Eighteenmile Creek Superfund Site
OU2 Supplemental RI/FS
Final Baseline Ecological Risk Assessment for Eighteenmile Creek
Operable Unit 2

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and

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List of Abbreviations and Acronyms

BERA	Baseline Ecological Risk Assessment
BSAF	biota sediment accumulation factors
BW	body weight
Canal	New York State Erie Canal
COPC	chemical of potential concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	conceptual site model
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
E & E	Ecology and Environment, Inc.
Eco-SSL	Ecological Soil Screening Levels
ED	exposure duration
EEEPC	Ecology and Environment Engineering, P.C.
EPA	(United States) Environmental Protection Agency
EPC	exposure point concentration
FF	floodplain forest
HPAH	high molecular weight PAH
HQ	Hazard Quotient
LOAEL	Lowest Observed Adverse Effect Level
LPAH	low molecular weight PAH
mg/kg	milligrams per kilogram
NHP	New York State Natural Heritage Program
NOAEL	No Observed Adverse Effect Level
NWI	National Wetlands Inventory
NYSDEC	New York State Department of Environmental Conservation

List of Abbreviations and Acronyms (cont.)

ORNL	Oak Ridge National Laboratory
OU2	Operable Unit 2
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
RI	Remedial Investigation
SLERA	Screening Level Ecological Risk Assessment
SSH	southern successional hardwood
SSL	soil screening levels
SUF	Site Use Factor
SVOC	semivolatile organic contaminant
TRV	toxicity reference value
TSC	tissue screening concentration
UCL	upper confidence limit
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
VOC	volatile organic contaminant

Executive Summary

As requested by the U.S. Environmental Protection Agency (EPA), Ecology and Environment, Inc. (E & E) prepared a Baseline Ecological Risk Assessment (BERA) for the Eighteenmile Creek Superfund Site (NYN000206456, the Site) Operable Unit 2 (OU2), Lockport, New York. The BERA is part of the Site Remedial Investigation/Feasibility Study (RI/FS) for OU2 (the OU2 site) and supports remedial decisions under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Superfund Amendments and Reauthorization Act of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan (EPA 1990). The BERA includes Step 3 to 7 of the eight-step ecological risk assessment process described in *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA 1997) and is consistent with other federal and state ecological risk assessment guidance. The BERA was conducted to identify a final list of Chemicals of Potential Concern (COPCs) for ecological receptors at the OU2 site and provide information that can be used to develop OU2 site-specific remedial goals for soil and sediment for use in the Feasibility Study (FS).

A Screening Level Ecological Risk Assessment (SLERA) for the OU2 site was prepared in July 2015 (E & E and LATA 2015) and a BERA Problem Formulation was prepared in December 2015 (E & E 2015). The BERA Problem Formulation concluded that ecological risks may be present at the OU2 site for several groups of ecological receptors, especially terrestrial vegetation, soil invertebrates, benthic macroinvertebrates, and wildlife that consume invertebrates from soil or sediment. The BERA Problem Formulation results indicated that additional sampling and testing was necessary to investigate bioaccumulation of contaminants from soil and sediment into invertebrates that reside in those media. That work was executed in January 2016 and the results were used to develop OU2 site-specific bioaccumulation factors and equations for key OU2 site-related contaminants, including polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), copper, lead, zinc, and selected legacy pesticides. The OU2 site-specific biota bioaccumulation factors and equations were incorporated into the BERA to better define exposure for invertivorous wildlife species.

Other changes that were made subsequent to the BERA Problem Formulation to better define ecological risks at the OU2 site include the following:

- **Use of More Conservative Toxicity Data for PCBs:** More-conservative toxicity reference values (TRVs) for PCBs for birds, mammals, and fish were incorporated into the BERA to ensure consistency with the TRVs used in EPA's *Draft Black River Site Ecological Risk Assessment* (EPA 2015a).
- **Use of Additional Soil and Sediment Data:** For the study conducted in January 2016, surface-soil and sediment samples were collected from the OU2 site and analyzed for metals, PCBs, and pesticides. Those data were incorporated into the existing Site database and used when calculating exposure point concentrations (EPCs) for soil and sediment.
- **Surface Soil Dataset Refinement:** For the BERA Problem Formulation report (E & E 2015), soil samples that were collected all or partially between 0 and 2 feet below ground surface (bgs) were used to estimate risks to terrestrial ecological receptors. In the BERA, potential risks to terrestrial ecological receptors are based on soil samples collected between 0 to 1 foot bgs. This change was made to be consistent with recent EPA guidance (EPA 2015b).
- **Additional Measures to Evaluate Risks to Fish:** To better estimate exposure and risk to fish from OU2 site-related contaminants, contaminant levels in forage fish and game fish collected from the OU2 site were compared with tissue screening concentrations (TSC) for effects in fish.

Because of these changes, the same wildlife assessment endpoints that were evaluated in the BERA Problem Formulation were included in the BERA to fully characterize OU2 site risks, especially with respect to PCBs. Table ES-1 lists the assessment endpoints, model species, risk questions, and measures used in the BERA.

A preliminary list of COPCs was provided in the BERA Problem Formulation report and included over 30 contaminants or contaminant groups with Hazard Quotients (HQs) greater than or equal to 1 for one or more assessment endpoints, including:

- Total PCBs;
- Selected metals (antimony, arsenic. barium, cadmium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc);
- High- and low-molecular-weight PAHs;
- Dioxins/furans;
- Selected pesticides (aldrin, beta-BHC, ΣDDT, dieldrin, delta-BHC, endosulfan I, endosulfan II, endosulfan sulfate, endrin, endrin aldehyde, endrin ketone, gamma-BHC [lindane], and heptachlor); and
- Selected semivolatile organic compounds (carbazole, dibenzofuran, 2-methylphenol, 4-methylphenol, and butyl benzyl phthalate).

These contaminants were re-evaluated in the BERA. The primary purpose of the BERA was to identify a final list of COPCs for ecological receptors at the OU2 site. Tables ES-2 and ES-3 provide a summary of COPCs by assessment endpoint based on the No Observed Adverse Effect Levels (NOAELs) and Lowest Observed Adverse Effect Levels (LOAELs), respectively, used in the BERA. For each assessment endpoint, contaminants were considered COPCs if the HQ equaled or exceeded 1, or if the contaminant was detected in site media and no toxicity information was available for that contaminant. Receptor-contaminant pairs that could not be assessed quantitatively for this reason are identified by an "x" in Tables ES-2 and ES-3. Some of these contaminants may be of concern.

Overall, the contaminants that resulted in the greatest HQs for the greatest number of receptors were total PCBs, copper, lead, and PAHs (see Tables ES-2 and ES-3). For example, copper and lead were found to pose a potential risk to terrestrial plants, soil invertebrates, benthos, and terrestrial and aquatic dependent wildlife (especially invertivorous species). Total PCBs were found to pose the greatest potential risk to aquatic-dependent receptors, with HQs that were several orders of magnitude greater than 1 for the swallow and bat, and one to two orders of magnitude greater than 1 for benthos.

Table ES-1 Assessment Endpoints, Representative Species, Risk Questions, and Measures Considered for the Baseline Ecological Risk Assessment (BERA) for Eighteenmile Creek OU2, Lockport, New York

Assessment Endpoint (Attribute)	Level of Organization	Representative Receptor	BERA Risk Question	BERA Measure	BERA Analysis Approach
TERRESTRIAL RECEPTORS					
Terrestrial Community Receptors					
Terrestrial vegetation (Survival, Growth, Reproduction [S, G, R])	Local Community	All plants that obtain nutrients primarily from soil	Are contaminant concentrations in surface soil greater than screening levels for effects on survival, growth, or reproduction of plants?	Surface-soil contaminant concentrations (95% UCL).	Compare surface-soil contaminant concentrations with literature-based soil screening levels for effects on plants.
Terrestrial invertebrates (S, G, R)	Local Community	All soil invertebrates (e.g., earthworms)	Are contaminant concentrations in surface soil greater than screening levels for effects on survival, growth, or reproduction of soil invertebrates?	Surface-soil contaminant concentrations (95% UCL).	Compare surface-soil contaminant concentrations with literature-based soil screening levels for effects on soil invertebrates.
Terrestrial Avian Receptors					
Terrestrial herbivorous birds (S, G, R)	Local Population	Mourning Dove	Does the daily dose of contaminants received from ingestion of soil and food items exceed TRVs for survival, growth, or reproduction of birds?	Measured contaminant concentrations in soil (95% UCL) and modeled concentrations in food items.	Modeled dose from ingestion of soil and food items compared with literature-based TRVs.
Terrestrial invertivorous birds (S, G, R)	Local Population	American robin	Does the daily dose of contaminants received from ingestion of soil and food items exceed TRVs for survival, growth, or reproduction of birds?	Measured contaminant concentrations in soil (95% UCL) and modeled concentrations in food items using site-specific BSAFs.	Modeled dose from ingestion of soil and food items compared with literature-based TRVs.
Terrestrial carnivorous birds (S, G, R)	Local Population	Red-shouldered hawk	Does the daily dose of contaminants received from ingestion of soil and food items exceed TRVs for survival, growth, or reproduction of birds?	Measured contaminant concentrations in soil (95% UCL) and modeled concentrations in food items.	Modeled dose from ingestion of soil and food items compared with literature-based TRVs.
Terrestrial Mammalian Receptors					
Terrestrial herbivorous mammals (S, G, R)	Local Population	Meadow vole	Does the daily dose of contaminants received from ingestion of soil and food items exceed TRVs for survival, growth, or reproduction of mammals?	Measured contaminant concentrations in soil (95% UCL) and modeled concentrations in food items.	Modeled dose from ingestion of soil and food items compared with literature-based TRVs.
Terrestrial invertivorous mammals (S, G, R)	Local Population	Short-tailed shrew	Does the daily dose of contaminants received from ingestion of soil and food items exceed TRVs for survival, growth, or reproduction of mammals?	Measured contaminant concentrations in soil (95% UCL) and modeled concentrations in food items using site-specific BSAFs.	Modeled dose from ingestion of soil and food items compared with literature-based TRVs.
Terrestrial carnivorous mammals (S, G, R)	Local Population	Weasel	Does the daily dose of contaminants received from ingestion of soil and food items exceed TRVs for survival, growth, or reproduction of mammals?	Measured contaminant concentrations in soil (95% UCL) and modeled concentrations in food items.	Modeled dose from ingestion of soil and food items compared with literature-based TRVs.

Table ES-1 Assessment Endpoints, Representative Species, Risk Questions, and Measures Considered for the Baseline Ecological Risk Assessment (BERA) for Eighteenmile Creek OU2, Lockport, New York

Assessment Endpoint (Attribute)	Level of Organization	Representative Receptor	BERA Risk Question	BERA Measure	BERA Analysis Approach
Terrestrial Reptiles					
Terrestrial Reptiles (S, G, R)	Local Population	Garter snake	None. Quantitative methods for evaluating the toxicity of contaminants to reptiles are poorly developed. Recommendation from BERA Problem Formulation was to exclude this Assessment Endpoint from the BERA. Risk estimates for wildlife are expected to be protective of reptiles, but this is an uncertainty.		
AQUATIC RECEPTORS					
Aquatic Community Receptors					
Benthic macroinvertebrates (S, G, R)	Local Community	Benthic macroinvertebrates	Are contaminant concentrations in sediment greater than screening levels for adverse effects on benthos?	Sediment contaminant concentrations (95% UCL).	Compare sediment contaminant concentrations with literature-based sediment screening levels for effects on benthic macroinvertebrates.
			Is sediment from OU2 toxic to laboratory-reared benthic macroinvertebrates?	Sediment bioassays with *Hyalella* and *Chironomus*	Compare organism survival and growth in OU2 site samples with reference area sample and laboratory control sample.
			Are contaminant concentrations in surface water greater than water quality criteria for protection of aquatic organisms?	Surface-water contaminant concentrations.	Compare surface-water contaminant concentrations with water quality criteria and standards.
Aquatic macrophytes (S, G, R)	Local Community	All freshwater aquatic plants	None. Recommendation from BERA Problem Formulation was to exclude this Assessment Endpoint from the BERA based on BERA Problem Formulation results (no surface water toxicity in surface water bioassays and no water quality criteria execcedances [except for aluminum, likely due to suspended solids in unfiltered samples]).		
Fish (S, G, R)	Local Community	Species present in habitat	Is surface water from OU2 toxic to fish?	Surface-water bioassay with fathead minnow larvae.	Compare fathead minnow survival and growth in OU2 surface water with reference area surface water.
			Are contaminant levels in fish collected from OU2 greater than fish tissue screening concentrations (TSCs)	Contaminant concentrations in individual forage fish and game fish collected from OU2.	Compare contaminant levels in individual fish from OU2 with TSCs for effects on fish.
			Are contaminant concentrations in surface water greater than water quality criteria for protection of aquatic organisms?	Surface-water contaminant concentrations.	Compare surface-water contaminant concentrations with water quality criteria and standards.
Other aquatic organisms (S, G, R)	Local Community	Invertebrates and amphibians	None. Recommendation from BERA Problem Formulation was to exclude this Assessment Endpoint from the BERA based on BERA Problem Formulation results (no surface water toxicity in surface water bioassays and no water quality criteria execcedances [except for aluminum, likely due to suspended solids in unfiltered samples]).		
Aquatic Mammalian Receptors					
Herbivorous mammals (S, G, R)	Local Population	Muskrat	Does the daily dose of contaminants received from ingestion of sediment and food items exceed TRVs for survival, growth, or reproduction of mammals?	Measured contaminant concentrations in sediment (95% UCL) and modeled concentrations in food items.	Modeled dose from ingestion of sediment and food items compared with literature-based TRVs.

Table ES-1 Assessment Endpoints, Representative Species, Risk Questions, and Measures Considered for the Baseline Ecological Risk Assessment (BERA) for Eighteenmile Creek OU2, Lockport, New York

Assessment Endpoint (Attribute)	Level of Organization	Representative Receptor	BERA Risk Question	BERA Measure	BERA Analysis Approach
Insectivorous mammals (S, G, R)	Local Population	Little Brown Bat	Does the daily dose of contaminants received from ingestion of food items exceed TRVs for survival, growth, or reproduction of mammals?	Measured contaminant concentrations in sediment (95% UCL) and modeled concentrations in food items using site-specific BSAFs.	Modeled dose from ingestion of food items compared with literature-based TRVs.
Piscivorous mammals (S, G, R)	Local Population	Mink	Does the daily dose of contaminants received from ingestion of sediment and food items exceed TRVs for survival, growth, or reproduction of mammals?	Measured contaminant concentrations in sediment (95% UCL) and measured concentrations (maximum) in OU2 forage fish.	Modeled dose from ingestion of sediment and food items compared with literature-based TRVs.
Aquatic Avian Receptors					
Herbivorous birds (S, G, R)	Local Population	Mallard	Does the daily dose of contaminants received from ingestion of sediment and food items exceed TRVs for survival, growth, or reproduction of birds?	Measured contaminant concentrations in sediment (95% UCL) and modeled concentrations in food items.	Modeled dose from ingestion of sediment and food items compared with literature-based TRVs.
Insectivorous birds (S, G, R)	Local Population	Swallow	Does the daily dose of contaminants received from ingestion of food items exceed TRVs for survival, growth, or reproduction of birds?	Measured contaminant concentrations in sediment (95% UCL) and modeled concentrations in food items using site-specific BSAFs.	Modeled dose from ingestion of food items compared with literature-based TRVs.
Piscivorous birds (S, G, R)	Local Population	Heron	Does the daily dose of contaminants received from ingestion of sediment and food items exceed TRVs for survival, growth, or reproduction of birds?	Measured contaminant concentrations in sediment (95% UCL) and measured concentrations (maximum) in OU2 forage fish.	Modeled dose from ingestion of sediment and food items compared with literature-based TRVs.
Aquatic Reptiles					
Aquatic-Dependent Reptiles (S, G, R)	Local Population	Painted turtle	None. Quantitative methods for evaluating the toxicity of contaminants to reptiles are poorly developed. Recommendation from BERA Problem Formulation was to exclude this Assessment Endpoint from the BERA. Risk estimates for wildlife are expected to be protective of reptiles, but this is an uncertainty.		

Key:
AE = Assessment Endpoint
BERA = Baseline Ecological Risk Assessment
BERA PF = Baseline Ecological Risk Assessment Problem Formulation
BSAF = Biota Soil (or Sediment) Accumulation Factor
EPA = Environmental Protection Agency
NYSDEC = New York State Department of Environmental Conservation
OU2 = Operational Unit 2 (Corridor Site)
(S, R, G) = Survival, growth, and reproduction
TRV = Toxicity Reference Value

Table ES-2 Summary of NOAEL-Based Hazard Quotients by Assessment Endpoint, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[b,c]	Assessment Endpoint and NOAEL-Based HQ[a]																	
						Terrestrial Wildlife[i]						Aquatic-Dependent Wildlife[j]						
	Plants[d]	Soil Fauna[e]	NYSDEC SCO[f]	Fish[g]	Benthos[h]	Robin	Shrew	Dove	Vole	Hawk	Weasel	Swallow	Bat	Mallard	Muskrat	Heron	Mink
Polychlorinated Biphenyls (PCBs)																		
Sum of Aroclors (ND = 0.5DL)		x	7		356	47	20				20	6,619	18,880	1	4	8	60
Metals																		
Aluminum																		
Antimony	6		x		3	x	6	x	3	x	2	x		x		x		
Arsenic	1		2															
Barium		1	1		x							2						
Beryllium					x	x		x		x		x		x		x		
Cadmium			2		2		1											
Chromium			2	2														
Cobalt			x															
Copper	20	18	28	2	15	4	4		1		1	6	4					
Iron					1													
Lead	10		19		22	8	4		1		1	3			1			
Manganese	4	2			2													
Mercury	8	23	13	1	8													
Methylmercury	--	--	--			--	--	--	--	--	--							3
Nickel	2		2		1	1	9											
Selenium	3						2						2					
Silver			2		1													
Thallium	3	x	x		x	x	60	x	1	x		x	3	x	3	x		
Vanadium			x		x							2						
Zinc	16	21	23	1	8													
Polycyclic Aromatic Hydrocarbons (PAHs)																		
HPAH sum	3	3	22		--		2		1			89	234		3			
LPAH sum	117	1	2		--													
Total PAHs	--	--	--		62	--	--	--	--	--	--	--	--	--	--	--	--	--
Other Semivolatile Organic Compounds (SVOCs)																		
2-Methylphenol	--	--	--		9	--	--	--	--	--	--	x		x		x		
4-Methylphenol	--	--	--		26	--	--	--	--	--	--	x		x		x		
Acetophenone	x	x	x		--	x	x	x	x	x	x	--	--	--	--	--	--	--
Benzyl butyl phthalate	x	x	x		18	x	x	x	x	x	x	x	x	x	x	x	x	x
Biphenyl (diphenyl)			x			x	x	x	x	x	x	x	x	x	x	x	x	x
Bis(2-ethylhexyl)phthalate	x	x	x															
Carbazole	2		x		6													
Dibenzofuran	2		x		20													
Di-n-butyl phthalate		x	x									--	--	--	--	--	--	--
Di-n-octylphthalate	x	x	x															
Phenol					229													
Pesticides																		
Aldrin		x			38	x		x		x		x		x		x		
alpha-BHC	x	x			2													
Endosulfan I	x	x	x		24													
beta-BHC	2	x			38								3					
Endosulfan II	x	x	x		13													
cis-Chlordane		x																
Σ DDT		x	56		4		1											
delta-BHC	x	x			10													
Dieldrin		x	3									1	4					
Endosulfan sulfate	x	x	x		19													
Endrin	2	x		3								1						
Endrin aldehyde	1	x	x			1												

Table ES-2 Summary of NOAEL-Based Hazard Quotients by Assessment Endpoint, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[b,c]	Assessment Endpoint and NOAEL-Based HQ[a]																	
						Terrestrial Wildlife[i]						Aquatic-Dependent Wildlife[j]						
	Plants[d]	Soil Fauna[e]	NYSDEC SCO[f]	Fish[g]	Benthos[h]	Robin	Shrew	Dove	Vole	Hawk	Weasel	Swallow	Bat	Mallard	Muskrat	Heron	Mink
Endrin ketone		x	x	--	2							6		--	--	--	--
gamma-BHC (lindane)		x			1												
Methoxychlor	x	x	x		2	x		x		x		x		x		x	
trans-Chlordane		x	x														
Dioxins/Furans																	
2,3,7,8-TCDD TEQ	x	x	x		51		10						5				

Key:
-- = not applicable
BERA = baseline ecological risk assessment
COC = contaminant of concern
HPAH = high molecular weight PAH
HQ = hazard quotient
LPAH = low molecular weight PAH
NYSDEC = New York State Department of Environmental Conservation
OU2 = Operable Unit 2
SLERA = screening level ecological risk assessment
TRV = toxicity reference value
Value (with or without shading) = HQ > or = 1.
x = chemical detected in site samples but no screening level or TRV is available. Possible COPC.

Notes:
a. Shading indicates magnitude of hazard quotient:

HQ	= > 1000
HQ	= 100 - 1000
HQ	= 10 - 100
HQ	= 1 - 10
	= < 1

b. Analytes detected in surface soil and sediment in recent OU2 site investigations are listed if frequency of detection was greater than 5% when a minimum of 20 samples were collected.
c. Essential nutrients (calcium, magnesium, sodium, and potassium) and major soil /sediment constitutes (aluminum) were excluded from the evaluation as per USEPA guidance (USEPA 1989, 2003a).
d. Based on comparing surface soil EPCs with soil screening levels for effects on plants (see Table 4-1).
e. Based on comparing surface soil EPCs with soil screening levels for effects on earthworms (see Table 4-2).
f. Based on comparing surface soil EPCs with NYSDEC soil clean-up goals for protection of ecological resources (see Table 4-3).
g. Maximum HQ (fish contaminant concentration / tissue screening concentrations) in forage or game fish (see Table 4-14 and 4-15).
h. Based on comparing surface sediment EPCs with sediment screening levels for effects on benthic macroinvertebrates (see Table 4-4a).
i. HQs for American robin (Table 4-24), short-tailed shrew (Table 4-25), mourning dove (Table 4-26), meadow vole (Table 4-27), red-shouldered hawk (Table 4-28), and long-tailed weasel (Table 4-29).
h. HQs for tree swallow (Table 4-30), little brown bat (Table 4-31), mallard (Table 4-32), muskrat (Table 4-33), great blue heron (Table 4-34), and mink (Table 4-35).

Table ES-3 Summary of LOAEL-Based Hazard Quotients by Assessment Endpoint, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[b,c]	Assessment Endpoint and LOAEL-Based HQ[a]																
						Terrestrial Wildlife[i]						Aquatic-Dependent Wildlife[j]					
	Plants[d]	Soil Fauna[e]	NYSDEC SCO[f]	Fish[g]	Benthos[h]	Robin	Shrew	Dove	Vole	Hawk	Weasel	Swallow	Bat	Mallard	Muskrat	Heron	Mink
Polychlorinated Biphenyls (PCBs)																	
Sum of Aroclors (ND = 0.5DL)		x	7		36	5	2				2	662	1,888	1			6
Metals																	
Aluminum																	
Antimony	6		x			x		x		x		x		x		x	
Arsenic	1		2														
Barium		1	1		3							1					
Beryllium					x	x		x		x		x		x		x	
Cadmium			2														
Chromium			2														
Cobalt			x														
Copper	20	18	28	2	3	3	3		1		1	5	3				
Iron																	
Lead	10		19		6	7	3				1	3			1		
Manganese	4	2															
Mercury	8	23	13	1	2												
Methylmercury	--	--	--			--	--	--	--	--	--						
Nickel	2		2				6										
Selenium	3						2						1				
Silver			2														
Thallium	3	x	x		x	x	6	x		x		x		x		x	
Vanadium			x									2					
Zinc	16	21	23	1	2												
Polycyclic Aromatic Hydrocarbons (PAHs)																	
HPAH sum	3	3	22		--							9	47				
LPAH sum	117	1	2		--												
Total PAHs	--	--	--		7	--	--	--	--	--	--	--	--	--	--	--	--
Other Semivolatile Organic Compounds (SVOCs)																	
2-Methylphenol	--	--	--		4	--	--	--	--	--	--	x		x		x	
4-Methylphenol	--	--	--			--	--	--	--	--	--	x		x		x	
Acetophenone	x	x	x		--	x	x	x	x	x	x	--	--	--	--	--	--
Benzyl butyl phthalate	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x
Biphenyl (diphenyl)			x			x	x	x	x	x	x	x	x	x	x	x	x
Bis(2-ethylhexyl)phthalate	x	x	x														
Carbazole	2		x		6												
Dibenzofuran	2		x		20												
Di-n-butyl phthalate		x	x									--	--	--	--	--	--
Di-n-octylphthalate	x	x	x														
Phenol	--	--	--		1	--	--	--	--	--	--						
Pesticides																	
Aldrin		x				x		x		x		x		x		x	
alpha-BHC	x	x															
Endosulfan I	x	x	x		1												
beta-BHC	2	x															
Endosulfan II	x	x	x														
cis-Chlordane		x															
Σ DDT		x	56														
delta-BHC	x	x															
Dieldrin		x	3										2				
Endosulfan sulfate	x	x	x														
Endrin	2	x		3													
Endrin aldehyde	1	x	x														

Table ES-3 Summary of LOAEL-Based Hazard Quotients by Assessment Endpoint, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[b,c]	Assessment Endpoint and LOAEL-Based HQ[a]																	
						Terrestrial Wildlife[i]						Aquatic-Dependent Wildlife[j]						
	Plants[d]	Soil Fauna[e]	NYSDEC SCO[f]	Fish[g]	Benthos[h]	Robin	Shrew	Dove	Vole	Hawk	Weasel	Swallow	Bat	Mallard	Muskrat	Heron	Mink
Endrin ketone		x	x											--	--	--	--
gamma-BHC (lindane)		x															
Methoxychlor	x	x	x		2	x		x		x		x		x		x	
trans-Chlordane		x	x														
Dioxins/Furans																	
2,3,7,8-TCDD TEQ	x	x	x		2												

Key:
-- = not applicable
BERA = baseline ecological risk assessment
COPC = contaminant of concern
HPAH = high molecular weight PAH
HQ = hazard quotient
LPAH = low molecular weight PAH
NYSDEC = New York State Department of Environmental Conservation
OU2 = Operable Unit 2
SLERA = screening level ecological risk assessment
TRV = toxicity reference value
Value (with or without shading) = HQ > or = 1.
x = chemical detected in site samples but no screening level or TRV is available. Possible COPC.

Notes:
a. Shading indicates magnitude of hazard quotient:

HQ	= > 1000
HQ	= 100 - 1000
HQ	= 10 - 100
HQ	= 1 - 10
	= < 1

b. Analytes detected in surface soil and sediment in recent OU2 site investigations are listed if frequency of detection was greater than 5% when a minimum of 20 samples were collected.
c. Essential nutrients (calcium, magnesium, sodium, and potassium) and major soil /sediment constitutes (aluminum) were excluded from the evaluation as per USEPA guidance (USEPA 1989, 2003a).
d. Based on comparing surface soil EPCs with soil screening levels for effects on plants (see Table 4-1).
e. Based on comparing surface soil EPCs with soil screening levels for effects on earthworms (see Table 4-2).
f. Based on comparing surface soil EPCs with NYSDEC soil clean-up goals for protection of ecological resources (see Table 4-3).
g. Maximum HQ (fish contaminant concentration / tissue screening concentrations) in forage or game fish (see Table 4-14 and 4-15).
h. Based on comparing surface sediment EPCs with sediment screening levels for effects on benthic macroinvertebrates (see Table 4-4b).
i. HQs for American robin (Table 4-24), short-tailed shrew (Table 4-25), mourning dove (Table 4-26), meadow vole (Table 4-27), red-shouldered hawk (Table 4-28), and long-tailed weasel (Table 4-29).
h. HQs for tree swallow (Table 4-30), little brown bat (Table 4-31), mallard (Table 4-32), muskrat (Table 4-33), great blue heron (Table 4-34), and mink (Table 4-35).

1 Introduction

This report presents a draft Baseline Ecological Risk Assessment (BERA) for the Eighteenmile Creek Superfund Site (NYN000206456, the Site) Operable Unit 2 (OU2), Lockport, New York. The BERA was prepared by Ecology and Environment, Inc. (E & E) for the United States Environmental Protection Agency (EPA) and United States Army Corps of Engineers (USACE)–Kansas City District under USACE Contract Number W912DQ-11-D-3006 and Delivery Order Number 0009. The BERA is part of the Site Remedial Investigation/Feasibility Study (RI/FS) for OU2 (the OU2 site) and supports remedial decisions under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Superfund Amendments and Reauthorization Act of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan (EPA 1990). The BERA was conducted to identify Chemicals of Potential Concern (COPCs) for ecological receptors at the OU2 site and provide information that can be used to develop OU2 site-specific remedial goals for soil and sediment for use in the Feasibility Study (FS).

The BERA includes Step 3 to 7 of the eight-step ecological risk assessment process described in *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA 1997). The BERA also is consistent with other notable federal and state ecological risk assessment guidance documents including:

- Guidelines for Ecological Risk Assessment (EPA 1998);
- Wildlife Exposure Factors Handbook (EPA 1993);
- Guidance for Developing Ecological Soil Screening Levels (EPA 2005a, 2007i); and
- Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (New York State Department of Environmental Conservation [NYSDEC] 1994).

In addition to the above-mentioned state and federal guidance documents, this assessment also utilizes publications from Oak Ridge National Laboratory (ORNL) and recent articles from the peer-reviewed literature, as appropriate.

The remainder of this section is organized as follows:

- **Section 2** describes the OU2 site and its ecological resources;
- **Section 3** presents a refined problem formulation and ecological effects evaluation;
- **Section 4** presents refined exposure estimates and risks calculations;
- **Section 5** identifies and discusses sources of uncertainty in the BERA;
- **Section 6** presents a summary of COPCs;
- **Section 7** contains references used in this report.

2 Site Location and Description

The Eighteenmile Creek is located in the city of Lockport, Niagara County, New York (see Figure 2-1). The OU2 site includes the channel and riparian zone of the creek for the first 3,000 feet downstream from the New York State Erie Canal (Canal) and four former commercial/industrial properties adjacent to the creek: (1) White Transportation Property; (2) former United Paperboard Company Property; (3) Upson Park; and (4) former Flintkote Plant Property. The former commercial/industrial properties are described in the Remedial Investigation (RI) completed by NYSDEC for the Eighteenmile Creek corridor (NYSDEC 2006; Ecology and Environment Engineering, P.C. [EEEPC] 2009) and the separate site investigation completed by NYSDEC and Niagara County on the former Flintkote Plant Property (TVGA Consultants 2005). This section describes only the ecological characteristics of the OU2 site.

2.1 Site Maps

Figure 2-1 shows the topography of the OU2 site and surrounding area. The OU2 site lies at the border of two relatively flat plains (the Ontario and Huron plains) that are separated by the Niagara Escarpment, which runs east-to-west along the northern portion of the city of Lockport (see Figure 2-1). Eighteenmile Creek flows northward through the OU2 site and eventually into Lake Ontario. Primarily urban, commercial, and residential land uses are within 2 miles of the OU2 site. Ecological community types on and near the OU2 site are shown on Figure 2-2 and described below. Wetlands and surface water features on and near the OU2 site are shown on Figures 2-3 and 2-4.

2.2 Description of Fish and Wildlife Resources

2.2.1 Ecological Community Types

Figure 2-2 shows community types based on Edinger et al. (2002) that occur at the OU2 site. The community types were identified by an E & E ecologist during a site visit in October 2007. Three natural community types were identified on the OU2 site: headwater stream, successional southern hardwoods, and floodplain forest/successional southern hardwoods (see Figure 2-2). No significant or unique habitats were among them. These community types are described below.

2.2.1.1 Headwater Streams

Eighteenmile Creek has the characteristics of a headwater stream within the OU2 site. The East Branch near the Canal and White Transportation property has high flow, water depth of 1 to 3 feet at mid-channel, and rocky bottom. Building ruins

are present near the headwaters of the East Branch and the creek is channelized in this area. The source of water to this branch is a mixture of Eighteenmile Creek water from upstream of the Canal and Canal water (via a spillway during high-water conditions and a plug during low-water conditions in the Canal). The banks of the East Branch are forested and sloped, making access to the creek channel difficult in most places.

The West Branch of Eighteenmile Creek also has the characteristics of a headwater stream, including moderate to high flow velocity in most places and a bottom composed of cobble, gravel, and sand. Water depth ranged from 0.5 to 2 feet at the time of the Site visit (October 2007). The channel of the West Branch is 15 to 20 feet wide in most places. The water in the West Branch originates from a dry dock on the north side of the Canal. The gate between the dry dock and barge canal leaks; thus, water from the Canal was able to enter the West Branch through the dry dock. Similar to the East Branch, the banks of the West Branch are forested and steep, making access to the creek channel difficult in most places.

The east and west branches of Eighteenmile Creek merge immediately upstream of Clinton Street and then flow north beneath Clinton Street into Mill Pond on the former United Paperboard Company property (see Figure 2-2). Mill Pond is formed by a concrete dam, known as the Clinton Street Dam that was constructed across the creek channel approximately 500 feet downstream of Clinton Street. At the time of the Site visit, the pool behind the dam was full and water was flowing through the dam via a partly open gate. Downstream of the dam, the creek channel is a series of rapidly flowing riffles and runs with a section of slower flow near the former Flintkote Plant Property. Near the former Flintkote Plant Property, the creek channel splits and flows around an island. Approximately 95% of the flow follows the channel on the west side of the island, with approximately 5% following the millrace on the east side of the island. The flow through the millrace was further reduced by a concrete blockage installed by the EPA during demolition of the former Flintkote Plant Property as part of the OU1 remedy. Most of the riparian zone of the creek downstream of Clinton Street is forested.

2.2.1.2 Successional Southern Hardwoods

The wooded area situated between Clinton Street and the Canal at the southwest end of the OU2 site is best described as southern successional hardwoods (SSH; see Figure 2-2). This cover type is a hardwood or mixed forest that occurs on sites that have been cleared or otherwise disturbed. According to Edinger et al. (2002), this is a broadly defined cover type and several seral and regional variants are known. The dominant tree species present at the OU2 site in this cover type include box elder (*Acer negundo*), black locust (*Robinia pseudoacacia*), tree-of-heaven (*Ailanthus altissima*), and Norway maple (*Acer negra*).

2.2.1.3 Floodplain Forest/Successional Southern Hardwoods

The riparian zone of the creek is best described as a combination of floodplain forest (FF) and SSH, depending on slope and elevation (see Figure 2-2). Low-lying areas near the creek channel are best characterized as FF, whereas areas fur-

ther from the channel at a somewhat higher elevation are best characterized as SSH. According to Edinger et al. (2002), the FF cover type occurs on mineral soils on low terraces of river floodplains and deltas. This cover type is characterized by its flooding regime (low areas are annually flooded in spring and high areas are flooded irregularly) and is quite variable and may be diverse. Dominant tree species present at the OU2 site in the FF/SSH cover type include cottonwood (*Populus deltoides*), willow (*Salix* spp.), silver maple (*Acer saccharinum*), box-elder, black locust, tree-of-heaven, and Norway maple. Common understory species in the FF/SSH cover type include poison ivy *(Toxicodendron radicans*), grapevines (*Vitis* spp.), raspberry (*Rubus* spp.), and white snakeroot (*Ageratina altissima*). Burdock (*Arctium* spp.), sumac (*Rhus* spp.), and goldenrod (*Solidago* spp.) were observed in areas where the canopy of the riparian zone was incomplete or lacking. Near the downstream end of the OU2 site, Japanese knotweed *(Polygonum cuspidatum*) was observed next to the Creek Channel in places.

2.2.2 Wetlands

Figures 2-3 and 2-4 show federal- and state-designated wetlands near the OU2 site. According to the National Wetlands Inventory (NWI), two reaches of Eighteenmile Creek within the study area are considered palustrine, permanently flooded, diked/impounded wetlands (PUBHh; see Figure 2-3). These two reaches are: (1) the Mill Street Pond that lies upstream of the Clinton Street Dam and (2) a portion of Eighteenmile Creek near the former Flintkote Plant Property, where the flow becomes slower and the channel widens before the creek flows through conduits under Williams Street. No state-designated wetlands lie within the OU2 site (see Figure 2-4). Figures 2-3 and 2-4 show that several federal- and state-designated wetlands are located beyond the OU2 site boundary but within 2 miles of the OU2 site. In particular, several large wetlands are located along the channel of Eighteenmile Creek downstream of the OU2 site (see Figures 2-3 and 2-4). These wetlands could potentially be affected by downstream transport of OU2 site-related contaminants.

2.2.3 Special Concern Species

2.2.3.1 State Listed Species

In July 2015, the New York State Natural Heritage Program (NHP) was contacted for information on species and habitats of concern in the OU2 site vicinity. The NHP indicated the following:

- The brindled madtom (*Noturus miurus*), a rare fish in New York State, has been collected from the Canal in Lockport, New York;
- Two miles to the northwest of the OU2 site, pawpaw (*Asimina triloba*) and yellow giant-hyssop (*Agastache nepetoides*), two plants listed by New York State as threatened, have been documented; and
- The northern harrier (*Circus cyaneus*, listed as threatened) has been documented in the area 2 miles to the east of the OU2 site.

The response letter from the NHP is included in Appendix A. None of the aforementioned species have been observed at the OU2 site by E & E personnel, but their possible presence there cannot be entirely ruled out.

2.2.3.2 Federally Listed Species

Information on federally listed species in Niagara County was obtained from the United States Fish and Wildlife Service (USFWS) website (http://ecos.fws.gov/tess_public/reports/species-by-current-range-county?fips=36063). The USFWS indicated that the northern long-eared bat (*Myotis septentrionalis*) is listed as threatened in Niagara County. The northern long-eared bat is found across much of the eastern and north central United States and all Canadian provinces from the Atlantic coast west to the southern Northwest Territories and eastern British Columbia. The range of this species includes 37 states, including New York State. White-nose syndrome, a fungal disease known to affect bats, is currently the predominant threat to this bat, especially throughout the Northeast where the species has declined by up to 99% from pre-white-nose syndrome levels at many hibernation sites. No northern long-eared bats were observed at the OU2 site by E & E personnel during recent field activities; however, their presence there cannot be ruled out.

2.2.4 Value to Ecological Receptors

Eighteenmile Creek provides habitat for fish, benthic invertebrates, and other aquatic life. The riparian zone of the creek provides habitat for small- to medium-sized mammals, songbirds, and other wildlife. Wildlife and evidence of wildlife observed at the OU2 site by E & E personnel include a blue heron (*Ardea herodias*), black-capped chickadee (*Poecilie atricapilla*), other songbirds, and tracks of white-tail deer (*Odocoileus virginianus*). Photographs of aquatic and riparian habitats and other features of the OU2 site are provided in Appendix G.

3 BERA Problem Formulation and Ecological Effects Evaluation

3.1 BERA Problem Formulation

Problem formulation is the first step in the risk assessment process and identifies the goals, breadth, and focus of the assessment (EPA 1997, 1998). The problem formulation step identifies OU2 site-related contaminants, contaminated media, potential ecological receptors, and potential exposure pathways. A conceptual site model (CSM) is then developed to summarize the relationship between contaminant sources, transport pathways, routes of exposure, and potential ecological receptors. Lastly, assessment endpoints and measures (previously called measurement endpoints) are developed to guide the remaining steps of the risk assessment process. A refined problem formulation and CSM for the OU2 site were presented in the BERA Problem Formulation (E & E 2015). Both were carried forward into the BERA without revision.

3.1.1 Contaminant Sources

High concentrations of polychlorinated biphenyls (PCBs) and metals in sediment from Eighteenmile Creek within the OU2 site and the millrace adjacent to the former Flintkote Plant Property were found during previous investigations (EEEPC 2009 and/or NYSDEC 2006). PCB-contaminated sediment in the Canal immediately upstream of Eighteenmile Creek and PCB-contaminated fill at Upson Park and the former United Paperboard Company property; and metals-contaminated fill at Upson Park, the White Transportation property, the former United Paperboard Company property, and the former Flintkote Plant Property also were found. The ultimate sources of the PCBs and metals likely are historic industrial and commercial activities on and near the OU2 site.

3.1.2 Site-Related Contaminants

The principal contaminants found in Eighteenmile Creek sediment by NYSDEC (2006) were PCBs, copper, lead, and zinc. Greater than 50% of the sediment samples collected from the creek by NYSDEC (2006) exceeded sediment quality benchmarks for these contaminants. PCBs, copper, lead, and zinc also were detected at elevated levels in sediment and floodplain soil samples collected by EEEPC (2009). In addition, samples collected by EEEPC (2009) also contained polycyclic aromatic hydrocarbons (PAHs) and organochlorine pesticides. Finally, the BERA Problem Formulation (E & E 2015) concluded that PCBs, copper, lead,

zinc, PAHs, pesticides, and other contaminants were COPCs for one or more groups of ecological receptors at the OU2 site.

3.1.3 Ecological Receptors

Based upon data gathered, the following groups of ecological receptors have the potential to be exposed to chemical contamination at the OU2 site:

- Plants and soil invertebrates living in the riparian zone of the creek;
- Mammals, birds, and reptiles that use the creek and its riparian zone to satisfy their food and habitat needs; and
- Aquatic organisms (fish, amphibians, benthic invertebrates, and aquatic plants) in the Creek.

3.1.4 Conceptual Site Model

Potential receptors and exposure pathways are summarized in the CSM shown in Figure 3-1. Terrestrial plants and soil invertebrates may be exposed to OU2 site-related chemicals by direct contact with contaminated soil and bioaccumulation of chemicals from soil. Birds, mammals, and reptiles that use the OU2 site may be exposed to OU2 site-related chemicals by incidental ingestion of contaminated soil and sediment, consumption of contaminated food items, and consumption of contaminated water. However, for wildlife, consumption of contaminated surface water typically accounts for only a minor fraction of total exposure. Direct contact with contaminated soil, sediment, and water also is considered a minor route of exposure for birds, mammals, and reptiles due to the protection provided by their external coverings (i.e., fur, feathers, and scales). Fish, amphibians, and benthic invertebrates using the creek may be affected by direct contact with contaminated water and sediment and ingestion of contaminated water, sediment, and food items. Aquatic plants may be exposed to OU2 site-related contaminants in contaminated surface water and sediment.

3.1.5 Assessment and Measurement Endpoints

Based on the ecological CSM and BERA Problem Formulation results, assessment endpoints, representative species, risk questions, and measures were selected for the BERA for the OU2 site (see Table 3-1). In total, four community-level assessment endpoints and 12 population-level assessment endpoints were selected. These assessment endpoints are:

Community-Level Assessment Endpoints

- Terrestrial plants;
- Soil invertebrates;
- Benthic macroinvertebrates; and
- Fish.

Population-Level Assessment Endpoints

- Terrestrial herbivorous birds;
- Terrestrial invertivorous birds;
- Terrestrial carnivorous birds;
- Terrestrial herbivorous mammals;
- Terrestrial invertivorous mammals;
- Terrestrial carnivorous mammals;
- Aquatic-dependent herbivorous birds;
- Aquatic-dependent insectivorous birds;
- Aquatic-dependent piscivorous birds;
- Aquatic-dependent herbivorous mammals;
- Aquatic-dependent insectivorous mammals; and
- Aquatic-dependent piscivorous mammals.

The community-level assessment endpoints were evaluated by comparing contaminant concentrations in soil, sediment, and surface water with media screening levels (see Table 3-1, last column). In addition, surface water and sediment bioassays were conducted in May 2015 to provide an additional measure for the benthic and aquatic community assessment endpoints. The wildlife population-level assessment endpoints were evaluated by calculating Hazard Quotients (HQs; see Table 3-1, last column). Representative wildlife model species for the population-level assessment endpoints are listed in Table 3-1 (third column). The wildlife species selected for evaluation are common in western New York State and are expected to be present at the OU2 site. Terrestrial and aquatic reptiles are called out in the CSM and listed as an assessment endpoint in Table 3-1; however, because toxicity data for reptiles are not available, a quantitative assessment of potential risks to reptiles from OU2 site-related contaminants cannot be undertaken. Risk estimates for birds and mammals may be protective of reptiles, but this is an uncertainty, and is discussed in the uncertainty section.

It should be noted that the BERA Problem Formulation recommended not evaluating many of the above-mentioned wildlife assessment endpoints in the BERA, including:

- Terrestrial herbivorous birds;
- Terrestrial carnivorous birds;
- Terrestrial herbivorous mammals;
- Terrestrial carnivorous mammals;
- Aquatic-dependent herbivorous mammals;

- Aquatic-dependent piscivorous mammals;
- Aquatic-dependent herbivorous birds; and
- Aquatic dependent piscivorous bird.

This recommendation was made because potential risks to these assessment endpoints were found to be negligible during BERA Problem Formulation. However, more-conservative toxicity reference values (TRVs) for PCBs for birds and mammals were adopted for the BERA to ensure consistency with the *Draft Black River Site Ecological Risk Assessment* (EPA 2015a). Also, additional surface-soil and sediment data were collected subsequent to BERA Problem Formulation. For these reasons, all wildlife assessment endpoints were included in the BERA to fully characterize potential OU2 site risks, especially with respect to PCBs.

Additionally, two community-level assessment endpoints evaluated in the BERA Problem Formulation were not retained for evaluation in the BERA: (1) aquatic macrophytes, and (2) other aquatic organisms, including aquatic invertebrates and larval amphibians. Potential risks to these assessment endpoints appear minimal based on available data. Specifically, no toxicity was observed in surface water bioassays conducted with OU2 site surface water, and contaminant levels in OU2 site surface water did not exceed chronic water quality criteria, except for total aluminum, likely due to suspended solids in the unfiltered samples submitted for analysis.

3.1.6 Data Sources for the BERA Problem Formulation

Existing data collected over approximately the past 10 years were used for the OU2 BERA Problem Formulation (see list of investigations in E & E and LATA 2014a). Additional data were collected to fill the identified data gaps and prepare the BERA for the OU2 site. The additional field investigations, completed in 2014 to 2016, are described fully in the OU2 supplemental RI report (E & E 2016). In May 2015, supplemental analysis of surface water and sediment from the OU2 site and a reference area for site-related contaminants and toxicity was undertaken, and forage fish were collected and analyzed for contaminants (see Appendices D and E for toxicity testing reports). In January 2016, sediment and surface-soil samples from the OU2 site were collected and submitted for chemical analysis and bioaccumulation testing. The resulting data were used to develop site-specific biota sediment/soil accumulation factors (BSAFs) or bioaccumulation equations and used in the BERA to estimate exposure of invertivorous wildlife to contaminants in sediment and soil (see Appendix C for further details).

All the recent and historical data were evaluated for data usability, validated, and compiled in a database. Data usability worksheets are provided as in Appendix D of the OU2 supplemental RI report (E & E 2016). The BERA used analytical data for surface soil (0 to 1 foot below ground surface), surface sediment (0 to 6 inches below the sediment water interface), and surface water. It should be noted that the surface water data available for use in the BERA Problem Formulation was limited (four samples) because past OU2 site investigations were focused on

evaluating the extent of contamination in soil and sediment. Also, not all parameters were analyzed regularly in all samples. For example, analytical data for dioxins/furans is limited to two samples each for surface sediment and surface soil. Numbers of samples for all parameters are provided in the media screening tables in Section 4.

3.2 Ecological Effects Evaluation

Media screening levels and wildlife TRVs used in the OU2 Screening Level Ecological Risk Assessment (SLERA) are described in this section.

3.2.1 Media Screening Levels

Media screening levels were identified for inorganic and organic analytes detected in soil, sediment, and/or surface water in recent OU2 site investigations, including sampling conducted in May 2015 and January 2016, EEEPC (2009), NYSDEC (2006), TVGA Consultants (2005), and other reports reviewed during evaluation of existing data for the OU2 site (E & E and LATA 2014b). Media screening levels selected for use in the OU2 BERA and their sources are described below by media. These media screening values were used previously in the SLERA and BERA Problem Formulation reports and found to be acceptable to EPA.

3.2.1.1 Surface Soil

For contaminants in surface soil, separate screening levels for terrestrial plants and soil fauna were identified. EPA Ecological Soil Screening Levels (Eco-SSLs) were used preferentially. If an Eco-SSL was not available for a given contaminant, a screening level was taken from another reputable source, such as Efroymson et al. (1997a, b), Los Alamos National Laboratory (2012), or National Park Service (NPS 2014). The soil screening values for plants and soil fauna used in the BERA and their sources are included in the media screening tables in Section 4.

PAHs in soil were summed into low- and high-molecular weight groups for evaluation, consistent with EPA (2007g). The concentration of low molecular weight PAHs (LPAHs) in a sample were calculated as the sum of acenaphthene, acenaphthylene, anthracene, fluorene, methyl-naphthalene, naphthalene, and phenanthrene. The concentration of high molecular weight PAHs (HPAHs) in a sample were calculated as the sum of benzo(a)anthracene, total benzofluoranthenes, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene.

For terrestrial birds and mammals, COPCs were identified by calculating HQs, rather than using soil screening levels (SSLs). Hence, the Eco-SSLs for birds and mammals were not used in the OU2 BERA. Wildlife TRVs that were used in the OU2 BERA are presented in Section 3.2.2.

Contaminant concentrations in surface soil also were compared with NYSDEC Restricted Use Soil Cleanup Objectives for Protection of Ecological Resources from Table 375-6.8(b) of Subpart 375-6: Remedial Program Soil Cleanup Objec-

tives (http://www.dec.ny.gov/regs-/15507.html#15515). The values are listed in the soil-screening tables discussed in Section 4.2. The NYSDEC soil cleanup objectives are risk-based concentrations for ecological receptors exposed to soil (receptor not always specified), background soil concentrations (when the risk-based concentration was less than background), or quantitation limits (when the risk-based concentration was less than the quantitation limit).

3.2.1.2 Sediment

For sediment, low-effect screening levels for protection of benthic macroinvertebrates were taken preferentially from NYSDEC (2014). If a screening level for a given contaminant was not available from NYSDEC (2014), other reputable sources were consulted, including NPS (2014), Buchman (2008), MacDonald et al. (1999), Persaud et al. (1993), and Long and Morgan (1991). The values used in the OU2 BERA and their sources and basis are listed in the sediment screening table discussed in Section 4.3. The following points are noteworthy:

- The sediment screening levels used in the OU2 BERA Problem Formulation are based on protection of benthos, not other ecological receptor groups.
- No bioaccumulation-based sediment screening levels were used. Potential risks to wildlife from bioaccumulative contaminants were evaluated herein by calculating HQs, as noted in Section 3.1.5 and Table 3-1.
- Both low-effect level and severe-effect level benchmarks were used. NYSDEC (2014) and others use a two-benchmark system to divide aquatic sediment into three general risk categories: no risk, uncertain risk, and likely risk. NYSDEC refers to the low and severe effect level benchmarks as Class A and Class C standards, respectively.
- PAHs in sediment were summed into a single value for total PAHs and compared with the low-effect level and severe-effect level benchmarks for total PAHs from NYSDEC (2104).

3.2.1.3 Surface Water

Surface water contaminant data for the OU2 site are limited to four samples because past OU2 site investigations were focused on evaluating soil and sediment contamination. The samples were analyzed for a wide range of contaminants, including PCBs, semivolatile organic contaminants (SVOCs), metals, and volatile organic contaminants (VOCs). Only metals were detected in the samples. Screening levels for the detected metal were taken from NYSDEC (1998), MacDonald et al. (1999), Suter and Tsao (1996), and EPA (2015c). The values are listed in the surface water screening table discussed in Section 4.4.

3.2.2 Wildlife Toxicity Reference Values

Chronic No Observed Adverse Effect Levels (NOAELs) and Lowest Observed Adverse Effect Levels (LOAELs) for effects on reproduction, survival, or growth were used to calculate HQs for wildlife in the OU2 BERA Problem Formulation. Chronic NOAELs and LOAELs were taken preferentially from the EPA Eco-SSL reports (EPA 2005b-j, 2006, 2007a-h, 2008). Chronic NOAELs and LOAELs for

contaminants not addressed by the EPA Eco-SSL reports were taken from Sample et al. (1996), NYSDEC (2002 and references therein), and other reputable sources. NOAELs and LOAELs for PCBs were taken from the *Draft Black River Site Ecological Risk Assessment* to ensure consistency with that assessment (EPA 2015a). The NOAELs and LOAELs used in the OU2 BERA are provided in Table 4-6. The following points are noteworthy:

- PAHs were summed into low- and high molecular weight groups for evaluation, consistent with EPA (2007g);
- PCBs were evaluated as total PCBs (sum of congeners or Aroclors); and
- Dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethane (DDD), and dichlorodiphenyldichloroethylene (DDE) were summed and evaluated using the avian and mammalian NOAELs and LOAELs for DDT and metabolites from EPA (2007h).

Allard et al. (2009) concluded that it is inappropriate to adjust chronic TRVs to account for differences in body weight between the test species and wildlife species being evaluated. Hence, test species and test-species body weights are not listed in Table 4-6.

4 Exposure Estimates and Risk Calculation

Exposure estimates and risk calculations are presented below for the terrestrial-plant community (Section 4.1), soil-invertebrate community (Section 4.2), benthic-macroinvertebrate community (Section 4.3), fish (Section 4.4) and representative terrestrial and aquatic-dependent wildlife receptors (Section 4.5).

Exposure point concentrations (EPCs) for contaminants in surface soil (0 to 12 inches below ground surface) and surface sediment (0 to 6 inches below the sediment-water interface) were calculated from the available data using ProUCL version 5 software. ProUCL version 5 also was used for outlier analysis and to examine data distributions. For contaminant datasets with no outliers, the 95% upper confidence limit (UCL) on the average concentration was used as the EPC. For datasets with outliers, the weighted average of the 95% UCL and outliers was used as the EPC. Appendix F provides a summary of the ProUCL output for soil and sediment, including the 95% UCL for each dataset, outliers for each dataset, and calculation of the weighted average of the 95% UCL and outliers for datasets with outliers. Because sample size was limited for surface water and fish tissue, 95% UCLs were not calculated for these media. Instead, the maximum detected concentration was used as the EPC.

4.1 Terrestrial Plant Community

COPCs for the terrestrial-plant community at the OU2 site were selected by comparing the surface soil EPCs with soil screening levels for effects on plants. The results of the comparisons are shown in Table 4-1. The concentrations of 10 metals, three pesticides, HPAHs, LPAHs, and two SVOCs exceeded the available screening levels. The greatest HQs (EPC divided by screening level) were for copper (20), lead (10), mercury (7.8), zinc (16), and LPAHs (117). Soil screening levels for plants are not available for dioxins/furans and several pesticides and SVOCs detected in surface soil at the OU2 site; these analytes also may be COPCs for the terrestrial plant community (see Table 4-1).

4.2 Soil Invertebrate Community

COPCs for the soil-invertebrate community at the OU2 site were selected by comparing the surface soil EPCs with soil screening levels for effects on earthworms. The results of the comparisons are shown in Table 4-2. The concentrations of five metals, HPAHs, and LPAHs exceeded the available screening levels.

The greatest HQs were for copper (18), mercury (23), and zinc (21). Soil screening levels for protection of soil invertebrates are not available for thallium, PCBs, dioxins/furans, 16 pesticides, and 8 SVOCs detected in OU2 site soil; these analytes also may be COPCs for the soil-invertebrate community (see Table 4-2).

As noted on Section 3.2.1.1, contaminant levels in OU2 site soils also were compared with NYSDEC Soil Cleanup Objectives for Protection of Ecological Resources. The results of the comparisons are shown in Table 4-3. Only silver (HQ 23) was identified as a COPC in soil in Table 4-3, but not in Table 4-1, Table 4-2, or for terrestrial wildlife exposed to contaminants in soil (see Section 4.5.2). In contrast, two metals (manganese and selenium) and two pesticides (beta-BHC and endrin) were identified as COPCs in soil in Table 4-1 (plants), Table 4-2 (soil invertebrates), or for terrestrial wildlife (see Section 4.5.2) for which the surface soil EPC did not exceed the NYSDEC soil clean-up objectives. This discrepancy likely is due to use of different toxicity data or exposure parameters by NYSDEC to develop their soil cleanup objectives compared with the toxicity data and exposure parameter used in this assessment.

4.3 Benthic Macroinvertebrate Community

Four lines-of-evidence were used to examine potential risks to the benthic macroinvertebrate community at the OU2 site: (1) comparing sediment EPCs with sediment screening levels for effects on benthic macroinvertebrates; (2) comparing maximum-detected contaminant concentrations in unfiltered surface water with chronic water criteria for protection of freshwater aquatic life; (3) conducting sediment toxicity tests with sediment from the OU2 site; and (4) conducting surface water toxicity tests with surface water from the OU2 site.

4.3.1 Benthic Community Measure No. 1 (Sediment Screening Levels)

Total PCBs, total PAHs, dioxins/furans, 10 metals, 12 pesticides, and six SVOCs were identified as COPCs in sediment for benthic macroinvertebrates based on comparing sediment EPCs with low effect level sediment screening benchmarks (NYSDEC Class A of equivalent, see Table 4-4a). The greatest HQs were for total PCBs (356), total PAHs (62), dioxins/furans (51), and phenol (229). When severe effect level screening benchmarks (NYSDEC Class C of equivalent) were used in the evaluation, the number of COPCs was reduced and the HQs were lower (compare Tables 4-4a and 4-4b). The greatest HQs based in severe effect level benchmarks were for total PCBs (36), dibenzofuran (20), total PAHs (7), and lead (6). If a sediment screening level was not available for a contaminant detected in sediment, that contaminant was retained as a COPC for the benthic community.

4.3.2 Benthic Community Measure No. 2 (Surface Water Criteria)

Table 4-5 compares maximum contaminant concentrations in unfiltered the OU2 site surface water samples with standards and criteria for protection of aquatic life. As noted above, only metals were detected in surface water samples collected from the OU2 site. Of the metals detected, only aluminum exceeded its chronic water quality criterion, but not its acute criterion, for protection of aquatic life.

High aluminum levels in the unfiltered surface water samples from the OU2 site likely are the result of suspended solids in the samples.

4.3.3 Benthic Community Measure No. 3 (Sediment Toxicity)

In May 2015, sediment bioassays with a representative insect (*Chironomus dilutus*) and crustacean (*Hyalella azteca*) were conducted with sediment samples from three locations at the OU2 site and a local reference site (see Figures 4-1 and 4-2). The reference site was located on the east branch of Eighteenmile Creek at Gasport, New York, approximately 1,500 feet north of the New York State Erie Canal. The sediment samples were collected and sent under chain-of-custody to the Great Lakes Environmental Center (GLEC), Traverse City, Michigan for testing.

Two bioassays were conducted with sediment from each location:

- EPA Method 100.4: *Hyalella azteca* 42-d Test for Measuring the Effects of Sediment-associated Contaminants on Survival, Growth, and Reproduction. *Hyalella* growth on day 28 has been shown be correlated with reproduction on day 42, so a test duration of 28 days was selected and the survival and growth endpoints were evaluated.
- EPA Method 100.5: Life-cycle Test for Measuring the Effects of Sediment-associated Contaminants on *Chironomus dilutus*. Test duration of 20 days was selected and survival and growth endpoints were evaluated.

Sediment testing was conducted in accordance with *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates, Second Edition* (EPA 2000) and the GLEC standard operating procedures for these tests.

4.3.3.1 Test Acceptability Requirements

***Hyalella azteca* 28-day test:** According to EPA (2000), in order for test results to be acceptable, mean control survival must be 80% or greater and growth in control sediment should be greater than 0.15 mg dry weight per individual. Other important test acceptability requirements are: (1) age of *Hyalella* at test initiation must be 7 to 8 days; (2) hardness, alkalinity, and ammonia in overlying water typically should not vary by more than 50% during the test; and (3) dissolved oxygen levels should be maintained above 2.5 mg/L in overlying water during the test (EPA 2000). These requirements were met with two exceptions (see Table 4-7a). First, in two replicates for sample OU2-SED01, dissolved oxygen in overlying water dropped to approximately 1.5 mg/L on Day 0 (before introduction of *Hyalella* into test chambers); this was corrected with aeration. Second, total ammonia in overlying water decreased by a factor of 3 to 10 in the laboratory control, the reference site sample (BG1-SED1), and OU2 site samples OU2-SED01, -SED02, and -SED03 over the test duration; however, a decrease in this parameter is not considered to be adverse. Overall, these deviations are considered inconsequential.

***Chironomus dilutes* 20-day test:** According to EPA (2000), in order for test results to be acceptable, mean control survival must be 70% or greater on day 20 and average organism size in control sediment on day 20 must be at least 0.6 mg/surviving organism as dry weight or 0.48 mg/surviving organism as ash free dry weight. Other important test acceptability requirements are: (1) test must be started with less than 1-day old larvae; (2) hardness, alkalinity, and ammonia in overlying water typically should not vary by more than 50% during the test; and (3) dissolved oxygen levels should be maintained above 2.5 mg/L in the overlying water (EPA 2000). These requirements were met, with two exceptions (see Table 4-7b). First, in two replicates for sample OU2-SED01, dissolved oxygen in overlying water dropped to approximately 1.5 mg/L on Day 0, but this problem was corrected by aeration. Second, total ammonia in overlying water decreased by a factor of 3 to 10 in the laboratory control and in samples BG1-SED01, OU2-SED01, OU2-SED02, and OU2-SED03 over the test duration; however, a decrease in this parameter is not considered to be adverse. Overall, these deviations are considered inconsequential.

4.3.3.2 Sediment Bioassay Results

Survival and growth results are summarized in Tables 4-8 and 4-9 for the *Hyalella* and *Chironomus* tests, respectively. Dunnett's test for comparing treatments with a control was used to test for significant differences between the OU2 samples and reference sample. This statistical procedure controls for the Type 1 error rate when comparing multiple treatments (OU2 site samples) with a common control (reference area sample). In the *Hyalella* 28-day test, growth and survival in one OU2 site sample, OU2-SED3, was significantly lower ($p < 0.05$) than in the reference area sample (see Table 4-8). Similarly, in the 20-day *Chironomus* test, growth and survival in sample OU2-SED3 was significantly less than in the reference area sample (see Table 4-9). Growth and survival of *Hyalella* and *Chironomus* in samples OU2-SED1 and OU2-SED2 were not depressed compared with the reference area (see Tables 4-8 and 4-9, respectively). These results suggest that sediment contaminant levels in the vicinity of sediment sample OU2-SED3 may adversely affect benthic aquatic organisms.

A preliminary review of the sediment chemistry data for samples used in the toxicity tests showed that sample OU2-SED3 contained higher levels of PCBs, pesticides, and many metals than the reference area sample or other OU2 site samples (see Table 4-10). Sample OU2-SED3 also had the highest number of contaminants exceeding screening levels. The total PCB concentration in sample OU2-SED03 (85 milligrams per kilogram [mg/kg]) was an order of magnitude greater than in the other OU2 site samples, three orders of magnitude greater than the reference area sample, and exceeded the PCB screening benchmark (0.1 mg/kg) by three orders of magnitude (see Table 4-10). Similarly, the levels of many pesticides in sample OU2-SED03 greatly exceeded concentrations in the other OU2 samples, the reference sample, and sediment screening levels (see Table 4-10). Finally, the levels of nine metals in sample OU2-SED03 were elevated above screening levels, background levels, and the levels in the other two samples tested

for sediment toxicity (OU2-SED01 and OU2-SED02) (see Table 4-10). Copper, lead, and zinc exceeded their screening levels by the greatest margin in sample OU2-SED03.

4.3.4 Benthic Community Measure No. 4 (Surface Water Toxicity)

Results of surface water bioassays with OU2 site surface water were used as a fourth line-of-evidence to evaluate potential risks to benthos at the OU2 site. Most benthic organisms are exposed constantly to surface water, especially those that prefer riffle/run habitats with coarse substrates. This habitat type is common in at the OU2 site. Also, evaluating toxicity of both sediment and surface water at a given site helps with understanding whether impacts to resident benthos are due to contaminants in sediment, surface water, or both media.

In May 2015, chronic surface water bioassays with a representative fish (*Pimephales promelas*, fathead minnow) and crustacean (*Ceriodaphnia dubia*) were conducted with surface water samples from three locations at the OU2 site and a local reference site, the east branch of Eighteenmile Creek at Gasport, New York (see Figures 4-1 and 4-2); these samples were co-located with the sediment samples used for sediment toxicity testing. The primary source of water to the east branch of Eighteenmile Creek at Gasport is the New York State Barge Canal, similar to the main stem of the creek in Lockport. The surface water samples were collected and sent under chain-of-custody to the Great Lakes Environmental Center (GLEC), Traverse City, Michigan for testing.

The fathead minnow larval survival and growth test (EPA Method 1000.0) and *Ceriodaphnia dubia* survival and reproduction test (EPA Method 1002.0) were conducted with each sample in accordance with *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms* (EPA 2002). Test acceptability criteria for the fathead minnow test (control survival ≥ 80%; average dry weight per surviving organism in control chambers ≥ 0.25 mg) and *Ceriodaphnia* test (control survival ≥ 80%; average of 15 or more young/surviving female in controls) were met.

Results are summarized in Tables 4-11 and 4-12 for the fathead minnow and *Ceriodaphnia* tests, respectively. Dunnett's test for comparing treatments with a control was used to test for significant differences between the OU2 site samples and reference area sample. For the fathead minnow test, no OU2 site sample had significantly lower growth or survival than the reference area sample (see Table 4-11). Similarly, for the *Ceriodaphnia* test, no OU2 site sample had significantly lower reproduction or survival than the reference area sample (see Table 4-12). These results suggest that contaminant levels in OU2 site surface water are not high enough to adversely affect aquatic life.

The unfiltered surface water samples from the OU2 site used in toxicity testing were analyzed for metals, SVOCs, pesticides, and PCBs. The data are included in Table 4-5. As noted above in Section 4.3.2, only metals were detected in surface

water samples from the OU2 site, and only aluminum exceeded its chronic criterion, likely due to suspended solids in the samples.

Overall, the four lines-of-evidence discussed above suggest that impacts to the benthic macroinvertebrate community at the OU2 site are likely, and that contaminants in sediment, not surface water, are the likely cause.

4.4 Fish Community

Three lines-of-evidence were used to examine potential risks to the fish community at the OU2 site: (1) comparing maximum-detected contaminant concentrations in unfiltered surface water from the OU2 site with chronic water criteria for protection of aquatic life; (2) conducting surface water bioassays with surface water from the OU2 site; and (3) comparing contaminant levels in fish from the OU2 site with critical tissue concentrations for effects on fish.

4.4.1 Fish Community Measure No. 1 (Surface Water Screening Levels)

One method used to identify COPCs for fish at the OU2 site was to compare maximum detected contaminant concentrations in unfiltered surface water with water quality criteria and standards for protection of aquatic life. The results of the comparisons are shown in Table 4-5. As noted above, only four surface water samples are available for the OU2 site and only metals were detected in the samples. Of the metals detected, only aluminum exceeded its chronic water quality criterion value, likely due to suspended solids in the samples.

4.4.2 Fish Community Measure No. 2 (Surface Water Toxicity Tests)

As a second line-of-evidence to evaluate potential risks to fish at OU2, results from bioassays with surface water from the OU2 site and a reference area were considered. In May 2015, the fathead minnow larval survival and growth test was conducted with surface water from the OU2 site and the reference area. No reduction in survival or growth of fathead minnow larvae was observed in surface water from the OU2 site compared with the reference area (see Section 4.3.4). These results suggest that surface water in the OU2 site is not toxic to fish and other aquatic life.

4.4.3 Fish Community Measure No. 3 (Fish Tissue Screening Levels)

As a third line-of-evidence to evaluate potential risks to fish, contaminant levels in fish from the OU2 site were compared with tissue screening concentrations (TSCs) for effects on fish. Fish sampling methods, analytical results, and data evaluation are described below.

In May 2015, forage fish and game fish samples were collected by electrofishing from the OU2 site. The game fish fillet samples were originally collected for the human health risk assessment, but are evaluated here to help understand potential risks to adult fish at the OU2 site. The fish samples were analyzed for (PCBs, as Aroclors), chlorinated pesticides, metals, SVOCs, and lipids. A subset of the fish samples also were analyzed for dioxins/furans and dioxin-like PCB congeners.

Game fish were filleted in the field in accordance with NYSDEC guidelines prior to shipment to the laboratory for analysis. NYSDEC guidance indicates that fillets should be analyzed with skin-on and ribs included. Forage fish were analyzed as whole-body composite samples. Details regarding the composition of the fish samples from the OU2 site are provided in Table 4-13.

Adult silver redhorse (*Moxostoma anisurum*), smallmouth bass (*Micropterus dolomieu*), and walleye (*Sander vitreus*) were collected for fillet analysis from the OU2 site (see Table 4-13). Three forage fish composite samples composed of juvenile rock bass (*Ambloplites rupestris*) and pumpkinseed sunfish (*Lepomis gibbosus*) also were collected from the OU2 site (see Table 4-13). The number of forage-fish composite samples collected from the OU2 site was lower than the target of 10 composite samples per area due to limited forage-fish availability.

Table 4-14 compares forage fish composite sample data from the OU2 site with TSCs for effects on fish from Dyer et al. (2000) for metals and pesticides, from Windward (2004) for dioxins/furans, and from the *Draft Black River Site Ecological Risk Assessment* (EPA 2015a) for total PCBs. There were few exceedances of TSCs in forage fish from the OU2 site (see gray-shaded cells in Table 4-14); specifically, tissue concentrations of chromium, copper, and zinc marginally exceeded their respective TSC in one sample.

Table 4-15 compares game-fish fillet data from the OU2 site with TSCs for effects on fish from Dyer et al. (2000) and Windward (2004). There were few exceedances of TSCs in the fillet samples from the OU2 site (see gray-shaded cells in Table 4-15); specifically, fillet concentrations of chromium, copper, and mercury equaled or marginally exceeded their respective TSC in one or two samples, and the tissue concentration of endrin exceeded its TSC in one sample.

Overall, the three lines-of-evidence discussed above suggest the potential risks to the fish community at the OU2 site likely are minimal. No toxicity was observed in surface water bioassays with OU2 site surface water, contaminant levels in unfiltered surface water samples from the OU2 site were below detection or less than chronic water quality criteria (except for aluminum), and contaminant levels in OU2 fish were generally less than TSCs for effects on fish.

4.5 Wildlife

COPCs for wildlife were selected by calculating exposure estimates and HQs in accordance with EPA (1997) guidance. This method is preferable to comparing contaminant concentrations in soil and sediment with screening levels for at least two reasons. First, soil and sediment screening levels for effects on wildlife are not available for all chemicals that were detected in soil and sediment at the OU2 site. Second, calculating exposure estimates for the principal wildlife feeding guilds present at a site provides a better understanding of potential wildlife risks and can be used to help develop site-specific remedial goals for soil and sediment.

4.5.1 Wildlife Screening Level Exposure Estimates

This section describes the receptors, data, and methods used to derive EPCs and exposure estimates for wildlife at the OU2 site.

4.5.1.1 Summary of Datasets Used to Calculate Exposure Estimates

Chemical analytical data for surface soil, sediment, and forage fish collected from the OU2 site over approximately the past 10 years were used in the evaluation, including sediment and forage fish data collected in May 2015 and sediment, soil, and bioaccumulation testing data from January 2016. Detected contaminants, numbers of samples, frequency of detection, minimum and maximum detected concentrations, and EPCs are summarized in Table 4-1 for surface soil and Table 4-4 for sediment. Forage fish contaminant data are presented and discussed above in Section 4.4.3. Surface water data were not used in the wildlife risk evaluation for two reasons: (1) exposure to contaminants from surface water consumption is minor compared with exposure from diet and incidental soil/sediment ingestion and (2) only four surface water samples were collected from the OU2 site and only selected metals were detected in the samples.

4.5.1.2 Exposure Scenarios and Pathways

Exposure estimates were calculated for 12 wildlife receptors from different feeding guilds as indicated in Table 3-1. These species are:

Herbivores

- Mourning dove (*Zenaida macroura*);
- Meadow vole (*Microtus pennsylvanicus*);
- Muskrat (*Ondatra zibethicus*); and
- Mallard (*Anas platyrhynchos*).

Invertivores

- Tree swallow (*Tachycineta bicolor*);
- American robin (*Turdus migratorius*);
- Short-tailed shrew (*Blarina brevicauda*); and
- Little brown bat (*Myotis lucifugus*).

Carnivores

- Red-shouldered hawk (*Buteo lineatus*); and
- Long-tailed weasel (*Mustela frenata*).

Piscivores

- Great Blue Heron (*Ardea herodias*); and
- Mink (*Mustela vison*).

4.5.1.3 Exposure Point Concentrations (EPCs)

Terrestrial Wildlife

The method used to develop EPCs for surface soil is described at the beginning of Section 4. The surface-soil EPCs were used as the basis for estimating exposure of terrestrial wildlife to contaminants in surface soil (see Table 4-17). To estimate dietary exposure for terrestrial wildlife species that consume soil invertebrates, terrestrial plants, or small mammals, OU2 site-specific or literature-based models were used to estimate contaminant concentrations in food items. The specific models used and their sources are provided in Tables 4-18, 4-19, and 4-21 for soil invertebrates, terrestrial plants, and small mammals, respectively. Of note, Table 4-18 includes OU2 site-specific models that were used to estimate contaminant levels in soil invertebrates, while Appendix C presents the site data and describes the methods used to develop these OU2 site-specific models. Surface soil EPCs were used as input to the models (see Tables 4-18, 4-19, and 4-21). The plant bioaccumulation models used in this assessment were for leafy plant tissues, not reproductive tissues, such as seeds. This approach is considered to be conservative for seed-eating receptors such as the mourning dove because contaminants are expected to be found at greater levels in leafy tissues compared with reproductive tissues (Baes et al. 1984). The literature-based bioaccumulation models for terrestrial biota used in the BERA were used previously in the SLERA and BERA Problem Formulation reports and were found acceptable to EPA.

Aquatic Dependent Wildlife

The method used to develop EPCs for surface sediment is described at the beginning of Section 4. The surface-sediment EPCs were used as the basis for estimating exposure of aquatic-dependent wildlife to contaminants in surface sediment (see Table 4-17). To estimate contaminant concentration in the food items of aquatic-dependent wildlife (aquatic plants, benthic macroinvertebrates, and fish), the following approaches were used:

- Bioaccumulation models for terrestrial plants for vegetative tissues were used to estimate contaminant concentrations in aquatic plants from sediment contaminant concentrations (see Table 4-20). These models were used previously in the SLERA and BERA Problem Formulation reports and were found acceptable to EPA. The surface sediment EPCs were used as input to the models (see Table 4-20).
- OU2 site-specific or literature-based bioaccumulation models and BSAFs were used to estimate contaminant concentrations in benthic macroinvertebrates from sediment contaminant concentrations (see Table 4-22 and Appendices B and C). The OU2 site-specific models and BSAFs were based on the

January 2016 sampling event. The literature-based models and BSAFs were used previously in the SLERA and BERA Problem Formulation reports and were found acceptable to EPA. The surface sediment EPCs were used as input to the models (see Table 4-22).

- Contaminant levels in forage fish composite samples collected from the OU2 site in May 2015 were used in the evaluation (see Tables 4-14 and 4-23). Because only three samples were collected, the maximum contaminant concentration in the samples was used.

4.5.1.4 Exposure Calculations

Contaminant exposure was calculated as the sum of exposures from diet and incidental soil or sediment ingestion. Dietary exposure was estimated using the following equation:

$$EE_{diet} = C_f \times IR_{f\text{-}BW} \times SUF \text{ (or ED)}$$

Where:
EE_{diet} = Estimated exposure from diet (mg/kg body weight [BW]/day)
C_f = Contaminant concentration in food (mg/kg, dry weight)
$IR_{f\text{-}BW}$ = Body-weight normalized food ingestion rate (kg dry weight/kg BW/day)
SUF = Site use factor (unitless)
ED = Exposure duration (unitless)

Wildlife exposure to chemicals through incidental soil/sediment ingestion was estimated in a manner similar to that used for dietary exposure, as shown in the following equation:

$$EE_{soil/sed.} = C_s \times IR_{s\text{-}BW} \times SUF \text{ (or ED)}$$

Where:
$EE_{soil/sed.}$ = Estimated exposure from incidental soil or sediment ingestion (mg/kg BW/day)
C_s = Contaminant concentration in soil or sediment (mg/kg, dry weight)
$IR_{s\text{-}BW}$ = Body-weight normalized soil/sediment ingestion rate (kg dry weight/kg BW/day)
SUF = Site use factor (unitless)
ED = Exposure duration (unitless)

The total exposure for a receptor was calculated as the sum of the exposure from diet and incidental soil or sediment ingestion as represented by the following equation:

$$EE_{total} = EE_{diet} + EE_{soil/sed.}$$

Where:
EE_{total} = Total estimated exposure (mg/kg BW/day)
EE_{diet} = Estimated exposure from diet (mg/kg BW/day)

$EE_{soil/sed.}$ = Estimated exposure from incidental soil or sediment ingestion (mg/kg BW/day)

Ingestion rates and body weights were taken from EPA (2007i), EPA (1999), TAMS Consultants, Inc. (1999), and Sample and Suter (1994). The values in EPA (1999) come from the *Wildlife Exposure Factors Handbook* (EPA 1993). The values are listed in Table 4-16. The ingestion rates and body weights used in the BERA were used previously in the SLERA and BERA Problem Formulation reports and were found acceptable to EPA.

The diet of each receptor was assumed to consist exclusively of its preferred prey (see Table 4-16). For example, the diets of the American robin and short-tailed shrew were assumed to consist entirely of soil invertebrates (e.g., earthworms).

The site use factor (SUF) indicates the portion of an animal's home range represented by the site. If the home range is larger than the site, the SUF equals the site area divided by the home range area. If the site area is greater than or equal to the home range, the SUF is equal to 1. Home range size was taken from EPA (1993) or other reputable sources. Exposure duration (ED) is the fraction of the year spent at the site. OU2 site presence was assumed to be 8 months for the dove, hawk, mallard, and heron; 7 months for the robin; 5 months for the swallow, and 8.5 months for the bat. The SUF and ED for each receptor are listed in Table 4-16. For wildlife receptors for which both the ED and SUF were < 1, only one factor (the lower of the two) was used to adjust the exposure estimate, as requested by EPA.

Tables 4-24 to 4-35 present the exposure estimates for the wildlife species evaluated in the BERA.

4.5.2 Wildlife Risk Determination

Potential risks posed by OU2 site-related chemicals were determined by calculating a NOAEL-based HQ and LOAEL-based HQ for each chemical for each endpoint species. The HQs were calculated by dividing the total exposure (EE_{total}) by the NOAEL (mg/kg BW/day) or LOAEL (mg/kg BW/day), as shown in the following equations:

$$HQ\text{-}NOAEL = EE_{total}/NOAEL$$

$$HQ\text{-}LOAEL = EE_{total}/LOAEL$$

For a given receptor and chemical, a HQ-NOAEL > 1 indicates that the estimated exposure exceeds the highest dose at which no adverse effect was observed. A HQ-LOAEL > 1 suggests that a chronic adverse effect on survival, growth, and/or reproduction is possible for an individual receptor.

The NOAEL-based HQs presented herein are generally lower that those presented in the SLERA for several reasons. In the BERA, the NOAEL HQs are based on

the 95% UCL on the average concentration and consider OU2 site use and exposure duration. Conversely, in the SLERA, the NOAEL HQs were based on maximum media concentrations and no consideration of OU2 site use or exposure duration (i.e., all wildlife model species were assumed to forage only at the OU2 site and be present there year-round). Also, for invertivorous wildlife (i.e., robin, shrew, swallow, and bat) the BERA used OU2 site-specific bioaccumulation factors to estimate contaminant levels in invertebrate prey, whereas the SLERA used conservative, literature-based bioaccumulation factors.

Tables 4-24 to 4-35 present the HQs for the 12 wildlife species evaluated in the BERA Problem Formulation. The risk results for these species are briefly discussed in turn below.

- American Robin: The robin was selected to represent the terrestrial avian invertivore assessment endpoint. For this receptor, the HQ-NOAELs for four contaminants were ≥ 1 (see Table 4-24). The greatest HQ-NOAELs were for PCBs (47), copper (3.9), and lead (8.2). The HQ-LOAELs for total PCBs (4.7), copper (3.4), and lead (6.9) exceeded 1 (see Table 4-24).
- Short-Tailed Shrew: The shrew was selected to represent the terrestrial mammalian invertivore assessment endpoint. For this receptor, the HQ-NOAELs for 11 contaminants were ≥ 1 (see Table 4-25). The greatest HQ-NOAELs were for thallium (60), total PCBs (20), and nickel (9.1). Eleven HQ-LOAELs exceeded 1 (see Table 4-25). The greatest HQ-LOAELs were for thallium (6) and nickel (5.7).
- Mourning Dove: The mourning dove was selected to represent the terrestrial avian herbivore assessment endpoint. For this receptor, no HQ-NOAELs or HQ-LOAELs were ≥ 1 (see Table 4-26).
- Meadow Vole: The meadow vole was selected to represent the terrestrial mammalian herbivore assessment endpoint. For this receptor, five HQ-NOAEL exceeded 1 (see Table 4-27) with the greatest HQ-NOAEL being for antimony (3). Only the HQ-LOAELs for lead was ≥ 1 (see Table 4-27).
- Red-Shouldered Hawk: The red-shouldered hawk was selected to represent the terrestrial avian carnivore assessment endpoint. For this receptor, no HQ-NOAELs or HQ-LOAELs were ≥ 1 (see Table 4-28).
- Long-Tailed Weasel: The long-tailed weasel was selected to represent the terrestrial mammalian carnivore assessment endpoint. For this receptor, the HQ-NOAELs for five contaminants (total PCBs, antimony, copper, lead, and thallium) were ≥ 1 (see Table 4-29). The greatest HQ-NOAEL was for total PCBs (20). The HQ-LOAELs for total PCBs (2), copper (1), and lead (1.3) were ≥ 1 (see Table 4-29).
- Tree Swallow: The tree swallow was selected to represent the aquatic-dependent avian insectivorous assessment endpoint. For this receptor, the HQ-NOAELs for nine contaminants were ≥ 1 (see Table 4-30). The greatest HQ-NOAELs were for total PCBs (6,600) and HPAHs (89). Eight HQ-

LOAELs were ≥ 1 (see Table 4-30). The greatest HQ-LOAEL was for total PCBs (660). The PCB risks for the swallow are highly elevated because the OU2 site-specific bioaccumulation testing data collected for the BERA indicated that PCBs in OU2 site sediment are highly bioavailable, more so than expected based on literature data. Also, the avian NOAEL and LOAEL for PCBs used in the BERA are more conservative than those used in the BERA Problem Formulation or SLERA; they were taken from the *Draft Black River Site Ecological Risk Assessment* (EPA 2015a) to ensure consistency with that assessment (see Executive Summary and Section 3.2.2).

