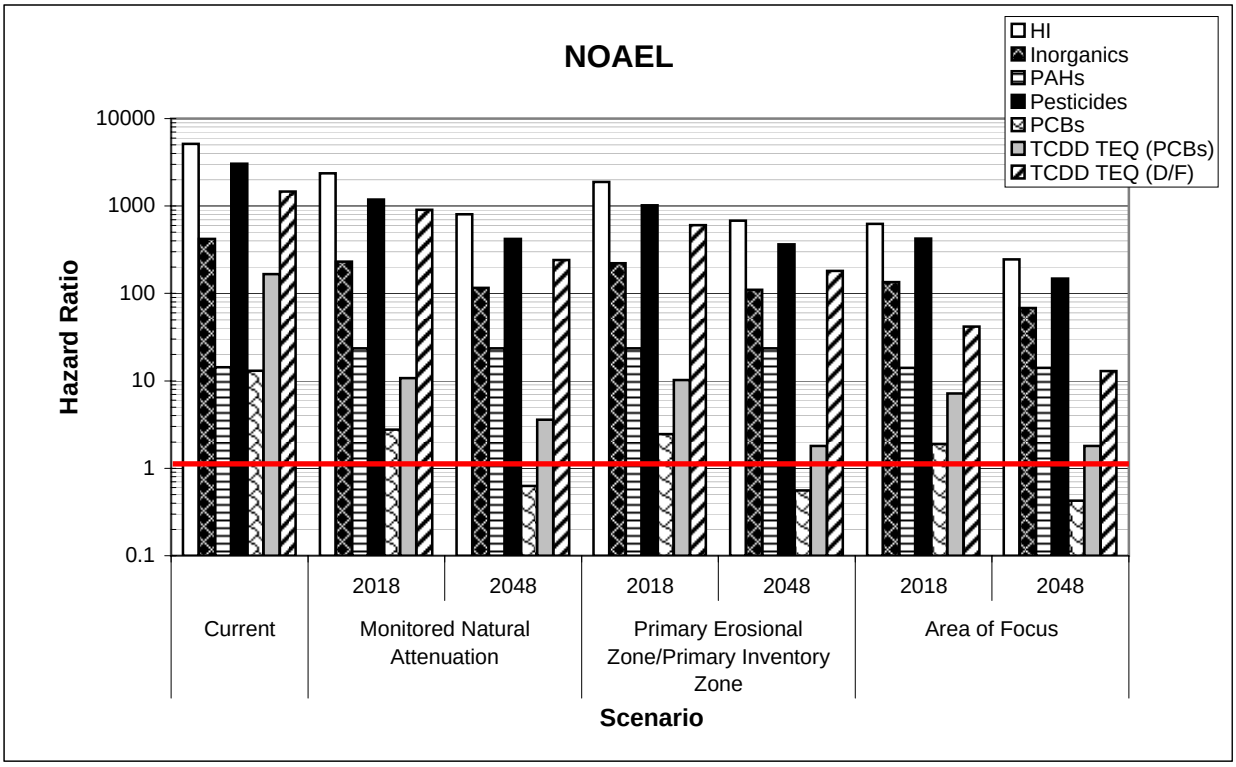
ND - not determined because a toxicity value is unavailable for this exposure route.
mg/kg - milligram per kilogram

ATTACHMENT 8
ECOLOGICAL RISK – FUTURE CONDITIONS

ATTACHMENT 8
FIGURE 8-1
SUMMARY OF TISSUE RESIDUE ASSESSMENT UNDER DIFFERENT REMEDIAL SCENARIOS - Benthos

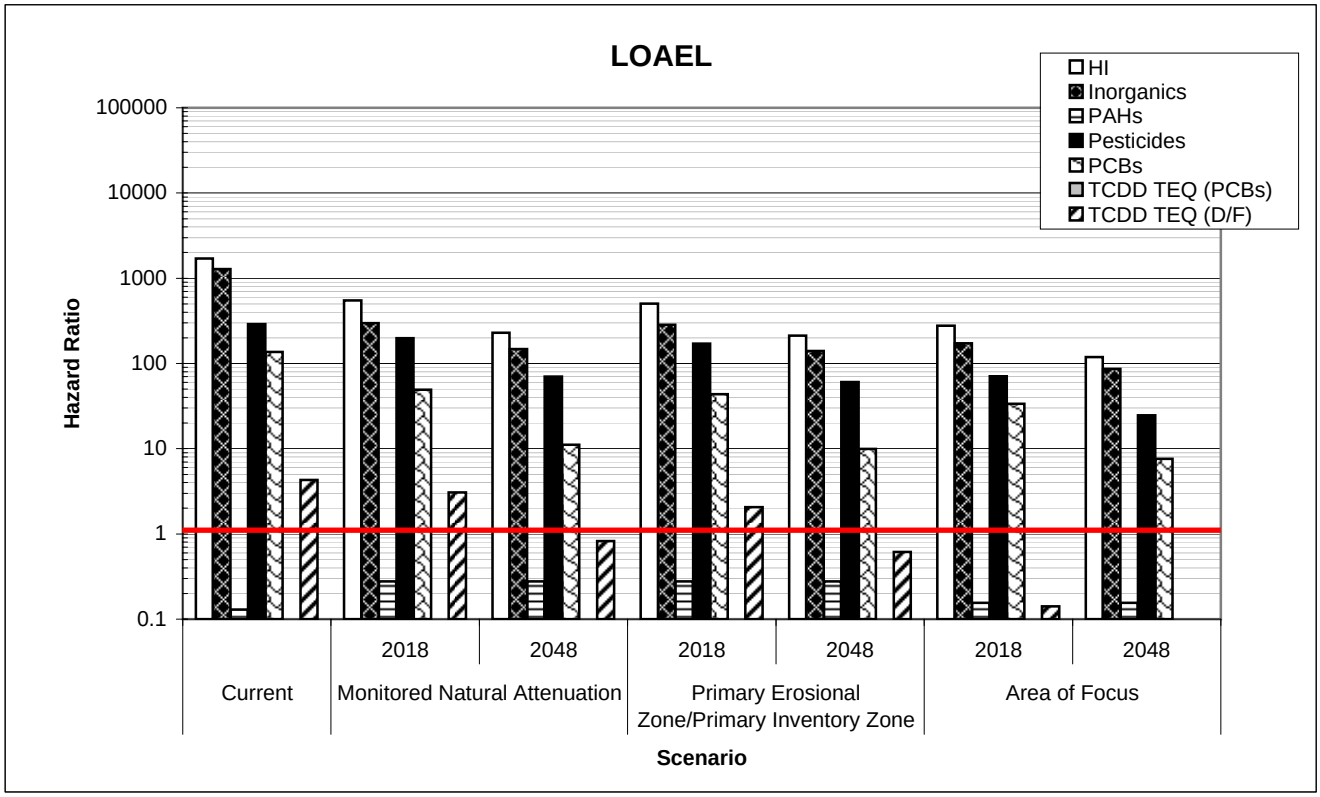
Focused Feasibility Study - Ecological Risk Assessment

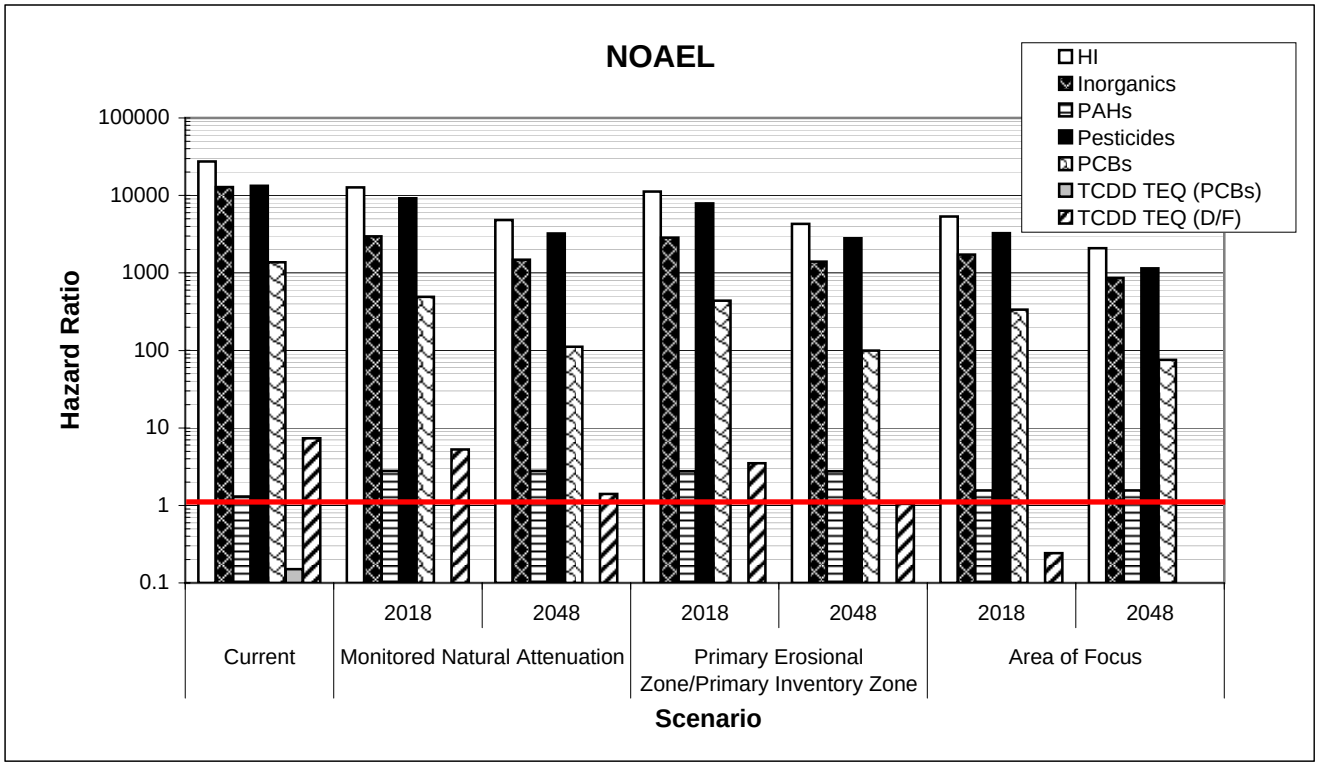




ATTACHMENT 8
FIGURE 8-2
SUMMARY OF TISSUE RESIDUE ASSESSMENT UNDER DIFFERENT REMEDIAL SCENARIOS - White Perch/American Eel

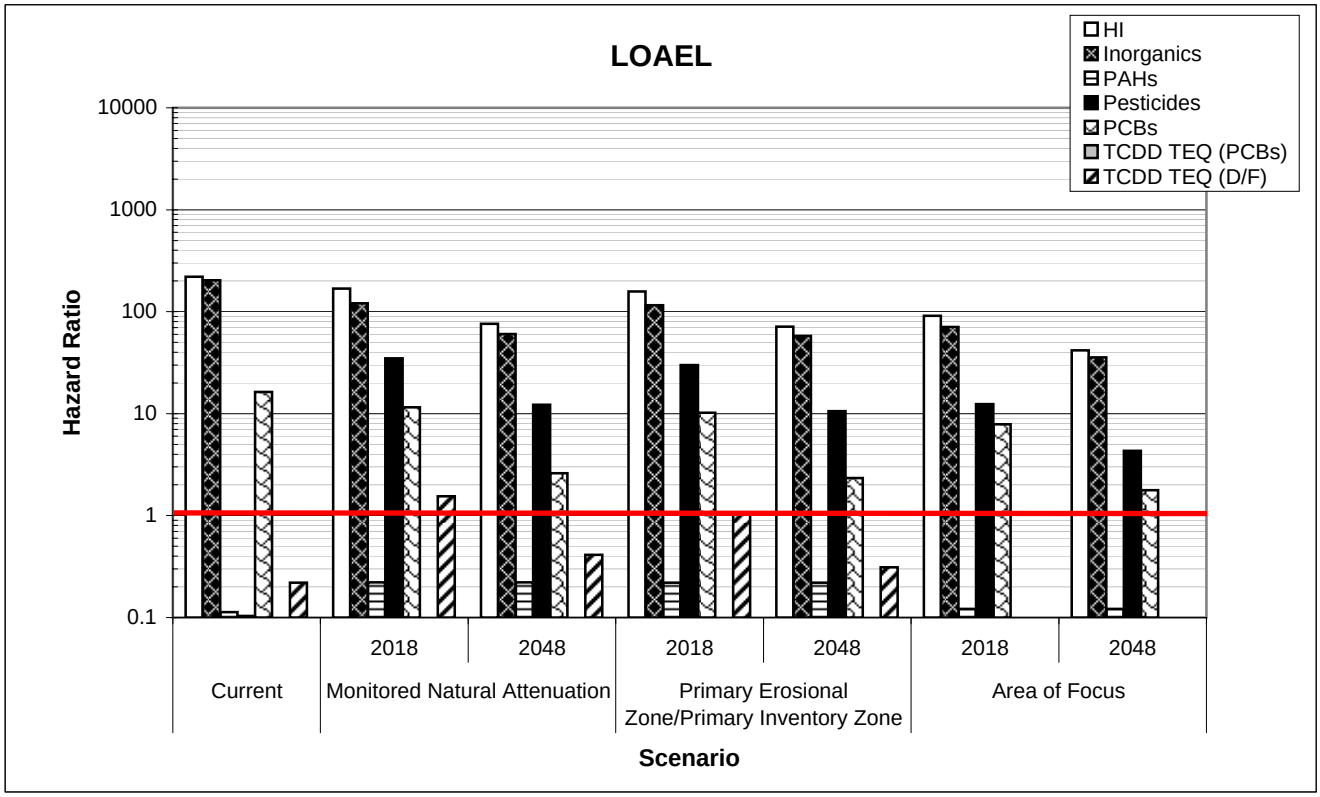
Focused Feasibility Study - Ecological Risk Assessment

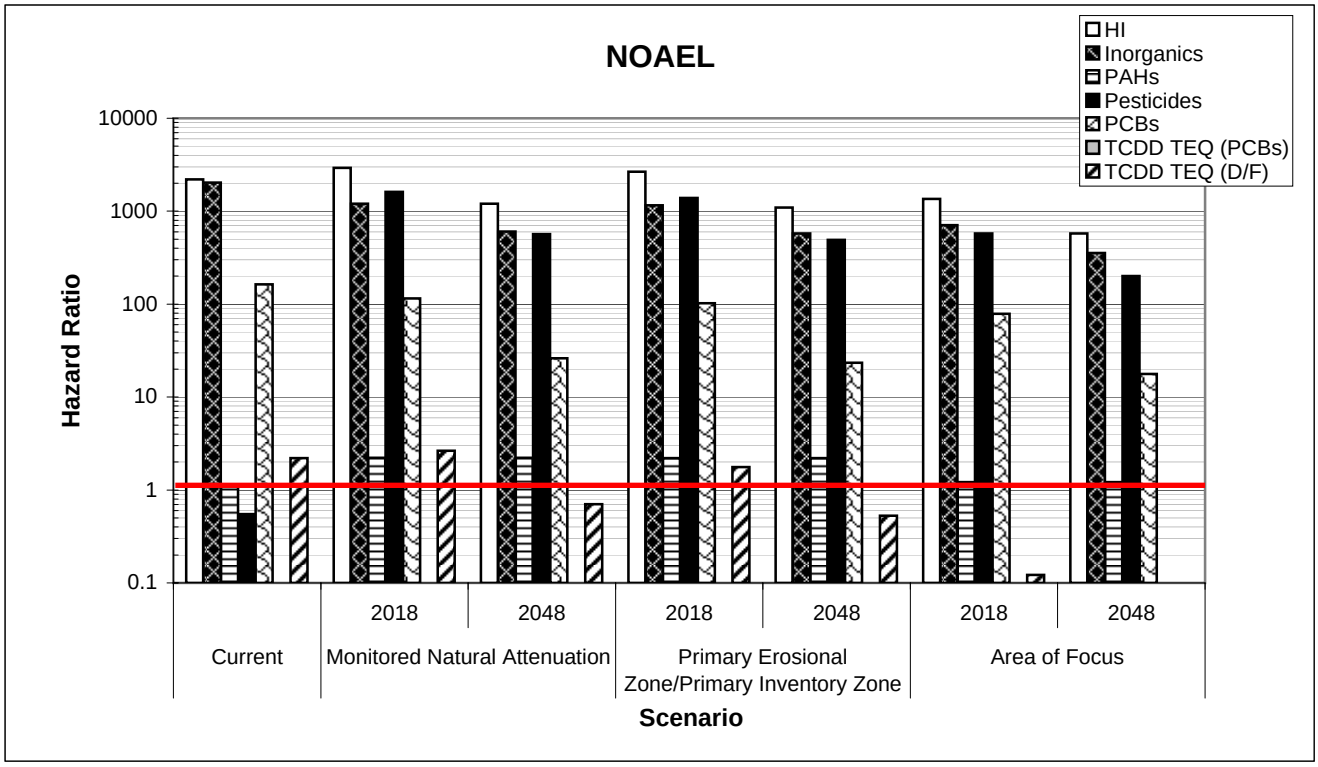




ATTACHMENT 8
FIGURE 8-3
SUMMARY OF TISSUE RESIDUE ASSESSMENT UNDER DIFFERENT REMEDIAL SCENARIOS - Mummichog

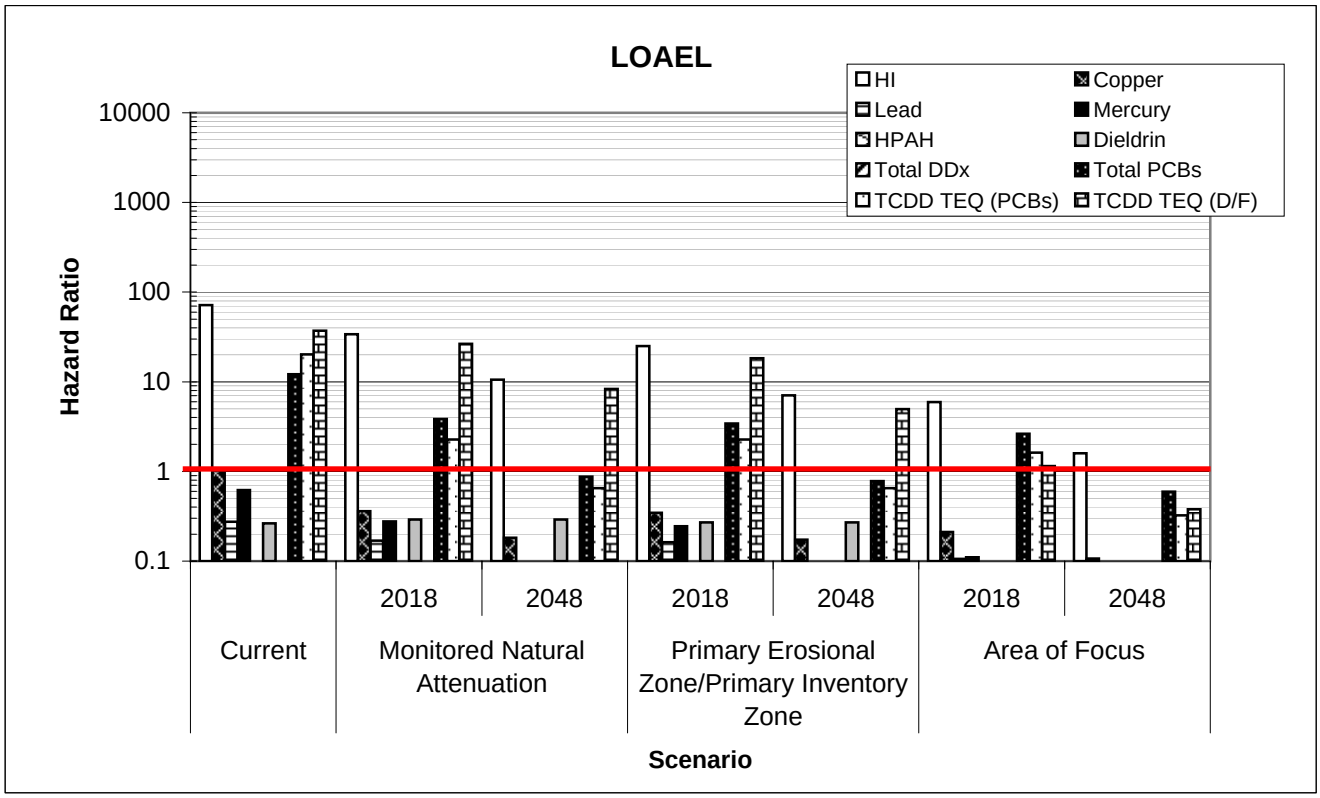
Focused Feasibility Study - Ecological Risk Assessment

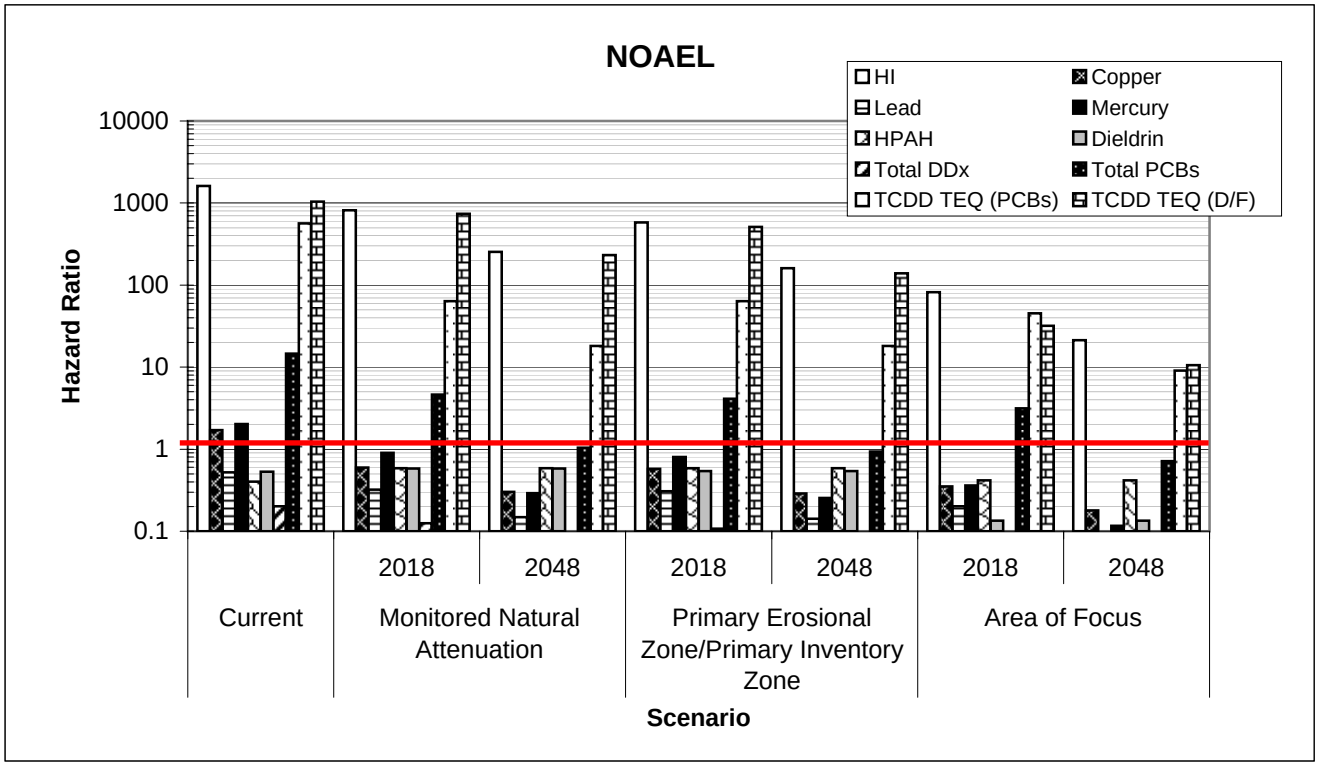




ATTACHMENT 8
FIGURE 8-4
SUMMARY OF WILDLIFE RISK ASSESSMENT UNDER DIFFERENT REMEDIAL SCENARIOS - Mink

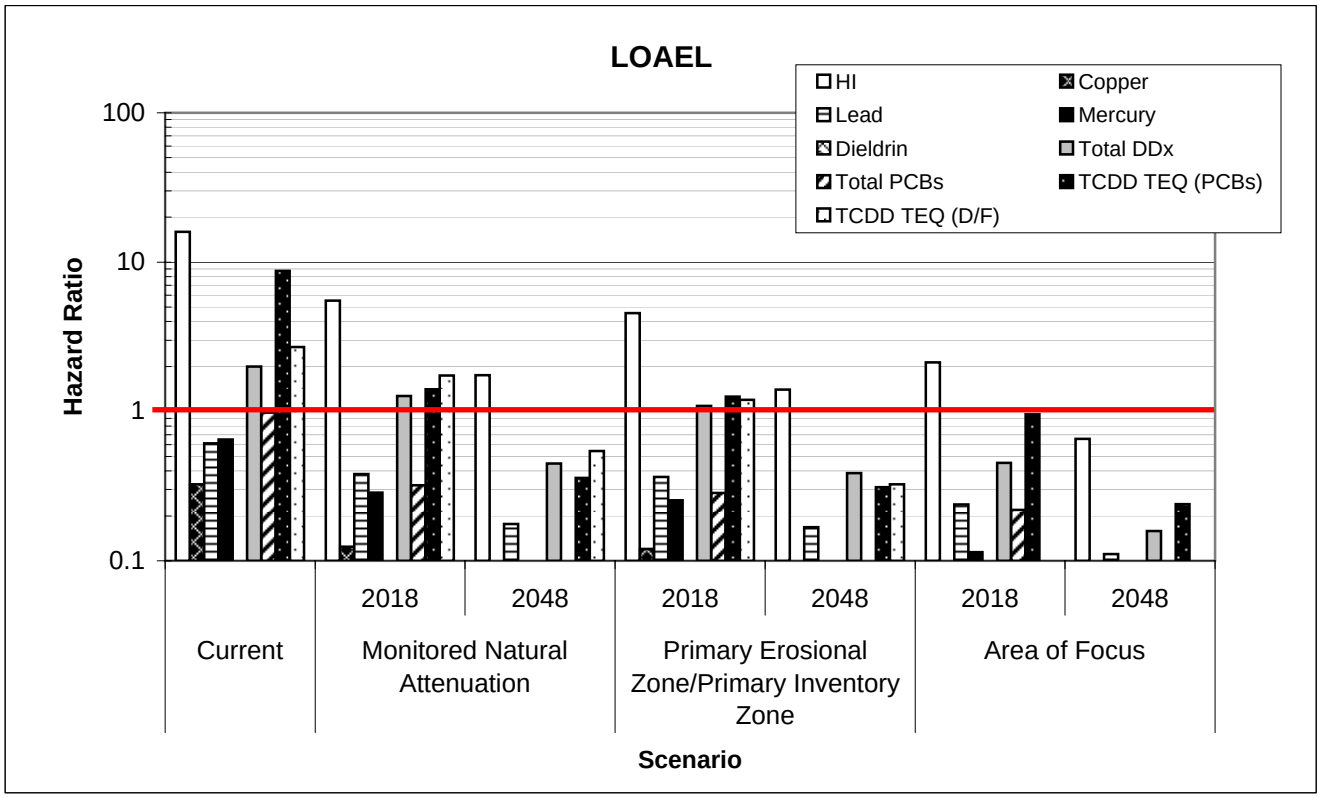
Focused Feasibility Study - Ecological Risk Assessment

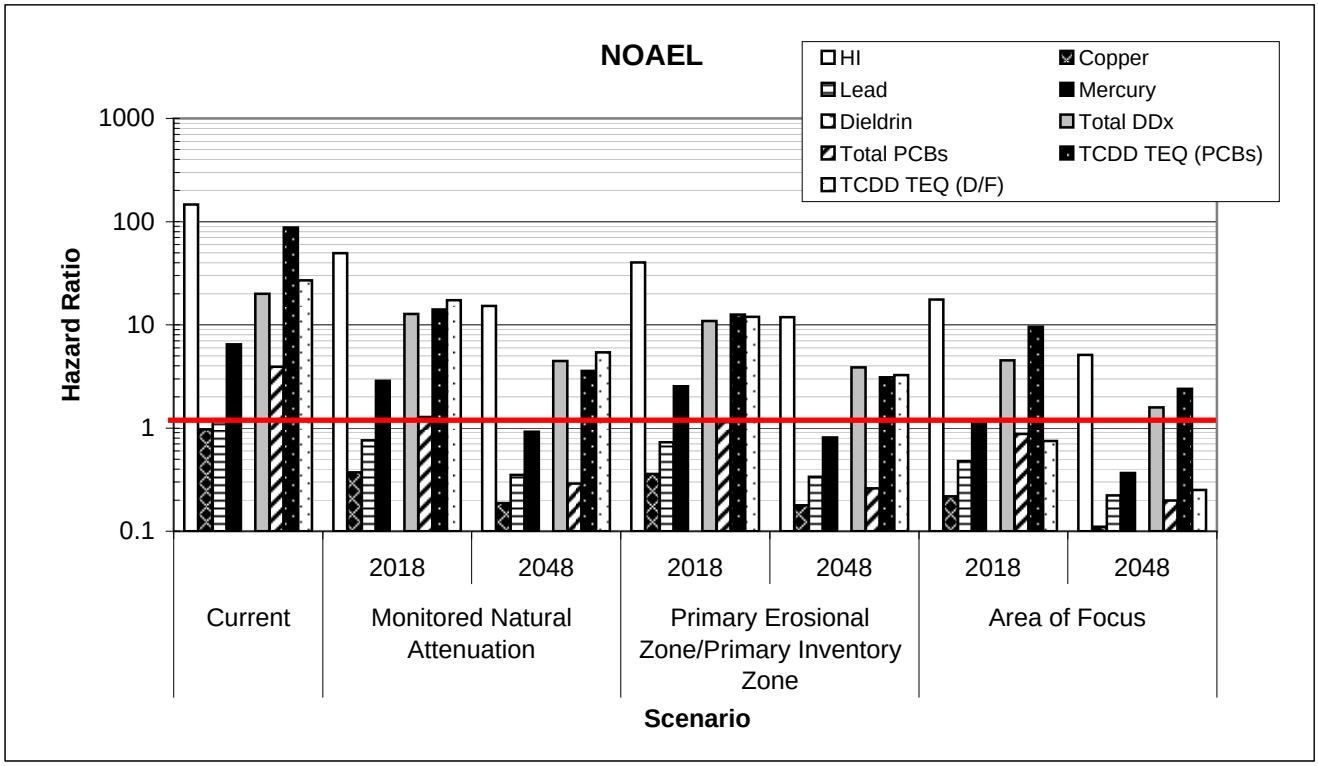




ATTACHMENT 8
FIGURE 8-5
SUMMARY OF WILDLIFE RISK ASSESSMENT UNDER DIFFERENT REMEDIAL SCENARIOS - Great Blue Heron

Focused Feasibility Study - Ecological Risk Assessment





ATTACHMENT 8
TABLE 8-1
SUMMARY OF SEDIMENT BENCHMARK COMPARISONS
Future Conditions (2018) - Monitored Natural Attenuation

Focused Feasibility Study - Ecological Risk Assessment

CASRN	Units	Chemical Parameter	*Marine/ Estuarine Values* NOAA ER-L[a]		NJDEP[b]		Lowest Sediment Benchmark[c]	Sediment EPC[d]	Hazard Quotient[e]	Relative Magnitude[f]
Inorganics/Metals										
7440-50-8	µg/g	Copper	34		34		34	138	**4.1**	**0.3%**
7439-92-1	µg/g	Lead	47		47		47	235	**5.0**	**0.3%**
7439-97-6	µg/g	Mercury	0.15		0.15		0.15	1.5	**10**	**0.7%**
								Total Inorganics/Metals	**19**	**1.2%**
Semivolatile Organics (PAHs)										
SUM_LOW_PAH	µg/g	Low Molecular Weight PAHs	0.55		-		0.55	33	**60**	**3.8%**
SUM_HIGH_PAH	µg/g	High Molecular Weight PAHs	1.7		-		1.7	86	**50**	**3.2%**
								Total PAHs	**111**	**7.0%**
PCBs (Aroclors)										
SUM_PCB	µg/g	Total PCBs	0.023		0.023		0.023	0.57	**25.0**	**1.6%**
								Total PCBs	**25**	**1.6%**
Pesticides										
60-57-1	µg/g	Dieldrin	0.000020		-		0.000020	0.020	**1,016**	**64%**
SUM_DDT	µg/g	DDx	0.0016		0.0016		0.0016	0.20	**124**	**8%**
								Total Pesticides	**1,140**	**72%**
Dioxin-like Compounds										
TCDD TEQ (D/F)	µg/g	TCDD TEQ (D/F)	0.0000032	g	-		0.0000032	0.00090	**282**	**18%**
TCDD TEQ (PCBs)	µg/g	TCDD TEQ (PCBs)	0.0000032	g	-		0.0000032	0.00000078	**0.2**	**0.0%**
								Total TCDD TEQ	**282**	**18%**
								Total	**1,577**	100%

a. ER-L = Effects Range-Low from Long *et al.* , 1995; except where noted.
b. NJDEP Guidance For Sediment Quality Evaluations, November 1998. References Long et al, 1995.
c. Minimum of the ER-L and the NJ sediment benchmark values.
d. Exposure Point Concentration (EPC) is based on the 95% Upper Confidence Level on the arithmetic mean of the values in the assessment data set as discussed in the text. TEQs calculated using fish TEFs.
e. Hazard Quotient (HQ) is the ratio of the EPC to the benchmark value.
f. Percentage of the COPEC HQ to the sum of all Hazard Quotients (excluding the TCDD TEQ value).
g. Derived by USFWS using sediment chemistry for Newark Bay and oyster effect data presented in Wintermyer and Cooper, 2003.

ATTACHMENT 8
TABLE 8-2
SUMMARY OF SEDIMENT BENCHMARK COMPARISONS
Future Conditions (2048) - Monitored Natural Attenuation

Focused Feasibility Study - Ecological Risk Assessment

CASRN	Units	Chemical Parameter	*Marine/ Estuarine Values* NOAA ER-L[a]		NJDEP[b]		Lowest Sediment Benchmark[c]	Sediment EPC[d]	Hazard Quotient[e]	Relative Magnitude[f]
Inorganics/Metals										
7440-50-8	µg/g	Copper	34		34		34	70	**2.1**	**0.2%**
7439-92-1	µg/g	Lead	47		47		47	109	**2.3**	**0.2%**
7439-97-6	µg/g	Mercury	0.15		0.15		0.15	0.50	**3**	**0.3%**
								Total Inorganics/Metals	**8**	**0.6%**
Semivolatile Organics (PAHs)										
SUM_LOW_PAH	µg/g	Low Molecular Weight PAHs	0.55		-		0.55	33	**60**	**4.8%**
SUM_HIGH_PAH	µg/g	High Molecular Weight PAHs	1.7		-		1.7	86	**50**	**4.0%**
								Total PAHs	**111**	**8.8%**
PCBs (Aroclors)										
SUM_PCB	µg/g	Total PCBs	0.023		0.023		0.023	0.13	**5.7**	**0.4%**
								Total PCBs	**6**	**0.4%**
Pesticides										
60-57-1	µg/g	Dieldrin	0.000020		-		0.000020	0.020	**1,016**	**81%**
SUM_DDT	µg/g	DDx	0.0016		0.0016		0.0016	0.069	**44**	**3%**
								Total Pesticides	**1,059**	**84%**
Dioxin-like Compounds										
TCDD TEQ (D/F)	µg/g	TCDD TEQ (D/F)	0.0000032	g	-		0.0000032	0.00024	**75**	**6%**
TCDD TEQ (PCBs)	µg/g	TCDD TEQ (PCBs)	0.0000032	g	-		0.0000032	0.00000026	**0.1**	**0.01%**
								Total TCDD TEQ	**75**	**6%**
								Total	**1,259**	100%

a. ER-L = Effects Range-Low from Long *et al.* , 1995; except where noted.
b. NJDEP Guidance For Sediment Quality Evaluations, November 1998. References Long et al, 1995.
c. Minimum of the ER-L and the NJ sediment benchmark values.
d. Exposure Point Concentration (EPC) is based on the 95% Upper Confidence Level on the arithmetic mean of the values in the assessment data set as discussed in the text. TEQs calculated using fish TEFs.
e. Hazard Quotient (HQ) is the ratio of the EPC to the benchmark value.
f. Percentage of the COPEC HQ to the sum of all Hazard Quotients (excluding the TCDD TEQ value).
g. Derived by USFWS using sediment chemistry for Newark Bay and oyster effect data presented in Wintermyer and Cooper, 2003.

ATTACHMENT 8
TABLE 8-3
SUMMARY OF SEDIMENT BENCHMARK COMPARISONS
Future Conditions (2018) - Primary Erosional Zone/Primary Inventory Zone

Focused Feasibility Study - Ecological Risk Assessment

CASRN	Units	Chemical Parameter	*Marine/ Estuarine Values* NOAA ER-L[a]		NJDEP[b]		Lowest Sediment Benchmark[c]	Sediment EPC[d]	Hazard Quotient[e]	Relative Magnitude[f]
Inorganics/Metals										
7440-50-8	µg/g	Copper	34		34		34	134	**3.9**	**0.3%**
7439-92-1	µg/g	Lead	47		47		47	226	**4.8**	**0.3%**
7439-97-6	µg/g	Mercury	0.15		0.15		0.15	1.4	**9**	**0.7%**
								Total Inorganics/Metals	**18**	**1.3%**
Semivolatile Organics (PAHs)										
SUM_LOW_PAH	µg/g	Low Molecular Weight PAHs	0.55		-		0.55	33	**60**	**4.3%**
SUM_HIGH_PAH	µg/g	High Molecular Weight PAHs	1.7		-		1.7	86	**50**	**3.6%**
								Total PAHs	**110**	**7.9%**
PCBs (Aroclors)										
SUM_PCB	µg/g	Total PCBs	0.023		0.023		0.023	0.5	**22.2**	**1.6%**
								Total PCBs	**22**	**1.6%**
Pesticides										
60-57-1	µg/g	Dieldrin	0.000020		-		0.000020	0.019	**943**	**68%**
SUM_DDT	µg/g	DDx	0.0016		0.0016		0.0016	0.17	**107**	**8%**
								Total Pesticides	**1,050**	**76%**
Dioxin-like Compounds										
TCDD TEQ (D/F)	µg/g	TCDD TEQ (D/F)	0.0000032	g	-		0.0000032	0.00060	**188**	**14%**
TCDD TEQ (PCBs)	µg/g	TCDD TEQ (PCBs)	0.0000032	g	-		0.0000032	0.0000007	**0.2**	**0.02%**
								Total TCDD TEQ	**188**	**14%**
								Total	**1,388**	100%

a. ER-L = Effects Range-Low from Long *et al.* , 1995; except where noted.
b. NJDEP Guidance For Sediment Quality Evaluations, November 1998. References Long et al, 1995.
c. Minimum of the ER-L and the NJ sediment benchmark values.
d. Exposure Point Concentration (EPC) is based on the 95% Upper Confidence Level on the arithmetic mean of the values in the assessment data set as discussed in the text. TEQs calculated using fish TEFs.
e. Hazard Quotient (HQ) is the ratio of the EPC to the benchmark value.
f. Percentage of the COPEC HQ to the sum of all Hazard Quotients (excluding the TCDD TEQ value).
g. Derived by USFWS using sediment chemistry for Newark Bay and oyster effect data presented in Wintermyer and Cooper, 2003.

ATTACHMENT 8
TABLE 8-4
SUMMARY OF SEDIMENT BENCHMARK COMPARISONS
Future Conditions (2048) - Primary Erosional Zone/Primary Inventory Zone

Focused Feasibility Study - Ecological Risk Assessment

CASRN	Units	Chemical Parameter	*Marine/ Estuarine Values* NOAA ER-L[a]		NJDEP[b]		Lowest Sediment Benchmark[c]	Sediment EPC[d]	Hazard Quotient[e]	Relative Magnitude[f]
Inorganics/Metals										
7440-50-8	µg/g	Copper	34		34		34	67	**2.0**	**0.2%**
7439-92-1	µg/g	Lead	47		47		47	104	**2.2**	**0.2%**
7439-97-6	µg/g	Mercury	0.15		0.15		0.15	0.44	**3**	**0.3%**
								Total Inorganics/Metals	**7**	**0.6%**
Semivolatile Organics (PAHs)										
SUM_LOW_PAH	µg/g	Low Molecular Weight PAHs	0.55		-		0.55	33	**60**	**5.2%**
SUM_HIGH_PAH	µg/g	High Molecular Weight PAHs	1.7		-		1.7	86	**50**	**4.3%**
								Total PAHs	**110**	**9.5%**
PCBs (Aroclors)										
SUM_PCB	µg/g	Total PCBs	0.023		0.023		0.023	0.11	**5.1**	**0.4%**
								Total PCBs	**5**	**0.4%**
Pesticides										
60-57-1	µg/g	Dieldrin	0.000020		-		0.000020	0.019	**943**	**81%**
SUM_DDT	µg/g	DDx	0.0016		0.0016		0.0016	0.060	**38**	**3%**
								Total Pesticides	**981**	**85%**
Dioxin-like Compounds										
TCDD TEQ (D/F)	µg/g	TCDD TEQ (D/F)	0.0000032	g	-		0.0000032	0.00018	**56**	**5%**
TCDD TEQ (PCBs)	µg/g	TCDD TEQ (PCBs)	0.0000032	g	-		0.0000032	0.00000013	**0.041**	**0.004%**
								Total TCDD TEQ	**56**	**5%**
								Total	**1,160**	100%

a. ER-L = Effects Range-Low from Long *et al.* , 1995; except where noted.
b. NJDEP Guidance For Sediment Quality Evaluations, November 1998. References Long et al, 1995.
c. Minimum of the ER-L and the NJ sediment benchmark values.
d. Exposure Point Concentration (EPC) is based on the 95% Upper Confidence Level on the arithmetic mean of the values in the assessment data set as discussed in the text. TEQs calculated using fish TEFs.
e. Hazard Quotient (HQ) is the ratio of the EPC to the benchmark value.
f. Percentage of the COPEC HQ to the sum of all Hazard Quotients (excluding the TCDD TEQ value).
g. Derived by USFWS using sediment chemistry for Newark Bay and oyster effect data presented in Wintermyer and Cooper, 2003.

ATTACHMENT 8
TABLE 8-5
SUMMARY OF SEDIMENT BENCHMARK COMPARISONS
Future Conditions (2018) - Area of Focus

Focused Feasibility Study - Ecological Risk Assessment

CASRN	Units	Chemical Parameter	*Marine/ Estuarine Values* NOAA ER-L[a]		NJDEP[b]		Lowest Sediment Benchmark[c]	Sediment EPC[d]	Hazard Quotient[e]	Relative Magnitude[f]
Inorganics/Metals										
7440-50-8	µg/g	Copper	34		34		34	81	**2.4**	**0.6%**
7439-92-1	µg/g	Lead	47		47		47	147	**3.2**	**0.8%**
7439-97-6	µg/g	Mercury	0.15		0.15		0.15	0.62	**4**	**1.1%**
								Total Inorganics/Metals	**10**	**2.5%**
Semivolatile Organics (PAHs)										
SUM_LOW_PAH	µg/g	Low Molecular Weight PAHs	0.55		-		0.55	16	**28**	**7.4%**
SUM_HIGH_PAH	µg/g	High Molecular Weight PAHs	1.7		-		1.7	61	**36**	**9.4%**
								Total PAHs	**64**	**16.8%**
PCBs (Aroclors)										
SUM_PCB	µg/g	Total PCBs	0.023		0.023		0.023	0.39	**17.0**	**4.4%**
								Total PCBs	**17**	**4.4%**
Pesticides										
60-57-1	µg/g	Dieldrin	0.000020		-		0.000020	0.0047	**235**	**61%**
SUM_DDT	µg/g	DDx	0.0016		0.0016		0.0016	0.070	**44**	**12%**
								Total Pesticides	**279**	**73%**
Dioxin-like Compounds										
TCDD TEQ (D/F)	µg/g	TCDD TEQ (D/F)	0.0000032	g	-		0.0000032	0.000041	**13**	**3%**
TCDD TEQ (PCBs)	µg/g	TCDD TEQ (PCBs)	0.0000032	g	-		0.0000032	0.00000052	**0.2**	**0.04%**
								Total TCDD TEQ	**13**	**3%**
								Total	**383**	100%

a. ER-L = Effects Range-Low from Long *et al.* , 1995; except where noted.
b. NJDEP Guidance For Sediment Quality Evaluations, November 1998. References Long et al, 1995.
c. Minimum of the ER-L and the NJ sediment benchmark values.
d. Exposure Point Concentration (EPC) is based on the 95% Upper Confidence Level on the arithmetic mean of the values in the assessment data set as discussed in the text. TEQs calculated using fish TEFs.
e. Hazard Quotient (HQ) is the ratio of the EPC to the benchmark value.
f. Percentage of the COPEC HQ to the sum of all Hazard Quotients (excluding the TCDD TEQ value).
g. Derived by USFWS using sediment chemistry for Newark Bay and oyster effect data presented in Wintermyer and Cooper, 2003.

ATTACHMENT 8
TABLE 8-6
SUMMARY OF SEDIMENT BENCHMARK COMPARISONS
Future Conditions (2048) - Area of Focus

Focused Feasibility Study - Ecological Risk Assessment

CASRN	Units	Chemical Parameter	*Marine/ Estuarine Values* NOAA ER-L[a]		NJDEP[b]		Lowest Sediment Benchmark[c]	Sediment EPC[d]	Hazard Quotient[e]	Relative Magnitude[f]
Inorganics/Metals										
7440-50-8	µg/g	Copper	34		34		34	41	**1.2**	**0.4%**
7439-92-1	µg/g	Lead	47		47		47	69	**1.5**	**0.4%**
7439-97-6	µg/g	Mercury	0.15		0.15		0.15	0.20	**1.3**	**0.4%**
								Total Inorganics/Metals	**4.0**	**1.2%**
Semivolatile Organics (PAHs)										
SUM_LOW_PAH	µg/g	Low Molecular Weight PAHs	0.55		-		0.55	16	**28**	**8.6%**
SUM_HIGH_PAH	µg/g	High Molecular Weight PAHs	1.7		-		1.7	61	**36**	**11.0%**
								Total PAHs	**64**	**19.7%**
PCBs (Aroclors)										
SUM_PCB	µg/g	Total PCBs	0.023		0.023		0.023	0.088	**4**	**1.2%**
								Total PCBs	**4**	**1.2%**
Pesticides										
60-57-1	µg/g	Dieldrin	0.000020		-		0.000020	0.0047	**235**	**72%**
SUM_DDT	µg/g	DDx	0.0016		0.0016		0.0016	0.024	**15.4**	**5%**
								Total Pesticides	**250**	**77%**
Dioxin-like Compounds										
TCDD TEQ (D/F)	µg/g	TCDD TEQ (D/F)	0.0000032	g	-		0.0000032	0.000013	**4.0**	**1%**
TCDD TEQ (PCBs)	µg/g	TCDD TEQ (PCBs)	0.0000032	g	-		0.0000032	0.00000013	**0.04**	**0.01%**
								Total TCDD TEQ	**4.1**	**1%**
								Total	**326**	**100%**

a. ER-L = Effects Range-Low from Long *et al.* , 1995; except where noted.
b. NJDEP Guidance For Sediment Quality Evaluations, November 1998. References Long et al, 1995.
c. Minimum of the ER-L and the NJ sediment benchmark values.
d. Exposure Point Concentration (EPC) is based on the 95% Upper Confidence Level on the arithmetic mean of the values in the assessment data set as discussed in the text. TEQs calculated using fish TEFs.
e. Hazard Quotient (HQ) is the ratio of the EPC to the benchmark value.
f. Percentage of the COPEC HQ to the sum of all Hazard Quotients (excluding the TCDD TEQ value).
g. Derived by USFWS using sediment chemistry for Newark Bay and oyster effect data presented in Wintermyer and Cooper, 2003.

ATTACHMENT 8
TABLE 8-7
CBR-BASED HAZARD QUOTIENTS FOR COPCs IN BLUE CRAB TISSUE
Future Conditions (2018) - Monitored Natural Attenuation

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	19	0.086	**0.86**	*Protothaca staminea*	Mortality - LD_{11}	1	**2.3E+02**	**2.3E+01**
Lead	µg/g	0.33	0.52	**5.2**	*Hyalella azteca*	Mortality - LD_{25}	2	6.4E-01	6.4E-02
Mercury[1]	µg/g	0.043	0.0095	**0.095**	*Acartia tonsa*	Reproduction - ED_{50}	3	**4.6E+00**	4.6E-01
Mercury (methyl)	µg/g	0.043	0.0095	**0.095**	*Acartia tonsa*	Reproduction - ED_{50}	3	**4.6E+00**	4.6E-01
						Total Inorganics/Metals		**2.3E+02**	**2.3E+01**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.25	0.022	**0.22**	*Mytilus edulis*	Reproduction - LOED	4	**1.1E+01**	**1.1E+00**
High Weight PAHs	µg/g	0.27	0.022	**0.22**	*Mytilus edulis*	Reproduction - LOED	4	**1.2E+01**	**1.2E+00**
						Total PAHs		**2.4E+01**	**2.4E+00**
PCBs (Aroclors)									
Aroclor, Total	µg/g	1.2	**0.42**	**1.1**	*Palaemonetes pugio*	Mortality - LOED	5	**2.8E+00**	**1.1E+00**
						Total PCBs		**2.8E+00**	**1.1E+00**
Pesticides									
Dieldrin	µg/g	0.014	**0.01**	**0.08**	*Penaeus duorarum*	Mortality - LOED	6	**1.4E+00**	1.7E-01
Total DDx	µg/g	0.22	0.00018	**0.0018**	*Hyalella azteca*	Mortality - LD_{50}	7	**1.2E+03**	**1.2E+02**
						Total Pesticides		**1.2E+03**	**1.2E+02**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.00014	**0.00000015**	**0.0000013**	*Crassostrea virginica*	Reproduction - LOED	8	**9.1E+02**	**1.0E+02**
TCDD TEQ (PCBs)	µg/g	0.0000016	**0.00000015**	**0.0000013**	*Crassostrea virginica*	Reproduction - LOED	8	**1.1E+01**	**1.2E+00**
						Total TCDD TEQ		**9.2E+02**	**1.1E+02**
						Total		**2.4E+03**	**2.5E+02**

Notes:

[a] Exposure Point Concentrations (95% UCLs) presented in Table 7-6. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on blue crab tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-7
CBR-BASED HAZARD QUOTIENTS FOR COPCs IN BLUE CRAB TISSUE
Future Conditions (2018) - Monitored Natural Attenuation

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

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8. Wintermyer, M.L., and K.R. Cooper, 2003. Dioxin/Furan and Polychlorinated Biphenyl Concentrations in Eastern Oyster (Crassostrea virginica, Gmelin) Tissues and the Effects on Egg-Fertilization and Development; J. Shellfish Res. 22(3):737-746.

ATTACHMENT 8
TABLE 8-8
CBR-BASED HAZARD QUOTIENTS FOR COPCs IN BLUE CRAB TISSUE
Future Conditions (2048) - Monitored Natural Attenuation

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	9.8	0.086	**0.86**	*Protothaca staminea*	Mortality - LD_{11}	1	**1.1E+02**	**1.1E+01**
Lead	µg/g	0.15	0.52	**5.2**	*Hyalella azteca*	Mortality - LD_{25}	2	3.0E-01	3.0E-02
Mercury[1]	µg/g	0.014	0.0095	**0.095**	*Acartia tonsa*	Reproduction - ED_{50}	3	**1.5E+00**	1.5E-01
Mercury (methyl)	µg/g	0.014	0.0095	**0.095**	*Acartia tonsa*	Reproduction - ED_{50}	3	**1.5E+00**	1.5E-01
						Total Inorganics/Metals		**1.2E+02**	**1.2E+01**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.25	0.022	**0.22**	*Mytilus edulis*	Reproduction - LOED	4	**1.1E+01**	**1.1E+00**
High Weight PAHs	µg/g	0.27	0.022	**0.22**	*Mytilus edulis*	Reproduction - LOED	4	**1.2E+01**	**1.2E+00**
						Total PAHs		**2.4E+01**	**2.4E+00**
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.26	**0.42**	**1.1**	*Palaemonetes pugio*	Mortality - LOED	5	6.3E-01	2.4E-01
						Total PCBs		6.3E-01	2.4E-01
Pesticides									
Dieldrin	µg/g	0.014	**0.01**	**0.08**	*Penaeus duorarum*	Mortality - LOED	6	**1.4E+00**	1.7E-01
Total DDx	µg/g	0.077	0.00018	**0.0018**	*Hyalella azteca*	Mortality - LD_{50}	7	**4.2E+02**	**4.2E+01**
						Total Pesticides		**4.2E+02**	**4.2E+01**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.000036	**0.00000015**	**0.0000013**	*Crassostrea virginica*	Reproduction - LOED	8	**2.4E+02**	**2.8E+01**
TCDD TEQ (PCBs)	µg/g	0.00000054	**0.00000015**	**0.0000013**	*Crassostrea virginica*	Reproduction - LOED	8	**3.6E+00**	4.2E-01
						Total TCDD TEQ		**2.5E+02**	**2.8E+01**
						Total		**8.1E+02**	**8.4E+01**

Notes:

[a] Exposure Point Concentrations (95% UCLs) presented in Table 7-6. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on blue crab tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-8
CBR-BASED HAZARD QUOTIENTS FOR COPCs IN BLUE CRAB TISSUE
Future Conditions (2048) - Monitored Natural Attenuation

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Roesijadi, G., 1980. Biol.Bull. 158:233-247; ERED Ref ID JA377.
2. Borgmann, U., and W.P. Norwood, 1999. Can. J. Fish. Aquat. Sci. 56; ERED Ref ID MEC04-063.
3. Hook, S., and N. Fisher, 2002. Marine Environ. Res. 53: 161-174; ERED Ref ID MEC03-211.
4. Eertman, R.H.M., C.L. Groenink, B. Sandee, and H. Hummel, 1995; ERED Ref ID URS75.
5. (NOAEL) Nimmo, D.R., J. Forester, P.T. Heitmuller, and G.H. Cook, 1974. Bull. Environ. Contam. Toxicol. 11(4):303-308; ERED Ref ID JA329
(LOAEL) Hansen, D.J., P.R. Parrish, and J. Forester, 1974. Environ. Res. 7:363-373; ERED Ref ID URS102.
6. Parrish, P.P., J.A. Couch, J. Forester, J.M. Patrick, and G.H. Cook, NS. Contribution No. 178, Gulf Breeze Environmental Research Laboratory, Sabine Island, Gulf Breeze, FL 32561; ERED Ref ID SEQ97-2.
7. Lotufo, G.R., P.F. Landrum, and M.L. Gedeon, 2001. Environ. Tox. Chem. 20(4):810-825; ERED Ref ID MEC03-102.
8. Wintermyer, M.L., and K.R. Cooper, 2003. Dioxin/Furan and Polychlorinated Biphenyl Concentrations in Eastern Oyster (Crassostrea virginica, Gmelin) Tissues and the Effects on Egg-Fertilization and Development; J. Shellfish Res. 22(3):737-746.