- Little Brown Bat: The little brown bat was selected to represent the aquatic-dependent mammalian insectivorous assessment endpoint. For this receptor, the HQ-NOAELs for eight contaminants were ≥ 1 (see Table 4-31). The greatest HQ-NOAELs were for total PCBs (19,000) and HPAHs (234). Five HQ-LOAELs were ≥ 1 (see Table 4-31). The greatest HQ-LOAELs were for total PCBs (1,900) and HPAHs (47). As noted above for the swallow, the PCB risks for the bat are highly elevated because the OU2 site-specific bioaccumulation testing data collected for the BERA indicated that PCBs in OU2 site sediment are highly bioavailable, more so than expected based on literature data. Also, the mammalian NOAEL and LOAEL for PCBs used in the BERA are more conservative than those used in the BERA Problem Formulation or SLERA; they were taken from the *Draft Black River Site Ecological Risk Assessment* (EPA 2015a) to ensure consistency with that assessment (see Executive Summary and Section 3.2.2)..
- Mallard: The mallard was selected to represent the aquatic-dependent avian herbivore assessment endpoint. For this receptor, only the HQ-NOAEL for total PCBs (1.2) was ≥ 1 (see Table 4-32). No HQ-LOAELs exceeded 1 for the mallard (see Table 4-32).
- Muskrat: The muskrat was selected to represent the aquatic-dependent mammalian herbivore assessment endpoint. For this receptor, the HQ-NOAELs for three contaminants (total PCBs, lead, and HPAHs) were ≥ 1 (see Table 4-33). No HQ-LOAELs were ≥ 1 (see Table 4-33).
- Great Blue Heron: The great blue heron was selected to represent the aquatic-dependent avian piscivore assessment endpoint. For this receptor, only the HQ-NOAEL for total PCBs (7.9) exceeded 1 (see Table 4-34). No HQ-LOAELs were ≥ 1 for the heron (see Table 4-34).
- Mink: The mink was selected to represent the aquatic-dependent mammalian piscivore assessment endpoint. For this receptor, the HQ-NOAELs for two contaminants (total PCBs and methylmercury) were ≥ 1 (see Table 4-35). Only the HQ-LOAEL for total PCBs (6) was ≥ 1 (see Table 4-35).

For all wildlife receptors discussed above, one or more contaminants detected in soil or sediment could not be assessed quantitatively because a chemical-specific TRV was not available. In these cases, the contaminant was considered a COPC for that receptor. Tables 4-36 and 4-37 identify the receptor-contaminant pairs that could not be assessed quantitatively.

5 Uncertainties

Significant sources of uncertainty in this ecological risk assessment include the following:

- **Bioaccessibility:** The bioaccessibility of contaminants in soil, sediment, and wildlife food items at the OU2 site is not fully understood. To be conservative, it was assumed that 100% of the contaminants in the soil, sediment, and food items ingested by wildlife were bioaccessible; that is, that 100% of the ingested dose can be extracted from its matrix in the gastrointestinal tract and is available for absorption. If bioaccessibility is less than 100%, which seems likely (Sample et al. 2013), then potential risks to all wildlife receptors would be correspondingly lower.
- **Reliability of Soil Benchmarks:** Many of the available soil screening benchmarks for plants and soil invertebrates (i.e., earthworms) were developed from laboratory studies in which chemical solutions were added to clean soil to arrive at a range of test concentrations. In such studies, the added chemicals are highly bioavailable. Comparing total contaminant concentrations in field samples to solution-based soil benchmarks is conservative and likely results in an overestimation of risk.
- **Availability of Media Screening Levels and Wildlife TRVs:** Screening levels are not available for all contaminants in all media. For example, soil screening levels for plants and soil fauna are not available for many pesticides and SVOCs (see Tables 4-1 and 4-2). Hence, potential risks to plants and soil fauna from these contaminants could not be evaluated. Also, for example, avian TRVs are not available for antimony, beryllium, and several pesticides and SVOCs (see Table 4-6). The lack to screening levels and TRVs for selected contaminants results in an underestimation of risk.
- **Thallium Toxicity to Mammals:** The mammalian NOAEL and LOAEL for thallium were derived from a study that identified a subchronic LOAEL (0.74 mg/kg/day) for effects on reproduction (Sample et al. 1996). The subchronic LOAEL was divided by 10 to arrive at a chronic LOAEL (0.074 mg/kg/day) and by 100 to arrive at a chronic NOAEL (0.0074 mg/kg/day). No other studies on the effects of thallium on mammalian reproduction, growth, or survival were identified by Sample et al. (1996), and an Eco-SSL report is not available for this metal. The chronic NOAEL for thallium is highly uncertain and is expected to be very conservatively biased. As a result, the mammalian risk estimates from thallium in this BERA likely are biased high.

- **Chemicals in Wildlife Food Items:** Uptake of PCBs into aquatic invertebrates at the OU2 site is not completely understood, despite having conducted an OU2 site-specific bioaccumulation study for this assessment. The concentration range for total PCBs in the sediment samples used in the bioaccumulation study was biased low (0.2 to 1.8 mg/kg) and did not capture the higher concentrations relevant for this BERA. For example, the EPC for total PCBs in sediment used in the BERA was 35.6 mg/kg when the total was calculated with non-detected Aroclors set equal to one-half of the method detection limit. This shortcoming of the bioaccumulation study made it necessary to apply the BSAFs developed from the study to sediment concentrations well above those used to develop the BSAFs. While is it true that biota exposed to higher contaminant concentrations in sediment generally accumulate higher tissue concentrations, bioaccumulation is not usually directly proportional. Instead, as the absolute tissue concentration increases the bioaccumulation factor (tissue concentration divided by sediment concentration) generally decreases. This pattern occurs because bioaccumulation is a nonlinear process with uptake higher at low concentrations, decreasing at higher concentrations due to saturation or toxicity limiting further accumulation (Sample et al. 2013). As a result, bioaccumulation of PCBs into native benthos at the OU2 site may have been overestimated in this assessment.

- **Wildlife Diet:** Uncertainty may result from the assumptions made about the diets of the wildlife receptors evaluated in this assessment. For the shrew and robin, the assumption of a diet consisting entirely of earthworms is conservative. In addition to earthworms, shrews consume other invertebrates (i.e., slugs, snails, centipedes, and various insects), fungi, plant materials, and small mammals (EPA 1993). Similarly, robins also consume other invertebrates (i.e., spiders, sowbugs, and various insects) and plant materials (EPA 1993). These foods are less intimately associated with the soil matrix than earthworms, and thus accumulate lesser amounts of soil contamination. The diet assumed for the shrew and robin in this assessment may overestimates exposure and risks from contaminants in soil.

- **No Quantitative Assessment for Reptiles:** Terrestrial and aquatic-dependent reptiles are expected to be present at the OU2 site and were identified in the conceptual site model (see Figure 3-1). Unfortunately, because reliable toxicity data for reptiles are sparse, a quantitative assessment of potential risks to reptiles from OU2 site-related contaminants was not undertaken. Risk estimates for birds and mammals may be indicative of potential risks to reptiles, but this is an uncertainty.

  PCB Risks to Invertivorous Birds and Mammals: The estimated risks to invertivorous birds and mammals from PCBs depend on the choice of bioaccumulation model and TRV as well as treatment of non-detected Aroclors when calculating the total PCB concentration. Table 5-1 shows how different combinations of these parameters affect the magnitude of the HQ for the robin, shrew, swallow, and bat; the HQs range by a factor of 10 for the shrew and bat and by a factor of 100 for the robin and swallow.

6 Summary of COPCs

The primary purpose of the BERA was to identify COPCs for ecological receptors at the OU2 site. Tables 4-36 and 4-37 provide a summary of COPCs by assessment endpoint based on the NOAELs and LOAELs, respectively, used in this evaluation. For each assessment endpoint, contaminants were considered COPCs if the HQ equaled or exceeded 1, or if the contaminant was detected in OU2 site media and no toxicity information was available for that contaminant. Receptor-contaminant pairs that could not be assessed quantitatively are identified by an "x" in Tables 4-36 and 4-37. These contaminants cannot be ruled out as possible COPCs.

In general, the contaminants that resulted in the greatest HQs for the greatest number of receptors were total PCBs, copper, lead, and PAHs. For example, copper and lead were found to pose a potential risk to terrestrial plants, soil invertebrates, benthos, and terrestrial and aquatic dependent wildlife (especially invertivorous species). Total PCBs were found to pose the greatest potential risk for aquatic-dependent receptors, with HQs greater than 600 for the swallow and bat, and over 35 for benthos (see Table 4-37).

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Tables

Table 3-1. Assessment Endpoints, Representative Species, Risk Questions, and Measures Considered for the Baseline Ecological Risk Assessment (BERA) for Eighteenmile Creek OU2, Lockport, New York.

Assessment Endpoint (Attribute)	Level of Organization	Representative Receptor	BERA Risk Question	BERA Measure	BERA Analysis Approach
TERRESTRIAL RECEPTORS					
Terrestrial Community Receptors					
Terrestrial vegetation (Survival, Growth, Reproduction [S, G, R])	Local Community	All plants that obtain nutrients primarily from soil	Are contaminant concentrations in surface soil greater than screening levels for effects on survival, growth, or reproduction of plants?	Surface-soil contaminant concentrations (95% UCL).	Compare surface-soil contaminant concentrations with literature-based soil screening levels for effects on plants.
Terrestrial invertebrates (S, G, R)	Local Community	All soil invertebrates (e.g., earthworms)	Are contaminant concentrations in surface soil greater than screening levels for effects on survival, growth, or reproduction of soil invertebrates?	Surface-soil contaminant concentrations (95% UCL).	Compare surface-soil contaminant concentrations with literature-based soil screening levels for effects on soil invertebrates.
Terrestrial Avian Receptors					
Terrestrial herbivorous birds (S, G, R)	Local Population	Mourning Dove	Does the daily dose of contaminants received from ingestion of soil and food items exceed TRVs for survival, growth, or reproduction of birds?	Measured contaminant concentrations in soil (95% UCL) and modeled concentrations in food items.	Modeled dose from ingestion of soil and food items compared with literature-based TRVs.
Terrestrial invertivorous birds (S, G, R)	Local Population	American robin	Does the daily dose of contaminants received from ingestion of soil and food items exceed TRVs for survival, growth, or reproduction of birds?	Measured contaminant concentrations in soil (95% UCL) and modeled concentrations in food items using site-specific BSAFs.	Modeled dose from ingestion of soil and food items compared with literature-based TRVs.
Terrestrial carnivorous birds (S, G, R)	Local Population	Red-shouldered hawk	Does the daily dose of contaminants received from ingestion of soil and food items exceed TRVs for survival, growth, or reproduction of birds?	Measured contaminant concentrations in soil (95% UCL) and modeled concentrations in food items.	Modeled dose from ingestion of soil and food items compared with literature-based TRVs.
Terrestrial Mammalian Receptors					
Terrestrial herbivorous mammals (S, G, R)	Local Population	Meadow vole	Does the daily dose of contaminants received from ingestion of soil and food items exceed TRVs for survival, growth, or reproduction of mammals?	Measured contaminant concentrations in soil (95% UCL) and modeled concentrations in food items.	Modeled dose from ingestion of soil and food items compared with literature-based TRVs.
Terrestrial invertivorous mammals (S, G, R)	Local Population	Short-tailed shrew	Does the daily dose of contaminants received from ingestion of soil and food items exceed TRVs for survival, growth, or reproduction of mammals?	Measured contaminant concentrations in soil (95% UCL) and modeled concentrations in food items using site-specific BSAFs.	Modeled dose from ingestion of soil and food items compared with literature-based TRVs.

Table 3-1. Assessment Endpoints, Representative Species, Risk Questions, and Measures Considered for the Baseline Ecological Risk Assessment (BERA) for Eighteenmile Creek OU2, Lockport, New York.

Assessment Endpoint (Attribute)	Level of Organization	Representative Receptor	BERA Risk Question	BERA Measure	BERA Analysis Approach
Terrestrial carnivorous mammals (S, G, R)	Local Population	Weasel	Does the daily dose of contaminants received from ingestion of soil and food items exceed TRVs for survival, growth, or reproduction of mammals?	Measured contaminant concentrations in soil (95% UCL) and modeled concentrations in food items.	Modeled dose from ingestion of soil and food items compared with literature-based TRVs.
Terrestrial Reptiles					
Terrestrial Reptiles (S, G, R)	Local Population	Garter snake	None. Quantitative methods for evaluating the toxicity of contaminants to reptiles are poorly developed. Recommendation from BERA Problem Formulation was to exclude this Assessment Endpoint from the BERA. Risk estimates for wildlife are expected to be protective of reptiles, but this is an uncertainty.		
AQUATIC RECEPTORS					
Aquatic Community Receptors					
Benthic macroinvertebrates (S, G, R)	Local Community	Benthic macroinvertebrates	Are contaminant concentrations in sediment greater than screening levels for adverse effects on benthos?	Sediment contaminant concentrations (95% UCL).	Compare sediment contaminant concentrations with literature-based sediment screening levels for effects on benthic macroinvertebrates.
			Is sediment from OU2 toxic to laboratory-reared benthic macroinvertebrates?	Sediment bioassays with *Hyalella* and *Chironomus*	Compare organism survival and growth in OU2 site samples with reference area sample and laboratory control sample.
			Are contaminant concentrations in surface water greater than water quality criteria for protection of aquatic organisms?	Surface-water contaminant concentrations.	Compare surface-water contaminant concentrations with water quality criteria and standards.
Aquatic macrophytes (S, G, R)	Local Community	All freshwater aquatic plants	None. Recommendation from BERA Problem Formulation was to exclude this Assessment Endpoint from the BERA based on BERA Problem Formulation results (no surface water toxicity in surface water bioassays and no water quality criteria execcedances [except for aluminum, likely due to suspended solids in unfiltered samples]).		
Fish (S, G, R)	Local Community	Species present in habitat	Is surface water from OU2 toxic to fish?	Surface-water bioassay with fathead minnow larvae.	Compare fathead minnow survival and growth in OU2 surface water with reference area surface water.
			Are contaminant levels in fish collected from OU2 greater than fish tissue screening concentrations (TSCs)	Contaminant concentrations in individual forage fish and game fish collected from OU2.	Compare contaminant levels in individual fish from OU2 with TSCs for effects on fish.
			Are contaminant concentrations in surface water greater than water quality criteria for protection of aquatic organisms?	Surface-water contaminant concentrations.	Compare surface-water contaminant concentrations with water quality criteria and standards.

Table 3-1. Assessment Endpoints, Representative Species, Risk Questions, and Measures Considered for the Baseline Ecological Risk Assessment (BERA) for Eighteenmile Creek OU2, Lockport, New York.

Assessment Endpoint (Attribute)	Level of Organization	Representative Receptor	BERA Risk Question	BERA Measure	BERA Analysis Approach
Other aquatic organisms (S, G, R)	Local Community	Invertebrates and amphibians	None. Recommendation from BERA Problem Formulation was to exclude this Assessment Endpoint from the BERA based on BERA Problem Formulation results (no surface water toxicity in surface water bioassays and no water quality criteria execcedances [except for aluminum, likely due to suspended solids in unfiltered samples]).		
Aquatic Mammalian Receptors					
Herbivorous mammals (S, G, R)	Local Population	Muskrat	Does the daily dose of contaminants received from ingestion of sediment and food items exceed TRVs for survival, growth, or reproduction of mammals?	Measured contaminant concentrations in sediment (95% UCL) and modeled concentrations in food items.	Modeled dose from ingestion of sediment and food items compared with literature-based TRVs.
Insectivorous mammals (S, G, R)	Local Population	Little Brown Bat	Does the daily dose of contaminants received from ingestion of food items exceed TRVs for survival, growth, or reproduction of mammals?	Measured contaminant concentrations in sediment (95% UCL) and modeled concentrations in food items using site-specific BSAFs.	Modeled dose from ingestion of food items compared with literature-based TRVs.
Piscivorous mammals (S, G, R)	Local Population	Mink	Does the daily dose of contaminants received from ingestion of sediment and food items exceed TRVs for survival, growth, or reproduction of mammals?	Measured contaminant concentrations in sediment (95% UCL) and measured concentrations (maximum) in OU2 forage fish.	Modeled dose from ingestion of sediment and food items compared with literature-based TRVs.
Aquatic Avian Receptors					
Herbivorous birds (S, G, R)	Local Population	Mallard	Does the daily dose of contaminants received from ingestion of sediment and food items exceed TRVs for survival, growth, or reproduction of birds?	Measured contaminant concentrations in sediment (95% UCL) and modeled concentrations in food items.	Modeled dose from ingestion of sediment and food items compared with literature-based TRVs.
Insectivorous birds (S, G, R)	Local Population	Swallow	Does the daily dose of contaminants received from ingestion of food items exceed TRVs for survival, growth, or reproduction of birds?	Measured contaminant concentrations in sediment (95% UCL) and modeled concentrations in food items using site-specific BSAFs.	Modeled dose from ingestion of food items compared with literature-based TRVs.
Piscivorous birds (S, G, R)	Local Population	Heron	Does the daily dose of contaminants received from ingestion of sediment and food items exceed TRVs for survival, growth, or reproduction of birds?	Measured contaminant concentrations in sediment (95% UCL) and measured concentrations (maximum) in OU2 forage fish.	Modeled dose from ingestion of sediment and food items compared with literature-based TRVs.

Table 3-1. Assessment Endpoints, Representative Species, Risk Questions, and Measures Considered for the Baseline Ecological Risk Assessment (BERA) for Eighteenmile Creek OU2, Lockport, New York.

Assessment Endpoint (Attribute)	Level of Organization	Representative Receptor	BERA Risk Question	BERA Measure	BERA Analysis Approach
Aquatic Reptiles					
Aquatic-Dependent Reptiles (S, G, R)	Local Population	Painted turtle	None. Quantitative methods for evaluating the toxicity of contaminants to reptiles are poorly developed. Recommendation from BERA Problem Formulation was to exclude this Assessment Endpoint from the BERA. Risk estimates for wildlife are expected to be protective of reptiles, but this is an uncertainty.		

Key:

AE = Assessment Endpoint
BERA = Baseline Ecological Risk Assessment
BERA PF = Baseline Ecological Risk Assessment Problem Formulation
BSAF = Biota Soil (or Sediment) Accumulation Factor
EPA = Environmental Protection Agency
NYSDEC = New York State Department of Environmental Conservation
OU2 = Operational Unit 2 (Corridor Site)
(S, R, G) = Survival, growth, and reproduction
TRV = Toxicity Reference Value
95% UCL = 95 percent upper confidence limit on arithmetic average concentration

Table 4-1 Soil Phytotoxicity Screening Levels and Results, Baseline Ecological Risk Assessment, Eighteenmile Creek Operable Unit 2, Lockport, New York.

Analyte[a]	Minimum Detected Value	Maximum Detected Value	Location of Maximum	Number of Samples	FoD	BERA EPC[b]	Soil Phytotoxicity Screening Level, Source, and Screening Result					
							Value	Source[c, d]	FoE[e]	HQ[f]	COC	Rationale[g]
Metals (mg/kg)												
Aluminum	1160 J	15100 J	18MC-SS14-Z1	104	104/104	--	--	No toxicity expected for soil with pH > 5.5 (USEPA 2003a)	--	--	No	MSC
Antimony	0.7 J	166 J	UPSON-1	114	72/114	31.4	5	Efroymson et al. 1997a	27/114	6.3	Yes	>SL
Arsenic	1	103	OU2-SS24	117	117/117	19.6	18	USEPA 2005b (Eco-SSL)	26/117	1.1	No	< SL
Barium	8.7 J	3900	UPSON-2B	114	113/114	458	500	Efroymson et al. 1997a	13/114	0.9	No	< SL
Beryllium	0.14 J	2.5 J	18MC-L03E-S05-Z1	104	102/104	0.52	10	Efroymson et al. 1997a	0/104	0.05	No	< SL
Cadmium	0.05 J	37.9	FS-SS02-S-O	114	104/114	7.9	32	USEPA 2005e (Eco-SSL)	1/114	0.2	No	< SL
Calcium	869 0	217000	18MC-SS09-Z1	104	104/104	--	--	--	--	--	No	MSC
Chromium	2.6 J	505	UPSON-2B	117	117/117	59.6	75	Alloway 1990	13/117	0.8	No	< SL
Cobalt	1.4	43.9 J	UPSON-1	114	113/114	9.2	13	USEPA 2005f (Eco-SSL)	10/114	0.7	No	< SL
Copper	6.6	51000	FS-SS02-S-O	117	117/117	1400	70	USEPA 2007a (Eco-SSL)	53/117	20	Yes	>SL
Iron	7560	231000	FS-SS02-S-O	104	104/104	--	--	No toxicity expected for soil with pH 5 to 8 (USEPA 2003b)	--	--	No	NUT
Lead	2.7	8600	FS-SP12-D02-S-O	121	121/121	1176	120	USEPA 2005g (Eco-SSL)	69/121	9.8	Yes	>SL
Magnesium	122	114000	18MC-SS09-Z1	104	104/104	--	--	--	--	--	No	MSC
Manganese	16.5	3310	UPSON-1B	114	114/114	762	220	USEPA 2007b (Eco-SSL)	82/114	3.5	Yes	>SL
Mercury	0.006 J	21.5	UPSON-1B	114	109/114	2.3	0.3	Alloway 1990	40/114	7.8	Yes	>SL
Nickel	3.8	909 J	18MC-L18-S06-Z1	114	114/114	68	38	USEPA 2007c (Eco-SSL)	23/114	1.8	Yes	>SL
Potassium	103	2810	18MC-L04W-S05-Z2	104	104/104	--	--	--	--	--	No	MSC
Selenium	0.64	11.5	18MC-SS01-Z1	104	42/104	1.6	0.52	USEPA 2007d (Eco-SSL)	41/104	3.1	Yes	>SL
Silver	0.11	80.6	UPSON-1	114	64/114	4.6	560	USEPA 2006 (Eco-SSL)	0/114	0.008	No	< SL
Sodium	49.8	1010	18MC-SS14-Z1	104	96/104	--	--	--	--	--	No	MSC
Thallium	0.14 J	32.7	FS-SS02-S-O	114	17/114	2.7	1	Alloway 1990	13/114	2.7	Yes	>SL
Vanadium	3.5	103	FS-SS01-S-O	114	114/114	17	50	Alloway 1990	1/114	0.3	No	< SL
Zinc	10.3 J	21900	FS-SS02-S-O	117	117/117	2508	160	USEPA 2007e (Eco-SSL)	60/117	16	Yes	>SL
Total PCBs (mg/kg)												
Aroclor Sum (ND = 0)	0.0078	390	OU2-SS09-Z2	134	71/134	5.4	40	Efroymson et al. 1997a	2/134	0.14	No	< SL
Aroclor Sum (ND = 0.5DL)	0.03625	399.75	OU2-SS09-Z1	134	123/134	6.5	40	Efroymson et al. 1997a	3/134	0.16	No	< SL
Pesticides (mg/kg)												
DDT, Total	0.0034	6.739 J	OU2-SS09-Z2	55	41/55	0.184	7.1	USEPA 2007f, MATC for plant growth	0/55	0.03	No	< SL
Aldrin	0.0012 J	0.0096 J	18MC-L09-S04-Z1	55	8/55	0.0012	0.0033	USEPA Region 5 soil ESL (2003), plant exposure	4/55	0.4	No	< SL
alpha-BHC	0.0013 J	0.0093 J	18MC-SS05-Z1	55	10/55	0.0020	--	No plant-specific soil screening level available	--	--	Yes	No SL
Endosulfan I	0.0013 J	0.016 J	18MC-L07-S05-Z1	54	8/54	0.0041	--	No plant-specific soil screening level available	--	--	Yes	No SL
beta-BHC	0.00078 J	0.054 J	18MC-L07-S05-Z1	55	3/55	0.0064	0.0040	USEPA Region 5 soil ESL (2003), plant exposure	2/55	1.6	Yes	>SL
Endosulfan II	0.0012 J	0.036 J	18MC-L09-S04-Z1	55	9/55	0.0031	--	No plant-specific soil screening level available	--	--	Yes	No SL
delta-BHC	0.00048 J	0.0085 J	18MC-SS01-Z1	55	9/55	0.0013	--	No plant-specific soil screening level available	--	--	Yes	No SL
Dieldrin	0.004 J	0.45	18MC-L16W-S04-Z1	55	12/55	0.0171	7.1	USEPA 2005j, MATC for plant growth	0/55	0.1	No	< SL
Endosulfan sulfate	0.0021 J	0.025	FS-SS09-S-O	55	3/55	0.0020	--	No plant-specific soil screening level available	--	--	Yes	No SL
Endrin	0.0018 J	0.2 J	OU2-SS09-Z2	55	8/55	0.0065	0.0034	LANL 2012 as cited in NPS 2014	7/55	1.9	Yes	>SL
Endrin aldehyde	0.0083 J	0.097 J	18MC-SS08-Z1	55	4/55	0.0045	0.0034	LANL 2012 as cited in NPS 2014 for endrin	4/55	1.3	Yes	>SL
Endrin ketone	0.0031 J	0.017 J	FS-SP12-D02-S-O	55	8/55	0.0021	0.0034	LANL 2012 as cited in NPS 2014 for endrin	7/55	0.6	No	< SL
gamma-BHC (lindane)	0.00058 J	0.011 J	18MC-L07-S05-Z1	55	8/55	0.0012	0.005	USEPA Region 5 ESL (2003), plant exposure	1/55	0.2	No	< SL
Methoxychlor	0.004 J	0.4 J	18MC-L09-S04-Z1	55	14/55	0.036	--	No plant-specific soil screening level available	--	--	Yes	No SL
alpha-Chlordane	0.00088 J	0.018	18MC-L02E-S04-Z1	55	5/55	0.00182	0.224	USEPA Region 5 soil ESL (2003) for chlordane, plant exposure	0/55	0.1	No	< SL
gamma-Chlordane	0.0068 J	0.1 J	18MC-L07-S05-Z1	55	4/55	0.00658	0.224	USEPA Region 5 soil ESL (2003) for chlordane, plant exposure	0/55	0.4	No	< SL
Dioxins (ng/kg)												
2,3,7,8-TCDD TEQ (ND=0)	10.59	10.59	OU2-SS09-Z1	1	1/1	Max.	--	No plant-specific soil screening level available	--	--	Yes	No SL

Table 4-1 Soil Phytotoxicity Screening Levels and Results, Baseline Ecological Risk Assessment, Eighteenmile Creek Operable Unit 2, Lockport, New York.

Analyte[a]	Minimum Detected Value	Maximum Detected Value	Location of Maximum	Number of Samples	FoD	BERA EPC[b]	Soil Phytotoxicity Screening Level, Source, and Screening Result					
							Value	Source[c, d]	FoE[e]	HQ[f]	COC	Rationale[g]
PAHs (mg/kg)												
HPAH Sum (ND = 0)	0.042	924	FS-SS06-S-O	67	63/67	45.1	18	LANL 2012 as cited in NPS 2014 for benzo(a)anthracene	10/67	2.5	Yes	>SL
HPAH Sum (ND = 0.5DL)	0.395	942	FS-SS06-S-O	67	61/67	56.9	18	LANL 2012 as cited in NPS 2014 for benzo(a)anthracene	15/67	3.2	Yes	>SL
LPAH Sum (ND = 0)	0.015	435 J	FS-SS06-S-O	67	61/67	14.6	0.25	LANL 2012 as cited in NPS 2014 for acenaphthene	35/67	58	Yes	>SL
LPAH Sum (ND = 0.5DL)	0.295	435	FS-SS06-S-O	67	61/67	29.4	0.25	LANL 2012 as cited in NPS 2014 for acenaphthene	51/67	117	Yes	>SL
Other SVOCs (mg/kg)												
Acetophenone	0.011 J	0.022 J	18MC-SS12-Z1	57	3/57	--	--	No plant-specific soil screening level available	--	--	Yes	No SL
Biphenyl (diphenyl)	0.014 J	0.39 J	18MC-L09-S04-Z1	58	5/58	--	60	Efroymson et al. 1997a	0/58	0.01	No	< SL
Bis(2-ethylhexyl) phthalate	0.026 J	50	FS-SS06-S-O	39	4/39	1.025	--	No plant-specific soil screening level available	--	--	Yes	No SL
Butyl benzyl phthalate	0.064 J	36	FS-SS06-S-O	74	22/74	--	--	No plant-specific soil screening level available	--	--	Yes	No SL
Carbazole	0.009 J	33 J	FS-SS06-S-O	57	29/57	0.419	0.25	LANL 2012 as cited in NPS 2014 for acenaphthene	7/57	1.7	Yes	>SL
Dibenzofuran	0.012 J	26 J	FS-SS06-S-O	57	22/57	0.467	0.25	LANL 2012 as cited in NPS 2014 for acenaphthene	4/57	1.9	Yes	>SL
Di-n-butyl phthalate	0.01 J	2.2 J	FS-SS01-S-O	57	13/57	0.327	200	Efroymson et al. 1997a	0/57	0.002	No	< SL
Di-n-octyl phthalate	0.008 J	15	FS-SS05-S-O	57	15/57	0.374	--	No plant-specific soil screening level available	--	--	Yes	No SL

Notes:

a = Analytes detected in surface soil in recent OU2 site investigations are listed if frequency of detection was > 5%. Frequency of detection was considered only when a minimum of 20 samples were collected.

b = 95% UCL (ProUCL recommendation) or maximum concentration (if number of samples was limited (e.g., 1 for 2,3,7,8 TCDD).

c = See Section 3.

d = Background soil concentrations were not used to help select COPCs for soil.

e = (Number of detected results > screening level) / (number of samples).

f = Hazard quotient = (BERA EPC) / (screening level)

g = Rational codes:

MSC = Major soil constituent (of low toxicity [USEPA 2003b])
NUT = Major nutrient element
> SL = Greater than or equal to screening level
< SL = Less than screening level
No SL = No screening level

Key:

-- (double dash) = not available
BERA = baseline ecological risk assessment
COC = contaminant of concern
DL = detection limit
Eco-SSL = Ecological Soil Screening Level
EPC = exposure point concentration
ESL = Ecological Screening Level
FoD = frequency of detection
FoE = frequency of exceedance
HPAH = high molecular weight PAHs
HQ = hazard quotient
LANL = Los Alamos National Laboratory
LPAHs = low molecular weight PAHs
ND = not detected
MATC = maximum acceptable toxicant concentration
mg/kg = milligrams per kilogram
NPS = National Park Service
PAHs = polycyclic aromatic hydrocarbons
PCBs = polychlorinated biphenyls
TCDD TEQ = Tetrachlorodibenzo-p-dioxin toxic equivalent
UCL = upper confidence limit
USEPA = United States Environmental Protection Agency
gray shading = exceeds screening level

Table 4-2 Soil Fauna Screening Levels and Results, Baseline Ecological Risk Assessment, Eighteenmile Creek Operable Unit 2, Lockport, New York.

Analyte[a]	Minimum Detected Value	Maximum Detected Value	Location of Maximum	Number of Samples	FoD	BERA EPC[b]	Soil Fauna Screening Level, Source, and Screening Result					
							Value	Source[c, d]	FoE[e]	HQ[f]	COC	Rationale[g]
Metals (mg/kg)												
Aluminum	1160 J	15100 J	18MC-SS14-Z1	104	104/104	--	--	No toxicity expected for soil with pH > 5.5 (USEPA 2003a)	--	--	No	MSC
Antimony	0.7 J	166 J	UPSON-1	114	72/114	31.4	78	USEPA 2005i (Eco-SSL)	4/114	0.4	No	< SL
Arsenic	1.0	103	OU2-SS24	117	117/117	19.6	60	Efroymson et al. 1997b (earthworm)	3/117	0.3	No	< SL
Barium	8.7 J	3900	UPSON-2B	114	113/114	458	330	USEPA 2005c (Eco-SSL)	18/114	1.4	Yes	>SL
Beryllium	0.14 J	2.5 J	18MC-L03E-S05-Z1	104	102/104	0.52	40	USEPA 2005d (Eco-SSL)	0/104	0.01	No	< SL
Cadmium	0.050 J	37.9	FS-SS02-S-O	114	104/114	7.9	140	USEPA 2005e (Eco-SSL)	0/114	0.06	No	< SL
Calcium	869 0	217000	18MC-SS09-Z1	104	104/104	--	--	--	--	--	No	MSC
Chromium	2.6 J	505	UPSON-2B	117	117/117	59.6	57	USEPA 2008 (MATC)	15/117	1.0	No	< SL
Cobalt	1.4	43.9 J	UPSON-1	114	113/114	9.2	1000	Efroymson et al. 1997b (soil microbe)	0/114	0.01	No	< SL
Copper	6.6 J	51000	FS-SS02-S-O	117	117/117	1400	80	USEPA 2007a (Eco-SSL)	51/117	18	Yes	>SL
Iron	7560	231000	FS-SS02-S-O	104	104/104	--	--	No toxicity expected for soil with pH 5 to 8 (USEPA 2003b)	--	--	No	NUT
Lead	2.7	8600	FS-SP12-D02-S-O	121	121/121	1176	1700	USEPA 2005g (Eco-SSL)	16/121	0.7	No	< SL
Magnesium	122	114000	18MC-SS09-Z1	104	104/104	--	--	--	--	--	No	MSC
Manganese	16.5	3310	UPSON-1B	114	114/114	762	450	USEPA 2007b (Eco-SSL)	51/114	1.7	Yes	>SL
Mercury	0.006 J	21.5	UPSON-1B	114	109/114	2.3	0.1	Efroymson et al. 1997b (earthworm)	61/114	23	Yes	>SL
Nickel	3.8	909 J	18MC-L18-S06-Z1	114	114/114	68	280	USEPA 2007c (Eco-SSL)	4/114	0.2	No	< SL
Potassium	103	2810	18MC-L04W-S05-Z2	104	104/104	--	--	--	--	--	No	MSC
Selenium	0.64	11.5	18MC-SS01-Z1	104	42/104	1.6	4.1	USEPA 2007d (Eco-SSL)	10/104	0.4	No	< SL
Silver	0.11	80.6	UPSON-1	114	64/114	4.6	50	Efroymson et al. 1997b (soil microbe)	3/114	0.09	No	< SL
Sodium	49.8	1010	18MC-SS14-Z1	104	96/104	--	--	--	--	--	No	MSC
Thallium	0.14 J	32.7	FS-SS02-S-O	114	17/114	2.7	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Vanadium	3.5	103	FS-SS01-S-O	114	114/114	17	20	Efroymson et al. 1997b (soil microbe)	21/114	0.9	No	< SL
Zinc	10.3 J	21900	FS-SS02-S-O	117	117/117	2508	120	USEPA 2007e (Eco-SSL)	66/117	21	Yes	>SL
Total PCBs (mg/kg)												
Aroclor Sum (ND = 0)	0.0078	390	OU2-SS09-Z2	134	71/134	5.4	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Aroclor Sum (ND = 0.5DL)	0.03625	400	OU2-SS09-Z1	134	71/134	6.5	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Pesticides (mg/kg)												
DDT, Total	0.0034	6.7 J	OU2-SS09-Z2	55	41/55	0.184	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Aldrin	0.0012 J	0.0096 J	18MC-L09-S04-Z1	55	8/55	0.0012	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
alpha-BHC	0.0013 J	0.0093 J	18MC-SS05-Z1	55	10/55	0.0020	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Endosulfan I	0.0013 J	0.016 J	18MC-L07-S05-Z1	54	8/54	0.0041	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
beta-BHC	0.00078 J	0.054 J	18MC-L07-S05-Z1	55	3/55	0.0064	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Endosulfan II	0.0012 J	0.036 J	18MC-L09-S04-Z1	55	9/55	0.0031	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
delta-BHC	0.00048 J	0.0085 J	18MC-SS01-Z1	55	9/55	0.0013	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Dieldrin	0.004 J	0.45	18MC-L16W-S04-Z1	55	12/55	0.0171	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Endosulfan sulfate	0.0021 J	0.025	FS-SS09-S-O	55	3/55	0.0020	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Endrin	0.0018 J	0.20 J	OU2-SS09-Z2	55	8/55	0.0065	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Endrin aldehyde	0.0083 J	0.097 J	18MC-SS08-Z1	55	4/55	0.0045	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Endrin ketone	0.0031 J	0.017 J	FS-SP12-D02-S-O	55	8/55	0.0021	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
gamma-BHC (lindane)	0.00058 J	0.011 J	18MC-L07-S05-Z1	55	8/55	0.0012	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Methoxychlor	0.0040 J	0.40 J	18MC-L09-S04-Z1	55	14/55	0.036	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
alpha-Chlordane	0.00088 J	0.018	18MC-L02E-S04-Z1	55	5/55	0.00182	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
gamma-Chlordane	0.0068 J	0.10 J	18MC-L07-S05-Z1	55	4/55	0.00658	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL

Table 4-2 Soil Fauna Screening Levels and Results, Baseline Ecological Risk Assessment, Eighteenmile Creek Operable Unit 2, Lockport, New York.

Analyte[a]	Minimum Detected Value	Maximum Detected Value	Location of Maximum	Number of Samples	FoD	BERA EPC[b]	Soil Fauna Screening Level, Source, and Screening Result					
							Value	Source[c, d]	FoE[e]	HQ[f]	COC	Rationale[g]
Dioxins (ng/kg)												
(ND=0)	10.59	10.59	OU2-SS09-Z1	1	1/1	Max.	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
PAHs (mg/kg)												
HPAH Sum (ND = 0)	0.042	924	FS-SS06-S-O	67	63/67	45.1	18	USEPA 2007g (Eco-SSL)	10/67	2.5	Yes	>SL
HPAH Sum (ND = 0.5DL)	0.395	942	FS-SS06-S-O	67	61/67	56.9	18	USEPA 2007g (Eco-SSL)	15/67	3.2	Yes	>SL
LPAH Sum (ND = 0)	0.015	435 J	FS-SS06-S-O	67	61/67	14.6	29	USEPA 2007g (Eco-SSL)	3/67	0.5	No	< SL
LPAH Sum (ND = 0.5DL)	0.295	435	FS-SS06-S-O	67	61/67	29.4	29	USEPA 2007g (Eco-SSL)	9/67	1.0	No	< SL
Other SVOCs (mg/kg)												
Acetophenone	0.011 J	0.022 J	18MC-SS12-Z1	57	3/57	--	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Biphenyl (diphenyl)	0.014 J	0.39 J	18MC-L09-S04-Z1	58	4/58	--	60	Efroymson et al. 1997a for plants	0/58	0.01	No	< SL
Bis(2-ethylhexyl) phthalate	0.026 J	50	FS-SS06-S-O	39	22/39	1.025	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Butyl benzyl phthalate	0.064 J	36	FS-SS06-S-O	74	5/74	--	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Carbazole	0.009 J	33 J	FS-SS06-S-O	57	29/57	0.419	29	USEPA 2007f (Eco-SSL) for LPAHs	1/57	0.01	No	< SL
Dibenzofuran	0.012 J	26 J	FS-SS06-S-O	57	22/57	0.467	29	USEPA 2007f (Eco-SSL) for LPAHs	0/57	0.9	No	< SL
Di-n-butyl phthalate	0.010 J	2.2 J	FS-SS01-S-O	57	13/57	0.327	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL
Di-n-octyl phthalate	0.008 J	15	FS-SS05-S-O	57	15/57	0.374	--	No soil invertebrate-specific screening value available	--	--	Yes	No SL

Notes:

a = Analytes detected in surface soil in recent OU2 site investigations are listed if frequency of detection was > 5%. Frequency of detection was considered only when a minimum of 20 samples were collected.

b = 95% UCL (ProUCL recommendation) or maximum concentration (if number of samples was limited (e.g., 1 for 2,3,7,8 TCDD).

c = See Section 3.

d = Background soil concentrations were not used to help select COPCs for soil.

e = Number of detected results > screening level over number of samples.

f = Hazard quotient = (BERA EPC) / (screening level)

g = Rational codes:

MSC = Major soil constituent (of low toxicity [USEPA 2003b])
NUT = Major nutrient element
> SL = Greater than or equal to screening level
< SL = Less than screening level
No SL = No screening level

Key:

-- (double dash) = not available
BERA = baseline ecological risk assessment
COC = contaminant of concern
DL = detection limit
EPC = exposure point concentration
Eco-SSL = Ecological Soil Screening Level
ESL = Ecological Screening Level
FoD = frequency of detection
FoE = frequency of exceedance
HPAH = high molecular weight PAHs
HQ = hazard quotient
LANL = Los Alamos National Laboratory
LPAHs = low molecular weight PAHs
ND = not detected
MATC = maximum acceptable toxicant concentration
mg/kg = milligrams per kilogram
NPS = National Park Service
PAHs = polycyclic aromatic hydrocarbons
PCBs= polychlorinated biphenyls
TCDD TEQ = Tetrachlorodibenzo-p-dioxin toxic equivalent
UCL = upper confidence limit
USEPA = United States Environmental Protection Agency
gray shading = exceeds screening level

Table 4-3 NYSDEC Ecological Soil Screening Levels and Result, BERA, Eighteenmile Creek Operable Unit 2, Lockport, New York.

Analyte[a]	Minimum Detected Value	Maximum Detected Value	Location of Maximum	Number of Samples	FoD	BERA EPC[b]	Soil Fauna Screening Level, Source, and Screening Result					
							Value	Source[c, d]	FoE[e]	HQ[f]	COC	Rationale[g]
Metals (mg/kg)												
Aluminum	1160 J	15100 J	18MC-SS14-Z1	104	104/104	--	--	No toxicity expected for soil with pH > 5.5 (USEPA 2003a)	--	--	No	MSC
Antimony	0.7 J	166 J	UPSON-1	114	72/114	31.4	--	No DEC value	--	--	Yes	No SL
Arsenic	1.0	103	OU2-SS24	117	117/117	19.6	13	DEC Table 375-6.8b Ecological Receptors (soil background)	40/117	1.5	Yes	>SL
Barium	8.7 J	3900	UPSON-2B	114	113/114	458	433	DEC Table 375-6.8b Ecological Receptors	14/114	1.1	Yes	>SL
Beryllium	0.14 J	2.5 J	18MC-L03E-S05-Z1	104	102/104	0.52	10	DEC Table 375-6.8b Ecological Receptors	0/104	0.05	No	< SL
Cadmium	0.05 J	37.9	FS-SS02-S-O	114	104/114	7.9	4	DEC Table 375-6.8b Ecological Receptors	16/114	2.0	Yes	>SL
Calcium	869 0	217000	18MC-SS09-Z1	104	104/104	--	--	--	--	--	No	MSC
Chromium	2.6 J	505	UPSON-2B	117	117/117	59.6	41	DEC Table 375-6.8b Ecological Receptors	24/117	1.5	Yes	>SL
Cobalt	1.4	43.9 J	UPSON-1	114	113/114	9.2	--	No DEC value	--	--	Yes	No SL
Copper	6.6 J	51000	FS-SS02-S-O	117	117/117	1400	50	DEC Table 375-6.8b Ecological Receptors	58/117	28	Yes	>SL
Iron	7560	231000	FS-SS02-S-O	104	104/104	--	--	No toxicity expected for soil with pH 5 to 8 (USEPA 2003b)	--	--	No	NUT
Lead	2.7	8600	FS-SP12-D02-S-O	121	121/121	1176	63	DEC Table 375-6.8b Ecological Receptors (soil background)	77/121	19	Yes	>SL
Magnesium	122	114000	18MC-SS09-Z1	104	104/104	--	--	--	--	--	No	MSC
Manganese	16.5	3310	UPSON-1B	114	114/114	762	1600	DEC Table 375-6.8b Ecological Receptors (soil background)	9/114	0.5	No	< SL
Mercury	0.006 J	21.5	UPSON-1B	114	109/114	2.3	0.18	DEC Table 375-6.8b Ecological Receptors (soil background)	49/114	13	Yes	>SL
Nickel	3.8	909 J	18MC-L18-S06-Z1	114	114/114	68	30	DEC Table 375-6.8b Ecological Receptors	32/114	2.3	Yes	>SL
Potassium	103	2810	18MC-L04W-S05-Z2	104	104/104	--	--	--	--	--	No	MSC
Selenium	0.64	11.5	18MC-SS01-Z1	104	42/104	1.6	3.9	DEC Table 375-6.8b Ecological Receptors (soil background)	11/104	0.4	No	< SL
Silver	0.11	80.6	UPSON-1	114	64/114	4.6	2	DEC Table 375-6.8b Ecological Receptors	14/114	2.3	Yes	>SL
Sodium	49.8	1010	18MC-SS14-Z1	104	96/104	--	--	--	--	--	No	MSC
Thallium	0.14 J	32.7	FS-SS02-S-O	114	17/114	2.7	--	No DEC value	--	--	Yes	No SL
Vanadium	3.5	103	FS-SS01-S-O	114	114/114	17	--	No DEC value	--	--	Yes	No SL
Zinc	10.3 J	21900	FS-SS02-S-O	117	117/117	2508	109	DEC Table 375-6.8b Ecological Receptors (soil background)	66/117	23	Yes	>SL
Total PCBs (mg/kg)												
Aroclor Sum (ND = 0)	0.0078	390	OU2-SS09-Z2	134	71/134	5.4	1	DEC Table 375-6.8b Ecological Receptors	11/134	5.4	Yes	>SL
Aroclor Sum (ND = 0.5DL)	0.03625	400	OU2-SS09-Z1	134	71/134	6.5	1	DEC Table 375-6.8b Ecological Receptors	17/134	6.5	Yes	>SL
Pesticides (mg/kg)												
DDT, Total	0.0034	6.7 J	OU2-SS09-Z2	55	41/55	0.184	0.0033	DEC Table 375-6.8b Ecological Receptors (CRQL)	30/55	56	Yes	>SL
Aldrin	0.0012 J	0.0096 J	18MC-L09-S04-Z1	55	8/55	0.0012	0.14	DEC Table 375-6.8b Ecological Receptors	0/55	0.01	No	< SL
alpha-BHC	0.0013 J	0.0093 J	18MC-SS05-Z1	55	10/55	0.0020	0.04	DEC Table 375-6.8b Ecological Receptors (mixed isomers)	0/55	0.05	No	< SL
Endosulfan I	0.0013 J	0.016 J	18MC-L07-S05-Z1	54	8/54	0.0041	--	No DEC value	--	--	Yes	No SL
beta-BHC	0.00078 J	0.054 J	18MC-L07-S05-Z1	55	3/55	0.0064	0.6	DEC Table 375-6.8b Ecological Receptors	0/55	0.1	No	< SL
Endosulfan II	0.0012 J	0.036 J	18MC-L09-S04-Z1	55	9/55	0.0031	--	No DEC value	--	--	Yes	No SL
delta-BHC	0.00048 J	0.0085 J	18MC-SS01-Z1	55	9/55	0.0013	0.04	DEC Table 375-6.8b Ecological Receptors (mixed isomers)	0/55	0.03	No	< SL
Dieldrin	0.004 J	0.45	18MC-L16W-S04-Z1	55	12/55	0.0171	0.006	DEC Table 375-6.8b Ecological Receptors	10/55	2.8	Yes	>SL
Endosulfan sulfate	0.0021 J	0.025	FS-SS09-S-O	55	3/55	0.0020	--	No DEC value	--	--	Yes	No SL
Endrin	0.0018 J	0.20 J	OU2-SS09-Z2	55	8/55	0.0065	0.014	DEC Table 375-6.8b Ecological Receptors	3/55	0.5	No	< SL
Endrin aldehyde	0.0083 J	0.097 J	18MC-SS08-Z1	55	4/55	0.0045	--	No DEC value	--	--	Yes	No SL
Endrin ketone	0.0031 J	0.017 J	FS-SP12-D02-S-O	55	8/55	0.0021	--	No DEC value	--	--	Yes	No SL
gamma-BHC (lindane)	0.00058 J	0.011 J	18MC-L07-S05-Z1	55	8/55	0.0012	6	DEC Table 375-6.8b Ecological Receptors	0/55	0.002	No	< SL
Methoxychlor	0.0040 J	0.40 J	18MC-L09-S04-Z1	55	14/55	0.036	--	No DEC value	--	--	Yes	No SL
alpha-Chlordane	0.00088 J	0.018	18MC-L02E-S04-Z1	55	5/55	0.00182	1.3	DEC Table 375-6.8b Ecological Receptors	0/55	0.01	No	< SL
gamma-Chlordane	0.0068 J	0.10 J	18MC-L07-S05-Z1	55	4/55	0.00658	--	No DEC value	--	--	Yes	No SL

Table 4-3 NYSDEC Ecological Soil Screening Levels and Result, BERA, Eighteenmile Creek Operable Unit 2, Lockport, New York.

Analyte[a]	Minimum Detected Value	Maximum Detected Value	Location of Maximum	Number of Samples	FoD	BERA EPC[b]	Soil Fauna Screening Level, Source, and Screening Result					
							Value	Source[c, d]	FoE[e]	HQ[f]	COC	Rationale[g]
Dioxins (ng/kg)												
2,3,7,8-TCDD TEQ	10.59	10.59	OU2-SS09-Z1	1	1/1	Max.	--	No DEC value	--	--	Yes	No SL
PAHs (mg/kg)												
HPAH Sum (ND = 0)	0.042	924	FS-SS06-S-O	67	63/67	45.1	2.6	DEC Table 375-6.8b Ecological Receptors (for benzo(a)pyrene)	31/67	17	Yes	>SL
HPAH Sum (ND = 0.5DL)	0.395	942	FS-SS06-S-O	67	61/67	56.9	2.6	DEC Table 375-6.8b Ecological Receptors (for benzo(a)pyrene)	39/67	22	Yes	>SL
LPAH Sum (ND = 0)	0.015	435 J	FS-SS06-S-O	67	61/67	14.6	20	DEC Table 375-6.8b Ecological Receptors (for acenaphthene)	3/67	0.7	No	< SL
LPAH Sum (ND = 0.5DL)	0.295	435	FS-SS06-S-O	67	61/67	29.4	20	DEC Table 375-6.8b Ecological Receptors (for acenaphthene)	12/67	1.5	No	< SL
Other SVOCs (mg/kg)												
Acetophenone	0.011 J	0.022 J	18MC-SS12-Z1	57	3/57	--	--	No DEC value	--	--	Yes	No SL
Biphenyl (diphenyl)	0.014 J	0.39 J	18MC-L09-S04-Z1	58	4/58	--	--	No DEC value	--	--	Yes	No SL
Bis(2-ethylhexyl) phthalate	0.026 J	50	FS-SS06-S-O	39	22/39	1.025	--	No DEC value	--	--	Yes	No SL
Butyl benzyl phthalate	0.064 J	36	FS-SS06-S-O	74	5/74	--	--	No DEC value	--	--	Yes	No SL
Carbazole	0.009 J	33 J	FS-SS06-S-O	57	29/57	0.419	--	No DEC value	--	--	Yes	No SL
Dibenzofuran	0.012 J	26 J	FS-SS06-S-O	57	22/57	0.467	--	No DEC value	--	--	Yes	No SL
Di-n-butyl phthalate	0.010 J	2.2 J	FS-SS01-S-O	57	13/57	0.327	--	No DEC value	--	--	Yes	No SL
Di-n-octyl phthalate	0.008 J	15	FS-SS05-S-O	57	15/57	0.374	--	No DEC value	--	--	Yes	No SL

Notes:

a = Analytes detected in surface soil in recent OU2 site investigations are listed if frequency of detection was > 5%. Frequency of detection was considered only when a minimum of 20 samples were collected.

b = 95% UCL (ProUCL recommendation) or maximum concentration (if number of samples was limited (e.g., 1 for 2,3,7,8 TCDD).

c = See Section 3.

d = Background soil concentrations were not used to help select COPCs for soil.

e = Number of detected results > screening level over number of samples.

f = Hazard quotient = (BERA EPC) / (screening level)

g = Rational codes:

MSC = Major soil constituent (of low toxicity [USEPA 2003b])

NUT = Major nutrient element

> SL = Greater than or equal to screening level

< SL = Less than screening level

Key:

-- (double dash) = not available

BERA = baseline ecological risk assessment

CRQL = contract required quantitation limit

DEC = Department of Environmental Conservation (New York State)

DL = detection limit

Eco-SSL = Ecological Soil Screening Level

EPC = exposure point concentration

ESL = Ecological Screening Level

FoD = frequency of detection

FoE = frequency of exceedance

HPAH = high molecular weight PAHs

HQ = hazard quotient

LANL = Los Alamos National Laboratory

LPAHs = low molecular weight PAHs

ND = not detected

MATC = maximum acceptable toxicant concentration

mg/kg = milligrams per kilogram

NPS = National Park Service

PAHs = polycyclic aromatic hydrocarbons

PCBs= polychlorinated biphenyls

TCDD TEQ = Tetrachlorodibenzo-p-dioxin toxic equivalent

UCL = upper confidence limit

USEPA = United States Environmental Protection Agency

gray shading = exceeds screening level

Table 4-4a Sediment Screening Results Based on Low-Level Effect Benchmarks (NYSDEC Class A or Equivalent), BERA, Eighteenmile Creek OU2, Lockport, New York

Analyte[a]	Minimum Detected Value	Maximum Detected Value	Location of Maximum	Number of Samples	FoD	BERA EPC[b]	Sediment Screening Level, Source, and Screening Result					
							Value	Source (Basis)[c, d, e]	FoE[f]	HQ[g]	COPC	Rationale[h]
Metals (mg/kg)												
Aluminum	1690	10600	OU2-SED09	11	11/11	8778	25,500	Buchman 2008 (ARCS *Hyalella* TEL)	0/11	0.3	No	< SL
Antimony	0.69	18.9	OU2-SED07	11	8/11	5.39	2	Long and Morgan 1991 (Marine ER-L)	5/11	2.7	Yes	>SL
Arsenic	1.2 J	51	SED-29B	91	91/91	7.19	10	NYSDEC 2014 (TEC from McDonald et al. 2000)	13/91	0.7	No	< SL
Barium	19.7	287	OU2-SED08	11	11/11	125	--	--	--	--	Yes	no SL
Beryllium	0.17	0.68 J	18MC-AS-S01-Z1	11	11/11	0.50	--	--	--	--	Yes	no SL
Cadmium	0.59	2.2	OU2-SED08	11	10/11	1.57	1	NYSDEC 2014 (TEC from McDonald et al. 2000)	7/11	1.6	Yes	>SL
Chromium	2.8	146 J	18MC-L05W-S03-Z1	91	91/91	33.6	43	NYSDEC 2014 (TEC from McDonald et al. 2000)	15/91	0.8	No	< SL
Cobalt	2.5	9.9	OU2-SED09	11	11/11	7.5	50	MacDonald et al 1999 (Criterion, Ontario)	0/11	0.2	No	< SL
Copper	16 J	7900	SED-29B	91	91/91	476	32	NYSDEC 2014 (TEC from McDonald et al. 2000)	83/91	15	Yes	>SL
Iron	9600	26800	OU2-SED09	11	11/11	22,324	20,000	Persaud et al. 1993 (LEL)	5/11	1.1	Yes	>SL
Lead	11 J	25400	SED-7	95	95/95	802	36	NYSDEC 2014 (TEC from McDonald et al. 2000)	93/95	22	Yes	>SL
Manganese	290	1590 J	18MC-AS-S01-Z1	11	11/11	673	460	Persaud et al. 1993 (LEL)	4/11	1.5	Yes	>SL
Mercury	0.11	6.2	OU2-SED07	13	13/13	1.6	0.2	NYSDEC 2014 (TEC from McDonald et al. 2000)	11/13	8.2	Yes	>SL
Nickel	8.9	38 J	OU2-SED03	11	11/11	31	23	NYSDEC 2014 (TEC from McDonald et al. 2000)	6/11	1.4	Yes	>SL
Selenium	0.37 J	1.5	FS-EMC01-SED-O	11	5/11	0.87	5	MacDonald et al 1999 (Criterion, B.C.)	0/11	0.2	No	< SL
Silver	0.23 J	2.4 J	OU2-SED03	11	10/11	1.4	1	NYSDEC 2014 (Marine ER-L from Long & Morgan 1991)	6/11	1.4	Yes	>SL
Thallium	0.15 J	3.3	FS-EMC01-SED-O	11	8/11	0.48	--	--	--	--	Yes	no SL
Vanadium	6	18.7	OU2-SED09	11	11/11	16.7	--	--	--	--	Yes	no SL
Zinc	37	23600	SED-29B	91	91/91	963	120	NYSDEC 2014 (TEC from McDonald et al. 2000)	81/91	8.0	Yes	>SL
Total PCBs (mg/kg)												
Aroclor Sum (ND = 0)	0.006	390	SED-34B	97	86/97	17.3	0.10	NYSDEC 2014 (DOW TOGS 5.1.9)	69/97	173	Yes	>SL
Aroclor Sum (ND = 0.5DL)	0.06	1315	SED-34B	97	86/97	35.6	0.10	NYSDEC 2014 (DOW TOGS 5.1.9)	69/97	356	Yes	>SL
Pesticides (mg/kg)												
Aldrin	0.00012 J	1.50 J	18MC-L09-S02-Z1	29	9/29	0.075	0.002	Persaud et al. 1993 (LEL)	6/29	38	Yes	>SL
alpha-BHC	0.00027 J+	0.041 J	18MC-L14E-S02-Z1	29	10/29	0.010	0.006	Persaud et al. 1993 (LEL)	8/29	1.7	Yes	>SL
Endosulfan I	0.00071 J	0.17 J	18MC-L09-S02-Z1	29	11/29	0.024	0.001	NYSDEC 2014 for 2% TOC for endosulfan	10/29	24	Yes	>SL
beta-BHC	0.00049 J	2.9 J	18MC-L09-S02-Z1	29	7/29	0.19	0.005	Persaud et al. 1993 (LEL)	7/29	38	Yes	>SL
Endosulfan II	0.00074 J	0.034 J	OU2-SED03	29	6/29	0.013	0.001	NYSDEC 2014 for 2% TOC for endosulfan	4/29	13	Yes	>SL
cis-Chlordane	0.002	0.052 J	OU2-SED03	29	7/29	0.011	0.068	NYSDEC 2014 for 2% TOC for chlordane	0/29	0.2	No	< SL
Σ DDT	0.00160	1.4	OU2-SED03	29	19/29	0.17	0.044	NYSDEC 2014 for 2% TOC	7/29	4	Yes	>SL
delta-BHC	0.00048 J	0.64 J	OU2-SED03	29	7/29	0.031	0.003	Persaud et al. 1993 (LEL) for BHC	5/29	10.3	Yes	>SL
Dieldrin	0.0013 J	1.8 J	18MC-L09-S02-Z1	29	14/29	0.13	0.18	NYSDEC 2014 for 2% TOC	2/29	0.7	No	< SL
Endosulfan sulfate	0.00091 J	0.083 J	OU2-SED03	29	4/29	0.019	0.001	NYSDEC 2014 for 2% TOC for endosulfan	3/29	19	Yes	>SL
Endrin	0.0022 J	0.53 J	OU2-SED03	29	6/29	0.036	0.090	NYSDEC 2014 for 2% TOC	2/29	0.4	No	< SL
Endrin aldehyde	0.0005 J	0.15	FS-EMC01-SED-O	29	4/29	0.02	0.090	NYSDEC 2014 for 2% TOC for endrin	2/23	0.2	No	< SL
Endrin ketone	0.00057 J	1.6 J	18MC-L09-S02-Z1	29	4/29	0.16	0.090	NYSDEC 2014 for 2% TOC for endrin	1/29	1.8	Yes	>SL
gamma-BHC (lindane)	0.00057 J	0.61 J	OU2-SED03	29	14/29	0.047	0.047	NYSDEC 2014 for 2% TOC	3/29	1.0	Yes	= SL
Heptachlor	0.003 J	0.55 J	OU2-SED03	29	5/29	0.053	0.075	NYSDEC 2014 for 2% TOC	2/29	0.7	No	< SL
Heptachlor epoxide	0.0011 J	0.43 J	FS-EMC01-SED-O	29	7/29	0.018	0.015	NYSDEC 2014 for 2% TOC	1/29	1.2	Yes	>SL
Methoxychlor	0.0016 J	1.6 J	18MC-L09-S02-Z1	29	10/29	0.094	0.059	NYSDEC 2014 for 2% TOC	5/29	1.6	Yes	>SL
trans-Chlordane	0.0050 J	0.75 J	18MC-L15E-S02-Z1	29	8/29	0.059	0.068	NYSDEC 2014 for 2% TOC for chlordane	3/29	0.9	No	< SL
Dioxins/Furans (mg/kg)												
2,3,7,8-TCDD TEQ (ND=0)	2.31E-05	3.38E-05	DEC-8	2	2/2	3.38E-05	8.5E-07	Buchman 2008 (TEL)	2/2	40	Yes	>SL
2,3,7,8-TCDD TEQ (ND=0.5DL)	2.31E-05	4.30E-05	DEC-8	2	2/2	4.30E-05	8.5E-07	Buchman 2008 (TEL)	2/2	51	Yes	>SL
PAHs (mg/kg)												
Total PAHs (ND = 0)	0.095	5458 J	FS-EMC01-SED-O	29	29/29	229	4	NYSDEC 2014 (ER-L from Long and Morgan 1991)	22/29	57	Yes	>SL
Total PAHs (ND = 0.5DL)	0.872	5458	FS-EMC01-SED-O	29	29/29	248	4	NYSDEC 2014 (ER-L from Long and Morgan 1991)	22/29	62	Yes	>SL
Other SVOCs (mg/kg)												
2-Methylphenol	0.16 J	0.22 J	18MC-L15E-S02-Z1	23	2/23	Max.	0.024	NPS 2014 (EqP value, 2% TOC)	2/23	9.2	Yes	>SL
4-Methylphenol	0.60 J	3.7	OU2-SED01	23	4/23	0.631	0.024	NPS 2014 (EqP value, 2% TOC) for 2-methylphenol	4/23	26	Yes	>SL
Benzaldehyde	0.034 J	0.043 J	18MC-L16E-S02-Z1	23	2/23	Max.	--	No benthos-specific screening level available	--	--	Yes	no SL
Benzyl butyl phthalate	0.073 J	0.40 J	OU2-SED01	23	2/23	Max.	0.022	NPS 2014 (EqP value, 2% TOC)	2/23	18	Yes	>SL
Bis(2-ethylhexyl) phthalate	0.072 J	28 J	18MC-L18-S02-Z1	23	9/23	4.5	360	NYSDEC 2014 for 2% TOC	0/23	0.013	No	< SL
Carbazole	0.011 J	160	FS-EMC01-SED-O	23	18/23	10.3	1.6	MacDonald et al 1999 (PAETA *Hyalella*)	2/23	6.4	Yes	>SL

Table 4-4a Sediment Screening Results Based on Low-Level Effect Benchmarks (NYSDEC Class A or Equivalent), BERA, Eighteenmile Creek OU2, Lockport, New York

Analyte[a]	Minimum Detected Value	Maximum Detected Value	Location of Maximum	Number of Samples	FoD	BERA EPC[b]	Sediment Screening Level, Source, and Screening Result					
							Value	Source (Basis)[c, d, e]	FoE[f]	HQ[g]	COPC	Rationale[h]
Dibenzofuran	0.010 J	140	FS-EMC01-SED-O	23	13/23	12	0.6	NPS 2014 (EqP value, 2% TOC)	2/23	20	Yes	>SL
Phenol	0.27 J	0.55	OU2-SED02	23	2/23	0.55	0.0024	NPS 2014 (EqP value, 2% TOC)	2/23	229	Yes	>SL

Notes:

a = Analytes detected in recent OU2 site investigations are listed if frequency of exceedance was > 5%. Frequency of detection was considered only when 20 or more samples were collected.

b = 95% UCL (from ProUCL, see Appendix F) or maximum concentration (if number of detects was < 4)

c = See Section 3. NYSDEC benchmarks in this table are their Class A standards.

d = .NYSDEC (2014) provides sediment screening values for organics normalized to 2% TOC; NYSDEC values were used without further adjustment. NPS (2014) provides sediment screening values for organics normalized to 1% TOC; NPS values were adjusted to 2% TOC to be consistent with NYSDEC values. Average site-specific sediment TOC is greater than 2% so the approach used here in conservative.

e = Background sediment concentrations were not used to help select COPCs for sediment.

f = Number of detected results > screening level over number of samples.

g = Hazard quotient = (BERA EPC) / (screening level)

h = Rational codes:

> SL = greater than screening level
< SL = less than screening level
= SL = equals screening level
no SL = no screening level.

Key:

-- (double dash) = Not available
BERA = Baseline Ecological Risk Assessment
COPC = Chemical of Potential Concern
DL = Detection limit
DOW TOGS = Division of Water, Technical & Operational Guidance Series
EPC = exposure point concentration
EqP = Equilibrium partitioning
ER-L = Effects Range - Low
FoD = Frequency of detection ([number of detects] / [number of samples])
FoE = Frequency of exceedance ([number of detected results > screening level] / [number of samples])
HQ = Hazard quotient
LEL = Lowest effect level
mg/kg = Milligrams per kilogram
N = Number of Samples
ND = Not detected
NPS = National Park Service
NYSDEC = New York State Department of Environmental Conservation
PAETA = Probable apparent effect threshold approach
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TCDD = Tetrachlorodibenzo-p-dioxin
TEQ = Toxic equivalent concentration
TEC = Threshold effect concentration
TEL = Threshold effect level
TOC = Total organic carbon
UCL = upper confidence limit
gray shading = exceeds or equals screening level

Table 4-4b Sediment Screening Results Based on Severe Effect Benchmarks (NYSDEC Class C or Equivalent), BERA, Eighteenmile Creek OU2, Lockport, NY.

Analyte[a]	Minimum Detected Value	Maximum Detected Value	Location of Maximum	Number of Samples	FoD	BERA EPC[b]	Sediment Screening Level, Source, and Screening Result					
							Value	Source (Basis)[c, d, e]	FoE[f]	HQ[g]	COPC	Rationale[h]
Metals (mg/kg)												
Aluminum	1690	10600	OU2-SED09	11	11/11	8778	58,000	MacDonald et al. 1999 (ER-M)	0/11	0.15	No	< SL
Antimony	0.69	18.9	OU2-SED07	11	11/11	5.4	25	Long and Morgan 1991 (Marine ER-M)	0/11	0.22	No	< SL
Arsenic	1.2 J	51	SED-29B	91	91/91	7.2	33	NYSDEC 2014 (PEC from McDonald et al. 2000)	1/91	0.22	No	< SL
Barium	19.7	287	OU2-SED08	11	11/11	125	48	Buchman 2008 (Marine AET, amphipod)	9/11	2.6	Yes	> SL
Beryllium	0.17	0.68 J	18MC-AS-S01-Z1	11	11/11	0.50	--	--	--	--	Yes	no SL
Cadmium	0.59	2.2	OU2-SED08	11	10/11	1.57	5	NYSDEC 2014 (PEC from McDonald et al. 2000)	0/11	0.31	No	< SL
Chromium	2.8	146 J	18MC-L05W-S03-Z1	91	91/91	33.6	110	NYSDEC 2014 (PEC from McDonald et al. 2000)	3/91	0.31	No	< SL
Cobalt	2.5	9.9	OU2-SED09	11	11/11	7.5	50	MacDonald et al 1999 (Criterion, Ontario)	0/11	0.15	No	< SL
Copper	16 J	7900	SED-29B	91	91/91	476	150	NYSDEC 2014 (PEC from McDonald et al. 2000)	38/91	3.2	Yes	>SL
Iron	9600	26800	OU2-SED09	11	11/11	22,324	40,000	Persaud et al. 1993 (SEL)	0/11	0.56	No	< SL
Lead	11 J	25400	SED-7	95	95/95	802	130	NYSDEC 2014 (PEC from McDonald et al. 2000)	80/95	6.2	Yes	>SL
Manganese	290	1590 J	18MC-AS-S01-Z1	11	11/11	673	1100	Persaud et al. 1993 (SEL)	1/11	0.61	No	< SL
Mercury	0.11	6.2	OU2-SED07	13	13/13	1.6	1	NYSDEC 2014 (PEC from McDonald et al. 2000)	5/13	1.6	Yes	>SL
Nickel	8.9	38 J	OU2-SED03	11	11/11	31	49	NYSDEC 2014 (PEC from McDonald et al. 2000)	0/11	0.63	No	< SL
Selenium	0.37 J	1.5	FS-EMC01-SED-O	11	5/11	0.87	5	MacDonald et al 1999 (Criterion, B.C.)	0/11	0.17	No	< SL
Silver	0.23 J	2.4 J	OU2-SED03	11	10/11	1.4	2.2	NYSDEC 2014 (Marine ER-M from Long & Morgan 1991)	1/11	0.64	No	< SL
Thallium	0.15 J	3.3	FS-EMC01-SED-O	11	8/11	0.48	--	--	--	--	Yes	no SL
Vanadium	5.9	18.7	OU2-SED09	11	11/11	16.7	57	Buchman 2008 (Marine AET, polychaete)	0/11	0.29	No	< SL
Zinc	37	23600	SED-29B	91	91/91	963	460	NYSDEC 2014 (PEC from McDonald et al. 2000)	28/91	2.1	Yes	>SL
Total PCBs (mg/kg)												
Aroclor Sum (ND = 0)	0.0060	390	SED-34B	97	86/97	17.3	1	NYSDEC 2014 (DOW TOGS 5.1.9)	40/97	17	Yes	>SL
Aroclor Sum (ND = 0.5DL)	0.06	1315	SED-34B	97	86/97	35.6	1	NYSDEC 2014 (DOW TOGS 5.1.9)	40/97	36	Yes	>SL
Pesticides (mg/kg)												
Aldrin	0.00012 J	1.5 J	18MC-L09-S02-Z1	29	9/29	0.075	0.16	Persaud et al. 1993 (SEL) for 2% TOC	2/29	0.47	No	< SL
alpha-BHC	0.00027 J	0.041 J	18MC-L14E-S02-Z1	29	10/29	0.010	0.20	Persaud et al. 1993 (SEL) for 2% TOC	0/29	0.05	No	< SL
Endosulfan I	0.00071 J	0.17 J	18MC-L09-S02-Z1	29	11/29	0.024	0.020	NYSDEC 2014 for 2% TOC for endosulfan	4/29	1.2	Yes	>SL
beta-BHC	0.00049 J	2.9 J	18MC-L09-S02-Z1	29	7/29	0.19	0.42	Persaud et al. 1993 (SEL) for 2% TOC	2/29	0.45	No	< SL
Endosulfan II	0.00074 J	0.034 J	OU2-SED03	29	6/29	0.013	0.020	NYSDEC 2014 for 2% TOC for endosulfan	1/29	0.65	No	< SL
cis-Chlordane	0.0020	0.052 J	OU2-SED03	29	7/29	0.011	38	NYSDEC 2014 for 2% TOC for chlordane	0/29	0.0003	No	< SL
Σ DDT	0.0016	1.4	OU2-SED03	29	19/29	0.17	48	NYSDEC 2014 for 2% TOC	0/29	0.004	No	< SL
delta-BHC	0.00048 J	0.64 J	OU2-SED03	29	7/29	0.031	0.24	Persaud et al. 1993 (SEL) for BHC	1/29	0.13	No	< SL
Dieldrin	0.0013 J	1.8 J	18MC-L09-S02-Z1	29	14/29	0.13	0.78	NYSDEC 2014 for 2% TOC	1/29	0.17	No	< SL
Endosulfan sulfate	0.00091 J	0.083 J	OU2-SED03	29	4/29	0.019	0.020	NYSDEC 2014 for 2% TOC for endosulfan	1/29	0.95	No	< SL
Endrin	0.0022 J	0.53 J	OU2-SED03	29	6/29	0.036	0.220	NYSDEC 2014 for 2% TOC	2/29	0.16	No	< SL
Endrin aldehyde	0.00050 J	0.15 J	FS-EMC01-SED-O	29	4/29	0.02	0.220	NYSDEC 2014 for 2% TOC for endrin	0/29	0.09	No	< SL
Endrin ketone	0.00057 J	1.6 J	18MC-L09-S02-Z1	29	4/29	0.16	0.220	NYSDEC 2014 for 2% TOC for endrin	1/29	0.73	No	< SL
gamma-BHC (lindane)	0.00057 J	0.61 J	OU2-SED03	29	14/29	0.047	0.078	NYSDEC 2014 for 2% TOC	3/29	0.60	No	< SL
Heptachlor	0.0030 J	0.55 J	OU2-SED03	29	5/29	0.053	10	NYSDEC 2014 for 2% TOC	0/29	0.005	No	< SL
Heptachlor epoxide	0.0011 J	0.43 J	FS-EMC01-SED-O	29	7/29	0.018	2.1	NYSDEC 2014 for 2% TOC	0/29	0.009	No	< SL
Methoxychlor	0.0016 J	1.6 J	18MC-L09-S02-Z1	29	10/29	0.094	0.059	NYSDEC 2014 for 2% TOC	5/29	1.6	Yes	>SL
trans-Chlordane	0.0050 J	0.75 J	18MC-L15E-S02-Z1	29	8/29	0.059	38	NYSDEC 2014 for 2% TOC for chlordane	0/29	0.002	No	< SL
Dioxins/Furans (mg/kg)												
2,3,7,8-TCDD TEQ (ND=0)	2.31E-05	3.38E-05	DEC-8	2	2/2	3.38E-05	2.2E-05	Buchman 2008 (PEL)	2/2	1.6	Yes	>SL
2,3,7,8-TCDD TEQ (ND=0.5DL)	2.31E-05	4.30E-05	DEC-8	2	2/2	4.30E-05	2.2E-05	Buchman 2008 (PEL)	2/2	2.0	Yes	>SL
PAHs (mg/kg)												
Total PAHs (ND = 0)	0.095	5458 J	FS-EMC01-SED-O	29	29/29	229	35	NYSDEC 2014 (ER-M from Long and Morgan 1991)	6/29	6.5	Yes	>SL
Total PAHs (ND = 0.5DL)	0.872	5458 J	FS-EMC01-SED-O	29	29/29	248	35	NYSDEC 2014 (ER-M from Long and Morgan 1991)	7/29	7.1	Yes	>SL
Other SVOCs (mg/kg)												
2-Methylphenol	0.16 J	0.22 J	18MC-L15E-S02-Z1	23	2/23	Max.	0.063	Jones et al. 1997 (WA State sediment quality standard)	2/23	3.5	Yes	>SL
4-Methylphenol	0.60 J	3.7 J	OU2-SED01	23	4/23	0.631	0.67	Jones et al. 1997 (WA State sediment quality standard)	3/23	0.94	No	< SL
Benzaldehyde	0.034 J	0.043 J	18MC-L16E-S02-Z1	23	2/23	Max.	--	No benthos-specific screening level available	--	--	Yes	no SL
Benzyl butyl phthalate	0.073 J	0.40 J	OU2-SED01	23	2/23	Max.	22	NPS 2014 (EqP value, 2% TOC)	0/23	0.02	No	< SL
Biphenyl (diphenyl)	1.4 J	1.4 J	18MC-L15E-S02-Z1	23	1/23	Max.	2.2	USEPA 1996 (SQB by EqP for 2% TOC)	0/23	0.64	No	< SL
Bis(2-ethylhexyl) phthalate	0.072 J	28 J	18MC-L18-S02-Z1	23	9/23	4.5	360	NYSDEC 2014 for 2% TOC	0/23	0.013	No	< SL

Table 4-4b Sediment Screening Results Based on Severe Effect Benchmarks (NYSDEC Class C or Equivalent), BERA, Eighteenmile Creek OU2, Lockport, NY.

Analyte[a]	Minimum Detected Value	Maximum Detected Value	Location of Maximum	Number of Samples	FoD	BERA EPC[b]	Sediment Screening Level, Source, and Screening Result					
							Value	Source (Basis)[c, d, e]	FoE[f]	HQ[g]	COPC	Rationale[h]
Carbazole	0.011 J	160	FS-EMC01-SED-O	23	18/23	10.3	1.8	MacDonald et al 1999 (AETA *Hyalella*)	3/23	5.7	Yes	>SL
Dibenzofuran	0.010 J	140	FS-EMC01-SED-O	23	13/23	12	0.6	NPS 2014 (EqP value, 2% TOC)	3/23	20	Yes	>SL
Di-n-octylphthalate	0.0080 J	0.013 J	18MC-L01E-S03-Z1	23	4/23	0.00391	34	NPS 2014 (EqP value, 2% TOC)	0/23	0.0001	No	< SL
Phenol	0.27 J	0.55	OU2-SED02	23	2/23	0.55	0.42	Jones et al. 1997 (WA State sediment quality standard)	1/23	1.3	Yes	>SL

Notes:

a = Analytes detected in recent OU2 site investigations are listed if frequency of exceedance was > 5%. Frequency of detection was considered only when 20 or more samples were collected.

b = 95% UCL (from ProUCL, see Appendix F) or maximum concentration (if number of detects was < 4).

c = See Section 3. NYSDEC benchmarks in this tables are their Class C standards.

d = .NYSDEC (2014) provides sediment screening values for organics normalized to 2% TOC; NYSDEC values were used without further adjustment. NPS (2014) provides sediment screening values for organics normalized to 1% TOC; NPS values were adjusted to 2% TOC to be consistent with NYSDEC values. Average site-specific sediment TOC is greater than 2% so the approach used here in conservative.

e = Background sediment concentrations were not used to help select COPCs for sediment.

f = Number of detected results > screening level over number of samples.

g = Hazard quotient = (BERA EPC) / (screening level)

h = Rational codes:

> SL = Greater than or equal to screening level

< SL = Less than screening level

no SL = no screening level.