ATTACHMENT 8
TABLE 8-9
CBR-BASED HAZARD QUOTIENTS FOR COPCs IN BLUE CRAB TISSUE
Future Conditions (2018) - Primary Erosional Zone/Primary Inventory Zone

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	19	0.086	**0.86**	*Protothaca staminea*	Mortality - LD_{11}	1	**2.2E+02**	**2.2E+01**
Lead	µg/g	0.32	0.52	**5.2**	*Hyalella azteca*	Mortality - LD_{25}	2	6.1E-01	6.1E-02
Mercury[1]	µg/g	0.038	0.0095	**0.095**	*Acartia tonsa*	Reproduction - ED_{50}	3	**4.0E+00**	4.0E-01
Mercury (methyl)	µg/g	0.038	0.0095	**0.095**	*Acartia tonsa*	Reproduction - ED_{50}	3	**4.0E+00**	4.0E-01
						Total Inorganics/Metals		**2.2E+02**	**2.2E+01**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.25	0.022	**0.22**	*Mytilus edulis*	Reproduction - LOED	4	**1.1E+01**	**1.1E+00**
High Weight PAHs	µg/g	0.27	0.022	**0.22**	*Mytilus edulis*	Reproduction - LOED	4	**1.2E+01**	**1.2E+00**
						Total PAHs		**2.4E+01**	**2.4E+00**
PCBs (Aroclors)									
Aroclor, Total	µg/g	1.0	**0.42**	**1.1**	*Palaemonetes pugio*	Mortality - LOED	5	**2.5E+00**	9.4E-01
						Total PCBs		**2.5E+00**	9.4E-01
Pesticides									
Dieldrin	µg/g	0.013	**0.01**	**0.08**	*Penaeus duorarum*	Mortality - LOED	6	**1.3E+00**	1.6E-01
Total DDx	µg/g	0.19	0.00018	**0.0018**	*Hyalella azteca*	Mortality - LD_{50}	7	**1.0E+03**	**1.0E+02**
						Total Pesticides		**1.0E+03**	**1.0E+02**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.000091	**0.00000015**	**0.0000013**	*Crassostrea virginica*	Reproduction - LOED	8	**6.0E+02**	**7.0E+01**
TCDD TEQ (PCBs)	µg/g	0.0000015	**0.00000015**	**0.0000013**	*Crassostrea virginica*	Reproduction - LOED	8	**1.0E+01**	**1.2E+00**
						Total TCDD TEQ		**6.1E+02**	**7.1E+01**
						Total		**1.9E+03**	**2.0E+02**

Notes:

[a] Exposure Point Concentrations (95% UCLs) presented in Table 7-7. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on blue crab tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-9
CBR-BASED HAZARD QUOTIENTS FOR COPCs IN BLUE CRAB TISSUE
Future Conditions (2018) - Primary Erosional Zone/Primary Inventory Zone

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Roesijadi, G., 1980. Biol.Bull. 158:233-247; ERED Ref ID JA377.
2. Borgmann, U., and W.P. Norwood, 1999. Can. J. Fish. Aquat. Sci. 56; ERED Ref ID MEC04-063.
3. Hook, S., and N. Fisher, 2002. Marine Environ. Res. 53: 161-174; ERED Ref ID MEC03-211.
4. Eertman, R.H.M., C.L. Groenink, B. Sandee, and H. Hummel, 1995; ERED Ref ID URS75.
5. (NOAEL) Nimmo, D.R., J. Forester, P.T. Heitmuller, and G.H. Cook, 1974. Bull. Environ. Contam. Toxicol. 11(4):303-308; ERED Ref ID JA329
(LOAEL) Hansen, D.J., P.R. Parrish, and J. Forester, 1974. Environ. Res. 7:363-373; ERED Ref ID URS102.
6. Parrish, P.P., J.A. Couch, J. Forester, J.M. Patrick, and G.H. Cook, NS. Contribution No. 178, Gulf Breeze Environmental Research Laboratory, Sabine Island, Gulf Breeze, FL 32561; ERED Ref ID SEQ97-2.
7. Lotufo, G.R., P.F. Landrum, and M.L. Gedeon, 2001. Environ. Tox. Chem. 20(4):810-825; ERED Ref ID MEC03-102.
8. Wintermyer, M.L., and K.R. Cooper, 2003. Dioxin/Furan and Polychlorinated Biphenyl Concentrations in Eastern Oyster (Crassostrea virginica, Gmelin) Tissues and the Effects on Egg-Fertilization and Development; J. Shellfish Res. 22(3):737-746.

ATTACHMENT 8
TABLE 8-10
CBR-BASED HAZARD QUOTIENTS FOR COPCs IN BLUE CRAB TISSUE
Future Conditions (2048) - Primary Erosional Zone/Primary Inventory Zone

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	9.3	0.086	**0.86**	*Protothaca staminea*	Mortality - LD_{11}	1	**1.1E+02**	**1.1E+01**
Lead	µg/g	0.15	0.52	**5.2**	*Hyalella azteca*	Mortality - LD_{25}	2	2.8E-01	2.8E-02
Mercury[1]	µg/g	0.012	0.0095	**0.095**	*Acartia tonsa*	Reproduction - ED_{50}	3	**1.3E+00**	1.3E-01
Mercury (methyl)	µg/g	0.012	0.0095	**0.095**	*Acartia tonsa*	Reproduction - ED_{50}	3	**1.3E+00**	1.3E-01
						Total Inorganics/Metals		**1.1E+02**	**1.1E+01**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.25	0.022	**0.22**	*Mytilus edulis*	Reproduction - LOED	4	**1.1E+01**	**1.1E+00**
High Weight PAHs	µg/g	0.27	0.022	**0.22**	*Mytilus edulis*	Reproduction - LOED	4	**1.2E+01**	**1.2E+00**
						Total PAHs		**2.4E+01**	**2.4E+00**
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.24	**0.42**	**1.1**	*Palaemonetes pugio*	Mortality - LOED	5	5.6E-01	2.1E-01
						Total PCBs		5.6E-01	2.1E-01
Pesticides									
Dieldrin	µg/g	0.013	**0.01**	**0.08**	*Penaeus duorarum*	Mortality - LOED	6	**1.3E+00**	1.6E-01
Total DDx	µg/g	0.067	0.00018	**0.0018**	*Hyalella azteca*	Mortality - LD_{50}	7	**3.6E+02**	**3.6E+01**
						Total Pesticides		**3.6E+02**	**3.6E+01**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.000027	**0.00000015**	**0.0000013**	*Crassostrea virginica*	Reproduction - LOED	8	**1.8E+02**	**2.1E+01**
TCDD TEQ (PCBs)	µg/g	0.00000027	**0.00000015**	**0.0000013**	*Crassostrea virginica*	Reproduction - LOED	8	**1.8E+00**	2.1E-01
						Total TCDD TEQ		**1.8E+02**	**2.1E+01**
						Total		**6.8E+02**	**7.1E+01**

Notes:

[a] Exposure Point Concentrations (95% UCLs) presented in Table 7-7. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on blue crab tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-10
CBR-BASED HAZARD QUOTIENTS FOR COPCs IN BLUE CRAB TISSUE
Future Conditions (2048) - Primary Erosional Zone/Primary Inventory Zone

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Roesijadi, G., 1980. Biol.Bull. 158:233-247; ERED Ref ID JA377.
2. Borgmann, U., and W.P. Norwood, 1999. Can. J. Fish. Aquat. Sci. 56; ERED Ref ID MEC04-063.
3. Hook, S., and N. Fisher, 2002. Marine Environ. Res. 53: 161-174; ERED Ref ID MEC03-211.
4. Eertman, R.H.M., C.L. Groenink, B. Sandee, and H. Hummel, 1995; ERED Ref ID URS75.
5. (NOAEL) Nimmo, D.R., J. Forester, P.T. Heitmuller, and G.H. Cook, 1974. Bull. Environ. Contam. Toxicol. 11(4):303-308; ERED Ref ID JA329
(LOAEL) Hansen, D.J., P.R. Parrish, and J. Forester, 1974. Environ. Res. 7:363-373; ERED Ref ID URS102.
6. Parrish, P.P., J.A. Couch, J. Forester, J.M. Patrick, and G.H. Cook, NS. Contribution No. 178, Gulf Breeze Environmental Research Laboratory, Sabine Island, Gulf Breeze, FL 32561; ERED Ref ID SEQ97-2.
7. Lotufo, G.R., P.F. Landrum, and M.L. Gedeon, 2001. Environ. Tox. Chem. 20(4):810-825; ERED Ref ID MEC03-102.
8. Wintermyer, M.L., and K.R. Cooper, 2003. Dioxin/Furan and Polychlorinated Biphenyl Concentrations in Eastern Oyster (Crassostrea virginica, Gmelin) Tissues and the Effects on Egg-Fertilization and Development; J. Shellfish Res. 22(3):737-746.

ATTACHMENT 8
TABLE 8-11
CBR-BASED HAZARD QUOTIENTS FOR COPCs IN BLUE CRAB TISSUE
Future Conditions (2018) - Area of Focus

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	11	0.086	**0.86**	*Protothaca staminea*	Mortality - LD_{11}	1	**1.3E+02**	**1.3E+01**
Lead	µg/g	0.21	0.52	**5.2**	*Hyalella azteca*	Mortality - LD_{25}	2	4.0E-01	4.0E-02
Mercury[1]	µg/g	0.017	0.0095	**0.095**	*Acartia tonsa*	Reproduction - ED_{50}	3	**1.8E+00**	1.8E-01
Mercury (methyl)	µg/g	0.017	0.0095	**0.095**	*Acartia tonsa*	Reproduction - ED_{50}	3	**1.8E+00**	1.8E-01
						Total Inorganics/Metals		**1.3E+02**	**1.3E+01**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.12	0.022	**0.22**	*Mytilus edulis*	Reproduction - LOED	4	**5.3E+00**	5.3E-01
High Weight PAHs	µg/g	0.19	0.022	**0.22**	*Mytilus edulis*	Reproduction - LOED	4	**8.8E+00**	8.8E-01
						Total PAHs		**1.4E+01**	**1.4E+00**
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.79	**0.42**	**1.1**	*Palaemonetes pugio*	Mortality - LOED	5	**1.9E+00**	7.2E-01
						Total PCBs		**1.9E+00**	7.2E-01
Pesticides									
Dieldrin	µg/g	0.0032	**0.01**	**0.08**	*Penaeus duorarum*	Mortality - LOED	6	3.2E-01	4.0E-02
Total DDx	µg/g	0.078	0.00018	**0.0018**	*Hyalella azteca*	Mortality - LD_{50}	7	**4.2E+02**	**4.2E+01**
						Total Pesticides		**4.2E+02**	**4.2E+01**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.0000062	**0.00000015**	**0.0000013**	*Crassostrea virginica*	Reproduction - LOED	8	**4.2E+01**	**4.8E+00**
TCDD TEQ (PCBs)	µg/g	0.0000011	**0.00000015**	**0.0000013**	*Crassostrea virginica*	Reproduction - LOED	8	**7.2E+00**	8.3E-01
						Total TCDD TEQ		**4.9E+01**	**5.6E+00**
						Total		**6.2E+02**	**6.4E+01**

Notes:

[a] Exposure Point Concentrations (95% UCLs) presented in Table 7-8. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on blue crab tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-11
CBR-BASED HAZARD QUOTIENTS FOR COPCs IN BLUE CRAB TISSUE
Future Conditions (2018) - Area of Focus

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Roesijadi, G., 1980. Biol.Bull. 158:233-247; ERED Ref ID JA377.
2. Borgmann, U., and W.P. Norwood, 1999. Can. J. Fish. Aquat. Sci. 56; ERED Ref ID MEC04-063.
3. Hook, S., and N. Fisher, 2002. Marine Environ. Res. 53: 161-174; ERED Ref ID MEC03-211.
4. Eertman, R.H.M., C.L. Groenink, B. Sandee, and H. Hummel, 1995; ERED Ref ID URS75.
5. (NOAEL) Nimmo, D.R., J. Forester, P.T. Heitmuller, and G.H. Cook, 1974. Bull. Environ. Contam. Toxicol. 11(4):303-308; ERED Ref ID JA329
(LOAEL) Hansen, D.J., P.R. Parrish, and J. Forester, 1974. Environ. Res. 7:363-373; ERED Ref ID URS102.
6. Parrish, P.P., J.A. Couch, J. Forester, J.M. Patrick, and G.H. Cook, NS. Contribution No. 178, Gulf Breeze Environmental Research Laboratory, Sabine Island, Gulf Breeze, FL 32561; ERED Ref ID SEQ97-2.
7. Lotufo, G.R., P.F. Landrum, and M.L. Gedeon, 2001. Environ. Tox. Chem. 20(4):810-825; ERED Ref ID MEC03-102.
8. Wintermyer, M.L., and K.R. Cooper, 2003. Dioxin/Furan and Polychlorinated Biphenyl Concentrations in Eastern Oyster (Crassostrea virginica, Gmelin) Tissues and the Effects on Egg-Fertilization and Development; J. Shellfish Res. 22(3):737-746.

ATTACHMENT 8
TABLE 8-12
CBR-BASED HAZARD QUOTIENTS FOR COPCs IN BLUE CRAB TISSUE
Future Conditions (2048) - Area of Focus

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	5.8	0.086	**0.86**	*Protothaca staminea*	Mortality - LD_{11}	1	**6.7E+01**	**6.7E+00**
Lead	µg/g	0.097	0.52	**5.2**	*Hyalella azteca*	Mortality - LD_{25}	2	1.9E-01	1.9E-02
Mercury[1]	µg/g	0.0055	0.0095	**0.095**	*Acartia tonsa*	Reproduction - ED_{50}	3	5.8E-01	5.8E-02
Mercury (methyl)	µg/g	0.0055	0.0095	**0.095**	*Acartia tonsa*	Reproduction - ED_{50}	3	5.8E-01	5.8E-02
						Total Inorganics/Metals		**6.8E+01**	**6.8E+00**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.12	0.022	**0.22**	*Mytilus edulis*	Reproduction - LOED	4	**5.3E+00**	5.3E-01
High Weight PAHs	µg/g	0.19	0.022	**0.22**	*Mytilus edulis*	Reproduction - LOED	4	**8.8E+00**	8.8E-01
						Total PAHs		**1.4E+01**	**1.4E+00**
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.18	**0.42**	**1.1**	*Palaemonetes pugio*	Mortality - LOED	5	4.3E-01	1.6E-01
						Total PCBs		4.3E-01	1.6E-01
Pesticides									
Dieldrin	µg/g	0.0032	**0.01**	**0.08**	*Penaeus duorarum*	Mortality - LOED	6	3.2E-01	4.0E-02
Total DDx	µg/g	0.027	0.00018	**0.0018**	*Hyalella azteca*	Mortality - LD_{50}	7	**1.5E+02**	**1.5E+01**
						Total Pesticides		**1.5E+02**	**1.5E+01**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.0000019	**0.00000015**	**0.0000013**	*Crassostrea virginica*	Reproduction - LOED	8	**1.3E+01**	**1.5E+00**
TCDD TEQ (PCBs)	µg/g	0.00000027	**0.00000015**	**0.0000013**	*Crassostrea virginica*	Reproduction - LOED	8	**1.8E+00**	2.1E-01
						Total TCDD TEQ		**1.5E+01**	**1.7E+00**
						Total		**2.5E+02**	**2.5E+01**

Notes:

[a] Exposure Point Concentrations (95% UCLs) presented in Table 7-8. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on blue crab tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-12
CBR-BASED HAZARD QUOTIENTS FOR COPCs IN BLUE CRAB TISSUE
Future Conditions (2048) - Area of Focus

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Roesijadi, G., 1980. Biol.Bull. 158:233-247; ERED Ref ID JA377.
2. Borgmann, U., and W.P. Norwood, 1999. Can. J. Fish. Aquat. Sci. 56; ERED Ref ID MEC04-063.
3. Hook, S., and N. Fisher, 2002. Marine Environ. Res. 53: 161-174; ERED Ref ID MEC03-211.
4. Eertman, R.H.M., C.L. Groenink, B. Sandee, and H. Hummel, 1995; ERED Ref ID URS75.
5. (NOAEL) Nimmo, D.R., J. Forester, P.T. Heitmuller, and G.H. Cook, 1974. Bull. Environ. Contam. Toxicol. 11(4):303-308; ERED Ref ID JA329
(LOAEL) Hansen, D.J., P.R. Parrish, and J. Forester, 1974. Environ. Res. 7:363-373; ERED Ref ID URS102.
6. Parrish, P.P., J.A. Couch, J. Forester, J.M. Patrick, and G.H. Cook, NS. Contribution No. 178, Gulf Breeze Environmental Research Laboratory, Sabine Island, Gulf Breeze, FL 32561; ERED Ref ID SEQ97-2.
7. Lotufo, G.R., P.F. Landrum, and M.L. Gedeon, 2001. Environ. Tox. Chem. 20(4):810-825; ERED Ref ID MEC03-102.
8. Wintermyer, M.L., and K.R. Cooper, 2003. Dioxin/Furan and Polychlorinated Biphenyl Concentrations in Eastern Oyster (Crassostrea virginica, Gmelin) Tissues and the Effects on Egg-Fertilization and Development; J. Shellfish Res. 22(3):737-746.

ATTACHMENT 8
TABLE 8-13
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN WHITE PERCH/AMERICAN EEL TISSUE
Future Conditions (2018) - Monitored Natural Attenuation

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	5.6	0.002	**0.02**	*Ictalurus punctatus*	Growth - LOED	1	**2.8E+03**	**2.8E+02**
Lead	µg/g	0.28	0.028	**0.28**	*Oncorhynchus mykiss*	Growth - ED_{11}	2	**1.0E+01**	**1.0E+00**
Mercury[1]	µg/g	0.16	0.006	**0.06**	*Ictalurus punctatus*	Mortality - LD_{50}	3	**2.6E+01**	**2.6E+00**
Mercury (methyl)	µg/g	0.16	0.001	**0.01**	*Fundulus heteroclitus*	Growth - ED_{146}	4	**1.6E+02**	**1.6E+01**
						Total Inorganics/Metals		**3.0E+03**	**3.0E+02**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.37	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	**1.8E+00**	1.8E-01
High Weight PAHs	µg/g	0.22	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	**1.0E+00**	1.0E-01
						Total PAHs		**2.8E+00**	2.8E-01
PCBs (Aroclors)									
Aroclor, Total	µg/g	1.2	0.0025	**0.025**	*Oryzias latipes*	Reproduction - ED_{11}	6	**4.9E+02**	**4.9E+01**
						Total PCBs		**4.9E+02**	**4.9E+01**
Pesticides									
Dieldrin	µg/g	0.032	0.011	**0.11**	*Oncorhynchus mykiss*	Growth - LOED	7	**2.9E+00**	2.9E-01
Total DDx	µg/g	0.36	**0.000039**	**0.0018**	*Oryzias latipes*	Mortality - LOED	8	**9.2E+03**	**2.0E+02**
						Total Pesticides		**9.2E+03**	**2.0E+02**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.00018	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	**5.3E+00**	**3.1E+00**
TCDD TEQ (PCBs)	µg/g	0.0000011	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	3.4E-02	2.0E-02
						Total TCDD TEQ		**5.3E+00**	**3.1E+00**
						Total		**1.3E+04**	**5.5E+02**

Notes:

[a] Exposure Point Concentration (95% UCLs) presented in Table 7-6. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on white perch and American eel tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-13
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN WHITE PERCH/AMERICAN EEL TISSUE
Future Conditions (2018) - Monitored Natural Attenuation

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Murai, T., J.W. Andrews, and R.G. Smith, Jr., 1981. Aquaculture 22:353-357; ERED Ref ID JA317.
2. Hansen, J.A., J. Lipton, P.G., Welsh, D. Cacela, and B. MacConnell, 2004. Environ. Tox. & Chem. 23:1902-1911; ERED Ref ID Weston05-031.
3. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson, 1979. The Biogeochemistry of Mercury, pg. 629-655; ERED Ref ID JA33.
4. Matta, M.B., J. Linse, C. Cairncross, L. Francendese, and R.M. Kocan, 2001. Environ. Tox. & Chem. 20(2)L327-335; ERED Ref ID MECO3-135.
5. Hose, J.E., J.B. Hannah, D. DiJulio, M.L. Landholt, B.S. Miller, W.T. Iwaoka, and S.P. Felton, 1982. Arch. Environ. Contam. Toxicol. 11:167-171; ERED Ref ID JA212
6. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo, 2005. Environ. Tox. Chem. 24:591-596; ERED Ref ID Weston05-046.
7. Dillon, T.M., 1984. Army Corps of Engineers Technical Report, D-84-2; ERED Ref ID MEC04-070.
8. Villalobos, S.B., D.M. Papoulias, S.D. Pastva, A.L. Blankenship, J. Meadow, D.E. Tillitt, and J.P. Giesy, 2003. Chemosphere 53:819-826; ERED Ref ID MEC04-293.
9. Walker, M.K., J.M. Spitsbergen, J.R. Olson, and R.E. Peterson, 1991. Can. J. Fish. Aquat. Sci.; ERED Ref ID JA474.

ATTACHMENT 8
TABLE 8-14
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN WHITE PERCH/AMERICAN EEL TISSUE
Future Conditions (2048) - Monitored Natural Attenuation

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	2.8	0.002	**0.02**	*Ictalurus punctatus*	Growth - LOED	1	**1.4E+03**	**1.4E+02**
Lead	µg/g	0.13	0.028	**0.28**	*Oncorhynchus mykiss*	Growth - ED_{11}	2	**4.7E+00**	4.7E-01
Mercury[1]	µg/g	0.050	0.006	**0.06**	*Ictalurus punctatus*	Mortality - LD_{50}	3	**8.4E+00**	8.4E-01
Mercury (methyl)	µg/g	0.050	0.001	**0.01**	*Fundulus heteroclitus*	Growth - ED_{146}	4	**5.0E+01**	**5.0E+00**
						Total Inorganics/Metals		**1.5E+03**	**1.5E+02**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.37	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	**1.8E+00**	1.8E-01
High Weight PAHs	µg/g	0.22	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	**1.0E+00**	1.0E-01
						Total PAHs		**2.8E+00**	2.8E-01
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.28	0.0025	**0.025**	*Oryzias latipes*	Reproduction - ED_{11}	6	**1.1E+02**	**1.1E+01**
						Total PCBs		**1.1E+02**	**1.1E+01**
Pesticides									
Dieldrin	µg/g	0.032	0.011	**0.11**	*Oncorhynchus mykiss*	Growth - LOED	7	**2.9E+00**	2.9E-01
Total DDx	µg/g	0.13	**0.000039**	**0.0018**	*Oryzias latipes*	Mortality - LOED	8	**3.2E+03**	**7.0E+01**
						Total Pesticides		**3.2E+03**	**7.0E+01**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.000048	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	**1.4E+00**	8.2E-01
TCDD TEQ (PCBs)	µg/g	0.00000038	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	1.1E-02	6.6E-03
						Total TCDD TEQ		**1.4E+00**	8.3E-01
						Total		**4.8E+03**	**2.3E+02**

Notes:

[a] Exposure Point Concentration (95% UCLs) presented in Table 7-6. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on white perch and American eel tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-14
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN WHITE PERCH/AMERICAN EEL TISSUE
Future Conditions (2048) - Monitored Natural Attenuation

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Murai, T., J.W. Andrews, and R.G. Smith, Jr., 1981. Aquaculture 22:353-357; ERED Ref ID JA317.
2. Hansen, J.A., J. Lipton, P.G., Welsh, D. Cacela, and B. MacConnell, 2004. Environ. Tox. & Chem. 23:1902-1911; ERED Ref ID Weston05-031.
3. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson, 1979. The Biogeochemistry of Mercury, pg. 629-655; ERED Ref ID JA33.
4. Matta, M.B., J. Linse, C. Cairncross, L. Francendese, and R.M. Kocan, 2001. Environ. Tox. & Chem. 20(2)L327-335; ERED Ref ID MECO3-135.
5. Hose, J.E., J.B. Hannah, D. DiJulio, M.L. Landholt, B.S. Miller, W.T. Iwaoka, and S.P. Felton, 1982. Arch. Environ. Contam. Toxicol. 11:167-171; ERED Ref ID JA212
6. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo, 2005. Environ. Tox. Chem. 24:591-596; ERED Ref ID Weston05-046.
7. Dillon, T.M., 1984. Army Corps of Engineers Technical Report, D-84-2; ERED Ref ID MEC04-070.
8. Villalobos, S.B., D.M. Papoulias, S.D. Pastva, A.L. Blankenship, J. Meadow, D.E. Tillitt, and J.P. Giesy, 2003. Chemosphere 53:819-826; ERED Ref ID MEC04-293.
9. Walker, M.K., J.M. Spitsbergen, J.R. Olson, and R.E. Peterson, 1991. Can. J. Fish. Aquat. Sci.; ERED Ref ID JA474.