Key:

-- (double dash) = Not available

AET = Apparent effect threshold

BERA = Baseline ecological risk assessment

COPC = Chemical of Potential Concern

DL = Detection limit

DOW TOGS = Division of Water, Technical & Operational Guidance Series

EPC = exposure point concentration

EqP = Equilibrium partitioning

ER-M = Effects Range - Median

FoD = Frequency of detection ([number of detects] / [number of samples])

FoE = Frequency of exceedance ([number of detected results > screening level] / [number of samples])

HQ = Hazard quotient

mg/kg = Milligrams per kilogram

N = Number of Samples

ND = Not detected

NPS = National Park Service

NYSDEC = New York State Department of Environmental Conservation

PAHs = Polycyclic aromatic hydrocarbons

PCBs = Polychlorinated biphenyls

PEC = Probable effect concentration

SEL = Severe effect level

TCDD = Tetrachlorodibenzo-p-dioxin

TEQ = Toxic equivalent concentration

TEC = Threshold effect concentration

TOC = Total organic carbon

UCL = upper confidence limit

gray shading = exceeds or equals screening level

Table 4-5 Surface Water Screening Levels and Results (for Unfiltered Samples) for Protection of Aquatic Life, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2, Lockport, New York

Analyte[a]	Minimum Detected Value	Maximum Detected Value	Location of Maximum	Number of Samples	FoD	Chronic Surface Water Screening Level, Source, and Screening Result					
						Value	Source (Basis)[b]	FoE[c]	HQ[d]	COC	Rationale[e]
Metals (µg/L)											
Aluminum	110	245	FS-EMC01-SW-O	4	4/4	100	NYSDEC (1998) ionic form	4/4	2.5	Yes	> SL
	110	245	FS-EMC01-SW-O	4	4/4	750	USEPA (2015) acute criterion	4/4	0.3	No	< SL
Arsenic	0.36 J	0.36 J	OU2-SW03	4	1/4	150	NYSDEC (1998) dissolved form	0/4	0.002	No	< SL
Barium	27	34	OU2-SW02	4	4/4	474	MacDonaled et al. (1999) for 154 mg/L hardness	0/4	0.07	No	< SL
Calcium	45,000	73,000	OU2-SW02	4	4/4	116,000	Suter and Tsao 1996 (LCV Daphnids)	0/4	0.63	No	< SL
Chromium	1 J	1.5 J	OU2-SW03	4	3/4	106	NYSDEC (1998, dissolved, 154 mg/L hardness	0/4	0.01	No	< SL
Cobalt	0.3	0.91	FS-EMC01-SW-O	4	4/4	5	NYSDEC (1998) acid soluble form	0/4	0.18	No	< SL
Copper	1.9	2.5	OU2-SW02	4	4/4	13	NYSDEC (1998, dissolved, 154 mg/L hardness	0/4	0.19	No	< SL
Iron	287	340	OU2-SW02	4	4/4	1,000	USEPA (2015) chronic criterion	0/4	0.34	No	< SL
Lead	1.5	3.5	FS-EMC01-SW-O	4	4/4	6	NYSDEC (1998, dissolved, 154 mg/L hardness	0/4	0.58	No	< SL
Magnesium	10,000	12,000	OU2-SW02	4	4/4	82,000	Suter and Tsao 1996 (LCV Daphnids)	0/4	0.15	No	< SL
Manganese	44	50	OU2-SW02	4	3/4	120	Suter and Tsao 1996 (Tier II SCV)	0/4	0.42	No	< SL
Nickel	1.4	2.5	FS-EMC01-SW-O	4	4/4	75	NYSDEC (1998, dissolved, 154 mg/L hardness	0/4	0.03	No	< SL
Potassium	1,990	2,400	OU2-SW02	4	4/4	53,000	Suter and Tsao 1996 (LCV Daphnids)	0/4	0.05	No	< SL
Sodium	16,600	35,000	OU2-SW02	4	4/4	680,000	Suter and Tsao 1996 (LCV Daphnids)	0/4	0.05	No	< SL
Thallium	0.091 J	0.22 J	OU2-SW01	4	2/4	8	NYSDEC (1998)	0/4	0.03	No	< SL
Vanadium	0.99	1.3	OU2-SW02	4	3/4	14	NYSDEC (1998) acid soluble form	0/4	0.09	No	< SL
Zinc	3.9	8	OU2-SW03	4	4/4	119	NYSDEC (1998, dissolved, 154 mg/L hardness	0/4	0.07	No	< SL

Key:

BERA = Baseline ecological risk assessment
COC = chemical of concern
FoD = Frequency of detection ([number of detects] / [number of samples])
FoE = Frequency of exceedance ([number of detected results > screening level] / [number of samples])
HQ = Hazard quotient
LCV = Lowest chronic value
NYSDEC = New York State Department of Environmental Conservation
SCV = Secondary chronic value
µg/L = Micrograms per liter
gray shading = exceeds screening level

Notes:

a = Detected analytes only are listed.
b = See Section 3.
c = (Number of detected results > screening level) / (number of samples).
d = Hazard quotient = (maximum concentration) / (screening level)
e = Rational codes:
> SL = Greater than or equal to screening level
< SL = Less than screening level

Table 4-6 TRVs for Birds and Mammals Used in Baseline Ecological Risk Assessment, Eighteenmile Creek Operable Unit 2, Lockport, New York

Analyte	Wildlife Class	NOAEL (mg/kg-day)	Critical Effect	LOAEL (mg/kg-day)	Critical Effect	Reference and Comments
Metals						
Antimony	Birds	na	na	na	na	na
	Mammals	0.059	Reproduction	0.59	Reproduction	USEPA (2005i). Highest bounded NOAEL (0.059 mg/kg-d) for growth or reproduction below lowest bounded LOAEL (0.59 mg/kg-d) for growth or reproduction from 20 laboratory toxicity studies.
Arsenic	Birds	2.24	Reproduction	3.55	Growth	USEPA(2005b). Lowest NOAEL for growth, reproduction, or survival from nine laboratory toxicity studies.
	Mammals	1.04	Growth	1.66	Growth	USEPA (2005b). Highest bounded NOAEL for growth, reproduction, or survival less than lowest bounded LOAEL for growth, reproduction, or survival from 62 laboratory toxicity studies.
Barium	Birds	20.8	Survival	41.7	Survival	Sample et al. (1996).
	Mammals	51.8	Reproduction, growth, and survival	121	Growth and survival	USEPA (2005c). Geometric mean NOAEL for growth, reproduction, and survival from 12 laboratory toxicity studies.
Beryllium	Birds	na	na	na	na	na
	Mammals	0.532	Survival	na	na	USEPA (2005d). Lowest NOAEL for growth, reproduction, or survival from four laboratory toxicity studies.
Cadmium	Birds	1.47	Reproduction, growth, and survival	2.37	Reproduction	USEPA (2005e). Geometric mean NOAEL for growth, reproduction, and survival from 49 laboratory toxicity studies.
	Mammals	0.77	Growth	1	Growth	USEPA (2005e). Highest bounded NOAEL (0.77 mg/kg-d) for reproduction, growth, or survival less than the lowest bounded LOAEL (1.0 mg/kg-d) from 141 laboratory toxicity studies.
Chromium	Birds	2.66	Reproduction, growth, and survival	2.78	Survival	USEPA (2008). Geometric mean NOAEL for growth, reproduction, and survival from 17 laboratory toxicity studies.
	Mammals	9.24	Reproduction and growth	na	na	USEPA (2008). Geometric mean NOAEL for reproduction and growth from 10 studies with trivalent chromium.
Cobalt	Birds	7.61	Growth	7.8	Growth	USEPA (2005f). Geometric mean NOAEL for growth from 10 toxicity studies. Lowest bounded LOAEL for growth or reproduction greater than geometric mean NOAEL.
	Mammals	7.33	Reproduction and Growth	10.9	Reproduction	USEPA (2005f). Geometric mean NOAEL for reproduction and growth based on 21 laboratory toxicity studies.
Copper	Birds	4.05	Reproduction	4.68	Growth	USEPA (2007a). Highest bounded NOAEL for reproduction, growth, or survival (4.05 mg/kg-day) lower than the lowest bounded LOAEL for reproduction, growth, or survival (4.68 mg/kg-day).
	Mammals	5.6	Reproduction	6.79	Growth	USEPA (2007a). Highest bounded NOAEL for reproduction, growth, or survival (5.6 mg/kg-day) lower than the lowest bounded LOAEL for reproduction, growth, or survival (6.79 mg/kg-day).

Table 4-6 TRVs for Birds and Mammals Used in Baseline Ecological Risk Assessment, Eighteenmile Creek Operable Unit 2, Lockport, New York

Analyte	Wildlife Class	NOAEL (mg/kg-day)	Critical Effect	LOAEL (mg/kg-day)	Critical Effect	Reference and Comments
Lead	Birds	1.63	Reproduction	1.94	Reproduction	USEPA (2005g). Highest bounded NOAEL (1.63 mg/kg-d) for growth, reproduction, or survival lower than the lowest bounded LOAEL (1.94 mg/kg-d) for growth, reproduction, or survival based on 57 laboratory toxicity studies.
	Mammals	4.7	Growth	5	Growth	USEPA (2005g). Highest bounded NOAEL (4.7 mg/kg-d) for growth, reproduction, or survival lower than the lowest bounded LOAEL (5 mg/kg-d) for growth, reproduction, or survival based on 220 laboratory toxicity studies.
Manganese	Birds	179	Reproduction and Growth	348	Growth	USEPA (2007b). Geometric mean NOAEL for reproduction and growth. Lowest bounded LOAEL for reproduction or growth greater than geometric mean NOAEL.
	Mammals	51.5	Reproduction and Growth	65	Growth	USEPA (2007b). Geometric mean NOAEL for reproduction and growth. Lowest bounded LOAEL for reproduction or growth greater than geometric mean NOAEL.
Mercury	Birds	0.45	Reproduction	0.9	Reproduction	Sample et al. (1996).
	Mammals	1	Reproduction	na	na	Sample et al. (1996).
Methylmercury	Birds	0.068	Reproduction	0.37	Reproduction	CH2MHILL (2000).
	Mammals	0.015	Reproduction	0.16	Reproduction	Sample et al. (1996) for mink.
Nickel	Birds	6.71	Growth and survival	11.5	Growth	USEPA (2007c). Geometric mean NOAEL for reproduction and growth. Lowest bounded LOAEL for reproduction or growth greater than geometric mean NOAEL.
	Mammals	1.7	Reproduction	2.71	Reproduction	USEPA (2007c). Highest bounded NOAEL for reproduction, growth, or survival below lowest bounded LOAEL for reproduction, growth, or survival.
Selenium	Birds	0.291	Survival	0.368	Reproduction	USEPA (2007d). Highest bounded NOAEL for reproduction, growth, or survival below lowest bounded LOAEL for reproduction, growth, or survival.
	Mammals	0.143	Growth	0.145	Reproduction	USEPA (2007d). Highest bounded NOAEL for reproduction, growth, or survival below lowest bounded LOAEL for reproduction, growth, or survival.
Silver	Birds	2.02	Growth	20.2	Growth	USEPA (2006). Lowest LOAEL for reproduction or growth divided by 10.
	Mammals	6.02	Growth	60.2	Growth	USEPA (2006). Lowest LOAEL for reproduction or growth divided by 10.
Thallium	Birds	NA	NA	NA	NA	NA
	Mammals	0.0074	Reproduction	0.074	Reproduction	Sample et al. (1996).
Vanadium	Birds	0.344	Growth	0.413	Reproduction	USEPA (2005h). Highest bounded NOAEL (0.344 mg/kg-d) for growth, reproduction, or survival less than lowest bounded LOAEL (0.413 mg/kg-d) for reproduction, growth, or survival based on 94 laboratory toxicity studies.
	Mammals	4.16	Reproduction and growth	5.11	Growth	USEPA (2005h). Highest bounded NOAEL (4.16 mg/kg-d) for growth or reproduction less than lowest bounded LOAEL (5.11 mg/kg-d) for growth, reproduction, or survival based on 94 laboratory toxicity studies.
Zinc	Birds	66.1	Reproduction and Growth	66.5	Reproduction	USEPA (2007e). Geometric mean NOAEL for reproduction and growth. Lowest bounded LOAEL for reproduction or growth greater than geometric mean NOAEL.
	Mammals	75.4	Reproduction and Growth	75.9	Reproduction	USEPA (2007e). Geometric mean NOAEL for reproduction and growth. Lowest bounded LOAEL for reproduction or growth greater than geometric mean NOAEL.

Table 4-6 TRVs for Birds and Mammals Used in Baseline Ecological Risk Assessment, Eighteenmile Creek Operable Unit 2, Lockport, New York

Analyte	Wildlife Class	NOAEL (mg/kg-day)	Critical Effect	LOAEL (mg/kg-day)	Critical Effect	Reference and Comments
Polychlorinated Biphenyls (PCBs)						
PCBs (sum of congeners or Aroclors) - **Primary**[a]	Birds	0.012	Reproduction	0.12	Reproduction	Lillie et al. (1974).
	Mammals	0.0034	Reproduction	0.0034	Reproduction	Restum et al. (1998). Used in BERA for mink, weasel, and bat.
		0.068	Reproduction	0.68	Reproduction	McCoy et al. 1995 as cited in Sample et al. 1996. Used for vole, muskrat, and shrew.
PCBs (sum of congeners or Aroclors) - **Secondary**	Birds	0.18	Reproduction	1.8	Reproduction	Sample et al. (1996) for Aroclor 1254 based on Dahlgren et al. (1972).
	Mammals	0.14	Reproduction	0.69	Reproduction	Sample et al. (1996) for Aroclor 1254 effects on mink.
Pesticides						
DDT and metabolites	Birds	0.227	Reproduction	0.281	Reproduction	USEPA (2007h). Highest bounded NOAEL lower than the lowest bounded LOAEL for reproduction, growth and survival.
	Mammals	0.147	Reproduction	0.274	Reproduction	USEPA (2007h). Highest bounded NOAEL below the lowest bounded LOAEL for reproduction, growth, or survival.
Aldrin	Birds	na	na	na	na	na
	Mammals	0.2	Reproduction	1	Reproduction	Sample et al. (1996).
alpha-BHC	Birds	0.56	Reproduction	2.25	Reproduction	Sample et al. (1996) for BHC mixed isomers.
	Mammals	0.014	Reproduction	0.14	Reproduction	Sample et al. (1996) for BHC mixed isomers.
alpha-Chlordane	Birds	2.14	Reproduction	10.7	Reproduction	Sample et al. (1996) for chlordane.
	Mammals	4.6	Reproduction	9.2	Reproduction	Sample et al. (1996) for chlordane.
beta-BHC	Birds	0.56	Reproduction	2.25	Reproduction	Sample et al. (1996) for BHC mixed isomers.
	Mammals	0.014	Reproduction	0.14	Reproduction	Sample et al. (1996) for BHC mixed isomers.
delta-BHC	Birds	0.56	Reproduction	2.25	Reproduction	Sample et al. (1996) for BHC mixed isomers.
	Mammals	0.014	Reproduction	0.14	Reproduction	Sample et al. (1996) for BHC mixed isomers.
Dieldrin	Birds	0.071	Reproduction	0.179	Survival	USEPA (2005j). Highest bounded NOAEL lower than the lowest bounded LOAEL for reproduction, growth, and survival.
	Mammals	0.015	Reproduction	0.03	Reproduction	USEPA (2005j). Highest bounded NOAEL below lowest bounded LOAEL for reproduction, growth, or survival.
Endosulfan I	Birds	10	Reproduction	na	na	Sample et al. (1996) for endosulfan.
	Mammals	0.15	Reproduction	na	na	Sample et al. (1996) for endosulfan.
Endosulfan II	Birds	10	Reproduction	na	na	Sample et al. (1996) for endosulfan.
	Mammals	0.15	Reproduction	na	na	Sample et al. (1996) for endosulfan.
Endosulfan sulfate	Birds	10	Reproduction	na	na	Sample et al. (1996) for endosulfan.
	Mammals	0.15	Reproduction	na	na	Sample et al. (1996) for endosulfan.
Endrin	Birds	0.01	Reproduction	0.1	Reproduction	Sample et al. (1996).
	Mammals	0.092	Reproduction	0.92	Reproduction	Sample et al. (1996).
Endrin aldehyde	Birds	0.01	Reproduction	0.1	Reproduction	Sample et al. (1996) for endrin
	Mammals	0.092	Reproduction	0.92	Reproduction	Sample et al. (1996) for endrin
Endrin ketone	Birds	0.01	Reproduction	0.1	Reproduction	Sample et al. (1996) for endrin
	Mammals	0.092	Reproduction	0.92	Reproduction	Sample et al. (1996) for endrin
gamma-BHC (lindane)	Birds	2	Reproduction	20	Reproduction	Sample et al. (1996).
	Mammals	8	Reproduction	na	Reproduction	Sample et al. (1996).
gamma-Chlordane	Birds	2.14	Reproduction	10.7	Reproduction	Sample et al. (1996) for chlordane.
	Mammals	4.6	Reproduction	9.2	Reproduction	Sample et al. (1996) for chlordane.

Table 4-6 TRVs for Birds and Mammals Used in Baseline Ecological Risk Assessment, Eighteenmile Creek Operable Unit 2, Lockport, New York

Analyte	Wildlife Class	NOAEL (mg/kg-day)	Critical Effect	LOAEL (mg/kg-day)	Critical Effect	Reference and Comments
Heptachlor	Birds	na	na	na	na	na
	Mammals	0.1	Reproduction	1	Reproduction	Sample et al. (1996).
Heptachlor epoxide	Birds	na	na	na	na	na
	Mammals	0.1	Reproduction	1	Reproduction	Sample et al. (1996) for heptachlor.
Methoxychlor	Birds	na	na	na	na	na
	Mammals	4	Reproduction	8	Reproduction	Sample et al. (1996).
trans-Chlordane	Birds	2.14	Reproduction	10.7	Reproduction	Sample et al. (1996) for chlordane.
	Mammals	4.6	Reproduction	9.2	Reproduction	Sample et al. (1996) for chlordane.
Dioxins and Furans						
2,3,7,8-TCDD	Birds	0.000014	Reproduction	0.00014	Reproduction	Sample et al. (1996).
	Mammals	0.000001	Reproduction	0.00001	Reproduction	Sample et al. (1996).
Polycyclic Aromatic Hydrocarbons						
LPAHs[b]	Birds	1653	Growth	na	na	USEPA (2007g); from Appendix 5.1for Bobwhite.
	Mammals	65.6	Growth	110	Growth	USEPA (2007g). Highest bounded NOAEL (65.5 mg/kg-d) below the lowest bounded LOAEL (110 mg/kg-d) for reproduction, growth, or survival.
HPAHs[c]	Birds	2	Growth	20	Growth	USEPA (2007g); from Appendix 5.2 for European starling.
	Mammals	0.615	Survival	3.07	Survival	USEPA (2007g). Highest bounded NOAEL (0.615 mg/kg-day) below the lowest bounded LOAEL (3.07 mg/kg-day) for reproduction, growth, or survival.
Other Semivolatile Organic Compounds						
2-Methylphenol	Birds	na	na	na	na	na
	Mammals	219	na	na	na	Hornshaw et al. (1986) as cited in NYSDEC (2002).
4-Methylphenol	Birds	na	na	na	na	na
	Mammals	219	na	na	na	Hornshaw et al. (1986) as cited in NYSDEC (2002).
4- Nitroaniline	Birds	na	na	na	na	na
	Mammals	na	na	na	na	na
Acetophenone	Birds	na	na	na	na	na
	Mammals	na	na	na	na	na
Benzaldehyde	Birds	na	na	na	na	na
	Mammals	na	na	na	na	na
Biphenyl	Birds	na	na	na	na	na
	Mammals	na	na	na	na	na
Bis(2-ethylhexyl)phthalate	Birds	1.1	Reproduction	na	na	Sample et al. (1996).
	Mammals	18.3	Reproduction	183	Reproduction	Sample et al. (1996).
Butyl benzyl phthalate	Birds	na	na	na	na	na
	Mammals	na	na	na	na	na
Carbazole	Birds	1653	Growth	na	na	USEPA (2007g); for LPAHs, from Appendix 5.1 for Bobwhite.
	Mammals	65.6	Growth	110	Growth	See reference and comment for LPAHs above.
Dibenzofuran	Birds	1653	Growth	na	na	USEPA (2007g); for LPAHs, from Appendix 5.1 for Bobwhite.
	Mammals	65.6	Growth	110	Growth	See reference and comment for LPAHs above.
Diethyl phthalate	Birds	na	na	na	na	na
	Mammals	4583	Reproduction	na	na	Sample et al. (1996).

Table 4-6 TRVs for Birds and Mammals Used in Baseline Ecological Risk Assessment, Eighteenmile Creek Operable Unit 2, Lockport, New York

Analyte	Wildlife Class	NOAEL (mg/kg-day)	Critical Effect	LOAEL (mg/kg-day)	Critical Effect	Reference and Comments
Dimethyl phthalate	Birds	na	na	na	na	na
	Mammals	4583	Reproduction	na	na	Sample et al. (1996) for diethylphthalate.
Di-n-butyl phthalate	Birds	0.11	Reproduction	1.1	Reproduction	Sample et al. (1996).
	Mammals	550	Reproduction	1833	Reproduction	Sample et al. (1996).
Di-n-octyl phthalate	Birds	0.11	Reproduction	1.1	Reproduction	Sample et al. (1996) for di-n-butyl phthalate.
	Mammals	55	Reproduction	550	Reproduction	Sample et al. (1996) for di-n-hexyl phthalate.
n-Nitrosodiphenylamine	Birds	na	na	na	na	na
	Mammals	na	na	na	na	na
Phenol	Birds	6	na	na	na	NCI (1980) as cited in NYSDEC (2002).
	Mammals	523	na	na	na	NCI (1980) as cited in NYSDEC (2002).

Notes:

a. Primary PCB TRVs are from Draft Black River Site Ecological Risk Assessment (EPA 2015a). Secondary PCB TRVs were used in SLERA and BERA Problem Formulation for OU2.

b. Sum of acenaphthylene, acenaphthene, anthracene, fluorene, methylnaphthalene, naphthalene, and phenanthrene.

c. Sum of benz(a)anthracene, total benzofluoranthenes, benzo(a)pyrene, chrysene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, indeno(1,2,3,-c,d)pyrene, fluoranthene, and pyrene.

Key:

BERA = baseline ecological risk assessment
BHC = benzenehexachloride
HPAH = high molecular weight PAH
LOAEL = lowest observed adverse effect level
LPAH = low molecular weight PAH
mg/kg/day = milligrams per kilogram per day
na = not available
NOAEL = no observed adverse effect level
NYSDEC = New York State Department of Environmental Conservation
PAH = polycyclic aromatic hydrocarbon
TRV = toxicity reference value
USEPA = United States Environmental Protection Agency

Table 4-7a. Summary of Test Acceptability Requirements for *Hyalella azteca* 28-day Test[a].

Parameter	Requirement	Actual
Control survival	> 80%	100%
Control growth	> 0.15 mg dry weight/individual.	average 0.53 mg dry weight/individual
Organism age	7 to 8 day old	7 to 8 day old
Dissolved oxygen in overlying water	> 2.5 mg/L	Daily readings > 2.5 mg/L except in two replicates for sample OU2-SED01 on Day 0 (before introduction of *Hyalella* to test chambers), but this deviation was corrected with aeration.
Hardness in overlying water	Should not change by more than 50% during test.	Variation in all samples < 50% over test duration.
Alkalinity in overlying water	Should not change by more than 50% during test.	Variation in all samples < 50% over test duration.
Ammonia in overlying water	Should not change by more than 50% during test.	Requirement not met. In the lab control and samples BG1-SED01, OU2-SED01, OU2-SED-02, and OU2-SED03, ammonia levels decrease by 3- to 10-fold from Day 0 to 28.

Note:
a = EPA (2000) Test Method 100.4.

Table 4-7b. Summary of Test Acceptability Requirements for *Chironomus dilutus* 20-day Test[a].

Parameter	Requirement	Actual
Control survival	> 70%	97%
Control growth	0.6 mg/surviving organism as dry weight or 0.48 mg/surviving organism as AFDW.	1.22 mg/surviving organism as AFDW.
Organism age	< 1day old at test initiation	< 1day old at test initiation
Dissolved oxygen in overlying water	> 2.5 mg/L	Daily readings > 2.5 mg/L except in two replicates for sample OU2-SED01 on Day 0 (before introduction of *Hyalella* to test chambers), but this deviation was corrected with aeration.
Hardness in overlying water	Should not change by more than 50% during test.	Variation in all samples < 50% over test duration.
Alkalinity in overlying water	Should not change by more than 50% during test.	Variation in all samples < 50% over test duration.
Ammonia in overlying water	Should not change by more than 50% during test.	Requirement not met. In the lab control and samples BG1-SED01, OU2-SED01, OU2-SED02, and OU2-SED03 ammonia levels decrease by 3- to 10-fold from Day 0 to 28.

Note:
a = EPA (2000) Test Method 100.5.

Table 4-8 20-day *Chironomus dilutus* Sediment Bioassay Results Summary, Eighteenmile Creek OU2, Lockport, New York

Sample	Location	Replicate[a] 1	2	3	4	5	6	7	8	Average	Is OU2 sample average less than reference sample average ($p < 0.05$)?[b]
Growth (mg AFDW / surviving organism)[c]											
BG1-SED01	Reference Area[d]	1.6320	1.6150	1.4209	1.2217	1.3520	1.5727	1.3360	1.2318	1.4228	--
OU2-SED01	Site (OU2)	1.4873	1.5073	1.2475	1.4175	1.3527	1.1825	1.5022	1.3411	1.3798	No
OU2-SED02	Site (OU2)	2.0318	1.5600	1.8617	1.6683	1.9800	1.5964	2.1311	1.8989	1.8410	No
OU2-SED03	Site (OU2)	(e)	(e)	(e)	(e)	(e)	(e)	(e)	(e)	(e)	Yes
Survival (%)[c]											
BG1-SED01	Reference Area[d]	83%	83%	92%	100%	83%	92%	83%	92%	89%	--
OU2-SED01	Site (OU2)	92%	92%	100%	100%	92%	100%	75%	75%	91%	No
OU2-SED02	Site (OU2)	92%	100%	100%	100%	100%	100%	75%	83%	94%	No
OU2-SED03	Site (OU2)	0%	0%	0%	0%	0%	0%	0%	0%	0%	Yes

Key:

-- (dash) = not applicable
AFWD = Ash free dry weight
OU2 = Operable Unit 2
p = probability

Notes:

a. Eight replicates with 12 test organisms per replicate at start of test.
b. Dunnett's test.
c. Results from USEPA (2000) Method 100.5 (20-day growth and survival test with *Chironomus dilutus*).
d. East branch of Eighteenmile Creek at Gasport, NY (1500 feet north of New York State barge canal).
e. Growth could not be determined because survival was 0% in all replicates.

Table 4-9 28-day *Hyalella azteca* Sediment Bioassay Results Summary, Eighteenmile Creek OU2, Lockport, New York

Sample	Location	Replicate[a] 1	2	3	4	5	6	7	8	Average	Is OU2 sample average less than reference sample average ($p < 0.05$)?[b]
Growth (mg dry weight / surviving organism)[c]											
BG1-SED01	Reference Area[d]	0.3680	0.4350	0.3911	0.4311	0.4510	0.3730	0.2850	0.3660	0.3875	--
OU2-SED01	Site (OU2)	0.5400	0.3870	0.5714	0.4567	0.4856	0.5600	0.4490	0.4630	0.4891	No
OU2-SED02	Site (OU2)	0.4930	0.4780	0.5470	0.5700	0.4880	0.5100	0.7000	0.5400	0.5408	No
OU2-SED03	Site (OU2)	0.1820	0.2575	0.1683	0.2367	0.2433	0.2833	0.1967	0.1840	0.2190	Yes
Survival (%)[c]											
BG1-SED01	Reference Area[d]	100%	100%	90%	90%	100%	100%	100%	100%	98%	--
OU2-SED01	Site (OU2)	100%	100%	70%	90%	90%	100%	100%	100%	94%	No
OU2-SED02	Site (OU2)	100%	100%	100%	100%	100%	100%	100%	100%	100%	No
OU2-SED03	Site (OU2)	50%	80%	60%	60%	90%	60%	60%	50%	64%	Yes

Key:

-- (dash) = not applicable

OU2 = Operable Unit 2

p = probability

Notes:

a. Eight replicates with 10 organisms per replicate at start of test.

b. Dunnett's test.

c. Results from USEPA (2000) Method 100.4 (28-day growth and survival test with *Hyalella azteca*).

d. East branch of Eighteenmile Creek at Gasport, NY (1500 feet north of New York State barge canal).

Table 4-10 Summary of Contaminant Data for Sediment Samples Used in Toxicity Testing, Eighteenmile Creek OU2, Lockport, NY

Chemical[a]	Unit	Screening Value[b]	BG1-SED01 (0 - 0.5 ft)	OU2-SED01 (0 - 0.5 ft)	OU2-SED02 (0 - 0.5 ft)	OU2-SED03 (0 - 0.5 ft)
Metals						
ALUMINUM	mg/kg	25500	7300	8300 J	2700	**8200 J**
ANTIMONY	mg/kg	2	ND	1.4 J	0.69	**3.5 J**
ARSENIC	mg/kg	10	4.3	4.5 J	2.8	**6 J**
BARIUM	mg/kg	--	61	84 J	28	**130 J**
BERYLLIUM	mg/kg	--	0.42	**0.45 J**	0.17	0.41 J
CADMIUM	mg/kg	1	1.5	0.59 J	0.68	**1.8 J**
CHROMIUM, TOTAL	mg/kg	43	17	25 J	19	**60 J**
COBALT	mg/kg	50	**8.1**	7 J	3	**8.1 J**
COPPER	mg/kg	32	41	170 J	120	**290 J**
IRON	mg/kg	20000	16000	19000 J	9600	**20000 J**
LEAD	mg/kg	36	30	310 J	370	**560 J**
MANGANESE	mg/kg	460	420	**490 J**	290	410 J
MERCURY	mg/kg	0.2	0.14	0.74 J	0.32	**1.1 J**
NICKEL	mg/kg	23	19	22 J	12	**38 J**
SELENIUM	mg/kg	5	1	0.9 J	0.37	**1.1 J**
SILVER	mg/kg	1	0.2	0.65 J	0.8	**2.4 J**
THALLIUM	mg/kg	--	**0.24**	0.18 J	ND	0.2 J
VANADIUM	mg/kg	--	15	17 J	5.9	**18 J**
ZINC	mg/kg	120	210	250 J	170	**730 J**
Polychlorinated Biphenyls (PCBs)						
PCB, Total	mg/kg	0.1	0.0366	14.6 J	0.549	**84.7 J**
PCB-1248 (AROCLOR 1248)	mg/kg	0.1	0.027 J	5.5	0.46 J	**56 J**
PCB-1254 (AROCLOR 1254)	mg/kg	0.1	ND	7.6	ND	**25 J**
PCB-1260 (AROCLOR 1260)	mg/kg	0.1	0.0096	1.5 J	0.089	**3.7 J**
Pesticides						
ALDRIN	mg/kg	0.002	ND	ND	**0.00012 J**	ND
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	mg/kg	0.006	ND	**0.00027 J+**	ND	ND
ALPHA ENDOSULFAN	mg/kg	0.001	ND	0.0055 J+	0.0014	**0.15**
ALPHA-CHLORDANE	mg/kg	0.068	ND	0.0034 J+	ND	**0.052 J**
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	mg/kg	0.005	ND	0.068 J+	0.00049 J	**2 J**
BETA ENDOSULFAN	mg/kg	0.001	0.00012 J	0.0022 J+	0.00074 J	**0.034 J**
Chlordane; Gamma-	mg/kg	0.068	0.0015	0.021 J+	0.013 J	**0.58**
DDT, Total	mg/kg	0.044	0.00612 J	0.0359 J+	0.0154 J	**1.385**
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	mg/kg	0.003	0.00015 J	0.021 J+	0.0031 J	**0.64 J**
DIELDRIN	mg/kg	0.18	0.00012 J	0.0036 J+	0.0013 J	**0.11 J**
ENDOSULFAN SULFATE	mg/kg	0.001	0.00033 J	0.0042 J+	0.00091 J	**0.083 J**
ENDRIN	mg/kg	0.09	0.00092	0.013 J+	0.0038 J	**0.53 J**
ENDRIN ALDEHYDE	mg/kg	0.09	0.00013 J	0.0022 J+	0.0005 J	**0.091**
ENDRIN KETONE	mg/kg	0.09	0.0003 J	0.012 J+	0.00057 J	**0.065 J**
GAMMA BHC (LINDANE)	mg/kg	0.047	ND	0.017 J+	0.0022 J	**0.3 J**
HEPTACHLOR	mg/kg	0.075	ND	0.014 J+	0.003 J	**0.55 J**
HEPTACHLOR EPOXIDE	mg/kg	0.015	0.00041 J	0.023 J+	0.0025 J	**0.43 J**
METHOXYCHLOR	mg/kg	0.059	0.00054 J	0.061 J+	0.0083 J	**0.52 J**
Semivolatile Organic Contaminants						
2-METHYLPHENOL (O-CRESOL)	mg/kg	0.024	ND	ND	**0.16 J**	ND
3- AND 4- METHYLPHENOL (TOTAL)	mg/kg	0.024	ND	**3.7**	1.2	0.76 J
4-CHLOROANILINE	mg/kg	--	0.022 J	ND	ND	ND
BENZALDEHYDE	mg/kg	--	0.057 J	ND	ND	ND
BENZYL BUTYL PHTHALATE	mg/kg	0.022	ND	**0.4 J**	ND	ND

Table 4-10 Summary of Contaminant Data for Sediment Samples Used in Toxicity Testing, Eighteenmile Creek OU2, Lockport, NY

Chemical[a]	Unit	Screening Value[b]	BG1-SED01 (0 - 0.5 ft)	OU2-SED01 (0 - 0.5 ft)	OU2-SED02 (0 - 0.5 ft)	OU2-SED03 (0 - 0.5 ft)
BIS(2-ETHYLHEXYL) PHTHALATE	mg/kg	360	0.056 J	ND	1.1 J	**1.9 J**
Polycyclic Aromatic Hydrocarbons						
PAH, Total	mg/kg	4	3.8	35	122	43
Organic Carbon						
TOTAL ORGANIC CARBON	%	--	6.5	6.1	9.6	9.2

Key:
-- (dash) = not available
Bold = Maximum detected concentration
J = estimated value
J+ = estimated (high) value
Shading = exceeds screening level

Notes:
a = Detected contaminants
b = NYSDEC Class A or equivalent (from Table 4-4a).

Table 4-11. Summary of Fathead Minnow Surface-Water Bioassay Results, Eighteenmile Creek OU2 Site, Lockport, New York.

Sample	Location	Replicate[a]				Average	Is OU2 sample average less than reference sample average ($p < 0.05$)?[b]
		1	2	3	4		
Growth (mg/fish dry weight)[c]							
BG1-SW01	Reference Area[d]	0.5140	0.5956	0.5060	0.5170	0.5332	--
OU2-SW01	Site (OU2)	0.5350	0.5590	0.5720	0.5989	0.5662	No
OU2-SW02	Site (OU2)	0.5380	0.6044	0.6550	0.6900	0.6219	No
OU2-SW03	Site (OU2)	0.5560	0.5130	0.5060	0.5230	0.5245	No
Survival (%)[c]							
BG1-SW01	Reference Area[d]	100%	90%	100%	100%	98%	--
OU2-SW01	Site (OU2)	100%	100%	90%	90%	95%	No
OU2-SW02	Site (OU2)	100%	90%	100%	90%	95%	No
OU2-SW03	Site (OU2)	100%	100%	100%	100%	100%	No

Key:

-- (dash) = not applicable

OU2 = Operable Unit 2

p = probability

Notes:

a. Four replicates with 10 fish (fathead minnow larvae) per replicate.

b. Dunnett's test.

c. Results from USEPA (2002) Method 1000.0 (Fathead Minnow Larval Survival and Growth Test).

d. East branch of Eighteenmile Creek at Gasport, NY (1500 feet north of New York State barge canal).

Table 4-12 Summary of *Ceriodaphnia dubia* Surface-Water Bioassay Results, Eighteenmile Creek OU2 Site, Lockport, New York

Sample	Location	Replicate[a]										Average	Is OU2 sample average less than reference sample average ($p < 0.05$)?[b]
		1	2	3	4	5	6	7	8	9	10		
Reproduction (young/female)[c]													
BG1-SW01	Reference Area[d]	24	21	21	22	16	19	24	19	19	18	20.3	--
OU2-SW01	Site (OU2)	18	20	31	24	23	--[e]	22	26	20	18	22.4	No
OU2-SW02	Site (OU2)	20	24	25	29	25	25	27	21	20	18	23.4	No
OU2-SW03	Site (OU2)	21	22	18	24	25	21	0[f]	25	24	24	22.7	No
Survival (%)[c]													
BG1-SW01	Reference Area[d]	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	--
OU2-SW01	Site (OU2)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	No
OU2-SW02	Site (OU2)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	No
OU2-SW03	Site (OU2)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	No

Key:

-- (dash) = not applicable

OU2 = Operable Unit 2

p = probability

Notes:

a. Ten replicates with 1 neonate per replicate at start of test.

b. Dunnett's test.

c. Results from USEPA (2002) Method 1002.0 (*Ceriodaphnia dubia* Survival and Reproduction test).

d. East branch of Eighteenmile Creek at Gasport, NY (1500 feet north of New York State barge canal).

e. Male

f. Outlier

Table 4-13 Summary of Fish Samples Collected from the Eighteenmile Creek OU2 Site in May 2015.

Fish Type	Sample Number	Species	Sample Type	Sample Composition Details
Eighteenmile Creek Operable Unit 2 (OU2)				
Game	OU2-RED-01	Silver Redhorse	Fillet, skin-on with ribs	1 fillet from 557-mm male
	OU2-RED-02	Silver Redhorse	Fillet, skin-on with ribs	1 fillet from 396-mm female
	OU2-RED-03	Silver Redhorse	Fillet, skin-on with ribs	1 fillet from 380-mm female
	OU2-SMB-01	Smallmouth Bass	Fillet, skin-on with ribs	1 fillet from 300-mm male
	OU2-SMB-02	Smallmouth Bass	Fillet, skin-on with ribs	1 fillet from 276-mm female
	OU2-SMB-03	Smallmouth Bass	Fillet, skin-on with ribs	1 fillet from 325-mm female
	OU2-SMB-04	Smallmouth Bass	Fillet, skin-on with ribs	1 fillet from 295-mm female
	OU2-WAL-01	Walleye	Fillet, skin-on with ribs	1 fillet from 555-mm female
	OU2-WAL-02	Walleye	Fillet, skin-on with ribs	1 fillet from 465-mm male
	OU2-WAL-03	Walleye	Fillet, skin-on with ribs	1 fillet from 572-mm female
Forage	OU2-ROC-01	Rock Bass	Whole-body composite	5 fish, 100 to 201 mm
	OU2-ROC-02	Rock Bass	Whole-body composite	5 fish, 134 to 205 mm
	OU2-ROC-03	Rock Bass/Pumpkinseed	Whole-body composite	2 fish, 163 and 100 mm

Key:
mm = millimeters
OU2 = Operable Unit 2

Table 4-14 May 2015 Forage Fish Composite Sample Data Summary, Eighteenmile Creek Operable Unit 2, Lockport, New York.

Analyte[a]	FoD	Tissue Screening Value[b] (mg/kg)	OU2 Site Eighteenmile Creek, Lockport, NY Rock Bass		
			OU2-ROC-C01	OU2-ROC-C02	OU2-ROC-C03
PERCENT LIPIDS	6/6	--	0.64	0.58	1.2
Metals (mg/kg wet weight)					
ALUMINUM	7/7	33	2.5 J	1.9 J	22
ARSENIC	7/7	1.7	0.14	0.24	0.35
BARIUM	7/7	--	0.5 J	1.2	2.8
CADMIUM	3/7	0.15	0.0088 J	0.0067 U	0.017 J
CHROMIUM, TOTAL	7/7	0.69	0.16 J	0.25	0.79
COBALT	7/7	--	0.016 J	0.019 J	0.067
COPPER	7/7	3.1	0.49	0.76	5.5
IRON	7/7	--	16	18	79
LEAD	7/7	2.2	0.1	0.18	0.78
MANGANESE	7/7	--	1	1.7	7.9
MERCURY	4/7	0.46	0.18	0.077 J	0.064 J
NICKEL	7/7	18.4	0.039 J	0.041 J	0.47
SELENIUM	7/7	1.1	0.43 J	0.42 J	0.53
VANADIUM	7/7	--	0.33	0.42	0.46
ZINC	7/7	27	18	22	31
PAHs (mg/kg wet weight)					
NAPHTHALENE	7/7	--	0.0046 J	0.0045 J	0.0046 J
PCBs (mg/kg wet weight)					
PCB-1254 (AROCLOR 1254)	7/7	0.91	0.34 J	0.11 J	0.62 J
PCB-1260 (AROCLOR 1260)	7/7	0.91	0.12	0.041	0.21
Dioxins/Furans (mg/kg wet weight)					
2,3,7,8-TCDD TEQ (ND = 0)		7.2E-05	2.9E-06 J	--	--
Pesticides (mg/kg wet weight)					
ALDRIN	7/7	--	0.00035 J	0.00068 J	0.00043 J
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	6/7	--	0.000093 J	0.00011 J	0.000068 U
ALPHA ENDOSULFAN	6/7	0.073	0.00094 J	0.00054 J	0.0022
ALPHA-CHLORDANE	6/7	0.55	0.003 J	0.0027	0.0022 J
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	7/7	--	0.00052	0.00037 J	0.00057 J
BETA ENDOSULFAN	6/7	0.073	0.00048 J	0.0006 J	0.00083 J
Chlordane; Gamma-	6/7	0.55	0.017	0.011 J	0.02
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	7/7	--	0.00038 J	0.00031 J	0.00052 J
DIELDRIN	7/7	0.22	0.0025 J	0.002 J	0.0036 J
ENDOSULFAN SULFATE	7/7	0.073	0.0037 J	0.0022	0.004
ENDRIN	7/7	0.025	0.03	0.011	0.03
ENDRIN ALDEHYDE	7/7	--	0.0036	0.0012 J	0.0037
ENDRIN KETONE	7/7	--	0.0026 J	0.002 J	0.0028 J
GAMMA BHC (LINDANE)	6/7	0.023	0.0011 J	0.0008 J	0.00079 J
HEPTACHLOR	6/7	--	0.00042 J	0.0006 J	0.00044 J
HEPTACHLOR EPOXIDE	7/7	--	0.01 J	0.0038 J	0.0067 J
METHOXYCHLOR	6/7	0.2	0.01 J	0.0043 J	0.011 J
P,P'-DDD	7/7	--	0.0018 J	0.0019 J	0.00074 J
P,P'-DDE	7/7	1	0.0097 J	0.02	0.0064 J
P,P'-DDT	7/7	0.47	0.055 J	0.021	0.099
SVOCs (mg/kg wet weight)					
BENZALDEHYDE	3/7	--	0.04 U	0.039 U	0.069 J
PHENOL	5/7	--	0.0063 U	0.0062 U	0.03 J

Key:

-- (dash) = not available

ND = non detects

TCDD = Tetrachlorodibenzo-p-dioxin

TEQ = Toxic Equivalent

Gray Shading = value exceeds tissue screening concentration (for effects on fish)

Notes:

a = Analytes detected in at least one sample are listed.

b = Dyer et al. (2000) except for 2,3,7,8 TCDD, which is from Windward (2004), and total PCBs, which is from draft Black River Site Ecological Risk Assessment (USEPA 2015).

Table 4-15 May 2015 Game Fish Sample Data Summary, Eighteenmile Creek Operable Unit 2, Lockport, New York.

Analyte[a]	FoD	Tissue Screening Value[b] (mg/kg)	OU2 Site									
			Eighteenmile Creek, Lockport, NY									
			Silver Redhorse			Smallmouth Bass				Walleye		
			OU2-RED-01	OU2-RED-02	OU2-RED-03	OU2-SMB-01	OU2-SMB-02	OU2-SMB-03	OU2-SMB-04	OU2-WAL-01	OU2-WAL-02	OU2-WAL-03
PERCENT LIPIDS	16/16	--	0.73	0.31	0.86	--	--	0.19	--	0.88	1.0	0.91
Metals (mg/kg wet weight)												
ALUMINUM	19/19	33	2.9 J	1.1 J	2.6 J	--	2.0 J	1.3 J	1.5 J	1.4 J	0.98 J	0.83 J
ARSENIC	19/19	1.7	0.027 J	0.029 J	0.046 J	--	0.21	0.16	0.20	0.14	0.18	0.078 J
BARIUM	19/19	--	0.22 J	0.20 J	0.16 J	--	0.23 J	0.18 J	0.17 J	0.22 J	0.22 J	0.092 J
CADMIUM	0/19	0.15	0.0071 U	0.0068 U	0.0072 U	--	0.0070 U	0.0069 U	0.0069 U	0.0071 U	0.0074 U	0.0067 U
CHROMIUM, TOTAL	19/19	0.69	0.19 J	0.35	1.1	--	0.22	0.51	0.19 J	0.18 J	0.19 J	0.16 J
COBALT	19/19	--	0.010 J	0.011 J	0.021 J	--	0.014 J	0.011 J	0.0097 J	0.008 J	0.0086 J	0.0054 J
COPPER	19/19	3.1	0.59	5.7	6.8	--	0.44	0.47	0.46	0.43	0.37	0.39
IRON	17/19	--	15	25	30	--	7.2	8.4	6.4	7.2	0.37 U	0.34 U
LEAD	19/19	2.2	0.031 J	0.14	0.22	--	0.054 J	0.060 J	0.33	0.030 J	0.024 J	0.018 J
MANGANESE	19/19	--	0.53	1.2	0.84	--	0.76	0.49	0.55	0.55	0.51 J	0.35 J
MERCURY	17/19	0.46	0.095 J	0.17	0.064 J	--	0.46	0.27	0.50	0.32	0.40	0.20
NICKEL	19/19	18.4	0.072 J	0.16	0.58	--	0.076 J	0.18	0.079 J	0.060 J	0.038 J	0.031 J
SELENIUM	19/19	1.1	0.34 J	0.20 J	0.32 J	--	0.56	0.47 J	0.56	0.39 J	0.52 J	0.26 J
VANADIUM	19/19	--	0.43	0.20	0.44	--	0.36	0.33	0.34	0.40	0.39	0.34
ZINC	19/19	27	12	6.8	12	--	13	8.7	8.4	6.7	8.2	5.7
PAHs (mg/kg wet weight)												
ACENAPHTHENE	2/18	--	0.0051 U	0.0051 U	0.0051 U	--	--	0.0051 U	0.0051 U	0.022 J	0.0051 U	0.019 J
NAPHTHALENE	3/18	--	0.0046 U	0.0046 U	0.0046 U	--	--	0.0046 U	0.0046 U	0.058	0.047 J	0.053
PCBs (mg/kg wet weight)												
PCB-1254 (AROCLOR 1254)	20/20	0.91	0.12 J	0.018 J	0.0044 J	0.11 J	0.058 J	0.46 J	0.084 J	0.060 J	0.080 J	0.060 J
PCB-1260 (AROCLOR 1260)	20/20	0.91	0.061 J	0.016	0.0023	0.050	0.024	0.15	0.028	0.044	0.056	0.029
Dioxins/Furans (mg/kg wet weight)												
2,3,7,8-TCDD TEQ (ND=0)	2/2	7.2E-05	--	--	--	2.5E-06 J	--	--	--	--	--	--
Pesticides (mg/kg wet weight)												
ALDRIN	18/20	--	0.000068 J	0.000024 J	0.000037 J	0.00039 J	0.000075 U	0.00031 J	0.00026 J	0.000074 J	0.000099 J	0.00024 J
ALPHA BHC	12/20	--	0.000014 U	0.000062 J	0.000028 J	0.000068 U	0.000068 U	0.000068 U	0.000068 U	0.000013 U	0.000030 J	0.000013 U
ALPHA ENDOSULFAN	19/20	0.073	0.00027 J	0.000018 J	0.000057 J	0.00030 J	0.00017 J	0.0033	0.00033 J	0.000087 J	0.00044 J	0.00041
ALPHA-CHLORDANE	20/20	0.55	0.0014 J	0.00016 J	0.00027	0.0011 J	0.00013 J	0.0037 J	0.00053 J	0.0010	0.0024 J	0.0029
BETA BHC	13/20	--	0.00054 J	0.000021 U	0.000047 J	0.00011 U	0.00015 J	0.00018 J	0.00011 U	0.000021 U	0.000059 J	0.000050 J
BETA ENDOSULFAN	19/20	0.073	0.00018 J	0.000025 J	0.000031 J	0.00030 J	0.000082 J	0.0020 J	0.00017 J	0.00018 J	0.00033 J	0.00042 J
Chlordane; Gamma-	19/20	0.55	0.0039 J	0.0024	0.00099	0.0048	0.0019	0.039	0.0044	0.0019	0.0056 J	0.0050
DELTA BHC	14/20	--	0.00025 J	0.000022 J	0.000067 J	0.00016 J	0.000064 U	0.0013	0.00013 J	0.000013 U	0.00032 J	0.00030 J
DIELDRIN	20/20	0.22	0.00081 J	0.00012 J	0.00015 J	0.00088 J	0.00041 J	0.0074 J	0.00075 J	0.00055 J	0.0012 J	0.0015 J
ENDOSULFAN SULFATE	20/20	0.073	0.00064 J	0.00015 J	0.00026	0.0016	0.00042 J	0.0090	0.00082	0.00079	0.0018 J	0.0018
ENDRIN	20/20	0.025	0.0050 J	0.0014	0.0012	0.0067	0.0034	0.066	0.0077 J	0.0028 J	0.0073 J	0.0061 J
ENDRIN ALDEHYDE	20/20	--	0.00030 J	0.00011 J	0.000066 J	0.00056 J	0.00041 J	0.0087	0.00085	0.00022 J	0.00064 J	0.00065 J
ENDRIN KETONE	20/20	--	0.00098 J	0.00032 J	0.00026 J	0.0017 J	0.00055 J	0.011 J	0.0008 J	0.00097 J	0.0017 J	0.0014 J
GAMMA BHC (LINDANE)	17/20	0.023	0.000074 J	0.00016	0.00014 J	0.00084	0.00043 J	0.00081 J	0.00050 J	0.00019 J	0.00027 J	0.00022 J
HEPTACHLOR	8/20	--	0.00032 J	0.000018 U	0.000018 U	0.000093 U	0.000093 U	0.0016 J	0.000093 U	0.000018 U	0.00028 J	0.00036 J
HEPTACHLOR EPOXIDE	20/20	--	0.0015 J	0.00026 J	0.00031 J	0.0033 J	0.00066 J	0.016 J	0.0020 J	0.00067 J	0.0024 J	0.0018 J
METHOXYCHLOR	18/20	0.2	0.0027 J	0.00092 J	0.00070 J	0.0028 J	0.0013 J	0.019 J	0.0019 J	0.0021 J	0.0052 J	0.000017 U
P,P'-DDD	18/20	--	0.0017 J	0.00013 J	0.00048 J	0.00045 J	0.000055 U	0.0011 J	0.000055 U	0.0009 J	0.0013 J	0.0027 J
P,P'-DDE	20/20	1	0.0095 J	0.0016	0.0023	0.0061 J	0.00069 J	0.0090 J	0.0012 J	0.0076	0.013 J	0.018
P,P'-DDT	20/20	0.47	0.0071 J	0.0024	0.0020	0.014	0.0067	0.12	0.016	0.0045	0.012 J	0.0014 J
SVOCs (mg/kg wet weight)												
2-METHYLPHENOL	2/18	--	0.019 U	0.019 U	0.019 U	--	--	0.019 U	0.019 U	0.028 J	0.018 U	0.033 J

Table 4-15 May 2015 Game Fish Sample Data Summary, Eighteenmile Creek Operable Unit 2, Lockport, New York.

Analyte[a]	FoD	Tissue Screening Value[b] (mg/kg)	OU2 Site									
			Eighteenmile Creek, Lockport, NY									
			Silver Redhorse			Smallmouth Bass				Walleye		
			OU2-RED-01	OU2-RED-02	OU2-RED-03	OU2-SMB-01	OU2-SMB-02	OU2-SMB-03	OU2-SMB-04	OU2-WAL-01	OU2-WAL-02	OU2-WAL-03
BENZALDEHYDE	3/18	--	0.040 U	0.040 U	0.040 U	--	--	0.040 U	0.040 U	0.039 U	0.039 U	0.039 U
PENTACHLOROPHENOL	1/18	--	0.024 U	0.024 U	0.024 U	--	--	0.024 U	0.024 U	0.050 J	0.024 U	0.024 U
PHENOL	7/18	--	0.0063 U	0.0063 U	0.0063 U	--	--	0.0063 U	0.15	0.11	0.10	0.11

Key:

-- (dash) = not available

ND = non detects

TCDD = Tetrachlorodibenzo-p-dioxin

TEQ = Toxic Equivalent

Gray Shading = value exceeds tissue screening concentration (for effects on fish)

Notes:

a = Analytes detected in at least one sample are listed.

b = Dyer et al. (2000) except for 2,3,7,8-TCDD, which is from Windward (2004), and total PCBs, which is from the draft Black River Site Ecological Risk Assessment (USEPA 2015).

Table 4-16 Wildlife Exposure Parameters, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2, Lockport, New York

Species	Assumed Diet	Home Range (ha or km)	Site Use Factor (SUF) (unitless)[g]	Exposure Duration (ED) (unitless)[h]	Body Weight (kg)	Food IR (kg dw/kg BW/d)	Fraction Soil in Diet	Soil or Sed. IR (kg dw/kg BW/d)	Water IR (L/kg BW/d)
Terrestrial Wildlife									
American Robin[a]	100% soil invertebrates	0.42 ha	1	0.58	0.08	0.141	0.10	0.014	0.137
Short-Tailed Shrew[b]	100% soil invertebrates	0.22 ha	1	1	0.015	0.209	0.03	0.0063	0.220
Mourning Dove[c]	100% plant seeds	2500 ha	0.003	0.67	0.15	0.190	0.14	0.0264	0.109
Meadow Vole[b]	100% herbaceous plants	0.037 ha	1	1	0.044	0.088	0.032	0.0028	0.136
Red-Tailed Hawk[c]	100% small mammals	60 to 1770 ha	0.13	0.67	0.96	0.035	0.057	0.0020	0.060
Long-Tailed Weasel[c]	100% small mammals	12 ha	0.64	1	0.085	0.13	0.043	0.0056	0.127
Aquatic-Dependent Wildlife									
Tree Swallow[d]	100% benthic invertebrates	0.1 km	1	0.42	0.0208	0.240	0.0	0.0	0.212
Little Brown Bat[e]	100% benthic invertebrates	0.1 km	1	0.71	0.007	0.114	0.0	0.0	0.157
Muskrat[f]	100% aquatic plants	0.048 ha	1	1	1.09	0.032	0.20	0.0064	0.098
Mallard[d]	100% aquatic plants	40 to 1440 ha	0.19	0.67	1.15	0.056	0.02	0.0011	0.056
Heron[d]	100% forage fish	0.98 km	1	0.67	2.39	0.043	0.02	0.0009	0.044
Mink[d]	100% forage fish	1.2 to 2.6 km	1	1	0.93	0.069	0.01	0.0007	0.100

Key:

BW = body weight
dw = dry weight
ha = hectare
IR = Ingestion rate
kg = kilogram
kg dw/kg BW/d = kilograms dry weight per kilograms body weight per day.
L/kg BW/d = Liters per kilogram body weight per day.
OU2 = Operable Unit 2
Shading = Lower of SUF or ED used in exposure assessment.

Notes:

a. USEPA (1999) for BW, BW-normalized food-IR (wet), fraction soil in diet, and water IR. Food moisture content of 68% assumed to convert wet food-IR to dry food IR (0.44 kg wet/kg BW/day x [1 − 0.68] = 0.141 kg dry/kg BW/day). Robin home range from Sample and Suter (1994).

b. USEPA (2007) for BW-normalized food-IR and fraction soil in diet. Sample and Suter (1994) for BW and water-IR. USEPA (1993) for home range for shrew and vole.

c. USEPA (2007) for BW-normalized food-IR and fraction soil in diet. USEPA (1999) for body weight and water IR. Dove home range from Baskett et al. (1993). Hawk home range from USEPA (1993). Weasel home range from Adirondack Ecological Center (2015).

d. TAMS (1999) for BW, food-IR (dry), fraction soil in diet, and water-IR. Mink and mallard home range from USEPA (1993). Tree swallow and heron home range from TAMS (1999).

e. TAMS (1999) for BW, food-IR (wet), fraction soil in diet, water-IR, and home range. Food moisture content of 68% assumed to convert wet food-IR to dry food-IR (wet food-IR x [1 - 0.68] = dry food-IR).

f. USEPA (1999) for BW, BW-normalized food-IR (wet), soil-IR, and water IR. Food moisture content of 88% assumed to convert wet food-IR to dry food IR (0.267 kg wet/kg BW/day x [1 − 0.88] = 0.032 kg dry/kg BW/day). Muskrat home range from USEPA (1993).

g. Site use factor estimated by dividing the terrestrial area of the site (7.72 ha) by the minimum home range size in hectares, or by dividing the length of the creek in OU2 (1.2 km) by the home range size in km. Resulting values > 1 were set equal to 1.

h. Exposure duration equals fraction of year spent at site. Site presence assumed to be 8 months for dove, hawk, mallard, and heron; 7 months for robin; 5 months for swallow; and 8.5 months for bat.

Table 4-17 Sources of Exposure Point Concentrations for Calculating Exposure Estimates for Wildlife, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2, Lockport, New York

Wildlife Model Species	Exposure Point Concentration							
	95% UCL on Average Concentration		Modeled Concentration[a] (from soil)			Modeled Concentration[b] (from sediment)		Measured Forage Fish Concentration
	OU2 Surface Soil	OU2 Sediment	Terrestrial Plant	Earthworm	Small Mammal	Aquatic Plant	Benthos	
Terrestrial Wildlife								
American Robin	X			X				
Short-Tailed Shrew	X			X				
Mourning Dove	X		X					
Meadow Vole	X		X					
Red-Tailed Hawk	X				X			
Long-Tailed Weasel	X				X			
Aquatic-Dependent Wildlife								
Tree Swallow							X	
Little Brown Bat							X	
Muskrat		X				X		
Mallard		X				X		
Great Blue Heron		X						X
Mink		X						X

Key:

BERA = Baseline Ecological Risk Assessment

BSAF = Biota Sediment (or Soil) Accumulation Factor

EPC = exposure point concentration

OU2 = Operable Unit 2

UCL = upper confidence limit

Notes:

a. Based on 95% UCL on average surface-soil concentration. For chemicals with no available model, the chemical concentration in plants, earthworms, and small mammals was set equal to the surface-soil EPC. Site-specific bioaccumulation equation used for earthworm EPC.

b. Based on 95% UCL on average surface sediment concentration. For chemicals with no available model, the chemical concentration in aquatic plants and benthos was set equal to the sediment EPC. Site-specific BSAF used for benthos EPC.

Table 4-18 American Robin and Short-Tailed Shrew Exposure Point Concentrations, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2, Lockport, New York

Analyte[a, b]	Surface Soil EPC (mg/kg dry)[c]	Soil-to-Earthworm Bioaccumulation Equation	Source	Earthworm EPC (mg/kg dry)
Polychlorinated Biphenyls (PCBs)				
Sum of Aroclors (NDs=0.5DL)	6.49	$C_e = (10 ^ (1.1455*\log(C_s / 0.205) + 0.0359)) * 0.11$	Site-specific (see note d)	6.26
Metals				
Antimony	31.4	$\log(C_e) = 0.6996*\log(C_s) - 1.1196$	Site-specific (see note e)	0.85
Arsenic	19.6	$\ln(C_e) = 0.706 * \ln(C_s) - 1.421$	USEPA 2007i	2.0
Barium	457.7	$C_e = 0.091 * C_s$	USEPA 2007i	42
Beryllium	0.516	$C_e = 0.045 * C_s$	USEPA 2007i	0.023
Cadmium	7.877	$\log(C_e) = 0.1392*\log(C_s) + 0.4174$	Site-specific (see note e)	3.48
Chromium	59.6	$C_e = 0.306 * C_s$	USEPA 2007i	18
Cobalt	9.177	$C_e = 0.122 * C_s$	USEPA 2007i	1.12
Copper	1400.3	$\log(C_e) = 0.4232*\log(C_s) + 0.3885$	Site-specific (see note e)	52.5
Lead	1176.3	$\log(C_e) = 0.8885*\log(C_s) - 1.0950$	Site-specific (see note e)	43.0
Manganese	761.9	$\ln(C_e) = 0.682 * \ln(C_s) - 0.809$	USEPA 2007i	41
Mercury	2.33	$\ln(C_e) = 0.118 * \ln(C_s) - 0.684$	Sample et al. 1998	0.56
Nickel	68.07	$C_e = 1.059 * C_s$	Sample et al. 1998	72
Selenium	1.623	$\ln(C_e) = 0.733 * \ln(C_s) - 0.075$	USEPA 2007i	1.3
Silver	4.613	$C_e = 2.045 * C_s$	USEPA 2007i	9.4
Thallium	2.657	$C_e = 0.763 * C_s$	Site-specific (see note e)	2.03
Vanadium	17.27	$C_e = 0.042 * C_s$	USEPA 2007i	0.73
Zinc	2508	$\log(C_e) = 0.1843*\log(C_s) + 1.6082$	Site-specific (see note e)	172
Polycyclic Aromatic Hydrocarbons (PAHs)				
HPAH sum (NDs = 0.5 DL)	56.9	$C_e = (10 ^ (0.5176*\log(C_s / 0.205) + 0.3333)) * 0.11$	Site-specific (see note d)	4.36
LPAH sum (NDs = 0.5 DL)	29.4	$C_e = 0.26 * C_s * f_L/f_{OC}$	Site-specific (see note d)	4.10
Other Semivolatile Organic Compounds (SVOCs)				
4-Nitroaniline	0.063	$C_e = C_s$	Assumed	0.063
Acetophenone	0.018	$C_e = C_s$	Assumed	0.018
Benzaldehyde	0.035	$C_e = C_s$	Assumed	0.035
Benzyl butyl phthalate	36	$C_e = C_s$	Assumed	36
Biphenyl (diphenyl)	0.39	$C_e = C_s$	Assumed	0.39
Bis(2-ethylhexyl)phthalate	1.025	$C_e = C_s$	Assumed	1.025
Carbazole	0.419	$C_e = C_s$	Assumed	0.419
Dibenzofuran	0.467	$C_e = C_s$	Assumed	0.467
Diethyl phthalate	23	$C_e = C_s$	Assumed	23
Di-n-butyl phthalate	0.327	$C_e = C_s$	Assumed	0.327
Di-n-octyl phthalate	0.347	$C_e = C_s$	Assumed	0.347
Phenol	0.034	$C_e = C_s$	Assumed	0.034
Pesticides				
Aldrin	0.00124	$C_e = 7.07 * C_s * f_L/f_{OC}$	Site-specific (see note d) for ΣDDT	0.005
alpha-BHC	0.00202	$C_e = 5.12 * C_s * f_L/f_{OC}$	Site-specific (see note d) for beta-BHC	0.006
Endosulfan I	0.0041	$C_e = 7.07 * C_s * f_L/f_{OC}$	Site-specific (see note d) for ΣDDT	0.016
beta-BHC	0.00636	$C_e = 5.12 * C_s * f_L/f_{OC}$	Site-specific (see note d)	0.017
Endosulfan II	0.0031	$C_e = 7.07 * C_s * f_L/f_{OC}$	Site-specific (see note d) for ΣDDT	0.012
cis-Chlordane (α-Chlordane)	0.00182	$C_e = 7.07 * C_s * f_L/f_{OC}$	Site-specific (see note d) for ΣDDT	0.007
Σ DDT	0.184	$C_e = 7.07 * C_s * f_L/f_{OC}$	Site-specific (see note d)	0.70
delta-BHC	0.00128	$C_e = 5.12 * C_s * f_L/f_{OC}$	Site-specific (see note d) for beta-BHC	0.004
Dieldrin	0.01706	$C_e = 5.60 * C_s * f_L/f_{OC}$	Site-specific (see note d)	0.051
Endosulfan sulfate	0.00198	$C_e = 7.07 * C_s * f_L/f_{OC}$	Site-specific (see note d) for ΣDDT	0.008
Endrin	0.00654	$C_e = 2.66 * C_s * f_L/f_{OC}$	Site-specific (see note d) for endrin aldehyde	0.0093

Table 4-18 American Robin and Short-Tailed Shrew Exposure Point Concentrations, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2, Lockport, New York

Analyte[a, b]	Surface Soil EPC (mg/kg dry)[c]	Soil-to-Earthworm Bioaccumulation Equation	Source	Earthworm EPC (mg/kg dry)
Endrin aldehyde	0.004494	$C_e = 2.66 * C_s * f_L/f_{OC}$	Site-specific (see note d)	0.0064
Endrin ketone	0.00211	$C_e = 2.66 * C_s * f_L/f_{OC}$	Site-specific (see note d) for endrin aldehyde	0.0030
gamma-BHC (lindane)	0.00119	$C_e = 5.12 * C_s * f_L/f_{OC}$	Site-specific (see note d) for beta-BHC	0.003
Methoxychlor	0.0358	$C_e = 7.07 * C_s * f_L/f_{OC}$	Site-specific (see note d) for ΣDDT	0.136
trans-Chlordane (γ-Chlordane)	0.00658	$C_e = 7.07 * C_s * f_L/f_{OC}$	Site-specific (see note d) for ΣDDT	0.025
Dioxins/Furans				
2,3,7,8-TCDD TEQ	1.06E-05	$\ln(C_e) = 1.182 * \ln(C_s) + 3.533$	Sample et al. 1998	4.5E-05

Key:
-- = not analyzed
BERA = baseline ecological risk assessment
C_e = chemical concentration in earthworm
C_s = chemical concentration in soil
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EPC = Exposure Point Concentration
f_L = fraction lipid in earthworm
f_{OC} = fraction organic carbon in soil
HPAH = high molecular weight PAH
HQ = hazard quotient
LPAH = low molecular weight PAH
mg/kg = milligrams per kilogram
NDs = non detects
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyls
SVOC = semivolatile organic compound
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent concentration
UCL = upper confidence limit

Notes:
a. Analytes detected in surface soil in recent OU2 site investigation are listed if frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major soil/sediment constitutes (aluminum) were excluded from the evaluation as per USEPA guidance (USEPA 1989, 2003a).
c. Surface soil EPCs fromTable 4-1 (see also Appendix F)
d. Site-specific bioaccumulation equations and BSAFs for organic contaminants developed from soil contaminant data (dry weight), soil organic carbon (OC) data (dry weight), earthworm contaminant data (dry weight), and earthworm lipid data (dry weight) from Eighteenmile Creek OU2 (see Appendix C for details). To estimate contaminant levels in native earthworms from OU2, we used site-specific soil OC of 20.5% dry weight and an assumed earthworm lipid content of 11% dry weight (equivalent to 1.9 % lipids wet weight assuming 83% moisture content for earthworms).
e. Site-specific bioaccumulation equations and BSAFs for metals developed from soil contaminant data (dry weight) and earthworm contaminant data (dry weight) from Eighteenmile Creek OU2 (see Appendix C for details).

Table 4-19 Mourning Dove and Meadow Vole Exposure Point Concentrations, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	Surface Soil EPC (mg/kg dry)[c]	Soil-to-Plant Bioaccumulation Equation[d]	Source	Plant EPC (mg/kg dry)
Polychlorinated Biphenyls				
Sum of Aroclors (NDs=0.5 DL)	6.49	$C_p = 0.017 * C_s$	Travis & Arms 1988 for Aroclor 1254	0.110
Metals				
Antimony	31.4	$\ln(C_p) = 0.938 * \ln(C_s) - 3.233$	USEPA 2007i	1.00
Arsenic	19.6	$C_p = 0.03725 * C_s$	USEPA 2007i	0.73
Barium	457.7	$C_p = 0.156 * C_s$	USEPA 2007i	71
Beryllium	0.516	$\ln(C_p) = 0.7345 * \ln(C_s) - 0.5361$	USEPA 2007i	0.36
Cadmium	7.877	$\ln(C_p) = 0.546 * \ln(C_s) - 0.475$	USEPA 2007i	1.92
Chromium	59.6	$C_p = 0.041 * C_s$	USEPA 2007i	2.44
Cobalt	9.177	$C_p = 0.0075 * C_s$	USEPA 2007i	0.069
Copper	1400.3	$\ln(C_p) = 0.394 * \ln(C_s) + 0.668$	USEPA 2007i	34
Lead	1176.3	$\ln(C_p) = 0.561 * \ln(C_s) - 1.328$	USEPA 2007i	14.0
Manganese	761.9	$C_p = 0.079 * C_s$	USEPA 2007i	60
Mercury	2.33	$\ln(C_p) = 0.544 * \ln(C_s) - 0.996$	Bechtel Jacobs 1998a	0.59
Nickel	68.07	$\ln(C_p) = 0.748 * \ln(C_s) - 2.223$	USEPA 2007i	2.5
Selenium	1.623	$\ln(C_p) = 1.104 * \ln(C_s) - 0.677$	USEPA 2007i	0.87
Silver	4.613	$C_p = 0.014 * C_s$	USEPA 2007i	0.065
Thallium	2.657	$C_p = 0.004 * C_s$	Baes et al. 1984	0.011
Vanadium	17.27	$C_p = 0.00485 * C_s$	USEPA 2007i	0.084
Zinc	2508	$\ln(C_p) = 0.554 * \ln(C_s) + 1.575$	USEPA 2007i	369
Polycyclic Aromatic Hydrocarbons (PAHs)				
HPAH sum (NDs=0.5 DL)	56.9	$\ln(C_p) = 0.9469 * \ln(C_s) - 1.7026$	USEPA 2007i	8.4
LPAH sum (NDs=0.5 DL)	29.4	$\ln(C_p) = 0.4544 * \ln(C_s) - 1.3205$	USEPA 2007i	1.24
Other Semivolatile Organic Compounds (SVOCs)				
4-Nitroaniline	0.063	$C_p = C_s$	Assumed	0.063
Acetophenone	0.018	$C_p = C_s$	Assumed	0.018
Benzaldehyde	0.035	$C_p = C_s$	Assumed	0.035
Benzyl butyl phthalate	36	$C_p = C_s$	Assumed	36
Biphenyl (diphenyl)	0.39	$C_p = C_s$	Assumed	0.39
Bis(2-ethylhexyl)phthalate	1.025	$C_p = C_s$	Assumed	1.025
Carbazole	0.419	$C_p = C_s$	Assumed	0.419
Dibenzofuran	0.467	$C_p = C_s$	Assumed	0.467
Diethyl phthalate	23	$C_p = C_s$	Assumed	23
Di-n-butyl phthalate	0.327	$C_p = C_s$	Assumed	0.327
Di-n-octylphthalate	0.347	$C_p = C_s$	Assumed	0.347
Phenol	0.034	$C_p = C_s$	Assumed	0.034
Pesticides				
Aldrin	0.00124	$C_p = 0.0214 * C_s$	Travis & Arms 1988 (Table 3)	0.00003
alpha-BHC	0.00202	$C_p = 0.389 * C_s$	Travis & Arms 1988 (Table 3) for lindane	0.0008
Endosulfan I	0.0041	$C_p = 0.237 * C_s$	Travis & Arms 1988 (Equation 3)	0.0010
beta-BHC	0.00636	$C_p = 0.389 * C_s$	Travis & Arms 1988 (Table 3) for lindane	0.002
Endosulfan II	0.0031	$C_p = 0.313 * C_s$	Travis & Arms 1988 (Equation 3)	0.0010
cis-Chlordane	0.00182	$C_p = 0.0155 * C_s$	Travis & Arms 1988 (Table 3)	0.0000
Σ DDT	0.184	$\ln(C_p) = 0.7524 * \ln(C_s) - 2.5119$	USEPA 2007i	0.023
delta-BHC	0.00128	$C_p = 0.389 * C_s$	Travis & Arms 1988 (Table 3) for lindane	0.0005
Dieldrin	0.01706	$C_p = 0.41 * C_s$	USEPA 2007i	0.007
Endosulfan sulfate	0.00198	$C_p = 0.297 * C_s$	Travis & Arms 1988 (Equation 3)	0.0006
Endrin	0.00654	$C_p = 0.0151 * C_s$	Travis & Arms 1988 (Table 3)	0.00010
Endrin aldehyde	0.004494	$C_p = 0.0151 * C_s$	Travis & Arms 1988 (Table 3) for endrin	0.00007
Endrin ketone	0.00211	$C_p = 0.0151 * C_s$	Travis & Arms 1988 (Table 3) for endrin	0.00003

Table 4-19 Mourning Dove and Meadow Vole Exposure Point Concentrations, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	Surface Soil EPC (mg/kg dry)[c]	Soil-to-Plant Bioaccumulation Equation[d]	Source	Plant EPC (mg/kg dry)
gamma-BHC (lindane)	0.00119	$C_p = 0.389 * C_s$	Travis & Arms 1988 (Table 3)	0.00046
Methoxychlor	0.0358	$C_p = 0.0448 * C_s$	Travis & Arms 1988 (Equation 3)	0.0016
trans-Chlordane	0.00658	$C_p = 0.0155 * C_s$	Travis & Arms 1988 (Table 3)	0.0001
Dioxins/Furans				
2,3,7,8-TCDD TEQ	1.06E-05	$C_p = 0.0135 * C_s$	Travis & Arms 1988 (Table 3)	1.43E-07

Key:
-- = not available
BERA = baseline ecological risk assessment
C_p = plant contaminant concentration
C_s = soil contaminant concentration
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EPC = Exposure Point Concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LPAH = low molecular weigjht PAH
mg/kg = milligrams per kilogram
NDs = non detects
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
PAH = polycyclic aromatic hydrocarbon
SVOCs = semivolatile organic compounds
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent concentration
UCL = upper confidence limit

Notes:
a. Analytes detected in surface soil in recent OU2 site investigation are listed if frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major soil/sediment constitutes (aluminum) were excluded from the evaluation as per USEPA guidance (USEPA 1989, 2003a).
c. Surface soil EPCs fromTable 4-1 (see also Appendix F)
d. Soil-to-plant vegetative (leafy) tissues.

Table 4-20 Muskrat and Mallard Exposure Point Concentrations, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2, Lockport, New York

Analyte[a, b]	Sediment EPC[c] (mg/kg dry)	Soil-to-Plant Bioaccumulation Equation[d]	Source	Plant EPC (mg/kg dry)
Polychlorinated Biphenyls (PCBs)				
Sum of Aroclors (NDs = 0.5 DL)	35.6	$C_p = 0.017 * C_s$	Travis and Arms 1988 for Aroclor 1254	0.61
Metals				
Antimony	5.39	$\ln(C_p) = 0.938 * \ln(C_s) - 3.233$	USEPA 2007i	0.19
Arsenic	7.19	$C_p = 0.03725 * C_s$	USEPA 2007i	0.27
Barium	125.1	$C_p = 0.156 * C_s$	USEPA 2007i	19.5
Beryllium	0.502	$\ln(C_p) = 0.7345 * \ln(C_s) - 0.5361$	USEPA 2007i	0.35
Cadmium	1.573	$\ln(C_p) = 0.546 * \ln(C_s) - 0.475$	USEPA 2007i	0.80
Chromium	33.6	$C_p = 0.041 * C_s$	USEPA 2007i	1.38
Cobalt	7.5	$C_p = 0.0075 * C_s$	USEPA 2007i	0.056
Copper	476.2	$\ln(C_p) = 0.394 * \ln(C_s) + 0.668$	USEPA 2007i	22.1
Lead	801.9	$\ln(C_p) = 0.561 * \ln(C_s) - 1.328$	USEPA 2007i	11.3
Manganese	672.8	$C_p = 0.079 * C_s$	USEPA 2007i	53.2
Mercury	1.63	$\ln(C_p) = 0.544 * \ln(C_s) - 0.996$	Bechtel Jacobs 1998a	0.48
Nickel	31.14	$\ln(C_p) = 0.748 * \ln(C_s) - 2.223$	USEPA 2007i	1.42
Selenium	0.866	$\ln(C_p) = 1.104 * \ln(C_s) - 0.677$	USEPA 2007i	0.43
Silver	1.421	$C_p = 0.014 * C_s$	USEPA 2007i	0.020
Thallium	0.48	$C_p = 0.004 * C_s$	Baes et al. 1984	0.002
Vanadium	16.65	$C_p = 0.00485 * C_s$	USEPA 2007i	0.081
Zinc	963.3	$\ln(C_p) = 0.554 * \ln(C_s) + 1.575$	USEPA 2007i	217
Polycyclic Aromatic Hydrocarbons (PAHs)				
HPAH sum (NDs = 0.5 DL)	168.9	$\ln(C_p) = 0.9469 * \ln(C_s) - 1.7026$	USEPA 2007i	23.4
LPAH sum (NDs = 0.5 DL)	76.4	$\ln(C_p) = 0.4544 * \ln(C_s) - 1.3205$	USEPA 2007i	1.92
Semivolatile Organic Compounds (SVOCs)				
2-Methylphenol	0.22	$C_p = C_s$	Assumed	0.22
4-Methylphenol	0.63	$C_p = C_s$	Assumed	0.631
Benzaldehyde	0.043	$C_p = C_s$	Assumed	0.043
Benzyl butyl phthalate	0.4	$C_p = C_s$	Assumed	0.4
Biphenyl (diphenyl)	1.4	$C_p = C_s$	Assumed	1.4
Bis(2-ethylhexyl)phthalate	4.50	$C_p = C_s$	Assumed	4.5
Carbazole	10.3	$C_p = C_s$	Assumed	10.3
Dibenzofuran	12.0	$C_p = C_s$	Assumed	12
Di-n-octylphthalate	0.0039	$C_p = C_s$	Assumed	0.0039
Phenol	0.55	$C_p = C_s$	Assumed	0.55
Pesticides				
Aldrin	0.075	$C_p = 0.0241 * C_s$	Travis and Arms 1988 (Table 3)	0.0018
alpha-BHC	0.01	$C_p = 0.389 * C_s$	Travis and Arms 1988 (Table 3) for lindane	0.0039
Endosulfan I	0.024	$C_p = 0.237 * C_s$	Travis and Arms 1988 (Equation 3)	0.0057
beta-BHC	0.19	$C_p = 0.389 * C_s$	Travis and Arms 1988 (Table 3) for lindane	0.0739
Endosulfan II	0.013	$C_p = 0.313 * C_s$	Travis and Arms 1988 (Equation 3)	0.00407
cis-Chlordane	0.011	$C_p = 0.0155 * C_s$	Travis and Arms 1988 (Table 3)	0.000171
Σ DDT	0.167	$\ln(C_p) = 0.7524 * \ln(C_s) - 2.5119$	USEPA 2007i	0.021
delta-BHC	0.031	$C_p = 0.389 * C_s$	Travis and Arms 1988 (Table 3) for lindane	0.0121
Dieldrin	0.129	$C_p = 0.41 * C_s$	USEPA 2007i	0.05289
Endosulfan sulfate	0.019	$C_p = 0.297 * C_s$	Travis and Arms 1988 (Equation 3)	0.0056
Endrin	0.036	$C_p = 0.0151 * C_s$	Travis and Arms 1988 (Table 3)	0.00054
Endrin aldehyde	0.02	$C_p = 0.0151 * C_s$	Travis and Arms 1988 (Table 3) for endrin	0.00030
Endrin ketone	0.164	$C_p = 0.0151 * C_s$	Travis and Arms 1988 (Table 3) for endrin	0.00248
gamma-BHC (lindane)	0.047	$C_p = 0.389 * C_s$	Travis and Arms 1988 (Table 3)	0.01828

Table 4-20 Muskrat and Mallard Exposure Point Concentrations, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2, Lockport, New York

Analyte[a, b]	Sediment EPC[c] (mg/kg dry)	Soil-to-Plant Bioaccumulation Equation[d]	Source	Plant EPC (mg/kg dry)
Methoxychlor	0.094	$C_p = 0.0448 * C_s$	Travis and Arms 1988 (Equation 3)	0.00421
trans-Chlordane	0.059	$C_p = 0.0155 * C_s$	Travis and Arms 1988 (Table 3)	0.00091
Dioxins/Furans				
2,3,7,8-TCDD TEQ (ND=0.5DL)	4.30E-05	$C_p = 0.0135 * C_s$	Travis and Arms 1988 (Table 3)	5.805E-07

Key:
-- = Not analyzed.
BERA = baseline ecological risk assessment
C_p = plant contaminant concentration
C_s = soil contaminant concentration
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EPC = Exposure point concentration
HQ = hazard quotient
mg/kg = milligrams per kilogram
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
SVOC = Semivolatile organic compound.
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent concentration
UCL = upper confidence limit
µg/kg = micrograms per kilogram
µg/L = micrograms per kilogram

Notes:
a. Analytes detected in sediment in recent OU2 site investigation are listed if frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major soil/sediment constitutes (aluminum) were excluded from the evaluation as per USEPA guidance (USEPA 1989, 2003a).
c. Sediment EPCs from Table 4-4 (see also Appendix F).
d. Soil-to-plant vegetative (leafy) tissues.

Table 4-21 Red-Shouldered Hawk and Weasel Exposure Point Concentrations, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a]	Surface Soil EPC (mg/kg dry)[c]	Diet- or Soil-to-Small Mammal Bioaccumulation Equation	Source	Small Mammal EPC (mg/kg dry)
Polychlorinated Biphenyls (PCBs)				
Sum of Aroclors (NDs = 0.5DL)	6.49	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.533
Metals				
Antimony	31.4	$C_m = 0.001 * 50 * C_d$	USEPA 2007i	0.050
Arsenic	19.6	$\ln(C_m) = 0.8188 * \ln(C_s) - 4.8471$	USEPA 2007i	0.090
Barium	457.7	$C_m = 0.00015 * 50 * C_d$	USEPA 2007i	0.54
Beryllium	0.516	$C_m = 0.001 * 50 * C_d$	USEPA 2007i	0.0180
Cadmium	7.877	$\ln(C_m) = 0.4723 * \ln(C_s) - 1.2571$	USEPA 2007i	0.76
Chromium	59.6	$\ln(C_m) = 0.7338 * \ln(C_s) - 1.4599$	USEPA 2007i	4.66
Cobalt	9.177	$\ln(C_m) = 1.307 * \ln(C_s) - 4.4669$	USEPA 2007i	0.21
Copper	1400.3	$\ln(C_m) = 0.1444 * \ln(C_s) + 2.042$	USEPA 2007i	21.9
Lead	1176.3	$\ln(C_m) = 0.4422 * \ln(C_s) + 0.0761$	USEPA 2007i	25
Manganese	761.9	$C_m = 0.0205 * C_s$	USEPA 2007i	15.6
Mercury	2.33	$C_m = 0.25 * 50 * C_d$	Baes et al. 1984	7.31
Nickel	68.07	$\ln(C_m) = 0.4658 * \ln(C_s) - 0.2462$	USEPA 2007i	5.6
Selenium	1.623	$\ln(C_m) = 0.3764 * \ln(C_s) - 0.4158$	USEPA 2007i	0.79
Silver	4.613	$C_m = 0.004 * C_s$	USEPA 2007i	0.0185
Thallium	2.657	$C_m = 0.1124 * C_s$	Sample et al. 1998	0.299
Vanadium	17.27	$C_m = 0.0123 * C_s$	USEPA 2007i	0.21
Zinc	2508	$\ln(C_m) = 0.0706 * \ln(C_s) + 4.3632$	USEPA 2007i	136
Polycyclic Aromatic Hydrocarbons (PAHs)				
HPAH sum (NDs = 0.5 DL)	56.9	$C_m = 0$	USEPA 2007i	0
LPAH sum (NDs = 0.5 DL)	29.4	$C_m = 0$	USEPA 2007i	0
Other Semivolatile Organic Compounds (SVOCs)				
4-Nitroaniline	0.063	$C_m = 0$	USEPA 2007i for PAHs	0
Acetophenone	0.018	$C_m = 0$	USEPA 2007i for PAHs	0
Benzaldehyde	0.035	$C_m = 0$	USEPA 2007i for PAHs	0
Benzyl butyl phthalate	36	$C_m = 0$	USEPA 2007i for PAHs	0
Biphenyl (diphenyl)	0.39	$C_m = 0$	USEPA 2007i for PAHs	0
Bis(2-ethylhexyl)phthalate	1.025	$C_m = 0$	USEPA 2007i for PAHs	0
Carbazole	0.419	$C_m = 0$	USEPA 2007i for PAHs	0
Dibenzofuran	0.467	$C_m = 0$	USEPA 2007i for PAHs	0
Diethyl phthalate	23	$C_m = 0$	USEPA 2007i for PAHs	0
Di-n-butyl phthalate	0.327	$C_m = 0$	USEPA 2007i for PAHs	0
Di-n-octylphthalate	0.347	$C_m = 0$	USEPA 2007i for PAHs	0
Phenol	0.034	$C_m = 0$	USEPA 2007i for PAHs	0
Pesticides				
Aldrin	0.00124	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.0001
alpha-BHC	0.00202	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.0038
Endosulfan I	0.0041	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.005
beta-BHC	0.00636	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.01
Endosulfan II	0.0031	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.005
cis-Chlordane	0.00182	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.0001
Σ DDT	0.184	$C_m = 4.83 * C_d$	USEPA 2007i	0.110
delta-BHC	0.00128	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.0024
Dieldrin	0.01706	$C_m = 1.2 * C_d$	USEPA 2007i	0.0084
Endosulfan sulfate	0.00198	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.003
Endrin	0.00654	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.00048
Endrin aldehyde	0.004494	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.00033

Table 4-21 Red-Shouldered Hawk and Weasel Exposure Point Concentrations, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a]	Surface Soil EPC (mg/kg dry)[c]	Diet- or Soil-to-Small Mammal Bioaccumulation Equation	Source	Small Mammal EPC (mg/kg dry)
Endrin ketone	0.00211	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.00015
gamma-BHC (lindane)	0.00119	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.0022
Methoxychlor	0.0358	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.0077
trans-Chlordane	0.00658	$C_m = 4.83 * C_d$	USEPA 2007i for Σ DDT	0.0005
Dioxins/Furans				
2,3,7,8-TCDD TEQ	1.06E-05	$\ln(C_m) = 1.0993 * \ln(C_s) + 0.8113$	Sample et al. 1998	7.6E-06

Key:
-- = not analyzed
BERA = baseline ecological risk assessment
C_d = chemical concentration in diet (terrestrial plants, see Table 4-19)
C_m = chemical concentration in small mammal tissue
C_s = chemical concentration in soil
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EPC = Exposure Point Concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LPAH = low molecular weight PAH
mg/kg = milligrams per kilogram
NDs = non detects
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
SVOC = semivolatile organic compound
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent concentration
UCL = upper confidence limit

Notes:
a. Analytes detected in surface soil in recent OU2 site investigation are listed if frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major soil/sediment constitutes (aluminum) were excluded from the evaluation as per USEPA guidance (USEPA 1989, 2003a).
c. Surface soil EPCs fromTable 4-1 (see also Appendix F)

Table 4-22 Tree Swallow and Little Brown Bat Exposure Point Concentrations, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	Sediment EPC[c] (mg//kg dry)	Sediment-to-Benthos Bioaccumulation Equation	Source	Benthic Invertebrate EPC (mg/kg dry)
Polychlorinated Biphenyls (PCBs)				
Sum of Aroclors (NDs=0.5DL)	35.6	$C_b = 15.82 * C_s * f_L/f_{OC}$	Site-specific (see note e)	793
Metals				
Antimony	5.39	$C_b = 0.079 * C_s$	Site-specific (see note f)	0.43
Arsenic	7.19	$\log(C_b) = 0.754 * \log(C_s) - 0.292$	Bechtel Jacobs 1998b	2.3
Barium	125.1	$C_b = 0.583 * C_s / (1 - 0.84)$	USACE 2004 (see note d)	456
Beryllium	0.502	$C_b = 0.071 * C_s / (1 - 0.84)$	USACE 2004 (see note d)	0.22
Cadmium	1.573	$\log(C_b) = 0.692 * \log(C_s) + 0.0395$	Bechtel Jacobs 1998b	1.50
Chromium	33.6	$\log(C_b) = 0.365 * \log(C_s) + 0.2092$	Bechtel Jacobs 1998b	5.8
Cobalt	7.5	$C_b = 0.098 * C_s / (1 - 0.84)$	USACE 2004 (see note d)	4.6
Copper	476.2	$C_b = 0.517 * C_s$	Site-specific (see note f)	246
Lead	801.9	$C_b = 0.067 * C_s$	Site-specific (see note f)	54
Manganese	672.8	$C_b = 0.077 * C_s / (1 - 0.84)$	USACE 2004 (see note d)	324
Mercury	1.63	$C_b = 0.076 * C_s$	Site-specific (see note f)	0.12
Nickel	31.14	$\log(C_b) = -0.425 * \log(C_s) + 1.48$	Bechtel Jacobs 1998b	7.00
Selenium	0.866	$C_b = 3.04 * C_s$	Site-specific (see note f)	2.63
Silver	1.421	$C_b = 0.136 * C_s / (1 - 0.84)$	USACE 2004 (see note d)	1.21
Thallium	0.48	$C_b = 0.561 * C_s$	Site-specific (see note f)	0.27
Vanadium	16.65	$C_b = 0.079 * C_s / (1 - 0.84)$	USACE 2004 (see note d)	8.2
Zinc	963.3	$\log(C_b) = 0.208 * \log(C_s) + 1.80$	Bechtel Jacobs 1998b	263
Polycyclic Aromatic Hydrocarbons (PAHs)				
HPAH sum (NDs = 0.5 DL)	168.9	$C_b = 7.48 * C_s * f_L/f_{OC}$	Site-specific (see note e)	1,779
LPAH sum (NDs = 0.5 DL)	76.4	$C_b = 1.07 * C_s * f_L/f_{OC}$	Site-specific (see note e)	115
Semivolatile Organic Compounds (SVOCs)				
2-Methylphenol	0.22	$C_b = C_s$	Assumed	0.22
4-Methylphenol	0.63	$C_b = C_s$	Assumed	0.63
Benzaldehyde	0.043	$C_b = C_s$	Assumed	0.043
Benzyl butyl phthalate	0.4	$C_b = C_s$	Assumed	0.400
Biphenyl (diphenyl)	1.4	$C_b = C_s$	Assumed	1.4
Bis(2-ethylhexyl)phthalate	4.50	$C_b = C_s$	Assumed	4.50
Carbazole	10.3	$C_b = C_s$	Assumed	10.30
Dibenzofuran	12.0	$C_b = C_s$	Assumed	12.00
Di-n-octylphthalate	0.0039	$C_b = C_s$	Assumed	0.004
Phenol	0.55	$C_b = C_s$	Assumed	0.55
Pesticides				
Aldrin	0.075	$C_b = 4.19 * C_s * f_L/f_{OC}$	Site-specific (see note e) for dieldrin	0.442
alpha-BHC	0.01	$C_b = 2.12 * C_s * f_L/f_{OC}$	Site-specific (see note e) for beta-BHC	0.0298
Endosulfan I	0.024	$C_b = 4.19 * C_s * f_L/f_{OC}$	Site-specific (see note e) for dieldrin	0.142
beta-BHC	0.19	$C_b = 2.12 * C_s * f_L/f_{OC}$	Site-specific (see note e)	0.567
Endosulfan II	0.013	$C_b = 4.19 * C_s * f_L/f_{OC}$	Site-specific (see note e) for dieldrin	0.077
cis-Chlordane	0.011	$C_b = 4.19 * C_s * f_L/f_{OC}$	Site-specific (see note e) for dieldrin	0.065
Σ DDT	0.167	$C_b = 2.11 * C_s * f_L/f_{OC}$	Site-specific (see note e)	0.496
delta-BHC	0.031	$C_b = 2.12 * C_s * f_L/f_{OC}$	Site-specific (see note e) for beta-BHC	0.0925
Dieldrin	0.129	$C_b = 4.19 * C_s * f_L/f_{OC}$	Site-specific (see note e)	0.761
Endosulfan sulfate	0.019	$C_b = 4.19 * C_s * f_L/f_{OC}$	Site-specific (see note e) for dieldrin	0.112
Endrin	0.036	$C_b = 2.45 * C_s * f_L/f_{OC}$	Site-specific (see note e) for endrin ketone	0.124
Endrin aldehyde	0.02	$C_b = 1.09 * C_s * f_L/f_{OC}$	Site-specific (see note e)	0.031
Endrin ketone	0.164	$C_b = 2.45 * C_s * f_L/f_{OC}$	Site-specific (see note e)	0.566
gamma-BHC (lindane)	0.047	$C_b = 2.12 * C_s * f_L/f_{OC}$	Site-specific (see note e) for beta-BHC	0.1403
Heptachlor	0.053	$C_b = 4.19 * C_s * f_L/f_{OC}$	Site-specific (see note e) for dieldrin	0.313

Table 4-22 Tree Swallow and Little Brown Bat Exposure Point Concentrations, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	Sediment EPC[c] (mg//kg dry)	Sediment-to-Benthos Bioaccumulation Equation	Source	Benthic Invertebrate EPC (mg/kg dry)
Heptachlor epoxide	0.018	$C_b = 4.19 * C_s * f_L/f_{OC}$	Site-specific (see note e) for dieldrin	0.106
Methoxychlor	0.094	$C_b = 4.19 * C_s * f_L/f_{OC}$	Site-specific (see note e) for dieldrin	0.555
trans-Chlordane	0.059	$C_b = 4.19 * C_s * f_L/f_{OC}$	Site-specific (see note e) for dieldrin	0.348
Dioxins/Furans				
2,3,7,8-TCDD TEQ (ND=0.5DL)	4.30E-05	$\log(C_b) = 1.110 * \log(C_s) + 0.59$	Bechtel Jacobs 1998b for PCBs	5.54E-05

Key:
BERA = baseline ecological risk assessment
BSAF = biota sediment accumulation factor
C_b = benthic-invertebrate contaminant concentration
C_s = sediment contaminant concentration
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EPC = exposure point concentration
f_L = fraction lipid in organism
f_{OC} = fraction organic carbon in sediment
HPAH = high molecular weight PAH
HQ = hazard quotient
LPAH = low molecular weigjht PAH
mg/kg = milligrams per kilogram
NOAEL = no observed adverse effect level
OC = organic carbon
OU2 = Operable Unit 2
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent concentration

Notes:
a. Analytes detected in sediment in recent OU2 site investigation are listed if frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major soil/sediment constitutes (aluminum and iron) were excluded from the evaluation as per USEPA guidance (USEPA 1989, 2003a).
c. Sediment EPCs from Table 4-4 (see also Appendix F).
d. BSAF developed from contaminant data for sediment and Lumbriculus tissue from USACE 2004 (see Appendix B for details). Water content of 84% assumed to convert wet weight invertebrate contaminant concentration to dry weigh basis.

Table 4-23 Great Blue Heron and Mink Exposure Point Concentrations, Baseline Ecological Risk Assessment. Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	Sediment EPC[c] (mg/kg dry)	Forage Fish EPC[d] (mg/kg wet)	Forage Fish EPC[e] (mg/kg dry)
Polychlorinated Biphenyls (PCBs)			
Sum of Aroclors (NDs = 0)	35.6	0.83	2.59
Metals			
Antimony	5.39	0.0013	0.0039
Arsenic	7.19	0.35	1.1
Barium	125.1	2.8	8.8
Beryllium	0.502	0.0037	0.0114
Cadmium	1.573	0.017	0.05
Chromium	33.6	0.79	2.5
Cobalt	7.5	0.067	0.21
Copper	476.2	5.5	17.2
Lead	801.9	0.78	2.4
Manganese	672.8	7.9	24.7
Mercury	1.63	0.18	0.56
Nickel	31.14	0.47	1.5
Selenium	0.866	0.53	1.7
Silver	1.421	0.0019	0.0059
Thallium	0.48	0.0010	0.0030
Vanadium	16.65	0.46	1.4
Zinc	963.3	31	97
Polycyclic Aromatic Hydrocarbons (PAHs)			
HPAH sum (NDs = 0)	168.9	0.049	0.15
LPAH sum (NDs = 0)	76.4	0.034	0.11
Semivolatile Organic Compounds (SVOCs)			
2-Methylphenol	0.22	0.0018	0.0056
4-Methylphenol	0.63	0.66	2.1
Benzaldehyde	0.043	0.069	0.22
Benzyl butyl phthalate	0.4	0.018	0.0563
Biphenyl (diphenyl)	1.4	0.012	0.0375
Bis(2-ethylhexyl)phthalate	4.50	0.022	0.0672
Carbazole	10.3	0.002	0.0077
Dibenzofuran	12.0	0.013	0.0406
Di-n-octylphthalate	0.0039	0.014	0.0438
Phenol	0.55	0.03	0.09
Pesticides			
Aldrin	0.075	0.00068	0.0021
alpha-BHC	0.01	0.00011	0.00034
Endosulfan I	0.024	0.0022	0.0069
beta-BHC	0.19	0.00057	0.0018
Endosulfan II	0.013	0.00083	0.0026
cis-Chlordane	0.011	0.003	0.0094
Σ DDT	0.167	0.106	0.33
delta-BHC	0.031	0.00052	0.0016
Dieldrin	0.129	0.0036	0.011
Endosulfan sulfate	0.019	0.004	0.013
Endrin	0.036	0.03	0.09
Endrin aldehyde	0.02	0.0037	0.012

Table 4-23 Great Blue Heron and Mink Exposure Point Concentrations, Baseline Ecological Risk Assessment. Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	Sediment EPC[c] (mg/kg dry)	Forage Fish EPC[d] (mg/kg wet)	Forage Fish EPC[e] (mg/kg dry)
Endrin ketone	0.164	0.0028	0.0088
gamma-BHC (lindane)	0.047	0.0011	0.0034
Methoxychlor	0.094	0.011	0.034
trans-Chlordane	0.059	0.02	0.063
Dioxins/furans			
2,3,7,8-TCDD TEQ (ND=0.5DL)	4.30E-05	2.90E-06	9.06E-06

Key:
BERA = baseline ecological risk assessment
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EPC = Exposure Point Concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LPAH = low molecular weight PAH
mg/kg = milligrams per kilogram
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent concentration
TTC = trophic transfer coefficient
Shading = Not detected in forage fish. Listed value is one-half method detection limit.

Notes:
a. Analytes detected in sediment in recent OU2 site investigation with frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major sediment constitutes (aluminum) were excluded from evaluation as per USEPA guidance (USEPA 1989, 2003a).
c. Sediment EPCs from Table 4-4 (see also Appendix F).
d. Maximum of three composite forage-fish samples collected in May 2015.
e. Moisture content of 68% assumed to convert wet weight concentration to dry weight concentration.

Table 4-24 American Robin Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-soil (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Polychlorinated Biphenyls (PCBs)							
Sum of Aroclors (NDs = 0.5DL)	5.4E-02	5.1E-01	5.7E-01	0.012	0.12	47	4.7
Metals							
Antimony	2.6E-01	7.0E-02	3.3E-01	--	--	--	--
Arsenic	1.6E-01	1.6E-01	3.3E-01	2.24	3.55	0.15	0.09
Barium	3.8E+00	3.4E+00	7.2E+00	20.8	41.7	0.35	0.17
Beryllium	4.3E-03	1.9E-03	6.2E-03	--	--	--	--
Cadmium	6.6E-02	2.9E-01	3.5E-01	1.47	2.37	0.24	0.15
Chromium	5.0E-01	1.5E+00	2.0E+00	2.66	2.78	0.75	0.72
Cobalt	7.7E-02	9.2E-02	1.7E-01	7.61	7.8	0.02	0.02
Copper	1.2E+01	4.3E+00	1.6E+01	4.05	4.68	3.9	3.4
Lead	9.8E+00	3.5E+00	1.3E+01	1.63	1.94	8.2	6.9
Manganese	6.4E+00	3.4E+00	9.7E+00	179	348	0.05	0.03
Mercury	1.9E-02	4.6E-02	6.5E-02	0.45	0.9	0.14	0.07
Nickel	5.7E-01	5.9E+00	6.5E+00	6.71	11.5	1.0	0.56
Selenium	1.4E-02	1.1E-01	1.2E-01	0.291	0.368	0.42	0.33
Silver	3.8E-02	7.7E-01	8.1E-01	2.02	20.2	0.40	0.04
Thallium	2.2E-02	1.7E-01	1.9E-01	--	--	--	--
Vanadium	1.4E-01	6.0E-02	2.0E-01	0.344	0.413	0.59	0.49
Zinc	2.1E+01	1.4E+01	3.5E+01	66.1	66.5	0.53	0.53
Polycyclic Aromatic Hydrocarbons (PAHs)							
HPAH sum (NDs = 0.5 DL)	4.7E-01	3.6E-01	8.3E-01	2	20	0.42	0.04
LPAH sum (NDs = 0.5 DL)	2.4E-01	3.4E-01	5.8E-01	1653	--	0.0004	--
Semivolatile Organic Compounds (SVOCs)							
4-Nitroaniline	5.3E-04	5.2E-03	5.7E-03	--	--	--	--
Acetophenone	1.5E-04	1.5E-03	1.6E-03	--	--	--	--
Benzaldehyde	2.9E-04	2.9E-03	3.2E-03	--	--	--	--
Benzyl butyl phthalate	3.0E-01	3.0E+00	3.3E+00	--	--	--	--
Biphenyl (diphenyl)	3.3E-03	3.2E-02	3.5E-02	--	--	--	--
Bis(2-ethylhexyl)phthalate	8.6E-03	8.4E-02	9.3E-02	1.1	--	0.08	--
Carbazole	3.5E-03	3.4E-02	3.8E-02	1653	--	0.00002	--
Dibenzofuran	3.9E-03	3.8E-02	4.2E-02	1653	--	0.00003	--
Diethyl phthalate	1.9E-01	1.9E+00	2.1E+00	--	--	--	--
Di-n-butyl phthalate	2.7E-03	2.7E-02	3.0E-02	0.11	1.1	0.27	0.03
Di-n-octyl phthalate	2.9E-03	2.9E-02	3.1E-02	0.11	1.1	0.29	0.03
Phenol	2.8E-04	2.8E-03	3.1E-03	6	--	0.001	--
Pesticides							
Aldrin	1.0E-05	3.9E-04	4.0E-04	--	--	--	--
alpha-BHC	1.7E-05	4.6E-04	4.7E-04	0.56	2.25	0.0008	0.000
Endosulfan I	3.4E-05	1.3E-03	1.3E-03	10	--	0.0001	--
beta-BHC	5.3E-05	1.4E-03	1.5E-03	0.56	2.25	0.00	0.001
Endosulfan II	2.6E-05	9.7E-04	9.9E-04	10	--	0.0001	--
cis-Chlordane	1.5E-05	5.7E-04	5.8E-04	2.14	10.7	0.0003	0.0001
Σ DDT	1.5E-03	5.7E-02	5.9E-02	0.227	0.281	0.26	0.21
delta-BHC	1.1E-05	2.9E-04	3.0E-04	0.56	2.25	0.001	0.000
Dieldrin	1.4E-04	4.2E-03	4.4E-03	0.071	0.179	0.06	0.02
Endosulfan sulfate	1.7E-05	6.2E-04	6.3E-04	10	--	0.0001	--
Endrin	5.5E-05	7.7E-04	8.2E-04	0.01	0.1	0.08	0.01
Endrin aldehyde	3.7E-05	5.3E-04	5.6E-04	0.01	0.1	0.06	0.01
Endrin ketone	1.8E-05	2.5E-04	2.6E-04	0.01	0.1	0.03	0.00
gamma-BHC (lindane)	9.9E-06	2.7E-04	2.8E-04	2	20	0.000	0.0000
Methoxychlor	3.0E-04	1.1E-02	1.1E-02	--	--	--	--
trans-Chlordane	5.5E-05	2.1E-03	2.1E-03	2.14	10.7	0.001	0.000

Table 4-24 American Robin Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-soil (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Dioxins/Furans							
2,3,7,8-TCDD TEQ	8.8E-08	3.7E-06	3.8E-06	1.4E-05	1.4E-04	0.27	0.03

Key:
-- = not available
BERA = baseline ecological risk assessment
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EE-diet = estimated chemical exposure from diet
EE-soil = estimated chemical exposure from incidental soil ingestion
EE-total = total chemical exposure
EE-water = estimated chemical exposure from surface water consumption
EPC = exposure point concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
LPAH = low molecular weight PAH
mg/kg = milligrams per kilogram
mg/kg/day = milligrams per kilogram per day
NDs = non detects
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent concentration
Grey shading = HQ > or = 1

Notes:
a. Analytes detected in surface soil in recent OU2 site investigation with frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major soil constitutes (aluminum) were excluded from evaluation as per USEPA guidance (USEPA 1989, 2003a).

Table 4-25 Short-Tailed Shrew Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-soil (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Polychlorinated Biphenyls (PCBs)							
Sum of Aroclors (NDs = 0.5DL)	4.1E-02	1.3E+00	1.3E+00	0.068	0.68	20	2.0
Metals							
Antimony	2.0E-01	1.8E-01	3.7E-01	0.059	0.59	6.3	0.63
Arsenic	1.2E-01	4.1E-01	5.4E-01	1.04	1.66	0.51	0.32
Barium	2.9E+00	8.7E+00	1.2E+01	51.8	121	0.22	0.10
Beryllium	3.2E-03	4.9E-03	8.1E-03	0.532	--	0.02	--
Cadmium	4.9E-02	7.3E-01	7.8E-01	0.77	1	1.0	0.78
Chromium	3.7E-01	3.8E+00	4.2E+00	9.24	--	0.5	--
Cobalt	5.8E-02	2.3E-01	2.9E-01	7.33	10.9	0.04	0.03
Copper	8.8E+00	1.1E+01	2.0E+01	5.6	6.79	3.5	2.9
Lead	7.4E+00	9.0E+00	1.6E+01	4.7	5	3.5	3.3
Manganese	4.8E+00	8.6E+00	1.3E+01	51.5	65	0.26	0.21
Mercury	1.5E-02	1.2E-01	1.3E-01	1	NA	0.13	--
Nickel	4.3E-01	1.5E+01	1.5E+01	1.7	2.71	9.1	5.7
Selenium	1.0E-02	2.8E-01	2.9E-01	0.143	0.145	2.0	2.0
Silver	2.9E-02	2.0E+00	2.0E+00	6.02	60.2	0.3	0.03
Thallium	1.7E-02	4.2E-01	4.4E-01	0.0074	0.074	60	6.0
Vanadium	1.1E-01	1.5E-01	2.6E-01	4.16	5.11	0.06	0.05
Zinc	1.6E+01	3.6E+01	5.2E+01	75.4	75.9	0.68	0.68
Polycyclic Aromatic Hydrocarbons (PAHs)							
HPAH sum (NDs = 0.5 DL)	3.6E-01	9.1E-01	1.3E+00	0.615	3.07	2.1	0.41
LPAH sum (NDs = 0.5 DL)	1.8E-01	8.6E-01	1.0E+00	65.6	110	0.02	0.01
Semivolatile Organic Compounds (SVOCs)							
4-Nitroaniline	4.0E-04	1.3E-02	1.4E-02	--	--	--	--
Acetophenone	1.1E-04	3.8E-03	3.9E-03	--	--	--	--
Benzaldehyde	2.2E-04	7.3E-03	7.5E-03	--	--	--	--
Benzyl butyl phthalate	2.3E-01	7.5E+00	7.7E+00	--	--	--	--
Biphenyl (diphenyl)	2.4E-03	8.2E-02	8.4E-02	--	--	--	--
Bis(2-ethylhexyl)phthalate	6.4E-03	2.1E-01	2.2E-01	18.3	183	0.01	0.001
Carbazole	2.6E-03	8.8E-02	9.0E-02	65.6	110	0.001	0.001
Dibenzofuran	2.9E-03	9.8E-02	1.0E-01	65.6	110	0.002	0.001
Diethyl phthalate	1.4E-01	4.8E+00	5.0E+00	4583	--	0.001	--
Di-n-butyl phthalate	2.1E-03	6.8E-02	7.0E-02	550	1833	0.0001	0.00004
Di-n-octyl phthalate	2.2E-03	7.3E-02	7.5E-02	55	550	0.001	0.0001
Phenol	2.1E-04	7.1E-03	7.3E-03	523	--	0.00001	--
Pesticides							
Aldrin	7.8E-06	9.8E-04	9.9E-04	0.2	1	0.00	0.00
alpha-BHC	1.3E-05	1.2E-03	1.2E-03	0.014	0.14	0.08	0.01
Endosulfan I	2.6E-05	3.3E-03	3.3E-03	0.15	--	0.02	--
beta-BHC	4.0E-05	3.7E-03	3.7E-03	0.014	0.14	0.26	0.03
Endosulfan II	1.9E-05	2.5E-03	2.5E-03	0.15	--	0.02	--
cis-Chlordane	1.1E-05	1.4E-03	1.5E-03	4.6	9.2	0.000	0.000
Σ DDT	1.2E-03	1.5E-01	1.5E-01	0.147	0.247	1.0	0.60
delta-BHC	8.0E-06	7.3E-04	7.4E-04	0.014	0.14	0.1	0.01
Dieldrin	1.1E-04	1.1E-02	1.1E-02	0.015	0.03	0.72	0.36
Endosulfan sulfate	1.2E-05	1.6E-03	1.6E-03	0.15	--	0.01	--
Endrin	4.1E-05	2.0E-03	2.0E-03	0.092	0.92	0.02	0.00
Endrin aldehyde	2.8E-05	1.3E-03	1.4E-03	0.092	0.92	0.01	0.00
Endrin ketone	1.3E-05	6.3E-04	6.4E-04	0.092	0.92	0.01	0.00
gamma-BHC (lindane)	7.5E-06	6.8E-04	6.9E-04	8	--	0.0001	--
Methoxychlor	2.2E-04	2.8E-02	2.9E-02	4	8	0.01	0.00

Table 4-25 Short-Tailed Shrew Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-soil (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
trans-Chlordane	4.1E-05	5.2E-03	5.3E-03	4.6	9.2	0.001	0.001
Dioxins/Furans							
2,3,7,8-TCDD TEQ	6.6E-08	9.4E-06	9.5E-06	1.0E-06	1.0E-05	9.5	0.9

Key:
-- = not available
BERA = baseline ecological risk assessment
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EE-diet = estimated chemical exposure from diet
EE-soil = estimated chemical exposure from incidental soil ingestion
EE-total = total chemical exposure
EPC = exposure point concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
LPAH = low molecular weight PAH
mg/kg = milligrams per kilogram
mg/kg/day = milligrams per kilogram per day
NDs = non detects
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent concentration
Grey shading = HQ > or = 1

Notes:
a. Analytes detected in surface soil in recent OU2 site investigation with frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major soil constitutes (aluminum) were excluded from evaluation as per USEPA guidance (USEPA 1989, 2003a).

Table 4-26 Mourning Dove Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-soil (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Polychlorinated Biphenyls (PCBs)							
Sum of Aroclors (NDs = 0.5DL)	5.3E-04	6.5E-05	5.9E-04	0.012	0.12	0.05	0.005
Metals							
Antimony	2.6E-03	5.9E-04	3.1E-03	--	--	--	--
Arsenic	1.6E-03	4.3E-04	2.0E-03	2.24	3.55	0.0009	0.0006
Barium	3.7E-02	4.2E-02	7.9E-02	20.8	41.7	0.004	0.002
Beryllium	4.2E-05	2.1E-04	2.5E-04	--	--	--	--
Cadmium	6.4E-04	1.1E-03	1.8E-03	1.47	2.37	0.0012	0.0007
Chromium	4.9E-03	1.4E-03	6.3E-03	2.66	2.78	0.002	--
Cobalt	7.5E-04	4.0E-05	7.9E-04	7.61	7.8	0.0001	0.000
Copper	1.1E-01	2.0E-02	1.3E-01	4.05	4.68	0.03	0.03
Lead	9.6E-02	8.2E-03	1.0E-01	1.63	1.94	0.06	0.05
Manganese	6.2E-02	3.5E-02	9.7E-02	179	348	0.0005	0.0003
Mercury	1.9E-04	3.4E-04	5.3E-04	0.45	0.9	0.0012	--
Nickel	5.6E-03	1.5E-03	7.0E-03	6.71	11.5	0.0010	0.00
Selenium	1.3E-04	5.1E-04	6.4E-04	0.291	0.368	0.002	0.00
Silver	3.8E-04	3.8E-05	4.1E-04	2.02	20.2	0.0002	0.000
Thallium	2.2E-04	6.2E-06	2.2E-04	--	--	--	--
Vanadium	1.4E-03	4.9E-05	1.5E-03	0.344	0.413	0.004	0.004
Zinc	2.0E-01	2.2E-01	4.2E-01	66.1	66.5	0.006	0.006
Polycyclic Aromatic Hydrocarbons (PAHs)							
HPAH sum (NDs = 0.5 DL)	4.6E-03	4.9E-03	9.5E-03	2	20	0.005	0.0005
LPAH sum (NDs = 0.5 DL)	2.4E-03	7.3E-04	3.1E-03	1653	--	0.000	--
Semivolatile Organic Compounds (SVOCs)							
4-Nitroaniline	5.1E-06	3.7E-05	4.2E-05	--	--	--	--
Acetophenone	1.5E-06	1.1E-05	1.2E-05	--	--	--	--
Benzaldehyde	2.9E-06	2.1E-05	2.3E-05	--	--	--	--
Benzyl butyl phthalate	2.9E-03	2.1E-02	2.4E-02	--	--	--	--
Biphenyl (diphenyl)	3.2E-05	2.3E-04	2.6E-04	--	--	--	--
Bis(2-ethylhexyl)phthalate	8.4E-05	6.0E-04	6.8E-04	1.1	--	0.0006	--
Carbazole	3.4E-05	2.5E-04	2.8E-04	1653	--	2.E-07	--
Dibenzofuran	3.8E-05	2.7E-04	3.1E-04	1653	--	2.E-07	--
Diethyl phthalate	1.9E-03	1.3E-02	1.5E-02	--	--	--	--
Di-n-butyl phthalate	2.7E-05	1.9E-04	2.2E-04	0.11	1.1	0.002	0.0002
Di-n-octylphthalate	2.8E-05	2.0E-04	2.3E-04	0.11	1.1	0.002	0.0002
Phenol	2.8E-06	2.0E-05	2.3E-05	6	--	0.000	--
Pesticides							
Aldrin	1.0E-07	1.6E-08	1.2E-07	--	--	--	--
alpha-BHC	1.6E-07	4.6E-07	6.3E-07	0.56	2.25	1.E-06	3.E-07
Endosulfan I	3.3E-07	5.7E-07	9.0E-07	10	--	9.E-08	--
beta-BHC	5.2E-07	1.5E-06	2.0E-06	0.56	2.25	4.E-06	9.E-07
Endosulfan II	2.5E-07	5.7E-07	8.2E-07	10	--	8.E-08	--
cis-Chlordane	1.5E-07	1.7E-08	1.6E-07	2.14	10.7	8.E-08	2.E-08
Σ DDT	1.5E-05	1.3E-05	2.8E-05	0.227	0.281	1.E-04	1.E-04
delta-BHC	1.0E-07	2.9E-07	4.0E-07	0.56	2.25	7.E-07	2.E-07
Dieldrin	1.4E-06	4.1E-06	5.5E-06	0.071	0.179	8.E-05	3.E-05
Endosulfan sulfate	1.6E-07	3.5E-07	5.1E-07	10	--	5.E-08	--
Endrin	5.3E-07	5.8E-08	5.9E-07	0.01	0.1	6.E-05	6.E-06
Endrin aldehyde	3.7E-07	4.0E-08	4.1E-07	0.01	0.1	4.E-05	4.E-06
Endrin ketone	1.7E-07	1.9E-08	1.9E-07	0.01	0.1	2.E-05	2.E-06
gamma-BHC (lindane)	9.7E-08	2.7E-07	3.7E-07	2	20	2.E-07	2.E-08
Methoxychlor	2.9E-06	9.4E-07	3.9E-06	--	--	--	--
trans-Chlordane	5.4E-07	6.0E-08	6.0E-07	2.14	10.7	3.E-07	6.E-08

Table 4-26 Mourning Dove Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-soil (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Dioxins/furans							
2,3,7,8-TCDD TEQ	8.6E-10	8.4E-11	9.5E-10	1.4E-05	1.4E-04	7.E-05	7.E-06

Key:
-- = not available
BERA = baseline ecological risk assessment
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EE-diet = estimated chemical exposure from diet
EE-soil = estimated chemical exposure from incidental soil ingestion
EE-total = total chemical exposure
EPC = exposure point concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
LPAH = low molecular weight PAH
mg/kg/day = milligrams per kilogram per day
NDs = non detects
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
Grey shading = HQ > or = 1

Notes:
a. Analytes detected in surface soil in recent OU2 site investigation with frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major soil constitutes (aluminum) were excluded from evaluation as per USEPA guidance (USEPA 1989, 2003a).

Table 4-27 Meadow Vole Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-soil (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Polychlorinated Biphenyls (PCBs)							
Sum of Aroclors (NDs = 0.5DL)	1.8E-02	9.7E-03	2.8E-02	0.068	0.68	0.41	0.04
Metals							
Antimony	8.8E-02	8.8E-02	1.8E-01	0.059	0.59	3.0	0.3
Arsenic	5.5E-02	6.4E-02	1.2E-01	1.04	1.66	0.11	0.07
Barium	1.3E+00	6.2E+00	7.5E+00	51.8	121	0.15	0.06
Beryllium	1.4E-03	3.1E-02	3.3E-02	0.532	--	0.06	--
Cadmium	2.2E-02	1.7E-01	1.9E-01	0.77	1	0.25	0.19
Chromium	1.7E-01	2.1E-01	3.8E-01	9.24	--	0.04	--
Cobalt	2.6E-02	6.0E-03	3.2E-02	7.33	10.9	0.004	0.003
Copper	3.9E+00	3.0E+00	6.9E+00	5.6	6.79	1.2	1.0
Lead	3.3E+00	1.2E+00	4.5E+00	4.7	5	1.0	0.9
Manganese	2.1E+00	5.3E+00	7.4E+00	51.5	65	0.14	0.1
Mercury	6.5E-03	5.1E-02	5.8E-02	1	--	0.06	--
Nickel	1.9E-01	2.2E-01	4.1E-01	1.7	2.71	0.2	0.2
Selenium	4.5E-03	7.6E-02	8.0E-02	0.143	0.145	0.6	0.6
Silver	1.3E-02	5.7E-03	1.9E-02	6.02	60.2	0.003	0.0003
Thallium	7.4E-03	9.3E-04	8.4E-03	0.0074	0.074	1.1	0.11
Vanadium	4.8E-02	7.3E-03	5.6E-02	4.16	5.11	0.01	0.01
Zinc	7.0E+00	3.2E+01	3.9E+01	75.4	75.9	0.52	0.52
Polycyclic Aromatic Hydrocarbons (PAHs)							
HPAH sum (NDs = 0.5 DL)	1.6E-01	7.3E-01	8.9E-01	0.615	3.07	1.4	0.3
LPAH sum (NDs = 0.5 DL)	8.2E-02	1.1E-01	1.9E-01	65.6	110	0.003	0.002
Other Semivolatile Organic Compounds (SVOCs)							
4-Nitroaniline	1.8E-04	5.5E-03	5.7E-03	--	--	--	--
Acetophenone	5.0E-05	1.6E-03	1.6E-03	--	--	--	--
Benzaldehyde	9.8E-05	3.1E-03	3.2E-03	--	--	--	--
Benzyl butyl phthalate	1.0E-01	3.2E+00	3.3E+00	--	--	--	--
Biphenyl (diphenyl)	1.1E-03	3.4E-02	3.5E-02	--	--	--	--
Bis(2-ethylhexyl)phthalate	2.9E-03	9.0E-02	9.3E-02	18.3	183	0.01	0.001
Carbazole	1.2E-03	3.7E-02	3.8E-02	65.6	110	0.001	0.0003
Dibenzofuran	1.3E-03	4.1E-02	4.2E-02	65.6	110	0.001	0.0004
Diethyl phthalate	6.4E-02	2.0E+00	2.1E+00	4583	--	0.0005	--
Di-n-butyl phthalate	9.2E-04	2.9E-02	3.0E-02	550	1833	0.0001	0.00002
Di-n-octylphthalate	9.7E-04	3.0E-02	3.1E-02	55	550	0.001	0.0001
Phenol	9.5E-05	3.0E-03	3.1E-03	523	--	0.00001	--
Pesticides							
Aldrin	3.5E-06	2.3E-06	5.8E-06	0.2	1	0.00003	0.00001
alpha-BHC	5.7E-06	6.9E-05	7.4E-05	0.014	0.14	0.01	0.0005
Endosulfan I	1.1E-05	8.5E-05	9.7E-05	0.15	--	0.001	--
beta-BHC	1.8E-05	2.2E-04	2.3E-04	0.014	0.14	0.0	0.00
Endosulfan II	8.7E-06	8.5E-05	9.4E-05	0.15	--	0.00	--
cis-Chlordane	5.1E-06	2.5E-06	7.6E-06	4.6	9.2	0.00000	0.00000
Σ DDT	5.2E-04	2.0E-03	2.5E-03	0.147	0.247	0.017	0.010
delta-BHC	3.6E-06	4.4E-05	4.7E-05	0.014	0.14	0.003	0.0003
Dieldrin	4.8E-05	6.1E-04	6.6E-04	0.015	0.03	0.044	0.022
Endosulfan sulfate	5.5E-06	5.1E-05	5.7E-05	0.15	--	0.000	--
Endrin	1.8E-05	8.6E-06	2.7E-05	0.092	0.92	0.0003	0.00003
Endrin aldehyde	1.3E-05	5.9E-06	1.9E-05	0.092	0.92	0.0002	0.00002
Endrin ketone	5.9E-06	2.8E-06	8.7E-06	0.092	0.92	0.0001	0.00001
gamma-BHC (lindane)	3.3E-06	4.1E-05	4.4E-05	8	--	0.000005	--
Methoxychlor	1.0E-04	1.4E-04	2.4E-04	4	8	0.0001	0.00003
trans-Chlordane	1.8E-05	8.9E-06	2.7E-05	4.6	9.2	0.0000	0.00000

Table 4-27 Meadow Vole Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-soil (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Dioxins/furans							
2,3,7,8-TCDD TEQ	3.0E-08	1.3E-08	4.2E-08	1.0E-06	1.0E-05	0.04	0.004

Key:
-- = not available
BERA = baseline ecological risk assessment
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EE-diet = estimated chemical exposure from diet
EE-soil = estimated chemical exposure from incidental soil ingestion
EE-total = total chemical exposure
EPC = exposure point concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
LPAH = low molecular weight PAH
mg/kg/day = milligrams per kilogram per day
NDs = non detects
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
Grey shading = HQ > or = 1

Notes:
a. Analytes detected in surface soil in recent OU2 site investigation with frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major soil constitutes (aluminum) were excluded from evaluation as per USEPA guidance (USEPA 1989, 2003a).

Table 4-28 Red Shouldered Hawk Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a]	EE-soil (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Polychlorinated Biphenyls (PCBs)							
Sum of Aroclors (NDs = 0.5DL)	1.7E-03	2.4E-03	4.1E-03	0.012	0.12	0.34	0.03
Metals							
Antimony	8.1E-03	2.3E-04	8.4E-03	--	--	--	--
Arsenic	5.1E-03	4.1E-04	5.5E-03	2.24	3.55	0.002	0.002
Barium	1.2E-01	2.4E-03	1.2E-01	20.8	41.7	0.006	0.003
Beryllium	1.3E-04	8.2E-05	2.2E-04	--	--	--	--
Cadmium	2.0E-03	3.4E-03	5.5E-03	1.47	2.37	0.004	0.002
Chromium	1.5E-02	2.1E-02	3.7E-02	2.66	2.78	0.014	0.013
Cobalt	2.4E-03	9.5E-04	3.3E-03	7.61	7.8	0.0004	0.0004
Copper	3.6E-01	1.0E-01	4.6E-01	4.05	4.68	0.11	0.10
Lead	3.0E-01	1.1E-01	4.2E-01	1.63	1.94	0.26	0.21
Manganese	2.0E-01	7.1E-02	2.7E-01	179	348	0.00	0.00
Mercury	6.0E-04	3.3E-02	3.4E-02	0.45	0.9	0.08	0.04
Nickel	1.8E-02	2.5E-02	4.3E-02	6.71	11.5	0.006	0.004
Selenium	4.2E-04	3.6E-03	4.0E-03	0.291	0.368	0.014	0.011
Silver	1.2E-03	8.4E-05	1.3E-03	2.02	20.2	0.0006	0.00006
Thallium	6.9E-04	1.4E-03	2.0E-03	--	--	--	--
Vanadium	4.5E-03	9.6E-04	5.4E-03	0.344	0.413	0.02	0.01
Zinc	6.5E-01	6.2E-01	1.3E+00	66.1	66.5	0.02	0.02
Polycyclic Aromatic Hydrocarbons (PAHs)							
HPAH sum (NDs = 0.5 DL)	1.5E-02	0.0E+00	1.5E-02	2	20	0.01	0.00
LPAH sum (NDs = 0.5 DL)	7.6E-03	0.0E+00	7.6E-03	1653	--	0.0000	--
Other Semivolatile Organic Compounds (SVOCs)							
4-Nitroaniline	1.6E-05	0.0E+00	1.6E-05	--	--	--	--
Acetophenone	4.7E-06	0.0E+00	4.7E-06	--	--	--	--
Benzaldehyde	9.1E-06	0.0E+00	9.1E-06	--	--	--	--
Benzyl butyl phthalate	9.3E-03	0.0E+00	9.3E-03	--	--	--	--
Biphenyl (diphenyl)	1.0E-04	0.0E+00	1.0E-04	--	--	--	--
Bis(2-ethylhexyl)phthalate	2.7E-04	0.0E+00	2.7E-04	1.1	--	2.E-04	--
Carbazole	1.1E-04	0.0E+00	1.1E-04	1653	--	7.E-08	--
Dibenzofuran	1.2E-04	0.0E+00	1.2E-04	1653	--	7.E-08	--
Diethyl phthalate	6.0E-03	0.0E+00	6.0E-03	--	--	--	--
Di-n-butyl phthalate	8.5E-05	0.0E+00	8.5E-05	0.11	1.1	8.E-04	8.E-05
Di-n-octylphthalate	9.0E-05	0.0E+00	9.0E-05	0.11	1.1	8.E-04	8.E-05
Phenol	8.8E-06	0.0E+00	8.8E-06	6	--	1.E-06	--
Pesticides							
Aldrin	3.2E-07	5.8E-07	9.0E-07	--	--	--	--
alpha-BHC	5.2E-07	1.7E-05	1.8E-05	0.56	2.25	3.E-05	8.E-06
Endosulfan I	1.1E-06	2.1E-05	2.2E-05	10	--	2.E-06	--
beta-BHC	1.6E-06	5.4E-05	5.6E-05	0.56	2.25	1.E-04	2.E-05
Endosulfan II	8.0E-07	2.1E-05	2.2E-05	10	--	2.E-06	--
cis-Chlordane	4.7E-07	6.2E-07	1.1E-06	2.14	10.7	5.E-07	1.E-07
Σ DDT	4.8E-05	5.0E-04	5.5E-04	0.227	0.281	2.E-03	2.E-03
delta-BHC	3.3E-07	1.1E-05	1.1E-05	0.56	2.25	2.E-05	5.E-06
Dieldrin	4.4E-06	3.8E-05	4.3E-05	0.071	0.179	6.E-04	2.E-04
Endosulfan sulfate	5.1E-07	1.3E-05	1.3E-05	10	--	1.E-06	--
Endrin	1.7E-06	2.2E-06	3.9E-06	0.01	0.1	4.E-04	4.E-05
Endrin aldehyde	1.2E-06	1.5E-06	2.7E-06	0.01	0.1	3.E-04	3.E-05
Endrin ketone	5.5E-07	7.0E-07	1.2E-06	0.01	0.1	1.E-04	1.E-05
gamma-BHC (lindane)	3.1E-07	1.0E-05	1.0E-05	2	20	5.E-06	5.E-07
Methoxychlor	9.3E-06	3.5E-05	4.4E-05	--	--	--	--
trans-Chlordane	1.7E-06	2.2E-06	3.9E-06	2.14	10.7	2.E-06	4.E-07

Table 4-28 Red Shouldered Hawk Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a]	EE-soil (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Dioxins/Furans							
2,3,7,8-TCDD TEQ	2.7E-09	3.5E-08	3.7E-08	1.4E-05	1.4E-04	0.003	0.0003

Key:
-- = not available.
BERA = baseline ecological risk assessment
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EE-diet = estimated chemical exposure from diet
EE-soil = estimated chemical exposure from incidental soil ingestion
EE-total = total chemical exposure
EPC = exposure point concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
LPAH = low molecular weight PAH
mg/kg/day = milligrams per kilogram per day
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
Grey shading = HQ > or = 1

Notes:
a. Analytes detected in surface soil in recent OU2 site investigation with frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major soil constitutes (aluminum) were excluded from evaluation as per USEPA guidance (USEPA 1989, 2003a).

Table 4-29 Long-Tailed Weasel Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a]	EE-soil (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Polychlorinated Biphenyls (PCBs)							
Sum of Aroclors (NDs = 0.5DL)	2.3E-02	4.5E-02	6.8E-02	0.0034	0.034	20	2.0
Metals							
Antimony	1.1E-01	4.2E-03	1.2E-01	0.059	0.59	2.0	0.2
Arsenic	7.0E-02	7.5E-03	7.8E-02	1.04	1.66	0.07	0.05
Barium	1.6E+00	4.5E-02	1.7E+00	51.8	121	0.03	0.01
Beryllium	1.9E-03	1.5E-03	3.4E-03	0.532	--	0.01	--
Cadmium	2.8E-02	6.3E-02	9.2E-02	0.77	1	0.12	0.09
Chromium	2.1E-01	3.9E-01	6.0E-01	9.24	--	0.07	--
Cobalt	3.3E-02	1.7E-02	5.0E-02	7.33	10.9	0.01	0.005
Copper	5.0E+00	1.8E+00	6.9E+00	5.6	6.79	1.2	1.0
Lead	4.2E+00	2.1E+00	6.3E+00	4.7	5	1.3	1.3
Manganese	2.7E+00	1.3E+00	4.0E+00	51.5	65	0.08	0.06
Mercury	8.4E-03	6.1E-01	6.2E-01	1	--	0.6	--
Nickel	2.4E-01	4.7E-01	7.1E-01	1.7	2.71	0.4	0.3
Selenium	5.8E-03	6.6E-02	7.2E-02	0.143	0.145	0.5	0.5
Silver	1.7E-02	1.5E-03	1.8E-02	6.02	60.2	0.003	0.0003
Thallium	9.6E-03	2.5E-02	3.5E-02	0.0074	0.074	4.7	0.47
Vanadium	6.2E-02	1.8E-02	8.0E-02	4.16	5.11	0.02	0.02
Zinc	9.0E+00	1.1E+01	2.0E+01	75.4	75.9	0.3	0.3
Polycyclic Aromatic Hydrocarbons (PAHs)							
HPAH sum (NDs = 0.5 DL)	2.0E-01	0.0E+00	2.0E-01	0.615	3.07	0.3	0.07
LPAH sum (NDs = 0.5 DL)	1.1E-01	0.0E+00	1.1E-01	65.6	110	0.002	0.0010
Other Semivolatile Organic Compounds (SVOCs)							
4-Nitroaniline	2.3E-04	0.0E+00	2.3E-04	--	--	--	--
Acetophenone	6.5E-05	0.0E+00	6.5E-05	--	--	--	--
Benzaldehyde	1.3E-04	0.0E+00	1.3E-04	--	--	--	--
Benzyl butyl phthalate	1.3E-01	0.0E+00	1.3E-01	--	--	--	--
Biphenyl (diphenyl)	1.4E-03	0.0E+00	1.4E-03	--	--	--	--
Bis(2-ethylhexyl)phthalate	3.7E-03	0.0E+00	3.7E-03	18.3	183	2.E-04	2.E-05
Carbazole	1.5E-03	0.0E+00	1.5E-03	65.6	110	2.E-05	1.E-05
Dibenzofuran	1.7E-03	0.0E+00	1.7E-03	65.6	110	3.E-05	2.E-05
Diethyl phthalate	8.3E-02	0.0E+00	8.3E-02	4583	--	2.E-05	--
Di-n-butyl phthalate	1.2E-03	0.0E+00	1.2E-03	550	1833	2.E-06	6.E-07
Di-n-octylphthalate	1.2E-03	0.0E+00	1.2E-03	55	550	2.E-05	2.E-06
Phenol	1.2E-04	0.0E+00	1.2E-04	523	--	2.E-07	--
Pesticides							
Aldrin	4.5E-06	1.1E-05	1.5E-05	0.2	1	0.0001	0.00002
alpha-BHC	7.3E-06	3.2E-04	3.2E-04	0.014	0.14	0.02	0.002
Endosulfan I	1.5E-05	3.9E-04	4.1E-04	0.15	--	0.00	--
beta-BHC	2.3E-05	1.0E-03	1.0E-03	0.014	0.14	0.1	0.01
Endosulfan II	1.1E-05	3.9E-04	4.0E-04	0.15	--	0.00	--
cis-Chlordane	6.5E-06	1.1E-05	1.8E-05	4.6	9.2	0.00000	0.00000
Σ DDT	6.6E-04	9.2E-03	9.8E-03	0.147	0.247	0.07	0.04
delta-BHC	4.6E-06	2.0E-04	2.1E-04	0.014	0.14	0.015	0.001
Dieldrin	6.1E-05	7.0E-04	7.6E-04	0.015	0.03	0.05	0.025
Endosulfan sulfate	7.1E-06	2.4E-04	2.4E-04	0.15	--	0.00	--
Endrin	2.4E-05	4.0E-05	6.3E-05	0.092	0.92	0.0007	0.00007
Endrin aldehyde	1.6E-05	2.7E-05	4.4E-05	0.092	0.92	0.000	0.0000
Endrin ketone	7.6E-06	1.3E-05	2.0E-05	0.092	0.92	0.0002	0.00002
gamma-BHC (lindane)	4.3E-06	1.9E-04	1.9E-04	8	--	0.00002	--
Methoxychlor	1.3E-04	6.5E-04	7.8E-04	4	8	0.0002	0.0001
trans-Chlordane	2.4E-05	4.1E-05	6.5E-05	4.6	9.2	0.00001	0.00001

Table 4-29 Long-Tailed Weasel Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a]	EE-soil (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Dioxins/Furans							
2,3,7,8-TCDD TEQ	3.8E-08	6.4E-07	6.8E-07	1.0E-06	1.0E-05	0.7	0.07

Key:
-- = not available
BERA = baseline ecological risk assessment
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EE-diet = estimated chemical exposure from diet
EE-soil = estimated chemical exposure from incidental soil ingestion
EE-total = total chemical exposure
EPC = exposure point concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
LPAH = low molecular weight PAH
mg/kg/day = milligrams per kilogram per day
NDs = not detects
NOAEL = no observed adverse effect level
OU2 = Operable Unit
Grey shading = HQ > or = 1

Notes:
a. Analytes detected in surface soil in recent OU2 site investigation with frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major soil constitutes (aluminum) were excluded from evaluation as per USEPA guidance (USEPA 1989, 2003a).

Table 4-30 Tree Swallow Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-sediment (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Polychlorinated Biphenyls (PCBs)							
Sum of Aroclors (NDs = 0.5DL)	0.0E+00	7.9E+01	7.9E+01	0.012	0.12	6619	662
Metals							
Antimony	0.0E+00	4.3E-02	4.3E-02	--	--	--	--
Arsenic	0.0E+00	2.3E-01	2.3E-01	2.24	3.55	0.10	0.06
Barium	0.0E+00	4.6E+01	4.6E+01	20.8	41.7	2.2	1.1
Beryllium	0.0E+00	2.2E-02	2.2E-02	--	--	--	--
Cadmium	0.0E+00	1.5E-01	1.5E-01	1.47	2.37	0.10	0.06
Chromium	0.0E+00	5.8E-01	5.8E-01	2.66	2.78	0.22	0.21
Cobalt	0.0E+00	4.6E-01	4.6E-01	7.61	7.8	0.06	0.06
Copper	0.0E+00	2.5E+01	2.5E+01	4.05	4.68	6.1	5.3
Lead	0.0E+00	5.4E+00	5.4E+00	1.63	1.94	3.3	2.8
Manganese	0.0E+00	3.2E+01	3.2E+01	179	348	0.18	0.09
Mercury	0.0E+00	1.2E-02	1.2E-02	0.45	0.9	0.03	0.01
Methylmercury[c]			1.2E-02	0.068	0.37	0.18	0.03
Nickel	0.0E+00	7.0E-01	7.0E-01	6.71	11.5	0.10	0.06
Selenium	0.0E+00	2.6E-01	2.6E-01	0.291	0.368	0.9	0.7
Silver	0.0E+00	1.2E-01	1.2E-01	2.02	20.2	0.06	0.006
Thallium	0.0E+00	2.7E-02	2.7E-02	--	--	--	--
Vanadium	0.0E+00	8.2E-01	8.2E-01	0.344	0.413	2.4	2.0
Zinc	0.0E+00	2.6E+01	2.6E+01	66.1	66.5	0.40	0.40
Polycyclic Aromatic Hydrocarbons (PAHs)							
HPAH sum (NDs = 0.5 DL)	0.0E+00	1.8E+02	1.8E+02	2	20	89	8.9
LPAH sum (NDs = 0.5 DL)	0.0E+00	1.2E+01	1.2E+01	1653	--	0.007	--
Semivolatile Organic Compounds (SVOCs)							
2-Methylphenol	0.0E+00	2.2E-02	2.2E-02	--	--	--	--
4-Methylphenol	0.0E+00	6.3E-02	6.3E-02	--	--	--	--
Benzaldehyde	0.0E+00	4.3E-03	4.3E-03	--	--	--	--
Benzyl butyl phthalate	0.0E+00	4.0E-02	4.0E-02	--	--	--	--
Biphenyl (diphenyl)	0.0E+00	1.4E-01	1.4E-01	--	--	--	--
Bis(2-ethylhexyl)phthalate	0.0E+00	4.5E-01	4.5E-01	1.1	--	0.41	--
Carbazole	0.0E+00	1.0E+00	1.0E+00	1653	--	0.00062	--
Dibenzofuran	0.0E+00	1.2E+00	1.2E+00	1653	--	0.00073	--
Di-n-octylphthalate	0.0E+00	3.9E-04	3.9E-04	0.11	1.1	0.004	0.0004
Phenol	0.0E+00	5.5E-02	5.5E-02	6	--	0.01	--
Pesticides							
Aldrin	0.0E+00	4.4E-02	4.4E-02	--	--	--	--
alpha-BHC	0.0E+00	3.0E-03	3.0E-03	0.56	2.25	0.005	0.001
Endosulfan I	0.0E+00	1.4E-02	1.4E-02	10	--	0.001	--
beta-BHC	0.0E+00	5.7E-02	5.7E-02	0.56	2.25	0.10	0.03
Endosulfan II	0.0E+00	7.7E-03	7.7E-03	10	--	0.0008	--
cis-Chlordane	0.0E+00	6.5E-03	6.5E-03	2.14	10.7	0.003	0.0006
Σ DDT	0.0E+00	5.0E-02	5.0E-02	0.227	0.281	0.22	0.18
delta-BHC	0.0E+00	9.3E-03	9.3E-03	0.56	2.25	0.017	0.004
Dieldrin	0.0E+00	7.6E-02	7.6E-02	0.071	0.179	1.1	0.43
Endosulfan sulfate	0.0E+00	1.1E-02	1.1E-02	10	--	0.0011	--
Endrin	0.0E+00	1.2E-02	1.2E-02	0.01	0.1	1.2	0.12
Endrin aldehyde	0.0E+00	3.1E-03	3.1E-03	0.01	0.1	0.31	0.031
Endrin ketone	0.0E+00	5.7E-02	5.7E-02	0.01	0.1	5.7	0.57
gamma-BHC (lindane)	0.0E+00	1.4E-02	1.4E-02	2	20	0.007	0.0007
Heptachlor	0.0E+00	3.1E-02	3.1E-02	--	--	--	--
Heptachlor epoxide	0.0E+00	1.1E-02	1.1E-02	--	--	--	--

Table 4-30 Tree Swallow Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-sediment (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Methoxychlor	0.0E+00	5.6E-02	5.6E-02	--	--	--	--
trans-Chlordane	0.0E+00	3.5E-02	3.5E-02	2.14	10.7	0.016	0.003
Dioxins/Furans							
2,3,7,8-TCDD TEQ (ND=0.5DL)	0.0E+00	5.5E-06	5.5E-06	0.000014	0.00014	0.40	0.0396

Key:
-- = not available
BERA = baseline ecological risk assessment
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EE-diet = estimated chemical exposure from diet
EE-sediment = estimated chemical exposure from incidental sediment ingestion
EE-total = total estimated exposure
EPC = exposure point concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
LPAH = low molecular weight PAH
mg/kg/day = milligrams per kilogram per day
ND = non detect
OU2 = Operable Unit 2
NOAEL = no observed adverse effect level
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent
Grey shading = HQ > or = 1.0

Notes:
a. Contaminants detected in sediment are listed if frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major sediment constitutes (aluminum) were excluded from the evaluation as per USEPA guidance (USEPA 1989, 2003a).
c. Inorganic mercury dose (EE-total) to receptor also evaluated as though it were 100% methylmercury.

Table 4-31 Little Brown Bat Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-sediment (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Polychlorinated Biphenyls (PCBs)							
Sum of Aroclors (NDs = 0.5DL)	0.0E+00	6.4E+01	6.4E+01	0.0034	0.034	18,880	1,888
Metals							
Antimony	0.0E+00	3.4E-02	3.4E-02	0.059	0.59	0.58	0.06
Arsenic	0.0E+00	1.8E-01	1.8E-01	1.04	1.66	0.18	0.11
Barium	0.0E+00	3.7E+01	3.7E+01	51.8	121	0.71	0.30
Beryllium	0.0E+00	1.8E-02	1.8E-02	0.532	--	0.03	--
Cadmium	0.0E+00	1.2E-01	1.2E-01	0.77	1	0.16	0.12
Chromium	0.0E+00	4.7E-01	4.7E-01	9.24	--	0.05	--
Cobalt	0.0E+00	3.7E-01	3.7E-01	7.33	10.9	0.05	0.03
Copper	0.0E+00	2.0E+01	2.0E+01	5.6	6.79	3.6	2.9
Lead	0.0E+00	4.3E+00	4.3E+00	4.7	5	0.93	0.87
Manganese	0.0E+00	2.6E+01	2.6E+01	51.5	65	0.51	0.40
Mercury	0.0E+00	1.0E-02	1.0E-02	1	--	0.01	--
Methylmercury[c]			1.0E-02	0.015	0.16	0.67	0.06
Nickel	0.0E+00	5.7E-01	5.7E-01	1.7	2.71	0.33	0.21
Selenium	0.0E+00	2.1E-01	2.1E-01	0.143	0.145	1.5	1.5
Silver	0.0E+00	9.8E-02	9.8E-02	6.02	60.2	0.02	0.002
Thallium	0.0E+00	2.2E-02	2.2E-02	0.0074	0.074	2.9	0.3
Vanadium	0.0E+00	6.7E-01	6.7E-01	4.16	5.11	0.16	0.13
Zinc	0.0E+00	2.1E+01	2.1E+01	75.4	75.9	0.28	0.28
Polycyclic Aromatic Hydrocarbons (PAHs)							
HPAH sum (NDs = 0.5 DL)	0.0E+00	1.4E+02	1.4E+02	0.615	3.07	234	47
LPAH sum (NDs = 0.5 DL)	0.0E+00	9.3E+00	9.3E+00	65.6	110	0.14	0.08
Semivolatile Organic Compounds (SVOCs)							
2-Methylphenol	0.0E+00	1.8E-02	1.8E-02	219	--	0.0001	--
4-Methylphenol	0.0E+00	5.1E-02	5.1E-02	219	--	0.0002	--
Benzaldehyde	0.0E+00	3.5E-03	3.5E-03	--	--	--	--
Benzyl butyl phthalate	0.0E+00	3.2E-02	3.2E-02	--	--	--	--
Biphenyl (diphenyl)	0.0E+00	1.1E-01	1.1E-01	--	--	--	--
Bis(2-ethylhexyl)phthalate	0.0E+00	3.6E-01	3.6E-01	18.3	183	0.020	0.0020
Carbazole	0.0E+00	8.3E-01	8.3E-01	65.6	110	0.013	0.0076
Dibenzofuran	0.0E+00	9.7E-01	9.7E-01	65.6	110	0.015	0.0088
Di-n-octylphthalate	0.0E+00	3.2E-04	3.2E-04	55	550	0.00001	0.000001
Phenol	0.0E+00	4.5E-02	4.5E-02	523	--	0.0001	--
Pesticides							
Aldrin	0.0E+00	3.6E-02	3.6E-02	0.2	1	0.18	0.04
alpha-BHC	0.0E+00	2.4E-03	2.4E-03	0.014	0.14	0.17	0.02
Endosulfan I	0.0E+00	1.1E-02	1.1E-02	0.15	--	0.08	--
beta-BHC	0.0E+00	4.6E-02	4.6E-02	0.014	0.14	3.3	0.33
Endosulfan II	0.0E+00	6.2E-03	6.2E-03	0.15	--	0.04	--
cis-Chlordane	0.0E+00	5.3E-03	5.3E-03	4.6	9.2	0.0011	0.0006
Σ DDT	0.0E+00	4.0E-02	4.0E-02	0.147	0.247	0.27	0.163
delta-BHC	0.0E+00	7.5E-03	7.5E-03	0.014	0.14	0.54	0.054
Dieldrin	0.0E+00	6.2E-02	6.2E-02	0.015	0.03	4.1	2.1
Endosulfan sulfate	0.0E+00	9.1E-03	9.1E-03	0.15	--	0.06	--
Endrin	0.0E+00	1.0E-02	1.0E-02	0.092	0.92	0.11	0.011
Endrin aldehyde	0.0E+00	2.5E-03	2.5E-03	0.092	0.92	0.03	0.003
Endrin ketone	0.0E+00	4.6E-02	4.6E-02	0.092	0.92	0.50	0.050
gamma-BHC (lindane)	0.0E+00	1.1E-02	1.1E-02	8	--	0.001	--
Heptachlor	0.0E+00	2.5E-02	2.5E-02	0.1	1	0.25	0.025

Table 4-31 Little Brown Bat Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-sediment (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Heptachlor epoxide	0.0E+00	8.6E-03	8.6E-03	0.1	1	0.09	0.009
Methoxychlor	0.0E+00	4.5E-02	4.5E-02	4	8	0.011	0.006
trans-Chlordane	0.0E+00	2.8E-02	2.8E-02	4.6	9.2	0.006	0.003
Dioxins/Furans							
2,3,7,8-TCDD TEQ (ND=0.5DL)	0.0E+00	4.5E-06	4.5E-06	0.000001	0.00001	4.5	0.4

Key:
-- = not available
BERA = baseline ecological risk assessment
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EE-diet = estimated chemical exposure from diet
EE-sediment = estimated chemical exposure from incidental sediment ingestion
EE-total = total estimated exposure
EPC = exposure point concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
LPAH = low molecular weight PAH
mg/kg/day = milligrams per kilogram per day
ND = non detect
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent
Grey shading = HQ > or = 1.0

Notes:
a. Contaminants detected in sediment are listed if frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major sediment constitutes (aluminum) were excluded from the evaluation as per USEPA guidance (USEPA 1989, 2003a).
c. Inorganic mercury dose (EE-total) to receptor also evaluated as though it were 100% methylmercury.

Table 4-32 Mallard Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-sediment (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Polychlorinated Biphenyls (PCBs)							
Sum of Aroclors (NDs = 0.5DL)	7.6E-03	6.5E-03	1.4E-02	0.012	0.12	1.2	0.12
Metals							
Antimony	1.2E-03	2.1E-03	3.2E-03	--	--	--	--
Arsenic	1.5E-03	2.9E-03	4.4E-03	2.24	3.55	0.002	0.001
Barium	2.7E-02	2.1E-01	2.4E-01	20.8	41.7	0.01	0.01
Beryllium	1.1E-04	3.8E-03	3.9E-03	--	--	--	--
Cadmium	3.4E-04	8.6E-03	8.9E-03	1.47	2.37	0.006	0.004
Chromium	7.2E-03	1.5E-02	2.2E-02	2.66	2.78	0.008	0.008
Cobalt	1.6E-03	6.0E-04	2.2E-03	7.61	7.8	0.0003	0.0003
Copper	1.0E-01	2.4E-01	3.4E-01	4.05	4.68	0.08	0.07
Lead	1.7E-01	1.2E-01	2.9E-01	1.63	1.94	0.18	0.15
Manganese	1.4E-01	5.7E-01	7.2E-01	179	348	0.004	0.002
Mercury	3.5E-04	5.2E-03	5.5E-03	0.45	0.9	0.012	0.006
Nickel	6.7E-03	1.5E-02	2.2E-02	6.71	11.5	0.003	0.002
Selenium	1.9E-04	4.7E-03	4.8E-03	0.291	0.368	0.02	0.01
Silver	3.1E-04	2.1E-04	5.2E-04	2.02	20.2	0.0003	0.00003
Thallium	1.0E-04	2.1E-05	1.2E-04	--	--	--	--
Vanadium	3.6E-03	8.7E-04	4.4E-03	0.344	0.413	0.013	0.011
Zinc	2.1E-01	2.3E+00	2.5E+00	66.1	66.5	0.038	0.038
Polycyclic Aromatic Hydrocarbons (PAHs)							
HPAH sum (NDs = 0.5 DL)	3.6E-02	2.5E-01	2.9E-01	2	20	0.14	0.014
LPAH sum (NDs = 0.5 DL)	1.6E-02	2.1E-02	3.7E-02	1653	--	0.00002	--
Other Semivolatile Organic Compounds (SVOCs)							
2-Methylphenol	4.7E-05	2.4E-03	2.4E-03	--	--	--	--
4-Methylphenol	1.4E-04	6.8E-03	6.9E-03	--	--	--	--
Benzaldehyde	9.2E-06	4.6E-04	4.7E-04	--	--	--	--
Benzyl butyl phthalate	8.6E-05	4.3E-03	4.4E-03	--	--	--	--
Biphenyl (diphenyl)	3.0E-04	1.5E-02	1.5E-02	--	--	--	--
Bis(2-ethylhexyl)phthalate	9.7E-04	4.8E-02	4.9E-02	1.1	--	0.045	--
Carbazole	2.2E-03	1.1E-01	1.1E-01	1653	--	0.000068	--
Dibenzofuran	2.6E-03	1.3E-01	1.3E-01	1653	--	0.000080	--
Di-n-octylphthalate	8.4E-07	4.2E-05	4.3E-05	0.11	1.1	0.0004	0.00004
Phenol	1.2E-04	5.9E-03	6.0E-03	6	--	0.001	--
Pesticides							
Aldrin	1.6E-05	1.9E-05	3.6E-05	--	--	--	--
alpha-BHC	2.1E-06	4.2E-05	4.4E-05	0.56	2.25	0.00008	0.00002
Endosulfan I	5.2E-06	6.1E-05	6.6E-05	10	--	0.00001	--
beta-BHC	4.1E-05	7.9E-04	8.3E-04	0.56	2.25	0.0015	0.0004
Endosulfan II	2.8E-06	4.4E-05	4.6E-05	10	--	0.000005	--
cis-Chlordane	2.4E-06	1.8E-06	4.2E-06	2.14	10.7	0.000002	0.0000004
Σ DDT	3.6E-05	2.3E-04	2.6E-04	0.227	0.281	0.001	0.0009
delta-BHC	6.7E-06	1.3E-04	1.4E-04	0.56	2.25	0.00024	0.00006
Dieldrin	2.8E-05	5.7E-04	6.0E-04	0.071	0.179	0.01	0.003
Endosulfan sulfate	4.1E-06	6.1E-05	6.5E-05	10	--	0.000006	--
Endrin	7.7E-06	5.8E-06	1.4E-05	0.01	0.1	0.0014	0.00014
Endrin aldehyde	4.3E-06	3.2E-06	7.5E-06	0.01	0.1	0.001	0.0001
Endrin ketone	3.5E-05	2.7E-05	6.2E-05	0.01	0.1	0.006	0.0006
gamma-BHC (lindane)	1.0E-05	2.0E-04	2.1E-04	2	20	0.0001	0.00001
Heptachlor	1.1E-05	1.9E-05	3.0E-05	--	--	--	--
Heptachlor epoxide	3.9E-06	4.6E-06	8.5E-06	--	--	--	--

Table 4-32 Mallard Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-sediment (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Methoxychlor	2.0E-05	4.5E-05	6.5E-05	--	--	--	--
trans-Chlordane	1.3E-05	9.8E-06	2.2E-05	2.14	10.7	0.000011	0.000002
Dioxins/Furans							
2,3,7,8-TCDD TEQ (ND=0.5DL)	9.2E-09	4.9E-09	1.4E-08	0.000014	0.00014	0.001	0.0001

Key:
-- = Not available
BERA = baseline ecological risk assessment
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EE-diet = estimated chemical exposure from diet
EE-sediment = estimated exposure from incidental sediment ingestion
EE-total = total estimated exposure
EPC = exposure point concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
LPAH = low molecular weight PAH
mg/kg/day = milligrams per kilogram per day
NDs = non detects
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent
Grey shading = HQ > or = 1.0

Notes:
a. Contaminants detected in sediment are listed if frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major sediment constitutes (aluminum) were excluded from the evaluation as per USEPA guidance (USEPA 1989, 2003a).

Table 4-33 Muskrat Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-sediment (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Polychlorinated Biphenyls (PCBs)							
Sum of Aroclors (NDs = 0.5DL)	2.3E-01	1.9E-02	2.5E-01	0.068	0.68	3.6	0.36
Metals							
Antimony	3.5E-02	6.1E-03	4.1E-02	0.059	0.59	0.69	0.07
Arsenic	4.6E-02	8.6E-03	5.5E-02	1.04	1.66	0.05	0.03
Barium	8.0E-01	6.3E-01	1.4E+00	51.8	121	0.03	0.01
Beryllium	3.2E-03	1.1E-02	1.5E-02	0.532	--	0.03	--
Cadmium	1.0E-02	2.6E-02	3.6E-02	0.77	1	0.05	0.04
Chromium	2.2E-01	4.4E-02	2.6E-01	9.24	--	0.03	--
Cobalt	4.8E-02	1.8E-03	5.0E-02	7.33	10.9	0.007	0.00
Copper	3.1E+00	7.1E-01	3.8E+00	5.6	6.79	0.67	0.55
Lead	5.1E+00	3.6E-01	5.5E+00	4.7	5	1.2	1.1
Manganese	4.3E+00	1.7E+00	6.0E+00	51.5	65	0.12	0.09
Mercury	1.0E-02	1.5E-02	2.6E-02	1	--	0.03	--
Nickel	2.0E-01	4.5E-02	2.5E-01	1.7	2.71	0.14	0.09
Selenium	5.6E-03	1.4E-02	1.9E-02	0.143	0.145	0.14	0.1
Silver	9.1E-03	6.4E-04	9.7E-03	6.02	60.2	0.002	0.0002
Thallium	3.1E-03	6.2E-05	3.1E-03	0.0074	0.074	0.42	0.04
Vanadium	1.1E-01	2.6E-03	1.1E-01	4.16	5.11	0.03	0.02
Zinc	6.2E+00	7.0E+00	1.3E+01	75.4	75.9	0.17	0.17
Polycyclic Aromatic Hydrocarbons (PAHs)							
HPAH sum (NDs = 0.5 DL)	1.1E+00	7.5E-01	1.8E+00	0.615	3.07	3.0	0.60
LPAH sum (NDs = 0.5 DL)	4.9E-01	6.1E-02	5.5E-01	65.6	110	0.008	0.005
Other Semivolatile Organic Compounds (SVOCs)							
2-Methylphenol	1.4E-03	7.0E-03	8.5E-03	219	--	0.00004	--
4-Methylphenol	4.0E-03	2.0E-02	2.4E-02	219	--	0.0001	--
Benzaldehyde	2.8E-04	1.4E-03	1.7E-03	--	--	--	--
Benzyl butyl phthalate	2.6E-03	1.3E-02	1.5E-02	--	--	--	--
Biphenyl (diphenyl)	9.0E-03	4.5E-02	5.4E-02	--	--	--	--
Bis(2-ethylhexyl)phthalate	2.9E-02	1.4E-01	1.7E-01	18.3	183	0.009	0.0009
Carbazole	6.6E-02	3.3E-01	4.0E-01	65.6	110	0.0060	0.0036
Dibenzofuran	7.7E-02	3.8E-01	4.6E-01	65.6	110	0.0070	0.0042
Di-n-octylphthalate	2.5E-05	1.3E-04	1.5E-04	55	550	0.000003	0.0000003
Phenol	3.5E-03	1.8E-02	2.1E-02	523	--	0.00004	--
Pesticides							
Aldrin	4.8E-04	5.8E-05	5.4E-04	0.2	1	0.003	0.0005
alpha-BHC	6.4E-05	1.2E-04	1.9E-04	0.014	0.14	0.01	0.0013
Endosulfan I	1.5E-04	1.8E-04	3.4E-04	0.15	--	0.002	
beta-BHC	1.2E-03	2.4E-03	3.6E-03	0.014	0.14	0.26	0.026
Endosulfan II	8.3E-05	1.3E-04	2.1E-04	0.15	--	0.0014	
cis-Chlordane	7.1E-05	5.5E-06	7.6E-05	4.6	9.2	0.00002	0.000008
Σ DDT	1.1E-03	6.8E-04	1.7E-03	0.147	0.247	0.01	0.01
delta-BHC	2.0E-04	3.9E-04	5.9E-04	0.014	0.14	0.04	0.0042
Dieldrin	8.3E-04	1.7E-03	2.5E-03	0.015	0.03	0.17	0.08
Endosulfan sulfate	1.2E-04	1.8E-04	3.0E-04	0.15	--	0.002	
Endrin	2.3E-04	1.7E-05	2.5E-04	0.092	0.92	0.0027	0.00027
Endrin aldehyde	1.3E-04	9.7E-06	1.4E-04	0.092	0.92	0.001	0.0001
Endrin ketone	1.1E-03	7.9E-05	1.1E-03	0.092	0.92	0.012	0.0012
gamma-BHC (lindane)	3.0E-04	5.9E-04	8.9E-04	8	--	0.0001	
Heptachlor	3.4E-04	5.6E-05	4.0E-04	0.1	1	0.004	0.0004
Heptachlor epoxide	1.2E-04	1.4E-05	1.3E-04	0.1	1	0.0013	0.00013

Table 4-33 Muskrat Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-sediment (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Methoxychlor	6.0E-04	1.3E-04	7.4E-04	4	8	0.0002	0.00009
trans-Chlordane	3.8E-04	2.9E-05	4.1E-04	4.6	9.2	0.00009	0.00004
Dioxins/Furans							
2,3,7,8-TCDD TEQ (ND=0.5DL)	2.8E-07	1.5E-08	2.9E-07	0.000001	0.00001	0.29	0.03

Key:
-- = Not available
BERA = baseline ecological risk assessment
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EE-diet = estimated chemical exposure from diet
EE-sediment = estimated exposure from incidental sediment ingestion
EE-total = total estimated exposure
EPC = exposure point concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
LPAH = low molecular weight PAH
mg/kg/day = milligrams per kilogram per day
ND = non detect
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent
Grey shading = HQ > or = 1.0

Notes:
a. Contaminants detected in sediment are listed if frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major sediment constitutes (aluminum) were excluded from the evaluation as per USEPA guidance (USEPA 1989, 2003a).

Table 4-34 Great Blue Heron Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2, Lockport, New York

Analyte[a, b]	EE-sediment (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Polychlorinated Biphenyls (PCBs)							
Sum of Aroclors (NDs = 0.5DL)	2.0E-02	7.4E-02	9.5E-02	0.012	0.12	7.9	0.79
Metals							
Antimony	3.1E-03	1.1E-04	3.2E-03	--	--	--	--
Arsenic	4.1E-03	3.1E-02	3.5E-02	2.24	3.55	0.02	0.01
Barium	7.2E-02	2.5E-01	3.2E-01	20.8	41.7	0.02	0.01
Beryllium	2.9E-04	3.3E-04	6.1E-04	--	--	--	--
Cadmium	9.0E-04	1.5E-03	2.4E-03	1.47	2.37	0.002	0.001
Chromium	1.9E-02	7.1E-02	9.0E-02	2.66	2.78	0.034	0.032
Cobalt	4.3E-03	6.0E-03	1.0E-02	7.61	7.8	0.001	0.001
Copper	2.7E-01	4.9E-01	7.6E-01	4.05	4.68	0.19	0.16
Lead	4.6E-01	7.0E-02	5.3E-01	1.63	1.94	0.32	0.27
Manganese	3.8E-01	7.1E-01	1.1E+00	179	348	0.01	0.003
Mercury	9.3E-04	1.6E-02	1.7E-02	0.45	0.9	0.04	0.02
Methylmercury[c]			1.7E-02	0.068	0.37	0.25	0.05
Nickel	1.8E-02	4.2E-02	6.0E-02	6.71	11.5	0.009	0.01
Selenium	5.0E-04	4.7E-02	4.8E-02	0.291	0.368	0.16	0.13
Silver	8.1E-04	1.7E-04	9.8E-04	2.02	20.2	0.000	0.0000
Thallium	2.7E-04	8.5E-05	3.6E-04	--	--	--	--
Vanadium	9.5E-03	4.1E-02	5.1E-02	0.344	0.413	0.15	0.12
Zinc	5.5E-01	2.8E+00	3.3E+00	66.1	66.5	0.05	0.05
Polycyclic Aromatic Hydrocarbons (PAHs)							
HPAH sum (NDs = 0.5 DL)	9.7E-02	4.3E-03	1.0E-01	2	20	0.05	0.005
LPAH sum (NDs = 0.5 DL)	4.4E-02	3.0E-03	4.7E-02	1653	--	0.00003	--
Semivolatile Organic Compounds (SVOCs)							
2-Methylphenol	1.3E-04	1.6E-04	2.9E-04	--	--	--	--
4-Methylphenol	3.6E-04	5.9E-02	5.9E-02	--	--	--	--
Benzaldehyde	2.5E-05	6.2E-03	6.2E-03	--	--	--	--
Benzyl butyl phthalate	2.3E-04	1.6E-03	1.8E-03	--	--	--	--
Biphenyl (diphenyl)	8.0E-04	1.1E-03	1.9E-03	--	--	--	--
Bis(2-ethylhexyl)phthalate	2.6E-03	1.9E-03	4.5E-03	1.1	--	0.004	--
Carbazole	5.9E-03	2.2E-04	6.1E-03	1653	--	0.0000037	--
Dibenzofuran	6.9E-03	1.2E-03	8.0E-03	1653	--	0.000005	--
Di-n-octylphthalate	2.2E-06	1.3E-03	1.3E-03	0.11	1.1	0.01	0.001
Phenol	3.1E-04	2.7E-03	3.0E-03	6	--	0.0005	--
Pesticides							
Aldrin	4.3E-05	6.1E-05	1.0E-04	--	--	--	
alpha-BHC	5.7E-06	9.8E-06	1.6E-05	0.56	2.25	0.00003	0.00001
Endosulfan I	1.4E-05	2.0E-04	2.1E-04	10	--	0.00002	--
beta-BHC	1.1E-04	5.1E-05	1.6E-04	0.56	2.25	0.0003	0.00007
Endosulfan II	7.4E-06	7.4E-05	8.2E-05	10	--	0.00001	--
cis-Chlordane	6.3E-06	2.7E-04	2.7E-04	2.14	10.7	0.0001	0.00003
Σ DDT	9.5E-05	9.5E-03	9.6E-03	0.227	0.281	0.04	0.03
delta-BHC	1.8E-05	4.6E-05	6.4E-05	0.56	2.25	0.0001	0.00003
Dieldrin	7.4E-05	3.2E-04	4.0E-04	0.071	0.179	0.006	0.002
Endosulfan sulfate	1.1E-05	3.6E-04	3.7E-04	10	--	0.00004	--
Endrin	2.1E-05	2.7E-03	2.7E-03	0.01	0.1	0.27	0.03
Endrin aldehyde	1.1E-05	3.3E-04	3.4E-04	0.01	0.1	0.03	0.003
Endrin ketone	9.4E-05	2.5E-04	3.4E-04	0.01	0.1	0.03	0.003
gamma-BHC (lindane)	2.7E-05	9.8E-05	1.3E-04	2	20	0.0001	0.00001
Heptachlor	3.0E-05	5.4E-05	8.4E-05	--	--	--	--

Table 4-34 Great Blue Heron Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2, Lockport, New York

Analyte[a, b]	EE-sediment (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Heptachlor epoxide	1.0E-05	8.9E-04	9.0E-04	--	--	--	--
Methoxychlor	5.4E-05	9.8E-04	1.0E-03	--	--	--	--
trans-Chlordane	3.4E-05	1.8E-03	1.8E-03	2.14	10.7	0.001	0.0002
Dioxins/Furans							
2,3,7,8-TCDD TEQ (ND=0.5DL)	3.7E-08	2.6E-07	3.0E-07	0.000014	0.00014	0.02	0.002

Key:
-- = not available
BERA = baseline ecological risk assessment
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EE-diet = estimated chemical exposure from diet
EE-sediment = estimated chemical exposure from incidental sediment ingestion
EE-total = total chemical exposure
EPC = exposure point concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
LPAH = low molecular weight PAH
mg/kg/day = milligrams per kilogram per day
ND = non detect
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent
Grey shading = HQ > or = 1.0

Notes:
a. Contaminants detected in sediment are listed if frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major soil /sediment constitutes (aluminum) were excluded from the evaluation as per USEPA guidance (USEPA 1989, 2003a).
c. Inorganic mercury dose (EE-total) to receptor also evaluated as though it were 100% methylmercury.