ATTACHMENT 8
TABLE 8-15
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN WHITE PERCH/AMERICAN EEL TISSUE
Future Conditions (2018) - Primary Erosional Zone/Primary Inventory Zone

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	5.4	0.002	**0.02**	*Ictalurus punctatus*	Growth - LOED	1	**2.7E+03**	**2.7E+02**
Lead	µg/g	0.27	0.028	**0.28**	*Oncorhynchus mykiss*	Growth - ED_{11}	2	**9.8E+00**	9.8E-01
Mercury[1]	µg/g	0.14	0.006	**0.06**	*Ictalurus punctatus*	Mortality - LD_{50}	3	**2.3E+01**	**2.3E+00**
Mercury (methyl)	µg/g	0.14	0.001	**0.01**	*Fundulus heteroclitus*	Growth - ED_{146}	4	**1.4E+02**	**1.4E+01**
						Total Inorganics/Metals		**2.9E+03**	**2.9E+02**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.36	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	**1.7E+00**	1.7E-01
High Weight PAHs	µg/g	0.22	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	**1.0E+00**	1.0E-01
						Total PAHs		**2.8E+00**	2.8E-01
PCBs (Aroclors)									
Aroclor, Total	µg/g	1.1	0.0025	**0.025**	*Oryzias latipes*	Reproduction - ED_{11}	6	**4.4E+02**	**4.4E+01**
						Total PCBs		**4.4E+02**	**4.4E+01**
Pesticides									
Dieldrin	µg/g	0.030	0.011	**0.11**	*Oncorhynchus mykiss*	Growth - LOED	7	**2.7E+00**	2.7E-01
Total DDx	µg/g	0.31	**0.000039**	**0.0018**	*Oryzias latipes*	Mortality - LOED	8	**7.9E+03**	**1.7E+02**
						Total Pesticides		**7.9E+03**	**1.7E+02**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.00012	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	**3.5E+00**	**2.1E+00**
TCDD TEQ (PCBs)	µg/g	0.0000011	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	3.2E-02	1.9E-02
						Total TCDD TEQ		**3.5E+00**	**2.1E+00**
						Total		**1.1E+04**	**5.0E+02**

Notes:

[a] Exposure Point Concentration (95% UCLs) presented in Table 7-7. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on white perch and American eel tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-15
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN WHITE PERCH/AMERICAN EEL TISSUE
Future Conditions (2018) - Primary Erosional Zone/Primary Inventory Zone

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Murai, T., J.W. Andrews, and R.G. Smith, Jr., 1981. Aquaculture 22:353-357; ERED Ref ID JA317.
2. Hansen, J.A., J. Lipton, P.G., Welsh, D. Cacela, and B. MacConnell, 2004. Environ. Tox. & Chem. 23:1902-1911; ERED Ref ID Weston05-031.
3. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson, 1979. The Biogeochemistry of Mercury, pg. 629-655; ERED Ref ID JA33.
4. Matta, M.B., J. Linse, C. Cairncross, L. Francendese, and R.M. Kocan, 2001. Environ. Tox. & Chem. 20(2)L327-335; ERED Ref ID MECO3-135.
5. Hose, J.E., J.B. Hannah, D. DiJulio, M.L. Landholt, B.S. Miller, W.T. Iwaoka, and S.P. Felton, 1982. Arch. Environ. Contam. Toxicol. 11:167-171; ERED Ref ID JA212
6. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo, 2005. Environ. Tox. Chem. 24:591-596; ERED Ref ID Weston05-046.
7. Dillon, T.M., 1984. Army Corps of Engineers Technical Report, D-84-2; ERED Ref ID MEC04-070.
8. Villalobos, S.B., D.M. Papoulias, S.D. Pastva, A.L. Blankenship, J. Meadow, D.E. Tillitt, and J.P. Giesy, 2003. Chemosphere 53:819-826; ERED Ref ID MEC04-293.
9. Walker, M.K., J.M. Spitsbergen, J.R. Olson, and R.E. Peterson, 1991. Can. J. Fish. Aquat. Sci.; ERED Ref ID JA474.

ATTACHMENT 8
TABLE 8-16
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN WHITE PERCH/AMERICAN EEL TISSUE
Future Conditions (2048) - Primary Erosional Zone/Primary Inventory Zone

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	2.7	0.002	**0.02**	*Ictalurus punctatus*	Growth - LOED	1	**1.4E+03**	**1.4E+02**
Lead	µg/g	0.13	0.028	**0.28**	*Oncorhynchus mykiss*	Growth - ED_{11}	2	**4.5E+00**	4.5E-01
Mercury[1]	µg/g	0.044	0.006	**0.06**	*Ictalurus punctatus*	Mortality - LD_{50}	3	**7.4E+00**	7.4E-01
Mercury (methyl)	µg/g	0.044	0.001	**0.01**	*Fundulus heteroclitus*	Growth - ED_{146}	4	**4.4E+01**	**4.4E+00**
						Total Inorganics/Metals		**1.4E+03**	**1.4E+02**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.36	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	**1.7E+00**	1.7E-01
High Weight PAHs	µg/g	0.22	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	**1.0E+00**	1.0E-01
						Total PAHs		**2.8E+00**	2.8E-01
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.25	0.0025	**0.025**	*Oryzias latipes*	Reproduction - ED_{11}	6	**9.9E+01**	**9.9E+00**
						Total PCBs		**9.9E+01**	**9.9E+00**
Pesticides									
Dieldrin	µg/g	0.030	0.011	**0.11**	*Oncorhynchus mykiss*	Growth - LOED	7	**2.7E+00**	2.7E-01
Total DDx	µg/g	0.11	**0.000039**	**0.0018**	*Oryzias latipes*	Mortality - LOED	8	**2.8E+03**	**6.0E+01**
						Total Pesticides		**2.8E+03**	**6.1E+01**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.000036	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	**1.1E+00**	6.2E-01
TCDD TEQ (PCBs)	µg/g	0.00000019	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	5.6E-03	3.3E-03
						Total TCDD TEQ		**1.1E+00**	6.2E-01
						Total		**4.3E+03**	**2.1E+02**

Notes:

[a] Exposure Point Concentration (95% UCLs) presented in Table 7-7. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on white perch and American eel tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-16
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN WHITE PERCH/AMERICAN EEL TISSUE
Future Conditions (2048) - Primary Erosional Zone/Primary Inventory Zone

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Murai, T., J.W. Andrews, and R.G. Smith, Jr., 1981. Aquaculture 22:353-357; ERED Ref ID JA317.
2. Hansen, J.A., J. Lipton, P.G., Welsh, D. Cacela, and B. MacConnell, 2004. Environ. Tox. & Chem. 23:1902-1911; ERED Ref ID Weston05-031.
3. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson, 1979. The Biogeochemistry of Mercury, pg. 629-655; ERED Ref ID JA33.
4. Matta, M.B., J. Linse, C. Cairncross, L. Francendese, and R.M. Kocan, 2001. Environ. Tox. & Chem. 20(2)L327-335; ERED Ref ID MECO3-135.
5. Hose, J.E., J.B. Hannah, D. DiJulio, M.L. Landholt, B.S. Miller, W.T. Iwaoka, and S.P. Felton, 1982. Arch. Environ. Contam. Toxicol. 11:167-171; ERED Ref ID JA212
6. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo, 2005. Environ. Tox. Chem. 24:591-596; ERED Ref ID Weston05-046.
7. Dillon, T.M., 1984. Army Corps of Engineers Technical Report, D-84-2; ERED Ref ID MEC04-070.
8. Villalobos, S.B., D.M. Papoulias, S.D. Pastva, A.L. Blankenship, J. Meadow, D.E. Tillitt, and J.P. Giesy, 2003. Chemosphere 53:819-826; ERED Ref ID MEC04-293.
9. Walker, M.K., J.M. Spitsbergen, J.R. Olson, and R.E. Peterson, 1991. Can. J. Fish. Aquat. Sci.; ERED Ref ID JA474.

ATTACHMENT 8
TABLE 8-17
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN WHITE PERCH/AMERICAN EEL TISSUE
Future Conditions (2018) - Area of Focus

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	3.3	0.002	**0.02**	*Ictalurus punctatus*	Growth - LOED	1	**1.7E+03**	**1.7E+02**
Lead	µg/g	0.18	0.028	**0.28**	*Oncorhynchus mykiss*	Growth - ED_{11}	2	**6.4E+00**	6.4E-01
Mercury[1]	µg/g	0.063	0.006	**0.06**	*Ictalurus punctatus*	Mortality - LD_{50}	3	**1.0E+01**	**1.0E+00**
Mercury (methyl)	µg/g	0.063	0.001	**0.01**	*Fundulus heteroclitus*	Growth - ED_{146}	4	**6.3E+01**	**6.3E+00**
						Total Inorganics/Metals		**1.7E+03**	**1.7E+02**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.17	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	8.2E-01	8.2E-02
High Weight PAHs	µg/g	0.15	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	7.4E-01	7.4E-02
						Total PAHs		**1.6E+00**	1.6E-01
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.84	0.0025	**0.025**	*Oryzias latipes*	Reproduction - ED_{11}	6	**3.4E+02**	**3.4E+01**
						Total PCBs		**3.4E+02**	**3.4E+01**
Pesticides									
Dieldrin	µg/g	0.0075	0.011	**0.11**	*Oncorhynchus mykiss*	Growth - LOED	7	6.8E-01	6.8E-02
Total DDx	µg/g	0.13	**0.000039**	**0.0018**	*Oryzias latipes*	Mortality - LOED	8	**3.3E+03**	**7.1E+01**
						Total Pesticides		**3.3E+03**	**7.1E+01**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.0000082	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	2.4E-01	1.4E-01
TCDD TEQ (PCBs)	µg/g	0.00000076	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	2.2E-02	1.3E-02
						Total TCDD TEQ		2.6E-01	1.5E-01
						Total		**5.3E+03**	**2.8E+02**

Notes:

[a] Exposure Point Concentration (95% UCLs) presented in Table 7-8. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on white perch and American eel tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-17
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN WHITE PERCH/AMERICAN EEL TISSUE
Future Conditions (2018) - Area of Focus

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Murai, T., J.W. Andrews, and R.G. Smith, Jr., 1981. Aquaculture 22:353-357; ERED Ref ID JA317.
2. Hansen, J.A., J. Lipton, P.G., Welsh, D. Cacela, and B. MacConnell, 2004. Environ. Tox. & Chem. 23:1902-1911; ERED Ref ID Weston05-031.
3. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson, 1979. The Biogeochemistry of Mercury, pg. 629-655; ERED Ref ID JA33.
4. Matta, M.B., J. Linse, C. Cairncross, L. Francendese, and R.M. Kocan, 2001. Environ. Tox. & Chem. 20(2)L327-335; ERED Ref ID MECO3-135.
5. Hose, J.E., J.B. Hannah, D. DiJulio, M.L. Landholt, B.S. Miller, W.T. Iwaoka, and S.P. Felton, 1982. Arch. Environ. Contam. Toxicol. 11:167-171; ERED Ref ID JA212
6. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo, 2005. Environ. Tox. Chem. 24:591-596; ERED Ref ID Weston05-046.
7. Dillon, T.M., 1984. Army Corps of Engineers Technical Report, D-84-2; ERED Ref ID MEC04-070.
8. Villalobos, S.B., D.M. Papoulias, S.D. Pastva, A.L. Blankenship, J. Meadow, D.E. Tillitt, and J.P. Giesy, 2003. Chemosphere 53:819-826; ERED Ref ID MEC04-293.
9. Walker, M.K., J.M. Spitsbergen, J.R. Olson, and R.E. Peterson, 1991. Can. J. Fish. Aquat. Sci.; ERED Ref ID JA474.

ATTACHMENT 8
TABLE 8-18
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN WHITE PERCH/AMERICAN EEL TISSUE
Future Conditions (2048) - Area of Focus

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	1.7	0.002	**0.02**	*Ictalurus punctatus*	Growth - LOED	1	**8.4E+02**	**8.4E+01**
Lead	µg/g	0.083	0.028	**0.28**	*Oncorhynchus mykiss*	Growth - ED_{11}	2	**3.0E+00**	3.0E-01
Mercury[1]	µg/g	0.020	0.006	**0.06**	*Ictalurus punctatus*	Mortality - LD_{50}	3	**3.4E+00**	3.4E-01
Mercury (methyl)	µg/g	0.020	0.001	**0.01**	*Fundulus heteroclitus*	Growth - ED_{146}	4	**2.0E+01**	**2.0E+00**
						Total Inorganics/Metals		**8.6E+02**	**8.6E+01**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.17	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	8.2E-01	8.2E-02
High Weight PAHs	µg/g	0.15	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	7.4E-01	7.4E-02
						Total PAHs		**1.6E+00**	1.6E-01
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.19	0.0025	**0.025**	*Oryzias latipes*	Reproduction - ED_{11}	6	**7.6E+01**	**7.6E+00**
						Total PCBs		**7.6E+01**	**7.6E+00**
Pesticides									
Dieldrin	µg/g	0.0075	0.011	**0.11**	*Oncorhynchus mykiss*	Growth - LOED	7	6.8E-01	6.8E-02
Total DDx	µg/g	0.044	**0.000039**	**0.0018**	*Oryzias latipes*	Mortality - LOED	8	**1.1E+03**	**2.5E+01**
						Total Pesticides		**1.1E+03**	**2.5E+01**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.0000025	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	7.5E-02	4.4E-02
TCDD TEQ (PCBs)	µg/g	0.00000019	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	5.6E-03	3.3E-03
						Total TCDD TEQ		8.1E-02	4.7E-02
						Total		**2.1E+03**	**1.2E+02**

Notes:

[a] Exposure Point Concentration (95% UCLs) presented in Table 7-8. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on white perch and American eel tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-18
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN WHITE PERCH/AMERICAN EEL TISSUE
Future Conditions (2048) - Area of Focus

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Murai, T., J.W. Andrews, and R.G. Smith, Jr., 1981. Aquaculture 22:353-357; ERED Ref ID JA317.
2. Hansen, J.A., J. Lipton, P.G., Welsh, D. Cacela, and B. MacConnell, 2004. Environ. Tox. & Chem. 23:1902-1911; ERED Ref ID Weston05-031.
3. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson, 1979. The Biogeochemistry of Mercury, pg. 629-655; ERED Ref ID JA33.
4. Matta, M.B., J. Linse, C. Cairncross, L. Francendese, and R.M. Kocan, 2001. Environ. Tox. & Chem. 20(2)L327-335; ERED Ref ID MECO3-135.
5. Hose, J.E., J.B. Hannah, D. DiJulio, M.L. Landholt, B.S. Miller, W.T. Iwaoka, and S.P. Felton, 1982. Arch. Environ. Contam. Toxicol. 11:167-171; ERED Ref ID JA212
6. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo, 2005. Environ. Tox. Chem. 24:591-596; ERED Ref ID Weston05-046.
7. Dillon, T.M., 1984. Army Corps of Engineers Technical Report, D-84-2; ERED Ref ID MEC04-070.
8. Villalobos, S.B., D.M. Papoulias, S.D. Pastva, A.L. Blankenship, J. Meadow, D.E. Tillitt, and J.P. Giesy, 2003. Chemosphere 53:819-826; ERED Ref ID MEC04-293.
9. Walker, M.K., J.M. Spitsbergen, J.R. Olson, and R.E. Peterson, 1991. Can. J. Fish. Aquat. Sci.; ERED Ref ID JA474.

ATTACHMENT 8
TABLE 8-19
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN MUMMICHOG TISSUE
Future Conditions (2018) - Monitored Natural Attenuation

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	2.3	0.002	**0.02**	*Ictalurus punctatus*	Growth - LOED	1	**1.2E+03**	**1.2E+02**
Lead	µg/g	0.51	0.028	**0.28**	*Oncorhynchus mykiss*	Growth - ED_{11}	2	**1.8E+01**	**1.8E+00**
Mercury[1]	µg/g	0.019	0.006	**0.06**	*Ictalurus punctatus*	Mortality - LD_{50}	3	**3.2E+00**	3.2E-01
Mercury (methyl)	µg/g	0.019	0.001	**0.01**	*Fundulus heteroclitus*	Growth - ED_{146}	4	**1.9E+01**	**1.9E+00**
						Total Inorganics/Metals		**1.2E+03**	**1.2E+02**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.31	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	**1.5E+00**	1.5E-01
High Weight PAHs	µg/g	0.15	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	7.3E-01	7.3E-02
						Total PAHs		**2.2E+00**	2.2E-01
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.29	0.0025	**0.025**	*Oryzias latipes*	Reproduction - ED_{11}	6	**1.2E+02**	**1.2E+01**
						Total PCBs		**1.2E+02**	**1.2E+01**
Pesticides									
Dieldrin	µg/g	0.0045	0.011	**0.11**	*Oncorhynchus mykiss*	Growth - LOED	7	4.1E-01	4.1E-02
Total DDx	µg/g	0.062	**0.000039**	**0.0018**	*Oryzias latipes*	Mortality - LOED	8	**1.6E+03**	**3.5E+01**
						Total Pesticides		**1.6E+03**	**3.5E+01**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.000090	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	**2.6E+00**	**1.6E+00**
TCDD TEQ (PCBs)	µg/g	0.00000040	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	1.2E-02	6.9E-03
						Total TCDD TEQ		**2.7E+00**	**1.6E+00**
						Total		**2.9E+03**	**1.7E+02**

Notes:

[a] Exposure Point Concentration (95% UCLs) presented in Table 7-6. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on mummichog tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-19
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN MUMMICHOG TISSUE
Future Conditions (2018) - Monitored Natural Attenuation

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Murai, T., J.W. Andrews, and R.G. Smith, Jr., 1981. Aquaculture 22:353-357; ERED Ref ID JA317.
2. Hansen, J.A., J. Lipton, P.G., Welsh, D. Cacela, and B. MacConnell, 2004. Environ. Tox. & Chem. 23:1902-1911; ERED Ref ID Weston05-031.
3. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson, 1979. The Biogeochemistry of Mercury, pg. 629-655; ERED Ref ID JA33.
4. Matta, M.B., J. Linse, C. Cairncross, L. Francendese, and R.M. Kocan, 2001. Environ. Tox. & Chem. 20(2)L327-335; ERED Ref ID MECO3-135.
5. Hose, J.E., J.B. Hannah, D. DiJulio, M.L. Landholt, B.S. Miller, W.T. Iwaoka, and S.P. Felton, 1982. Arch. Environ. Contam. Toxicol. 11:167-171; ERED Ref ID JA212
6. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo, 2005. Environ. Tox. Chem. 24:591-596; ERED Ref ID Weston05-046.
7. Dillon, T.M., 1984. Army Corps of Engineers Technical Report, D-84-2; ERED Ref ID MEC04-070.
8. Villalobos, S.B., D.M. Papoulias, S.D. Pastva, A.L. Blankenship, J. Meadow, D.E. Tillitt, and J.P. Giesy, 2003. Chemosphere 53:819-826; ERED Ref ID MEC04-293.
9. Walker, M.K., J.M. Spitsbergen, J.R. Olson, and R.E. Peterson, 1991. Can. J. Fish. Aquat. Sci.; ERED Ref ID JA474.

ATTACHMENT 8
TABLE 8-20
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN MUMMICHOG TISSUE
Future Conditions (2048) - Monitored Natural Attenuation

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	1.2	0.002	**0.02**	*Ictalurus punctatus*	Growth - LOED	1	**5.9E+02**	**5.9E+01**
Lead	µg/g	0.23	0.028	**0.28**	*Oncorhynchus mykiss*	Growth - ED_{11}	2	**8.5E+00**	8.5E-01
Mercury[1]	µg/g	0.0061	0.006	**0.06**	*Ictalurus punctatus*	Mortality - LD_{50}	3	**1.0E+00**	1.0E-01
Mercury (methyl)	µg/g	0.0061	0.001	**0.01**	*Fundulus heteroclitus*	Growth - ED_{146}	4	**6.1E+00**	6.1E-01
						Total Inorganics/Metals		**6.1E+02**	**6.1E+01**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.31	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	**1.5E+00**	1.5E-01
High Weight PAHs	µg/g	0.15	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	7.3E-01	7.3E-02
						Total PAHs		**2.2E+00**	2.2E-01
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.065	0.0025	**0.025**	*Oryzias latipes*	Reproduction - ED_{11}	6	**2.6E+01**	**2.6E+00**
						Total PCBs		**2.6E+01**	**2.6E+00**
Pesticides									
Dieldrin	µg/g	0.0045	0.011	**0.11**	*Oncorhynchus mykiss*	Growth - LOED	7	4.1E-01	4.1E-02
Total DDx	µg/g	0.022	**0.000039**	**0.0018**	*Oryzias latipes*	Mortality - LOED	8	**5.7E+02**	**1.2E+01**
						Total Pesticides		**5.7E+02**	**1.2E+01**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.000024	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	7.1E-01	4.1E-01
TCDD TEQ (PCBs)	µg/g	0.00000013	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	3.9E-03	2.3E-03
						Total TCDD TEQ		7.1E-01	4.2E-01
						Total		**1.2E+03**	**7.6E+01**

Notes:

[a] Exposure Point Concentration (95% UCLs) presented in Table 7-6. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on mummichog tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-20
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN MUMMICHOG TISSUE
Future Conditions (2048) - Monitored Natural Attenuation

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Murai, T., J.W. Andrews, and R.G. Smith, Jr., 1981. Aquaculture 22:353-357; ERED Ref ID JA317.
2. Hansen, J.A., J. Lipton, P.G., Welsh, D. Cacela, and B. MacConnell, 2004. Environ. Tox. & Chem. 23:1902-1911; ERED Ref ID Weston05-031.
3. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson, 1979. The Biogeochemistry of Mercury, pg. 629-655; ERED Ref ID JA33.
4. Matta, M.B., J. Linse, C. Cairncross, L. Francendese, and R.M. Kocan, 2001. Environ. Tox. & Chem. 20(2)L327-335; ERED Ref ID MECO3-135.
5. Hose, J.E., J.B. Hannah, D. DiJulio, M.L. Landholt, B.S. Miller, W.T. Iwaoka, and S.P. Felton, 1982. Arch. Environ. Contam. Toxicol. 11:167-171; ERED Ref ID JA212
6. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo, 2005. Environ. Tox. Chem. 24:591-596; ERED Ref ID Weston05-046.
7. Dillon, T.M., 1984. Army Corps of Engineers Technical Report, D-84-2; ERED Ref ID MEC04-070.
8. Villalobos, S.B., D.M. Papoulias, S.D. Pastva, A.L. Blankenship, J. Meadow, D.E. Tillitt, and J.P. Giesy, 2003. Chemosphere 53:819-826; ERED Ref ID MEC04-293.
9. Walker, M.K., J.M. Spitsbergen, J.R. Olson, and R.E. Peterson, 1991. Can. J. Fish. Aquat. Sci.; ERED Ref ID JA474.

ATTACHMENT 8
TABLE 8-21
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN MUMMICHOG TISSUE
Future Conditions (2018) - Primary Erosional Zone/Primary Inventory Zone

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	2.3	0.002	**0.02**	*Ictalurus punctatus*	Growth - LOED	1	**1.1E+03**	**1.1E+02**
Lead	µg/g	0.49	0.028	**0.28**	*Oncorhynchus mykiss*	Growth - ED_{11}	2	**1.8E+01**	**1.8E+00**
Mercury[1]	µg/g	0.017	0.006	**0.06**	*Ictalurus punctatus*	Mortality - LD_{50}	3	**2.8E+00**	2.8E-01
Mercury (methyl)	µg/g	0.017	0.001	**0.01**	*Fundulus heteroclitus*	Growth - ED_{146}	4	**1.7E+01**	**1.7E+00**
						Total Inorganics/Metals		**1.2E+03**	**1.2E+02**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.31	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	**1.5E+00**	1.5E-01
High Weight PAHs	µg/g	0.15	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	7.3E-01	7.3E-02
						Total PAHs		**2.2E+00**	2.2E-01
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.26	0.0025	**0.025**	*Oryzias latipes*	Reproduction - ED_{11}	6	**1.0E+02**	**1.0E+01**
						Total PCBs		**1.0E+02**	**1.0E+01**
Pesticides									
Dieldrin	µg/g	0.0042	0.011	**0.11**	*Oncorhynchus mykiss*	Growth - LOED	7	3.8E-01	3.8E-02
Total DDx	µg/g	0.054	**0.000039**	**0.0018**	*Oryzias latipes*	Mortality - LOED	8	**1.4E+03**	**3.0E+01**
						Total Pesticides		**1.4E+03**	**3.0E+01**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.000060	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	**1.8E+00**	**1.0E+00**
TCDD TEQ (PCBs)	µg/g	0.00000038	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	1.1E-02	6.6E-03
						Total TCDD TEQ		**1.8E+00**	**1.0E+00**
						Total		**2.7E+03**	**1.6E+02**

Notes:

[a] Exposure Point Concentration (95% UCLs) presented in Table 7-7. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on mummichog tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-21
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN MUMMICHOG TISSUE
Future Conditions (2018) - Primary Erosional Zone/Primary Inventory Zone

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Murai, T., J.W. Andrews, and R.G. Smith, Jr., 1981. Aquaculture 22:353-357; ERED Ref ID JA317.
2. Hansen, J.A., J. Lipton, P.G., Welsh, D. Cacela, and B. MacConnell, 2004. Environ. Tox. & Chem. 23:1902-1911; ERED Ref ID Weston05-031.
3. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson, 1979. The Biogeochemistry of Mercury, pg. 629-655; ERED Ref ID JA33.
4. Matta, M.B., J. Linse, C. Cairncross, L. Francendese, and R.M. Kocan, 2001. Environ. Tox. & Chem. 20(2)L327-335; ERED Ref ID MECO3-135.
5. Hose, J.E., J.B. Hannah, D. DiJulio, M.L. Landholt, B.S. Miller, W.T. Iwaoka, and S.P. Felton, 1982. Arch. Environ. Contam. Toxicol. 11:167-171; ERED Ref ID JA212
6. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo, 2005. Environ. Tox. Chem. 24:591-596; ERED Ref ID Weston05-046.
7. Dillon, T.M., 1984. Army Corps of Engineers Technical Report, D-84-2; ERED Ref ID MEC04-070.
8. Villalobos, S.B., D.M. Papoulias, S.D. Pastva, A.L. Blankenship, J. Meadow, D.E. Tillitt, and J.P. Giesy, 2003. Chemosphere 53:819-826; ERED Ref ID MEC04-293.
9. Walker, M.K., J.M. Spitsbergen, J.R. Olson, and R.E. Peterson, 1991. Can. J. Fish. Aquat. Sci.; ERED Ref ID JA474.

ATTACHMENT 8
TABLE 8-22
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN MUMMICHOG TISSUE
Future Conditions (2048) - Primary Erosional Zone/Primary Inventory Zone

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	1.1	0.002	**0.02**	*Ictalurus punctatus*	Growth - LOED	1	**5.6E+02**	**5.6E+01**
Lead	µg/g	0.22	0.028	**0.28**	*Oncorhynchus mykiss*	Growth - ED_{11}	2	**8.1E+00**	8.1E-01
Mercury[1]	µg/g	0.0054	0.006	**0.06**	*Ictalurus punctatus*	Mortality - LD_{50}	3	9.0E-01	9.0E-02
Mercury (methyl)	µg/g	0.0054	0.001	**0.01**	*Fundulus heteroclitus*	Growth - ED_{146}	4	**5.4E+00**	5.4E-01
						Total Inorganics/Metals		**5.8E+02**	**5.8E+01**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.31	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	**1.5E+00**	1.5E-01
High Weight PAHs	µg/g	0.15	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	7.3E-01	7.3E-02
						Total PAHs		**2.2E+00**	2.2E-01
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.058	0.0025	**0.025**	*Oryzias latipes*	Reproduction - ED_{11}	6	**2.3E+01**	**2.3E+00**
						Total PCBs		**2.3E+01**	**2.3E+00**
Pesticides									
Dieldrin	µg/g	0.0042	0.011	**0.11**	*Oncorhynchus mykiss*	Growth - LOED	7	3.8E-01	3.8E-02
Total DDx	µg/g	0.019	**0.000039**	**0.0018**	*Oryzias latipes*	Mortality - LOED	8	**4.9E+02**	**1.1E+01**
						Total Pesticides		**4.9E+02**	**1.1E+01**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.000018	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	5.3E-01	3.1E-01
TCDD TEQ (PCBs)	µg/g	0.000000067	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	2.0E-03	1.2E-03
						Total TCDD TEQ		5.3E-01	3.1E-01
						Total		**1.1E+03**	**7.1E+01**

Notes:

[a] Exposure Point Concentration (95% UCLs) presented in Table 7-7. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on mummichog tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-22
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN MUMMICHOG TISSUE
Future Conditions (2048) - Primary Erosional Zone/Primary Inventory Zone

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Murai, T., J.W. Andrews, and R.G. Smith, Jr., 1981. Aquaculture 22:353-357; ERED Ref ID JA317.
2. Hansen, J.A., J. Lipton, P.G., Welsh, D. Cacela, and B. MacConnell, 2004. Environ. Tox. & Chem. 23:1902-1911; ERED Ref ID Weston05-031.
3. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson, 1979. The Biogeochemistry of Mercury, pg. 629-655; ERED Ref ID JA33.
4. Matta, M.B., J. Linse, C. Cairncross, L. Francendese, and R.M. Kocan, 2001. Environ. Tox. & Chem. 20(2)L327-335; ERED Ref ID MECO3-135.
5. Hose, J.E., J.B. Hannah, D. DiJulio, M.L. Landholt, B.S. Miller, W.T. Iwaoka, and S.P. Felton, 1982. Arch. Environ. Contam. Toxicol. 11:167-171; ERED Ref ID JA212
6. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo, 2005. Environ. Tox. Chem. 24:591-596; ERED Ref ID Weston05-046.
7. Dillon, T.M., 1984. Army Corps of Engineers Technical Report, D-84-2; ERED Ref ID MEC04-070.
8. Villalobos, S.B., D.M. Papoulias, S.D. Pastva, A.L. Blankenship, J. Meadow, D.E. Tillitt, and J.P. Giesy, 2003. Chemosphere 53:819-826; ERED Ref ID MEC04-293.
9. Walker, M.K., J.M. Spitsbergen, J.R. Olson, and R.E. Peterson, 1991. Can. J. Fish. Aquat. Sci.; ERED Ref ID JA474.