Table 4-35 Mink Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-sediment (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Polychlorinated Biphenyls (PCBs)							
Sum of Aroclors (NDs = 0.5DL)	2.5E-02	1.8E-01	2.0E-01	0.0034	0.034	60	6
Metals							
Antimony	3.7E-03	2.7E-04	4.0E-03	0.059	0.59	0.07	0.007
Arsenic	5.0E-03	7.6E-02	8.1E-02	1.04	1.66	0.08	0.05
Barium	8.7E-02	6.1E-01	6.9E-01	51.8	121	0.01	0.01
Beryllium	3.5E-04	7.9E-04	1.1E-03	0.532	--	0.002	--
Cadmium	1.1E-03	3.7E-03	4.8E-03	0.77	1	0.01	0.005
Chromium	2.3E-02	1.7E-01	1.9E-01	9.24	--	0.021	--
Cobalt	5.2E-03	1.4E-02	2.0E-02	7.33	10.9	0.003	0.002
Copper	3.3E-01	1.2E+00	1.5E+00	5.6	6.79	0.27	0.22
Lead	5.5E-01	1.7E-01	7.2E-01	4.7	5	0.15	0.14
Manganese	4.7E-01	1.7E+00	2.2E+00	51.5	65	0.04	0.03
Mercury	1.1E-03	3.9E-02	4.0E-02	1	--	0.04	--
Methylmercury[c]			4.0E-02	0.015	0.16	2.7	0.25
Nickel	2.2E-02	1.0E-01	1.2E-01	1.7	2.71	0.07	0.05
Selenium	6.0E-04	1.1E-01	1.2E-01	0.143	0.145	0.81	0.79
Silver	9.8E-04	4.1E-04	1.4E-03	6.02	60.2	0.0002	0.00002
Thallium	3.3E-04	2.1E-04	5.4E-04	0.0074	0.074	0.1	0.01
Vanadium	1.2E-02	9.9E-02	1.1E-01	4.16	5.11	0.03	0.02
Zinc	6.7E-01	6.7E+00	7.4E+00	75.4	75.9	0.10	0.10
Polycyclic Aromatic Hydrocarbons (PAHs)							
HPAH sum (NDs = 0.5 DL)	1.2E-01	1.0E-02	1.3E-01	0.615	3.07	0.21	0.041
LPAH sum (NDs = 0.5 DL)	5.3E-02	7.4E-03	6.0E-02	65.6	110	0.0009	0.0005
Semivolatile Organic Compounds (SVOCs)							
2-Methylphenol	1.5E-04	3.9E-04	5.4E-04	219	--	0.000002	--
4-Methylphenol	4.4E-04	1.4E-01	1.4E-01	219	--	0.0007	--
Benzaldehyde	3.0E-05	1.5E-02	1.5E-02	--	--	--	--
Benzyl butyl phthalate	2.8E-04	3.9E-03	4.2E-03	--	--	--	--
Biphenyl (diphenyl)	9.7E-04	2.6E-03	3.6E-03	--	--	--	--
Bis(2-ethylhexyl)phthalate	3.1E-03	4.6E-03	7.8E-03	18.3	183	0.0004	0.00004
Carbazole	7.1E-03	5.3E-04	7.7E-03	65.6	110	0.00012	0.00007
Dibenzofuran	8.3E-03	2.8E-03	1.1E-02	65.6	110	0.00017	0.00010
Di-n-octylphthalate	2.7E-06	3.0E-03	3.0E-03	55	550	0.00006	0.00001
Phenol	3.8E-04	6.5E-03	6.9E-03	523	--	0.00001	--
Pesticides							
Aldrin	5.2E-05	1.5E-04	2.0E-04	0.2	1	0.001	0.0002
alpha-BHC	6.9E-06	2.4E-05	3.1E-05	0.014	0.14	0.002	0.0002
Endosulfan I	1.7E-05	4.8E-04	4.9E-04	0.15	--	0.003	--
beta-BHC	1.3E-04	1.2E-04	2.5E-04	0.014	0.14	0.018	0.002
Endosulfan II	9.0E-06	1.8E-04	1.9E-04	0.15	--	0.001	--
cis-Chlordane	7.6E-06	6.5E-04	6.6E-04	4.6	9.2	0.0001	0.00007
Σ DDT	1.2E-04	2.3E-02	2.3E-02	0.147	0.247	0.16	0.09
delta-BHC	2.1E-05	1.1E-04	1.3E-04	0.014	0.14	0.01	0.0010
Dieldrin	8.9E-05	7.8E-04	8.7E-04	0.015	0.03	0.06	0.03
Endosulfan sulfate	1.3E-05	8.6E-04	8.8E-04	0.15	--	0.01	--
Endrin	2.5E-05	6.5E-03	6.5E-03	0.092	0.92	0.07	0.007
Endrin aldehyde	1.4E-05	8.0E-04	8.1E-04	0.092	0.92	0.01	0.0009
Endrin ketone	1.1E-04	6.1E-04	7.2E-04	0.092	0.92	0.01	0.0008
gamma-BHC (lindane)	3.3E-05	2.4E-04	2.7E-04	8	--	0.00003	--
Heptachlor	3.7E-05	1.3E-04	1.7E-04	0.1	1	0.002	0.0002
Heptachlor epoxide	1.2E-05	2.2E-03	2.2E-03	0.1	1	0.022	0.002

Table 4-35 Mink Exposure Estimates and Hazard Quotients, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[a, b]	EE-sediment (mg/kg/d)	EE-diet (mg/kg/d)	EE-total (mg/kg/d)	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	HQ-NOAEL	HQ-LOAEL
Methoxychlor	6.5E-05	2.4E-03	2.4E-03	4	8	0.001	0.0003
trans-Chlordane	4.1E-05	4.3E-03	4.4E-03	4.6	9.2	0.001	0.0005
Dioxins/Furans							
2,3,7,8-TCDD TEQ (ND=0.5DL)	3.0E-08	6.3E-07	6.6E-07	0.000001	0.00001	0.66	0.07

Key:
-- = not available
BERA = baseline ecological risk assessment
COPC = chemical of potential concern
DL = detection limit
DDT = dichlorodiphenyltrichloroethane
EE-diet = estimated chemical exposure from diet
EE-sediment = estimated chemical exposure from incidental sediment ingestion
EE-total = total chemical exposure
EPC = exposure point concentration
HPAH = high molecular weight PAH
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
LPAH = low molecular weight PAH
mg/kg/day = milligrams per kilogram per day
ND = non detect
NOAEL = no observed adverse effect level
OU2 = Operable Unit 2
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent
Grey shading = HQ > or = 1.0

Notes:
a. Contaminants detected in sediment are listed if frequency of detection was > 5%.
b. Essential nutrients (calcium, iron, magnesium, sodium, and potassium) and major sediment constitutes (aluminum) were excluded from evaluation as per USEPA guidance (USEPA 1989, 2003a).
c. Inorganic mercury dose (EE-total) to receptor also evaluated as though it were 100% methylmercury.

Table 4-36 Summary of NOAEL-Based Hazard Quotients by Assessment Endpoint, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[b,c]	Assessment Endpoint and NOAEL-Based HQ[a]																	
						Terrestrial Wildlife[i]						Aquatic-Dependent Wildlife[j]						
	Plants[d]	Soil Fauna[e]	NYSDEC SCO[f]	Fish[g]	Benthos[h]	Robin	Shrew	Dove	Vole	Hawk	Weasel	Swallow	Bat	Mallard	Muskrat	Heron	Mink
Polychlorinated Biphenyls (PCBs)																		
Sum of Aroclors (ND = 0.5DL)		x	7		**356**	47	20				20	**6,619**	**18,880**	1	4	8	60
Metals																		
Aluminum																		
Antimony	6		x		3	x	6	x	3	x	2	x		x		x		
Arsenic	1		2															
Barium		1	1		x							2						
Beryllium					x	x		x		x		x		x		x		
Cadmium			2		2		1											
Chromium			2	2														
Cobalt			x															
Copper	20	18	28	2	15	4	4		1		1	6	4					
Iron					1													
Lead	10		19		22	8	4		1		1	3			1			
Manganese	4	2			2													
Mercury	8	23	13	1	8													
Methylmercury	--	--	--			--	--	--	--	--	--							3
Nickel	2		2		1	1	9											
Selenium	3						2						2					
Silver			2		1													
Thallium	3	x	x		x	x	60	x	1	x		x	3	x	3	x		
Vanadium			x		x							2						
Zinc	16	21	23	1	8													
Polycyclic Aromatic Hydrocarbons (PAHs)																		
HPAH sum	3	3	22		--		2		1			89	234		3			
LPAH sum	**117**	1	2		--													
Total PAHs	--	--	--		62	--	--	--	--	--	--	--	--	--	--	--	--	--
Other Semivolatile Organic Compounds (SVOCs)																		
2-Methylphenol	--	--	--		9	--	--	--	--	--	--	x		x		x		
4-Methylphenol	--	--	--		26	--	--	--	--	--	--	x		x		x		
Acetophenone	x	x	x		--	x	x	x	x	x	x	--	--	--	--	--	--	--
Benzyl butyl phthalate	x	x	x		18	x	x	x	x	x	x	x	x	x	x	x	x	x
Biphenyl (diphenyl)			x			x	x	x	x	x	x	x	x	x	x	x	x	x
Bis(2-ethylhexyl)phthalate	x	x	x															
Carbazole	2		x		6													
Dibenzofuran	2		x		20													
Di-n-butyl phthalate		x	x									--	--	--	--	--	--	--
Di-n-octylphthalate	x	x	x															
Phenol					**229**													
Pesticides																		
Aldrin		x			38	x		x		x		x		x		x		
alpha-BHC	x	x			2													
Endosulfan I	x	x	x		24													
beta-BHC	2	x			38								3					
Endosulfan II	x	x	x		13													
cis-Chlordane		x																
Σ DDT		x	56		4		1											
delta-BHC	x	x			10													
Dieldrin		x	3									1	4					
Endosulfan sulfate	x	x	x		19													
Endrin	2	x		3								1						
Endrin aldehyde	1	x	x			1												

Table 4-36 Summary of NOAEL-Based Hazard Quotients by Assessment Endpoint, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[b,c]	Assessment Endpoint and NOAEL-Based HQ[a]																
						Terrestrial Wildlife[i]						Aquatic-Dependent Wildlife[j]					
	Plants[d]	Soil Fauna[e]	NYSDEC SCO[f]	Fish[g]	Benthos[h]	Robin	Shrew	Dove	Vole	Hawk	Weasel	Swallow	Bat	Mallard	Muskrat	Heron	Mink
Endrin ketone		x	x	--	2							6		--	--	--	--
gamma-BHC (lindane)		x			1												
Methoxychlor	x	x	x		2	x		x		x		x		x		x	
trans-Chlordane		x	x														
Dioxins/Furans																	
2,3,7,8-TCDD TEQ	x	x	x		51		10						5				

Key:
-- = not applicable
BERA = baseline ecological risk assessment
COC = contaminant of concern
HPAH = high molecular weight PAH
HQ = hazard quotient
LPAH = low molecular weight PAH
NYSDEC = New York State Department of Environmental Conservation
OU2 = Operable Unit 2
SLERA = screening level ecological risk assessment
TRV = toxicity reference value
Value (with or without shading) = HQ > or = 1.
x = chemical detected in site samples but no screening level or TRV is available. Possible COPC.

Notes:
a. Shading indicates magnitude of hazard quotient:

HQ	= > 1000
HQ	= 100 - 1000
HQ	= 10 - 100
HQ	= 1 - 10
	= < 1

b. Analytes detected in surface soil and sediment in recent OU2 site investigations are listed if frequency of detection was greater than 5% when a minimum of 20 samples were collected.
c. Essential nutrients (calcium, magnesium, sodium, and potassium) and major soil /sediment constitutes (aluminum) were excluded from the evaluation as per USEPA guidance (USEPA 1989, 2003a).
d. Based on comparing surface soil EPCs with soil screening levels for effects on plants (see Table 4-1).
e. Based on comparing surface soil EPCs with soil screening levels for effects on earthworms (see Table 4-2).
f. Based on comparing surface soil EPCs with NYSDEC soil clean-up goals for protection of ecological resources (see Table 4-3).
g. Maximum HQ (fish contaminant concentration / tissue screening concentrations) in forage or game fish (see Table 4-14 and 4-15).
h. Based on comparing surface sediment EPCs with sediment screening levels for effects on benthic macroinvertebrates (see Table 4-4a).
i. HQs for American robin (Table 4-24), short-tailed shrew (Table 4-25), mourning dove (Table 4-26), meadow vole (Table 4-27), red-shouldered hawk (Table 4-28), and long-tailed weasel (Table 4-29).
h. HQs for tree swallow (Table 4-30), little brown bat (Table 4-31), mallard (Table 4-32), muskrat (Table 4-33), great blue heron (Table 4-34), and mink (Table 4-35).

Table 4-37 Summary of LOAEL-Based Hazard Quotients by Assessment Endpoint, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[b,c]	Assessment Endpoint and LOAEL-Based HQ[a]																
						Terrestrial Wildlife[i]						Aquatic-Dependent Wildlife[j]					
	Plants[d]	Soil Fauna[e]	NYSDEC SCO[f]	Fish[g]	Benthos[h]	Robin	Shrew	Dove	Vole	Hawk	Weasel	Swallow	Bat	Mallard	Muskrat	Heron	Mink
Polychlorinated Biphenyls (PCBs)																	
Sum of Aroclors (ND = 0.5DL)		x	7		36	5	2				2	662	1,888	1			6
Metals																	
Aluminum																	
Antimony	6		x			x		x		x		x		x		x	
Arsenic	1		2														
Barium		1	1		3							1					
Beryllium					x	x		x		x		x		x		x	
Cadmium			2														
Chromium			2	2													
Cobalt			x														
Copper	20	18	28	2	3	3	3		1		1	5	3				
Iron																	
Lead	10		19		6	7	3				1	3			1		
Manganese	4	2															
Mercury	8	23	13	1	2												
Methylmercury	--	--	--			--	--	--	--	--	--						
Nickel	2		2				6										
Selenium	3						2						1				
Silver			2														
Thallium	3	x	x		x	x	6	x		x		x		x		x	
Vanadium			x									2					
Zinc	16	21	23	1	2												
Polycyclic Aromatic Hydrocarbons (PAHs)																	
HPAH sum	3	3	22		--							9	47				
LPAH sum	117	1	2		--												
Total PAHs	--	--	--		7	--	--	--	--	--	--	--	--	--	--	--	--
Other Semivolatile Organic Compounds (SVOCs)																	
2-Methylphenol	--	--	--		4	--	--	--	--	--	--	x		x		x	
4-Methylphenol	--	--	--			--	--	--	--	--	--	x		x		x	
Acetophenone	x	x	x		--	x	x	x	x	x	x	--	--	--	--	--	--
Benzyl butyl phthalate	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x
Biphenyl (diphenyl)			x			x	x	x	x	x	x	x	x	x	x	x	x
Bis(2-ethylhexyl)phthalate	x	x	x														
Carbazole	2		x		6												
Dibenzofuran	2		x		20												
Di-n-butyl phthalate		x	x									--	--	--	--	--	--
Di-n-octylphthalate	x	x	x														
Phenol	--	--	--		1	--	--	--	--	--	--						
Pesticides																	
Aldrin		x				x		x		x		x		x		x	
alpha-BHC	x	x															
Endosulfan I	x	x	x		1												
beta-BHC	2	x															
Endosulfan II	x	x	x														
cis-Chlordane		x															
Σ DDT		x	56														
delta-BHC	x	x															
Dieldrin		x	3										2				
Endosulfan sulfate	x	x	x														
Endrin	2	x		3													
Endrin aldehyde	1	x	x														
Endrin ketone		x	x											--	--	--	--
gamma-BHC (lindane)		x															
Methoxychlor	x	x	x		2	x		x		x		x		x		x	

Table 4-37 Summary of LOAEL-Based Hazard Quotients by Assessment Endpoint, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

Analyte[b,c]	Assessment Endpoint and LOAEL-Based HQ[a]																	
						Terrestrial Wildlife[i]						Aquatic-Dependent Wildlife[j]						
	Plants[d]	Soil Fauna[e]	NYSDEC SCO[f]	Fish[g]	Benthos[h]	Robin	Shrew	Dove	Vole	Hawk	Weasel	Swallow	Bat	Mallard	Muskrat	Heron	Mink
trans-Chlordane		x	x														
Dioxins/Furans																	
2,3,7,8-TCDD TEQ	x	x	x		2												

Key:
-- = not applicable
BERA = baseline ecological risk assessment
COPC = contaminant of concern
HPAH = high molecular weight PAH
HQ = hazard quotient
LPAH = low molecular weight PAH
NYSDEC = New York State Department of Environmental Conservation
OU2 = Operable Unit 2
SLERA = screening level ecological risk assessment
TRV = toxicity reference value
Value (with or without shading) = HQ > or = 1.
x = chemical detected in site samples but no screening level or TRV is available. Possible COPC.

Notes:
a. Shading indicates magnitude of hazard quotient:

HQ	= > 1000
HQ	= 100 - 1000
HQ	= 10 - 100
HQ	= 1 - 10
	= < 1

b. Analytes detected in surface soil and sediment in recent OU2 site investigations are listed if frequency of detection was greater than 5% when a minimum of 20 samples were collected.
c. Essential nutrients (calcium, magnesium, sodium, and potassium) and major soil /sediment constitutes (aluminum) were excluded from the evaluation as per USEPA guidance (USEPA 1989, 2003a).
d. Based on comparing surface soil EPCs with soil screening levels for effects on plants (see Table 4-1).
e. Based on comparing surface soil EPCs with soil screening levels for effects on earthworms (see Table 4-2).
f. Based on comparing surface soil EPCs with NYSDEC soil clean-up goals for protection of ecological resources (see Table 4-3).
g. Maximum HQ (fish contaminant concentration / tissue screening concentrations) in forage or game fish (see Table 4-14 and 4-15).
h. Based on comparing surface sediment EPCs with sediment screening levels for effects on benthic macroinvertebrates (see Table 4-4b).
i. HQs for American robin (Table 4-24), short-tailed shrew (Table 4-25), mourning dove (Table 4-26), meadow vole (Table 4-27), red-shouldered hawk (Table 4-28), and long-tailed weasel (Table 4-29).
h. HQs for tree swallow (Table 4-30), little brown bat (Table 4-31), mallard (Table 4-32), muskrat (Table 4-33), great blue heron (Table 4-34), and mink (Table 4-35).

Table 5-1 Influence of Bioaccumulation Model, TRV, and Treatment of Non-Detects on HQs for Total PCBs for Invertivorous Wildlife, Baseline Ecological Risk Assessment, Eighteenmile Creek OU2 Site, Lockport, New York

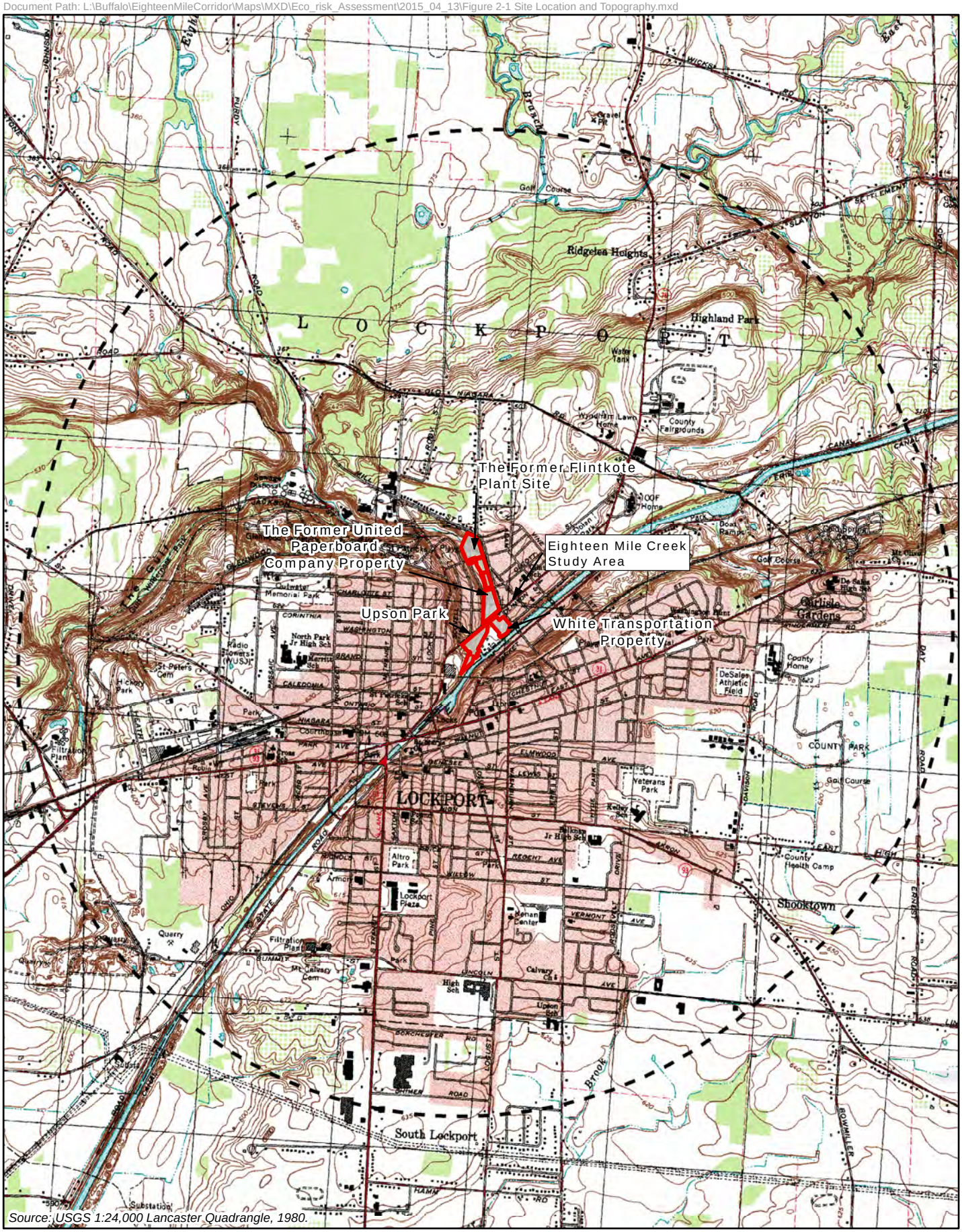
Bioaccumulation Model	TRV (LOAEL) Source	LOAEL (mg/kg/d)	Treatment of Non-Detects	Surface Soil EPC (mg/kg)	Sediment EPC (mg/kg)	Receptor and Hazard Quotient			
						Robin[c]	Shrew[c]	Swallow[d]	Bat[d]
Mammalian Invertivores									
Site-Specific[a]	Black River ERA	0.68 (shrew), 0.034 (bat)	ND = 0.5DL	6.49	35.6	--	2.0	--	1888
			ND = 0	5.40	17.3	--	1.6	--	918
Literature-Based[b]	Black River ERA	0.68 (shrew), 0.034 (bat)	ND = 0.5DL	6.49	35.6	--	16	--	489
			ND = 0	5.40	17.3	--	13	--	219
Avian Invertivores									
Site-Specific[a]	Black River ERA	0.12	ND = 0.5DL	6.49	35.6	4.7	--	662	--
			ND = 0	5.40	17.3	3.8	--	322	--
	Dahlgren et al. 1972	1.8	ND = 0.5DL	6.49	35.6	0.32	--	44	--
			ND = 0	5.40	17.3	0.26	--	21	--
Literature-Based[b]	Black River ERA	0.12	ND = 0.5DL	6.49	35.6	36	--	171	--
			ND = 0	5.40	17.3	29	--	77	--
	Dahlgren et al. 1972	1.8	ND = 0.5DL	6.49	35.6	2.4	--	11	--
			ND = 0	5.40	17.3	1.9	--	5.1	--

Key:
-- (dash) = not relevant or not available
EPC = exposure point concentration
ERA = Ecological Risk Assessment
HQ = hazard quotient
LOAEL = lowest observed adverse effect level
ND = non detects
OU2 = operable unit 2
PCBs = polychlorinated biphenyls
TRV = toxicity reference value
Shading = LOAEL-based HQ from this assessment (Table 4-24 for robin, Table 4-25 for shrew, Table 4-30 for swallow, and Table 4-31 for bat).

Notes:
a = From Table 4-18 (for robin and shrew) and Table 4-22 (for swallow and bat). See also Appendix C.
b = From Bechtel Jacobs (1998) for sediment-to-benthos bioaccumulation model and from Sample et al. (1998) for soil-to-earthworm bioaccumulation model.
c = Diet consist of earthworms from terrestrial habitat within OU2.
d = Diet consist of emergent aquatic insects from Eighteenmile Creek within OU2.

Figures

© Ecology & Environment, Inc. GIS Department
Document Path: L:\Buffalo\EighteenMileCorridor\Maps\MXD\Eco_risk_Assessment\2015_04_13\Figure 2-1 Site Location and Topography.mxd



Site Boundary
Two Mile Radius

N W E S

0 1,250 2,500 5,000 Feet

Figure 2-1
Topography in the Vicinity of the Eighteenmile Creek Corridor Site
City of Lockport, New York

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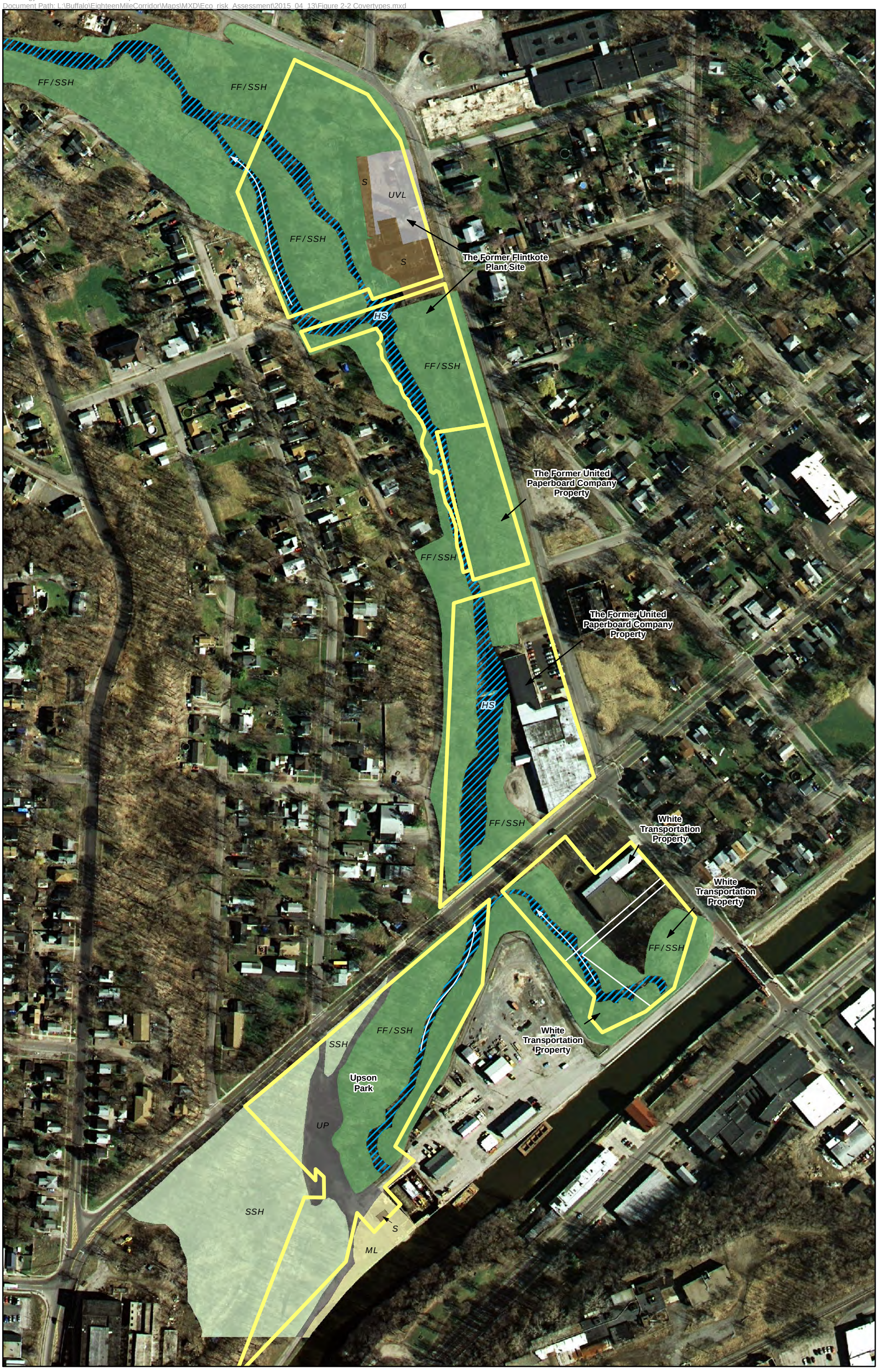
Document Path: L:\Buffalo\EighteenMileCorridor\Maps\MXD\Eco_risk_Assessment\2015_04_13\Figure 2-2 Covertypes.mxd



Site Boundary

Covertypes

Headwater Stream (HS)

Mowed Lawn (ML)

Successional Southern Hardwoods (SSH)

Floodplain Forest (FF/SSH)

Unpaved Road/Path (UP)

Urban Structure Exterior (S)

Urban Vacant Lot (UVL)

N W E S

0 125 250 500 Feet

Figure 2-2
Ecological Covertypes and Drainage Pathways
Eighteenmile Creek Corridor Site
City of Lockport, New York

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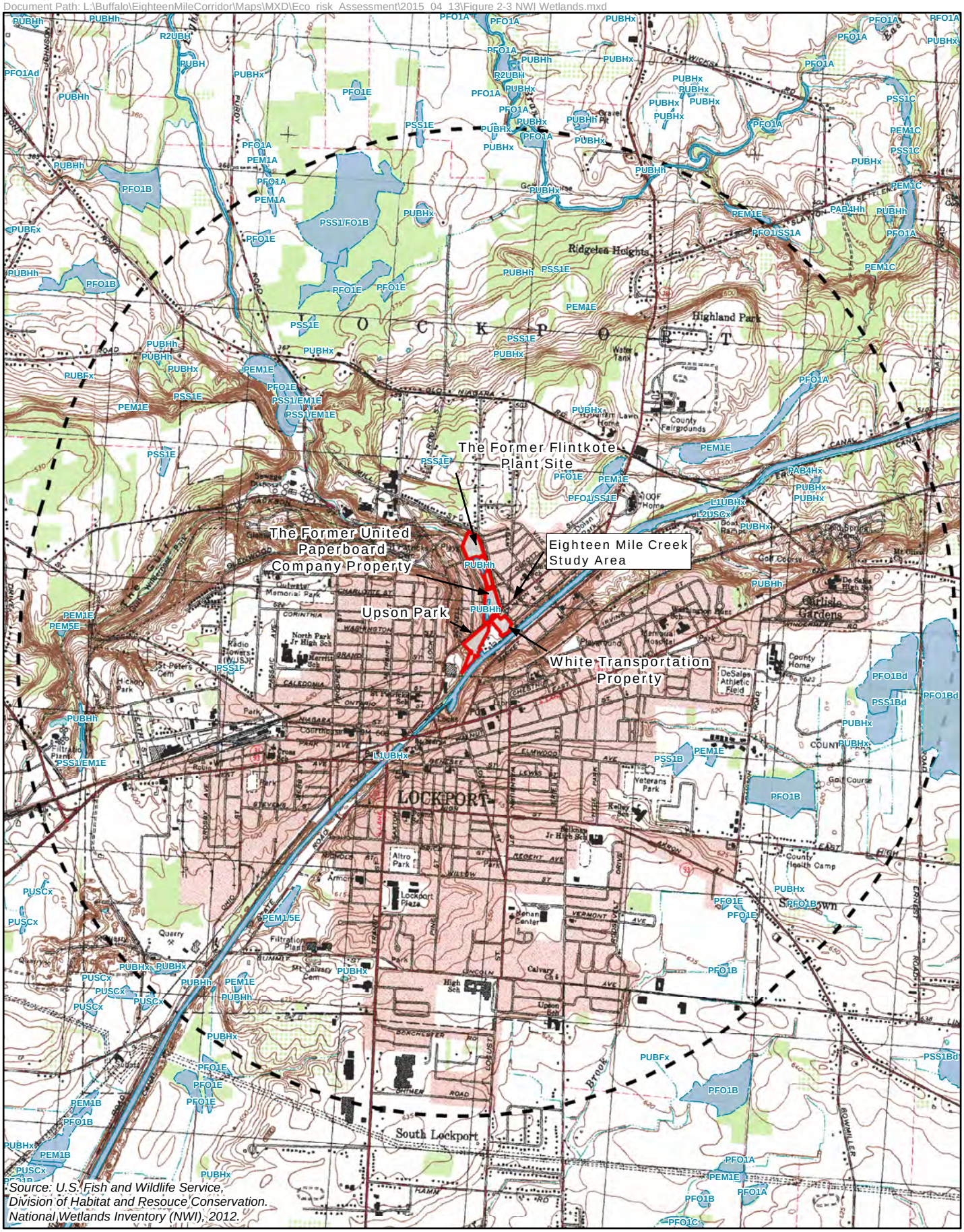
Document Path: L:\Buffalo\EighteenMileCorridor\Maps\MXD\Eco_risk_Assessment\2015_04_13\Figure 2-3 NWI Wetlands.mxd



National Wetland Inventory Wetlands

Site Boundary

Two Mile Radius

N W E S

0 1,250 2,500 5,000 Feet

Figure 2-3
NWI Wetlands in the Vicinity of the Eighteenmile Creek Corridor Site
City of Lockport, New York

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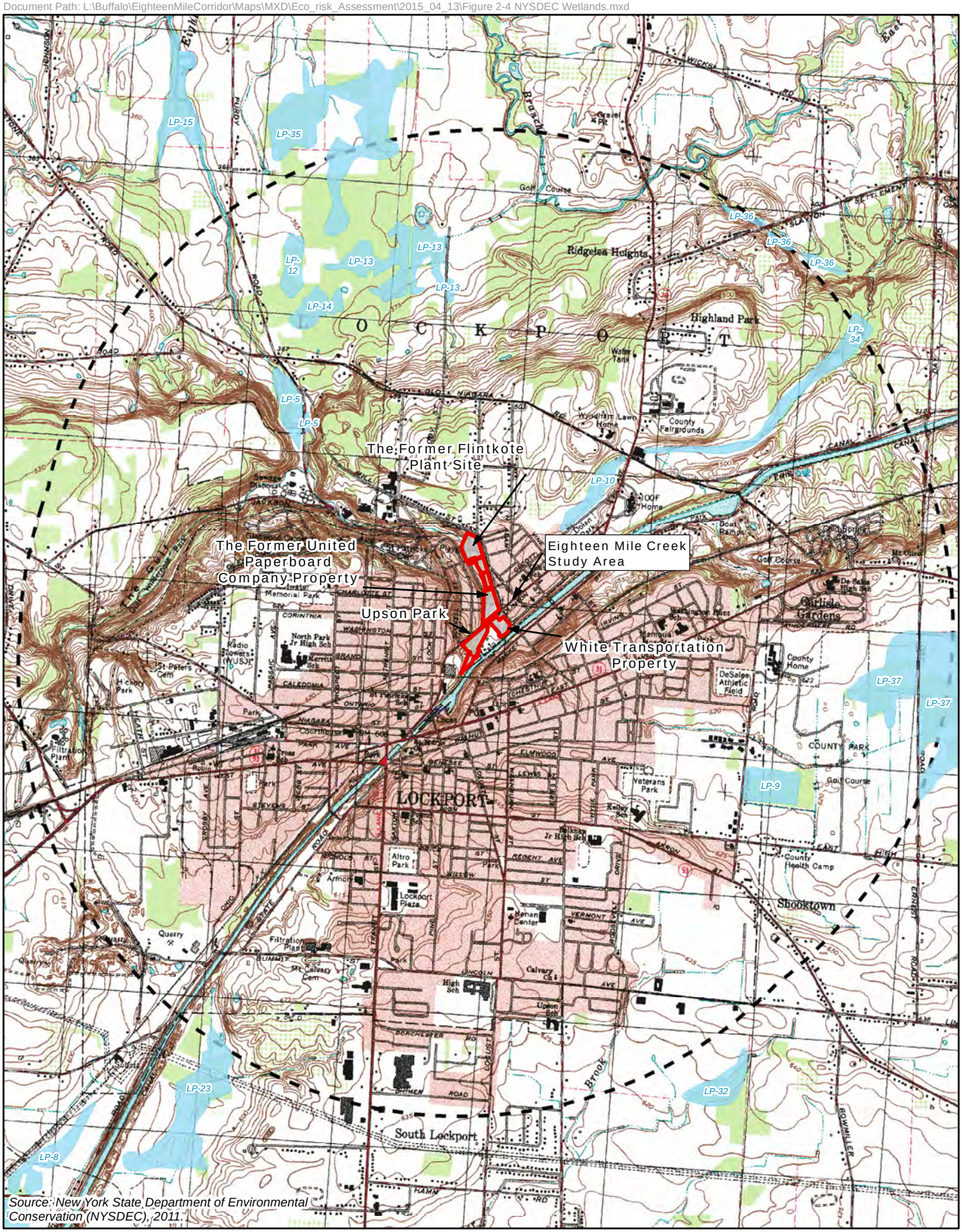
Document Path: L:\Buffalo\EighteenMileCorridor\Maps\MXD\Eco_risk_Assessment\2015_04_13\Figure 2-4 NYSDEC Wetlands.mxd



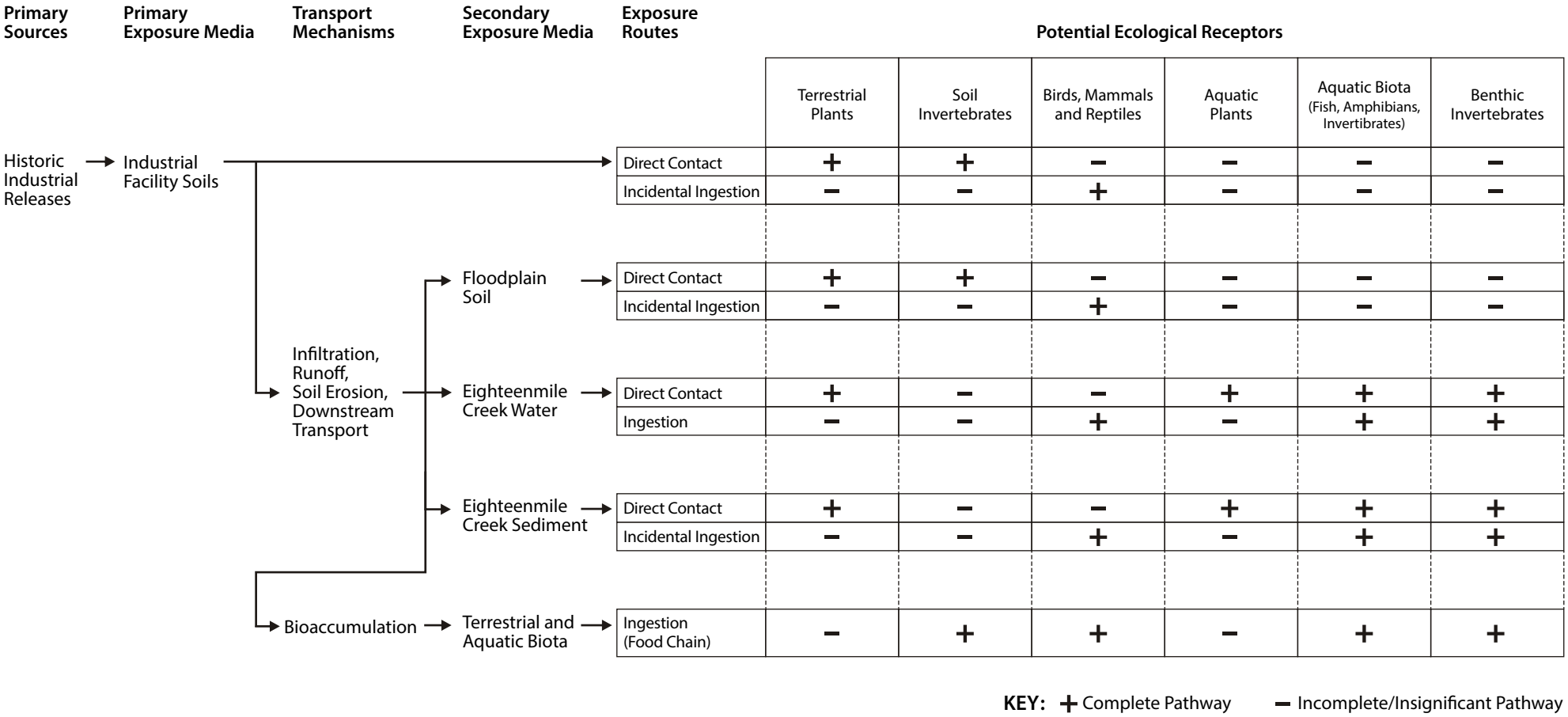
Source: New York State Department of Environmental Conservation (NYSDEC), 2011.

NYSDEC Freshwater Wetlands
Site Boundary
Two Mile Radius

N W E S

0 1,250 2,500 5,000 Feet

Figure 2-4
New York State Designated Wetlands in the Vicinity of the Eighteenmile Creek Corridor Site City of Lockport, New York



SOURCE: Ecology and Environment, Inc., 2015

Figure 3-1 Ecological Conceptual Site Model, Eighteenmile Creek Operable Unit 2 (OU2) Site

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Document Path: L:\Buffaloleighteenmile\Mxds\2016_July\Fig4-1a OU2_Creek_Sample_Locations_Northern.mxd Date: 7/18/2016

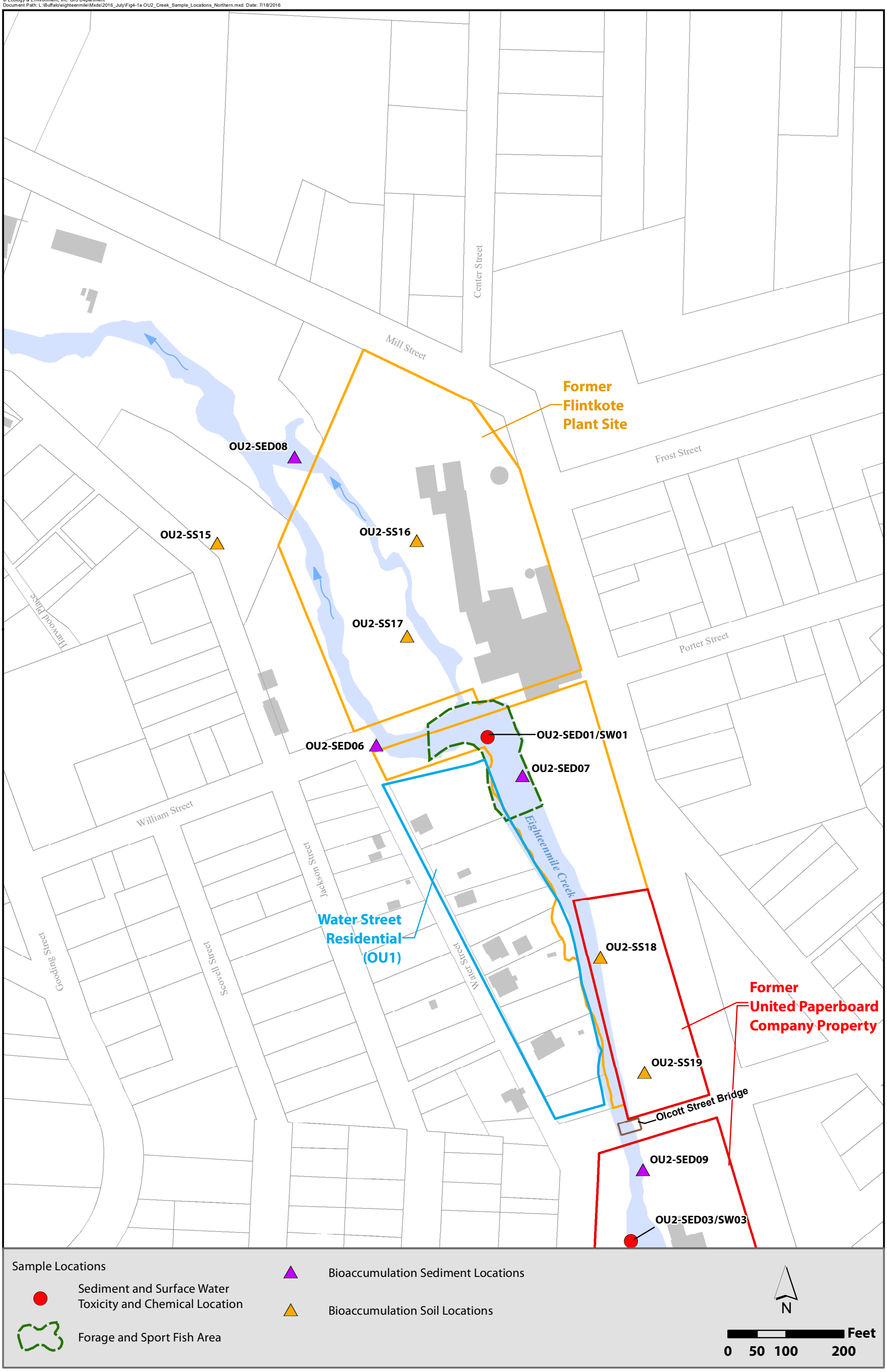

Figure 4-1a Toxicity, Bioaccumulation and Fish Sample Locations
Eighteenmile Creek RI OU2 Northern
Map 1 of 2

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Document Path: L:\Buffalo\eighteenmile\Mxds\2016_July\Fig4-1b OU2_Creek_Sample_Locations_Southern.mxd Date: 7/18/2016

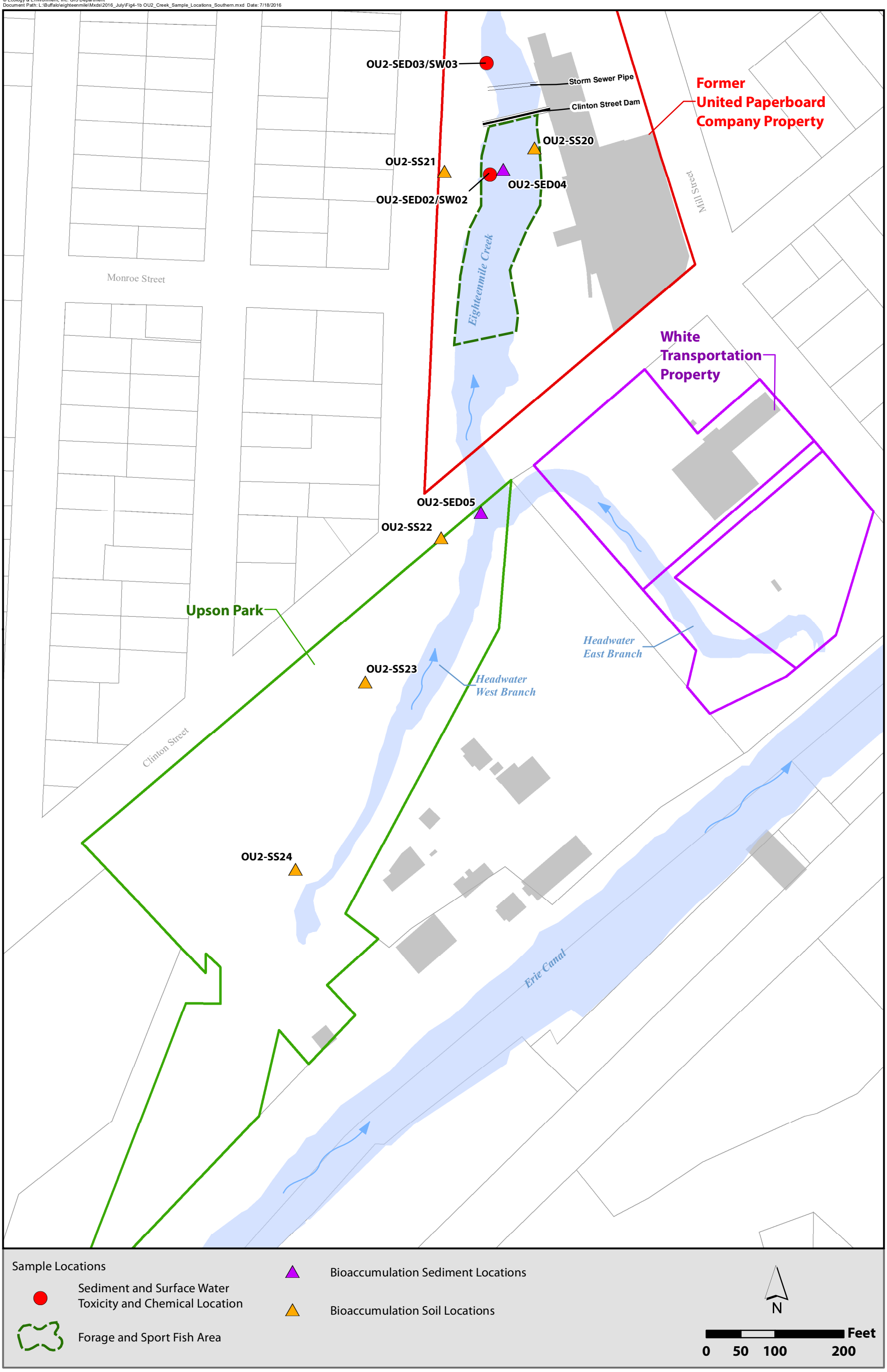

Figure 4-1b Toxicity, Bioaccumulation and Fish Sample Locations
Eighteenmile Creek RI OU2 Southern
Map 2 of 2

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Document Path: L:\Buffalo\eighteenmile\Mxds\2016_May\Fig4-2_OU2_Reference_Sample_Locations.mxd Date: 5/6/2016

Niagara County

84.00-3-42.111

BG1-SED01/SW01

BG1-SED02

BG1-SED03

84.00-3-35.2

Quaker Rd

Slayton Settlement Rd

BG1-SED04

BG1-SED05

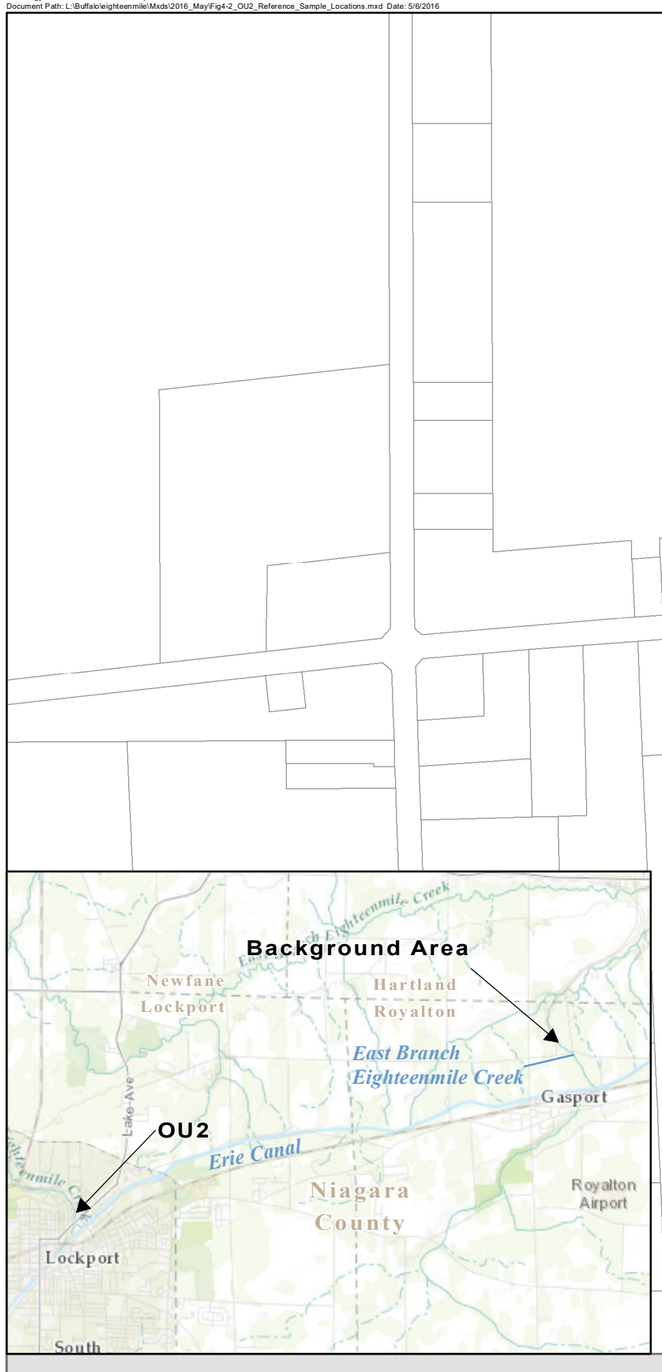
BG1-SED06

BG1-SED07

East Branch Eighteenmile Creek

Bolton Rd

Erie Canal



Background Sediment and Chemical Location

Background Sediment and Surface Water Toxicity and Chemical Location

Forage and Sport Fish Area

Tax Parcels (2015)

Water Feature

N

0 250 500 1,000 Feet

Figure 4-2
Eighteenmile Creek Background Fish, Sediment and Surface Water Reference Sample Locations

A Agency Correspondence

This appendix includes the latest correspondence from the New York State Natural Heritage Program regarding observations of special concern plant and animal species in at and near the OU2 site.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Division of Fish, Wildlife & Marine Resources
New York Natural Heritage Program
625 Broadway, 5th Floor, Albany, New York 12233-4757
Phone: (518) 402-8935 • **Fax:** (518) 402-8925
Website: www.dec.ny.gov

Joe Martens
Commissioner

August 19, 2015

Carl Mach
Ecology and Environment, Inc.
Corporate Center, 368 Pleasant View Drive
Lancaster, NY 14086

Re: Eighteenmile Creek Corridor Site
Town/City: City of Lockport. County: Niagara.

Dear Carl Mach:

In response to your recent request, we have reviewed the New York Natural Heritage Program database with respect to the above project.

In the immediate vicinity of the project site, as listed in the enclosed report, brindled madtom (*Noturus miurus*), a rare fish in New York State, has been collected in the New York State Barge Canal in Lockport. Further from the project site, but within two miles, the plants pawpaw (*Asimina triloba*) and yellow giant-hyssop (*Agastache nepetoides*), both listed by NYS as Threatened, have been documented two miles to the northwest of the project site; and norther harrier (*Circus cyaneus*, listed as Threatened) has been documented in the area two miles to the east of the project site.

For most sites, comprehensive field surveys have not been conducted; the enclosed report only includes records from our databases. We cannot provide a definitive statement as to the presence or absence of all rare or state-listed species or significant natural communities. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

Our databases are continually growing as records are added and updated. If this proposed project is still under development one year from now, we recommend that you contact us again so that we may update this response with the most current information.

The presence of the plants and animals identified in the enclosed report may result in this project requiring additional review or permit conditions. For further guidance, and for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the appropriate NYS DEC Regional Office, Division of Environmental Permits, as listed at www.dec.ny.gov/about/39381.html.

Sincerely,

Andrea Chaloux

Andrea Chaloux
Environmental Review Specialist
New York Natural Heritage Program

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The following rare animals have been documented in the vicinity of your project site.

We recommend that potential onsite and offsite impacts of the proposed project on these species be addressed as part of any environmental assessment or review conducted as part of the planning, permitting and approval process, such as reviews conducted under SEQR. Field surveys of the project site may be necessary to determine the status of a species at the site, particularly for sites that are currently undeveloped and may still contain suitable habitat. Final requirements of the project to avoid, minimize, or mitigate potential impacts are determined by the lead permitting agency or the government body approving the project.

The following animals, while not listed by New York State as Endangered or Threatened, are of conservation concern to the state, and are considered rare by the New York Natural Heritage Program.

COMMON NAME	*SCIENTIFIC NAME*	*NY STATE LISTING*	*HERITAGE CONSERVATION STATUS*
Fish			
Brindled Madtom	*Noturus miurus*	Unlisted	Critically Imperiled in NYS

New York State Barge Canal, Lockport, 2009-07-20. 6822

This report only includes records from the NY Natural Heritage databases. For most sites, comprehensive field surveys have not been conducted, and we cannot provide a definitive statement as to the presence or absence of all rare or state-listed species. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

If any rare plants or animals are documented during site visits, we request that information on the observations be provided to the New York Natural Heritage Program so that we may update our database.

Information about many of the rare animals and plants in New York, including habitat, biology, identification, conservation, and management, are available online in Natural Heritage's Conservation Guides at www.guides.nynhp.org, from NatureServe Explorer at www.natureserve.org/explorer, and from USDA's Plants Database at http://plants.usda.gov/index.html (for plants).

B

Literature-Based Biota Sediment Accumulation Factors (BSAFs)

Literature-based Biota Sediment Accumulation Factors (BSAFs) for some contaminants were used in the Baseline Ecological Risk Assessment (BERA) for Eighteenmile Creek Operable Unit 2 (OU2) to estimate contaminant concentrations in benthic macroinvertebrates. These literature-based BSAFs were used in the SLERA and BERA Problem Formulation reports and found to be acceptable to EPA. Contaminant concentrations in benthic macroinvertebrates were used in the BERA to estimate dietary exposure to birds and mammals that consume aquatic invertebrates.

BSAFs for many metals and some organic contaminants are available from Bechtel Jacobs (1998). For contaminants not addressed by Bechtel Jacobs (1998), E & E developed BSAFs from bioaccumulation testing data generated by the United States Army Corps of Engineers (USACE) at the Eighteenmile Creek and Buffalo River Areas of Concern. Details are provided below. Finally, E & E developed site-specific BSAFs and bioaccumulation equations from sampling data collected from the OU2 site in January 2016 (see Appendix C). When possible, the site-specific BSAFs and bioaccumulation equations were used in the BERA. However, it was necessary to use literature-based BSAFs for contaminants not covered by the January 2016 work. The 2016 work was focused on contaminants that were identified as risk drivers for invertivorous wildlife in the BERA Problem Formulation report, not all contaminants present at the OU2 site.

Metals and Pesticides

Biota Sediment Accumulation Factors (BSAFs) for selected metals were developed using data from USACE (2004) for metals concentrations in sediment and *Lumbriculus* tissue. USACE (2004) collected sediment samples from five locations in lower Eighteenmile Creek (downstream from Burt Dam) for bioaccumulation testing with *Lumbriculus* following EPA Method 100.3 (EPA 2000). BSAFs for metals were calculated from these data as follows:

$$BSAF = C_o/C_s$$

Where:
C_o = contaminant concentration in organism (*Lumbriculus*) (mg/kg wet weight)
C_s = contaminant concentration in sediment (mg/kg dry weight)

The metals data and BSAFs are presented in Table B-1.

BSAFs for pesticides were calculated using data from USACE (2004) for pesticides and TOC in sediment and pesticides and lipids in *Lumbriculus*. The following equation from EPA (2009) was used:

$$BSAF = (C_o/f_l)/(C_s/f_{soc}) = C_l/C_{soc}$$

Where:
C_o = contaminant concentration in organism (µg/kg wet weight);
f_l = lipid fraction of organism (g lipid/g wet weight);

C_s = contaminant concentration in surficial sediment (µg/kg dry weight);
f_{soc} = fraction organic carbon in sediment (g organic carbon/g dry weight);
C_l = contaminant concentration in organism on a lipid basis (µg/g organic carbon); and
C_{soc} = contaminant concentration in sediment on an organic carbon basis (µg/g organic carbon).

The pesticides data and BSAFs are presented in Table B-2.

Polycyclic Aromatic Hydrocarbons (PAHs)

The USACE (2003) collected sediment samples from six locations in the Buffalo River for bioaccumulation testing with *Lumbriculus* following EPA Method 100.3 (EPA 2000). They calculated and presented BSAFs for individual PAHs. E & E used the BSAFs developed by the USACE (2003) to estimate average BSAFs for low molecular weight PAHs (LPAHs) and high molecular weight PAHs (HPAHs). Tables B-3 and B-4 present the BSAFs for individual PAHs from USACE (2003) and the average BSAFs for HPAHs and LPAHs, respectively.

References

Bechtel Jacobs Company LLC. 1998. *Biota-Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation,* Bechtel Jacobs Company LLC, Oak Ridge, TN, BJC/OR-112.

United States Army Corps of Engineers (USACE). 2004. *Sediment Sampling, Biological Analyses, and Chemical Analyses for Eighteenmile Creek AOC, Olcott, NY, Volume II, Laboratory Reports,* USACE Engineer Research and Development Center, Environmental Laboratory, Vicksburg, MS.

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United States Environmental Protection Agency (EPA). 2009. *Estimation of Biota Sediment Accumulation Factor (BSAF) from Paired Observations of Chemical Concentrations in Biota and Sediment.* Prepared by USEPA Mid-Continental Ecology Division, Duluth MN for USEPA Ecological Risk Assessment Support Center, Cincinnati, OH.

_____. 2000. *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates, Second Edition,* Office of Research and Development, Duluth, Minnesota and Office of Water, Washington, D.C. EPA 600/R-99/064.

Table B-1. BSAFs for Metals Based on Sediment and *Lumbriculus* Data from USACE (2004).

Analyte[a]	Sample	*Lumbriculus* Tissue Concentration (mg/kg wet)[b]	Sediment Concentration (mg/kg dry)[c]	Sample BSAF	Average BSAF
Antimony	EBU-1	0.026	0.345	0.075	0.105
	EBU-2	0.066	0.446	0.148	
	EBU-3	0.065	0.56	0.116	
	EBU-4	0.047	2.97	0.016	
	EBU-5	0.057	0.334	0.171	
Barium	EBU-1	45.3	113	0.401	0.583
	EBU-2	57.9	137	0.423	
	EBU-3	68.7	122	0.563	
	EBU-4	69.7	122	0.571	
	EBU-5	63.0	65.8	0.957	
Beryllium	EBU-1	0.035	0.523	0.067	0.071
	EBU-2	0.044	0.679	0.065	
	EBU-3	0.051	0.598	0.085	
	EBU-4	0.049	0.629	0.078	
	EBU-5	0.037	0.604	0.061	
Cobalt	EBU-1	0.95	8.77	0.108	0.098
	EBU-2	1.20	12.1	0.099	
	EBU-3	1.76	13.9	0.127	
	EBU-4	1.29	12.3	0.105	
	EBU-5	0.62	11.8	0.053	
Manganese	EBU-1	41.5	535	0.078	0.077
	EBU-2	24.4	409	0.060	
	EBU-3	40.0	475	0.084	
	EBU-4	42.6	517	0.082	
	EBU-5	34.7	440	0.079	
Selenium	EBU-1	0.46	0.498	0.924	1.269
	EBU-2	0.48	0.45	1.067	
	EBU-3	0.34	3.53	0.096	
	EBU-4	0.42	0.319	1.317	
	EBU-5	0.30	0.102	2.941	
Silver	EBU-1	0.008	0.47	0.017	0.136
	EBU-2	0.023	0.615	0.037	
	EBU-3	0.040	0.618	0.065	
	EBU-4	0.029	0.34	0.085	
	EBU-5	0.086	0.181	0.475	
Thallium	EBU-1	0.056	0.198	0.283	0.154
	EBU-2	0.028	0.29	0.097	
	EBU-3	0.041	0.288	0.142	
	EBU-4	0.023	0.237	0.097	
	EBU-5	0.019	0.126	0.151	
Vanadium	EBU-1	1.39	20.8	0.067	0.079
	EBU-2	1.72	25.3	0.068	
	EBU-3	2.32	24.5	0.095	
	EBU-4	2.13	23.5	0.091	
	EBU-5	1.53	20.5	0.075	

Key:
BSAF = biota sediment accumulation factor
USACE = United States Army Corps of Engineers
Shading = average BSAF used in SLERA

Notes:
a = Metals for which a BSAF was not available from Bechtel-Jacobs (1998).
b = *Lumbiculus* metals data from Appendix F Table 6 in USACE (2004).
c = Sediment metals data from Appendix A Table 4 in USACE (2004)

Table B-2. BSAFs for Pesticides Based on Sediment and *Lumbriculus* Data from USACE (2004).

Analyte	Sample	*Lumbriculus* Tissue Concentration (µg/kg wet)[a]	Sediment Concentration (µg/kg dry)[b]	Sediment Organic Carbon (g/g dry)[c]	*Lumbriculus* Lipid Content (g/g wet)[d]	Sample BSAF	Average BSAF
Aldrin	EBU-1	0.64	0.60	0.033	0.0127	2.76	3.66
	EBU-2	0.73	0.64	0.039	0.0169	2.65	
	EBU-3	0.74	0.61	0.036	0.0115	3.82	
	EBU-4	0.66	0.59	0.031	0.0096	3.63	
	EBU-5	0.79	0.44	0.029	0.0096	5.42	
alpha-BHC	EBU-1	0.64	0.60	0.033	0.0127	2.76	5.34
	EBU-2	0.73	0.64	0.039	0.0169	2.65	
	EBU-3	2.37	0.61	0.036	0.0115	12.23	
	EBU-4	0.66	0.59	0.031	0.0096	3.63	
	EBU-5	0.79	0.44	0.029	0.0096	5.42	
Endosulfan I	EBU-1	0.64	0.60	0.033	0.0127	2.76	3.66
	EBU-2	0.73	0.64	0.039	0.0169	2.65	
	EBU-3	0.74	0.61	0.036	0.0115	3.82	
	EBU-4	0.66	0.59	0.031	0.0096	3.63	
	EBU-5	0.79	0.44	0.029	0.0096	5.42	
beta-BHC	EBU-1	0.64	0.60	0.033	0.0127	2.76	3.81
	EBU-2	0.73	0.64	0.039	0.0169	2.65	
	EBU-3	0.89	0.61	0.036	0.0115	4.59	
	EBU-4	0.66	0.59	0.031	0.0096	3.63	
	EBU-5	0.79	0.44	0.029	0.0096	5.42	
Endosulfan II	EBU-1	1.31	1.20	0.033	0.0127	2.83	3.68
	EBU-2	1.46	1.28	0.039	0.0169	2.64	
	EBU-3	1.49	1.21	0.036	0.0115	3.84	
	EBU-4	1.32	1.17	0.031	0.0096	3.63	
	EBU-5	1.58	0.88	0.029	0.0096	5.44	
Chlordane	EBU-1	6.36	6.03	0.033	0.0127	2.74	3.66
	EBU-2	7.31	6.37	0.039	0.0169	2.65	
	EBU-3	7.43	6.07	0.036	0.0115	3.83	
	EBU-4	6.62	5.87	0.031	0.0096	3.64	
	EBU-5	7.91	4.40	0.029	0.0096	5.43	
Σ DDT	EBU-1	23.04	18.63	0.033	0.0127	3.21	3.38
	EBU-2	14.09	25.05	0.039	0.0169	1.30	
	EBU-3	16.34	16.53	0.036	0.0115	3.10	
	EBU-4	15.01	34.57	0.031	0.0096	1.40	
	EBU-5	15.24	5.82	0.029	0.0096	7.91	
delta-BHC	EBU-1	0.64	0.60	0.033	0.0127	2.76	3.66
	EBU-2	0.73	0.64	0.039	0.0169	2.65	
	EBU-3	0.74	0.61	0.036	0.0115	3.82	
	EBU-4	0.66	0.59	0.031	0.0096	3.63	
	EBU-5	0.79	0.44	0.029	0.0096	5.42	
Dieldrin	EBU-1	1.31	1.20	0.033	0.0127	2.83	3.68
	EBU-2	1.46	1.28	0.039	0.0169	2.64	
	EBU-3	1.49	1.21	0.036	0.0115	3.84	
	EBU-4	1.32	1.17	0.031	0.0096	3.63	
	EBU-5	1.58	0.88	0.029	0.0096	5.44	
Endosulfan Sulfate	EBU-1	1.31	1.20	0.033	0.0127	2.83	5.68
	EBU-2	1.46	1.28	0.039	0.0169	2.64	
	EBU-3	5.58	1.21	0.036	0.0115	14.40	
	EBU-4	3.52	3.65	0.031	0.0096	3.11	
	EBU-5	1.58	0.88	0.029	0.0096	5.44	
Endrin	EBU-1	1.31	1.20	0.033	0.0127	2.83	3.75
	EBU-2	1.46	1.28	0.039	0.0169	2.64	
	EBU-3	1.63	1.21	0.036	0.0115	4.21	
	EBU-4	1.32	1.17	0.031	0.0096	3.63	
	EBU-5	1.58	0.88	0.029	0.0096	5.44	
Endrin Aldehyde	EBU-1	1.31	1.20	0.033	0.0127	2.83	3.68
	EBU-2	1.46	1.28	0.039	0.0169	2.64	
	EBU-3	1.49	1.21	0.036	0.0115	3.84	
	EBU-4	1.32	1.17	0.031	0.0096	3.63	
	EBU-5	1.58	0.88	0.029	0.0096	5.44	
gamma-BHC	EBU-1	0.64	0.60	0.033	0.0127	2.76	3.66
	EBU-2	0.73	0.64	0.039	0.0169	2.65	
	EBU-3	0.74	0.61	0.036	0.0115	3.82	
	EBU-4	0.66	0.59	0.031	0.0096	3.63	
	EBU-5	0.79	0.44	0.029	0.0096	5.42	

Table B-2. BSAFs for Pesticides Based on Sediment and *Lumbriculus* Data from USACE (2004).

Analyte	Sample	*Lumbriculus* Tissue Concentration (µg/kg wet)[a]	Sediment Concentration (µg/kg dry)[b]	Sediment Organic Carbon (g/g dry)[c]	*Lumbriculus* Lipid Content (g/g wet)[d]	Sample BSAF	Average BSAF
Heptachlor	EBU-1	0.77	0.60	0.033	0.0127	3.32	4.47
	EBU-2	0.83	0.64	0.039	0.0169	3.01	
	EBU-3	0.74	0.61	0.036	0.0115	3.82	
	EBU-4	1.11	0.59	0.031	0.0096	6.11	
	EBU-5	0.89	0.44	0.029	0.0096	6.11	
Heptachlor epoxide	EBU-1	0.64	0.60	0.033	0.0127	2.76	3.66
	EBU-2	0.73	0.64	0.039	0.0169	2.65	
	EBU-3	0.74	0.61	0.036	0.0115	3.82	
	EBU-4	0.66	0.59	0.031	0.0096	3.63	
	EBU-5	0.79	0.44	0.029	0.0096	5.42	
Methoxychlor	EBU-1	6.36	6.03	0.033	0.0127	2.74	3.66
	EBU-2	7.31	6.37	0.039	0.0169	2.65	
	EBU-3	7.43	6.07	0.036	0.0115	3.83	
	EBU-4	6.62	5.87	0.031	0.0096	3.64	
	EBU-5	7.91	4.40	0.029	0.0096	5.43	

Key:

BSAF = biota sediment accumulation factor

USACE = United States Army Corps of Engineers

Shading = average BSAF used in SLERA

Notes:

a = *Lumbriculus* pesticide data from Appendix F Table 4 in USACE (2004). One-third reporting level used for non-detects.

b = Sediment pesticide data from Appendix A Table 1 in USACE (2004). One-third reporting level used for non-detects as per USACE (2004).

c = Sediment organic carbon data from Appendix A Table 5 in USACE (2004).

d = *Lumbriculus* lipid data from Appendix F Table 2 in USACE (2004).

Table B-3. Biota Sediment Accumulation Factors (BSAFs) for High Molecular Weight PAHs from Buffalo River Sampling Stations (USACE 2003).

High Molecular Weight PAH	Sampling Station						Row Average
	BR-2	BR-4	BR-5	BR-6	BR-7	BR-9	
Flouranthene	0.732	0.430	0.455	0.434	2.30	3.20	1.259
Pyrene	0.819	0.467	0.421	0.403	2.05	3.34	1.250
Chrysene	0.860	0.472	0.428	0.544	2.90	3.85	1.509
Benzo(a)anthracene	0.476	0.351	0.321	0.273	2.90	3.28	1.267
Benzo(b)fluoranthene	0.674	0.489	0.398	0.554	3.98	4.79	1.814
Benzo(k)fluoranthene	0.543	0.380	0.447	0.380	3.58	4.92	1.708
Benzo(a)pyrene	0.304	0.354	0.283	0.152	4.04	3.96	1.516
Indeno(1,2,3-cd)pyrene	0.222	0.198	0.217	0.101	3.43	3.21	1.230
Dibenz(a,h)anthracene	0.645	0.304	0.582	0.202	2.05	1.97	0.959
Benzo(g,h,i)perylene	0.283	0.264	0.255	0.147	2.80	3.01	1.127
Column average	0.556	0.371	0.381	0.319	3.003	3.553	1.364

Key:
PAH = polycyclic aromatic hydrocarbon
SLERA = screening level ecological risk assessment
USACE = United States Army Corps of Engineers
Shading = average BSAF used in SLERA

Table B-4. Biota Sediment Accumulation Factors (BSAFs) for Low Molecular Weight PAHs from Buffalo River Sampling Stations (USACE 2003).

Low Molecular Weight PAH	Sampling Station						Row Average
	BR-2	BR-4	BR-5	BR-6	BR-7	BR-9	
Naphthalene	0.800	0.172	0.063	0.233	1.79	4.07	1.188
Acenaphthylene	3.780	1.940	1.400	2.970	1.96	3.79	2.640
Acenapthene	0.660	2.850	0.534	0.172	0.96	3.43	1.434
Fluorene	0.449	0.357	0.278	0.363	1.33	1.89	0.778
Phenanathrene	0.731	0.371	0.100	0.306	0.993	1.87	0.729
Antracene	0.544	0.312	0.206	0.210	2.60	1.53	0.900
Column average	1.161	1.000	0.430	0.709	1.606	2.763	1.278

Key:
PAH = polycyclic aromatic hydrocarbon
SLERA = screening level ecological risk assessment
USACE = United States Army Corps of Engineers
Shading = average BSAF used in SLERA

C Site-Specific BSAFs and Bioaccumulation Equations

Biota sediment/soil accumulation factors (BSAFs) and bioaccumulation equations were used in the Baseline Ecological Risk Assessment (BERA) for the Eighteen-mile Creek Operable Unit 2 (OU2) site to estimate contaminant concentrations in sediment/soil invertebrates consumed by wildlife. For the BERA, Ecology and Environment, Inc. (E & E) developed site-specific BSAFs and bioaccumulation equations from site-specific bioaccumulation testing data for the OU2 site. The work was focused on contaminants predicted to pose a risk to invertivorous wildlife in the draft BERA Problem Formulation report (E & E 2015a). Sampling and analysis methods and calculation methods are described below.

Sampling, Testing, and Analysis Methods

In January 2016, composite sediment samples were collected with a Ponar dredge or shovel at six locations in the OU2 site creek channel at depths of 0 to 6 inches beneath the sediment-water interface. Sample locations were chosen to represent a wide concentration range for total polychlorinated biphenyls (PCBs), lead, and other contaminants based on historical sediment data (see Figure 4-1).

Also in January 2016, composite surface-soil samples were collected with a hand auger or shovel at 10 locations along the creek banks and area adjacent to the channel at depths of 0 to 12 inches below ground surface. Sample locations were chosen to represent a wide concentration range for total PCBs, lead, and other contaminants based on historical surface-soil data (see Figure 4-1).

Samples for bioaccumulation testing were sent to EnviroSystems, Inc., where they were sieved, homogenized, and subsampled for chemical analyses. United States Environmental Protection Agency (EPA) Method 100.3 (*Lumbriculus variegatus* Bioaccumulation Test for Sediments) was used to evaluate bioaccumulation of chemicals from sediment. American Society of Testing and Materials (ASTM) Designation E1676-12 (Standard Guide for Conducting Laboratory Soil Toxicity or Bioaccumulation Tests with the Lumbricid Earthworm *Eisenia fetida*) was used to evaluate bioaccumulation of chemicals from soil. Soil and sediment subsamples were analyzed for metals, PCBs (as Aroclors), polycyclic aromatic hydrocarbons (PAHs), and organochlorine pesticides by Chemtech Consulting Group – CHM, and for total organic carbon (TOC) by the DESA Regional Laboratory. At the conclusion of the sediment and soil bioaccumulation tests, the test organisms were separated from the sediment and soil and analyzed for percent lipids and the same contaminants analyzed for in sediment and soil.

Further details regarding sample collection, testing, and analysis are provided in the Quality Assurance Project Plan (QAPP) (E & E 2015b). Appendices I and J of the BERA include the bioaccumulation testing reports for *Lumbriculus* and earthworms, respectively, from EnviroSystems, Inc.

BSAFs for Metals

BSAFs for metals were calculated as follows:

$$BSAF = C_b/C_s$$

Where:
C_b = contaminant concentration in biota (mg/kg dry weight)
C_s = contaminant concentration in sediment/soil (mg/kg dry weight)

The metals data and BSAFs for sediment are presented in Table C-1. The metals data and BSAFs for surface soil are presented in Table C-3.

BSAFs for Organic Contaminants

BSAFs for organic contaminants were calculated from organic-contaminant and TOC data for sediment/soil and organic-contaminant and lipid data for biota. The following equation from EPA (2009) was used:

$$BSAF = (C_b/f_l)/(C_s/f_{soc}) = C_l/C_{soc}$$

Where:
C_b = contaminant concentration in biota (µg/g dry weight);
f_l = lipid fraction of organism (g lipid/g dry weight);
C_s = contaminant concentration in sediment/soil (µg/g dry weight);
f_{soc} = fraction organic carbon in sediment/soil (g organic carbon/g dry weight);
C_l = contaminant concentration in biota on a lipid basis (µg/g lipid); and
C_{soc} = contaminant concentration in sediment/soil on an organic carbon basis (µg/g organic carbon).

Tables C-2 and C-4 present the organic-contaminant BSAFs for sediment and soil, respectively, and data used to calculate them.

Bioaccumulation Equations

Regression analyses of the sediment or soil and biota data were performed for each chemical and data set combination. Data were evaluated graphically and considered to be best fit by a power model. This is consistent with evaluations reported elsewhere (Bechtel Jacobs 1998). The power model of the form

$$y = a(x)^b$$

was linearized for the regression analyses by log-transforming the sediment or soil and biota concentrations. The transformed model is:

$$\log(y) = a + b \log(x)$$

Where:
y = contaminant concentration in biota (mg/kg dry weight for metals; mg/kg lipid for organic contaminants);
x = contaminant concentration in sediment or soil (mg/kg dry weight for metals; mg/kg organic carbon for organic contaminants);
a = log-transformed y-intercept; and
b = slope.

Table C-5 summarizes the results of the regression analysis of the log-transformed sediment and *Lumbriculus* contaminant data. Table C-6 summarizes the results of the regression analysis of the log-transformed surface soil and earthworm contaminant data.

BSAFs and Bioaccumulation Equations Selected for Use in the BERA

For a given contaminant, the bioaccumulation equation was used in the BERA if the relationship between the contaminant level in sediment and *Lumbriculus*, or soil and earthworms, was significant ($p < 0.1$) and positive. If not, the geometric mean BSAF was used.

No significant relationships were found between contaminant concentrations in sediment and *Lumbriculus* (see Table C-5 and Figures C-1a to C-1n). Hence, for contaminants in sediment, the geometric mean BSAFs from Tables C-1 and C-2 were used in the BERA.

A significant positive relationship was found between contaminant levels in surface soil and earthworms for antimony, cadmium, copper, lead, zinc, total PCBs, and high molecular weight PAHs (see Table C-6 and Figures C-2a to m); therefore, the bioaccumulation equations for these contaminants were used in the BERA. For thallium, low-molecular weight PAHs, ΣDDT, beta- hexachlorocyclohexane (BHC), dieldrin, and endrin aldehyde, the geometric mean BSAFs from Tables C-3 and C-4 were used in the BERA.

Laboratory Control Samples

Clean control samples were tested concurrently with sediment and soil samples from the OU2 site. Test organisms exposed to control sediment and soil were separated from these media and analyzed for bioaccumulative contaminants. Control samples are tested for several reasons, including: (1) to provide a measure of test acceptability; (2) to provide evidence of the health and relative quality of the test organisms; (3) to determine the suitability of test conditions and organism handling procedures; and (4) to provide a basis for interpreting data obtained from test sediments and soils.

The levels of pesticides, high- and low-molecular weight PAHs, and total PCBs in *Lumbriculus* exposed to control sediment were less than the range observed in *Lumbriculus* exposed to OU2 site sediment (see Table C-7). This result suggests that there were no significant sources of inadvertent contamination during conduct of the *Lumbriculus* bioaccumulation tests.

Levels of high- and low-molecular weight PAHs in earthworms exposed to control soil were less than the range observed in earthworms exposed to OU2 site soil (see Table C-8). This result suggests that there were no significant sources of PAH contamination during conduct of the earthworm bioaccumulation tests. The total PCB concentration in earthworms exposed to laboratory control soil appeared elevated and fell within the range observed for earthworms exposed to

OU2 site soil (see Table C-8). One pesticide (dichlorodiphenyldichloroethene [DDE]) was detected in the laboratory control earthworm sample (see Table C-8). Without further investigation, it is uncertain whether the total PCBs and DDE in the laboratory control earthworm sample were due to the presence of these substances in the laboratory control soil sample to which the worms were exposed, or the result of inadvertent contamination during analysis. Nonetheless, the detection of PCBs in the control earthworm sample is not expected to have adversely affected the usefulness of the study results because a significant, positive relationship between PCBs in soil and earthworms was observed in this study, as would be expected (see Figure C-2g and Table C-6).

Comparison of Site-Specific and Literature-Based BSAFs

The OU2-specific soil-to-earthworm BSAFs for total PCBs and metals typically were less than literature-based BSAFs for these contaminants (see Table C-9). This also held true for the sediment-to-benthos BSAFs for metals; however, for total PCBs, the OU2-specific sediment-to-benthos BSAF was greater than the literature based value (see Table C-9). Overall, these comparisons suggest that metals and PCBs are less bioavailable at the OU2 site than would be expected based on literature, except for PCBs in sediment, which seem to be more available at the OU2 site than expected based on literature.

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Table C-1. BSAFs for Metals Based on Sediment and *Lumbriculus* Data from Eighteenmile Creek OU2.

Analyte	Sample	*Lumbriculus* Tissue Concentration (mg/kg wet)[a]	Percent Moisture (%)[a]	*Lumbriculus* Tissue Concentration (mg/kg dry)[a]	Sediment Concentration (mg/kg dry)[b]	Sample BSAF[c]	Geometric Mean BSAF
Antimony	OU2-SED04-Z1	0.027	90.0	0.270	*0.75*	*0.36*	*0.079*
	OU2-SED05-Z1	0.021	91.4	0.244	*0.42*	*0.58*	
	OU2-SED06-Z1	0.012	89.6	0.115	*0.85*	*0.14*	
	OU2-SED07-Z1	0.03	88.5	0.261	18.9	0.01	
	OU2-SED08-Z1	0.03	87.9	0.248	5.6	0.04	
	OU2-SED09-Z1	0.021	90.1	0.212	15.3	0.01	
Copper	OU2-SED04-Z1	10.6	90.0	106.000	130	0.82	0.517
	OU2-SED05-Z1	10.4	91.4	120.930	49.5	2.44	
	OU2-SED06-Z1	6.39	89.6	61.442	179	0.34	
	OU2-SED07-Z1	9.15	88.5	79.565	570	0.14	
	OU2-SED08-Z1	15.9	87.9	131.405	376	0.35	
	OU2-SED09-Z1	7.77	90.1	78.485	137	0.57	
Lead	OU2-SED04-Z1	2.29	90.0	22.900	194	0.12	0.067
	OU2-SED05-Z1	2.10	91.4	24.419	58.7	0.42	
	OU2-SED06-Z1	2.54	89.6	24.423	333	0.07	
	OU2-SED07-Z1	2.64	88.5	22.957	792	0.03	
	OU2-SED08-Z1	2.60	87.9	21.488	399	0.05	
	OU2-SED09-Z1	1.14	90.1	11.515	715	0.02	
Mercury	OU2-SED04-Z1	0.0068	90.0	0.068	0.48	0.14	0.076
	OU2-SED05-Z1	0.005	91.4	0.058	0.062	0.94	
	OU2-SED06-Z1	0.0042	89.6	0.040	0.91	0.04	
	OU2-SED07-Z1	0.0086	88.5	0.075	6.2	0.01	
	OU2-SED08-Z1	0.01	87.9	0.099	1.9	0.05	
	OU2-SED09-Z1	0.0066	90.1	0.067	1.3	0.05	
Selenium	OU2-SED04-Z1	0.557	90.0	5.570	*1.9*	*2.93*	*3.044*
	OU2-SED05-Z1	0.523	91.4	6.081	*1.05*	*5.79*	
	OU2-SED06-Z1	0.633	89.6	6.087	*2.15*	*2.83*	
	OU2-SED07-Z1	0.576	88.5	5.009	*1.65*	*3.04*	
	OU2-SED08-Z1	0.597	87.9	4.934	*2.2*	*2.24*	
	OU2-SED09-Z1	0.542	90.1	5.475	*2.25*	*2.43*	
Thallium	OU2-SED04-Z1	0.026	90.0	0.260	0.2	1.30	*0.561*
	OU2-SED05-Z1	*0.01*	*91.4*	*0.116*	0.41	*0.28*	
	OU2-SED06-Z1	*0.01*	*89.6*	*0.096*	0.17	*0.57*	
	OU2-SED07-Z1	*0.01*	*88.5*	*0.087*	0.15	*0.58*	
	OU2-SED08-Z1	*0.01*	*87.9*	*0.083*	0.18	*0.46*	
	OU2-SED09-Z1	*0.01*	*90.1*	*0.101*	0.18	*0.56*	

Key:
BSAF = biota sediment accumulation factor
OU2 = Operable Unit 2

Notes:
a = *Lumbriculus* metals data from 28-day bioaccumulation test with OU2 sediment collected in January 2016.
b = Sediment metals data from OU2 sediment samples collected in January 2016.
c = BSAF = C_b/C_s; where C_b is chemical concentration in biota (mg/kg dry weight) and C_s is chemical concentration in sediment (mg/kg dry weight)
Orange Italics = Chemical was not detected. Listed value is, or was calculated from, one-half method detection limit.

Table C-2. BSAFs for Organic Contaminants Based on Sediment and *Lumbriculus* Data from Eighteenmile Creek OU2.

Analyte	Sample	*Lumbriculus* Tissue Concentration (µg/g wet)[a]	Percent Moisture (%)[a]	*Lumbriculus* Tissue Concentration (µg/g dry)[a]	Sediment Concentration (µg/g dry)[b]	Sediment TOC (g/g dry)[b]	*Lumbriculus* Lipid Content (g/g wet)[a]	*Lumbriculus* Lipid Content (g/g dry)[a]	Sample BSAF[c]	Geometric Mean BSAF
PCB, Total	OU2-SED04-Z1	0.109	88.7	0.96	*0.302*	0.076	0.0097	0.0858	*2.83*	*15.82*
	OU2-SED05-Z1	0.057	89.1	0.52	*0.176*	0.110	0.0100	0.0917	*3.57*	
	OU2-SED06-Z1	0.550	88.4	4.74	*0.356*	0.054	0.0100	0.0862	*8.35*	
	OU2-SED07-Z1	1.230	88.0	10.25	0.206	0.065	0.0097	0.0808	40.01	
	OU2-SED08-Z1	3.400	88.8	30.36	1.800	0.090	0.0110	0.0982	15.45	
	OU2-SED09-Z1	3.100	89.0	28.18	0.063	0.061	0.0100	0.0909	300.16	
Sum of HPAHs	OU2-SED04-Z1	0.9854	88.7	8.72	3.060	0.076	0.0097	0.0858	2.52	7.48
	OU2-SED05-Z1	0.6247	89.1	5.73	1.858	0.110	0.0100	0.0917	3.70	
	OU2-SED06-Z1	1.609	88.4	13.87	1.170	0.054	0.0100	0.0862	7.43	
	OU2-SED07-Z1	1.333	88.0	11.11	1.581	0.065	0.0097	0.0808	5.65	
	OU2-SED08-Z1	0.5938	88.8	5.30	0.210	0.090	0.0110	0.0982	23.14	
	OU2-SED09-Z1	0.72	89.0	6.57	0.228	0.061	0.0100	0.0909	19.34	
Sum of LPAHs	OU2-SED04-Z1	0.043	88.7	0.378	0.399	0.076	0.0097	0.0858	0.84	1.07
	OU2-SED05-Z1	0.032	89.1	0.293	0.302	0.110	0.0100	0.0917	1.16	
	OU2-SED06-Z1	0.066	88.4	0.572	0.110	0.054	0.0100	0.0862	3.25	
	OU2-SED07-Z1	0.080	88.0	0.667	0.250	0.065	0.0097	0.0808	2.14	
	OU2-SED08-Z1	0.026	88.8	0.231	0.088	0.090	0.0110	0.0982	2.41	
	OU2-SED09-Z1	0.024	89.0	0.221	*1.575*	0.061	0.0100	0.0909	*0.09*	
Σ DDT	OU2-SED04-Z1	0.0012	88.7	0.011	*0.0101*	0.076	0.0097	0.0858	*0.94*	*2.11*
	OU2-SED05-Z1	*0.0015*	*89.1*	*0.014*	*0.0059*	0.110	0.0100	0.0917	*2.82*	
	OU2-SED06-Z1	*0.0053*	*88.4*	*0.045*	*0.0117*	0.054	0.0100	0.0862	*2.42*	
	OU2-SED07-Z1	*0.0066*	*88.0*	*0.055*	*0.0095*	0.065	0.0097	0.0808	*4.64*	
	OU2-SED08-Z1	*0.0148*	*88.8*	*0.132*	*0.0123*	0.090	0.0110	0.0982	*9.81*	
	OU2-SED09-Z1	0.00064	89.0	0.006	*0.0131*	0.061	0.0100	0.0909	*0.30*	
Beta - BHC	OU2-SED04-Z1	*0.0005*	*88.7*	*0.0044*	*0.0018*	0.076	0.0097	0.0858	*2.24*	*2.12*
	OU2-SED05-Z1	*0.0005*	*89.1*	*0.0046*	*0.0010*	0.110	0.0100	0.0917	*5.50*	
	OU2-SED06-Z1	*0.0005*	*88.4*	*0.0043*	*0.0020*	0.054	0.0100	0.0862	*1.35*	
	OU2-SED07-Z1	*0.0005*	*88.0*	*0.0042*	*0.0016*	0.065	0.0097	0.0808	*2.09*	
	OU2-SED08-Z1	*0.0005*	*88.8*	*0.0045*	*0.0021*	0.090	0.0110	0.0982	*1.95*	
	OU2-SED09-Z1	*0.0005*	*89.0*	*0.0045*	*0.0023*	0.061	0.0100	0.0909	*1.36*	
Dieldrin	OU2-SED04-Z1	*0.0005*	*88.7*	*0.0044*	*0.0034*	0.076	0.0097	0.0858	*1.17*	*4.19*
	OU2-SED05-Z1	*0.0005*	*89.1*	*0.0046*	*0.0020*	0.110	0.0100	0.0917	*2.82*	
	OU2-SED06-Z1	*0.00145*	*88.4*	*0.0125*	*0.0039*	0.054	0.0100	0.0862	*2.01*	
	OU2-SED07-Z1	*0.0021*	*88.0*	*0.0175*	*0.0032*	0.065	0.0097	0.0808	*4.47*	
	OU2-SED08-Z1	*0.0100*	*88.8*	*0.0893*	*0.0041*	0.090	0.0110	0.0982	*19.96*	
	OU2-SED09-Z1	*0.0065*	*89.0*	*0.0591*	*0.0044*	0.061	0.0100	0.0909	*9.11*	
Endrin aldehyde	OU2-SED04-Z1	*0.0005*	*88.7*	*0.0044*	*0.0034*	0.076	0.0097	0.0858	*1.17*	*1.09*
	OU2-SED05-Z1	*0.0005*	*89.1*	*0.0046*	*0.0020*	0.110	0.0100	0.0917	*2.82*	
	OU2-SED06-Z1	*0.0005*	*88.4*	*0.0043*	*0.0039*	0.054	0.0100	0.0862	*0.69*	
	OU2-SED07-Z1	*0.0005*	*88.0*	*0.0042*	*0.0032*	0.065	0.0097	0.0808	*1.06*	
	OU2-SED08-Z1	*0.0005*	*88.8*	*0.0045*	*0.0041*	0.090	0.0110	0.0982	*1.00*	
	OU2-SED09-Z1	*0.0005*	*89.0*	*0.0045*	*0.0044*	0.061	0.0100	0.0909	*0.70*	

Table C-2. BSAFs for Organic Contaminants Based on Sediment and *Lumbriculus* Data from Eighteenmile Creek OU2.

Analyte	Sample	*Lumbriculus* Tissue Concentration (µg/g wet)[a]	Percent Moisture (%)[a]	*Lumbriculus* Tissue Concentration (µg/g dry)[a]	Sediment Concentration (µg/g dry)[b]	Sediment TOC (g/g dry)[b]	*Lumbriculus* Lipid Content (g/g wet)[a]	*Lumbriculus* Lipid Content (g/g dry)[a]	Sample BSAF[c]	Geometric Mean BSAF
Endrin ketone	OU2-SED04-Z1	*0.00115*	*88.7*	*0.0102*	*0.0034*	0.076	0.0097	0.0858	*2.69*	*2.45*
	OU2-SED05-Z1	*0.0005*	*89.1*	*0.0046*	*0.0020*	0.110	0.0100	0.0917	*2.82*	
	OU2-SED06-Z1	*0.0009*	*88.4*	*0.0078*	*0.0039*	0.054	0.0100	0.0862	*1.25*	
	OU2-SED07-Z1	*0.0013*	*88.0*	*0.0108*	*0.0032*	0.065	0.0097	0.0808	*2.77*	
	OU2-SED08-Z1	*0.00205*	*88.8*	*0.0183*	*0.0041*	0.090	0.0110	0.0982	*4.09*	
	OU2-SED09-Z1	*0.00145*	*89.0*	*0.0132*	*0.0044*	0.061	0.0100	0.0909	*2.03*	

Key:
BSAF = biota sediment accumulation factor
HPAHs = high molecular weight PAHs
LPAHs = low molecular weight PAHs
OU2 = Operable Unit 2
TOC = total organic carbon

Notes:
a = *Lumbriculus* organics and lipid data from 28-day bioaccumulation test with OU2 sediment collected in January 2016.
b = Sediment organics and TOC data from OU2 sediment samples collected in January 2016.
c = BSAF = $(C_b/f_l)/(C_s/f_{soc})$; where C_b is chemical concentration in biota (µg/g dry), C_s is chemical concentration in sediment (µg/g dry), f_L is biota lipid content (g/g dry), and F_{soc} is sediment TOC (g/g dry).
Orange Italics = Chemical was not detected. Listed value is, or was calculated from, one-half method detection limit.

Table C-3. BSAFs for Metals Based on Surface Soil and Earthworm Data from Eighteenmile Creek OU2.

Analyte	Sample	Earthworm Tissue Concentration (mg/kg wet)[a]	Percent Moisture (%)[a]	Earthworm Tissue Concentration (mg/kg dry)[a]	Soil Concentration (mg/kg dry)[b]	Sample BSAF[c]	Geometric Mean BSAF
Antimony	OU2-SS15-Z1	0.028	81.1	0.148	1.6	0.093	0.054
	OU2-SS16-Z1	0.017	81.7	0.093	1.4	0.066	
	OU2-SS17-Z1	0.134	82.6	0.770	110	0.007	
	OU2-SS18-Z1	0.008	82.5	0.046	*0.6*	*0.076*	
	OU2-SS19-Z1	0.005	81.8	0.027	*0.455*	*0.060*	
	OU2-SS20-Z1	0.07	81.8	0.385	9.6	0.040	
	OU2-SS21-Z1	0.024	81.1	0.127	1.5	0.085	
	OU2-SS22-Z1	0.012	82.9	0.070	*0.475*	*0.148*	
	OU2-SS23-Z1	0.016	81.5	0.086	2.4	0.036	
	OU2-SS24-Z1	0.925	79.3	4.469	75.5	0.059	
Cadmium	OU2-SS15-Z1	0.381	81.1	2.016	0.57	3.537	1.769
	OU2-SS16-Z1	0.742	81.7	4.055	1.7	2.385	
	OU2-SS17-Z1	0.452	82.6	2.598	35.4	0.073	
	OU2-SS18-Z1	0.411	82.5	2.349	0.48	4.893	
	OU2-SS19-Z1	0.297	81.8	1.632	0.48	3.400	
	OU2-SS20-Z1	0.608	81.8	3.341	1.7	1.965	
	OU2-SS21-Z1	0.572	81.1	3.026	0.96	3.153	
	OU2-SS22-Z1	0.392	82.9	2.292	0.6	3.821	
	OU2-SS23-Z1	0.479	81.5	2.589	0.82	3.158	
	OU2-SS24-Z1	1.19	79.3	5.749	14.7	0.391	
Copper	OU2-SS15-Z1	2.66	81.1	14.07	59	0.239	0.112
	OU2-SS16-Z1	3.69	81.7	20.16	144	0.140	
	OU2-SS17-Z1	23	82.6	132.18	8250	0.016	
	OU2-SS18-Z1	1.93	82.5	11.03	34.4	0.321	
	OU2-SS19-Z1	2.42	81.8	13.30	67	0.198	
	OU2-SS20-Z1	4.24	81.8	23.30	197	0.118	
	OU2-SS21-Z1	3.91	81.1	20.69	120	0.172	
	OU2-SS22-Z1	2.39	82.9	13.98	56	0.250	
	OU2-SS23-Z1	2.82	81.5	15.24	97.2	0.157	
	OU2-SS24-Z1	18.3	79.3	88.41	7410	0.012	
Lead	OU2-SS15-Z1	2.37	81.1	12.54	165	0.076	0.043
	OU2-SS16-Z1	1.01	81.7	5.52	123	0.045	
	OU2-SS17-Z1	4.66	82.6	26.78	2480	0.011	
	OU2-SS18-Z1	0.327	82.5	1.87	30.5	0.061	
	OU2-SS19-Z1	0.527	81.8	2.90	152	0.019	
	OU2-SS20-Z1	12	81.8	65.93	386	0.171	
	OU2-SS21-Z1	2.54	81.1	13.44	335	0.040	
	OU2-SS22-Z1	1.19	82.9	6.96	169	0.041	
	OU2-SS23-Z1	0.856	81.5	4.63	210	0.022	
	OU2-SS24-Z1	34.8	79.3	168.12	2080	0.081	
Thallium	OU2-SS15-Z1	0.059	81.1	0.312	0.3	1.041	*0.763*
	OU2-SS16-Z1	0.032	81.7	0.175	0.14	1.249	
	OU2-SS17-Z1	0.021	82.6	0.121	*0.355*	*0.340*	
	OU2-SS18-Z1	0.041	82.5	0.234	*0.3*	*0.781*	
	OU2-SS19-Z1	0.02	81.8	0.110	*0.225*	*0.488*	
	OU2-SS20-Z1	0.147	81.8	0.808	*0.295*	*2.738*	
	OU2-SS21-Z1	0.031	81.1	0.164	*0.26*	*0.631*	
	OU2-SS22-Z1	*0.01*	*82.9*	*0.058*	*0.235*	*0.249*	
	OU2-SS23-Z1	0.024	81.5	0.130	*0.25*	*0.519*	
	OU2-SS24-Z1	0.11	79.3	0.531	*0.3*	*1.771*	

Table C-3. BSAFs for Metals Based on Surface Soil and Earthworm Data from Eighteenmile Creek OU2.

Analyte	Sample	Earthworm Tissue Concentration (mg/kg wet)[a]	Percent Moisture (%)[a]	Earthworm Tissue Concentration (mg/kg dry)[a]	Soil Concentration (mg/kg dry)[b]	Sample BSAF[c]	Geometric Mean BSAF
Zinc	OU2-SS15-Z1	20.1	81.1	106.3	126	0.844	0.324
	OU2-SS16-Z1	20.5	81.7	112.0	381	0.294	
	OU2-SS17-Z1	29.4	82.6	169.0	9030	0.019	
	OU2-SS18-Z1	17.4	82.5	99.4	89.2	1.115	
	OU2-SS19-Z1	17.6	81.8	96.7	174	0.556	
	OU2-SS20-Z1	21.4	81.8	117.6	320	0.367	
	OU2-SS21-Z1	20.4	81.1	107.9	237	0.455	
	OU2-SS22-Z1	17.6	82.9	102.9	132	0.780	
	OU2-SS23-Z1	17.9	81.5	96.8	204	0.474	
	OU2-SS24-Z1	55.8	79.3	269.6	3730	0.072	

Key:
BSAF = biota soil accumulation factor
OU2 = Operable Unit 2

Notes:
a = Earthworm metals data from bioaacummulation tests with OU2 soil collected in January 2016.
b = Soil metals data from OU2 surface soil samples collected in January 2016.
c = BSAF = C_b/C_s; where C_b is chemical concentration in biota (mg/kg dry weight) and C_s is chemical concentration in soil (mg/kg dry weight)
Orange Italics = Chemical was not detected. Listed value is, or was calculated from, one-half method detection limit.

Table C-4. BSAFs for Organic Contaminants Based on Surface Soil and Earthworm Data from Eighteen Mile Creek OU2.

Analyte	Sample	Earthworm Tissue Concentration (µg/g wet)[a]	Percent Moisture (%)[a]	Earthworm Tissue Concentration (µg/g dry)[a]	Soil Concentration (µg/g dry)[b]	Soil TOC (g/g dry)[b]	Earthworm Lipid Content (g/g wet)[a]	Earthworm Lipid Content (g/g dry)[a]	Sample BSAF[c]	Geometric Mean BSAF
PCB, Total	OU2-SS15-Z1	0.0146	82.7	0.084	*0.225*	0.096	0.020	0.116	*0.31*	*1.30*
	OU2-SS16-Z1	0.0669	83.3	0.401	0.033	0.096	0.020	0.120	9.73	
	OU2-SS17-Z1	2.52	83.2	15.00	4.300	0.170	0.020	0.119	4.98	
	OU2-SS18-Z1	0.0078	83.4	0.047	*0.239*	0.290	0.018	0.108	*0.53*	
	OU2-SS19-Z1	0.0092	84.2	0.058	*0.180*	0.040	0.017	0.108	*0.12*	
	OU2-SS20-Z1	8.90	82.7	51.45	38.000	0.360	0.020	0.116	4.22	
	OU2-SS21-Z1	0.013	82.8	0.074	*0.221*	0.083	0.019	0.110	*0.25*	
	OU2-SS22-Z1	0.029	84.5	0.189	*0.194*	0.081	0.017	0.110	*0.72*	
	OU2-SS23-Z1	0.047	83.8	0.290	*0.203*	0.100	0.018	0.111	*1.29*	
	OU2-SS24-Z1	0.82	81.4	4.409	0.400	0.140	0.019	0.102	15.11	
Sum of HPAHs	OU2-SS15-Z1	0.08511	82.7	0.49	2.107	0.096	0.020	0.116	0.19	0.45
	OU2-SS16-Z1	4.024	83.3	24.10	43.380	0.096	0.020	0.120	0.45	
	OU2-SS17-Z1	0.03989	83.2	0.237	6.510	0.170	0.020	0.119	0.05	
	OU2-SS18-Z1	0.0227	83.4	0.137	0.122	0.290	0.018	0.108	3.00	
	OU2-SS19-Z1	0.1927	84.2	1.220	1.470	0.040	0.017	0.108	0.31	
	OU2-SS20-Z1	0.906	82.7	5.237	74.200	0.360	0.020	0.116	0.22	
	OU2-SS21-Z1	0.990	82.8	5.756	0.536	0.083	0.019	0.110	8.07	
	OU2-SS22-Z1	0.212	84.5	1.370	3.610	0.081	0.017	0.110	0.28	
	OU2-SS23-Z1	0.062	83.8	0.381	3.040	0.100	0.018	0.111	0.11	
	OU2-SS24-Z1	0.297	81.4	1.597	1.363	0.140	0.019	0.102	1.61	
Sum of LPAHs	OU2-SS15-Z1	0.0127	82.7	0.073	0.491	0.096	0.020	0.116	0.12	0.26
	OU2-SS16-Z1	0.1040	83.3	0.623	6.840	0.096	0.020	0.120	0.07	
	OU2-SS17-Z1	0.0042	83.2	0.025	2.360	0.170	0.020	0.119	0.02	
	OU2-SS18-Z1	0.0039	83.4	0.023	0.056	0.290	0.018	0.108	1.11	
	OU2-SS19-Z1	0.0155	84.2	0.098	0.170	0.040	0.017	0.108	0.21	
	OU2-SS20-Z1	0.1530	82.7	0.884	26.320	0.360	0.020	0.116	0.10	
	OU2-SS21-Z1	0.3970	82.8	2.308	0.063	0.083	0.019	0.110	27.53	
	OU2-SS22-Z1	0.0247	84.5	0.159	0.813	0.081	0.017	0.110	0.14	
	OU2-SS23-Z1	0.0036	83.8	0.022	0.490	0.100	0.018	0.111	0.04	
	OU2-SS24-Z1	0.0180	81.4	0.097	0.061	0.140	0.019	0.102	2.17	
Σ DDT	OU2-SS15-Z1	0.0154	82.7	0.089	0.0038	0.096	0.020	0.116	19.50	*7.07*
	OU2-SS16-Z1	0.0028	83.3	0.017	*0.0065*	0.096	0.020	0.120	*2.08*	
	OU2-SS17-Z1	*0.0342*	*83.2*	*0.204*	*0.0095*	0.170	0.020	0.119	*30.76*	
	OU2-SS18-Z1	0.0008	83.4	0.005	*0.0080*	0.290	0.018	0.108	*1.58*	
	OU2-SS19-Z1	0.0014	84.2	0.009	0.0012	0.040	0.017	0.108	2.75	
	OU2-SS20-Z1	*0.0405*	*82.7*	*0.234*	*0.0081*	0.360	0.020	0.116	*90.10*	
	OU2-SS21-Z1	0.0188	82.8	0.109	*0.0074*	0.083	0.019	0.110	*11.17*	
	OU2-SS22-Z1	0.0055	84.5	0.035	*0.0065*	0.081	0.017	0.110	*4.06*	
	OU2-SS23-Z1	0.0096	83.8	0.059	*0.0068*	0.100	0.018	0.111	*7.90*	
	OU2-SS24-Z1	0.0150	81.4	0.081	0.0623	0.140	0.019	0.102	1.77	
Beta - BHC	OU2-SS15-Z1	*0.00090*	*82.7*	*0.0052*	*0.0013*	0.096	0.020	0.116	*3.32*	*5.21*
	OU2-SS16-Z1	*0.00050*	*83.3*	*0.0030*	*0.0011*	0.096	0.020	0.120	*2.18*	
	OU2-SS17-Z1	*0.00600*	*83.2*	*0.0357*	*0.0016*	0.170	0.020	0.119	*31.88*	
	OU2-SS18-Z1	*0.00095*	*83.4*	*0.0057*	*0.0014*	0.290	0.018	0.108	*11.34*	
	OU2-SS19-Z1	*0.00065*	*84.2*	*0.0041*	*0.0010*	0.040	0.017	0.108	*1.53*	
	OU2-SS20-Z1	*0.0006*	*82.7*	*0.0035*	*0.0014*	0.360	0.020	0.116	*7.71*	
	OU2-SS21-Z1	*0.00065*	*82.8*	*0.0038*	*0.0013*	0.083	0.019	0.110	*2.27*	
	OU2-SS22-Z1	*0.00085*	*84.5*	*0.0055*	*0.0011*	0.081	0.017	0.110	*3.68*	
	OU2-SS23-Z1	*0.0005*	*83.8*	*0.0031*	*0.0012*	0.100	0.018	0.111	*2.42*	
	OU2-SS24-Z1	*0.0045*	*81.4*	*0.0242*	*0.0014*	0.140	0.019	0.102	*23.68*	

Table C-4. BSAFs for Organic Contaminants Based on Surface Soil and Earthworm Data from Eighteen Mile Creek OU2.

Analyte	Sample	Earthworm Tissue Concentration (µg/g wet)[a]	Percent Moisture (%)[a]	Earthworm Tissue Concentration (µg/g dry)[a]	Soil Concentration (µg/g dry)[b]	Soil TOC (g/g dry)[b]	Earthworm Lipid Content (g/g wet)[a]	Earthworm Lipid Content (g/g dry)[a]	Sample BSAF[c]	Geometric Mean BSAF
Dieldrin	OU2-SS15-Z1	0.0034	82.7	0.0197	*0.0025*	0.096	0.020	0.116	*6.53*	*5.60*
	OU2-SS16-Z1	0.018	83.3	0.1078	*0.0022*	0.096	0.020	0.120	*40.19*	
	OU2-SS17-Z1	*0.011*	*83.2*	*0.0655*	*0.0032*	0.170	0.020	0.119	*29.68*	
	OU2-SS18-Z1	*0.0005*	*83.4*	*0.0030*	*0.0027*	0.290	0.018	0.108	*3.04*	
	OU2-SS19-Z1	*0.0005*	*84.2*	*0.0032*	*0.0020*	0.040	0.017	0.108	*0.59*	
	OU2-SS20-Z1	*0.026*	*82.7*	*0.1503*	*0.0027*	0.360	0.020	0.116	*173.33*	
	OU2-SS21-Z1	*0.0005*	*82.8*	*0.0029*	*0.0025*	0.083	0.019	0.110	*0.89*	
	OU2-SS22-Z1	0.00028	84.5	0.0018	*0.0022*	0.081	0.017	0.110	*0.62*	
	OU2-SS23-Z1	0.00094	83.8	0.0058	*0.0023*	0.100	0.018	0.111	*2.32*	
	OU2-SS24-Z1	*0.0036*	*81.4*	*0.0194*	*0.0027*	0.140	0.019	0.102	*9.82*	
Endrin aldehyde	OU2-SS15-Z1	*0.0005*	*82.7*	*0.0029*	*0.0025*	0.096	0.020	0.116	*0.96*	*2.66*
	OU2-SS16-Z1	*0.0006*	*83.3*	*0.0036*	*0.0022*	0.096	0.020	0.120	*1.34*	
	OU2-SS17-Z1	*0.0105*	*83.2*	*0.0625*	*0.0032*	0.170	0.020	0.119	*28.33*	
	OU2-SS18-Z1	*0.0005*	*83.4*	*0.0030*	*0.0027*	0.290	0.018	0.108	*3.04*	
	OU2-SS19-Z1	*0.0005*	*84.2*	*0.0032*	*0.0020*	0.040	0.017	0.108	*0.59*	
	OU2-SS20-Z1	*0.00205*	*82.7*	*0.0118*	*0.0027*	0.360	0.020	0.116	*13.67*	
	OU2-SS21-Z1	*0.0005*	*82.8*	*0.0029*	*0.0025*	0.083	0.019	0.110	*0.89*	
	OU2-SS22-Z1	*0.000495*	*84.5*	*0.0032*	*0.0022*	0.081	0.017	0.110	*1.10*	
	OU2-SS23-Z1	*0.0005*	*83.8*	*0.0031*	*0.0023*	0.100	0.018	0.111	*1.23*	
	OU2-SS24-Z1	*0.006*	*81.4*	*0.0323*	*0.0027*	0.140	0.019	0.102	*16.37*	

Key:
BSAF = biota soil accumulation factor
HPAHs = high molecular weight PAHs
LPAHs = low molecular weight PAHs
OU2 = Operable Unit 2
TOC = total organic carbon

Notes:
a = Earthworm metals and lipid data from bioaccumulation tests with OU2 soil collected in January 2016.
b = Soil metals and TOC data from OU2 surface soil samples collected in January 2016.
c = BSAF = $(C_b/f_l)/(C_s/f_{soc})$; where C_b is chemical concentration in biota (µg/g dry), C_s is chemical concentration in soil (µg/g dry), f_L is biota lipid content (g/g dry), and F_{soc} is soil TOC content (g/g dry).
Orange Italics = Chemical was not detected. Listed value is, or was calculated from, one-half method detection limit.

Table C-5. Summary Results for Regression Analyses of Log-Transformed Sediment and *Lumbriculus* Data, Eighteenmile Creek OU2 Site, Lockport, New York.

Analyte	N	FoD Sediment	FoD Biota	Range of x (Sediment Contaminant Level)		log-Transformed y-Intercept (a)	Slope (b)	Slope > Zero (p < 0.1)		R^2
				Minimum (mg/kg dry)	Maximum (mg/kg dry)			Yes/No?	p value	
Metals[a]										
Antimony	6	3/6	6/6	0.42	18.9	-0.6842	0.0470	No	0.6422	0.0592
Copper	6	6/6	6/6	49.5	570	2.1250	-0.0694	No	0.6982	0.0416
Lead	6	6/6	6/6	58.7	792	1.6876	-0.1497	No	0.3159	0.2470
Mercury	6	6/6	6/6	0.062	6.2	-1.1792	0.0721	No	0.4624	0.1415
Selenium	6	0/6	6/6	1.05	2.25	0.7715	-0.1188	No	0.4562	0.1451
Thallium	6	6/6	1/6	0.15	0.41	-0.7666	0.2581	No	0.6772	0.0478
PCBs[b]										
Total PCBs	6	3/6	6/6	0.063	1.80	1.5272	0.4273	No	0.6103	0.0708
PAHs[b]										
HPAHs	6	6/6	6/6	0.21	3.06	1.6626	0.2714	No	0.1217	0.4896
LPAHs	6	5/6	6/6	0.09	1.58	0.6485	-0.0718	No	0.7742	0.0230
Pesticides[b]										
ΣDDT	6	0/6	2/6	*0.0059*	*0.0131*	-0.3439	0.2284	No	0.8508	0.0100
beta-BHC	6	0/6	0/6	*0.0010*	*0.0023*	-1.3019	0.0010	No	0.9833	0.0001
Dieldrin	6	0/6	0/6	*0.0020*	*0.0044*	1.0614	1.3276	No	0.2548	0.3061
Endrin aldehyde	6	0/6	0/6	*0.0020*	*0.0044*	-1.3027	0.0006	No	0.9893	0.0453
Endrin Ketone	6	0/6	0/6	*0.0020*	*0.0044*	-0.1472	0.6000	No	0.1480	0.4447

Key:
FoD = frequency of detection
HPAHs = high molecular weight PAHs
LPAHs = low molecular weight PAHs
N = number of observations
OU2 = operable unit 2
PAHs = polycyclic aromatic hydrocarbons
PCBs = polychlorinated biphenyls

Note:

a. For metals, equation is log(y) = a + b[log(x)] , where y = concentration in biota (mg/kg dry weight) and x = concentration in soil (mg/kg dry weight), a = estimated intercept in log units, and b = estimated slope in log units.

b. For organic contaminants, equation is log(y) = a + b[log(x)] , where y = chemical concentration in biota (mg/kg lipid) and x = chemical concentration in soil (mg/kg organic carbon), a = estimated intercept in log units, and b = estimated slope in log units.

Orange Italics = Chemical was not detected. Listed value is one-half method detection limit.

Table C-6. Summary Results for Regression Analyses of Log-Transformed Surface Soil and Earthworm Data, Eighteenmile Creek OU2 Site, Lockport, New York.

Analyte	N	FoD Soil	FoD Biota	Range of x (Soil Contaminant Level)		log-Transformed y-Intercept (a)	Slope (b)	Slope > Zero (p < 0.1)		R^2
				Minimum (mg/kg dry)	Maximum (mg/kg dry)			Yes/No?	p value	
Metals[a]										
Antimony	10	7/10	10/10	0.455	110	-1.1196	0.6996	Yes	0.0001	0.8585
Cadmium	10	10/10	10/10	0.48	35.4	0.4174	0.1392	Yes	0.0808	0.3328
Copper	10	10/10	10/10	34.4	8250	0.3885	0.4232	Yes	0.0000	0.9848
Lead	10	10/10	10/10	30.5	2480	-1.0950	0.8885	Yes	0.0031	0.6864
Thallium	10	2/10	9/10	0.14	0.355	-0.1518	0.9418	No	0.3856	0.0952
Zinc	10	10/10	10/10	89.2	9030	1.6082	0.1843	Yes	0.0013	0.7448
PCBs[b]										
Total PCBs	10	4/10	10/10	*0.033*	38.0	0.0359	1.1455	Yes	0.0125	0.5620
PAHs[b]										
HPAHs	10	10/10	10/10	0.122	74.2	0.3333	0.5176	Yes	0.0551	0.3863
LPAHs	10	10/10	10/10	0.056	26.3	-0.0734	0.2255	No	0.4359	0.0775
Pesticides[b]										
ΣDDT	10	3/10	8/10	*0.0012*	*0.0623*	0.0826	0.3735	No	0.4945	0.0602
beta-BHC	10	0/10	0/10	*0.0010*	*0.0016*	-1.4956	-0.1170	No	0.8407	0.0054
Dieldrin	10	0/10	4/10	*0.0020*	*0.0032*	-3.1159	-1.2866	No	0.2025	0.1941
Endrin aldehyde	10	0/10	0/10	*0.0020*	*0.0032*	-2.3155	-0.6214	No	0.3999	0.0899

Key:

FoD = frequency of detection
HPAHs = high molecular weight PAHs
LPAHs = low molecular weight PAHs
N = number of observations
OU2 = operable unit 2
PAHs = polycyclic aromatic hydrocarbons
PCBs = polychlorinated biphenyls

Notes:

a. For metals, equation is log(y) = a + b[log(x)] , where y = concentration in biota (mg/kg dry weight) and x = concentration in soil (mg/kg dry weight), a = estimated intercept in log units, and b = estimated slope in log units.

b. For organic contaminants, equation is log(y) = a + b[log(x)] , where y = chemical concentration in biota (mg/kg lipid) and x = chemical concentration in soil (mg/kg organic carbon), a = estimated intercept in log units, and b = estimated slope in log units.

Orange Italics = Chemical was not detected. Listed value is one-half method detection limit.

Table C-7. Comparison of Contaminant Levels in Lumbriculus Exposed to Laboratory Control Sediment and Eighteenmile Creek OU2 Site Sediment.

Analyte	Lumbriculus Concentration (µg/kg)	
	Lab Control	Site Range
Pesticides	All ND	ΣDDT Detected
HPAHs (ND = 0)	23	594 - 1609
LPAHs (ND = 0)	11	24 - 80
Total PCBs (ND = 0)	29	57 - 3400

Key:

DDT = dichlorodiphenyltrichloroethane

HPAHs = high molecular weight PAHs

LPAHs = low molecular weight PAHs

ND = not detected

ND=0 = not detected compounds set equal to zero when calculating totals

OU2 = Operable unit 2

PAHs = polycyclic aromatic hydrocarbons

PCBs = polychlorinated biphenyls

Table C-8. Comparison of Contaminant Levels in Earthworms Exposed to Laboratory Control Soil and Eighteenmile Creek OU2 Site Soil.

Analyte	Earthworm Concentration (µg/kg wet)	
	Lab Control	Site Range
Pesticides	All ND except for DDE	Several Detected
HPAHs (ND = 0)	18.3	23 - 4024
LPAHs (ND = 0)	2.6	3.6 - 397
Total PCBs (ND = 0)	140	7.8 - 8900

Key:

DDE = dichlorodiphenyldichloroethylene

HPAHs = high molecular weight PAHs

LPAHs = low molecular weight PAHs

ND = not detected

ND=0 = not detected compounds set equal to zero when calculating totals

OU2 = Operable Unit 2

PAHs = polycyclic aromatic hydrocarbons

PCBs = polychlorinated biphenyls

Table C-9. Comparison of Literature-Based and Site-Specific BSAFs for Selected Contaminants in Surface Soil and Sediment.

Contaminant	Site-Specific BSAF[a] (geometric mean)	Literature-Based	
		BSAF	Source
Soil-to-Earthworm			
Total PCBs	*1.30*	10.67	Bechtel-Jacobs (1998b), median value
Cadmium	1.77	14.26	Bechtel-Jacobs (1998b), median value
Copper	0.11	0.64	Bechtel-Jacobs (1998b), median value
Lead	0.043	0.23	Bechtel-Jacobs (1998b), median value
Zinc	0.32	3.78	Bechtel-Jacobs (1998b), median value
Sediment-to-Benthos			
Total PCBs	*15.82*	4.67	Bechtel-Jacobs (1998a), median value
Copper	0.52	1.556	Bechtel-Jacobs (1998a), median value
Lead	0.067	0.071	Bechtel-Jacobs (1998a), median value
Mercury	0.076	1.136	Bechtel-Jacobs (1998a), median value

Key:

BSAF = biota soil (or sediment) accumulation factor
DDT = dichlorodiphenyltrichloroethane
HPAHs = high molecular weight PAHs
LPAHs = low molecular weight PAHs
PAHs = polycyclic aromatic hydrocarbons
PCBs = polychlorinated biphenyls

Notes:

a = Tables C-1 to C-4 this appendix.
Orange italics = Listed value was calculated from one-half method detection limit.
gray shading = greater value of pair (site-specific vs. literature based)

02:1003239.0009.03.34\Sediment and Lubriculus Scatterplots.ai-5/3/16-GRA

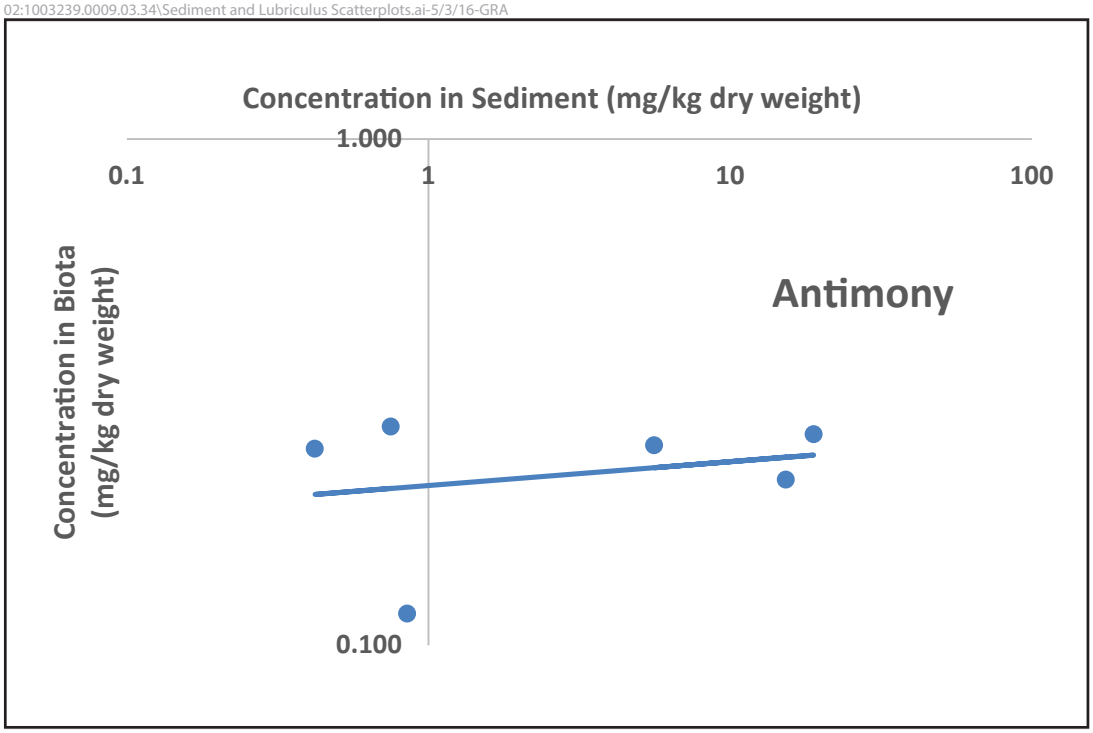

Figure C-1a Log-log scatterplot of antimony in sediment and *Lumbriculus* from 28-day bioaccumulation study

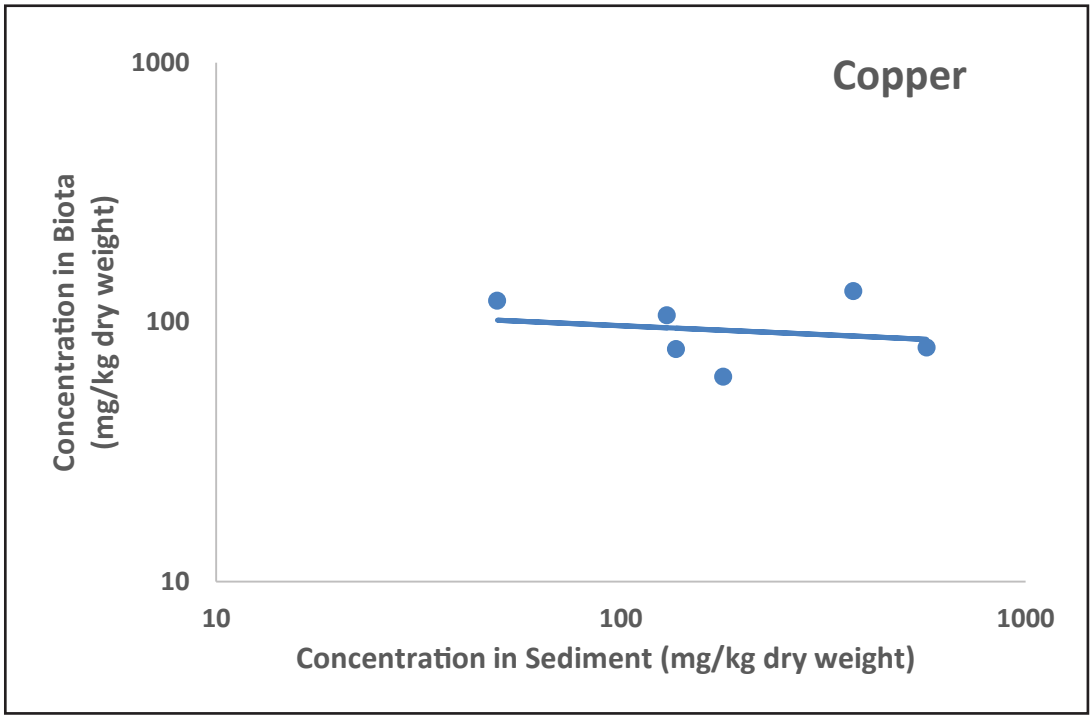

Figure C-1b Log-log scatterplot of copper in sediment and *Lumbriculus* from 28-day bioaccumulation study

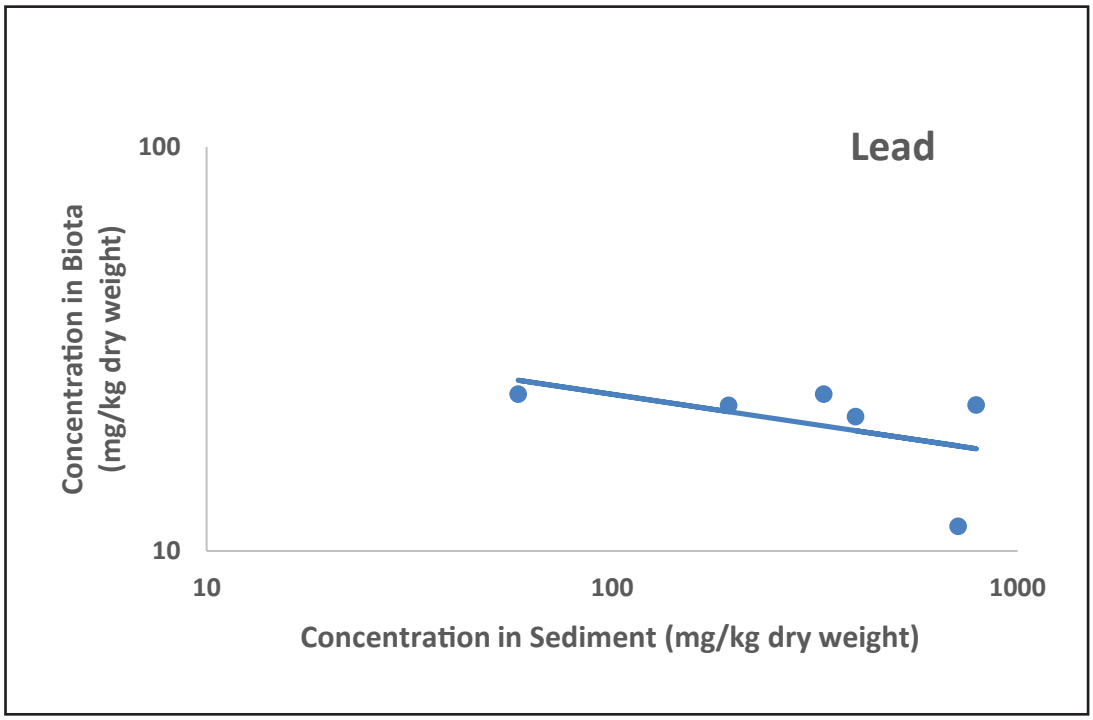

Figure C-1c Log-log scatterplot of lead in sediment and *Lumbriculus* from 28-day bioaccumulation study

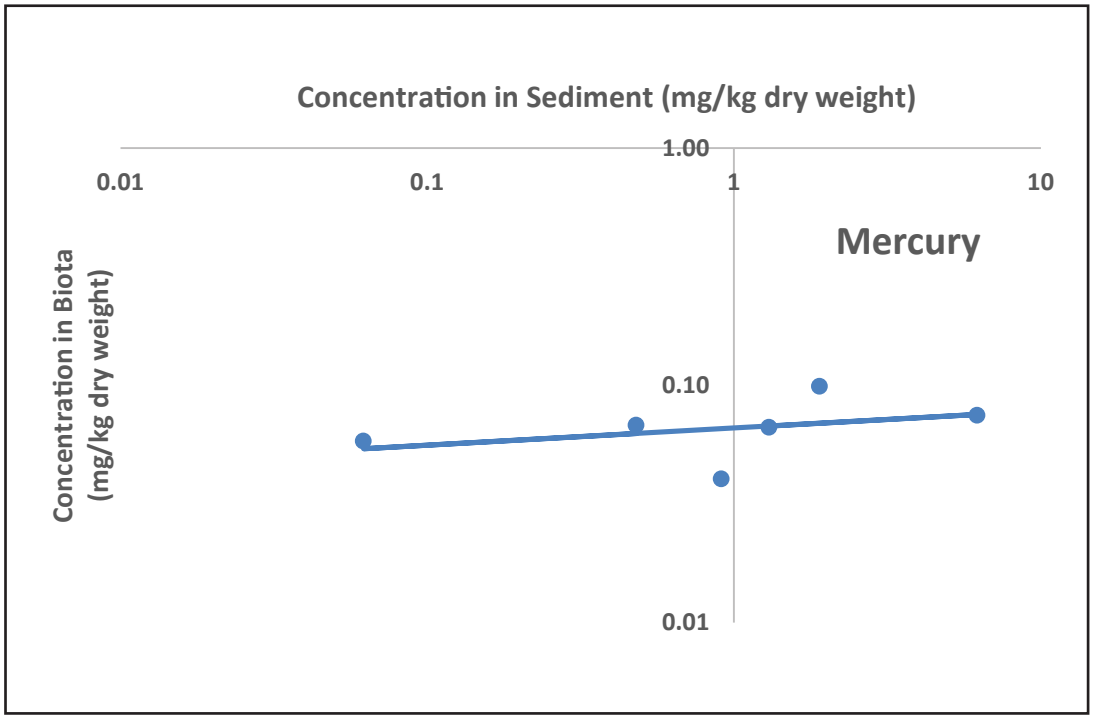

Figure C-1d Log-log scatterplot of mercury in sediment and *Lumbriculus* from 28-day bioaccumulation study

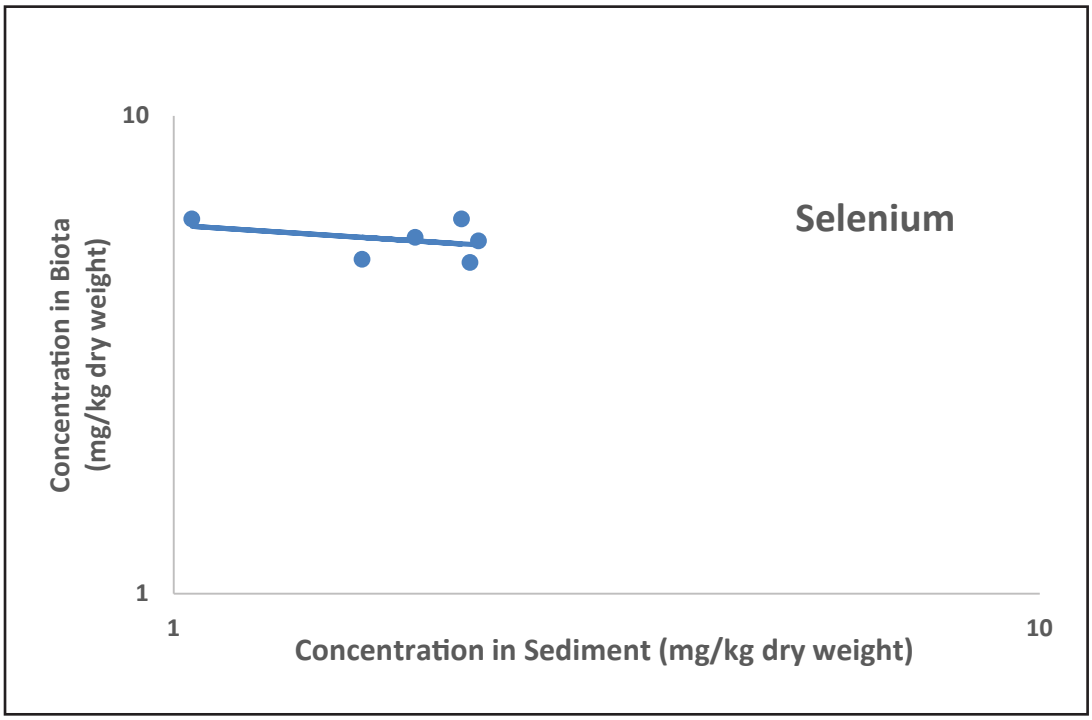

Figure C-1e Log-log scatterplot of selenium in sediment and *Lumbriculus* from 28-day bioaccumulation study

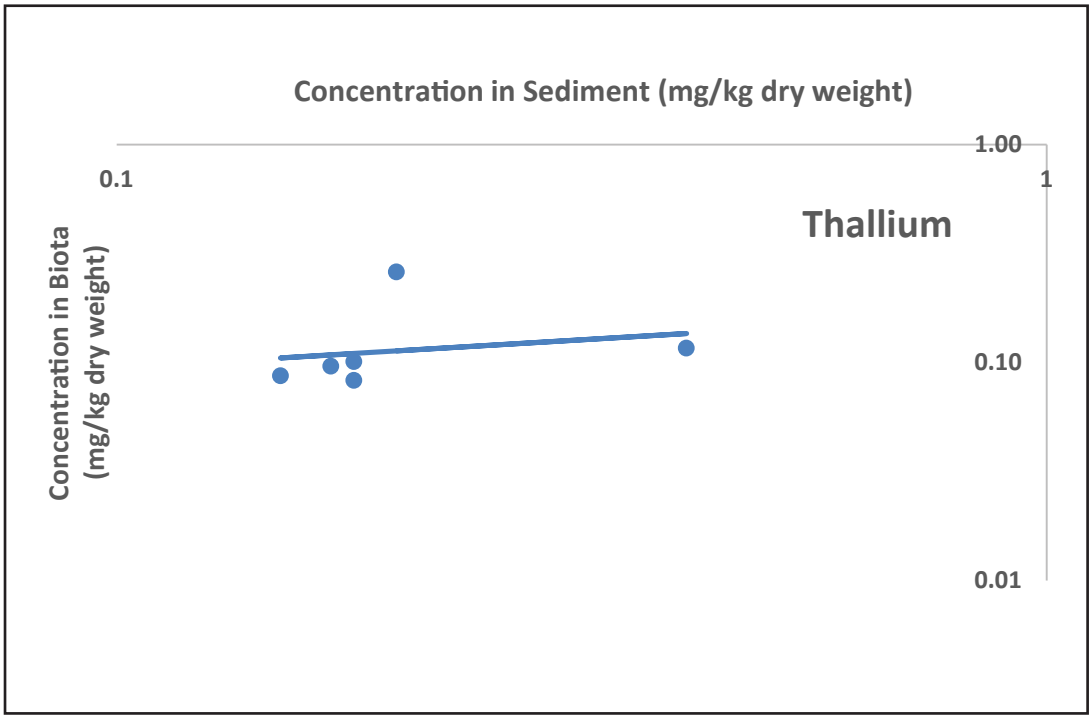

Figure C-1f Log-log scatterplot of thallium in sediment and *Lumbriculus* from 28-day bioaccumulation study

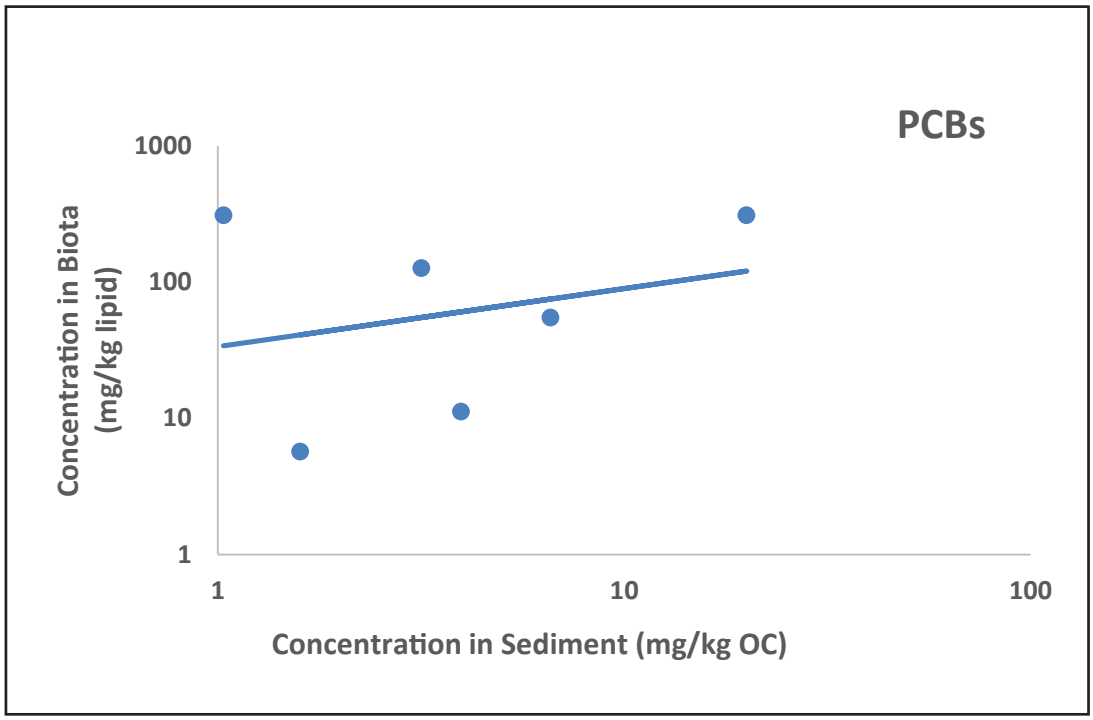

Figure C-1g Log-log scatterplot of total PCBs antimony in sediment and *Lumbriculus* from 28-day bioaccumulation study

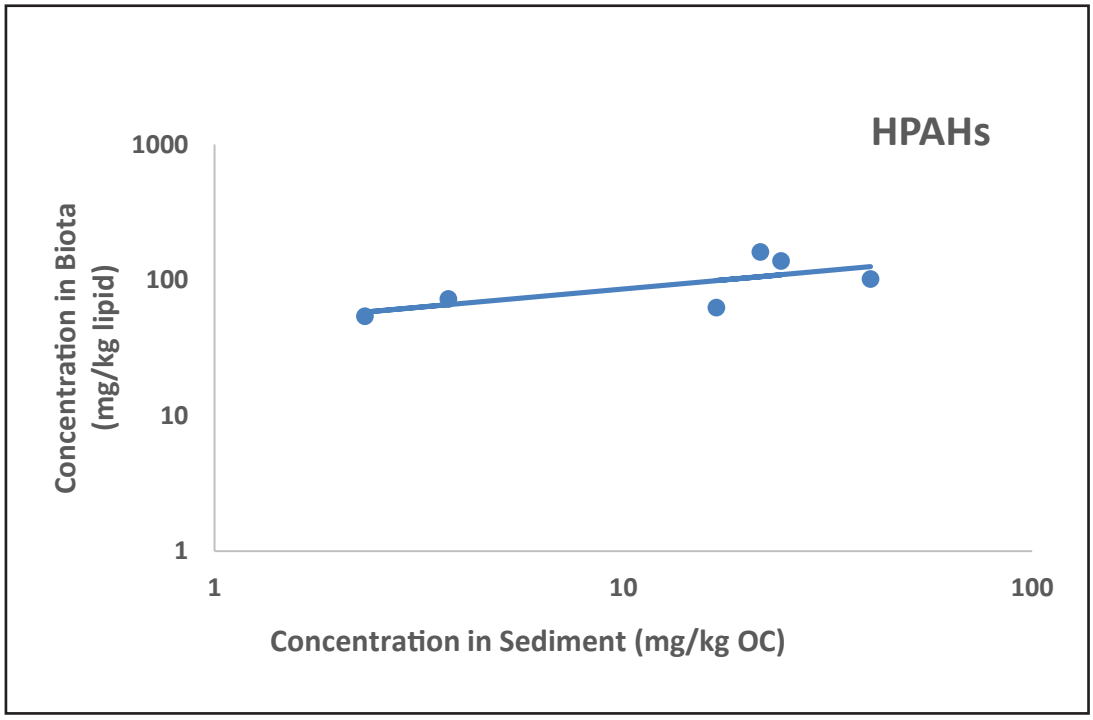

Figure C-1h Log-log scatterplot of high-molecular weight PAHs in sediment and *Lumbriculus* from 28-day bioaccumulation study

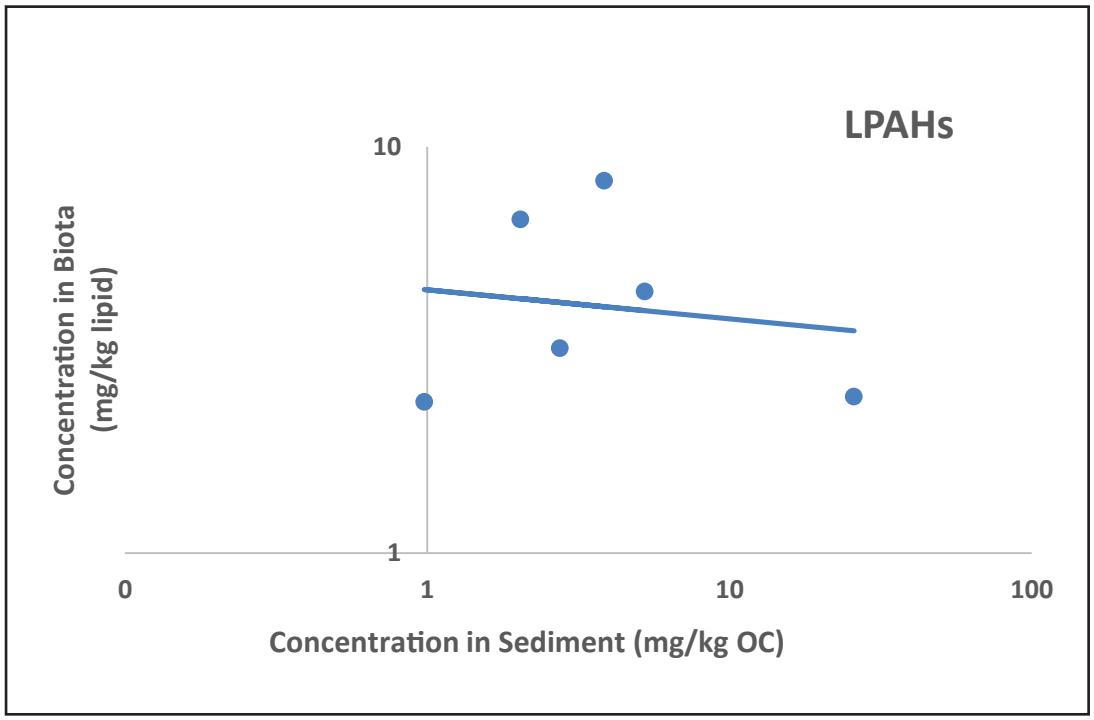

Figure C-1i Log-log scatterplot of low-molecular weight PAHs in sediment and *Lumbriculus* from 28-day bioaccumulation study

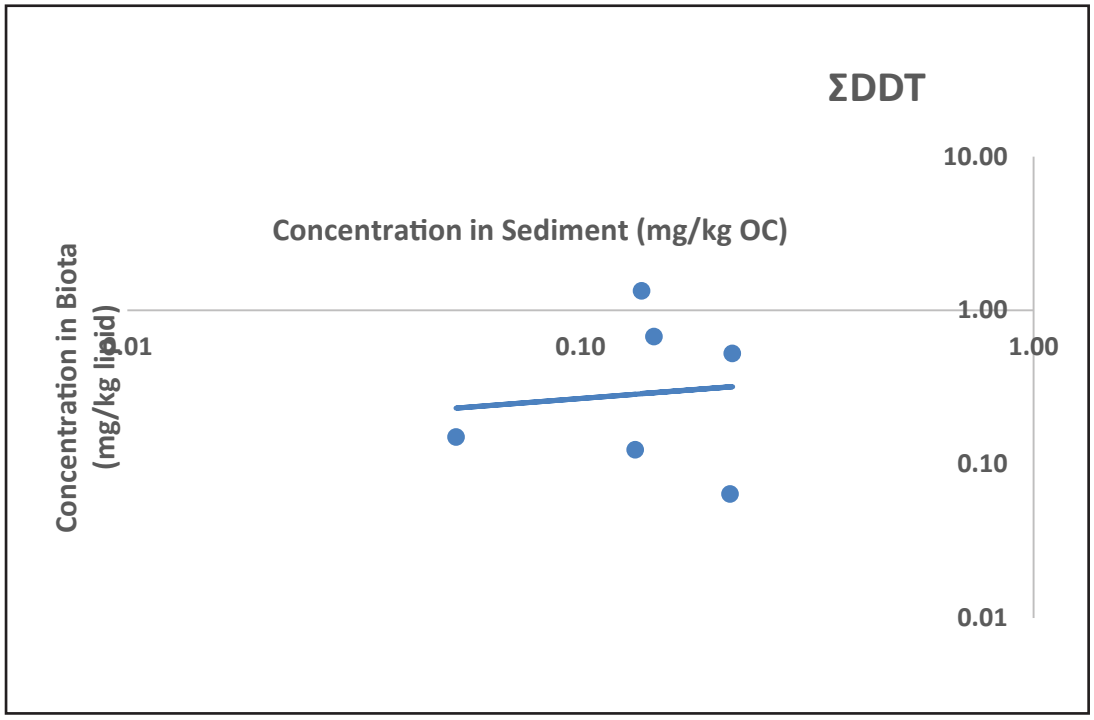

Figure C-1j Log-log scatterplot of ΣDDT in sediment and *Lumbriculus* from 28-day bioaccumulation study

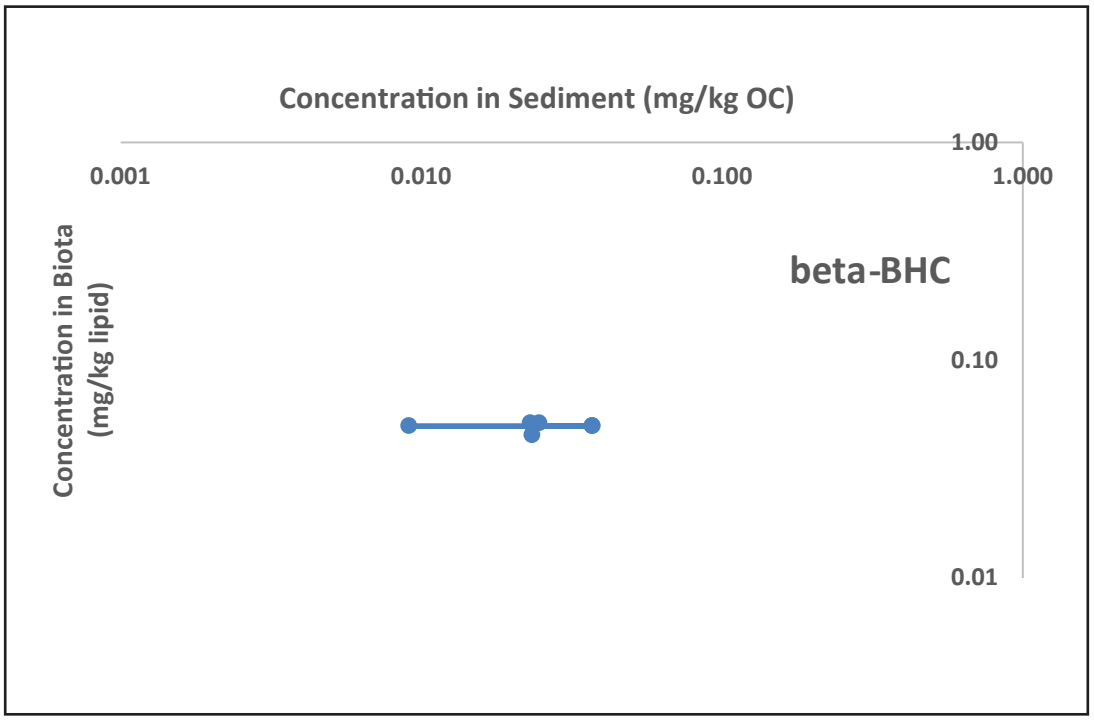

Figure C-1k Log-log scatterplot of beta-BHC in sediment and *Lumbriculus* from 28-day bioaccumulation study

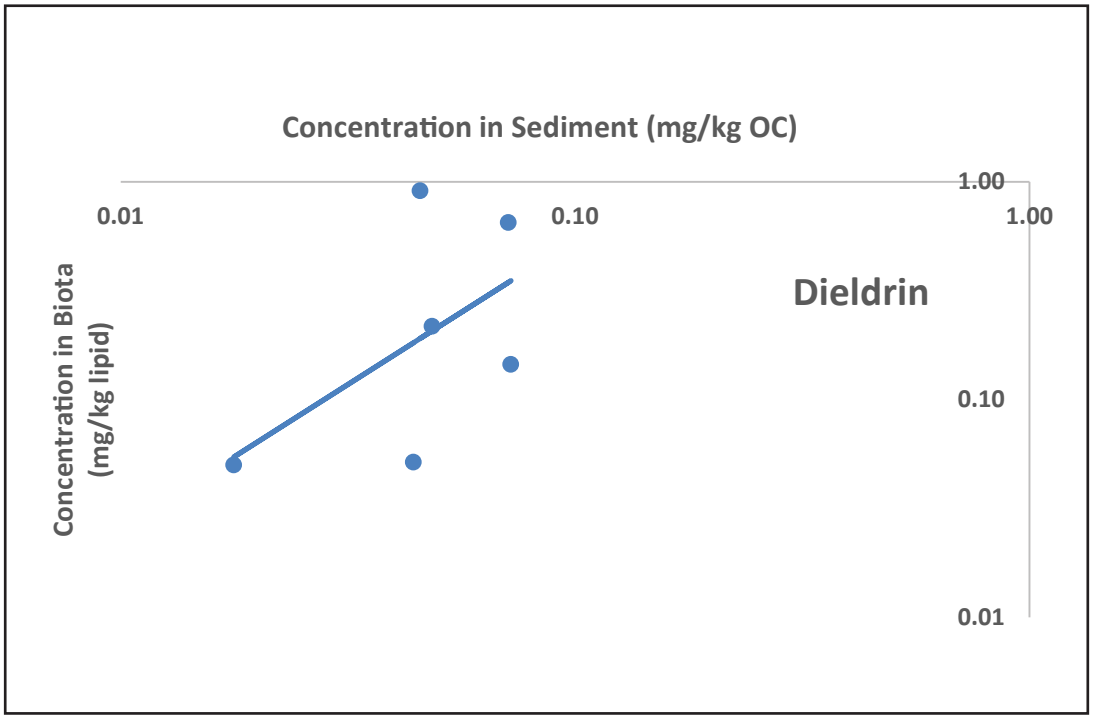

Figure C-1l Log-log scatterplot of dieldrin in sediment and *Lumbriculus* from 28-day bioaccumulation study

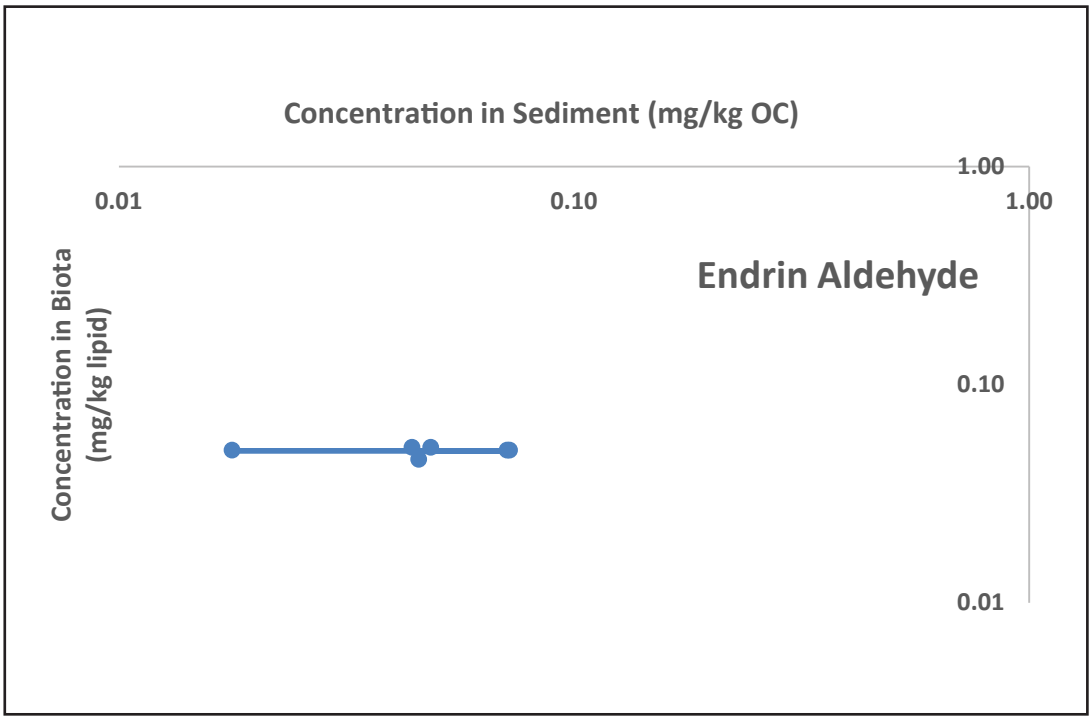

Figure C-1m Log-log scatterplot of endrin aldehyde in sediment and *Lumbriculus* from 28-day bioaccumulation study

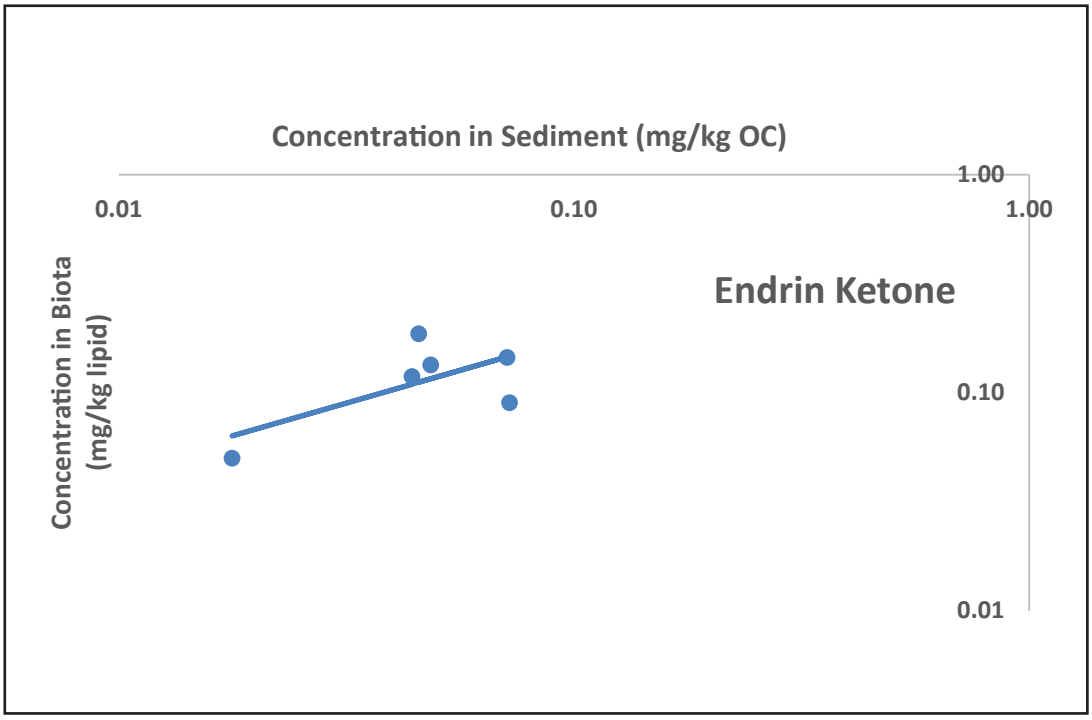

Figure C-1n Log-log scatterplot of endrin ketone in sediment and *Lumbriculus* from 28-day bioaccumulation study

02:1003239.0009.03.34\soil and Earthworms Scatterplots.ai-5/3/16-GRA

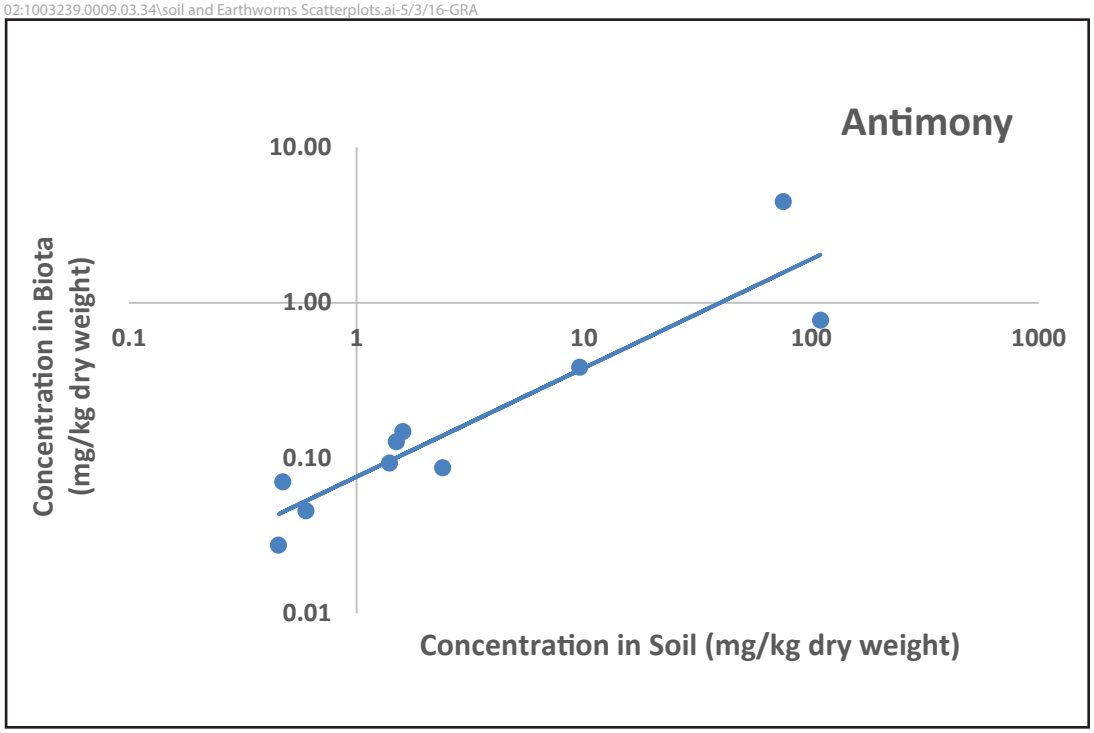

Figure C-2a Log-log scatterplot of antimony in soil and earthworms from 28-day bioaccumulation study

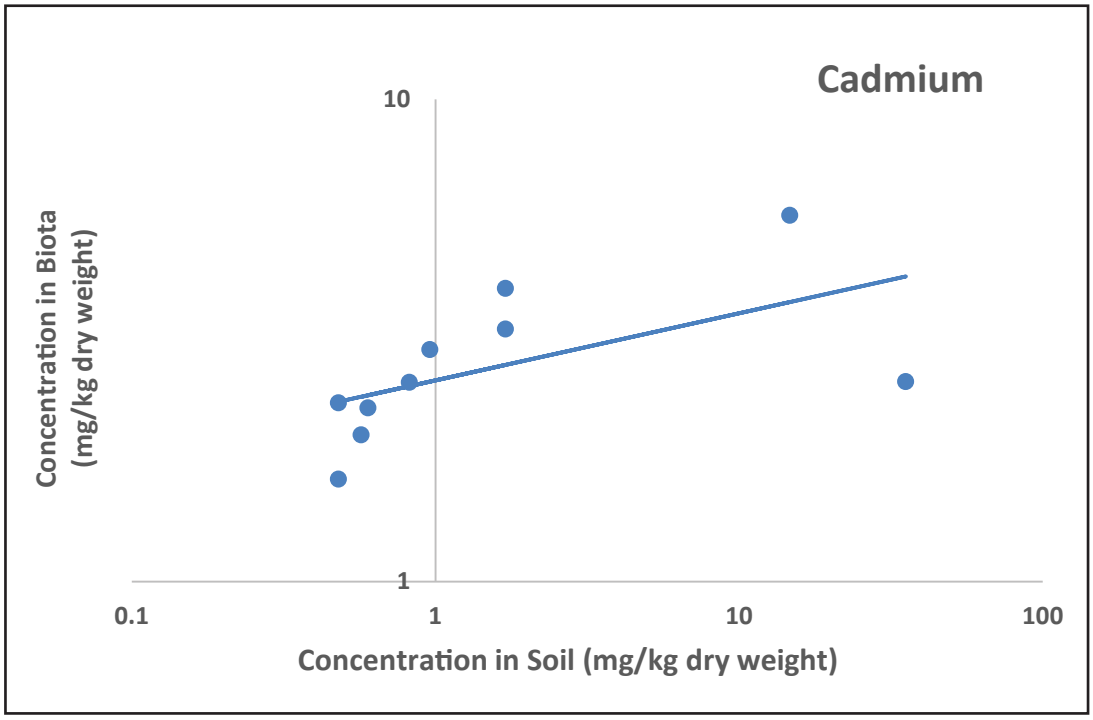

Figure C-2b Log-log scatterplot of cadmium in soil and earthworms from 28-day bioaccumulation study