ATTACHMENT 8
TABLE 8-23
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN MUMMICHOG TISSUE
Future Conditions (2018) - Area of Focus

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	1.4	0.002	**0.02**	*Ictalurus punctatus*	Growth - LOED	1	**6.9E+02**	**6.9E+01**
Lead	µg/g	0.32	0.028	**0.28**	*Oncorhynchus mykiss*	Growth - ED_{11}	2	**1.1E+01**	**1.1E+00**
Mercury[1]	µg/g	0.0076	0.006	**0.06**	*Ictalurus punctatus*	Mortality - LD_{50}	3	**1.3E+00**	1.3E-01
Mercury (methyl)	µg/g	0.0076	0.001	**0.01**	*Fundulus heteroclitus*	Growth - ED_{146}	4	**7.6E+00**	7.6E-01
						Total Inorganics/Metals		**7.1E+02**	**7.1E+01**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.15	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	6.9E-01	6.9E-02
High Weight PAHs	µg/g	0.11	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	5.2E-01	5.2E-02
						Total PAHs		**1.2E+00**	1.2E-01
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.2	0.0025	**0.025**	*Oryzias latipes*	Reproduction - ED_{11}	6	**7.9E+01**	**7.9E+00**
						Total PCBs		**7.9E+01**	**7.9E+00**
Pesticides									
Dieldrin	µg/g	0.0010	0.011	**0.11**	*Oncorhynchus mykiss*	Growth - LOED	7	9.5E-02	9.5E-03
Total DDx	µg/g	0.022	**0.000039**	**0.0018**	*Oryzias latipes*	Mortality - LOED	8	**5.7E+02**	**1.2E+01**
						Total Pesticides		**5.7E+02**	**1.2E+01**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.0000041	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	1.2E-01	7.1E-02
TCDD TEQ (PCBs)	µg/g	0.00000027	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	7.9E-03	4.6E-03
						Total TCDD TEQ		1.3E-01	7.6E-02
						Total		**1.4E+03**	**9.1E+01**

Notes:

[a] Exposure Point Concentration (95% UCLs) presented in Table 7-8. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on mummichog tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-23
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN MUMMICHOG TISSUE
Future Conditions (2018) - Area of Focus

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Murai, T., J.W. Andrews, and R.G. Smith, Jr., 1981. Aquaculture 22:353-357; ERED Ref ID JA317.
2. Hansen, J.A., J. Lipton, P.G., Welsh, D. Cacela, and B. MacConnell, 2004. Environ. Tox. & Chem. 23:1902-1911; ERED Ref ID Weston05-031.
3. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson, 1979. The Biogeochemistry of Mercury, pg. 629-655; ERED Ref ID JA33.
4. Matta, M.B., J. Linse, C. Cairncross, L. Francendese, and R.M. Kocan, 2001. Environ. Tox. & Chem. 20(2)L327-335; ERED Ref ID MECO3-135.
5. Hose, J.E., J.B. Hannah, D. DiJulio, M.L. Landholt, B.S. Miller, W.T. Iwaoka, and S.P. Felton, 1982. Arch. Environ. Contam. Toxicol. 11:167-171; ERED Ref ID JA212
6. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo, 2005. Environ. Tox. Chem. 24:591-596; ERED Ref ID Weston05-046.
7. Dillon, T.M., 1984. Army Corps of Engineers Technical Report, D-84-2; ERED Ref ID MEC04-070.
8. Villalobos, S.B., D.M. Papoulias, S.D. Pastva, A.L. Blankenship, J. Meadow, D.E. Tillitt, and J.P. Giesy, 2003. Chemosphere 53:819-826; ERED Ref ID MEC04-293.
9. Walker, M.K., J.M. Spitsbergen, J.R. Olson, and R.E. Peterson, 1991. Can. J. Fish. Aquat. Sci.; ERED Ref ID JA474.

ATTACHMENT 8
TABLE 8-24
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN MUMMICHOG TISSUE
Future Conditions (2048) - Area of Focus

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL
Inorganics/Metals									
Copper	µg/g	0.70	0.002	**0.02**	*Ictalurus punctatus*	Growth - LOED	1	**3.5E+02**	**3.5E+01**
Lead	µg/g	0.15	0.028	**0.28**	*Oncorhynchus mykiss*	Growth - ED_{11}	2	**5.3E+00**	5.3E-01
Mercury[1]	µg/g	0.0024	0.006	**0.06**	*Ictalurus punctatus*	Mortality - LD_{50}	3	4.1E-01	4.1E-02
Mercury (methyl)	µg/g	0.0024	0.001	**0.01**	*Fundulus heteroclitus*	Growth - ED_{146}	4	**2.4E+00**	2.4E-01
						Total Inorganics/Metals		**3.6E+02**	**3.6E+01**
Semivolatile Organics (PAHs)									
Low Weight PAHs	µg/g	0.15	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	6.9E-01	6.9E-02
High Weight PAHs	µg/g	0.11	0.21	**2.1**	*Psettichthys melanostictus*	Mortality - LD_{51}	5	5.2E-01	5.2E-02
						Total PAHs		**1.2E+00**	1.2E-01
PCBs (Aroclors)									
Aroclor, Total	µg/g	0.044	0.0025	**0.025**	*Oryzias latipes*	Reproduction - ED_{11}	6	**1.8E+01**	**1.8E+00**
						Total PCBs		**1.8E+01**	**1.8E+00**
Pesticides									
Dieldrin	µg/g	0.0010	0.011	**0.11**	*Oncorhynchus mykiss*	Growth - LOED	7	9.5E-02	9.5E-03
Total DDx	µg/g	0.0078	**0.000039**	**0.0018**	*Oryzias latipes*	Mortality - LOED	8	**2.0E+02**	**4.3E+00**
						Total Pesticides		**2.0E+02**	**4.3E+00**
Dioxin-like Compounds									
TCDD TEQ (D/F)	µg/g	0.0000013	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	3.8E-02	2.2E-02
TCDD TEQ (PCBs)	µg/g	0.000000067	**0.000034**	**0.00006**	*Salvelinus namaycush*	Growth - LOED	9	2.0E-03	1.2E-03
						Total TCDD TEQ		4.0E-02	2.3E-02
						Total		**5.7E+02**	**4.2E+01**

Notes:

[a] Exposure Point Concentration (95% UCLs) presented in Table 7-8. TCDD Toxic Equivalencies based on fish TEF values, EPCs based on mummichog tissue data.

[b] Critical Body Residues (CBRs) are obtained from summary of tissue effects data presented in CSM Technical Memorandum #3 (Battelle, 2006).

[c] Hazard Quotient is the ratio of the EPC to the NOAEL or LOAEL CBR.

[1]Analyte is not included in the HI totals.

Non-bolded CBR values were estimated using a 10-fold extrapolation factor.

ATTACHMENT 8
TABLE 8-24
CBR-BASED HAZARD QUOTIENTS FOR COPECS IN MUMMICHOG TISSUE
Future Conditions (2048) - Area of Focus

Focused Feasibility Study - Ecological Risk Assessment

Chemical	Units	EPC [a]	CBR [b]		Species	Endpoint	Reference	Hazard Quotients [c]	
			NOAEL	LOAEL				NOAEL	LOAEL

References:

1. Murai, T., J.W. Andrews, and R.G. Smith, Jr., 1981. Aquaculture 22:353-357; ERED Ref ID JA317.
2. Hansen, J.A., J. Lipton, P.G., Welsh, D. Cacela, and B. MacConnell, 2004. Environ. Tox. & Chem. 23:1902-1911; ERED Ref ID Weston05-031.
3. Birge, W.J., J.A. Black, A.G. Westerman, and J.E. Hudson, 1979. The Biogeochemistry of Mercury, pg. 629-655; ERED Ref ID JA33.
4. Matta, M.B., J. Linse, C. Cairncross, L. Francendese, and R.M. Kocan, 2001. Environ. Tox. & Chem. 20(2)L327-335; ERED Ref ID MECO3-135.
5. Hose, J.E., J.B. Hannah, D. DiJulio, M.L. Landholt, B.S. Miller, W.T. Iwaoka, and S.P. Felton, 1982. Arch. Environ. Contam. Toxicol. 11:167-171; ERED Ref ID JA212
6. Nakayama, K., Y. Oshima, K. Nagafuchi, T. Hano, Y. Shimasaki, and T. Honjo, 2005. Environ. Tox. Chem. 24:591-596; ERED Ref ID Weston05-046.
7. Dillon, T.M., 1984. Army Corps of Engineers Technical Report, D-84-2; ERED Ref ID MEC04-070.
8. Villalobos, S.B., D.M. Papoulias, S.D. Pastva, A.L. Blankenship, J. Meadow, D.E. Tillitt, and J.P. Giesy, 2003. Chemosphere 53:819-826; ERED Ref ID MEC04-293.
9. Walker, M.K., J.M. Spitsbergen, J.R. Olson, and R.E. Peterson, 1991. Can. J. Fish. Aquat. Sci.; ERED Ref ID JA474.

TABLE 8-25
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0034	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-26
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.4E+02	mg/kg	8.3E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	1.5E-01	8.9E-02
Lead	2.4E+02	mg/kg	1.4E+00	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	3.0E-01	1.6E-01
Methyl Mercury	1.5E+00	mg/kg	9.3E-03	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	1.7E-01	5.2E-02
LPAH	3.3E+01	mg/kg	2.0E-01	mg/kg-d	-	-			
HPAH	8.6E+01	mg/kg	5.2E-01	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	5.2E-01	5.2E-02
Dieldrin	2.0E-02	mg/kg	1.2E-04	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	8.2E-03	4.1E-03
Total DDx	2.0E-01	mg/kg	1.2E-03	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	1.5E-03	3.0E-04
Total PCBs	5.7E-01	mg/kg	3.4E-03	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	4.3E-02	3.6E-02
TEQ PCB-mammals	8.7E-06	mg/kg	5.2E-08	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	6.5E-01	2.3E-02
TEQ D/F-mammals	9.4E-04	mg/kg	5.6E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**7.1E+01**	**2.5E+00**
							HAZARD INDICES:	**7.2E+01**	**2.9E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-25.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-27
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.17	USEPA, 1993	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	20%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-28
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.9E+01	mg/kg	1.2E+00	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	2.1E-01	1.2E-01
Lead	3.3E-01	mg/kg	2.0E-02	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	4.3E-03	2.3E-03
Methyl Mercury	4.3E-02	mg/kg	2.6E-03	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	4.7E-02	1.4E-02
LPAH	2.5E-01	mg/kg	1.5E-02	mg/kg-d	-	-			
HPAH	2.7E-01	mg/kg	1.6E-02	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	1.6E-02	1.6E-03
Dieldrin	1.4E-02	mg/kg	8.2E-04	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	5.5E-02	2.7E-02
Total DDx	2.2E-01	mg/kg	1.3E-02	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	1.7E-02	3.3E-03
Total PCBs	1.2E+00	mg/kg	7.0E-02	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	8.8E-01	7.3E-01
TEQ PCB-mammals	2.2E-05	mg/kg	1.3E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**1.7E+01**	6.0E-01
TEQ D/F-mammals	1.4E-04	mg/kg	8.6E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**1.1E+02**	**3.8E+00**
							HAZARD INDICES:	**1.3E+02**	**5.3E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-27.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-29
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : White perch/American eel / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.17	USEPA, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	80%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-30
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : White perch/American eel / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	5.6E+00	mg/kg	1.4E+00	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	2.4E-01	1.4E-01
Lead	2.8E-01	mg/kg	6.8E-02	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	1.5E-02	7.7E-03
Methyl Mercury	1.6E-01	mg/kg	3.8E-02	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	6.9E-01	2.1E-01
LPAH	3.7E-01	mg/kg	8.9E-02	mg/kg-d	-	-			
HPAH	2.2E-01	mg/kg	5.2E-02	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	5.2E-02	5.2E-03
Dieldrin	3.2E-02	mg/kg	7.8E-03	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	5.2E-01	2.6E-01
Total DDx	3.6E-01	mg/kg	8.6E-02	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	1.1E-01	2.1E-02
Total PCBs	1.2E+00	mg/kg	3.0E-01	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	**3.7E+00**	**3.1E+00**
TEQ PCB-mammals	1.5E-05	mg/kg	3.7E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**4.6E+01**	**1.7E+00**
TEQ D/F-mammals	1.9E-04	mg/kg	4.5E-05	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**5.6E+02**	**2.0E+01**
							HAZARD INDICES:	**6.2E+02**	**2.6E+01**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-29.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-31
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK
TOTAL RISK (HI): 8.1E+02

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		7.1E+01		1.1E+02	5.6E+02	***7.4E+02***	***91%***
TCDD TEQ (PCBs)		6.5E-01		1.7E+01	4.6E+01	***6.4E+01***	8%
Total PCBs		4.3E-02		8.8E-01	3.7E+00	***4.6E+00***	1%
Mercury		1.7E-01		4.7E-02	6.9E-01	9.0E-01	0%
Copper		1.5E-01		2.1E-01	2.4E-01	6.0E-01	0%
HPAH		5.2E-01		1.6E-02	5.2E-02	5.8E-01	0%
Dieldrin		8.2E-03		5.5E-02	5.2E-01	5.8E-01	0%
Lead		3.0E-01		4.3E-03	1.5E-02	3.2E-01	0%
Total DDx		1.5E-03		1.7E-02	1.1E-01	1.3E-01	0%
LPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**7.2E+01**	**-**	**1.3E+02**	**6.2E+02**	**8.1E+02**	
PERCENTAGE OF TOTAL RISK		**9%**		**15%**	**76%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-32
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK
TOTAL RISK (HI): 3.4E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		2.5E+00		3.8E+00	2.0E+01	***2.7E+01***	***78%***
Total PCBs		3.6E-02		7.3E-01	3.1E+00	***3.8E+00***	***11%***
TCDD TEQ (PCBs)		2.3E-02		6.0E-01	1.7E+00	***2.3E+00***	7%
Copper		8.9E-02		1.2E-01	1.4E-01	3.6E-01	1%
Dieldrin		4.1E-03		2.7E-02	2.6E-01	2.9E-01	1%
Mercury		5.2E-02		1.4E-02	2.1E-01	2.8E-01	1%
Lead		1.6E-01		2.3E-03	7.7E-03	1.7E-01	1%
HPAH		5.2E-02		1.6E-03	5.2E-03	5.8E-02	0%
Total DDx		3.0E-04		3.3E-03	2.1E-02	2.5E-02	0%
LPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**2.9E+00**	**-**	**5.3E+00**	**2.6E+01**	**3.4E+01**	
PERCENTAGE OF TOTAL RISK		**9%**		**16%**	**76%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-33
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0034	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-34
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	7.0E+01	mg/kg	4.2E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	7.5E-02	4.5E-02
Lead	1.1E+02	mg/kg	6.6E-01	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	1.4E-01	7.4E-02
Methyl Mercury	5.0E-01	mg/kg	3.0E-03	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	5.4E-02	1.7E-02
LPAH	3.3E+01	mg/kg	2.0E-01	mg/kg-d	-	-			
HPAH	8.6E+01	mg/kg	5.2E-01	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	5.2E-01	5.2E-02
Dieldrin	2.0E-02	mg/kg	1.2E-04	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	8.2E-03	4.1E-03
Total DDx	6.9E-02	mg/kg	4.2E-04	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	5.2E-04	1.0E-04
Total PCBs	1.3E-01	mg/kg	7.7E-04	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	9.7E-03	8.1E-03
TEQ PCB-mammals	2.5E-06	mg/kg	1.5E-08	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	1.9E-01	6.7E-03
TEQ D/F-mammals	2.9E-04	mg/kg	1.8E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**2.2E+01**	7.9E-01
							HAZARD INDICES:	**2.3E+01**	9.9E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-33.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-35
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.17	USEPA, 1993	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	20%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-36
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	9.8E+00	mg/kg	5.9E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	1.1E-01	6.3E-02
Lead	1.5E-01	mg/kg	9.3E-03	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	2.0E-03	1.0E-03
Methyl Mercury	1.4E-02	mg/kg	8.3E-04	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	1.5E-02	4.6E-03
LPAH	2.5E-01	mg/kg	1.5E-02	mg/kg-d	-	-			
HPAH	2.7E-01	mg/kg	1.6E-02	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	1.6E-02	1.6E-03
Dieldrin	1.4E-02	mg/kg	8.2E-04	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	5.5E-02	2.7E-02
Total DDx	7.7E-02	mg/kg	4.6E-03	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	5.8E-03	1.2E-03
Total PCBs	2.6E-01	mg/kg	1.6E-02	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	2.0E-01	1.7E-01
TEQ PCB-mammals	6.3E-06	mg/kg	3.8E-07	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**4.8E+00**	1.7E-01
TEQ D/F-mammals	4.5E-05	mg/kg	2.7E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**3.4E+01**	**1.2E+00**
							HAZARD INDICES:	**3.9E+01**	**1.6E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-35.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-37
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : White perch/American eel / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.17	USEPA, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	80%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-38
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : White perch/American eel / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	2.8E+00	mg/kg	6.8E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	1.2E-01	7.3E-02
Lead	1.3E-01	mg/kg	3.2E-02	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	6.7E-03	3.6E-03
Methyl Mercury	5.0E-02	mg/kg	1.2E-02	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	2.2E-01	6.7E-02
LPAH	3.7E-01	mg/kg	8.9E-02	mg/kg-d	-	-			
HPAH	2.2E-01	mg/kg	5.2E-02	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	5.2E-02	5.2E-03
Dieldrin	3.2E-02	mg/kg	7.8E-03	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	5.2E-01	2.6E-01
Total DDx	1.3E-01	mg/kg	3.0E-02	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	3.8E-02	7.6E-03
Total PCBs	2.8E-01	mg/kg	6.7E-02	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	8.4E-01	7.0E-01
TEQ PCB-mammals	4.4E-06	mg/kg	1.1E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**1.3E+01**	4.7E-01
TEQ D/F-mammals	5.9E-05	mg/kg	1.4E-05	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**1.8E+02**	**6.3E+00**
							HAZARD INDICES:	**1.9E+02**	**7.9E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-37.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-39
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK
TOTAL RISK (HI): 2.5E+02

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		2.2E+01		3.4E+01	1.8E+02	***2.3E+02***	***92%***
TCDD TEQ (PCBs)		1.9E-01		4.8E+00	1.3E+01	***1.8E+01***	7%
Total PCBs		9.7E-03		2.0E-01	8.4E-01	***1.0E+00***	0%
Dieldrin		8.2E-03		5.5E-02	5.2E-01	5.8E-01	0%
Copper		7.5E-02		1.1E-01	1.2E-01	3.0E-01	0%
Mercury		5.4E-02		1.5E-02	2.2E-01	2.9E-01	0%
HPAH		5.2E-01		1.6E-02	5.2E-02	5.8E-01	0%
Lead		1.4E-01		2.0E-03	6.7E-03	1.5E-01	0%
Total DDx		5.2E-04		5.8E-03	3.8E-02	4.4E-02	0%
LPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**2.3E+01**	**-**	**3.9E+01**	**1.9E+02**	**2.5E+02**	
PERCENTAGE OF TOTAL RISK		**9%**		**15%**	**76%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-40
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: MINK
TOTAL RISK (HI): 1.1E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		7.9E-01		1.2E+00	6.3E+00	***8.3E+00***	***79%***
Total PCBs		8.1E-03		1.7E-01	7.0E-01	8.7E-01	8%
TCDD TEQ (PCBs)		6.7E-03		1.7E-01	4.7E-01	6.5E-01	6%
Dieldrin		4.1E-03		2.7E-02	2.6E-01	2.9E-01	3%
Copper		4.5E-02		6.3E-02	7.3E-02	1.8E-01	2%
Mercury		1.7E-02		4.6E-03	6.7E-02	8.9E-02	1%
Lead		7.4E-02		1.0E-03	3.6E-03	7.8E-02	1%
HPAH		5.2E-02		1.6E-03	5.2E-03	5.8E-02	1%
Total DDx		1.0E-04		1.2E-03	7.6E-03	8.8E-03	0%
LPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**9.9E-01**	**-**	**1.6E+00**	**7.9E+00**	**1.1E+01**	
PERCENTAGE OF TOTAL RISK		**9%**		**16%**	**75%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-41
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-42
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.4E+02	mg/kg	7.1E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.8E-01	5.9E-02
Lead	2.4E+02	mg/kg	1.2E+00	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	7.4E-01	3.7E-01
Methyl Mercury	1.5E+00	mg/kg	7.9E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	**1.0E+00**	1.0E-01
LPAH	3.3E+01	mg/kg	1.7E-01	mg/kg-d	-	-			
HPAH	8.6E+01	mg/kg	4.4E-01	mg/kg-d	-	-			
Dieldrin	2.0E-02	mg/kg	1.0E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	1.5E-03	2.7E-05
Total DDx	2.0E-01	mg/kg	1.0E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	3.6E-01	3.6E-02
Total PCBs	5.7E-01	mg/kg	2.9E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	2.9E-02	7.3E-03
TEQ PCB-birds	1.7E-04	mg/kg	8.5E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	6.1E-01	6.1E-02
TEQ D/F-birds	9.6E-04	mg/kg	4.9E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**3.5E+00**	3.5E-01
							HAZARD INDICES:	**6.5E+00**	9.9E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-41.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-43
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	15%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-44
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.9E+01	mg/kg	3.0E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	7.4E-02	2.5E-02
Lead	3.3E-01	mg/kg	5.1E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	3.2E-03	1.6E-03
Methyl Mercury	4.3E-02	mg/kg	6.7E-04	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	8.6E-02	8.6E-03
LPAH	2.5E-01	mg/kg	3.8E-03	mg/kg-d	-	-			
HPAH	2.7E-01	mg/kg	4.2E-03	mg/kg-d	-	-			
Dieldrin	1.4E-02	mg/kg	2.1E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	3.0E-03	5.6E-05
Total DDx	2.2E-01	mg/kg	3.4E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**1.2E+00**	1.2E-01
Total PCBs	1.2E+00	mg/kg	1.8E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	1.8E-01	4.5E-02
TEQ PCB-birds	2.2E-04	mg/kg	3.3E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**2.4E+00**	2.4E-01
TEQ D/F-birds	1.6E-04	mg/kg	2.5E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.8E+00**	1.8E-01
							HAZARD INDICES:	**5.7E+00**	6.2E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-43.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-45
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : White perch/American eel / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{fish}	PERCENT FISH IN DIET	unitless	85%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-46
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : White perch/American eel / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	5.6E+00	mg/kg	4.9E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.2E-01	4.1E-02
Lead	2.8E-01	mg/kg	2.5E-02	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	1.5E-02	7.6E-03
Methyl Mercury	1.6E-01	mg/kg	1.4E-02	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	**1.8E+00**	1.8E-01
LPAH	3.7E-01	mg/kg	3.2E-02	mg/kg-d	-	-			
HPAH	2.2E-01	mg/kg	1.9E-02	mg/kg-d	-	-			
Dieldrin	3.2E-02	mg/kg	2.8E-03	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	4.0E-02	7.4E-04
Total DDx	3.6E-01	mg/kg	3.1E-02	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**1.1E+01**	**1.1E+00**
Total PCBs	1.2E+00	mg/kg	1.1E-01	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	**1.1E+00**	2.7E-01
TEQ PCB-birds	1.8E-04	mg/kg	1.6E-05	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.1E+01**	**1.1E+00**
TEQ D/F-birds	1.9E-04	mg/kg	1.7E-05	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.2E+01**	**1.2E+00**
							HAZARD INDICES:	**3.7E+01**	**3.9E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-45.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-47
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON
TOTAL RISK (HI): 5.0E+01

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
TCDD TEQ (D/F)		3.5E+00		1.8E+00	1.2E+01	***1.7E+01***	***35%***
Total DDx		3.6E-01		1.2E+00	1.1E+01	***1.3E+01***	***26%***
Total PCBs		2.9E-02		1.8E-01	1.1E+00	***1.3E+00***	3%
Mercury		1.0E+00	-	8.6E-02	1.8E+00	***2.9E+00***	6%
TCDD TEQ (PCBs)		6.1E-01		2.4E+00	1.1E+01	***1.4E+01***	***28%***
Lead		7.4E-01	-	3.2E-03	1.5E-02	7.6E-01	2%
Copper		1.8E-01	-	7.4E-02	1.2E-01	3.7E-01	1%
Dieldrin		1.5E-03	-	3.0E-03	4.0E-02	4.4E-02	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**6.5E+00**	**-**	**5.7E+00**	**3.7E+01**	**5.0E+01**	
PERCENTAGE OF TOTAL RISK		**13%**		**12%**	**75%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-48
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON
TOTAL RISK (HI): 5.5E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		3.5E-01		1.8E-01	1.2E+00	***1.7E+00***	***31%***
Total DDx		3.6E-02		1.2E-01	1.1E+00	***1.3E+00***	***23%***
Total PCBs		7.3E-03		4.5E-02	2.7E-01	3.2E-01	6%
Lead		3.7E-01	-	1.6E-03	7.6E-03	3.8E-01	7%
Mercury		1.0E-01	-	8.6E-03	1.8E-01	2.9E-01	5%
Copper		5.9E-02	-	2.5E-02	4.1E-02	1.2E-01	2%
TCDD TEQ (PCBs)		6.1E-02		2.4E-01	1.1E+00	***1.4E+00***	***26%***
Dieldrin		2.7E-05	-	5.6E-05	7.4E-04	8.3E-04	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**9.9E-01**	**-**	**6.2E-01**	**3.9E+00**	**5.5E+00**	
PERCENTAGE OF TOTAL RISK		**18%**		**11%**	**71%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-49
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-50
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	7.0E+01	mg/kg	3.6E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	8.9E-02	3.0E-02
Lead	1.1E+02	mg/kg	5.6E-01	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	3.4E-01	1.7E-01
Methyl Mercury	5.0E-01	mg/kg	2.5E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	3.3E-01	3.3E-02
LPAH	3.3E+01	mg/kg	1.7E-01	mg/kg-d	-	-			
HPAH	8.6E+01	mg/kg	4.4E-01	mg/kg-d	-	-			
Dieldrin	2.0E-02	mg/kg	1.0E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	1.5E-03	2.7E-05
Total DDx	6.9E-02	mg/kg	3.6E-04	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	1.3E-01	1.3E-02
Total PCBs	1.3E-01	mg/kg	6.6E-04	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	6.6E-03	1.7E-03
TEQ PCB-birds	4.2E-05	mg/kg	2.2E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	1.5E-01	1.5E-02
TEQ D/F-birds	3.0E-04	mg/kg	1.5E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.1E+00**	1.1E-01
							HAZARD INDICES:	**2.2E+00**	3.7E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-49.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-51
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	15%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-52
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	9.8E+00	mg/kg	1.5E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	3.7E-02	1.2E-02
Lead	1.5E-01	mg/kg	2.4E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	1.5E-03	7.3E-04
Methyl Mercury	1.4E-02	mg/kg	2.1E-04	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	2.7E-02	2.7E-03
LPAH	2.5E-01	mg/kg	3.8E-03	mg/kg-d	-	-			
HPAH	2.7E-01	mg/kg	4.2E-03	mg/kg-d	-	-			
Dieldrin	1.4E-02	mg/kg	2.1E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	3.0E-03	5.6E-05
Total DDx	7.7E-02	mg/kg	1.2E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	4.3E-01	4.3E-02
Total PCBs	2.6E-01	mg/kg	4.1E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	4.1E-02	1.0E-02
TEQ PCB-birds	5.5E-05	mg/kg	8.5E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	6.0E-01	6.0E-02
TEQ D/F-birds	5.1E-05	mg/kg	7.9E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	5.6E-01	5.6E-02
							HAZARD INDICES:	**1.7E+00**	1.9E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-51.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-53
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : White perch/American eel / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{fish}	PERCENT FISH IN DIET	unitless	85%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-54
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : White perch/American eel / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	2.8E+00	mg/kg	2.5E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	6.1E-02	2.1E-02
Lead	1.3E-01	mg/kg	1.1E-02	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	7.1E-03	3.5E-03
Methyl Mercury	5.0E-02	mg/kg	4.4E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	5.6E-01	5.6E-02
LPAH	3.7E-01	mg/kg	3.2E-02	mg/kg-d	-	-			
HPAH	2.2E-01	mg/kg	1.9E-02	mg/kg-d	-	-			
Dieldrin	3.2E-02	mg/kg	2.8E-03	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	4.0E-02	7.4E-04
Total DDx	1.3E-01	mg/kg	1.1E-02	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**3.9E+00**	3.9E-01
Total PCBs	2.8E-01	mg/kg	2.4E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	2.4E-01	6.1E-02
TEQ PCB-birds	4.5E-05	mg/kg	4.0E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**2.8E+00**	2.8E-01
TEQ D/F-birds	6.0E-05	mg/kg	5.3E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**3.8E+00**	3.8E-01
							HAZARD INDICES:	**1.1E+01**	**1.2E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-53.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-55
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON
TOTAL RISK (HI): 1.5E+01

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
TCDD TEQ (D/F)		1.1E+00		5.6E-01	3.8E+00	***5.4E+00***	***36%***
Total DDx		1.3E-01		4.3E-01	3.9E+00	***4.5E+00***	***29%***
Mercury		3.3E-01	-	2.7E-02	5.6E-01	9.2E-01	6%
Total PCBs		6.6E-03		4.1E-02	2.4E-01	2.9E-01	2%
Lead		3.4E-01	-	1.5E-03	7.1E-03	3.5E-01	2%
TCDD TEQ (PCBs)		1.5E-01		6.0E-01	2.8E+00	***3.6E+00***	***23%***
Copper		8.9E-02	-	3.7E-02	6.1E-02	1.9E-01	1%
Dieldrin		1.5E-03	-	3.0E-03	4.0E-02	4.4E-02	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**2.2E+00**	**-**	**1.7E+00**	**1.1E+01**	**1.5E+01**	
PERCENTAGE OF TOTAL RISK		**14%**		**11%**	**75%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-56
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON
TOTAL RISK (HI): 1.8E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		1.1E-01		5.6E-02	3.8E-01	5.4E-01	***31%***
Total DDx		1.3E-02		4.3E-02	3.9E-01	4.5E-01	***26%***
Total PCBs		1.7E-03		1.0E-02	6.1E-02	7.3E-02	4%
Lead		1.7E-01	-	7.3E-04	3.5E-03	1.8E-01	***10%***
Mercury		3.3E-02	-	2.7E-03	5.6E-02	9.2E-02	5%
Copper		3.0E-02	-	1.2E-02	2.1E-02	6.3E-02	4%
TCDD TEQ (PCBs)		1.5E-02		6.0E-02	2.8E-01	3.6E-01	***20%***
Dieldrin		2.7E-05	-	5.6E-05	7.4E-04	8.3E-04	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**3.7E-01**	**-**	**1.9E-01**	**1.2E+00**	**1.8E+00**	
PERCENTAGE OF TOTAL RISK		**21%**		**11%**	**68%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-57
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-58
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.4E+02	mg/kg	7.1E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.8E-01	5.9E-02
Lead	2.4E+02	mg/kg	1.2E+00	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	7.4E-01	3.7E-01
Methyl Mercury	1.5E+00	mg/kg	7.9E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	**1.0E+00**	1.0E-01
LPAH	3.3E+01	mg/kg	1.7E-01	mg/kg-d	-	-			
HPAH	8.6E+01	mg/kg	4.4E-01	mg/kg-d	-	-			
Dieldrin	2.0E-02	mg/kg	1.0E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	1.5E-03	2.7E-05
Total DDx	2.0E-01	mg/kg	1.0E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	3.6E-01	3.6E-02
Total PCBs	5.7E-01	mg/kg	2.9E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	2.9E-02	7.3E-03
TEQ PCB-birds	1.7E-04	mg/kg	8.5E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	6.1E-01	6.1E-02
TEQ D/F-birds	9.6E-04	mg/kg	4.9E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**3.5E+00**	3.5E-01
							HAZARD INDICES:	**6.5E+00**	9.9E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-57.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-59
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	15%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-60
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.9E+01	mg/kg	3.0E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	7.4E-02	2.5E-02
Lead	3.3E-01	mg/kg	5.1E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	3.2E-03	1.6E-03
Methyl Mercury	4.3E-02	mg/kg	6.7E-04	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	8.6E-02	8.6E-03
LPAH	2.5E-01	mg/kg	3.8E-03	mg/kg-d	-	-			
HPAH	2.7E-01	mg/kg	4.2E-03	mg/kg-d	-	-			
Dieldrin	1.4E-02	mg/kg	2.1E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	3.0E-03	5.6E-05
Total DDx	2.2E-01	mg/kg	3.4E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**1.2E+00**	1.2E-01
Total PCBs	1.2E+00	mg/kg	1.8E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	1.8E-01	4.5E-02
TEQ PCB-birds	2.2E-04	mg/kg	3.3E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**2.4E+00**	2.4E-01
TEQ D/F-birds	1.6E-04	mg/kg	2.5E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.8E+00**	1.8E-01
							HAZARD INDICES:	**5.7E+00**	6.2E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-59.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-61
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Mummichog / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: Mummichog
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{fish}	PERCENT FISH IN DIET	unitless	85%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-62
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Mummichog / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: Mummichog
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	2.3E+00	mg/kg	2.0E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	5.0E-02	1.7E-02
Lead	5.1E-01	mg/kg	4.4E-02	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	2.7E-02	1.4E-02
Methyl Mercury	1.9E-02	mg/kg	1.7E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	2.1E-01	2.1E-02
LPAH	3.1E-01	mg/kg	2.7E-02	mg/kg-d	-	-			
HPAH	1.5E-01	mg/kg	1.3E-02	mg/kg-d	-	-			
Dieldrin	4.5E-03	mg/kg	4.0E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	5.6E-03	1.0E-04
Total DDx	6.2E-02	mg/kg	5.5E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**2.0E+00**	2.0E-01
Total PCBs	2.9E-01	mg/kg	2.5E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	2.5E-01	6.3E-02
TEQ PCB-birds	4.8E-05	mg/kg	4.2E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**3.0E+00**	3.0E-01
TEQ D/F-birds	8.9E-05	mg/kg	7.8E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**5.6E+00**	5.6E-01
							HAZARD INDICES:	**1.1E+01**	**1.2E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-61.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-63
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON
TOTAL RISK (HI): 2.3E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		3.5E+00		1.8E+00	5.6E+00	***1.1E+01***	***47%***
Total DDx		3.6E-01		1.2E+00	2.0E+00	***3.5E+00***	***15%***
Mercury		1.0E+00		8.6E-02	2.1E-01	***1.3E+00***	6%
Total PCBs		2.9E-02		1.8E-01	2.5E-01	4.6E-01	2%
Lead		7.4E-01		3.2E-03	2.7E-02	7.7E-01	3%
TCDD TEQ (PCBs)		6.1E-01		2.4E+00	3.0E+00	***6.0E+00***	***26%***
Copper		1.8E-01		7.4E-02	5.0E-02	3.0E-01	1%
Dieldrin		1.5E-03		3.0E-03	5.6E-03	1.0E-02	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**6.5E+00**	**-**	**5.7E+00**	**1.1E+01**	**2.3E+01**	
PERCENTAGE OF TOTAL RISK		**28%**		**25%**	**48%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-64
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON
TOTAL RISK (HI): 2.8E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		3.5E-01		1.8E-01	5.6E-01	***1.1E+00***	***39%***
Lead		3.7E-01		1.6E-03	1.4E-02	3.9E-01	***14%***
Total DDx		3.6E-02		1.2E-01	2.0E-01	3.5E-01	***13%***
Total PCBs		7.3E-03		4.5E-02	6.3E-02	1.2E-01	4%
Mercury		1.0E-01		8.6E-03	2.1E-02	1.3E-01	5%
Copper		5.9E-02		2.5E-02	1.7E-02	1.0E-01	4%
TCDD TEQ (PCBs)		6.1E-02		2.4E-01	3.0E-01	6.0E-01	***22%***
Dieldrin		2.7E-05		5.6E-05	1.0E-04	1.9E-04	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**9.9E-01**	**-**	**6.2E-01**	**1.2E+00**	**2.8E+00**	
PERCENTAGE OF TOTAL RISK		**36%**		**22%**	**42%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-65
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-66
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	7.0E+01	mg/kg	3.6E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	8.9E-02	3.0E-02
Lead	1.1E+02	mg/kg	5.6E-01	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	3.4E-01	1.7E-01
Methyl Mercury	5.0E-01	mg/kg	2.5E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	3.3E-01	3.3E-02
LPAH	3.3E+01	mg/kg	1.7E-01	mg/kg-d	-	-			
HPAH	8.6E+01	mg/kg	4.4E-01	mg/kg-d	-	-			
Dieldrin	2.0E-02	mg/kg	1.0E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	1.5E-03	2.7E-05
Total DDx	6.9E-02	mg/kg	3.6E-04	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	1.3E-01	1.3E-02
Total PCBs	1.3E-01	mg/kg	6.6E-04	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	6.6E-03	1.7E-03
TEQ PCB-birds	4.2E-05	mg/kg	2.2E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	1.5E-01	1.5E-02
TEQ D/F-birds	3.0E-04	mg/kg	1.5E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.1E+00**	1.1E-01
							HAZARD INDICES:	**2.2E+00**	3.7E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-65.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-67
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	15%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-68
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	9.8E+00	mg/kg	1.5E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	3.7E-02	1.2E-02
Lead	1.5E-01	mg/kg	2.4E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	1.5E-03	7.3E-04
Methyl Mercury	1.4E-02	mg/kg	2.1E-04	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	2.7E-02	2.7E-03
LPAH	2.5E-01	mg/kg	3.8E-03	mg/kg-d	-	-			
HPAH	2.7E-01	mg/kg	4.2E-03	mg/kg-d	-	-			
Dieldrin	1.4E-02	mg/kg	2.1E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	3.0E-03	5.6E-05
Total DDx	7.7E-02	mg/kg	1.2E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	4.3E-01	4.3E-02
Total PCBs	2.6E-01	mg/kg	4.1E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	4.1E-02	1.0E-02
TEQ PCB-birds	5.5E-05	mg/kg	8.5E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	6.0E-01	6.0E-02
TEQ D/F-birds	5.1E-05	mg/kg	7.9E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	5.6E-01	5.6E-02
							HAZARD INDICES:	**1.7E+00**	1.9E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-67.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-69
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Mummichog / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: Mummichog
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{fish}	PERCENT FISH IN DIET	unitless	85%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-70
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Mummichog / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: Mummichog
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.2E+00	mg/kg	1.0E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	2.5E-02	8.5E-03
Lead	2.3E-01	mg/kg	2.1E-02	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	1.3E-02	6.3E-03
Methyl Mercury	6.1E-03	mg/kg	5.3E-04	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	6.8E-02	6.8E-03
LPAH	3.1E-01	mg/kg	2.7E-02	mg/kg-d	-	-			
HPAH	1.5E-01	mg/kg	1.3E-02	mg/kg-d	-	-			
Dieldrin	4.5E-03	mg/kg	4.0E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	5.6E-03	1.0E-04
Total DDx	2.2E-02	mg/kg	1.9E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	6.9E-01	6.9E-02
Total PCBs	6.5E-02	mg/kg	5.7E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	5.7E-02	1.4E-02
TEQ PCB-birds	1.2E-05	mg/kg	1.1E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	7.6E-01	7.6E-02
TEQ D/F-birds	2.8E-05	mg/kg	2.4E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.7E+00**	1.7E-01
							HAZARD INDICES:	**3.4E+00**	3.5E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-69.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-71
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON
TOTAL RISK (HI): 7.2E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		1.1E+00		5.6E-01	1.7E+00	***3.4E+00***	***47%***
Total DDx		1.3E-01		4.3E-01	6.9E-01	***1.2E+00***	***17%***
Mercury		3.3E-01		2.7E-02	6.8E-02	4.2E-01	6%
Lead		3.4E-01		1.5E-03	1.3E-02	3.6E-01	5%
Total PCBs		6.6E-03		4.1E-02	5.7E-02	1.0E-01	1%
Copper		8.9E-02		3.7E-02	2.5E-02	1.5E-01	2%
TCDD TEQ (PCBs)		1.5E-01		6.0E-01	7.6E-01	***1.5E+00***	***21%***
Dieldrin		1.5E-03		3.0E-03	5.6E-03	1.0E-02	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**2.2E+00**	**-**	**1.7E+00**	**3.4E+00**	**7.2E+00**	
PERCENTAGE OF TOTAL RISK		**30%**		**24%**	**47%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-72
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Monitored Natural Attenuation
RECEPTOR: HERON
TOTAL RISK (HI): 9.1E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		1.1E-01		5.6E-02	1.7E-01	3.4E-01	***37%***
Lead		1.7E-01		7.3E-04	6.3E-03	1.8E-01	***20%***
Total DDx		1.3E-02		4.3E-02	6.9E-02	1.2E-01	***14%***
Total PCBs		1.7E-03		1.0E-02	1.4E-02	2.6E-02	3%
Copper		3.0E-02		1.2E-02	8.5E-03	5.1E-02	6%
Mercury		3.3E-02		2.7E-03	6.8E-03	4.2E-02	5%
TCDD TEQ (PCBs)		1.5E-02		6.0E-02	7.6E-02	1.5E-01	***17%***
Dieldrin		2.7E-05		5.6E-05	1.0E-04	1.9E-04	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**3.7E-01**	**-**	**1.9E-01**	**3.5E-01**	**9.1E-01**	
PERCENTAGE OF TOTAL RISK		**41%**		**20%**	**39%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-73
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0034	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-74
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.3E+02	mg/kg	8.0E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	1.4E-01	8.6E-02
Lead	2.3E+02	mg/kg	1.4E+00	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	2.9E-01	1.5E-01
Methyl Mercury	1.4E+00	mg/kg	8.2E-03	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	1.5E-01	4.6E-02
LPAH	3.3E+01	mg/kg	2.0E-01	mg/kg-d	-	-			
HPAH	8.6E+01	mg/kg	5.2E-01	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	5.2E-01	5.2E-02
Dieldrin	1.9E-02	mg/kg	1.1E-04	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	7.6E-03	3.8E-03
Total DDx	1.7E-01	mg/kg	1.0E-03	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	1.3E-03	2.5E-04
Total PCBs	5.0E-01	mg/kg	3.0E-03	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	3.8E-02	3.2E-02
TEQ PCB-mammals	8.7E-06	mg/kg	5.2E-08	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	6.5E-01	2.3E-02
TEQ D/F-mammals	6.4E-04	mg/kg	3.9E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**4.8E+01**	**1.7E+00**
							HAZARD INDICES:	**5.0E+01**	**2.1E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-73.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-75
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.17	USEPA, 1993	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	20%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-76
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.9E+01	mg/kg	1.1E+00	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	2.0E-01	1.2E-01
Lead	3.2E-01	mg/kg	1.9E-02	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	4.1E-03	2.2E-03
Methyl Mercury	3.8E-02	mg/kg	2.3E-03	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	4.2E-02	1.3E-02
LPAH	2.5E-01	mg/kg	1.5E-02	mg/kg-d	-	-			
HPAH	2.7E-01	mg/kg	1.6E-02	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	1.6E-02	1.6E-03
Dieldrin	1.3E-02	mg/kg	7.7E-04	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	5.1E-02	2.6E-02
Total DDx	1.9E-01	mg/kg	1.1E-02	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	1.4E-02	2.8E-03
Total PCBs	1.0E+00	mg/kg	6.2E-02	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	7.8E-01	6.5E-01
TEQ PCB-mammals	2.2E-05	mg/kg	1.3E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**1.7E+01**	6.0E-01
TEQ D/F-mammals	9.8E-05	mg/kg	5.9E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**7.4E+01**	**2.6E+00**
							HAZARD INDICES:	**9.2E+01**	**4.1E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-75.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-77
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : White perch/American eel / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.17	USEPA, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	80%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-78
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : White perch/American eel / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	5.4E+00	mg/kg	1.3E+00	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	2.3E-01	1.4E-01
Lead	2.7E-01	mg/kg	6.6E-02	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	1.4E-02	7.4E-03
Methyl Mercury	1.4E-01	mg/kg	3.3E-02	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	6.1E-01	1.9E-01
LPAH	3.6E-01	mg/kg	8.8E-02	mg/kg-d	-	-			
HPAH	2.2E-01	mg/kg	5.2E-02	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	5.2E-02	5.2E-03
Dieldrin	3.0E-02	mg/kg	7.2E-03	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	4.8E-01	2.4E-01
Total DDx	3.1E-01	mg/kg	7.4E-02	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	9.2E-02	1.8E-02
Total PCBs	1.1E+00	mg/kg	2.6E-01	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	**3.3E+00**	**2.7E+00**
TEQ PCB-mammals	1.5E-05	mg/kg	3.7E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**4.6E+01**	**1.7E+00**
TEQ D/F-mammals	1.3E-04	mg/kg	3.1E-05	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**3.9E+02**	**1.4E+01**
							HAZARD INDICES:	**4.4E+02**	**1.9E+01**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-77.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-79
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK
TOTAL RISK (HI): 5.8E+02

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
TCDD TEQ (D/F)		4.8E+01		7.4E+01	3.9E+02	***5.1E+02***	***88%***
TCDD TEQ (PCBs)		6.5E-01		1.7E+01	4.6E+01	***6.4E+01***	***11%***
Total PCBs		3.8E-02		7.8E-01	3.3E+00	***4.1E+00***	1%
Mercury		1.5E-01		4.2E-02	6.1E-01	8.0E-01	0%
HPAH		5.2E-01		1.6E-02	5.2E-02	5.8E-01	0%
Copper		1.4E-01		2.0E-01	2.3E-01	5.8E-01	0%
Dieldrin		7.6E-03		5.1E-02	4.8E-01	5.4E-01	0%
Lead		2.9E-01		4.1E-03	1.4E-02	3.1E-01	0%
Total DDx		1.3E-03		1.4E-02	9.2E-02	1.1E-01	0%
LPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**5.0E+01**	**-**	**9.2E+01**	**4.4E+02**	**5.8E+02**	
PERCENTAGE OF TOTAL RISK		**9%**		**16%**	**76%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-80
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK
TOTAL RISK (HI): 2.5E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		1.7E+00		2.6E+00	1.4E+01	***1.8E+01***	***73%***
Total PCBs		3.2E-02		6.5E-01	2.7E+00	***3.4E+00***	***14%***
TCDD TEQ (PCBs)		2.3E-02		6.0E-01	1.7E+00	***2.3E+00***	9%
Copper		8.6E-02		1.2E-01	1.4E-01	3.5E-01	1%
Dieldrin		3.8E-03		2.6E-02	2.4E-01	2.7E-01	1%
Mercury		4.6E-02		1.3E-02	1.9E-01	2.4E-01	1%
Lead		1.5E-01		2.2E-03	7.4E-03	1.6E-01	1%
HPAH		5.2E-02		1.6E-03	5.2E-03	5.8E-02	0%
Total DDx		2.5E-04		2.8E-03	1.8E-02	2.2E-02	0%
LPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**2.1E+00**	**-**	**4.1E+00**	**1.9E+01**	**2.5E+01**	
PERCENTAGE OF TOTAL RISK		**8%**		**16%**	**75%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-81
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0034	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-82
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	6.7E+01	mg/kg	4.0E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	7.2E-02	4.3E-02
Lead	1.0E+02	mg/kg	6.3E-01	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	1.3E-01	7.0E-02
Methyl Mercury	4.4E-01	mg/kg	2.6E-03	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	4.8E-02	1.5E-02
LPAH	3.3E+01	mg/kg	2.0E-01	mg/kg-d	-	-			
HPAH	8.6E+01	mg/kg	5.2E-01	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	5.2E-01	5.2E-02
Dieldrin	1.9E-02	mg/kg	1.1E-04	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	7.6E-03	3.8E-03
Total DDx	6.0E-02	mg/kg	3.6E-04	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	4.5E-04	9.0E-05
Total PCBs	1.1E-01	mg/kg	6.9E-04	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	8.6E-03	7.2E-03
TEQ PCB-mammals	2.5E-06	mg/kg	1.5E-08	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	1.9E-01	6.7E-03
TEQ D/F-mammals	1.8E-04	mg/kg	1.1E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**1.3E+01**	4.7E-01
							HAZARD INDICES:	**1.4E+01**	6.7E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-81.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-83
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.17	USEPA, 1993	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	20%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-84
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	9.3E+00	mg/kg	5.6E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	1.0E-01	6.0E-02
Lead	1.5E-01	mg/kg	8.9E-03	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	1.9E-03	1.0E-03
Methyl Mercury	1.2E-02	mg/kg	7.3E-04	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	1.3E-02	4.1E-03
LPAH	2.5E-01	mg/kg	1.5E-02	mg/kg-d	-	-			
HPAH	2.7E-01	mg/kg	1.6E-02	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	1.6E-02	1.6E-03
Dieldrin	1.3E-02	mg/kg	7.7E-04	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	5.1E-02	2.6E-02
Total DDx	6.7E-02	mg/kg	4.0E-03	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	5.0E-03	1.0E-03
Total PCBs	2.4E-01	mg/kg	1.4E-02	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	1.8E-01	1.5E-01
TEQ PCB-mammals	6.3E-06	mg/kg	3.8E-07	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**4.8E+00**	1.7E-01
TEQ D/F-mammals	2.7E-05	mg/kg	1.6E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**2.0E+01**	7.2E-01
							HAZARD INDICES:	**2.5E+01**	**1.1E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-83.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-85
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : White perch/American eel / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.17	USEPA, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	80%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-86
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : White perch/American eel / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	2.7E+00	mg/kg	6.5E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	1.2E-01	7.0E-02
Lead	1.3E-01	mg/kg	3.0E-02	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	6.4E-03	3.4E-03
Methyl Mercury	4.4E-02	mg/kg	1.1E-02	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	1.9E-01	5.9E-02
LPAH	3.6E-01	mg/kg	8.8E-02	mg/kg-d	-	-			
HPAH	2.2E-01	mg/kg	5.2E-02	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	5.2E-02	5.2E-03
Dieldrin	3.0E-02	mg/kg	7.2E-03	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	4.8E-01	2.4E-01
Total DDx	1.1E-01	mg/kg	2.6E-02	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	3.3E-02	6.5E-03
Total PCBs	2.5E-01	mg/kg	6.0E-02	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	7.5E-01	6.2E-01
TEQ PCB-mammals	4.4E-06	mg/kg	1.1E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**1.3E+01**	4.7E-01
TEQ D/F-mammals	3.5E-05	mg/kg	8.5E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**1.1E+02**	**3.8E+00**
							HAZARD INDICES:	**1.2E+02**	**5.3E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-85.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-87
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK
TOTAL RISK (HI): 1.6E+02

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		1.3E+01		2.0E+01	1.1E+02	***1.4E+02***	***87%***
TCDD TEQ (PCBs)		1.9E-01		4.8E+00	1.3E+01	***1.8E+01***	***11%***
Total PCBs		8.6E-03		1.8E-01	7.5E-01	9.3E-01	1%
HPAH		5.2E-01		1.6E-02	5.2E-02	5.8E-01	0%
Dieldrin		7.6E-03		5.1E-02	4.8E-01	5.4E-01	0%
Copper		7.2E-02		1.0E-01	1.2E-01	2.9E-01	0%
Mercury		4.8E-02		1.3E-02	1.9E-01	2.6E-01	0%
Lead		1.3E-01		1.9E-03	6.4E-03	1.4E-01	0%
Total DDx		4.5E-04		5.0E-03	3.3E-02	3.8E-02	0%
LPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.4E+01**	**-**	**2.5E+01**	**1.2E+02**	**1.6E+02**	
PERCENTAGE OF TOTAL RISK		**9%**		**16%**	**75%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-88
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: MINK
TOTAL RISK (HI): 7.1E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		4.7E-01		7.2E-01	3.8E+00	***5.0E+00***	***70%***
Total PCBs		7.2E-03		1.5E-01	6.2E-01	7.8E-01	***11%***
Dieldrin		3.8E-03		2.6E-02	2.4E-01	2.7E-01	4%
TCDD TEQ (PCBs)		6.7E-03		1.7E-01	4.7E-01	6.5E-01	9%
Copper		4.3E-02		6.0E-02	7.0E-02	1.7E-01	2%
Mercury		1.5E-02		4.1E-03	5.9E-02	7.8E-02	1%
Lead		7.0E-02		1.0E-03	3.4E-03	7.5E-02	1%
HPAH		5.2E-02		1.6E-03	5.2E-03	5.8E-02	1%
Total DDx		9.0E-05		1.0E-03	6.5E-03	7.6E-03	0%
LPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**6.7E-01**	**-**	**1.1E+00**	**5.3E+00**	**7.1E+00**	
PERCENTAGE OF TOTAL RISK		**9%**		**16%**	**74%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-89
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-90
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.3E+02	mg/kg	6.9E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.7E-01	5.7E-02
Lead	2.3E+02	mg/kg	1.2E+00	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	7.1E-01	3.6E-01
Methyl Mercury	1.4E+00	mg/kg	7.0E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	9.0E-01	9.0E-02
LPAH	3.3E+01	mg/kg	1.7E-01	mg/kg-d	-	-			
HPAH	8.6E+01	mg/kg	4.4E-01	mg/kg-d	-	-			
Dieldrin	1.9E-02	mg/kg	9.7E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	1.4E-03	2.6E-05
Total DDx	1.7E-01	mg/kg	8.7E-04	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	3.1E-01	3.1E-02
Total PCBs	5.0E-01	mg/kg	2.6E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	2.6E-02	6.5E-03
TEQ PCB-birds	1.5E-04	mg/kg	7.6E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	5.4E-01	5.4E-02
TEQ D/F-birds	6.6E-04	mg/kg	3.4E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**2.4E+00**	2.4E-01
							HAZARD INDICES:	**5.1E+00**	8.4E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-89.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-91
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	15%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-92
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.9E+01	mg/kg	2.9E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	7.1E-02	2.4E-02
Lead	3.2E-01	mg/kg	4.9E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	3.0E-03	1.5E-03
Methyl Mercury	3.8E-02	mg/kg	5.9E-04	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	7.6E-02	7.6E-03
LPAH	2.5E-01	mg/kg	3.8E-03	mg/kg-d	-	-			
HPAH	2.7E-01	mg/kg	4.2E-03	mg/kg-d	-	-			
Dieldrin	1.3E-02	mg/kg	2.0E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	2.8E-03	5.2E-05
Total DDx	1.9E-01	mg/kg	2.9E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**1.0E+00**	1.0E-01
Total PCBs	1.0E+00	mg/kg	1.6E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	1.6E-01	4.0E-02
TEQ PCB-birds	1.9E-04	mg/kg	3.0E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**2.1E+00**	2.1E-01
TEQ D/F-birds	1.1E-04	mg/kg	1.7E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.2E+00**	1.2E-01
							HAZARD INDICES:	**4.7E+00**	5.1E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-91.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-93
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : White perch/American eel / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{fish}	PERCENT FISH IN DIET	unitless	85%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-94
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : White perch/American eel / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	5.4E+00	mg/kg	4.7E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.2E-01	3.9E-02
Lead	2.7E-01	mg/kg	2.4E-02	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	1.5E-02	7.3E-03
Methyl Mercury	1.4E-01	mg/kg	1.2E-02	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	**1.6E+00**	1.6E-01
LPAH	3.6E-01	mg/kg	3.2E-02	mg/kg-d	-	-			
HPAH	2.2E-01	mg/kg	1.9E-02	mg/kg-d	-	-			
Dieldrin	3.0E-02	mg/kg	2.6E-03	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	3.7E-02	6.9E-04
Total DDx	3.1E-01	mg/kg	2.7E-02	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**9.6E+00**	9.6E-01
Total PCBs	1.1E+00	mg/kg	9.6E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	9.6E-01	2.4E-01
TEQ PCB-birds	1.6E-04	mg/kg	1.4E-05	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**9.9E+00**	9.9E-01
TEQ D/F-birds	1.3E-04	mg/kg	1.2E-05	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**8.3E+00**	8.3E-01
							HAZARD INDICES:	**3.0E+01**	**3.2E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-93.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-95
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON
TOTAL RISK (HI): 4.0E+01

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
TCDD TEQ (D/F)		2.4E+00		1.2E+00	8.3E+00	***1.2E+01***	***30%***
Total DDx		3.1E-01		1.0E+00	9.6E+00	***1.1E+01***	***27%***
Total PCBs		2.6E-02		1.6E-01	9.6E-01	***1.1E+00***	3%
Mercury		9.0E-01	-	7.6E-02	1.6E+00	***2.5E+00***	6%
TCDD TEQ (PCBs)		5.4E-01		2.1E+00	9.9E+00	***1.3E+01***	***31%***
Lead		7.1E-01	-	3.0E-03	1.5E-02	7.3E-01	2%
Copper		1.7E-01	-	7.1E-02	1.2E-01	3.6E-01	1%
Dieldrin		1.4E-03	-	2.8E-03	3.7E-02	4.1E-02	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**5.1E+00**	**-**	**4.7E+00**	**3.0E+01**	**4.0E+01**	
PERCENTAGE OF TOTAL RISK		**13%**		**12%**	**76%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-96
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON
TOTAL RISK (HI): 4.6E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		2.4E-01		1.2E-01	8.3E-01	***1.2E+00***	***26%***
Total DDx		3.1E-02		1.0E-01	9.6E-01	***1.1E+00***	***24%***
Total PCBs		6.5E-03		4.0E-02	2.4E-01	2.9E-01	6%
Lead		3.6E-01	-	1.5E-03	7.3E-03	3.6E-01	8%
Mercury		9.0E-02	-	7.6E-03	1.6E-01	2.5E-01	6%
Copper		5.7E-02	-	2.4E-02	3.9E-02	1.2E-01	3%
TCDD TEQ (PCBs)		5.4E-02		2.1E-01	9.9E-01	***1.3E+00***	***27%***
Dieldrin		2.6E-05	-	5.2E-05	6.9E-04	7.7E-04	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**8.4E-01**	**-**	**5.1E-01**	**3.2E+00**	**4.6E+00**	
PERCENTAGE OF TOTAL RISK		**18%**		**11%**	**70%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-97
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-97
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-99
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	15%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-100
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	9.3E+00	mg/kg	1.4E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	3.6E-02	1.2E-02
Lead	1.5E-01	mg/kg	2.3E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	1.4E-03	7.0E-04
Methyl Mercury	1.2E-02	mg/kg	1.9E-04	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	2.4E-02	2.4E-03
LPAH	2.5E-01	mg/kg	3.8E-03	mg/kg-d	-	-			
HPAH	2.7E-01	mg/kg	4.2E-03	mg/kg-d	-	-			
Dieldrin	1.3E-02	mg/kg	2.0E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	2.8E-03	5.2E-05
Total DDx	6.7E-02	mg/kg	1.0E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	3.7E-01	3.7E-02
Total PCBs	2.4E-01	mg/kg	3.6E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	3.6E-02	9.1E-03
TEQ PCB-birds	4.8E-05	mg/kg	7.3E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	5.2E-01	5.2E-02
TEQ D/F-birds	3.1E-05	mg/kg	4.7E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	3.4E-01	3.4E-02
							HAZARD INDICES:	**1.3E+00**	1.5E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-99.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-101
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : White perch/American eel / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{fish}	PERCENT FISH IN DIET	unitless	85%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-102
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : White perch/American eel / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	2.7E+00	mg/kg	2.4E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	5.9E-02	2.0E-02
Lead	1.3E-01	mg/kg	1.1E-02	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	6.7E-03	3.4E-03
Methyl Mercury	4.4E-02	mg/kg	3.9E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	5.0E-01	5.0E-02
LPAH	3.6E-01	mg/kg	3.2E-02	mg/kg-d	-	-			
HPAH	2.2E-01	mg/kg	1.9E-02	mg/kg-d	-	-			
Dieldrin	3.0E-02	mg/kg	2.6E-03	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	3.7E-02	6.9E-04
Total DDx	1.1E-01	mg/kg	9.5E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**3.4E+00**	3.4E-01
Total PCBs	2.5E-01	mg/kg	2.2E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	2.2E-01	5.4E-02
TEQ PCB-birds	3.9E-05	mg/kg	3.4E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**2.5E+00**	2.5E-01
TEQ D/F-birds	3.6E-05	mg/kg	3.2E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**2.3E+00**	2.3E-01
							HAZARD INDICES:	**8.9E+00**	9.4E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-101.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-103
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON
TOTAL RISK (HI): 1.2E+01

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
Total DDx		1.1E-01		3.7E-01	3.4E+00	***3.9E+00***	***33%***
TCDD TEQ (D/F)		6.6E-01		3.4E-01	2.3E+00	***3.3E+00***	***27%***
Mercury		2.9E-01	-	2.4E-02	5.0E-01	8.1E-01	7%
Total PCBs		5.9E-03		3.6E-02	2.2E-01	2.6E-01	2%
Lead		3.3E-01	-	1.4E-03	6.7E-03	3.4E-01	3%
TCDD TEQ (PCBs)		1.3E-01		5.2E-01	2.5E+00	***3.1E+00***	***26%***
Copper		8.5E-02	-	3.6E-02	5.9E-02	1.8E-01	2%
Dieldrin		1.4E-03	-	2.8E-03	3.7E-02	4.1E-02	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.6E+00**	**-**	**1.3E+00**	**8.9E+00**	**1.2E+01**	
PERCENTAGE OF TOTAL RISK		**14%**		**11%**	**75%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-104
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON
TOTAL RISK (HI): 1.4E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Total DDx		1.1E-02		3.7E-02	3.4E-01	3.9E-01	***28%***
TCDD TEQ (D/F)		6.6E-02		3.4E-02	2.3E-01	3.3E-01	***23%***
Lead		1.6E-01	-	7.0E-04	3.4E-03	1.7E-01	***12%***
Total PCBs		1.5E-03		9.1E-03	5.4E-02	6.5E-02	5%
Mercury		2.9E-02	-	2.4E-03	5.0E-02	8.1E-02	6%
Copper		2.8E-02	-	1.2E-02	2.0E-02	6.0E-02	4%
TCDD TEQ (PCBs)		1.3E-02		5.2E-02	2.5E-01	3.1E-01	***22%***
Dieldrin		2.6E-05	-	5.2E-05	6.9E-04	7.7E-04	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**3.1E-01**	**-**	**1.5E-01**	**9.4E-01**	**1.4E+00**	
PERCENTAGE OF TOTAL RISK		**22%**		**11%**	**67%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-105
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-106
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.3E+02	mg/kg	6.9E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.7E-01	5.7E-02
Lead	2.3E+02	mg/kg	1.2E+00	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	7.1E-01	3.6E-01
Methyl Mercury	1.4E+00	mg/kg	7.0E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	9.0E-01	9.0E-02
LPAH	3.3E+01	mg/kg	1.7E-01	mg/kg-d	-	-			
HPAH	8.6E+01	mg/kg	4.4E-01	mg/kg-d	-	-			
Dieldrin	1.9E-02	mg/kg	9.7E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	1.4E-03	2.6E-05
Total DDx	1.7E-01	mg/kg	8.7E-04	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	3.1E-01	3.1E-02
Total PCBs	5.0E-01	mg/kg	2.6E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	2.6E-02	6.5E-03
TEQ PCB-birds	1.5E-04	mg/kg	7.6E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	5.4E-01	5.4E-02
TEQ D/F-birds	6.6E-04	mg/kg	3.4E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**2.4E+00**	2.4E-01
							HAZARD INDICES:	**5.1E+00**	8.4E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-105.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-107
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	15%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-108
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.9E+01	mg/kg	2.9E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	7.1E-02	2.4E-02
Lead	3.2E-01	mg/kg	4.9E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	3.0E-03	1.5E-03
Methyl Mercury	3.8E-02	mg/kg	5.9E-04	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	7.6E-02	7.6E-03
LPAH	2.5E-01	mg/kg	3.8E-03	mg/kg-d	-	-			
HPAH	2.7E-01	mg/kg	4.2E-03	mg/kg-d	-	-			
Dieldrin	1.3E-02	mg/kg	2.0E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	2.8E-03	5.2E-05
Total DDx	1.9E-01	mg/kg	2.9E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**1.0E+00**	1.0E-01
Total PCBs	1.0E+00	mg/kg	1.6E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	1.6E-01	4.0E-02
TEQ PCB-birds	1.9E-04	mg/kg	3.0E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**2.1E+00**	2.1E-01
TEQ D/F-birds	1.1E-04	mg/kg	1.7E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.2E+00**	1.2E-01
							HAZARD INDICES:	**4.7E+00**	5.1E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-107.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-109
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Mummichog / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: Mummichog
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{fish}	PERCENT FISH IN DIET	unitless	85%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-110
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Mummichog / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: Mummichog
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	2.3E+00	mg/kg	2.0E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	4.9E-02	1.6E-02
Lead	4.9E-01	mg/kg	4.3E-02	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	2.6E-02	1.3E-02
Methyl Mercury	1.7E-02	mg/kg	1.5E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	1.9E-01	1.9E-02
LPAH	3.1E-01	mg/kg	2.7E-02	mg/kg-d	-	-			
HPAH	1.5E-01	mg/kg	1.3E-02	mg/kg-d	-	-			
Dieldrin	4.2E-03	mg/kg	3.7E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	5.2E-03	9.7E-05
Total DDx	5.4E-02	mg/kg	4.7E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**1.7E+00**	1.7E-01
Total PCBs	2.6E-01	mg/kg	2.2E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	2.2E-01	5.6E-02
TEQ PCB-birds	4.3E-05	mg/kg	3.7E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**2.7E+00**	2.7E-01
TEQ D/F-birds	6.1E-05	mg/kg	5.4E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**3.8E+00**	3.8E-01
							HAZARD INDICES:	**8.7E+00**	9.2E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-109.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-111
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON
TOTAL RISK (HI): 1.8E+01

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
TCDD TEQ (D/F)		2.4E+00		1.2E+00	3.8E+00	***7.5E+00***	***41%***
Total DDx		3.1E-01		1.0E+00	1.7E+00	***3.0E+00***	***16%***
Mercury		9.0E-01		7.6E-02	1.9E-01	***1.2E+00***	6%
Total PCBs		2.6E-02		1.6E-01	2.2E-01	4.1E-01	2%
Lead		7.1E-01		3.0E-03	2.6E-02	7.4E-01	4%
TCDD TEQ (PCBs)		5.4E-01		2.1E+00	2.7E+00	***5.3E+00***	***29%***
Copper		1.7E-01		7.1E-02	4.9E-02	2.9E-01	2%
Dieldrin		1.4E-03		2.8E-03	5.2E-03	9.3E-03	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**5.1E+00**	**-**	**4.7E+00**	**8.7E+00**	**1.8E+01**	
PERCENTAGE OF TOTAL RISK		**28%**		**25%**	**47%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-112
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON
TOTAL RISK (HI): 2.3E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		2.4E-01		1.2E-01	3.8E-01	7.5E-01	***33%***
Lead		3.6E-01		1.5E-03	1.3E-02	3.7E-01	***16%***
Total DDx		3.1E-02		1.0E-01	1.7E-01	3.0E-01	***13%***
Total PCBs		6.5E-03		4.0E-02	5.6E-02	1.0E-01	5%
Mercury		9.0E-02		7.6E-03	1.9E-02	1.2E-01	5%
Copper		5.7E-02		2.4E-02	1.6E-02	9.7E-02	4%
TCDD TEQ (PCBs)		5.4E-02		2.1E-01	2.7E-01	5.3E-01	***23%***
Dieldrin		2.6E-05		5.2E-05	9.7E-05	1.7E-04	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**8.4E-01**	**-**	**5.1E-01**	**9.2E-01**	**2.3E+00**	
PERCENTAGE OF TOTAL RISK		**37%**		**23%**	**41%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-113
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-114
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	6.7E+01	mg/kg	3.4E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	8.5E-02	2.8E-02
Lead	1.0E+02	mg/kg	5.4E-01	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	3.3E-01	1.6E-01
Methyl Mercury	4.4E-01	mg/kg	2.2E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	2.9E-01	2.9E-02
LPAH	3.3E+01	mg/kg	1.7E-01	mg/kg-d	-	-			
HPAH	8.6E+01	mg/kg	4.4E-01	mg/kg-d	-	-			
Dieldrin	1.9E-02	mg/kg	9.7E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	1.4E-03	2.6E-05
Total DDx	6.0E-02	mg/kg	3.1E-04	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	1.1E-01	1.1E-02
Total PCBs	1.1E-01	mg/kg	5.9E-04	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	5.9E-03	1.5E-03
TEQ PCB-birds	3.6E-05	mg/kg	1.9E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	1.3E-01	1.3E-02
TEQ D/F-birds	1.8E-04	mg/kg	9.3E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	6.6E-01	6.6E-02
							HAZARD INDICES:	**1.6E+00**	3.1E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-113.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-115
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	15%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-116
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	9.3E+00	mg/kg	1.4E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	3.6E-02	1.2E-02
Lead	1.5E-01	mg/kg	2.3E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	1.4E-03	7.0E-04
Methyl Mercury	1.2E-02	mg/kg	1.9E-04	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	2.4E-02	2.4E-03
LPAH	2.5E-01	mg/kg	3.8E-03	mg/kg-d	-	-			
HPAH	2.7E-01	mg/kg	4.2E-03	mg/kg-d	-	-			
Dieldrin	1.3E-02	mg/kg	2.0E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	2.8E-03	5.2E-05
Total DDx	6.7E-02	mg/kg	1.0E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	3.7E-01	3.7E-02
Total PCBs	2.4E-01	mg/kg	3.6E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	3.6E-02	9.1E-03
TEQ PCB-birds	4.8E-05	mg/kg	7.3E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	5.2E-01	5.2E-02
TEQ D/F-birds	3.1E-05	mg/kg	4.7E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	3.4E-01	3.4E-02
							HAZARD INDICES:	**1.3E+00**	1.5E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-115.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-117
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Mummichog / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: Mummichog
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{fish}	PERCENT FISH IN DIET	unitless	85%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-118
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Mummichog / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: Mummichog
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.1E+00	mg/kg	9.8E-02	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	2.4E-02	8.1E-03
Lead	2.2E-01	mg/kg	2.0E-02	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	1.2E-02	6.0E-03
Methyl Mercury	5.4E-03	mg/kg	4.7E-04	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	6.0E-02	6.0E-03
LPAH	3.1E-01	mg/kg	2.7E-02	mg/kg-d	-	-			
HPAH	1.5E-01	mg/kg	1.3E-02	mg/kg-d	-	-			
Dieldrin	4.2E-03	mg/kg	3.7E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	5.2E-03	9.7E-05
Total DDx	1.9E-02	mg/kg	1.7E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	5.9E-01	5.9E-02
Total PCBs	5.8E-02	mg/kg	5.1E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	5.1E-02	1.3E-02
TEQ PCB-birds	1.1E-05	mg/kg	9.3E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	6.6E-01	6.6E-02
TEQ D/F-birds	1.7E-05	mg/kg	1.5E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.0E+00**	1.0E-01
							HAZARD INDICES:	**2.5E+00**	2.6E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-117.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-119
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON
TOTAL RISK (HI): 5.4E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		6.6E-01		3.4E-01	1.0E+00	***2.0E+00***	***38%***
Total DDx		1.1E-01		3.7E-01	5.9E-01	***1.1E+00***	***20%***
Mercury		2.9E-01		2.4E-02	6.0E-02	3.7E-01	7%
Lead		3.3E-01		1.4E-03	1.2E-02	3.4E-01	6%
Total PCBs		5.9E-03		3.6E-02	5.1E-02	9.3E-02	2%
Copper		8.5E-02		3.6E-02	2.4E-02	1.4E-01	3%
TCDD TEQ (PCBs)		1.3E-01		5.2E-01	6.6E-01	***1.3E+00***	***24%***
Dieldrin		1.4E-03		2.8E-03	5.2E-03	9.3E-03	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.6E+00**	**-**	**1.3E+00**	**2.5E+00**	**5.4E+00**	
PERCENTAGE OF TOTAL RISK		**30%**		**25%**	**45%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-120
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Primary Erosional Zone/Primary Inventory Zone
RECEPTOR: HERON
TOTAL RISK (HI): 7.2E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		6.6E-02		3.4E-02	1.0E-01	2.0E-01	***28%***
Lead		1.6E-01		7.0E-04	6.0E-03	1.7E-01	***24%***
Total DDx		1.1E-02		3.7E-02	5.9E-02	1.1E-01	***15%***
Total PCBs		1.5E-03		9.1E-03	1.3E-02	2.3E-02	3%
Copper		2.8E-02		1.2E-02	8.1E-03	4.8E-02	7%
Mercury		2.9E-02		2.4E-03	6.0E-03	3.7E-02	5%
TCDD TEQ (PCBs)		1.3E-02		5.2E-02	6.6E-02	1.3E-01	***18%***
Dieldrin		2.6E-05		5.2E-05	9.7E-05	1.7E-04	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**3.1E-01**	**-**	**1.5E-01**	**2.6E-01**	**7.2E-01**	
PERCENTAGE OF TOTAL RISK		**43%**		**20%**	**36%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-121
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0034	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-122
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	8.1E+01	mg/kg	4.9E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	8.8E-02	5.3E-02
Lead	1.5E+02	mg/kg	8.9E-01	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	1.9E-01	1.0E-01
Methyl Mercury	6.2E-01	mg/kg	3.7E-03	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	6.8E-02	2.1E-02
LPAH	1.6E+01	mg/kg	9.4E-02	mg/kg-d	-	-			
HPAH	6.1E+01	mg/kg	3.7E-01	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	3.7E-01	3.7E-02
Dieldrin	4.7E-03	mg/kg	2.8E-05	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	1.9E-03	9.4E-04
Total DDx	7.0E-02	mg/kg	4.2E-04	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	5.3E-04	1.1E-04
Total PCBs	3.9E-01	mg/kg	2.3E-03	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	2.9E-02	2.4E-02
TEQ PCB-mammals	6.2E-06	mg/kg	3.7E-08	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	4.7E-01	1.7E-02
TEQ D/F-mammals	4.0E-05	mg/kg	2.4E-07	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**3.0E+00**	1.1E-01
							HAZARD INDICES:	**4.3E+00**	3.6E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-121.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-123
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.17	USEPA, 1993	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	20%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-124
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.1E+01	mg/kg	6.9E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	1.2E-01	7.3E-02
Lead	2.1E-01	mg/kg	1.3E-02	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	2.7E-03	1.4E-03
Methyl Mercury	1.7E-02	mg/kg	1.0E-03	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	1.9E-02	5.8E-03
LPAH	1.2E-01	mg/kg	7.0E-03	mg/kg-d	-	-			
HPAH	1.9E-01	mg/kg	1.2E-02	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	1.2E-02	1.2E-03
Dieldrin	3.2E-03	mg/kg	1.9E-04	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	1.3E-02	6.4E-03
Total DDx	7.8E-02	mg/kg	4.7E-03	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	5.9E-03	1.2E-03
Total PCBs	7.9E-01	mg/kg	4.8E-02	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	6.0E-01	5.0E-01
TEQ PCB-mammals	1.6E-05	mg/kg	9.5E-07	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**1.2E+01**	4.3E-01
TEQ D/F-mammals	6.2E-06	mg/kg	3.7E-07	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**4.6E+00**	1.7E-01
							HAZARD INDICES:	**1.7E+01**	**1.2E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-123.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-125
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : White perch/American eel / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.17	USEPA, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	80%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-126
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : White perch/American eel / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	3.3E+00	mg/kg	8.0E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	1.4E-01	8.5E-02
Lead	1.8E-01	mg/kg	4.3E-02	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	9.1E-03	4.8E-03
Methyl Mercury	6.3E-02	mg/kg	1.5E-02	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	2.8E-01	8.4E-02
LPAH	1.7E-01	mg/kg	4.1E-02	mg/kg-d	-	-			
HPAH	1.5E-01	mg/kg	3.7E-02	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	3.7E-02	3.7E-03
Dieldrin	7.5E-03	mg/kg	1.8E-03	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	1.2E-01	6.0E-02
Total DDx	1.3E-01	mg/kg	3.1E-02	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	3.8E-02	7.7E-03
Total PCBs	8.4E-01	mg/kg	2.0E-01	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	**2.5E+00**	**2.1E+00**
TEQ PCB-mammals	1.1E-05	mg/kg	2.6E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**3.3E+01**	**1.2E+00**
TEQ D/F-mammals	8.1E-06	mg/kg	1.9E-06	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**2.4E+01**	8.7E-01
							HAZARD INDICES:	**6.1E+01**	**4.4E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-125.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-127
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK
TOTAL RISK (HI): 8.2E+01

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
TCDD TEQ (PCBs)		4.7E-01		1.2E+01	3.3E+01	***4.5E+01***	***55%***
TCDD TEQ (D/F)		3.0E+00		4.6E+00	2.4E+01	***3.2E+01***	***39%***
Total PCBs		2.9E-02		6.0E-01	2.5E+00	***3.1E+00***	4%
HPAH		3.7E-01		1.2E-02	3.7E-02	4.2E-01	1%
Mercury		6.8E-02		1.9E-02	2.8E-01	3.6E-01	0%
Copper		8.8E-02		1.2E-01	1.4E-01	3.5E-01	0%
Lead		1.9E-01		2.7E-03	9.1E-03	2.0E-01	0%
Dieldrin		1.9E-03		1.3E-02	1.2E-01	1.3E-01	0%
Total DDx		5.3E-04		5.9E-03	3.8E-02	4.5E-02	0%
LPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**4.3E+00**	**-**	**1.7E+01**	**6.1E+01**	**8.2E+01**	
PERCENTAGE OF TOTAL RISK		**5%**		**21%**	**74%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-128
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK
TOTAL RISK (HI): 5.9E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Total PCBs		2.4E-02		5.0E-01	2.1E+00	***2.6E+00***	***44%***
TCDD TEQ (PCBs)		1.7E-02		4.3E-01	1.2E+00	***1.6E+00***	***27%***
TCDD TEQ (D/F)		1.1E-01		1.7E-01	8.7E-01	***1.1E+00***	***19%***
Copper		5.3E-02		7.3E-02	8.5E-02	2.1E-01	4%
Mercury		2.1E-02		5.8E-03	8.4E-02	1.1E-01	2%
Lead		1.0E-01		1.4E-03	4.8E-03	1.1E-01	2%
Dieldrin		9.4E-04		6.4E-03	6.0E-02	6.7E-02	1%
HPAH		3.7E-02		1.2E-03	3.7E-03	4.2E-02	1%
Total DDx		1.1E-04		1.2E-03	7.7E-03	8.9E-03	0%
LPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**3.6E-01**	**-**	**1.2E+00**	**4.4E+00**	**5.9E+00**	
PERCENTAGE OF TOTAL RISK		**6%**		**20%**	**74%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-129
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0034	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-130
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	4.1E+01	mg/kg	2.5E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	4.4E-02	2.7E-02
Lead	6.9E+01	mg/kg	4.1E-01	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	8.8E-02	4.6E-02
Methyl Mercury	2.0E-01	mg/kg	1.2E-03	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	2.2E-02	6.6E-03
LPAH	1.6E+01	mg/kg	9.4E-02	mg/kg-d	-	-			
HPAH	6.1E+01	mg/kg	3.7E-01	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	3.7E-01	3.7E-02
Dieldrin	4.7E-03	mg/kg	2.8E-05	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	1.9E-03	9.4E-04
Total DDx	2.4E-02	mg/kg	1.5E-04	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	1.8E-04	3.7E-05
Total PCBs	8.8E-02	mg/kg	5.3E-04	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	6.6E-03	5.5E-03
TEQ PCB-mammals	1.2E-06	mg/kg	7.5E-09	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	9.3E-02	3.3E-03
TEQ D/F-mammals	1.3E-05	mg/kg	8.0E-08	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**1.0E+00**	3.6E-02
							HAZARD INDICES:	**1.6E+00**	1.6E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-129.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-131
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.17	USEPA, 1993	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	20%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-132
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	5.8E+00	mg/kg	3.5E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	6.2E-02	3.7E-02
Lead	9.7E-02	mg/kg	5.9E-03	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	1.2E-03	6.6E-04
Methyl Mercury	5.5E-03	mg/kg	3.3E-04	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	6.1E-03	1.9E-03
LPAH	1.2E-01	mg/kg	7.0E-03	mg/kg-d	-	-			
HPAH	1.9E-01	mg/kg	1.2E-02	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	1.2E-02	1.2E-03
Dieldrin	3.2E-03	mg/kg	1.9E-04	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	1.3E-02	6.4E-03
Total DDx	2.7E-02	mg/kg	1.6E-03	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	2.1E-03	4.1E-04
Total PCBs	1.8E-01	mg/kg	1.1E-02	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	1.3E-01	1.1E-01
TEQ PCB-mammals	3.2E-06	mg/kg	1.9E-07	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**2.4E+00**	8.5E-02
TEQ D/F-mammals	2.0E-06	mg/kg	1.2E-07	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**1.5E+00**	5.5E-02
							HAZARD INDICES:	**4.1E+00**	3.0E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-131.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-133
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : White perch/American eel / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.17	USEPA, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	80%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Mitchell, 1961	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

References:
Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-134
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : White perch/American eel / MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.7E+00	mg/kg	4.0E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	7.2E-02	4.3E-02
Lead	8.3E-02	mg/kg	2.0E-02	mg/kg-d	4.7E+00	8.9E+00	mg/kg-d	4.2E-03	2.2E-03
Methyl Mercury	2.0E-02	mg/kg	4.9E-03	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	8.8E-02	2.7E-02
LPAH	1.7E-01	mg/kg	4.1E-02	mg/kg-d	-	-			
HPAH	1.5E-01	mg/kg	3.7E-02	mg/kg-d	1.0E+00	1.0E+01	mg/kg-d	3.7E-02	3.7E-03
Dieldrin	7.5E-03	mg/kg	1.8E-03	mg/kg-d	1.5E-02	3.0E-02	mg/kg-d	1.2E-01	6.0E-02
Total DDx	4.4E-02	mg/kg	1.1E-02	mg/kg-d	8.0E-01	4.0E+00	mg/kg-d	1.3E-02	2.7E-03
Total PCBs	1.9E-01	mg/kg	4.6E-02	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	5.7E-01	4.8E-01
TEQ PCB-mammals	2.2E-06	mg/kg	5.3E-07	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**6.6E+00**	2.4E-01
TEQ D/F-mammals	2.7E-06	mg/kg	6.4E-07	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**8.0E+00**	2.9E-01
							HAZARD INDICES:	**1.6E+01**	**1.1E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-133.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-135
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK
TOTAL RISK (HI): 2.1E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
TCDD TEQ (D/F)		1.0E+00		1.5E+00	8.0E+00	***1.1E+01***	***50%***
TCDD TEQ (PCBs)		9.3E-02		2.4E+00	6.6E+00	***9.1E+00***	***43%***
Total PCBs		6.6E-03		1.3E-01	5.7E-01	7.1E-01	3%
HPAH		3.7E-01		1.2E-02	3.7E-02	4.2E-01	2%
Copper		4.4E-02		6.2E-02	7.2E-02	1.8E-01	1%
Dieldrin		1.9E-03		1.3E-02	1.2E-01	1.3E-01	1%
Mercury		2.2E-02		6.1E-03	8.8E-02	1.2E-01	1%
Lead		8.8E-02		1.2E-03	4.2E-03	9.3E-02	0%
Total DDx		1.8E-04		2.1E-03	1.3E-02	1.6E-02	0%
LPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.6E+00**	**-**	**4.1E+00**	**1.6E+01**	**2.1E+01**	
PERCENTAGE OF TOTAL RISK		**8%**		**19%**	**73%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-136
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : MINK

Focused Feasiblity Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: MINK
TOTAL RISK (HI): 1.6E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Total PCBs		5.5E-03		1.1E-01	4.8E-01	5.9E-01	***37%***
TCDD TEQ (D/F)		3.6E-02		5.5E-02	2.9E-01	3.8E-01	***24%***
Copper		2.7E-02		3.7E-02	4.3E-02	1.1E-01	7%
Dieldrin		9.4E-04		6.4E-03	6.0E-02	6.7E-02	4%
Lead		4.6E-02		6.6E-04	2.2E-03	4.9E-02	3%
HPAH		3.7E-02		1.2E-03	3.7E-03	4.2E-02	3%
Mercury		6.6E-03		1.9E-03	2.7E-02	3.5E-02	2%
TCDD TEQ (PCBs)		3.3E-03		8.5E-02	2.4E-01	3.2E-01	***20%***
Total DDx		3.7E-05		4.1E-04	2.7E-03	3.1E-03	0%
LPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.6E-01**	**-**	**3.0E-01**	**1.1E+00**	**1.6E+00**	
PERCENTAGE OF TOTAL RISK		**10%**		**19%**	**71%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-137
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-138
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	8.1E+01	mg/kg	4.2E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.0E-01	3.5E-02
Lead	1.5E+02	mg/kg	7.6E-01	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	4.7E-01	2.3E-01
Methyl Mercury	6.2E-01	mg/kg	3.2E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	4.1E-01	4.1E-02
LPAH	1.6E+01	mg/kg	8.0E-02	mg/kg-d	-	-			
HPAH	6.1E+01	mg/kg	3.1E-01	mg/kg-d	-	-			
Dieldrin	4.7E-03	mg/kg	2.4E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	3.4E-04	6.4E-06
Total DDx	7.0E-02	mg/kg	3.6E-04	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	1.3E-01	1.3E-02
Total PCBs	3.9E-01	mg/kg	2.0E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	2.0E-02	5.0E-03
TEQ PCB-birds	1.1E-04	mg/kg	5.8E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	4.1E-01	4.1E-02
TEQ D/F-birds	4.1E-05	mg/kg	2.1E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	1.5E-01	1.5E-02
							HAZARD INDICES:	**1.7E+00**	3.8E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-137.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-139
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$ Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$ Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	15%	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-140
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.1E+01	mg/kg	1.8E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	4.3E-02	1.5E-02
Lead	2.1E-01	mg/kg	3.2E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	2.0E-03	9.9E-04
Methyl Mercury	1.7E-02	mg/kg	2.7E-04	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	3.4E-02	3.4E-03
LPAH	1.2E-01	mg/kg	1.8E-03	mg/kg-d	-	-			
HPAH	1.9E-01	mg/kg	3.0E-03	mg/kg-d	-	-			
Dieldrin	3.2E-03	mg/kg	4.9E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	6.9E-04	1.3E-05
Total DDx	7.8E-02	mg/kg	1.2E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	4.3E-01	4.3E-02
Total PCBs	7.9E-01	mg/kg	1.2E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	1.2E-01	3.1E-02
TEQ PCB-birds	1.5E-04	mg/kg	2.3E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.6E+00**	1.6E-01
TEQ D/F-birds	7.0E-06	mg/kg	1.1E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	7.7E-02	7.7E-03
							HAZARD INDICES:	**2.3E+00**	2.6E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-139.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-141
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : White perch/American eel / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{fish}	PERCENT FISH IN DIET	unitless	85%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-142
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : White perch/American eel / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	3.3E+00	mg/kg	2.9E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	7.1E-02	2.4E-02
Lead	1.8E-01	mg/kg	1.6E-02	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	9.6E-03	4.8E-03
Methyl Mercury	6.3E-02	mg/kg	5.5E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	7.0E-01	7.0E-02
LPAH	1.7E-01	mg/kg	1.5E-02	mg/kg-d	-	-			
HPAH	1.5E-01	mg/kg	1.4E-02	mg/kg-d	-	-			
Dieldrin	7.5E-03	mg/kg	6.5E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	9.2E-03	1.7E-04
Total DDx	1.3E-01	mg/kg	1.1E-02	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**4.0E+00**	4.0E-01
Total PCBs	8.4E-01	mg/kg	7.3E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	7.3E-01	1.8E-01
TEQ PCB-birds	1.2E-04	mg/kg	1.1E-05	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**7.5E+00**	7.5E-01
TEQ D/F-birds	8.3E-06	mg/kg	7.3E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	5.2E-01	5.2E-02
							HAZARD INDICES:	**1.4E+01**	**1.5E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-141.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-143
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON
TOTAL RISK (HI): 1.8E+01

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
Total DDx		1.3E-01		4.3E-01	4.0E+00	***4.5E+00***	***26%***
Total PCBs		2.0E-02		1.2E-01	7.3E-01	8.7E-01	5%
Mercury		4.1E-01	-	3.4E-02	7.0E-01	***1.1E+00***	7%
TCDD TEQ (D/F)		1.5E-01		7.7E-02	5.2E-01	7.5E-01	4%
TCDD TEQ (PCBs)		4.1E-01		1.6E+00	7.5E+00	***9.6E+00***	***54%***
Lead		4.7E-01	-	2.0E-03	9.6E-03	4.8E-01	3%
Copper		1.0E-01	-	4.3E-02	7.1E-02	2.2E-01	1%
Dieldrin		3.4E-04	-	6.9E-04	9.2E-03	1.0E-02	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.7E+00**	**-**	**2.3E+00**	**1.4E+01**	**1.8E+01**	
PERCENTAGE OF TOTAL RISK		**10%**		**13%**	**77%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-144
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON
TOTAL RISK (HI): 2.1E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Total PCBs		5.0E-03		3.1E-02	1.8E-01	2.2E-01	***10%***
Total DDx		1.3E-02		4.3E-02	4.0E-01	4.5E-01	***21%***
Lead		2.3E-01	-	9.9E-04	4.8E-03	2.4E-01	***11%***
Mercury		4.1E-02	-	3.4E-03	7.0E-02	1.1E-01	5%
TCDD TEQ (D/F)		1.5E-02		7.7E-03	5.2E-02	7.5E-02	4%
Copper		3.5E-02	-	1.5E-02	2.4E-02	7.3E-02	3%
TCDD TEQ (PCBs)		4.1E-02		1.6E-01	7.5E-01	9.6E-01	***45%***
Dieldrin		6.4E-06	-	1.3E-05	1.7E-04	1.9E-04	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**3.8E-01**	**-**	**2.6E-01**	**1.5E+00**	**2.1E+00**	
PERCENTAGE OF TOTAL RISK		**18%**		**12%**	**70%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-145
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-146
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	4.1E+01	mg/kg	2.1E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	5.2E-02	1.8E-02
Lead	6.9E+01	mg/kg	3.5E-01	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	2.2E-01	1.1E-01
Methyl Mercury	2.0E-01	mg/kg	1.0E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	1.3E-01	1.3E-02
LPAH	1.6E+01	mg/kg	8.0E-02	mg/kg-d	-	-			
HPAH	6.1E+01	mg/kg	3.1E-01	mg/kg-d	-	-			
Dieldrin	4.7E-03	mg/kg	2.4E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	3.4E-04	6.4E-06
Total DDx	2.4E-02	mg/kg	1.3E-04	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	4.5E-02	4.5E-03
Total PCBs	8.8E-02	mg/kg	4.5E-04	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	4.5E-03	1.1E-03
TEQ PCB-birds	2.8E-05	mg/kg	1.4E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	1.0E-01	1.0E-02
TEQ D/F-birds	1.4E-05	mg/kg	7.1E-08	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	5.1E-02	5.1E-03
							HAZARD INDICES:	6.0E-01	1.6E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-145.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-147
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	15%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-148
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	5.8E+00	mg/kg	8.9E-02	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	2.2E-02	7.4E-03
Lead	9.7E-02	mg/kg	1.5E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	9.2E-04	4.6E-04
Methyl Mercury	5.5E-03	mg/kg	8.6E-05	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	1.1E-02	1.1E-03
LPAH	1.2E-01	mg/kg	1.8E-03	mg/kg-d	-	-			
HPAH	1.9E-01	mg/kg	3.0E-03	mg/kg-d	-	-			
Dieldrin	3.2E-03	mg/kg	4.9E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	6.9E-04	1.3E-05
Total DDx	2.7E-02	mg/kg	4.2E-04	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	1.5E-01	1.5E-02
Total PCBs	1.8E-01	mg/kg	2.8E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	2.8E-02	6.9E-03
TEQ PCB-birds	3.7E-05	mg/kg	5.6E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	4.0E-01	4.0E-02
TEQ D/F-birds	2.4E-06	mg/kg	3.6E-08	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	2.6E-02	2.6E-03
							HAZARD INDICES:	6.4E-01	7.4E-02

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-147.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-149
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : White perch/American eel / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{fish}	PERCENT FISH IN DIET	unitless	85%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-150
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : White perch/American eel / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: White perch/American eel
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.7E+00	mg/kg	1.5E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	3.6E-02	1.2E-02
Lead	8.3E-02	mg/kg	7.2E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	4.4E-03	2.2E-03
Methyl Mercury	2.0E-02	mg/kg	1.8E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	2.3E-01	2.3E-02
LPAH	1.7E-01	mg/kg	1.5E-02	mg/kg-d	-	-			
HPAH	1.5E-01	mg/kg	1.4E-02	mg/kg-d	-	-			
Dieldrin	7.5E-03	mg/kg	6.5E-04	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	9.2E-03	1.7E-04
Total DDx	4.4E-02	mg/kg	3.9E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	**1.4E+00**	1.4E-01
Total PCBs	1.9E-01	mg/kg	1.7E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	1.7E-01	4.1E-02
TEQ PCB-birds	3.0E-05	mg/kg	2.6E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.9E+00**	1.9E-01
TEQ D/F-birds	2.8E-06	mg/kg	2.4E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	1.7E-01	1.7E-02
							HAZARD INDICES:	**3.9E+00**	4.2E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-149.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-151
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON
TOTAL RISK (HI): 5.1E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Total PCBs		4.5E-03		2.8E-02	1.7E-01	2.0E-01	4%
TCDD TEQ (D/F)		5.1E-02		2.6E-02	1.7E-01	2.5E-01	5%
Mercury		1.3E-01	-	1.1E-02	2.3E-01	3.7E-01	7%
Lead		2.2E-01	-	9.2E-04	4.4E-03	2.2E-01	4%
Total DDx		4.5E-02		1.5E-01	1.4E+00	***1.6E+00***	***31%***
TCDD TEQ (PCBs)		1.0E-01		4.0E-01	1.9E+00	***2.4E+00***	***47%***
Copper		5.2E-02	-	2.2E-02	3.6E-02	1.1E-01	2%
Dieldrin		3.4E-04	-	6.9E-04	9.2E-03	1.0E-02	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**6.0E-01**	**-**	**6.4E-01**	**3.9E+00**	**5.1E+00**	
PERCENTAGE OF TOTAL RISK		**12%**		**13%**	**76%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-152
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON
TOTAL RISK (HI): 6.6E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Total PCBs		1.1E-03		6.9E-03	4.1E-02	4.9E-02	8%
Lead		1.1E-01	-	4.6E-04	2.2E-03	1.1E-01	***17%***
TCDD TEQ (D/F)		5.1E-03		2.6E-03	1.7E-02	2.5E-02	4%
Copper		1.8E-02	-	7.4E-03	1.2E-02	3.7E-02	6%
Mercury		1.3E-02	-	1.1E-03	2.3E-02	3.7E-02	6%
Total DDx		4.5E-03		1.5E-02	1.4E-01	1.6E-01	***24%***
TCDD TEQ (PCBs)		1.0E-02		4.0E-02	1.9E-01	2.4E-01	***36%***
Dieldrin		6.4E-06	-	1.3E-05	1.7E-04	1.9E-04	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.6E-01**	**-**	**7.4E-02**	**4.2E-01**	**6.6E-01**	
PERCENTAGE OF TOTAL RISK		**24%**		**11%**	**64%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-153
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-154
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	8.1E+01	mg/kg	4.2E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.0E-01	3.5E-02
Lead	1.5E+02	mg/kg	7.6E-01	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	4.7E-01	2.3E-01
Methyl Mercury	6.2E-01	mg/kg	3.2E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	4.1E-01	4.1E-02
LPAH	1.6E+01	mg/kg	8.0E-02	mg/kg-d	-	-			
HPAH	6.1E+01	mg/kg	3.1E-01	mg/kg-d	-	-			
Dieldrin	4.7E-03	mg/kg	2.4E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	3.4E-04	6.4E-06
Total DDx	7.0E-02	mg/kg	3.6E-04	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	1.3E-01	1.3E-02
Total PCBs	3.9E-01	mg/kg	2.0E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	2.0E-02	5.0E-03
TEQ PCB-birds	1.1E-04	mg/kg	5.8E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	4.1E-01	4.1E-02
TEQ D/F-birds	4.1E-05	mg/kg	2.1E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	1.5E-01	1.5E-02
							HAZARD INDICES:	**1.7E+00**	3.8E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-153.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-155
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	15%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-156
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.1E+01	mg/kg	1.8E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	4.3E-02	1.5E-02
Lead	2.1E-01	mg/kg	3.2E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	2.0E-03	9.9E-04
Methyl Mercury	1.7E-02	mg/kg	2.7E-04	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	3.4E-02	3.4E-03
LPAH	1.2E-01	mg/kg	1.8E-03	mg/kg-d	-	-			
HPAH	1.9E-01	mg/kg	3.0E-03	mg/kg-d	-	-			
Dieldrin	3.2E-03	mg/kg	4.9E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	6.9E-04	1.3E-05
Total DDx	7.8E-02	mg/kg	1.2E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	4.3E-01	4.3E-02
Total PCBs	7.9E-01	mg/kg	1.2E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	1.2E-01	3.1E-02
TEQ PCB-birds	1.5E-04	mg/kg	2.3E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**1.6E+00**	1.6E-01
TEQ D/F-birds	7.0E-06	mg/kg	1.1E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	7.7E-02	7.7E-03
							HAZARD INDICES:	**2.3E+00**	2.6E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-155.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-157
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Mummichog / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: Mummichog
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{fish}	PERCENT FISH IN DIET	unitless	85%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-158
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Mummichog / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
MEDIUM: FISH
EXPOSURE MEDIUM: Mummichog
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	1.4E+00	mg/kg	1.2E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	3.0E-02	9.9E-03
Lead	3.2E-01	mg/kg	2.8E-02	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	1.7E-02	8.5E-03
Methyl Mercury	7.6E-03	mg/kg	6.7E-04	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	8.5E-02	8.5E-03
LPAH	1.5E-01	mg/kg	1.3E-02	mg/kg-d	-	-			
HPAH	1.1E-01	mg/kg	9.6E-03	mg/kg-d	-	-			
Dieldrin	1.0E-03	mg/kg	9.2E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	1.3E-03	2.4E-05
Total DDx	2.2E-02	mg/kg	1.9E-03	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	6.9E-01	6.9E-02
Total PCBs	2.0E-01	mg/kg	1.7E-02	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	1.7E-01	4.3E-02
TEQ PCB-birds	3.3E-05	mg/kg	2.8E-06	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	**2.0E+00**	2.0E-01
TEQ D/F-birds	3.8E-06	mg/kg	3.4E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	2.4E-01	2.4E-02
							HAZARD INDICES:	**3.3E+00**	3.7E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-157.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-159
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON
TOTAL RISK (HI): 7.3E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Total DDx		1.3E-01		4.3E-01	6.9E-01	***1.3E+00***	***17%***
Total PCBs		2.0E-02		1.2E-01	1.7E-01	3.1E-01	4%
Mercury		4.1E-01		3.4E-02	8.5E-02	5.3E-01	7%
Lead		4.7E-01		2.0E-03	1.7E-02	4.8E-01	7%
TCDD TEQ (D/F)		1.5E-01		7.7E-02	2.4E-01	4.7E-01	6%
TCDD TEQ (PCBs)		4.1E-01		1.6E+00	2.0E+00	***4.1E+00***	***56%***
Copper		1.0E-01		4.3E-02	3.0E-02	1.8E-01	2%
Dieldrin		3.4E-04		6.9E-04	1.3E-03	2.3E-03	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.7E+00**	**-**	**2.3E+00**	**3.3E+00**	**7.3E+00**	
PERCENTAGE OF TOTAL RISK		**23%**		**32%**	**45%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-160
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2018)
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON
TOTAL RISK (HI): 1.0E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Lead		2.3E-01		9.9E-04	8.5E-03	2.4E-01	***24%***
Total PCBs		5.0E-03		3.1E-02	4.3E-02	7.8E-02	8%
Total DDx		1.3E-02		4.3E-02	6.9E-02	1.3E-01	***12%***
Copper		3.5E-02		1.5E-02	9.9E-03	5.9E-02	6%
Mercury		4.1E-02		3.4E-03	8.5E-03	5.3E-02	5%
TCDD TEQ (D/F)		1.5E-02		7.7E-03	2.4E-02	4.7E-02	5%
TCDD TEQ (PCBs)		4.1E-02		1.6E-01	2.0E-01	4.1E-01	***40%***
Dieldrin		6.4E-06		1.3E-05	2.4E-05	4.3E-05	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**3.8E-01**	**-**	**2.6E-01**	**3.7E-01**	**1.0E+00**	
PERCENTAGE OF TOTAL RISK		**38%**		**26%**	**36%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-161
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.019	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-162
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Surficial sediment / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: Surficial sediment
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	4.1E+01	mg/kg	2.1E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	5.2E-02	1.8E-02
Lead	6.9E+01	mg/kg	3.5E-01	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	2.2E-01	1.1E-01
Methyl Mercury	2.0E-01	mg/kg	1.0E-03	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	1.3E-01	1.3E-02
LPAH	1.6E+01	mg/kg	8.0E-02	mg/kg-d	-	-			
HPAH	6.1E+01	mg/kg	3.1E-01	mg/kg-d	-	-			
Dieldrin	4.7E-03	mg/kg	2.4E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	3.4E-04	6.4E-06
Total DDx	2.4E-02	mg/kg	1.3E-04	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	4.5E-02	4.5E-03
Total PCBs	8.8E-02	mg/kg	4.5E-04	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	4.5E-03	1.1E-03
TEQ PCB-birds	2.8E-05	mg/kg	1.4E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	1.0E-01	1.0E-02
TEQ D/F-birds	1.4E-05	mg/kg	7.1E-08	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	5.1E-02	5.1E-03
							HAZARD INDICES:	6.0E-01	1.6E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-161.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-163
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION $EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	15%	assumption	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation: $C_{invert} = C_{sed} * BAF_{invert}$
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-164
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Blue crab / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE MEDIUM: Blue crab
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	5.8E+00	mg/kg	8.9E-02	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	2.2E-02	7.4E-03
Lead	9.7E-02	mg/kg	1.5E-03	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	9.2E-04	4.6E-04
Methyl Mercury	5.5E-03	mg/kg	8.6E-05	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	1.1E-02	1.1E-03
LPAH	1.2E-01	mg/kg	1.8E-03	mg/kg-d	-	-			
HPAH	1.9E-01	mg/kg	3.0E-03	mg/kg-d	-	-			
Dieldrin	3.2E-03	mg/kg	4.9E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	6.9E-04	1.3E-05
Total DDx	2.7E-02	mg/kg	4.2E-04	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	1.5E-01	1.5E-02
Total PCBs	1.8E-01	mg/kg	2.8E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	2.8E-02	6.9E-03
TEQ PCB-birds	3.7E-05	mg/kg	5.6E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	4.0E-01	4.0E-02
TEQ D/F-birds	2.4E-06	mg/kg	3.6E-08	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	2.6E-02	2.6E-03
							HAZARD INDICES:	6.4E-01	7.4E-02

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-163.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-165
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : Mummichog / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: Mummichog
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.39	Kushlan, 1978	
	P_{fish}	PERCENT FISH IN DIET	unitless	85%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Bayer, 1978	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	58%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	2.2	USEPA, 1993	

References:

Bayer,R.D., 1978. Aspects of an Oregon estuarine great blue heron population; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

Kushlan, J.A., 1978. Feeding ecology of wading birds; In: Sprunt, A., J. Ogden, S. Winkler, eds. Wading Birds; Natl. Audubon Soc. Res. Rep. 7:213-217.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE 8-166
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : Mummichog / HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
MEDIUM: FISH
EXPOSURE MEDIUM: Mummichog
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Copper	7.0E-01	mg/kg	6.1E-02	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.5E-02	5.0E-03
Lead	1.5E-01	mg/kg	1.3E-02	mg/kg-d	1.6E+00	3.3E+00	mg/kg-d	7.9E-03	4.0E-03
Methyl Mercury	2.4E-03	mg/kg	2.1E-04	mg/kg-d	7.8E-03	7.8E-02	mg/kg-d	2.7E-02	2.7E-03
LPAH	1.5E-01	mg/kg	1.3E-02	mg/kg-d	-	-			
HPAH	1.1E-01	mg/kg	9.6E-03	mg/kg-d	-	-			
Dieldrin	1.0E-03	mg/kg	9.2E-05	mg/kg-d	7.1E-02	3.8E+00	mg/kg-d	1.3E-03	2.4E-05
Total DDx	7.8E-03	mg/kg	6.8E-04	mg/kg-d	2.8E-03	2.8E-02	mg/kg-d	2.4E-01	2.4E-02
Total PCBs	4.4E-02	mg/kg	3.9E-03	mg/kg-d	1.0E-01	4.0E-01	mg/kg-d	3.9E-02	9.7E-03
TEQ PCB-birds	8.1E-06	mg/kg	7.1E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	5.1E-01	5.1E-02
TEQ D/F-birds	1.3E-06	mg/kg	1.1E-07	mg/kg-d	1.4E-06	1.4E-05	mg/kg-d	8.0E-02	8.0E-03
							HAZARD INDICES:	9.2E-01	1.0E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table 8-165.
b. Reference Dose Values presented in Table 6-4. A dash indicates that no value is available.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE 8-167
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON
TOTAL RISK (HI): 2.2E+00

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
TCDD TEQ (D/F)		5.1E-02		2.6E-02	8.0E-02	1.6E-01	7%
Lead		2.2E-01		9.2E-04	7.9E-03	2.3E-01	***10%***
Total PCBs		4.5E-03		2.8E-02	3.9E-02	7.1E-02	3%
Mercury		1.3E-01		1.1E-02	2.7E-02	1.7E-01	8%
Copper		5.2E-02		2.2E-02	1.5E-02	8.9E-02	4%
Total DDx		4.5E-02		1.5E-01	2.4E-01	4.4E-01	***20%***
TCDD TEQ (PCBs)		1.0E-01		4.0E-01	5.1E-01	***1.0E+00***	***47%***
Dieldrin		3.4E-04		6.9E-04	1.3E-03	2.3E-03	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**6.0E-01**	**-**	**6.4E-01**	**9.2E-01**	**2.2E+00**	
PERCENTAGE OF TOTAL RISK		**28%**		**30%**	**43%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE 8-168
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED TRVs : HERON

Focused Feasibility Study - Ecological Risk Assessment
LOWER PASSAIC RIVER RESTORATION PROJECT
New Jersey

SCENARIO TIMEFRAME: FUTURE (2048)
EXPOSURE POINT: RME - Area of Focus
RECEPTOR: HERON
TOTAL RISK (HI): 3.4E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Lead		1.1E-01		4.6E-04	4.0E-03	1.1E-01	***33%***
Total PCBs		1.1E-03		6.9E-03	9.7E-03	1.8E-02	5%
Copper		1.8E-02		7.4E-03	5.0E-03	3.0E-02	9%
TCDD TEQ (D/F)		5.1E-03		2.6E-03	8.0E-03	1.6E-02	5%
Mercury		1.3E-02		1.1E-03	2.7E-03	1.7E-02	5%
Total DDx		4.5E-03		1.5E-02	2.4E-02	4.4E-02	***13%***
TCDD TEQ (PCBs)		1.0E-02		4.0E-02	5.1E-02	1.0E-01	***30%***
Dieldrin		6.4E-06		1.3E-05	2.4E-05	4.3E-05	0%
LPAH							
HPAH							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.6E-01**	**-**	**7.4E-02**	**1.0E-01**	**3.4E-01**	
PERCENTAGE OF TOTAL RISK		**47%**		**22%**	**31%**	**100%**	

Notes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.