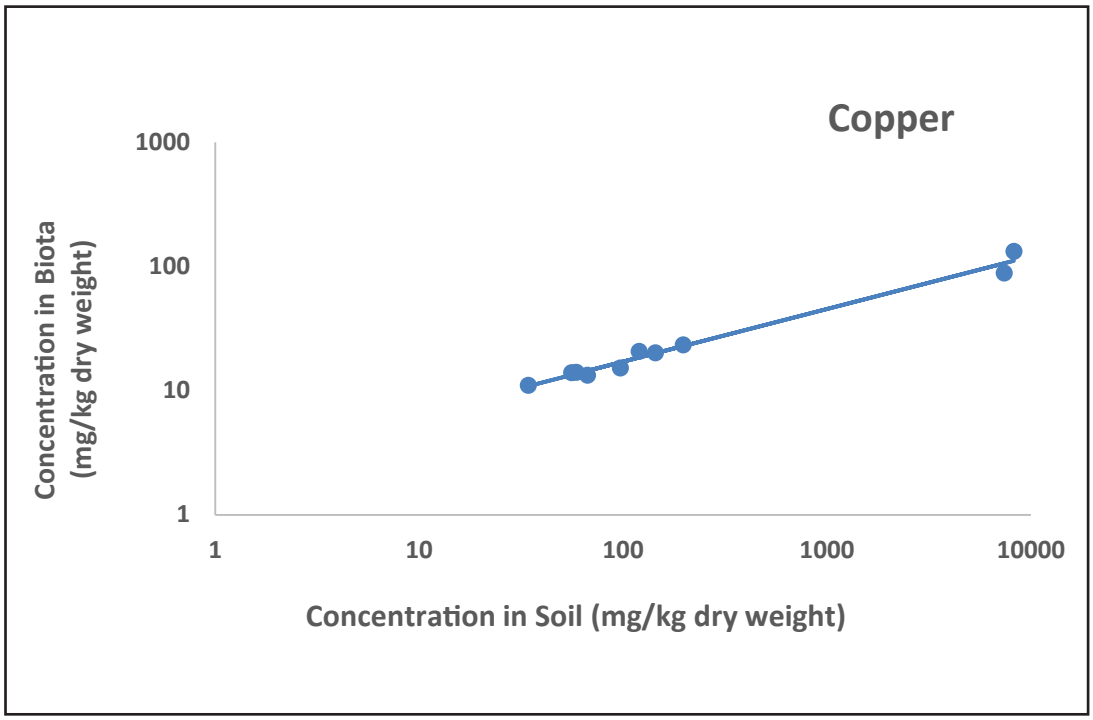

Figure C-2c Log-log scatterplot of copper in soil and earthworms from 28-day bioaccumulation study

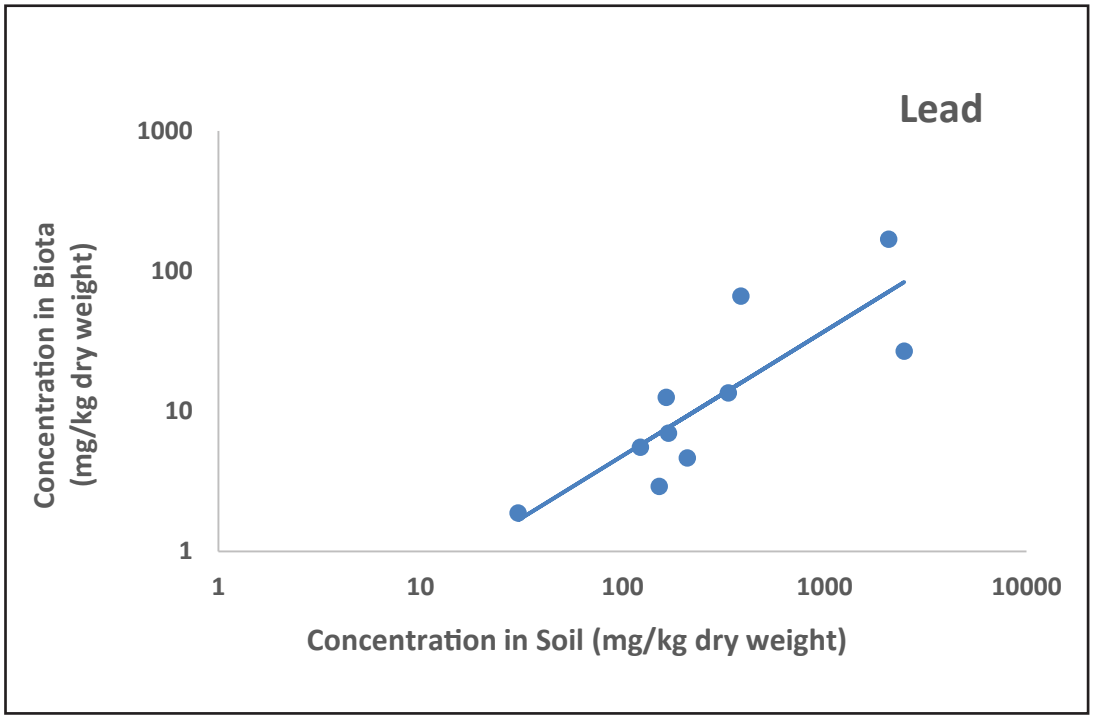

Figure C-2d Log-log scatterplot of lead in soil and earthworms from 28-day bioaccumulation study

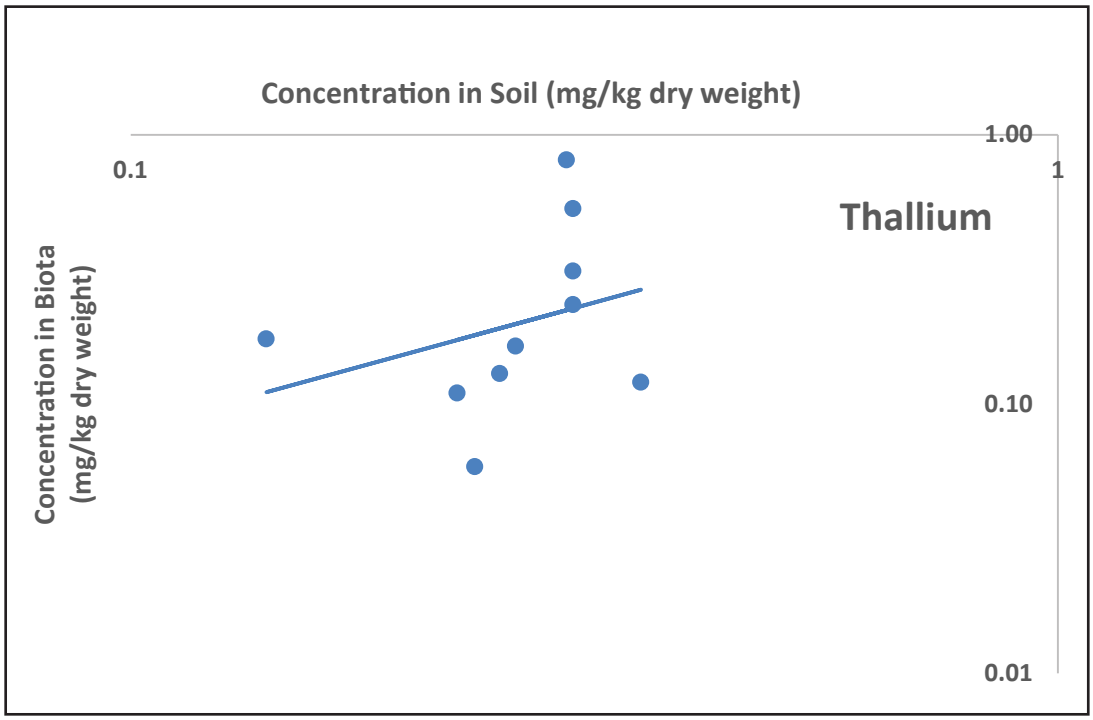

Figure C-2e Log-log scatterplot of thallium in soil and earthworms from 28-day bioaccumulation study

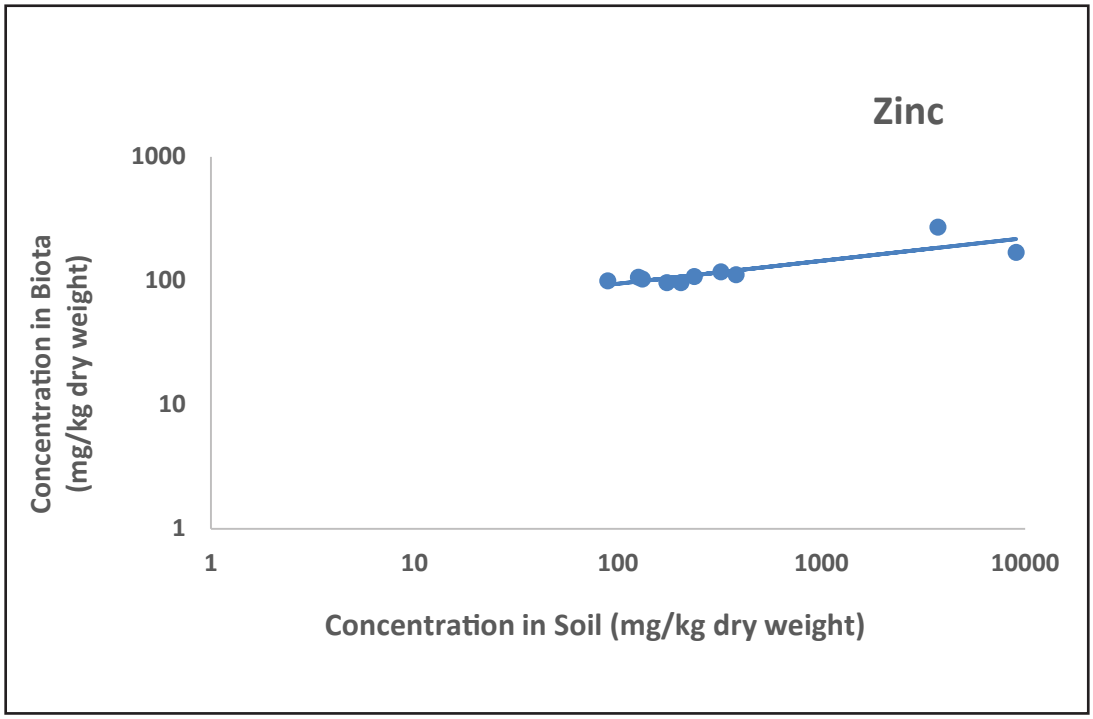

Figure C-2f Log-log scatterplot of zinc in soil and earthworms from 28-day bioaccumulation study

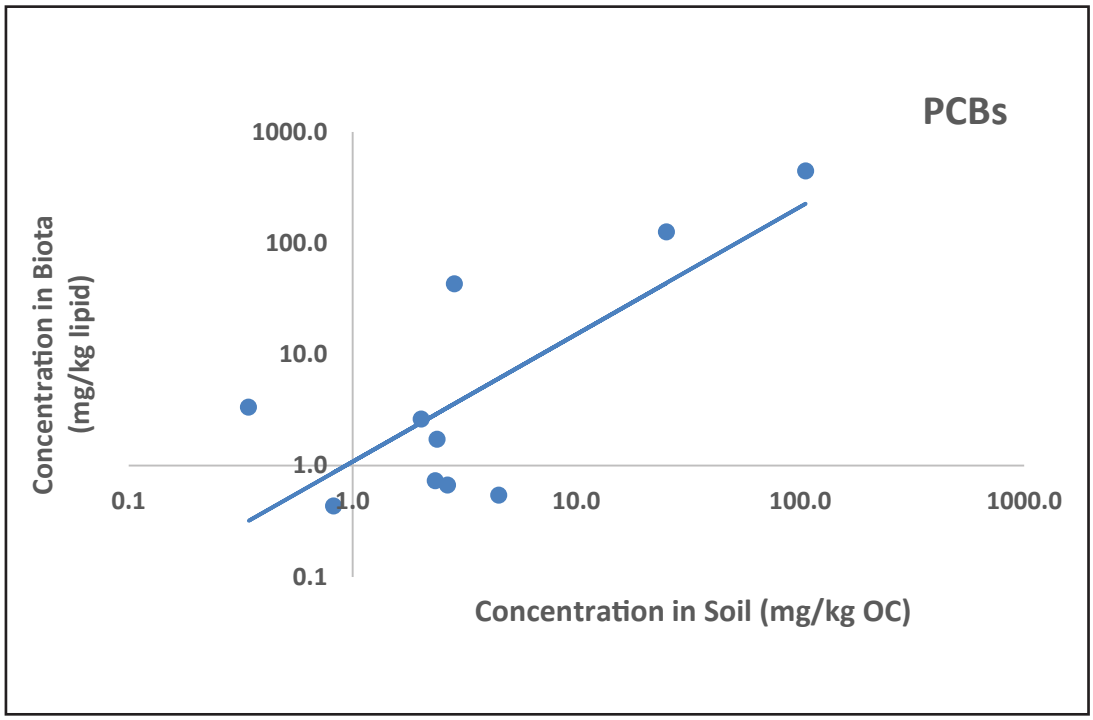

Figure C-2g Log-log scatterplot of total PCBs in soil and earthworms from 28-day bioaccumulation study

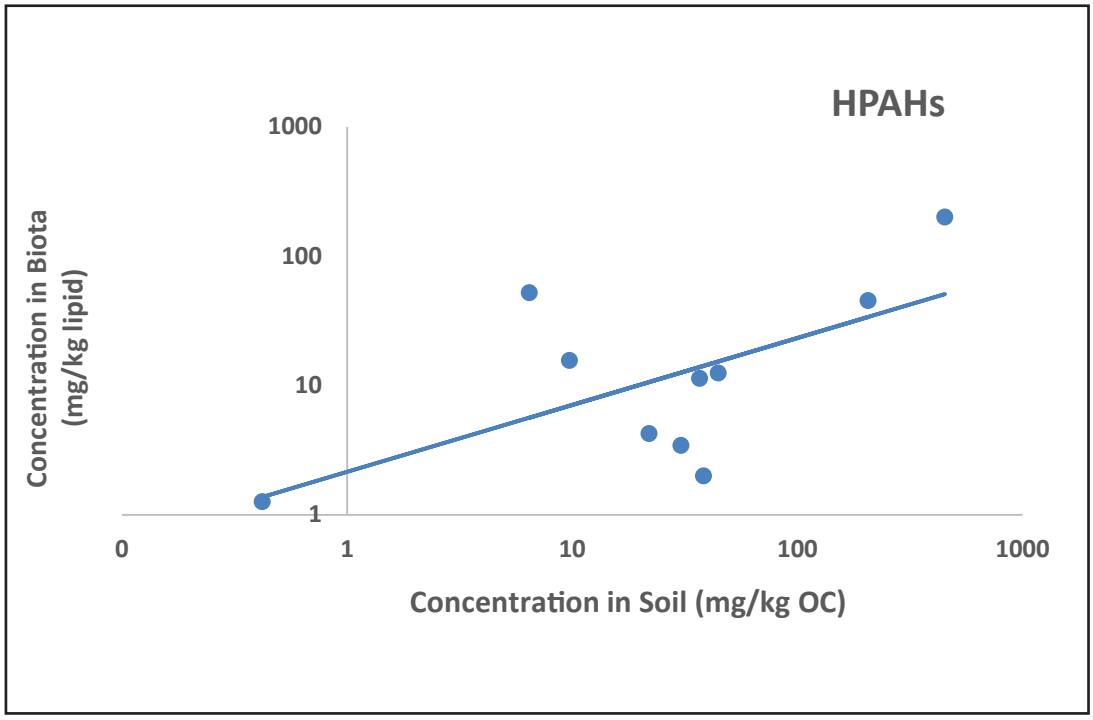

Figure C-2h Log-log scatterplot of high-molecular weight PAHs in soil and earthworms from 28-day bioaccumulation study

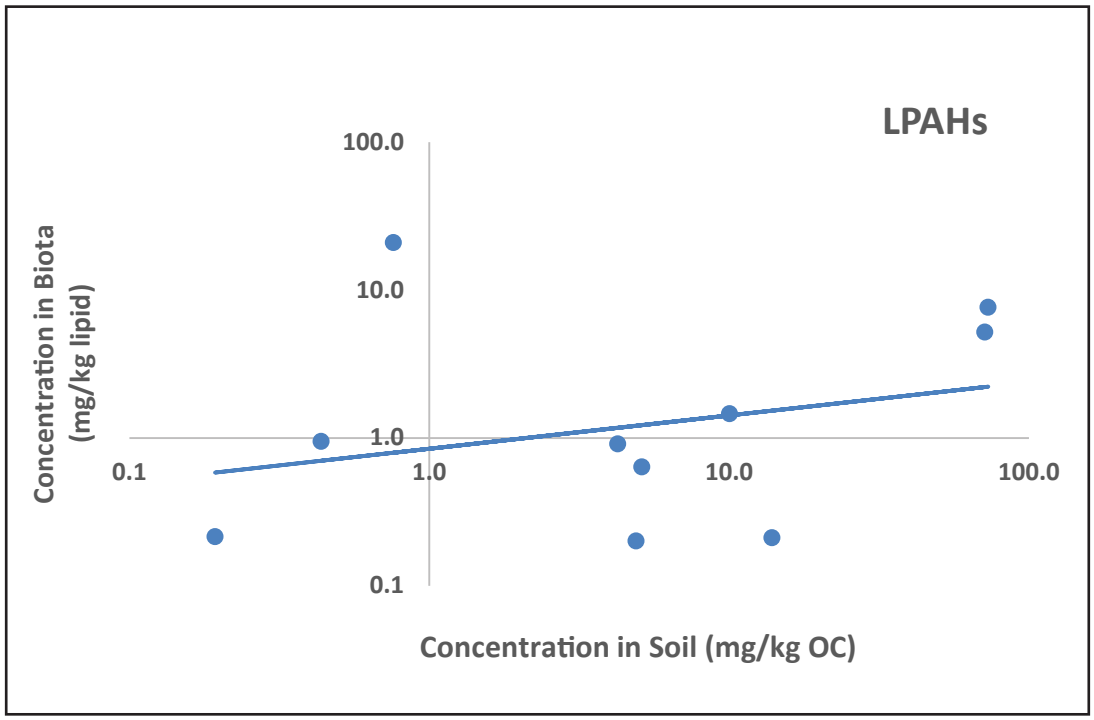

Figure C-2i Log-log scatterplot of low-molecular weight PAHs in soil and earthworms from 28-day bioaccumulation study

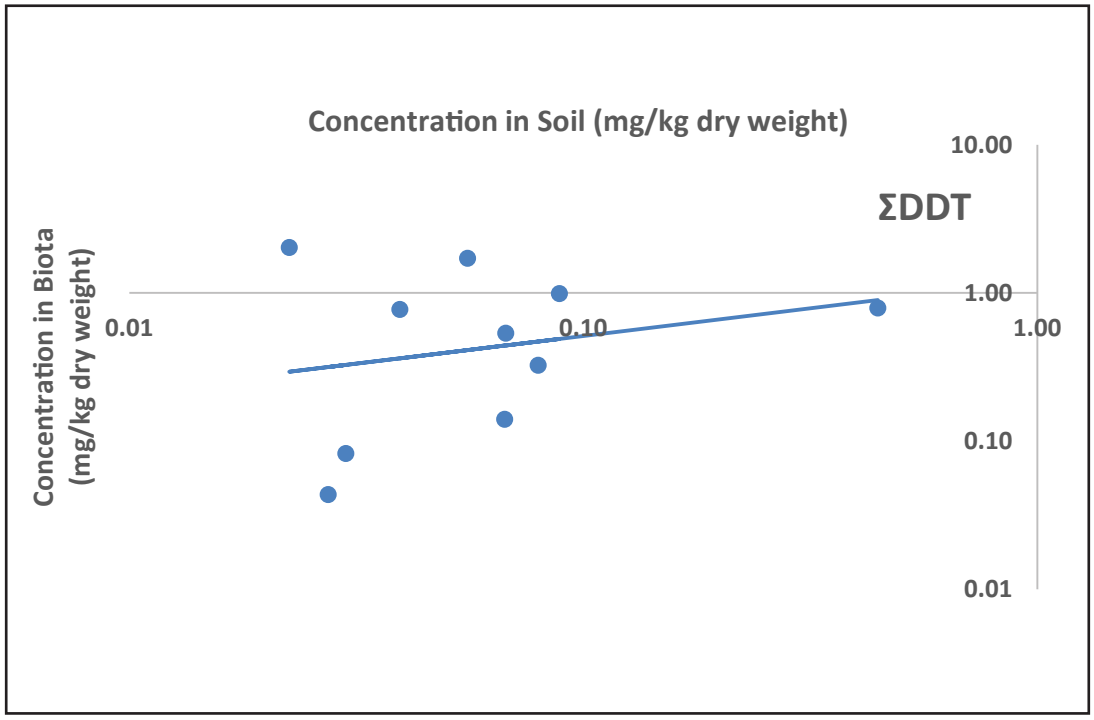

Figure C-2j Log-log scatterplot of ΣDDT in soil and earthworms from 28-day bioaccumulation study

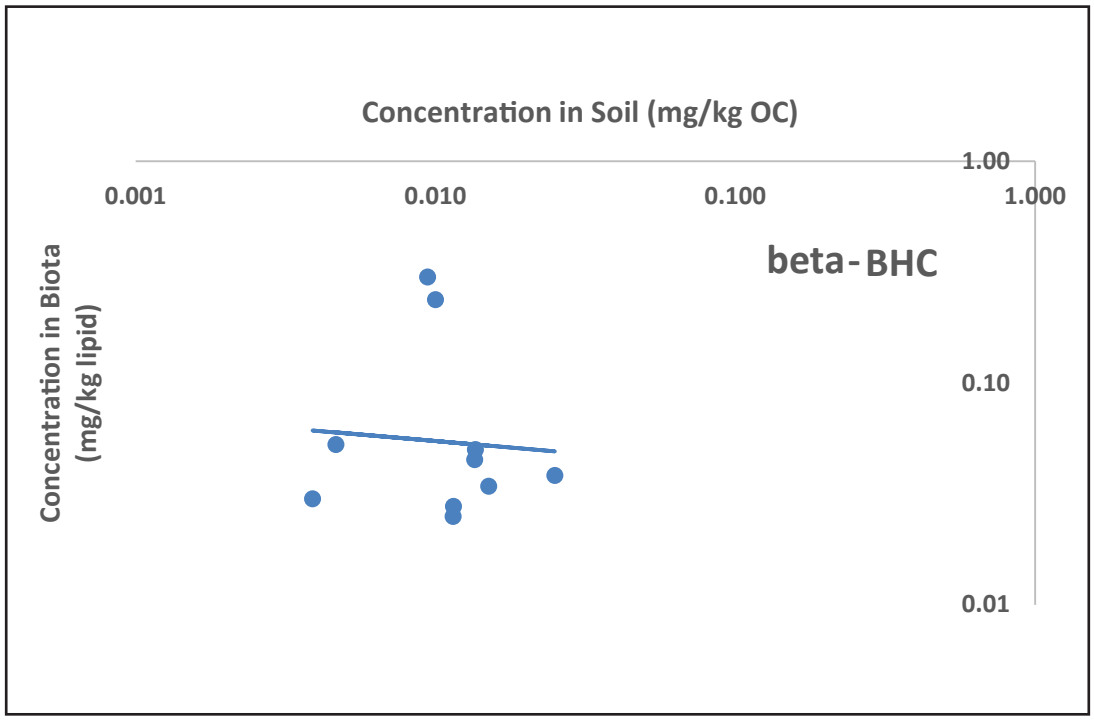

Figure C-2k Log-log scatterplot of beta-BHC in soil and earthworms from 28-day bioaccumulation study

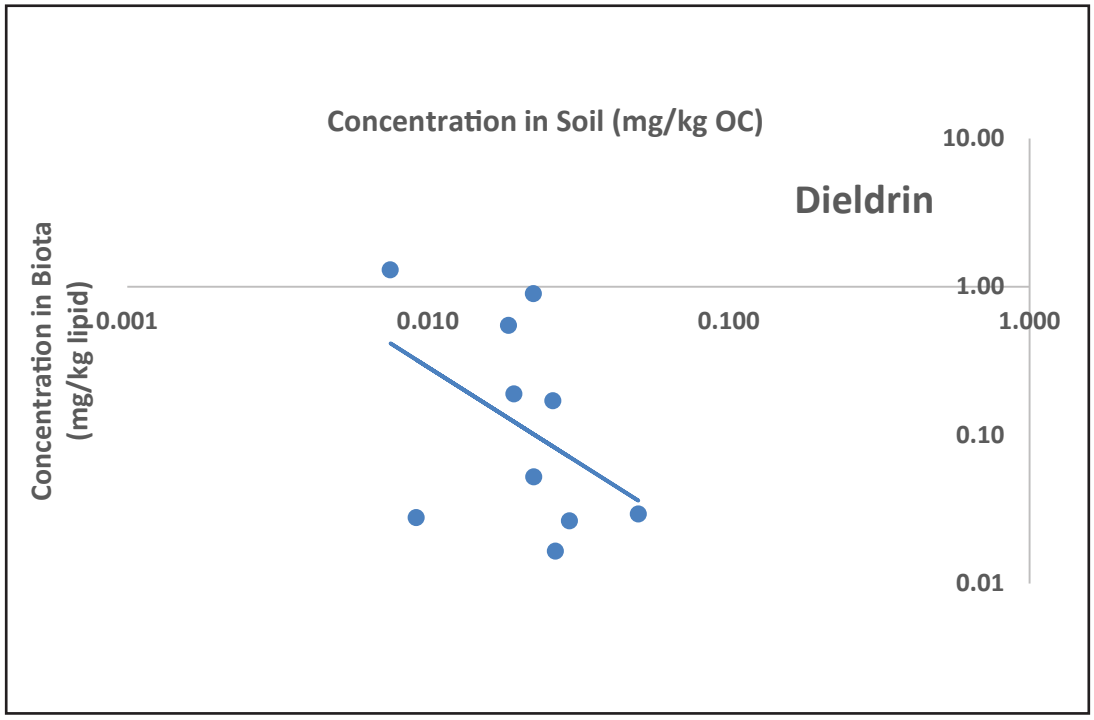

Figure C-2l Log-log scatterplot of dieldrin in soil and earthworms from 28-day bioaccumulation study

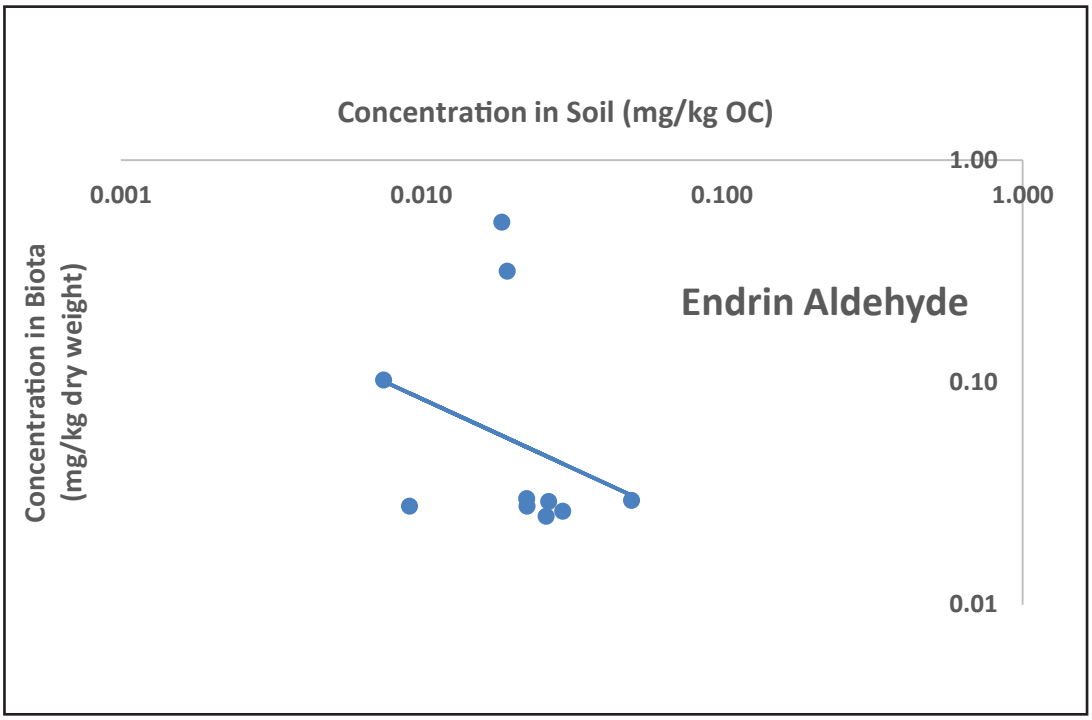

Figure C-2m Log-log scatterplot of endrin aldehyde in soil and earthworms from 28-day bioaccumulation study

D

Sediment Bioassay Laboratory Report

July 23, 2015

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FINAL REPORT: Results for the 20-day *Chironomus dilutus* and 28-day *Hyalella azteca* Whole Sediment Toxicity Testing
18 Mile Creek Site; OU2; New York
USEPA Contract Number EP-W-10-007
GLEC Project Number: 5135

Dear Ms. Kalmbach:

Great Lakes Environmental Center, Inc. (GLEC) has completed our analysis of four sediment samples that were collected by Ecology and Environment, Inc. personnel on May 21 and 26, 2015, for the 18 Mile Creek Site; OU2; New York. Our analysis included the following whole sediment toxicity tests: *Chironomus dilutus* (*C. dilutus)* 20-day growth and survival and *Hyalella azteca* (*H. azteca*) 28-day growth and survival.

Whole Sediment Toxicity

The sample identification numbers, survival, and growth test results for the whole sediment toxicity assessments for the four sediment samples and laboratory controls are summarized and provided in the following tables:

- Table 1: 20-Day *C. dilutus* Average Percent Survival
- Table 2: 20-Day *C. dilutus* Average Growth and Biomass Estimates (expressed as average ash-free-dry-weight (AFDW))
- Table 3: 28-Day *H. azteca* Average Percent Survival
- Table 4: 28-Day *H. azteca* Average Growth and Biomass Estimates

Water quality data for the overlying water for each sediment sample tested are summarized in Tables 5 and 6 for the *C. dilutus* and *H. azteca*, respectively. Summaries of the statistically

significant differences (p=0.05) between the laboratory control and the four investigative sediment samples are provided in Table 7 for the *C. dilutu*s tests and in Table 8 for the *H. azteca* tests.

A detailed summary of the overlying water quality measurements is provided in Appendices B1 (*C. dilutus*) and B2 (*H. azteca*).

The survival, growth, and statistical analysis data sheets and summaries for the *C. dilutus* and *H. azteca* tests are shown in Appendices C1 through C2, and D1 through D2, respectively.

The daily laboratory bench data sheets are kept on file at GLEC and are also provided on the enclosed compact diskettes. Chain of Custody forms and reference toxicant data are provided in Appendices A and E, respectively.

METHODS

The whole sediment toxicity tests were conducted at our Traverse City, Michigan laboratory following GLEC's written Standard Operating Procedures (SOPs) which are based on the procedures outlined in U.S. EPA Method, EPA/600/R-99/064 *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates*, Second Edition and American Society for Testing and Materials (ASTM) 1706-05, *Standard Test Methods for Measuring the Toxicity of Sediment Associated Contaminants with Freshwater Invertebrates* (ASTM 2010).

The four sediment samples were collected by Ecology and Environment, Inc. personnel and delivered by courier to the GLEC toxicology laboratory located in Traverse City, Michigan. The sediment samples were received at GLEC, where they were assigned a unique GLEC laboratory identification number and stored at 0≤6°C, but not frozen, until test initiation (see table below).

Sample I.D.	Sample Description	GLEC Lab. ID Number	Date Sampled	Date Received
BG1-SED01	Site Sample	10,505	May 21, 2015	May 22, 2015
OU2-SED02	Site Sample	10,506	May 21, 2015	May 22, 2015
OU2-SED01	Site Sample	10,513	May 26, 2015	May 27, 2015
OU2-SED03	Site Sample	10,514	May 26, 2015	May 27, 2015

The 20-day *C. dilutus* toxicity tests and the 28-day *H. azteca* toxicity tests were initiated on June 10, 2015 for each of the four sediment samples, one GLEC laboratory control sediment and one water only exposure, per test organism.

20-DAY *CHIRONOMUS DILUTUS* AND 28-DAY *HYALELLA AZTECA* WHOLE SEDIMENT TOXICITY TESTS

Summary of Test Procedures: 20-Day *Chironomus dilutus* and 28-Day *Hyalella azteca*

Newly-hatched *C. dilutus* larvae (< 24 hours old from egg cases purchased from Aquatic BioSystems) were used to initiate the 20-day whole sediment toxicity tests, laboratory control and water only exposures. Juvenile *H. azteca* (7-8 days old; cultured in house) were used to initiate the 28-day whole sediment toxicity tests, laboratory control, and water only exposure. All organisms were randomly placed in test chambers using a large bore pipette. The *C. dilutus* and *H. azteca* were continuously exposed for the duration of the test (20-days and 28-days, respectively) to each of the sediment samples, one laboratory control sediment and one water only exposure.

In the water only exposures, test organisms were exposed to the overlying water with no sediment. There were eight replicate beakers for each sediment sample, the water only exposure, and the GLEC laboratory control sediment. The *C. dilutus* replicate beakers each contained 12 test organisms and the *H. azteca* replicate beakers each contained 10 test organisms. The GLEC laboratory control sediment is a reference sediment that is collected from the Boardman River, a local river that has a primarily forested watershed in the Pere Marquette State Forest.

The *C. dilutus* and *H. azteca* were exposed in 470 mL glass test chambers, each containing 100 mL of whole sediment and 175 mL of overlying water.

Prior to adding the whole sediment to each test chamber, the laboratory control sediment as well as each investigative sediment sample were thoroughly homogenized using a pre-cleaned stainless steel all purpose mixer or spoon until a uniform color and texture was achieved.

The homogenized sediment was then added to each test chamber using a pre-cleaned stainless steel spoon. After the addition of the sediment to the test chambers, the overlying water was immediately added; this was considered to be test day -1, the test day prior to day 0 (June 09, 2015 for the *C. dilutus* tests and for the *H. azteca* tests). Test organisms were randomly added to each replicate test chamber the following day (test day 0), June 10, 2015.

Overlying water was intermittently supplied to each test chamber at least twice daily (once every 12-hours) via a static-renewal water delivery system. The overlying water for each sediment sample, the laboratory control sediment, and the water only exposure consisted of

de-chlorinated municipal (Traverse City, Michigan) tap (Lake Michigan sourced) water, with an average hardness of 137 mg/L and an average alkalinity of 96 mg/L. Temperature, dissolved oxygen (DO), pH, and specific conductance of the overlying water was measured daily prior to use.

The *C. dilutus* test chambers were fed 1.5 mL of Tetrafin® goldfish food slurry (4 mg/mL dry solids) once daily. The *H. azteca* test chambers were fed 1.0 mL mixture of yeast, trout food, and cerophyl (YTC; ~1800 (1700-1900 +/- 5%) mg/L solids) once daily.

The test chambers were placed in a temperature controlled water bath under the specified conditions of 23 ± 1°C; photoperiod 16 hours light: eight hours dark; and light intensity of 100-1000 lux.

Temperature of the overlying water in the test chambers was measured daily in two alternating replicates for each test sediment, and the results were recorded on the laboratory bench data sheets.

Alkalinity, hardness, pH, conductance, and total ammonia (as N) were measured in the overlying water on test days 0 and 20 for the *C. dilutus* tests (Table 7 and Appendix B1) and on days 0 and 28 for the *H. azteca* tests (Table 8 and Appendix B2). For the 20-day *C. dilutus* and 28-day *H. azteca* whole sediment toxicity tests, conductivity was measured weekly, and pH and DO were measured at least three times per week from two randomly selected test chambers. The alkalinity, hardness, and total ammonia (as N) samples were a composite sample collected from all replicates of a given treatment. All test exposure water quality measurements were recorded on the laboratory bench data sheets (see enclosed compact disc).

If the DO dropped below 2.5 mg/L in any measured test chamber, the number of daily overlying water renewals was increased (up to 4 times per day) for all treatments until the DO increased to greater than 3.0 mg/L. Once the DO had increased to above 3.0 mg/L, additional water renewals were suspended unless the DO values dropped back below 2.5 mg/L, at which time the additional water renewals were re-initiated. If additional renewals did not maintain the DO above 2.5 mg/L, then aeration was initiated. There was an instance in the whole sediment toxicity tests of decreased DO and the addition of aeration at approximately 100 bubbles per minute.

Observations of organism behavior and anomalies were made daily for each test chamber and recorded on the laboratory bench data sheets.

The number of *C. dilutus* surviving in each replicate test chamber was recorded at test termination (20 days), and a summary of the percent survival at test termination is provided in Tables 1 and 2. The average ash free dry weight [AFDW in milligrams (mg)] of the surviving organisms for each *C. dilutus* replicate, and the biomass [AFDW (mg) of the surviving

organisms divided by the initial number of organisms] was also determined at test termination, and the results are summarized in Table 2.

The number of surviving *H. azteca* in each replicate chamber was recorded at test termination (28 days) and the survival data are summarized in Tables 3 and 4. The average dry weight [in milligrams (mg)] of the surviving organisms for each *H. azteca* replicate, and the biomass [dry weight (mg) of the surviving organisms divided by the initial number of organisms] was also determined at test termination, and the data are summarized in Table 4.

A statistical procedure, using the program TOXCALC (version 5.0.32) and following statistical guidelines provided in U.S. EPA Method 600/R-99/064 and ASTM Method 1706-95B (2000), was used to compare the 20-day *C. dilutus* and the 28-Day *H. azteca* survival and growth data from the four investigative sediment samples to survival and growth data from the laboratory control sediment sample. Prior to analysis, all percent survival data were transformed using an arc sine-square root transformation. All transformed data were then tested using either the homoscedastic or heteroscedastic t-tests, which are used for comparing a single treatment to a single control.

The homoscedastic t-test assumes the data are normally distributed (Shapiro-Wilk Test or Kolmogorov D Test) and the variances are equal (F-test). If the variances are not equal, the data are analyzed using the heteroscedastic t-test. If the data are not normally distributed, then the data are analyzed using a nonparametric t-test (e.g., Steel's Many-One Rank Test or Wilcoxon Rank Sum Test with Bonferroni's Adjustment).

Growth data were initially evaluated for normal distribution and homogeneity of variances. In those cases where the data were not normally distributed or homogenous, the data were analyzed using either the heteroscedastic t-test or the nonparametric test. In addition to growth being evaluated as average dry weight of the surviving organisms, growth was also analyzed as biomass (average dry weight of surviving organisms divided by the number of initial organisms).

The survival and growth for each investigative sample was considered statistically different when significantly lower ($p < 0.05$) than observed in the laboratory control sediment.

Organisms exposed to the GLEC laboratory control sediment and the water only exposure achieved acceptable survival and growth, as specified in the U.S. EPA Method /600/R-99/064. In this instance, GLEC's laboratory control sediment and water only exposure results were used to confirm test acceptability and the health of the test organisms.

RESULTS

20-Day *Chironomus dilutus* and 28-Day *Hyalella azteca* Whole Sediment Toxicity Tests

20-Day *Chironomus dilutus*

The organisms exposed to the laboratory control sediment and to the water only exposure exceeded the minimum survival (70 percent) and growth (0.48 mg AFDW at test termination) criteria for acceptable controls for the *C. dilutus* tests (Tables 1 and 2). The acceptability requirements for survival and growth for the *C. dilutus* test can be found in U.S. EPA Method 600/R-99/064, Table 12.1. There was 96.9 percent survival in the laboratory control sediment.

The overlying water quality measurements (Table 5) were also within the acceptable limits following the U.S. EPA testing protocol. Daily mean temperatures were 23°C ± 1 °C; dissolved oxygen (DO) was maintained above 2.5 mg/L in the overlying water; and there were no variations greater than 50% in overlying water hardness or alkalinity measurements within each test type. Total ammonia over the duration of twenty days varied between 0.09 mg/L and 1.18 mg/L in the overlying water among all sediment types. Consequently, the *C. dilutus* whole sediment toxicity tests were conducted following the standard protocols and are valid assessments of sediment toxicity, with the following exceptions.

Noted Exceptions to the Protocol: On June 10, test day 0 prior to the addition of organisms, the DO measured in two replicates of the following sediment sample fell below the acceptable dissolved oxygen limit of 2.5 mg/L:

- OU2-SED01; GLC Number 10,513 (1.6 and 1.5 mg/L).

In response to the drop in DO on June 10, 2015, aeration was initiated in each test chamber of each sediment type, at a rate of approximately 100 bubbles per minute, in lieu of increased overlying water renewals. It was GLEC's opinion that initiating aeration would be more beneficial to the test organism survival than to increase frequency of renewals over 4 days.

All test chambers were observed daily to assess organism behavior and no unusual observations were noted with the test organisms in these sediment samples.

Statistical Analysis for 20-Day *Chironomus dilutus* Tests

Laboratory Control Sediment Compared to Investigative Sediment Samples

C. dilutus survival and growth results (Appendix C1) from the laboratory control sediment (CS#: 128) were compared statistically to the four investigative sediment samples. After 20 days of exposure when compared to the laboratory control sediment, *C. dilutus* survival was significantly reduced ($p<0.05$) in two investigative sediment samples (see Tables 1, 2, and 7, and Appendix C2):

- BG1-SED01 (GLC Number 10,505); and
- OU2-SED03 (GLC Number 10,514).

Because there was 100 percent mortality in the sediment sample OU2-SED03 (GLC Number 10,514), no statistical analysis was conducted.

When compared to the laboratory control sediment (see Tables 2 and 7 and Appendix C2), *C. dilutus* growth measured as AFDW of surviving organisms (mg) and expressed as biomass [AFDW of surviving organisms divided by the initial number of organisms (mg)] was not significantly reduced ($p>0.05$) in the any of the three sediment samples.

Outputs for the survival and growth statistical analyses for the *C. dilutus* whole sediment toxicity tests are provided in Appendices C1 and C2.

28-Day *Hyalella Azteca*

The *H. azteca* test organisms exposed to the GLEC laboratory control sediment and to the water only exposure exceeded the minimum survival criteria (80%), and displayed acceptable measurable growth (Tables 3 and 4). The requirements for acceptable survival and growth for the *H. azteca* can be found in U.S. EPA /600/R-99/064, Table 14.3. There was 100 percent survival in the laboratory control.

The overlying water quality measurements (Table 6) were also within the acceptable limits following the U.S. EPA testing protocol. Daily mean temperatures were 23 ± 1 °C; dissolved oxygen (DO) was maintained above 2.5 mg/L in the overlying water, and there were no variations greater than 50% in overlying water hardness or alkalinity measurements within each test type. Total ammonia over the duration of twenty-eight days varied between 0.07 mg/L and 1.18 mg/L in the overlying water among all sediment types. Consequently, the *H. azteca* whole sediment toxicity tests were conducted following the standard protocols and are valid assessments of sediment toxicity, with the following exceptions.

Noted Exceptions to the Protocol: On June 10, test day 0 prior to the addition of organisms, the DO measured in two replicates of the following sediment sample fell below the acceptable dissolved oxygen limit of 2.5 mg/L:

- OU2-SED01; GLC Number 10,513 (1.4 and 1.3 mg/L).

In response to the drop in DO on June 10, 2015, aeration was initiated in each test chamber and each sediment type at a rate of approximately 100 bubbles per minute, in lieu of increased overlying water renewals. It was GLEC's opinion that initiating aeration would be more beneficial to the test organism survival than to increase frequency of renewals over 4 days.

All test chambers were checked daily to assess organism behavior and no unusual observations were noted with the test organisms in these sediment samples.

Statistical Analysis for 28-Day *Hyalella azteca* Tests

Laboratory Control Sediment Compared to Investigative Sediment Samples

Survival and growth results (Appendix D1) from the laboratory control sediment (CS# 128) were compared statistically to the four investigative sediment samples. After 28 days of exposure when compared to laboratory control sediment (see Tables 3, 4, and 8 and Appendix D2) *H. azteca* survival was significantly reduced ($p < 0.05$) in one sediment sample:

- OU2-SED03 (GLC Number 10,514).

After 28 days of exposure there were statistically significant reductions ($p < 0.05$) in two of the four investigative sediment samples for *H. azteca* growth (expressed as average dry weight) of the surviving organisms when compared to laboratory control sediment (see Table 4 and Appendices D1):

- BG1-SED01 (GLC Number 10,505); and
- OU2-SED03 (GLC Number 10,514).

H. azteca growth (measured as biomass) when compared to the laboratory control sediment (see Tables 4 and 8 and Appendix D2), was significantly reduced ($p<0.05$) in three investigative sediment samples including:

- BG1-SED01 (GLC Number 10,505);
- OU2-SED01; GLC Number 10,513; and
- OU2-SED03 (GLC Number 10,514).

Outputs for the survival and growth statistical analyses for the *H. azteca* whole sediment toxicity tests are provided in Appendices D1 and D2.

SUMMARY

In summary, GLEC completed whole sediment toxicity testing and analysis of four sediment samples. Each whole sediment toxicity test was performed following acceptable methods, without exception, and is accurate and complete. Whole sediment toxicity test results are in compliance with the requirements of the National Environmental Laboratory Accreditation Conference (NELAC).

Statistical analyses were completed for the whole sediment toxicity tests with *C. dilutus* and *H. azteca*. All data are summarized in the following tables and raw data reported in the appendices to this report.

C. dilutus survival was significantly reduced in two sediment samples when compared to the laboratory control sediment (Table 7). *C. dilutus* growth, expressed as average Ash-Free-Dry-Weight or biomass was significantly reduced in one of investigative site sediment samples (due to 100 percent mortality), when compared to laboratory control sample (Table 7).

H. azteca survival was significantly reduced in one of the investigative sediment samples when compared to the laboratory control sediment (Table 8). *H. azteca* growth, expressed either as average dry weight was significantly reduced in two of the four sediment samples, when compared to the laboratory control sediment (Table 8). *H. azteca* growth, expressed as biomass was significantly reduce in three of the four sediment samples.

If you have any questions, or if you would like additional information, please contact either myself or Dennis McCauley at (231) 941-2230. Thank you for the opportunity to provide this service to Ecology and Environment. We look forward to continue providing environmental services to you in the future.

Sincerely,

Mailee W. Garton
Laboratory Coordinator

John H. Barkach
Senior Program Manager

MWG:mg

ACCREDITED IN ACCORDANCE WITH nelac

TABLE 1. **Comparison of Number of Surviving *Chironomus dilutus* per Replicate[r] and Percent Survival between the Laboratory Control Sediment and the Investigative Sediments Samples; *Chironomus dilutus* 20-Day Whole Sediment Toxicity Tests Conducted June 10-June 30, 2015;**
USEPA Ecology and Environment, Inc.; Eighteen Mile Creek Site-OU2, New York.

Replicate Number GLC Number	Laboratory Control CS# 128	BG1-SED01 10,505	OU2-SED02 10,506	OU2-SED01 10,513	OU2-SED03 10,514	Water Only Secondary Control
1	10	10	11	11	0	12
2	11	10	12	11	0	10
3	12	11	12	12	0	10
4	12	12	12	12	0	12
5	12	10	12	11	0	11
6	12	11	12	12	0	12
7	12	10	9	9	0	11
8	12	11	10	9	0	11
20-Day Whole Sediment Toxicity Test Percent Survival[r]	**96.9**	**88.5** [b]	**93.8**	**90.6**	**0.0** [b]	**92.7**

[r] Replicates initiated with 12 organisms each

[b] Significantly different ($p < 0.05$) from laboratory control CS#128.

TABLE 2 **Comparison of Average[1] Dry Weight (mg), Biomass[2] (mg) and Percent Survival between the Laboratory Control Sediment and the Investigative Sediments Samples;**
Chironomus dilutus **20-Day Whole Sediment Toxicity Tests Conducted June 10-June 30, 2015;**
USEPA Ecology and Environment, Inc.; Eighteen Mile Creek Site-OU2, New York.

GLC Number	Laboratory Control CS#128		BG1-SED01 10,505		OU2-SED02 10,506		OU2-SED01 10,513		OU2-SED03 10,514		Water Only Secondary Control	
Replicate Number	Average[1] Weight (mg)	Biomass[2] Weight (mg)	Average[1] Weight (mg)	Biomass[2] Weight (mg)	Average[1] Weight (mg)	Biomass[2] Weight (mg)	Average[1] Weight (mg)	Biomass[2] Weight (mg)	Average[1] Weight (mg)	Biomass[2] Weight (mg)	Average[1] Weight (mg)	Biomass[2] Weight (mg)
1	1.55100	1.29250	1.63200	1.36000	2.03182	1.86250	1.48727	1.36333	0.00000	0.00000	0.52583	0.52583
2	1.33455	1.22333	1.61500	1.34583	1.56000	1.56000	1.50727	1.38167	0.00000	0.00000	0.77800	0.64833
3	0.97417	0.97417	1.42091	1.30250	1.86167	1.86167	1.24750	1.24750	0.00000	0.00000	0.44500	0.37083
4	1.20167	1.20167	1.22167	1.22167	1.66833	1.66833	1.41750	1.41750	0.00000	0.00000	0.62917	0.62917
5	1.11583	1.11583	1.35200	1.12667	1.98000	1.98000	1.35273	1.24000	0.00000	0.00000	0.54273	0.49750
6	1.19000	1.19000	1.57273	1.44167	1.59636	1.59636	1.18250	1.18250	0.00000	0.00000	0.44417	0.44417
7	1.28250	1.28250	1.33600	1.11333	2.13111	1.59833	1.50222	1.12667	0.00000	0.00000	0.49727	0.45583
8	1.08167	1.08167	1.23182	1.12917	1.89889	1.55364	1.34111	1.00583	0.00000	0.00000	0.58545	0.53667
Average[1] Ash-Free-Dry Weight (AFDW) (mg)	**1.21642**		**1.42277**		**1.84102**		**1.37976**		**0.00000**[c]		**0.55595**	
Biomass[2] Weight (AFDW) (mg)		**1.17021**		**1.25510**		**1.71010**		**1.24563**		**0.00000**[c]		**0.51354**
20-Day Percent Survival	**96.9**		**88.5**[b]		**93.8**		**90.6**		**0.0**[b]		**92.7**	

[1] Average Ash-Free-Dry-Weight (AFDW) is the total ash-free-dry weight of surviving organisms

[2] Biomass weight is the total Ash-Free-Dry-Weight of surviving organisms divided by the initial number of organisms of 12.

[b] Significantly different ($p < 0.05$) from laboratory control CS#128.

[c] Statistical analysis for average growth and biomass was not conducted due to 100% mortality.

TABLE 3. Comparison of Number of Surviving *Hyalella azteca* per Replicate[r] and Percent Survival between the Laboratory Control Sediment and the Investigative Sediments Samples;
***Hyalella azteca* 28-Day Whole Sediment Toxicity Tests Conducted June 10-July 8, 2015;**
USEPA Ecology and Environment, Inc.; Eighteen Mile Creek Site-OU2, New York.

Replicate Number GLC Number	Laboratory Control CS# 127	BG1-SED01 10,505	OU2-SED02 10,506	OU2-SED01 10,513	OU2-SED03 10,514	Water Only Secondary Control
1	10	10	10	10	5	9
2	10	10	10	10	8	10
3	10	9	10	7	6	10
4	10	9	10	9	6	10
5	10	10	10	9	9	10
6	10	10	10	10	6	10
7	10	10	10	10	6	10
8	10	10	10	10	5	10
28-Day Whole Sediment Toxicity Test Percent Survival[r]	**100.0**	**97.5**	**100.0**	**93.8**	**63.8** [b]	**98.8**

[r] Replicates initiated with 10 organisms each

[b] Significantly different ($p < 0.05$) from laboratory control CS#128.

TABLE 4 **Comparison of Average[1] Dry Weight (mg), Biomass[2] (mg) and Percent Survival Between the Laboratory Control Sediment and the Investigative Sediments Samples;**
***Hyalella azteca* 28-Day Whole Sediment Toxicity Tests Conducted June10-July 8, 2015;**
USEPA Ecology and Environment, Inc.; Eighteen Mile Creek Site-OU2, New York.

GLC Number	Laboratory Control CS#128		BG1-SED01 10,505		OU2-SED02 10,506		OU2-SED01 10,513		OU2-SED03 10,514		Water Only Secondary Control	
Replicate Number	Average[1] Weight (mg)	Biomass[2] Weight (mg)	Average[1] Weight (mg)	Biomass[2] Weight (mg)	Average[1] Weight (mg)	Biomass[2] Weight (mg)	Average[1] Weight (mg)	Biomass[2] Weight (mg)	Average[1] Weight (mg)	Biomass[2] Weight (mg)	Average[1] Weight (mg)	Biomass[2] Weight (mg)
1	0.62000	0.62000	0.36800	0.36800	0.49300	0.49300	0.54000	0.54000	0.18200	0.09100	0.46556	0.41900
2	0.38600	0.38600	0.43500	0.43500	0.47800	0.47800	0.38700	0.38700	0.25750	0.20600	0.41800	0.41800
3	0.58200	0.58200	0.39111	0.35200	0.54700	0.54700	0.57143	0.40000	0.16833	0.10100	0.52600	0.52600
4	0.49100	0.49100	0.43111	0.38800	0.57000	0.57000	0.45667	0.41100	0.23667	0.14200	0.39200	0.39200
5	0.53000	0.53000	0.45100	0.45100	0.48800	0.48800	0.48556	0.43700	0.24333	0.21900	0.46800	0.46800
6	0.47100	0.47100	0.37300	0.37300	0.51000	0.51000	0.56000	0.56000	0.28333	0.17000	0.45700	0.45700
7	0.54000	0.54000	0.28500	0.28500	0.70000	0.70000	0.44900	0.44900	0.19667	0.11800	0.50000	0.50000
8	0.60600	0.60600	0.36600	0.36600	0.54000	0.54000	0.46300	0.46300	0.18400	0.09200	0.57800	0.57800
Average[1] Dry Weight (mg)	**0.52825**		**0.38753**[b]		**0.54075**		**0.48908**		**0.21898**[b]		**0.47557**	
Average Biomass[2] Weight (mg)		**0.52825**		**0.37725**[b]		**0.54075**		**0.45588**[b]		**0.14238**[b]		**0.46975**
28-Day Percent Survival	**100.0**		**97.5**		**100.0**		**93.8**		**63.8**[b]		**98.8**	

Note: Average Dry Weight of Hyallela azteca at test initiation = 0.02612 mg.

[1] Average Dry Weight is the total dry weight of surviving organisms

[2] Biomass weight is the total dry weight of surviving organisms divided by the initial number of organisms of 10.

[b] Significantly different ($p < 0.05$) from laboratory control CS#128.

TABLE 5. **Summary of Mean Water Quality Parameters of Overlying Water Collected Prior to Renewal; *Chironomus dilutus* 20-Day Whole Sediment Toxicity Tests Conducted June 10-June 30, 2015; USEPA Ecology and Environment, Inc.; Eighteen Mile Creek Site-OU2, New York.**

Sample ID GLC No.	**Temperature (°C)** (range) n=42	**pH (s.u.)** (range) n=20	**Dissolved Oxygen (mg/L)** (range) n=22	**Specific Conductivity (µmhos/cm)** (range) n=8	**Hardness (CaCO3 mg/L)** (range) n=2, n=3 GLC No. 10505	**Alkalinity (CaCO3 mg/L)** (range) n=2, n=3 GLC No. 10505	**Ammonia (mg/L as N)** (range) n=2, n=4 GLC No. 10505
Laboratory Control CS#128	**22.6** (22.1-23.6)	**8.18** (7.66-8.42)	**8.1** (5.2-8.8)	**324** (312-334)	**146** (144-148)	**109** (102-116)	**0.42** (0.15-0.69)
Water Only Control NA	**22.7** (22.2-23.7)	**8.28** (8.09-8.44)	**8.4** (7.9-8.7)	**311** (300-322)	**134** (132-136)	**110** (100-120)	**0.21** (0.09-0.32)
BG1-SED01 GLC No. 10,505	**22.6** (22.1-23.6)	**8.27** (7.73-8.53)	**7.9** (6.2-8.7)	**379** (370-386)	**156** (144-164)	**111** (110-112)	**0.27** (0.14-0.43)
OU2-SED02 GLC No. 10,506	**22.6** (22.0-23.6)	**8.22** (7.28-8.64)	**7.5** (3.5-8.4)	**390** (336-449)	**154** (152-156)	**119** (112-126)	**0.52** (0.11-0.92)
OU2-SED01 GLC No. 10,513	**22.6** (22.0-23.6)	**8.18** (7.47-8.48)	**7.3** (1.5-8.4)	**367** (339-398)	**156** (156-156)	**120** (100-140)	**0.65** (0.12-1.18)
OU2-SED03 GLC No. 10,514	**22.6** (22.0-23.6)	**8.25** (7.64-8.57)	**7.8** (5.1-8.5)	**362** (331-402)	**158** (152-164)	**101** (96-106)	**0.23** (0.13-0.32)

TABLE 6. **Summary of Mean Water Quality Parameters of Overlying Water Collected Prior to Renewal; *Hyalella azteca* 28-Day Whole Sediment Toxicity Tests Conducted June 10-July 8, 2015; USEPA Ecology and Environment, Inc.; Eighteen Mile Creek Site-OU2, New York.**

Sample ID **GLC No.**	**Temperature (°C)** (range) n=58	**pH (s.u.)** (range) n=26	**Dissolved Oxygen (mg/L)** (range) n=28;	**Specific Conductivity (µmhos/cm)** (range) n=10	**Hardness (CaCO3 mg/L)** (range) n=2, n=4 GLC No. 10505	**Alkalinity (CaCO3 mg/L)** (range) n=2, n=4 GLC No. 10505	**Ammonia (mg/L as N)** (range) n=2, n=4 GLC No. 10505
Laboratory Control CS#128	**22.8** (22.2-23.9)	**8.20** (7.95-8.51)	**8.2** (6.0-8.8)	**323** (306-342)	**144** (144-144)	**111** (106-116)	**0.40** (0.11-0.69)
Water Only Control NA	**22.7** (22.0-23.9)	**8.30** (8.08-8.53)	**8.5** (7.7-8.9)	**308** (301-316)	**136** (136-136)	**111** (102-120)	**0.24** (0.09-0.38)
BG1-SED01 GLC No. 10,505	**22.7** (22.1-23.8)	**8.35** (7.93-8.63)	**8.4** (7.6-8.9)	**354** (324-385)	**148** (144-152)	**109** (104-112)	**0.24** (0.08-0.43)
OU2-SED02 GLC No. 10,506	**22.7** (22.0-23.7)	**8.33** (7.45-8.60)	**7.9** (4.3-8.7)	**391** (361-440)	**168** (156-180)	**130** (126-134)	**0.50** (0.07-0.92)
OU2-SED01 GLC No. 10,513	**22.7** (22.1-23.8)	**8.23** (7.55-8.53)	**7.6** (1.3-8.7)	**354** (323-418)	**152** (148-156)	**120** (100-140)	**0.63** (0.07-1.18)
OU2-SED03 GLC No. 10,514	**22.6** (22.1-23.7)	**8.23** (7.57-8.54)	**8.0** (4.6-8.6)	**353** (321-394)	**156** (148-164)	**102** (98-106)	**0.20** (0.07-0.32)

Table 7. **Summary of Statistically Significant Differences (p< 0.05) Between the Laboratory Control and Investigative Sediment Samples;**
Chironomus dilutus **20-Day Whole Sediment Toxicity Tests Conducted June 10-June 30, 2015;**
USEPA Ecology and Environment, Inc.; Eighteen Mile Creek Site-OU2, New York.

Sample ID GLC No.	20-Day Survival	20-Day Growth[1] (AFDW)	20-Day Biomass[2] (AFDW)
BG1-SED01 GLC No. 10,505	**b**		
OU2-SED02 GLC No. 10,506			
OU2-SED01 GLC No. 10,513			
OU2-SED03 GLC No. 10,514	**b**	**c**	**c**

[1] Growth is average Ash-Free-Dry-Weight (AFDW) of surviving organisms
[2] Biomass weight is the total Ash-Free-Dry-Weight of surviving organisms divided by the initial number of organisms
[b] Significantly different (p< 0.05) from laboratory control CS#128.
[c] Statistical analysis for average growth and biomass was not conducted due to 100% mortality.

Table 8. **Summary of Statistically Significant Differences (p< 0.05) Between the Laboratory Control and Investigative Sediment Samples;**
***Hyalella azteca* 28-Day Whole Sediment Toxicity Tests Conducted June10-July 8, 2015;**
USEPA Ecology and Environment, Inc.; Eighteen Mile Creek Site-OU2, New York.

Sample ID GLC No.	28-Day Survival	28-Day Growth[1] (AFDW)	28-Day Biomass[2] (AFDW)
BG1-SED01 GLC No. 10,505		**b**	**b**
OU2-SED02 GLC No. 10,506			
OU2-SED01 GLC No. 10,513			**b**
OU2-SED03 GLC No. 10,514	**b**	**b**	**b**

[1] Average Dry Weight is the total dry weight of surviving organisms
[2] Biomass weight is the total dry weight of surviving organisms divided by the initial number of organisms of 10.
[b] Significantly different (p< 0.05) from laboratory control CS#128.

Appendix A
Chain of Custodies

GREAT LAKES ENVIRONMENTAL CENTER, INC.

CHAIN OF CUSTODY RECORD

TRAVERSE CITY, MI LABORATORY
739 Hastings Street
Traverse City, MI 49686

www.glec.com
Phone (231)941 2230
Fax (231)941-2240

Submitting Company: Ecology + Environment

Report Results To: Lynne Kalmbach

Address: 36 S Pleasant View Dr. Lancaster, NY 14086

Phone: 716-684-8060 E-mail: lkalmbach@ene-com

Project Name: 18mile creek OU2

Project Number: 5135-00

P.O.#:

Sampled by: initials ☐ GLEC ☒ Client BVE

#	GLEC No.	Sample Identification	Sample Information: Date	Time	Matrix	Grab or Composite	Preservative	Sample Containers: Type	Size	No.	Requested Analysis: 1000.1	1000.2	100.4	100.5		Temp				
1	10509	BG1-SW01	5/26/15	0855	SW	G	—	cube	1gal	5	X	X				2.0				
2	10510	OU2-SW01		1045	SW		—	"	"	5	X	X				0.7				
3	10513	OU2-SED01		1045	Sed		—	1gal	bucket	1			X	X		0.6				
4	10511	OU2-SW02		1300	SW		—	cube	1gal	5	X	X				1.5				
5	10514	OU2-SED03		1315	Sed		—	bucket	1gal	1			X	X		0.6				
6	10512	OU2-SW03		1320	SW		—	cube	1gal	5	X	X				1.0				
7																				
8																				

Client Notes:

RELEASED BY / ORGANIZATION	DATE	TIME	RECEIVED BY / ORGANIZATION	DATE	TIME
Print Name & Organization: Benjamin N. Cole / E+E	5/26/15	1800	Print Name & Organization: Michelle VanDenBrandt, GLEC	5/27/15	1113
Signature:			Signature:	5/27/15	1113
Print Name & Organization			Print Name & Organization		
Signature			Signature		

FOR LAB USE ONLY

Temperature of Samples: 2.0, 0.7, 1.5, 1.0 °C

☒ Received on Wet Ice

Notes/Anomalies/Discrepancies: none

MATRIX CODES: S = SEDIMENT; SW = SURFACE WATER; E = EFFLUENT; GW = GROUNDWATER; WW = WASTEWATER; BT = BIOLOGICAL TISSUE; SL = SLUDGE; AQ = AQUATIC ORGANISM

H.a = plain | Con = white
C.d. = bl. tape | water only = pink.

GREAT LAKES ENVIRONMENTAL CENTER, INC.

TRAVERSE CITY, MI - LABORATORY
739 Hastings Street
Traverse City, MI 49686

www.glec.com
Phone (231)941-2230
Fax (231)941-2240

CHAIN OF CUSTODY RECORD

Submitting Company: Los Alamos Technical Assoc / ENE

Report Results To: Lynne Kalmbach

Address: 756 Park Meadow Rd.

Phone: 614.508.1200 E-mail: lkalmbach@ene.com

Project Name: EMC-OU2 w 5/21/15

Project Number:

P.O.#: OHO-15-204

Sampled by: initials ☐ GLEC ☒ Client ENE

	GLEC No.	Sample Identification	Sample Information: Date	Time	Matrix	Grab or Composite	Preservative	Sample Containers: Type	Size	No.	Requested Analysis: 18.4	18.5
1	10505	BG1-SED01	5/21/15	1240	SED	Comp	None/Ice		1gal	1	X	X
2	10506	OU2-SED02	5/21/15	1600	SED	Comp	None/Ice		1gal	1	X	X
3												
4												
5												
6												
7												
8												

Client Notes:

RELEASED BY / ORGANIZATION	DATE	TIME	RECEIVED BY / ORGANIZATION	DATE	TIME
Print Name & Organization: Lynne Kalmbach ENE	5/21/15	1740	Print Name & Organization: Mitchmor GLEC	5/22/15	1115
Signature:			Signature:		
Print Name & Organization			Print Name & Organization		
Signature			Signature		

FOR LAB USE ONLY

Temperature of Samples: 2.0 °C

Notes/Anomalies/Discrepancies: N/A

☒ Received on Wet ice

MATRIX CODES: S = SEDIMENT; SW = SURFACE WATER; E = EFFLUENT; GW = GROUNDWATER; WW = WASTEWATER; BT = BIOLOGICAL TISSUE; SL = SLUDGE; AQ = AQUATIC ORGANISM

CUSTODY SEAL
DATE
SIGNATURE
QEC
Quality Environmental Containers
CUSTODY SEAL
DATE
SIGNATURE
QEC
Quality Environmental Containers
CUSTODY SEAL
DATE
SIGNATURE
QEC
Quality Environmental Containers
CUSTODY SEAL
DATE
SIGNATURE
QEC
Quality Environmental Containers
304-256-3900

Appendix B-1
Overlying Water Quality Summaries

- *Chironomus dilutus*

Project Name: Ecology and Environment
Project Number: 5135-00

Test Dates: 6/10-30/2015
Test Type: 20 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Chironomus dilutus*

100% Data Entry

Date	Initials	Data Entered
6/24/2015	KS	day 0-14
6/29/2015	MLV	Days 15-18
7/8/2015	MLV	Days 19-20

100% Data Quality Check

Date	Initials	Data QC'ed	Errors Found Y or N	Errors Corrected :Y or N
6/29/2015	MLV	Days 0-14	Y	Y
7/15/2015	KN	Days 15-20	N	n/a

100% Error Corrected Quality Check

Date	Initials	Data QC'ed
7/21/2015	mwg	con day 6- temp 10513 day 9 temps

Data QC 10%

Date	Initials	Data QC'ed
7/21/2015	mwg	days 1-2; day 14

Project Name: Ecology and Environment
Project Number: 5135-00
Sample ID: Laboratory Control
GLEC ID: CS# 128

Test Dates: 6/10-30/2015
Test Type: 20 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Chironomus dilutus*

Date	Test Day	Temperature (°C)	pH (s.u.)	D.O. (mg/L)	Conductivity (µmos)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)	Ammonia Result Code
10-Jun-15	0	23.3	7.99	6.8	332	144	116	0.69	
		23.4	8.01	6.9	334				
11-Jun-15	1	22.8		8.4					
		22.8		8.5					
12-Jun-15	2	22.5	8.31	8.4					
		22.5	8.36	8.5					
13-Jun-15	3	22.1							
		22.2							
14-Jun-15	4	22.6							
		22.6							
15-Jun-15	5	22.3	8.42	8.8					
		22.4	8.35	8.7					
16-Jun-15	6	23.2							
		23.2							
17-Jun-15	7	22.9	8.24	8.5	333				
		23.1	8.18	8.4	330				
18-Jun-15	8	23.6							
		23.6							
19-Jun-15	9	22.7	8.32	8.1					
		22.7	8.28	8.1					
20-Jun-15	10	22.7							
		22.6							
21-Jun-15	11	22.8							
		22.9							
22-Jun-15	12	22.6	8.22	8.0					
		22.6	8.28	8.1					
23-Jun-15	13	22.7							
		22.7							
24-Jun-15	14	22.3	8.27	8.6	313				
		22.5	8.30	8.4	312				
25-Jun-15	15	22.3							
		22.3							
26-Jun-15	16	22.3	7.66	5.2					
		22.3	8.14	8.1					
27-Jun-15	17	22.3							
		22.3							
28-Jun-15	18	22.1							
		22.1							
29-Jun-15	19	22.2	8.11	8.0					
		22.3	8.19	8.5					
30-Jun-15	20	22.6	7.96	8.3	315	148	102	0.15	J
		22.6	8.10	8.3	323				
MEAN		**22.6**	**8.18**	**8.1**	**324**	**146**	**109**	**0.42**	
N=		**42**	**20**	**22**	**8**	**2**	**2**	**2**	
Max #		**23.6**	**8.42**	**8.8**	**334**	**148**	**116**	**0.69**	
Min #		**22.1**	**7.66**	**5.2**	**312**	**144**	**102**	**0.15**	

Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L)
MDL = Minimum Detection Limit (0.02 mg/L)
U = Below MDL
J = ≥MDL and <RL

Project Name: Ecology and Environment
Project Number: 5135-00
Sample ID: Water Only Control
GLEC ID: Secondary Control

Test Dates: 6/10-30/2015
Test Type: 20 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Chironomus dilutus*

Date	Test Day	Temperature (°C)	pH (s.u.)	D.O. (mg/L)	Conductivity (µmos)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)	Ammonia Result Code
10-Jun-15	0	23.3	8.16	8.1	300	136	120	0.09	j
		23.4	8.22	8.2	300				
11-Jun-15	1	23.0		8.5					
		22.9		8.5					
12-Jun-15	2	22.5	8.44	8.7					
		22.5	8.42	8.6					
13-Jun-15	3	22.2							
		22.2							
14-Jun-15	4	22.6							
		22.6							
15-Jun-15	5	22.5	8.28	8.7					
		22.5	8.38	8.6					
16-Jun-15	6	23.3							
		23.4							
17-Jun-15	7	23.1	8.34	8.4	321				
		23.1	8.27	8.5	322				
18-Jun-15	8	23.6							
		23.7							
19-Jun-15	9	22.8	8.21	7.9					
		22.9	8.35	8.1					
20-Jun-15	10	22.6							
		22.5							
21-Jun-15	11	22.6							
		22.6							
22-Jun-15	12	22.6	8.36	8.4					
		22.7	8.35	8.5					
23-Jun-15	13	22.7							
		22.8							
24-Jun-15	14	22.4	8.09	8.1	312				
		22.5	8.33	8.1	316				
25-Jun-15	15	22.3							
		22.4							
26-Jun-15	16	22.4	8.15	8.1					
		22.4	8.31	8.3					
27-Jun-15	17	22.3							
		22.3							
28-Jun-15	18	22.2							
		22.2							
29-Jun-15	19	22.2	8.23	8.3					
		22.2	8.29	8.6					
30-Jun-15	20	22.6	8.22	8.4	309	132	100	0.32	
		22.6	8.20	8.5	309				
MEAN		**22.7**	**8.28**	**8.4**	**311**	**134**	**110**	**0.21**	
N=		**42**	**20**	**22**	**8**	**2**	**2**	**2**	
Max #		**23.7**	**8.44**	**8.7**	**322**	**136**	**120**	**0.32**	
Min #		**22.2**	**8.09**	**7.9**	**300**	**132**	**100**	**0.09**	

Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L)
MDL = Minimum Detection Limit (0.02 mg/L)
U = Below MDL
J = ≥MDL and <RL

Project Name: Ecology and Environment
Project Number: 5135-00
Sample ID: BG1-SED01
GLEC ID: 10505

Test Dates: 6/10-30/2015
Test Type: 20 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Chironomus dilutus*

Date	Test Day	Temperature (°C)	pH (s.u.)	D.O. (mg/L)	Conductivity (µmos)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)	Ammonia Result Code
10-Jun-15	0	23.2	7.75	6.2	370	144	110	0.43	
		23.3	7.73	6.2	386			0.37	
11-Jun-15	1	22.7		8.5					
		22.8		8.4					
12-Jun-15	2	22.5	8.22	8.0					
		22.5	8.26	8.1					
13-Jun-15	3	22.2							
		22.2							
14-Jun-15	4	22.6							
		22.6							
15-Jun-15	5	22.3	8.32	8.7					
		22.4	8.33	8.1					
16-Jun-15	6	23.3							
		23.3							
17-Jun-15	7	23.1	8.45	7.7	379				
		23.2	8.46	7.9	384				
18-Jun-15	8	23.5							
		23.6							
19-Jun-15	9	22.8	8.53	7.8					
		22.8	8.51	7.7					
20-Jun-15	10	22.6							
		22.6							
21-Jun-15	11	22.5							
		22.6							
22-Jun-15	12	22.7	8.35	7.7					
		22.6	8.39	7.4					
23-Jun-15	13	22.7							
		22.7							
24-Jun-15	14	22.4	8.44	8.1	384				
		22.5	8.30	8.0	374				
25-Jun-15	15	22.4							
		22.4							
26-Jun-15	16	22.4	8.35	8.4					
		22.4	8.26	8.2					
27-Jun-15	17	22.1							
		22.2							
28-Jun-15	18	22.2							
		22.2							
29-Jun-15	19	22.2	8.16	8.1					
		22.2	8.22	8.1					
30-Jun-15	20	22.5	8.29	8.6	371	164	112	0.15	J
		22.5	8.12	8.3	386	160	112	0.14	J
MEAN		**22.6**	**8.27**	**7.9**	**379**	**156**	**111**	**0.27**	
N=		**42**	**20**	**22**	**8**	**3**	**3**	**4**	
Max #		**23.6**	**8.53**	**8.7**	**386**	**164**	**112**	**0.43**	
Min #		**22.1**	**7.73**	**6.2**	**370**	**144**	**110**	**0.14**	

Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L)
MDL = Minimum Detection Limit (0.02 mg/L)
U = Below MDL
J = ≥MDL and <RL

Project Name: Ecology and Environment
Project Number: 5135-00
Sample ID: BG1-SED01
GLEC ID: 10506

Test Dates: 6/10-30/2015
Test Type: 20 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Chironomus dilutus*

Date	Test Day	Temperature (°C)	pH (s.u.)	D.O. (mg/L)	Conductivity (µmos)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)	Ammonia Result Code
10-Jun-15	0	23.4	7.28	3.5	365	156	126	0.92	
		23.5	7.43	3.5	363				
11-Jun-15	1	22.7		8.0					
		22.7		8.1					
12-Jun-15	2	22.5	8.28	8.1					
		22.5	8.27	7.9					
13-Jun-15	3	22.2							
		22.2							
14-Jun-15	4	22.6							
		22.6							
15-Jun-15	5	22.2	8.38	8.4					
		22.3	8.20	7.4					
16-Jun-15	6	23.3							
		23.3							
17-Jun-15	7	23.2	8.59	8.2	449				
		23.2	8.64	8.4	441				
18-Jun-15	8	23.6							
		23.6							
19-Jun-15	9	22.8	8.49	7.4					
		22.8	8.36	6.6					
20-Jun-15	10	22.6							
		22.4							
21-Jun-15	11	22.5							
		22.4							
22-Jun-15	12	22.5	8.25	7.3					
		22.6	8.30	7.3					
23-Jun-15	13	22.7							
		22.7							
24-Jun-15	14	22.3	8.13	7.7	391				
		22.4	8.25	7.7	404				
25-Jun-15	15	22.3							
		22.3							
26-Jun-15	16	22.3	8.21	8.3					
		22.3	8.25	8.3					
27-Jun-15	17	22.1							
		22.2							
28-Jun-15	18	22.0							
		22.1							
29-Jun-15	19	22.2	8.26	8.3					
		22.2	8.28	8.3					
30-Jun-15	20	22.5	8.24	8.1	369	152	112	0.11	J
		22.4	8.25	8.2	336				
MEAN		**22.6**	**8.22**	**7.5**	**390**	**154**	**119**	**0.52**	
N=		**42**	**20**	**22**	**8**	**2**	**2**	**2**	
Max #		**23.6**	**8.64**	**8.4**	**449**	**156**	**126**	**0.92**	
Min #		**22.0**	**7.28**	**3.5**	**336**	**152**	**112**	**0.11**	

Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L)
MDL = Minimum Detection Limit (0.02 mg/L)
U = Below MDL
J = ≥MDL and <RL

Project Name: Ecology and Environment
Project Number: 5135-00
Sample ID: OU2-SED01
GLEC ID: 10513

Test Dates: 6/10-30/2015
Test Type: 20 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Chironomus dilutus*

Date	Test Day	Temperature (°C)	pH (s.u.)	D.O. (mg/L)	Conductivity (µmos)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)	Ammonia Result Code
10-Jun-15	0	22.8	7.47	1.6	391	156	140	1.18	
		23.1	7.52	1.5	384				
11-Jun-15	1	22.7		8.0					
		22.7		7.5					
12-Jun-15	2	22.5	8.45	8.1					
		22.5	8.39	7.7					
13-Jun-15	3	22.1							
		22.1							
14-Jun-15	4	22.8							
		22.7							
15-Jun-15	5	22.3	8.48	8.3					
		22.4	8.48	8.2					
16-Jun-15	6	23.4							
		23.4							
17-Jun-15	7	23.4	8.41	8.1	394				
		23.2	8.37	8.0	398				
18-Jun-15	8	23.6							
		23.6							
19-Jun-15	9	22.7	8.41	7.6					
		22.8	8.30	7.5					
20-Jun-15	10	22.5							
		22.6							
21-Jun-15	11	22.6							
		22.6							
22-Jun-15	12	22.6	8.32	7.8					
		22.7	8.19	7.8					
23-Jun-15	13	22.7							
		22.8							
24-Jun-15	14	22.2	7.83	6.4	339				
		22.3	8.19	7.6	348				
25-Jun-15	15	22.2							
		22.3							
26-Jun-15	16	22.3	7.84	7.1					
		22.3	8.15	7.3					
27-Jun-15	17	22.3							
		22.3							
28-Jun-15	18	22.0							
		22.1							
29-Jun-15	19	22.1	8.29	8.4					
		22.2	8.26	8.4					
30-Jun-15	20	22.5	8.16	8.3	340	156	100	0.12	J
		22.4	8.14	8.3	340				
MEAN		**22.6**	**8.18**	**7.3**	**367**	**156**	**120**	**0.65**	
N=		**42**	**20**	**22**	**8**	**2**	**2**	**2**	
Max #		**23.6**	**8.48**	**8.4**	**398**	**156**	**140**	**1.18**	
Min #		**22.0**	**7.47**	**1.5**	**339**	**156**	**100**	**0.12**	

Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L)
MDL = Minimum Detection Limit (0.02 mg/L)
U = Below MDL
J = ≥MDL and <RL

Project Name: Ecology and Environment
Project Number: 5135-00
Sample ID: OU2-SED03
GLEC ID: 10514

Test Dates: 6/10-30/2015
Test Type: 20 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Chironomus dilutus*

Date	Test Day	Temperature (°C)	pH (s.u.)	D.O. (mg/L)	Conductivity (µmos)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)	Ammonia Result Code
10-Jun-15	0	22.8	7.64	5.1	353	164	106	0.32	
		23.0	7.73	5.2	380				
11-Jun-15	1	22.7		8.5					
		22.7		8.2					
12-Jun-15	2	22.5	8.57	8.2					
		22.6	8.54	8.2					
13-Jun-15	3	22.1							
		22.1							
14-Jun-15	4	22.8							
		22.7							
15-Jun-15	5	22.4	8.48	8.3					
		22.5	8.49	8.3					
16-Jun-15	6	23.3							
		23.4							
17-Jun-15	7	23.2	8.45	8.0	402				
		23.3	8.39	7.8	397				
18-Jun-15	8	23.6							
		23.6							
19-Jun-15	9	22.9	8.38	7.7					
		22.9	8.30	7.6					
20-Jun-15	10	22.5							
		22.5							
21-Jun-15	11	22.6							
		22.6							
22-Jun-15	12	22.6	8.26	7.7					
		22.6	8.24	7.7					
23-Jun-15	13	22.7							
		22.8							
24-Jun-15	14	22.2	8.20	8.1	347				
		22.3	8.26	7.9	344				
25-Jun-15	15	22.3							
		22.3							
26-Jun-15	16	22.3	8.14	8.2					
		22.3	8.22	8.4					
27-Jun-15	17	22.0							
		22.1							
28-Jun-15	18	22.2							
		22.2							
29-Jun-15	19	22.2	8.25	8.5					
		22.1	8.24	8.5					
30-Jun-15	20	22.5	8.09	8.3	340	152	96	0.13	J
		22.5	8.11	8.2	331				
MEAN		**22.6**	**8.25**	**7.8**	**362**	**158**	**101**	**0.23**	
N=		**42**	**20**	**22**	**8**	**2**	**2**	**2**	
Max #		**23.6**	**8.57**	**8.5**	**402**	**164**	**106**	**0.32**	
Min #		**22.0**	**7.64**	**5.1**	**331**	**152**	**96**	**0.13**	

Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L)
MDL = Minimum Detection Limit (0.02 mg/L)
U = Below MDL
J = ≥MDL and <RL

Appendix B-2
Overlying Water Quality Summaries

- *Hyalella azteca*

Project Name: Ecology and Environment
Project Number: 5135-00

Test Dates: 6/10-7/8/2015
Test Type: 28 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Hyalella azteca*

100% Data Entry

Date	Initials	Data Entered
6/24/2015	MP	Day 0-14, ALL
6/29/2015	MLV	Days 15-18
7/8/2015	MLV	Days 19-27
7/9/2015	MLV	Day 28

100% Data Quality Check

Date	Initials	Data QC'ed	Errors Found Y or N	Errors Corrected :Y or N
6/29/2015	MLV	Days 0-14	Y	Y
7/15/2015	KN	Days 15-28	N	n/a

100% Error Corrected Quality Check

Date	Initials	Data QC'ed
7/21/2015	mwg	con day 11-temp water only day 7 DO

Data QC 10%

Date	Initials	Data QC'ed
7/21/2015	mwg	day 8-9 day 14 day 26-27

Project Name: Ecology and Environment
Project Number: 5135-00
Sample ID: Laboratory Control
GLEC ID: CS# 128

Test Dates: 6/10-7/8/2015
Test Type: 28 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Hyalella azteca*

Date	Test Day	Temperature (°C)	pH (s.u.)	D.O. (mg/L)	Conductivity (µmos)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)	Ammonia Result Code
10-Jun-15	0	23.6	7.95	7.1	327	144	116	0.69	
		23.6	7.97	6.8	327				
11-Jun-15	1	23.2		8.4					
		23.1		8.3					
12-Jun-15	2	22.8	8.19	8.2					
		22.7	8.27	8.1					
13-Jun-15	3	22.2							
		22.2							
14-Jun-15	4	22.9							
		22.9							
15-Jun-15	5	22.4	8.23	8.8					
		22.5	8.32	8.7					
16-Jun-15	6	23.7							
		23.8							
17-Jun-15	7	23.4	8.10	8.6	325				
		23.4	8.18	8.6	325				
18-Jun-15	8	23.9							
		23.9							
19-Jun-15	9	23.3	8.14	8.5					
		23.2	8.31	8.4					
20-Jun-15	10	22.6							
		22.6							
21-Jun-15	11	22.7							
		22.6							
22-Jun-15	12	22.7	8.14	7.8					
		22.7	8.20	8.2					
23-Jun-15	13	22.6							
		22.5							
24-Jun-15	14	22.5	8.07	8.7	315				
		22.5	8.22	8.6	306				
25-Jun-15	15	22.3							
		22.4							
26-Jun-15	16	22.5	8.25	8.7					
		22.5	8.27	8.6					
27-Jun-15	17	22.3							
		22.4							
28-Jun-15	18	22.2							
		22.2							
29-Jun-15	19	22.3	8.06	6.0					
		22.4	8.11	6.4					
30-Jun-15	20	22.5							
		22.5							
1-Jul-15	21	22.7	8.40	8.2	323				
		22.7	8.51	8.3	342				
2-Jul-15	22	22.7							
		22.7							
3-Jul-15	23	22.8	8.28	8.3					
		22.8	8.23	8.5					
4-Jul-15	24	22.7							
		22.7							
5-Jul-15	25	22.6							
		22.8							
6-Jul-15	26	22.8	8.23	8.2					
		22.8	8.33	8.3					
7-Jul-15	27	23.0							
		22.8							
8-Jul-15	28	22.7	7.99	8.4	322	144	106	0.11	J
		22.7	8.27	8.5	315				
MEAN		**22.8**	**8.20**	**8.2**	**323**	**144**	**111**	**0.40**	
N=		**58**	**26**	**28**	**10**	**2**	**2**	**2**	
Max #		**23.9**	**8.51**	**8.8**	**342**	**144**	**116**	**0.69**	
Min #		**22.2**	**7.95**	**6.0**	**306**	**144**	**106**	**0.11**	

Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L)
MDL = Minimum Detection Limit (0.02 mg/L)
U = Below MDL
J = ≥MDL and <RL

Project Name: Ecology and Environment
Project Number: 5135-00
Sample ID: Water Only Control
GLEC ID: Secondary Control

Test Dates: 6/10-7/8/2015
Test Type: 28 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Hyalella azteca*

Date	Test Day	Temperature (°C)	pH (s.u.)	D.O. (mg/L)	Conductivity (µmos)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)	Ammonia Result Code
10-Jun-15	0	23.4	8.08	8.3	301	136	120	0.09	J
		23.5	8.12	8.4	303				
11-Jun-15	1	23.1		8.5					
		23.2		8.5					
12-Jun-15	2	22.7	8.40	8.6					
		22.7	8.32	8.5					
13-Jun-15	3	22.2							
		22.2							
14-Jun-15	4	22.9							
		22.9							
15-Jun-15	5	22.6	8.32	8.9					
		22.6	8.34	8.8					
16-Jun-15	6	23.7							
		23.7							
17-Jun-15	7	23.5	8.31	8.5	315				
		23.4	8.22	8.6	316				
18-Jun-15	8	23.9							
		23.9							
19-Jun-15	9	23.1	8.36	8.5					
		23.1	8.35	8.5					
20-Jun-15	10	22.6							
		22.5							
21-Jun-15	11	22.5							
		22.5							
22-Jun-15	12	22.7	8.29	8.5					
		22.6	8.27	8.5					
23-Jun-15	13	22.6							
		22.6							
24-Jun-15	14	22.2	8.33	8.7	302				
		22.3	8.39	8.7	311				
25-Jun-15	15	22.5							
		22.5							
26-Jun-15	16	22.5	8.32	8.8					
		22.5	8.37	8.9					
27-Jun-15	17	22.1							
		22.3							
28-Jun-15	18	22.0							
		22.1							
29-Jun-15	19	22.3	8.18	7.8					
		22.3	8.21	7.7					
30-Jun-15	20	22.5							
		22.4							
1-Jul-15	21	22.8	8.44	8.3	304				
		22.7	8.53	8.3	313				
2-Jul-15	22	22.7							
		22.7							
3-Jul-15	23	22.8	8.22	8.3					
		22.8	8.29	8.4					
4-Jul-15	24	22.7							
		22.8							
5-Jul-15	25	22.6							
		22.6							
6-Jul-15	26	22.6	8.26	8.3					
		22.7	8.35	8.4					
7-Jul-15	27	22.8							
		22.9							
8-Jul-15	28	22.6	8.24	8.3	304	136	102	0.38	
		22.7	8.33	8.4	311				
MEAN		**22.7**	**8.30**	**8.5**	**308**	**136**	**111**	**0.24**	
N=		**58**	**26**	**28**	**10**	**2**	**2**	**2**	
Max #		**23.9**	**8.53**	**8.9**	**316**	**136**	**120**	**0.38**	
Min #		**22.0**	**8.08**	**7.7**	**301**	**136**	**102**	**0.09**	

Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L)
MDL = Minimum Detection Limit (0.02 mg/L)
U = Below MDL
J = ≥MDL and <RL

Project Name: Ecology and Environment
Project Number: 5135-00
Sample ID: BG1-SED01
GLEC ID: 10505

Test Dates: 6/10-7/8/2015
Test Type: 28 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Hyalella azteca*

Date	Test Day	Temperature (°C)	pH (s.u.)	D.O. (mg/L)	Conductivity (µmos)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)	Ammonia Result Code
10-Jun-15	0	23.1	7.95	8.2	341	144	110	0.43	
		23.2	7.93	7.6	341	144	112	0.37	
11-Jun-15	1	23.1		8.5					
		23.0		8.4					
12-Jun-15	2	22.5	8.29	8.5					
		22.5	8.26	8.3					
13-Jun-15	3	22.2							
		22.2							
14-Jun-15	4	22.8							
		22.8							
15-Jun-15	5	22.6	8.41	8.7					
		22.6	8.33	8.7					
16-Jun-15	6	23.5							
		23.5							
17-Jun-15	7	23.5	8.50	8.2	361				
		23.5	8.55	8.2	355				
18-Jun-15	8	23.7							
		23.8							
19-Jun-15	9	23.0	8.63	8.4					
		23.0	8.60	8.3					
20-Jun-15	10	22.6							
		22.6							
21-Jun-15	11	22.7							
		22.8							
22-Jun-15	12	22.7	8.45	8.3					
		22.7	8.47	8.3					
23-Jun-15	13	22.6							
		22.7							
24-Jun-15	14	22.4	8.39	8.7	377				
		22.5	8.42	8.6	376				
25-Jun-15	15	22.3							
		22.4							
26-Jun-15	16	22.5	8.38	8.9					
		22.5	8.39	8.9					
27-Jun-15	17	22.1							
		22.2							
28-Jun-15	18	22.1							
		22.1							
29-Jun-15	19	22.3	8.34	8.4					
		22.3	8.31	8.4					
30-Jun-15	20	22.4							
		22.5							
1-Jul-15	21	22.8	8.43	8.3	348				
		22.7	8.57	8.3	385				
2-Jul-15	22	22.7							
		22.8							
3-Jul-15	23	22.8	8.28	8.4					
		22.8	8.32	8.4					
4-Jul-15	24	22.8							
		22.8							
5-Jul-15	25	22.7							
		22.6							
6-Jul-15	26	22.6	8.23	8.3					
		22.6	8.21	8.3					
7-Jul-15	27	23.0							
		23.0							
8-Jul-15	28	22.7	8.24	8.3	336	152	104	0.08	J
		22.6	8.21	8.2	324	152	108	0.08	J
MEAN		**22.7**	**8.35**	**8.4**	**354**	**148**	**109**	**0.24**	
N=		**58**	**26**	**28**	**10**	**4**	**4**	**4**	
Max #		**23.8**	**8.63**	**8.9**	**385**	**152**	**112**	**0.43**	
Min #		**22.1**	**7.93**	**7.6**	**324**	**144**	**104**	**0.08**	

Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L)
MDL = Minimum Detection Limit (0.02 mg/L)
U = Below MDL
J = ≥MDL and <RL

Project Name: Ecology and Environment
Project Number: 5135-00
Sample ID: BG1-SED01
GLEC ID: 10506

Test Dates: 6/10-7/8/2015
Test Type: 28 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Hyalella azteca*

Date	Test Day	Temperature (°C)	pH (s.u.)	D.O. (mg/L)	Conductivity (µmos)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)	Ammonia Result Code
10-Jun-15	0	23.2	7.54	4.3	377	156	126	0.92	
		23.3	7.45	4.4	361				
11-Jun-15	1	22.9		8.2					
		23.0		8.2					
12-Jun-15	2	22.2	8.26	8.4					
		22.4	8.27	8.4					
13-Jun-15	3	22.2							
		22.2							
14-Jun-15	4	22.7							
		22.7							
15-Jun-15	5	22.5	8.25	8.0					
		22.6	8.22	7.9					
16-Jun-15	6	23.5							
		23.5							
17-Jun-15	7	23.5	8.56	8.2	434				
		23.4	8.60	8.2	440				
18-Jun-15	8	23.7							
		23.7							
19-Jun-15	9	22.8	8.52	7.6					
		22.9	8.41	7.4					
20-Jun-15	10	22.4							
		22.4							
21-Jun-15	11	22.5							
		22.5							
22-Jun-15	12	22.6	8.47	8.4					
		22.6	8.43	8.3					
23-Jun-15	13	22.7							
		22.7							
24-Jun-15	14	22.4	8.45	8.6	393				
		22.3	8.49	8.5	415				
25-Jun-15	15	22.4							
		22.5							
26-Jun-15	16	22.3	8.39	8.7					
		22.3	8.44	8.7					
27-Jun-15	17	22.1							
		22.2							
28-Jun-15	18	22.0							
		22.1							
29-Jun-15	19	22.2	8.38	8.5					
		22.2	8.36	8.5					
30-Jun-15	20	22.5							
		22.5							
1-Jul-15	21	22.6	8.57	8.4	362				
		22.6	8.48	8.0	378				
2-Jul-15	22	22.7							
		22.7							
3-Jul-15	23	22.8	8.28	7.7					
		22.8	8.25	7.7					
4-Jul-15	24	22.8							
		22.8							
5-Jul-15	25	22.7							
		22.7							
6-Jul-15	26	22.6	8.34	8.0					
		22.6	8.40	8.0					
7-Jul-15	27	22.9							
		22.9							
8-Jul-15	28	22.5	8.33	8.2	385	180	134	0.07	J
		22.5	8.41	8.2	366				
MEAN		**22.7**	**8.33**	**7.9**	**391**	**168**	**130**	**0.50**	
N=		**58**	**26**	**28**	**10**	**2**	**2**	**2**	
Max #		**23.7**	**8.60**	**8.7**	**440**	**180**	**134**	**0.92**	
Min #		**22.0**	**7.45**	**4.3**	**361**	**156**	**126**	**0.07**	

Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L)
MDL = Minimum Detection Limit (0.02 mg/L)
U = Below MDL
J = ≥MDL and <RL

Project Name: Ecology and Environment
Project Number: 5135-00
Sample ID: OU2-SED01
GLEC ID: 10513

Test Dates: 6/10-7/8/2015
Test Type: 28 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Hyalella azteca*

Date	Test Day	Temperature (°C)	pH (s.u.)	D.O. (mg/L)	Conductivity (µmos)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)	Ammonia Result Code
10-Jun-15	0	23.3	7.61	1.4	346	156	140	1.18	
		23.3	7.55	1.3	418				
11-Jun-15	1	22.8		8.1					
		22.9		8.2					
12-Jun-15	2	22.3	8.53	8.2					
		22.4	8.49	7.9					
13-Jun-15	3	22.2							
		22.2							
14-Jun-15	4	22.6							
		22.6							
15-Jun-15	5	22.6	8.47	8.3					
		22.6	8.53	8.3					
16-Jun-15	6	23.5							
		23.5							
17-Jun-15	7	23.4	8.50	8.0	399				
		23.4	8.44	8.0	400				
18-Jun-15	8	23.8							
		23.8							
19-Jun-15	9	23.0	8.34	7.9					
		23.0	8.38	7.8					
20-Jun-15	10	22.5							
		22.5							
21-Jun-15	11	22.7							
		22.7							
22-Jun-15	12	22.5	8.32	8.3					
		22.6	8.16	7.6					
23-Jun-15	13	22.7							
		22.7							
24-Jun-15	14	22.2	8.24	8.4	336				
		22.3	8.23	7.9	330				
25-Jun-15	15	22.5							
		22.5							
26-Jun-15	16	22.3	8.14	8.7					
		22.3	8.18	8.4					
27-Jun-15	17	22.3							
		22.3							
28-Jun-15	18	22.1							
		22.2							
29-Jun-15	19	22.2	8.24	8.4					
		22.2	8.18	8.3					
30-Jun-15	20	22.5							
		22.5							
1-Jul-15	21	22.1	8.17	7.1	331				
		22.4	8.28	7.6	326				
2-Jul-15	22	22.7							
		22.7							
3-Jul-15	23	22.7	8.16	8.0					
		22.8	8.22	7.9					
4-Jul-15	24	22.8							
		22.8							
5-Jul-15	25	22.6							
		22.6							
6-Jul-15	26	22.5	8.04	8.2					
		22.5	8.12	6.9					
7-Jul-15	27	22.9							
		23.0							
8-Jul-15	28	22.6	8.22	8.2	323	148	100	0.07	J
		22.6	8.21	8.1	329				
MEAN		**22.7**	**8.23**	**7.6**	**354**	**152**	**120**	**0.63**	
N=		**58**	**26**	**28**	**10**	**2**	**2**	**2**	
Max #		**23.8**	**8.53**	**8.7**	**418**	**156**	**140**	**1.18**	
Min #		**22.1**	**7.55**	**1.3**	**323**	**148**	**100**	**0.07**	

Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L)
MDL = Minimum Detection Limit (0.02 mg/L)
U = Below MDL
J = ≥MDL and <RL

Project Name: Ecology and Environment
Project Number: 5135-00
Sample ID: OU2-SED03
GLEC ID: 10514

Test Dates: 6/10-7/8/2015
Test Type: 28 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Hyalella azteca*

Date	Test Day	Temperature (°C)	pH (s.u.)	D.O. (mg/L)	Conductivity (µmos)	Hardness (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)	Ammonia Result Code
10-Jun-15	0	23.2	7.61	6.0	376	164	106	0.32	
		23.3	7.57	4.6	370				
11-Jun-15	1	22.8		8.3					
		22.8		8.3					
12-Jun-15	2	22.4	8.50	8.4					
		22.4	8.54	8.4					
13-Jun-15	3	22.2							
		22.2							
14-Jun-15	4	22.6							
		22.6							
15-Jun-15	5	22.1	8.52	8.6					
		22.2	8.54	8.5					
16-Jun-15	6	23.5							
		23.5							
17-Jun-15	7	23.3	8.41	8.1	392				
		23.4	8.44	8.0	394				
18-Jun-15	8	23.7							
		23.7							
19-Jun-15	9	22.8	8.39	8.1					
		22.8	8.41	8.1					
20-Jun-15	10	22.7							
		22.5							
21-Jun-15	11	22.6							
		22.6							
22-Jun-15	12	22.5	8.18	7.9					
		22.6	8.30	8.1					
23-Jun-15	13	22.8							
		22.7							
24-Jun-15	14	22.1	8.10	8.4	328				
		22.3	8.16	8.0	350				
25-Jun-15	15	22.4							
		22.5							
26-Jun-15	16	22.3	8.14	8.5					
		22.3	8.17	8.5					
27-Jun-15	17	22.4							
		22.3							
28-Jun-15	18	22.1							
		22.1							
29-Jun-15	19	22.2	8.16	8.3					
		22.3	8.11	8.4					
30-Jun-15	20	22.4							
		22.4							
1-Jul-15	21	22.5	8.39	8.3	330				
		22.5	8.39	8.2	335				
2-Jul-15	22	22.7							
		22.7							
3-Jul-15	23	22.7	8.24	8.0					
		22.7	8.19	8.0					
4-Jul-15	24	22.8							
		22.8							
5-Jul-15	25	22.7							
		22.7							
6-Jul-15	26	22.5	8.04	7.5					
		22.5	8.15	7.7					
7-Jul-15	27	23.0							
		23.0							
8-Jul-15	28	22.6	8.16	7.8	321	148	98	0.07	J
		22.6	8.23	8.0	330				
MEAN		**22.6**	**8.23**	**8.0**	**353**	**156**	**102**	**0.20**	
N=		**58**	**26**	**28**	**10**	**2**	**2**	**2**	
Max #		**23.7**	**8.54**	**8.6**	**394**	**164**	**106**	**0.32**	
Min #		**22.1**	**7.57**	**4.6**	**321**	**148**	**98**	**0.07**	

Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L)
MDL = Minimum Detection Limit (0.02 mg/L)
U = Below MDL
J = ≥MDL and <RL

Appendix C1
Chironomus dilutus
20-Day Bench Sheets

- Survival
- Weight

QC'd by: MLV

5135-00
Ecology & Environmental
Chironomus dilutus 20-Day Survival and Growth Whole Sediment Toxicity Test

Project Number:	5135-00	Project Name:	Ecology & Environmental
GLC#:	CS 128	Test Photoperiod:	16:8
Sample ID:	Laboratory Control	Test System:	Sediment-100 mL and Overlying Water-175mL Manual Delivery
Test Species:	*Chironomus dilutus*	Test Temperature:	23± 1°C
Date Addition of Sediment:	6/9/2015	Test Organism Source/Age:	ABS <24 hours
Test Initiation Date:	6/10/2015	Test Termination Date:	6/30/2015

Test Day: 20
Date: 6/30/2015
Overlying Water: Dechlor
Overlying Water Batch ID (GLC Number): NA
1000 MLW chemistries time/Initial

Number Daily Renewals: —
□ — renewal time/Initials — □ — renewal
□ — renewal time/Initials — □ — renewal
~~Feed: TFS# (4g/L) — □ Feed 1.5 ml/replicate~~
~~Screen: Cleaned: □ yes □ no~~

Replicate	Temperature (23± 1°C)*	pH	Dissolved Oxygen (mg/L)*	Specific Conductance (µmhos/cm)	Hardness (mg/L $CaCO_3$)	Alkalinity (mg/L $CaCO_3$)	Ammonia (as N)	Observations/ # Surviving Organisms
Record Meter ID	40	203	175	175	N/A	203	4	Init: MLW
1	22.6	7.96	8.3	315	148	102	0.15 J	pupae: 0 larvae: 10 midge: 0 — 10/12
2	22.6	8.10	8.3	323	end: 4.0	end: 12.3		pupae: 0 larvae: 11 midge: 0 — 11/12
3					start: 0.3	start: 7.2		pupae: 0 larvae: 12 midge: 0 — 12/12
4					Titrant used (mL): 3.7	Titrant used (mL): 5.1		pupae: 0 larvae: 12 midge: 0 — 12/12
5					Sample volume (mL): 25	Sample volume (mL): 50		pupae: 0 larvae: 12 midge: 0 — 12/12
6								pupae: 0 larvae: 12 midge: 0 — 12/12
7								pupae: 0 larvae: 12 midge: 0 — 12/12
8								pupae: 0 larvae: 12 midge: 0 — 12/12

Relative % Difference: RPD ≤15%

$$RPD = \frac{(S_1 - S_2)}{(S_1 + S_2)/2} \times 100 =$$

revised: June 2012

* Contact Laboratory Coordinator if Dissolved Oxygen level is < 2.5 mg/L or if Temperature is out of range.
*Alkalinity, hardness and ammonia analyzed from a composite sample of all 8 replicates.
Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L).
MDL = Minimum Detection Limit (0.02 mg/L) - last updated 12/2014.
U = Below MDL. J = ≥ MDL and < RL.

KEY:
AV: Animals Visible
NAV: No Animals Visible
FOV: Foreign Organism Visible

QC'd by: MLV

5135-00
Ecology & Environmental
Chironomus dilutus 20-Day Survival and Growth Whole Sediment Toxicity Test

Project Number:	5135-00	Project Name:	Ecology & Environmental
GLC#:	Water Only	Test Photoperiod:	16:8
Sample ID:	Secondary Control	Test System:	Sediment-100 mL and Overlying Water-175mL Manual Delivery
Test Species:	*Chironomus dilutus*	Test Temperature:	23± 1°C
Date Addition of Sediment:	6/9/2015	Test Organism Source/Age:	ABS <24 hours
Test Initiation Date:	6/10/2015	Test Termination Date:	6/30/2015

Test Day: 20
Date: 6/30/2015
Overlying Water: Dechlor
Overlying Water Batch ID (GLC Number): NA
chemistries time/Initial

Number Daily Renewals: —
□ — renewal time/Initials ~~□ renewal~~
~~□ renewal time/Initials □ renewal~~
~~Feed: TFS# (4g/L) □ Feed 1.5 ml/replicate~~
~~Screen: Cleaned: □ yes □ no~~

Replicate	Temperature (23± 1°C)*	pH	Dissolved Oxygen (mg/L)*	Specific Conductance (µmhos/cm)	Hardness (mg/L $CaCO_3$)	Alkalinity (mg/L $CaCO_3$)	Ammonia (as N)	Observations/ # Surviving Organisms
Record Meter ID	40	203	175	175	N/A	203	4	Init: Nur
1	22.6	8.22	8.4	309	132	100	0.32	pupae: 0 larvae: 12 midge: 0 — 12/12
2	22.6	8.20	8.5	309	end: 7.3	end: 17.3		pupae: 0 larvae: 10 midge: 0 — 10/12
3					start: 4.0	start: 12.3		pupae: 0 larvae: 10 midge: 0 — 10/12
4					Titrant used (mL): 3.3	Titrant used (mL): 5.0		pupae: 0 larvae: 12 midge: 0 — 12/12
5					Sample volume (mL): 25	Sample volume (mL): 50		pupae: 0 larvae: 11 midge: 0 — 11/12
6								pupae: 0 larvae: 12 midge: 0 — 12/12
7								pupae: 0 larvae: 11 midge: 0 — 11/12
8								pupae: 0 larvae: 11 midge: 0 — 11/12

Relative % Difference: RPD ≤15%

$$RPD = \frac{(S_1 - S_2)}{(S_1 + S_2)/2} \times 100 =$$

* Contact Laboratory Coordinator if Dissolved Oxygen level is < 2.5 mg/L or if Temperature is out of range.
*Alkalinity, hardness and ammonia analyzed from a composite sample of all 8 replicates.
Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L).
MDL = Minimum Detection Limit (0.02 mg/L) - last updated 12/2014.
U = Below MDL. J = ≥ MDL and < RL.

KEY:
AV: Animals Visible
NAV: No Animals Visible
FOV: Foreign Organism Visible

revised: June 2012

QC'd by: MLV

5135-00
Ecology & Environmental
Chironomus dilutus 20-Day Survival and Growth Whole Sediment Toxicity Test

Project Number:	5135-00	Project Name:	Ecology & Environmental
GLC#:	10505	Test Photoperiod:	16:8
Sample ID:	BG1-SED01	Test System:	Sediment-100 mL and Overlying Water-175mL Manual Delivery
Test Species:	*Chironomus dilutus*	Test Temperature:	23± 1°C
Date Addition of Sediment:	6/9/2015	Test Organism Source/Age:	ABS <24 hours
Test Initiation Date:	6/10/2015	Test Termination Date:	6/30/2015

Test Day: 20
Date: 6/30/2015
Overlying Water: Dechlor
Overlying Water Batch ID (GLC Number): NA
Pwormur chemistries time/Initial

Number Daily Renewals: —
□ — renewal time/Initials — □ renewal
□ renewal time/Initials □ renewal
Feed: TFS# (4g/L) □ Feed 1.5 ml/replicate
Screens Cleaned: □ yes □ no

Replicate	Temperature (23± 1°C)*	pH	Dissolved Oxygen (mg/L)*	Specific Conductance (µmhos/cm)	Hardness (mg/L $CaCO_3$)	Alkalinity (mg/L $CaCO_3$)	Ammonia (as N)	Observations/ # Surviving Organisms
Record Meter ID	40	203	175	175	N/A	203	4	Init: Mwb
1	22.5	8.29	8.6	371	164 | Dup 160	112 | Dup 112	0.15 J	pupae: 6 larvae: 10 midge: 8 — 10 /12
2	22.5	8.12	8.3	386	end: 11.4 | 15.4	end: 22.9 | 28.5	Dup 0.14 J	pupae: 0 larvae: 10 midge: 0 — 10 /12
3					start: 7.3 | 11.4	start: 17.3 | 22.9		pupae: 0 larvae: 11 midge: 0 — 11 /12
4					Titrant used (mL): 4.1 | 4.0	Titrant used (mL): 5.6 | 5.6		pupae: 0 larvae: 12 midge: 0 — 12/12
5					Sample volume (mL): 25 | 25	Sample volume (mL): 50 | 50		pupae: 0 larvae: 10 midge: 0 — 10 /12
6								pupae: 9 larvae: midge: 6 — 11 /12
7								pupae: 10 larvae: midge: 0 — 10/12
8								pupae: 0 larvae: 11 midge: 0 — 11 /12

Relative % Difference: RPD ≤15%

$$RPD = \frac{(S_1 - S_2)}{(S_1 + S_2)/2} \times 100 =$$

* Contact Laboratory Coordinator if Dissolved Oxygen level is < 2.5 mg/L or if Temperature is out of range.
*Alkalinity, hardness and ammonia analyzed from a composite sample of all 8 replicates.

Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L).
MDL = Minimum Detection Limit (0.02 mg/L) - last updated 12/2014.
U = Below MDL. J = ≥ MDL and < RL.

KEY:
AV: Animals Visible
NAV: No Animals Visible
FOV: Foreign Organism Visible

revised: June 2012

QC'd by: MLV

5135-00
Ecology & Environmental
Chironomus dilutus 20-Day Survival and Growth Whole Sediment Toxicity Test

Project Number:	5135-00	Project Name:	Ecology & Environmental
GLC#:	10506	Test Photoperiod:	16:8
Sample ID:	OU2-SED02	Test System:	Sediment-100 mL and Overlying Water-175mL, Manual Delivery
Test Species:	*Chironomus dilutus*	Test Temperature:	23± 1°C
Date Addition of Sediment:	6/9/2015	Test Organism Source/Age:	ABS <24 hours
Test Initiation Date:	6/10/2015	Test Termination Date:	6/30/2015

Test Day: 20
Date: 6/30/2015
Overlying Water: Dechlor
Overlying Water Batch ID (GLC Number): NA
AM/PM chemistries time/Initial

Number Daily Renewals: —
renewal time/Initials — renewal
renewal time/Initials — renewal
Food: TFS# (4g/L) — Feed 1.5 ml/replicate
Screens Cleaned: yes no

Replicate	Temperature (23± 1°C)*	pH	Dissolved Oxygen (mg/L)*	Specific Conductance (µmhos/cm)	Hardness (mg/L $CaCO_3$)	Alkalinity (mg/L $CaCO_3$)	Ammonia (as N)	Observations/ # Surviving Organisms
Record Meter ID	40	203	175	175	N/A	203	4	Init: MLV
1	22.5	8.24	8.1	369	152	112	0.1U	pupae:0 larvae:11 midge:0 — 11/12
2	22.4	8.25	8.2	336	end: 19.2	end: 34.1		pupae:0 larvae:12 midge:0 — 12/12
3					start: 15.4	start: 28.5		pupae:0 larvae:12 midge:0 — 12/12
4					Titrant used (mL): 3.8	Titrant used (mL): 5.6		pupae:0 larvae:12 midge:0 — 12/12
5					Sample volume (mL): 25	Sample volume (mL): 50		pupae:0 larvae:10 midge:2 — 12/12
6								pupae:0 larvae:11 midge:1 — 12/12
7								pupae:0 larvae:9 midge:0 — 9/12
8								pupae:1 larvae:9 midge:0 — 10/12

Relative % Difference: RPD ≤15%

$$RPD = \frac{(S_1 - S_2)}{(S_1 + S_2)/2} \times 100 =$$

revised: June 2012

* Contact Laboratory Coordinator if Dissolved Oxygen level is < 2.5 mg/L or if Temperature is out of range.
*Alkalinity, hardness and ammonia analyzed from a composite sample of all 8 replicates.
Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L).
MDL = Minimum Detection Limit (0.02 mg/L) - last updated 12/2014.
U = Below MDL. *J* = ≥ MDL and < RL.

KEY:
AV: Animals Visible
NAV: No Animals Visible
FOV: Foreign Organism Visible

QC'd by: MLV

5135-00
Ecology & Environmental
Chironomus dilutus 20-Day Survival and Growth Whole Sediment Toxicity Test

Project Number:	5135-00	Project Name:	Ecology & Environmental
GLC#:	10513	Test Photoperiod:	16:8
Sample ID:	OU2-SED01	Test System:	Sediment-100 mL and Overlying Water-175mL Manual Delivery
Test Species:	*Chironomus dilutus*	Test Temperature:	23± 1°C
Date Addition of Sediment:	6/9/2015	Test Organism Source/Age:	ABS <24 hours
Test Initiation Date:	6/10/2015	Test Termination Date:	6/30/2015

Test Day: 20
Date: 6/30/2015
Overlying Water: Dechlor
Overlying Water Batch ID (GLC Number): NA
~~0900 hrs~~ chemistries time/Initial

Number Daily Renewals: ——
~~□ —— renewal time/Initials —□—— renewal~~
~~□ —— renewal time/Initials —□—— renewal~~
~~Feed: TFS# (4g/L) —□ Feed 1.5 ml/replicate~~
~~Screens Cleaned: □ yes □ no~~

Replicate	Temperature (23± 1°C)*	pH	Dissolved Oxygen (mg/L)*	Specific Conductance (µmhos/cm)	Hardness (mg/L $CaCO_3$)	Alkalinity (mg/L $CaCO_3$)	Ammonia (as N)	Observations/ # Surviving Organisms
Record Meter ID	40	203	175	175	N/A	203	4	Init: MLV
1	22.5	8.16	8.3	340	156	100	0.125	pupae: 0 larvae: 11 midge: 0 — 11/12
2	22.4	8.14	8.3	340	end: 23.1	end: 39.1		pupae: 0 larvae: 11 midge: 0 — 11/12
3					start: 19.2	start: 34.1		pupae: 0 larvae: 12 midge: 0 — 12/12
4					Titrant used (mL): 3.9	Titrant used (mL): 5.0		pupae: 0 larvae: 12 midge: 0 — 12/12
5					Sample volume (mL): 25	Sample volume (mL): 50		pupae: 0 larvae: 11 midge: 0 — 11/12
6								pupae: 0 larvae: 12 midge: 0 — 12/12
7								pupae: 0 larvae: 9 midge: 0 — 9/12
8								pupae: 0 larvae: 9 midge: 0 — 9/12

Relative % Difference: RPD ≤15%

$$RPD = \frac{(S_1 - S_2)}{(S_1 + S_2)/2} \times 100 =$$

* Contact Laboratory Coordinator if Dissolved Oxygen level is < 2.5 mg/L or if Temperature is out of range.
*Alkalinity, hardness and ammonia analyzed from a composite sample of all 8 replicates.
Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L).
MDL = Minimum Detection Limit (0.02 mg/L) - last updated 12/2014.
U = Below MDL. J = ≥ MDL and < RL.

KEY:
AV: Animals Visible
NAV: No Animals Visible
FOV: Foreign Organism Visible

revised: June 2012

QC'd by: MLV

5135-00
Ecology & Environmental
Chironomus dilutus 20-Day Survival and Growth Whole Sediment Toxicity Test

Project Number:	5135-00	Project Name:	Ecology & Environmental
GLC#:	10514	Test Photoperiod:	16:8
Sample ID:	OU2-SED03	Test System:	Sediment-100 mL and Overlying Water-175mL Manual Delivery
Test Species:	*Chironomus dilutus*	Test Temperature:	23± 1°C
Date Addition of Sediment:	6/9/2015	Test Organism Source/Age:	ABS <24 hours
Test Initiation Date:	6/10/2015	Test Termination Date:	6/30/2015

Test Day: 20
Date: 6/30/2015
Overlying Water: Dechlor
Overlying Water Batch ID (GLC Number): NA
X(all) Daily chemistries time/Initial

Number Daily Renewals: —
renewal time/Initials — renewal
renewal time/Initials — renewal
Feed: TFS# (4g/L) — Feed 1.5 ml/replicate
Screens Cleaned: yes no

Replicate	Temperature (23± 1°C)*	pH	Dissolved Oxygen (mg/L)*	Specific Conductance (µmhos/cm)	Hardness (mg/L $CaCO_3$)	Alkalinity (mg/L $CaCO_3$)	Ammonia (as N)	Observations/ # Surviving Organisms
Record Meter ID	40	203	175	175	N/A	203	4	Init: MLV
1	22.5	8.09	8.3	340	152	96	0.13	pupae: 0 larvae: 0 midge: 0 — 0 /12 oil sheen
2	22.5	8.11	8.2	331	end: 26.9	end: 43.9		pupae: 0 larvae: 0 midge: 0 — 0 /12
3					start: 23.1	start: 39.1		pupae: 0 larvae: 0 midge: 0 — 0 /12
4					Titrant used (mL): 3.8	Titrant used (mL): 4.8		pupae: 0 larvae: 0 midge: 0 — 0 /12
5					Sample volume (mL): 25	Sample volume (mL): 50		pupae: 0 larvae: 0 midge: 0 — 0 /12
6								pupae: 0 larvae: 0 midge: 0 — 0 /12
7								pupae: 0 larvae: 0 midge: 0 — 0 /12
8								pupae: 0 larvae: 0 midge: 0 — 0 /12 sheen

Relative % Difference: RPD ≤15%

$$RPD = \frac{(S_1 - S_2)}{(S_1 + S_2)/2} \times 100$$

* Contact Laboratory Coordinator if Dissolved Oxygen level is < 2.5 mg/L or if Temperature is out of range.
*Alkalinity, hardness and ammonia analyzed from a composite sample of all 8 replicates.

Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L).
MDL = Minimum Detection Limit (0.02 mg/L) - last updated 12/2014.
U = Below MDL. J = ≥ MDL and < RL.

KEY:
AV: Animals Visible
NAV: No Animals Visible
FOV: Foreign Organism Visible

revised: June 2012

Project Name: Ecology & Environmental
Project Number: 5135-00

Test Dates: 6/10/2015-6/30/2015
Test Type: 20 Day Whole Sediment Toxicity Survival and Growth
Test Species: *Chironumus dilutus*

100% Data Entry

Date	Initials	Data Entered
7/14/2015	MLV	weight data

100% Data Quality Check

Date	Initials	Data QC'ed	Errors Found Y or N	Errors Corrected: Y or N
7/15/2015	KN	weight data	N	n/a

100% Error Corrected Quality Check

Date	Initials	Data QC'ed
n/a	n/a	n/a

Data QC 10%

Date	Initials	Data QC'ed
7/21/2015	mwg	

QC'd by: DS

5135-00
Ecology & Environmental
Chironomus dilutus WEIGHT DATA

Project Number:	**5135-00**	Type/Model of Drying Oven: **Blue M**	Type/Model of Muffle Furnace: **F6020 Thermolyne MOD.**
Project Name:	**Ecology & Environmental**	Oven Temperature: **60 °C**	Muffle Furnace Temperature: **550 °C**
GLC#:	**CS 128**	Drying Duration (Hours): **~24 hrs**	Drying Duration (Hours): **2 hrs**
Sample ID:	**Laboratory Control**	Date/Time in: 6/30/15 1200	Date/Time in: 7/7/15 0947
		Date/Time out: 7/1/15 1337	Date/Time out: 7/7/15 1400
Test Species:	***Chironomus dilutus***	Dessicator: # 128	Dessicator: # 128 MLV 7/13/15
Test Date:	6/10/2015	Date/Time in: 7/1/15 1338	Date/Time in: 7/8/15 1614
	6/30/2015	Date/Time out: 7/8/15 0841	Date/Time out: 7/13/15 1423
		Dry Weigh Date / Technician's Initials: 7/8/15 mcm	Ashed Weigh Date / Technician's Initials: 7/13/15 1423 MLV

	Replicate Number	A Number of Organisms at Test Initiation	B Dry Weight of Pan and Organisms (g)	C Ashed Weight of Pan and Organisms (g)	B-C Total Ash-Free Dry Weight (g)	D Number of Organisms Weighed	B-C/D Average Ash-Free Dry Weight (mg)	E Number of Pupae and Midges at Day ~~10~~ 20 7/15/15 KN	(B-C) / (A-E) *Biomass weight (mg)
Sample ID:	1	~~10~~ 12	0.85572	0.84021	0.00000	10	#DIV/0!	0	0.00000
Laboratory Control	2	~~10~~	0.84207	0.82739	0.00000	11	#DIV/0!	0	0.00000
GLC Number:	3	10	0.84072	0.82903	0.00000	12	#DIV/0!	0	0.00000
CS 128	4	~~10~~	0.86267	0.84825	0.00000	12	#DIV/0!	0	0.00000
	5	~~10~~	0.86018	0.84679	0.00000	12	#DIV/0!	0	0.00000
	6	~~10~~	0.85077	0.83649	0.00000	12	#DIV/0!	0	0.00000
	7	~~10~~	0.84278	0.82739	0.00000	12	#DIV/0!	0	0.00000
	8	~~10~~ 12	0.85842	0.84544	0.00000	12	#DIV/0!	0	0.00000
						AVERAGE:	#DIV/0!		0.00000

7/14/15 MLV

*Biomass weight (mg) - defined as the total ash-free dry weight of surviving organisms divided by the initial number of organisms minus pupae and midges

Day 0 weights	80		0.83930	0	80	Average at Day 0 (mg)		0

weight of pan only = 0.83781 ashed

See Attached sheet for calculated weights.

QC'd by:_DS__

5135-00
Ecology & Environment
Chironomus dilutus 20-Day WEIGHT DATA

Project Number:	**5135-00**	Type/Model of Drying Oven: **Blue M**	Type/Model of Muffle Furnace: **F6020 Thermolyne MOD.**
Project Name:	**Ecology and Environment**	Oven Temperature: **60 °C**	Muffle Furnace Temperature: **550 °C**
GLC#:	**CS 128**	Drying Duration (Hours): **~ 24 hrs**	Drying Duration (Hours): **2 hrs**
Sample ID:	**Laboratory Control**	Date/Time in: **6/30/15 1200**	Date/Time in: **7/7/15 0947**
		Date/Time out: **7/1/15 1337**	Date/Time out: **7/7/15 1400**
Test Species:	***Chironomus dilutus***	Dessicator: **#128**	Dessicator: **# 128**
Test Date:	**6/10/2015**	Date/Time in: **7/1/15 1338**	Date/Time in: **7/8/15 1614**
	6/30/2015	Date/Time out: **7/8/15 0841**	Date/Time out: **7/13/15 1423**
		Dry Weigh Date / Technician's Initials: **7/8/15 MGM**	Ashed Weigh Date / Technician's Initials: **7/13/15 MLV**

	Replicate Number	**A** Number of Organisms at Test Initiation	**B** Dry Weight of Pan and Organisms (g)	**C** Ashed Weight of Pan and Organisms (g)	**B-C** Total Ash-Free Dry Weight (g)	**D** Number of Organisms Weighed	**B-C/D** Average Ash-Free Dry Weight (mg)	**E** Number of Pupae and Midges at Day 20	**(B-C) / (A-E)** *Biomass weight (mg)
Sample ID:	**1**	12	0.85572	0.84021	0.01551	10	1.55100	0	1.29250
Laboratory Control	**2**	12	0.84207	0.82739	0.01468	11	1.33455	0	1.22333
GLC Number:	**3**	12	0.84072	0.82903	0.01169	12	0.97417	0	0.97417
CS 128	**4**	12	0.86267	0.84825	0.01442	12	1.20167	0	1.20167
	5	12	0.86018	0.84679	0.01339	12	1.11583	0	1.11583
	6	12	0.85077	0.83649	0.01428	12	1.19000	0	1.19000
	7	12	0.84278	0.82739	0.01539	12	1.28250	0	1.28250
	8	12	0.85842	0.84544	0.01298	12	1.08167	0	1.08167
						AVERAGE:	1.21642		1.17021

*Biomass weight (mg) : defined as the total ash-free dry weight of surviving organisms divided by the initial number of organisms minus pupae and midges

Day 0 weights	80		0.8393	-0.8393	80	Average at Day 0 (mg)		

Weight of Pan with out ashed organisms.

See Attached sheet for calculated weights.

QC'd by: DS

5135-00
Ecology & Environmental
Chironomus dilutus WEIGHT DATA

Project Number:	5135-00	Type/Model of Drying Oven: Blue M	Type/Model of Muffle Furnace: F6020 Thermolyne MOD.
Project Name:	Ecology & Environmental	Oven Temperature: 60 °C	Muffle Furnace Temperature: 550 °C
GLC#:	Water Only	Drying Duration (Hours): ~24 hrs	Drying Duration (Hours): 2 hrs
Sample ID:	Secondary Control	Date/Time in: 6/30/15 1200	Date/Time in: 7/7/15 0947
		Date/Time out: 7/1/15 1337	Date/Time out: 7/7/15 1400
Test Species:	*Chironomus dilutus*	Dessicator: # 128	Dessicator: # 128
Test Date:	6/10/2015	Date/Time in: 7/1/15 1338	Date/Time in: 7/9/15 1614
	6/30/2015	Date/Time out: 7/8/15 0841	Date/Time out: 7/13/15 1423
		Dry Weigh Date / Technician's Initials: 7/8/15 mbm	Ashed Weigh Date / Technician's Initials: 7/13/15 1423 MLV

	Replicate Number	A Number of Organisms at Test Initiation	B Dry Weight of Pan and Organisms (g)	C Ashed Weight of Pan and Organisms (g)	B-C Total Ash-Free Dry Weight (g)	D Number of Organisms Weighed	B-C/D Average Ash-Free Dry Weight (mg)	E Number of Pupae and Midges at Day ~~10~~ 20 7/15/15 KN	(B-C) / (A-E) *Biomass weight (mg)
Sample ID:	1	12	0.84159	0.83528	0.00000	12	#DIV/0!	0	0.00000
Secondary Control	2		0.86270	0.85492	0.00000	10	#DIV/0!	0	0.00000
GLC Number:	3	7/14/15 MLV	0.83659	0.83214	0.00000	10	#DIV/0!	0	0.00000
Water Only	4		0.83763	0.83008	0.00000	12	#DIV/0!	0	0.00000
	5		0.86457	0.85860	0.00000	11	#DIV/0!	0	0.00000
	6		0.85340	0.84807	0.00000	12	#DIV/0!	0	0.00000
	7		0.85486	0.84939	0.00000	11	#DIV/0!	0	0.00000
	8	12	0.82854	0.82210	0.00000	11	#DIV/0!	0	0.00000
						AVERAGE:	#DIV/0!	[redacted]	0.00000

*Biomass weight (mg) : defined as the total ash-free dry weight of surviving organisms divided by the initial number of organisms minus pupae and midges

Day 0 weights	80			0	80	Average at Day 0 (mg)		0

See Attached sheet for calculated weights.

QC'd by:_DS___

5135-00
Ecology & Environment
Chironomus dilutus 20-Day WEIGHT DATA

Project Number:	**5135-00**	Type/Model of Drying Oven: **Blue M**		Type/Model of Muffle Furnace: **F6020 Thermolyne MOD**.	
Project Name:	**Ecology and Environment**	Oven Temperature: **60 °C**		Muffle Furnace Temperature: **550 °C**	
GLC#:	**Water Only**	Drying Duration (Hours): **~ 24 hrs**		Drying Duration (Hours): **2 hrs**	
Sample ID:	**Secondary Control**	Date/Time in:	**6/30/15 1200**	Date/Time in: **7/7/15 0947**	
		Date/Time out:	**7/1/15 1337**	Date/Time out **7/7/15 1400**	
Test Species:	***Chironomus dilutus***	Dessicator:	**#128**	Dessicator:	**# 128**
Test Date:	**6/10/2015**	Date/Time in:	**7/1/15 1338**	Date/Time in: **7/8/15 1614**	
	6/30/2015	Date/Time out:	**7/8/15 0841**	Date/Time out **7/13/15 1423**	
		Dry Weigh Date / Technician's Initials: **7/8/15 MGM**		Ashed Weigh Date / Technician's Initials: **7/13/15 MLV**	

	Replicate Number	**A** Number of Organisms at Test Initiation	**B** Dry Weight of Pan and Organisms (g)	**C** Ashed Weight of Pan and Organisms (g)	**B-C** Total Ash-Free Dry Weight (g)	**D** Number of Organisms Weighed	**B-C/D** Average Ash-Free Dry Weight (mg)	**E** Number of Pupae and Midges at Day 20	**(B-C) / (A-E)** *Biomass weight (mg)
Sample ID:	**1**	12	0.84159	0.83528	0.00631	12	0.52583	0	0.52583
Secondary Control	**2**	12	0.86270	0.85492	0.00778	10	0.77800	0	0.64833
GLC Number:	**3**	12	0.83659	0.83214	0.00445	10	0.44500	0	0.37083
Water Only	**4**	12	0.83763	0.83008	0.00755	12	0.62917	0	0.62917
	5	12	0.86457	0.85860	0.00597	11	0.54273	0	0.49750
	6	12	0.85340	0.84807	0.00533	12	0.44417	0	0.44417
	7	12	0.85486	0.84939	0.00547	11	0.49727	0	0.45583
	8	12	0.82854	0.82210	0.00644	11	0.58545	0	0.53667
						AVERAGE:	0.55595		0.51354

*Biomass weight (mg) : defined as the total ash-free dry weight of surviving organisms divided by the initial number of organisms minus pupae and midges

Day 0 weights	80			0	80	Average at Day 0 (mg)		0

See Attached sheet for calculated weights.

QC'd by: DS

5135-00
Ecology & Environmental
Chironomus dilutus WEIGHT DATA

Project Number:	5135-00	Type/Model of Drying Oven: **Blue M**	Type/Model of Muffle Furnace: **F6020 Thermolyne MOD.**
Project Name:	**Ecology & Environmental**	Oven Temperature: **60 °C**	Muffle Furnace Temperature: **550 °C**
GLC#:	**10505**	Drying Duration (Hours): **~24 hrs**	Drying Duration (Hours): **2 hrs**
Sample ID:	**BG1-SED01**	Date/Time in: 6/30/15 1200	Date/Time in: 7/7/15 0947
		Date/Time out: 7/1/15 1337	Date/Time out: 7/7/15 1400
Test Species:	***Chironomus dilutus***	Dessicator: # 128	Dessicator: # 128
Test Date:	**6/10/2015**	Date/Time in: 7/1/15 1338	Date/Time in: 7/8/15 1614
	6/30/2015	Date/Time out: 7/8/15 0841	Date/Time out: 7/13/15 1423
		Dry Weigh Date / Technician's Initials: 7/8/15 MLM	Ashed Weigh Date / Technician's Initials: 7/13/15 1423 MLV

	Replicate Number	A Number of Organisms at Test Initiation	B Dry Weight of Pan and Organisms (g)	C Ashed Weight of Pan and Organisms (g)	B-C Total Ash-Free Dry Weight (g)	D Number of Organisms Weighed	B-C/D Average Ash-Free Dry Weight (mg)	E Number of Pupae and Midges at Day ~~10~~ 20 7/15/15 KN	(B-C) / (A-E) *Biomass weight (mg)
Sample ID:	1	10 12	0.84237	0.82605	0.00000	10	#DIV/0!	0	0.00000
BG1-SED01	2	10	0.84586	0.82971	0.00000	10	#DIV/0!	0	0.00000
GLC Number:	3	10 MLV	0.86151	0.84588	0.00000	11	#DIV/0!	0	0.00000
10505	4	10	0.86432	0.84966	0.00000	12	#DIV/0!	0	0.00000
	5	7/14/15 MLV 10	0.84877	0.83525	0.00000	10	#DIV/0!	0	0.00000
	6	10	0.86288	0.84558	0.00000	11	#DIV/0!	0	0.00000
	7	10	0.85365	0.84029	0.00000	10	#DIV/0!	0	0.00000
	8	10 12	0.85824	0.84469	0.00000	11	#DIV/0!	0	0.00000
						AVERAGE:	#DIV/0!	[redacted]	0.00000

*Biomass weight (mg) : defined as the total ash-free dry weight of surviving organisms divided by the initial number of organisms minus pupae and midges

Day 0 weights	80			0	80	Average at Day 0 (mg)		0

See Attached sheet for calculated weights.

QC'd by:_DS___

5135-00
Ecology & Environment
Chironomus dilutus 20-Day WEIGHT DATA

Project Number:	**5135-00**	Type/Model of Drying Oven: **Blue M**		Type/Model of Muffle Furnace: **F6020 Thermolyne MOD**.	
Project Name:	**Ecology and Environment**	Oven Temperature: **60 °C**		Muffle Furnace Temperature: **550 °C**	
GLC#:	**10505**	Drying Duration (Hours): **~ 24 hrs**		Drying Duration (Hours): **2 hrs**	
Sample ID:	**BG1-SED01**	Date/Time in:	**6/30/15 1200**	Date/Time in: **7/7/15 0947**	
		Date/Time out:	**7/1/15 1337**	Date/Time out **7/7/15 1400**	
Test Species:	***Chironomus dilutus***	Dessicator:	**#128**	Dessicator:	**# 128**
Test Date:	**6/10/2015**	Date/Time in:	**7/1/15 1338**	Date/Time in: **7/8/15 1614**	
	6/30/2015	Date/Time out:	**7/8/15 0841**	Date/Time out **7/13/15 1423**	
		Dry Weigh Date / Technician's Initials: **7/8/15 MGM**		Ashed Weigh Date / Technician's Initials: **7/13/15 MLV**	

	Replicate Number	**A** Number of Organisms at Test Initiation	**B** Dry Weight of Pan and Organisms (g)	**C** Ashed Weight of Pan and Organisms (g)	**B-C** Total Ash-Free Dry Weight (g)	**D** Number of Organisms Weighed	**B-C/D** Average Ash-Free Dry Weight (mg)	**E** Number of Pupae and Midges at Day 20	**(B-C) / (A-E)** *Biomass weight (mg)
Sample ID:	**1**	12	0.84237	0.82605	0.01632	10	1.63200	0	1.36000
BG1-SED01	**2**	12	0.84586	0.82971	0.01615	10	1.61500	0	1.34583
GLC Number:	**3**	12	0.86151	0.84588	0.01563	11	1.42091	0	1.30250
10505	**4**	12	0.86432	0.84966	0.01466	12	1.22167	0	1.22167
	5	12	0.84877	0.83525	0.01352	10	1.35200	0	1.12667
	6	12	0.86288	0.84558	0.01730	11	1.57273	0	1.44167
	7	12	0.85365	0.84029	0.01336	10	1.33600	0	1.11333
	8	12	0.85824	0.84469	0.01355	11	1.23182	0	1.12917
						AVERAGE:	1.42277		1.25510

*Biomass weight (mg) : defined as the total ash-free dry weight of surviving organisms divided by the initial number of organisms minus pupae and midges

Day 0 weights	80			0	80	Average at Day 0 (mg)		0

See Attached sheet for calculated weights.

QC'd by: DS

5135-00
Ecology & Environmental
Chironomus dilutus WEIGHT DATA

Project Number:	5135-00	Type/Model of Drying Oven: Blue M	Type/Model of Muffle Furnace: F6020 Thermolyne MOD.
Project Name:	Ecology & Environmental	Oven Temperature: 60 °C	Muffle Furnace Temperature: 550 °C
GLC#:	10506	Drying Duration (Hours): ~ 24 hrs	Drying Duration (Hours): 2 hrs
Sample ID:	OU2-SED02	Date/Time in: 6/30/15 1200	Date/Time in: 7/7/15 0947
		Date/Time out: 7/1/15 1337	Date/Time out: 7/7/15 1400
Test Species:	*Chironomus dilutus*	Dessicator: # 128	Dessicator: # 128
Test Date:	6/10/2015	Date/Time in: 7/1/15 1337	Date/Time in: 7/8/15 1614
	6/30/2015	Date/Time out: 7/8/15 0841	Date/Time out: 7/13/15 1423
		Dry Weigh Date / Technician's Initials: 7/8/15 MGM	Ashed Weigh Date / Technician's Initials: 7/13/15 1423 MLV

	Replicate Number	A Number of Organisms at Test Initiation	B Dry Weight of Pan and Organisms (g)	C Ashed Weight of Pan and Organisms (g)	B-C Total Ash-Free Dry Weight (g)	D Number of Organisms Weighed	B-C/D Average Ash-Free Dry Weight (mg)	E Number of Pupae and Midges at Day ~~10~~ 20 7/15/15 KN	(B-C) / (A-E) *Biomass weight (mg)
Sample ID:	1	12	0.86933	0.84698	0.00000	11	#DIV/0!	0	0.00000
OU2-SED02	2		0.85759	0.83887	0.00000	12	#DIV/0!	0	0.00000
GLC Number:	3		0.88630	0.86396	0.00000	12	#DIV/0!	0	0.00000
10506	4	7/1/15 MLV	0.86930	0.84928	0.00000	12	#DIV/0!	0	0.00000
	5		0.85038	0.83058	0.00000	10 ~~12~~	#DIV/0!	0 pupae 2 midge	0.00000
	6		0.85124	0.83368	0.00000	11 ~~12~~	#DIV/0!	0 pupae 1 midge	0.00000
	7		0.87146	0.85228	0.00000	9	#DIV/0!	0	0.00000
	8	12	0.86848	0.85139	0.00000	9 ~~10~~	#DIV/0!	1 pupae 0 midge	0.00000
						AVERAGE:	#DIV/0!		0.00000

7/8/15 MGM
* subtracted midge or pupae from total

*Biomass weight (mg) : defined as the total ash-free dry weight of surviving organisms divided by the initial number of organisms minus pupae and midges

Day 0 weights	80			0	80	Average at Day 0 (mg)		0

See Attached sheet for calculated weights.

QC'd by:__DS__

5135-00
Ecology & Environment
Chironomus dilutus 20-Day WEIGHT DATA

Project Number:	**5135-00**	Type/Model of Drying Oven: **Blue M**		Type/Model of Muffle Furnace: **F6020 Thermolyne MOD**.	
Project Name:	**Ecology and Environment**	Oven Temperature: **60 °C**		Muffle Furnace Temperature: **550 °C**	
GLC#:	**10506**	Drying Duration (Hours): **~ 24 hrs**		Drying Duration (Hours): **2 hrs**	
Sample ID:	**OU2-SED02**	Date/Time in:	**6/30/15 1200**	Date/Time in: **7/7/15 0947**	
		Date/Time out:	**7/1/15 1337**	Date/Time out **7/7/15 1400**	
Test Species:	***Chironomus dilutus***	Dessicator:	**#128**	Dessicator:	**# 128**
Test Date:	**6/10/2015**	Date/Time in:	**7/1/15 1338**	Date/Time in: **7/8/15 1614**	
	6/30/2015	Date/Time out:	**7/8/15 0841**	Date/Time out **7/13/15 1423**	
		Dry Weigh Date / Technician's Initials: **7/8/15 MGM**		Ashed Weigh Date / Technician's Initials: **7/13/15 MLV**	

	Replicate Number	**A** Number of Organisms at Test Initiation	**B** Dry Weight of Pan and Organisms (g)	**C** Ashed Weight of Pan and Organisms (g)	**B-C** Total Ash-Free Dry Weight (g)	**D** Number of Organisms Weighed	**B-C/D** Average Ash-Free Dry Weight (mg)	**E** Number of Pupae and Midges at Day 20	**(B-C) / (A-E)** *Biomass weight (mg)
Sample ID:	**1**	12	0.86933	0.84698	0.02235	11	2.03182	0	1.86250
OU2-SED02	**2**	12	0.85759	0.83887	0.01872	12	1.56000	0	1.56000
GLC Number:	**3**	12	0.88630	0.86396	0.02234	12	1.86167	0	1.86167
10506	**4**	12	0.86930	0.84928	0.02002	12	1.66833	0	1.66833
	5	12	0.85038	0.83058	0.01980	10	1.98000	2	1.98000
	6	12	0.85124	0.83368	0.01756	11	1.59636	1	1.59636
	7	12	0.87146	0.85228	0.01918	9	2.13111	0	1.59833
	8	12	0.86848	0.85139	0.01709	9	1.89889	1	1.55364
						AVERAGE:	1.84102		1.71010

*Biomass weight (mg) : defined as the total ash-free dry weight of surviving organisms divided by the initial number of organisms minus pupae and midges

Day 0 weights	80			0	80	Average at Day 0 (mg)		0

See Attached sheet for calculated weights.

QC'd by: DS

5135-00
Ecology & Environmental
Chironomus dilutus WEIGHT DATA

Project Number:	5135-00	Type/Model of Drying Oven: Blue M	Type/Model of Muffle Furnace: F6020 Thermolyne MOD.
Project Name:	Ecology & Environmental	Oven Temperature: 60 °C	Muffle Furnace Temperature: 550 °C
GLC#:	10513	Drying Duration (Hours): ~24 hrs	Drying Duration (Hours): 2 hrs
Sample ID:	OU2-SED01	Date/Time in: 6/30/15 1200	Date/Time in: 7/7/15 0947
		Date/Time out: 7/1/15 1337	Date/Time out: 7/7/15 1400
Test Species:	*Chironomus dilutus*	Dessicator: # 128	Dessicator: # 128
Test Date:	6/10/2015	Date/Time in: 7/1/15 1338	Date/Time in: 7/8/15 1614
	6/30/2015	Date/Time out: 7/8/15 0841	Date/Time out: 7/13/15 1423
		Dry Weigh Date / Technician's Initials: 7/8/15 MLN	Ashed Weigh Date / Technician's Initials: 7/13/15 1423 MLN

	Replicate Number	A Number of Organisms at Test Initiation	B Dry Weight of Pan and Organisms (g)	C Ashed Weight of Pan and Organisms (g)	B-C Total Ash-Free Dry Weight (g)	D Number of Organisms Weighed	B-C/D Average Ash-Free Dry Weight (mg)	E Number of Pupae and Midges at Day ~~10~~ 20 7/15/15 KN	(B-C) / (A-E) *Biomass weight (mg)
Sample ID:	1	12	0.85723	0.84087	0.00000	11	#DIV/0!	0	0.00000
OU2-SED01	2	12	0.85728	0.84070	0.00000	11	#DIV/0!	0	0.00000
GLC Number:	3	12	0.86528	0.85031	0.00000	12	#DIV/0!	0	0.00000
10513	4	12	0.86784	0.85083	0.00000	12	#DIV/0!	0	0.00000
	5	10	0.84805	0.83317	0.00000	11	#DIV/0!	0	0.00000
	6	12	0.87185	0.85766	0.00000	12	#DIV/0!	0	0.00000
	7	12	0.86485	0.85133	0.00000	9	#DIV/0!	0	0.00000
	8	12	0.84909	0.83702	0.00000	9	#DIV/0!	0	0.00000
		7/14/15 MLN				AVERAGE:	#DIV/0!		0.00000

*Biomass weight (mg) : defined as the total ash-free dry weight of surviving organisms divided by the initial number of organisms minus pupae and midges

Day 0 weights	80			0	80	Average at Day 0 (mg)		0

See Attached sheet for calculated weights.

QC'd by:_DS___

5135-00
Ecology & Environment
Chironomus dilutus 20-Day WEIGHT DATA

Project Number:	**5135-00**	Type/Model of Drying Oven: **Blue M**		Type/Model of Muffle Furnace: **F6020 Thermolyne MOD**.	
Project Name:	**Ecology and Environment**	Oven Temperature: **60 °C**		Muffle Furnace Temperature: **550 °C**	
GLC#:	**10513**	Drying Duration (Hours): **~ 24 hrs**		Drying Duration (Hours): **2 hrs**	
Sample ID:	**OU2-SED01**	Date/Time in:	**6/30/15 1200**	Date/Time in: **7/7/15 0947**	
		Date/Time out:	**7/1/15 1337**	Date/Time out **7/7/15 1400**	
Test Species:	***Chironomus dilutus***	Dessicator:	**#128**	Dessicator:	**# 128**
Test Date:	**6/10/2015**	Date/Time in:	**7/1/15 1338**	Date/Time in: **7/8/15 1614**	
	6/30/2015	Date/Time out:	**7/8/15 0841**	Date/Time out **7/13/15 1423**	
		Dry Weigh Date / Technician's Initials: **7/8/15 MGM**		Ashed Weigh Date / Technician's Initials: **7/13/15 MLV**	

	Replicate Number	**A** Number of Organisms at Test Initiation	**B** Dry Weight of Pan and Organisms (g)	**C** Ashed Weight of Pan and Organisms (g)	**B-C** Total Ash-Free Dry Weight (g)	**D** Number of Organisms Weighed	**B-C/D** Average Ash-Free Dry Weight (mg)	**E** Number of Pupae and Midges at Day 20	**(B-C) / (A-E)** *Biomass weight (mg)
Sample ID:	**1**	12	0.85723	0.84087	0.01636	11	1.48727	0	1.36333
OU2-SED01	**2**	12	0.85728	0.84070	0.01658	11	1.50727	0	1.38167
GLC Number:	**3**	12	0.86528	0.85031	0.01497	12	1.24750	0	1.24750
10513	**4**	12	0.86784	0.85083	0.01701	12	1.41750	0	1.41750
	5	12	0.84805	0.83317	0.01488	11	1.35273	0	1.24000
	6	12	0.87185	0.85766	0.01419	12	1.18250	0	1.18250
	7	12	0.86485	0.85133	0.01352	9	1.50222	0	1.12667
	8	12	0.84909	0.83702	0.01207	9	1.34111	0	1.00583
						AVERAGE:	1.37976		1.24563

*Biomass weight (mg) : defined as the total ash-free dry weight of surviving organisms divided by the initial number of organisms minus pupae and midges

Day 0 weights	80			0	80	Average at Day 0 (mg)		0

See Attached sheet for calculated weights.

QC'd by: DJ

5135-00
Ecology & Environmental
Chironomus dilutus WEIGHT DATA

Project Number:	5135-00	Type/Model of Drying Oven: Blue M	Type/Model of Muffle Furnace: F6020 Thermolyne MOD.
Project Name:	Ecology & Environmental	Oven Temperature: 60 °C	Muffle Furnace Temperature: 550 °C
GLC#:	10514	Drying Duration (Hours): ~24 hrs	Drying Duration (Hours): 2 hrs
Sample ID:	OU2-SED03	Date/Time in:	Date/Time in:
		Date/Time out:	Date/Time out:
Test Species:	*Chironomus dilutus*	Dessicator: #	Dessicator: # 128
Test Date:	6/10/2015	Date/Time in:	Date/Time in:
	6/30/2015	Date/Time out:	Date/Time out:
		Dry Weigh Date / Technician's Initials:	Ashed Weigh Date / Technician's Initials:

	Replicate Number	A Number of Organisms at Test Initiation	B Dry Weight of Pan and Organisms (g)	C Ashed Weight of Pan and Organisms (g)	B-C Total Ash-Free Dry Weight (g)	D Number of Organisms Weighed	B-C/D Average Ash-Free Dry Weight (mg)	E Number of Pupae and Midges at Day 10	(B-C) / (A-E) *Biomass weight (mg)
Sample ID:	1	10			0.00000	0	#DIV/0!		0.00000
OU2-SED03	2	10			0.00000	0	#DIV/0!		0.00000
GLC Number:	3	10			0.00000	0	#DIV/0!		0.00000
10514	4	10			0.00000	0	#DIV/0!		0.00000
	5	10			0.00000	0	#DIV/0!		0.00000
	6	10			0.00000	0	#DIV/0!		0.00000
	7	10			0.00000	0	#DIV/0!		0.00000
	8	10			0.00000	0	#DIV/0!		0.00000
						AVERAGE:	#DIV/0!		0.00000

*Biomass weight (mg) : defined as the total ash-free dry weight of surviving organisms divided by the initial number of organisms minus pupae and midges

Day 0 weights	80			0	80	Average at Day 0 (mg)		0

See Attached sheet for calculated weights.

Appendix C2
Chironomus dilutus
20-Day Statistical Data

- Survival
- Weight

Test: EPA 100.5-Chironomus dilutus Partial Life-cycle Test — Test ID: 5134cd715
Species: CDIL-Chironomus dilutus — Protocol: EPA 600/R-99/064
Sample ID: 18 mile creek — Sample Type: -WHOLE SEDIMENT
Start Date: 6/10/2015 End Date: 6/30/2015 — Lab ID: -GREAT LAKES ENVIRONMENTAL CENTER

Pos	ID	Rep	Group	Day 0	Day 4	Day 1	Day 1	Day 2	Day 2	# pupae + Mi	Alive in Sedi	Remain in Se	Emerged	Weight pan/c	Weight ashed pan/orgs aft
	1	1	lab con	12				10	10	0				0.85572	0.84021
	2	2	lab con	12				11	11	0				0.84207	0.82739
	3	3	lab con	12				12	12	0				0.84072	0.82903
	4	4	lab con	12				12	12	0				0.86267	0.84825
	5	5	lab con	12				12	12	0				0.86018	0.84679
	6	6	lab con	12				12	12	0				0.85077	0.83649
	7	7	lab con	12				12	12	0				0.84278	0.82739
	8	8	lab con	12				12	12	0				0.85842	0.84544
	9	1	water only	12				12	12	0				0.84159	0.83528
	10	2	water only	12				10	10	0				0.8627	0.85492
	11	3	water only	12				10	10	0				0.83659	0.83214
	12	4	water only	12				12	12	0				0.83763	0.83008
	13	5	water only	12				11	11	0				0.86457	0.8586
	14	6	water only	12				12	12	0				0.8534	0.84807
	15	7	water only	12				11	11	0				0.85486	0.84939
	16	8	water only	12				11	11	0				0.82854	0.8221
	17	1	BG1-SED01 1(	12				10	10	0				0.84237	0.82605
	18	2	BG1-SED01 1(	12				10	10	0				0.84586	0.82971
	19	3	BG1-SED01 1(	12				11	11	0				0.86151	0.84588
	20	4	BG1-SED01 1(	12				12	12	0				0.86432	0.84966
	21	5	BG1-SED01 1(	12				10	10	0				0.84877	0.83525
	22	6	BG1-SED01 1(	12				11	11	0				0.86288	0.84558
	23	7	BG1-SED01 1(	12				10	10	0				0.85365	0.84029
	24	8	BG1-SED01 1(	12				11	11	0				0.85824	0.84469
	25	1	OU2-SED02 10	12				11	11	0				0.86933	0.84698
	26	2	OU2-SED02 10	12				12	12	0				0.85759	0.83887
	27	3	OU2-SED02 10	12				12	12	0				0.8863	0.86396
	28	4	OU2-SED02 10	12				12	12	0				0.8693	0.84928
	29	5	OU2-SED02 10	12				10	12	2				0.85038	0.83058
	30	6	OU2-SED02 10	12				11	12	1				0.85124	0.83368
	31	7	OU2-SED02 10	12				9	9	0				0.87146	0.85228
	32	8	OU2-SED02 10	12				9	10	1				0.86848	0.85139
	33	1	OU2-SED01 10	12				11	11	0				0.85723	0.84087
	34	2	OU2-SED01 10	12				11	11	0				0.85728	0.8407
	35	3	OU2-SED01 10	12				12	12	0				0.86528	0.85031
	36	4	OU2-SED01 10	12				12	12	0				0.86784	0.85083
	37	5	OU2-SED01 10	12				11	11	0				0.84805	0.83317
	38	6	OU2-SED01 10	12				12	12	0				0.87185	0.85766

Test: EPA 100.5-Chironomus dilutus Partial Life-cycle Test									Test ID: 5134cd715						
Species: CDIL-Chironomus dilutus									Protocol: EPA 600/R-99/064						
Sample ID: 18 mile creek									Sample Type: -WHOLE SEDIMENT						
Start Date: 6/10/2015			End Date: 6/30/2015						Lab ID: -GREAT LAKES ENVIRONMENTAL CENTER						
Pos	ID	Rep	Group	Day 0	Day 4	Day 10	Day 10	Day 20	Day 20	# pupae + M	Alive in Sedi	Remain in Se	Emerged	Weight pan/c	Weight ashed pan/orgs aft
	39	7	OU2-SED01 10	12				9	9	0				0.86485	0.85133
	40	8	OU2-SED01 10	12				9	9	0				0.84909	0.83702
	41	1	OU2-SED03 10	12				0	0	0				0	0
	42	2	OU2-SED03 10	12				0	0	0				0	0
	43	3	OU2-SED03 10	12				0	0	0				0	0
	44	4	OU2-SED03 10	12				0	0	0				0	0
	45	5	OU2-SED03 10	12				0	0	0				0	0
	46	6	OU2-SED03 10	12				0	0	0				0	0
	47	7	OU2-SED03 10	12				0	0	0				0	0
	48	8	OU2-SED03 10	12				0	0	0				0	0

Comments: USACOE Ecology & Environmental 18 Mile Creek 20-day C. dilutus surviva

Chironomus dilutus Partial Life-cycle Test-20-Day Survival

Start Date: 6/10/2015	Test ID: 5134cd715	Sample ID:	18 mile creek
End Date: 6/30/2015	Lab ID: -GREAT LAKES ENVIRONMI	Sample Type:	-WHOLE SEDIMENT
Sample Da	Protocol: EPA 600/R-99/064	Test Species:	CDIL-Chironomus dilutus

Comments USACOE Ecology & Environmental 18 Mile Creek 20-day C. dilutus surviva

Conc-%	1	2	3	4	5	6	7	8
lab con	0.8333	0.9167	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
water only	1.0000	0.8333	0.8333	1.0000	0.9167	1.0000	0.9167	0.9167
BG1-SED01 10505	0.8333	0.8333	0.9167	1.0000	0.8333	0.9167	0.8333	0.9167
OU2-SED02 10506	0.9167	1.0000	1.0000	1.0000	1.0000	1.0000	0.7500	0.8333
OU2-SED01 10513	0.9167	0.9167	1.0000	1.0000	0.9167	1.0000	0.7500	0.7500
OU2-SED03 10514	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
lab con	0.9688	1.0449	1.3730	1.1503	1.4260	7.563	8			
water only	0.9271	1.0000	1.3015	1.1503	1.4260	8.898	8			
*BG1-SED01 10505	0.8854	0.9551	1.2326	1.1503	1.4260	8.152	8	2.748	1.771	0.0905
OU2-SED02 10506	0.9375	1.0112	1.3256	1.0472	1.4260	11.436	8	0.729	1.782	0.1158
OU2-SED01 10513	0.9063	0.9775	1.2758	1.0472	1.4260	12.293	8	1.462	1.782	0.1185
*OU2-SED03 10514	0.0000	0.0000	0.1448	0.1448	0.1448	0.000	8	33.455	1.895	0.0696

Auxiliary Tests	Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.91901		0.919		-0.8226	0.447
Equality of variance cannot be confirmed						
The control means are not significantly different (p = 0.21)	1.29951		2.14479			
Hypothesis Test (1-tail, 0.05)	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Heteroscedastic t Test indicates significant differences	0.03117	0.03243	2.16371	0.01369	7.0E-22	4, 35
Treatments vs lab con						

Chironomus dilutus Partial Life-cycle Test-20-Day Growth (AFDW)

Start Date: 6/10/2015	Test ID: 5134cd715	Sample ID:	18 mile creek
End Date: 6/30/2015	Lab ID: -GREAT LAKES ENVIRONMENT/	Sample Type:	-WHOLE SEDIMENT
Sample Da	Protocol: EPA 600/R-99/064	Test Species:	CDIL-Chironomus dilutus

Comments USACOE Ecology & Environmental 18 Mile Creek 20-day C. dilutus survival and growth

Conc-%	1	2	3	4	5	6	7	8
lab con	1.5510	1.3345	0.9742	1.2017	1.1158	1.1900	1.2825	1.0817
water only	0.5258	0.7780	0.4450	0.6292	0.5427	0.4442	0.4973	0.5855
BG1-SED01 10505	1.6320	1.6150	1.4209	1.2217	1.3520	1.5727	1.3360	1.2318
OU2-SED02 10506	2.0318	1.5600	1.8617	1.6683	1.9800	1.5964	2.1311	1.8989
OU2-SED01 10513	1.4873	1.5073	1.2475	1.4175	1.3527	1.1825	1.5022	1.3411

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
lab con	1.2164	2.1880	1.2164	0.9742	1.5510	14.512	8	*		
water only	0.5560	1.0000	0.5560	0.4442	0.7780	19.805	8			
BG1-SED01 10505	1.4228	2.5591	1.4228	1.2217	1.6320	11.660	8	-2.409	1.761	0.1509
OU2-SED02 10506	1.8410	3.3115	1.8410	1.5600	2.1311	11.473	8	-6.418	1.761	0.1714
OU2-SED01 10513	1.3798	2.4818	1.3798	1.1825	1.5073	8.786	8	-2.157	1.761	0.1334

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97093	0.904	0.0998	-0.8096
Bartlett's Test indicates equal variances (p = 0.58)	1.96593	7.81473		
The control means are significantly different (p = 3.49E-07)	8.9788	2.14479		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	0.13335	0.10963	0.56595	0.0295	5.8E-07	3, 28
Treatments vs lab con						

Chironomus dilutus Partial Life-cycle Test-20-Day Biomass (AFDW)

Start Date: 6/10/2015	Test ID: 5134cd715	Sample ID:	18 mile creek
End Date: 6/30/2015	Lab ID: -GREAT LAKES ENVIRONMENTAL	Sample Type:	-WHOLE SEDIMENT
Sample Da	Protocol: EPA 600/R-99/064	Test Species:	CDIL-Chironomus dilutus

Comments USACOE Ecology & Environmental 18 Mile Creek 20-day C. dilutus survival and growth

Conc-%	1	2	3	4	5	6	7	8
lab con	1.2925	1.2233	0.9742	1.2017	1.1158	1.1900	1.2825	1.0817
water only	0.5258	0.6483	0.3708	0.6292	0.4975	0.4442	0.4558	0.5367
BG1-SED01 10505	1.3600	1.3458	1.3025	1.2217	1.1267	1.4417	1.1133	1.1292
OU2-SED02 10506	1.8625	1.5600	1.8617	1.6683	1.9800	1.5964	1.5983	1.5536
OU2-SED01 10513	1.3633	1.3817	1.2475	1.4175	1.2400	1.1825	1.1267	1.0058
OU2-SED03 10514	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
lab con	1.1702	2.2787	1.1702	0.9742	1.2925	9.192	8	*		
water only	0.5135	1.0000	0.5135	0.3708	0.6483	18.176	8			
BG1-SED01 10505	1.2551	2.4440	1.2551	1.1133	1.4417	9.981	8	-1.454	1.761	0.1028
OU2-SED02 10506	1.7101	3.3300	1.7101	1.5536	1.9800	9.715	8	-7.715	1.761	0.1233
OU2-SED01 10513	1.2456	2.4256	1.2456	1.0058	1.4175	11.255	8	-1.207	1.761	0.1100
OU2-SED03 10514	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	8			

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96449	0.904	0.10361	-0.9619
Bartlett's Test indicates equal variances (p = 0.72)	1.32945	7.81473		
The control means are significantly different (p = 3.19E-09)	13.0411	2.14479		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences Treatments vs lab con	0.11004	0.09403	0.48483	0.01863	3.0E-08	3, 28

Appendix D1
Hyalella azteca
28-Day Bench Sheets

- Survival
- Weight

QC'd by: MLV

5135-00
Ecology & Environment
Hyalella azteca 28-Day Survival and Growth Whole Sediment Toxicity Test

Project Number:	5135-00	Project Name: Ecology & Environment	
GLC#:	CS 128	Test Photoperiod: 16:8	
Sample ID:	Laboratory Control	Test System: Sediment-100 mL and Overlying Water-175mL Manual Delivery	
Test Species:	*Hyalella azteca*	Test Temperature: 23± 1°C	
Date Addition of Sediment:	6/9/2015	Test Organism Source/Age:	in house 7-8 days 6/4/2015
Test Initiation Date:	6/10/2015	Test Termination Date:	7/8/2015

Test Day: 28
Date: 7/8/2015 DS 8/5
Overlying Water: Dechlor
Overlying Water Batch ID (GLC Number): NA
DS 7/5/15 chemistries time/Initial

Number Daily Renewals: 21 DS 7/8/15
~~X Stormed~~ renewal time/Initials ~~MLV 7/7/15~~ MLV 7/8/15 renewal time/Initials
□ — renewal time/Initials □ — renewal time/Initials
Food: YTC# ~~700mw34~~ Feed 1.0 ml/replicate * MLV 7/7/15 ~~MLV~~ wrong food used
Screens Cleaned: □ yes ☒ no

Replicate	Temperature (23± 1°C)*	pH	Dissolved Oxygen (mg/L)*	Specific Conductance (µmhos/cm)	Hardness (mg/L $CaCO_3$) 7/7/15	Alkalinity (mg/L $CaCO_3$) 7/7/15	Ammonia (as N) ~~7/7/15 MLV~~ 7/8/15 MLV	Observations/ 10 organisms per replicate
Record Meter ID	40	203	175	175	N/A	203	4 MLV	Init: DS 8/5
1	22.7	7.99	8.4	322	144	106	0.11 J	10/10
2	22.7	8.27	8.5	315	end: 6.6	end: 9.3		10/10
3					start: 2.7	start: 4.0		10/10
4					Titrant used (mL): 3.6	Titrant used (mL): 5.3		10/10
5					Sample volume (mL): 25	Sample volume (mL): 50		10/10
6								10/10
7								10/10
8								10/10

Relative % Difference: RPD ≤15%

$$RPD = \frac{(S_1 - S_2)}{(S_1 + S_2)/2} \times 100 =$$

* Contact Laboratory Coordinator if Dissolved Oxygen level is < 2.5 mg/L or if Temperature is out of range.
*Alkalinity, hardness and ammonia analyzed from a composite sample of all 8 replicates.
Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L).
MDL = Minimum Detection Limit (0.02 mg/L) - last updated 12/2014.
U = Below MDL. J = ≥ MDL and < RL.

KEY:
AV: Animals Visible
NAV: No Animals Visible
FOV: Foreign Organism Visible

revised: June 2012

QC'd by: MLV

5135-00
Ecology & Environment
Hyalella azteca 28-Day Survival and Growth Whole Sediment Toxicity Test

Project Number:	**5135-00** Project Name: **Ecology & Environment**		
GLC#:	**Water Only**	Test Photoperiod:	**16:8**
Sample ID:	**Secondary Control**	Test System:	**Sediment-100 mL and Overlying Water-175mL Manual Delivery**
Test Species:	*Hyalella azteca*	Test Temperature:	**23± 1°C**
Date Addition of Sediment:	**6/9/2015**	Test Organism Source/Age:	**in house 7-8 days 6/4/2015**
Test Initiation Date:	**6/10/2015**	Test Termination Date:	**7/8/2015**

Test Day: **28**

Date: **7/8/2015**

Overlying Water: **Dechlor**

Overlying Water Batch ID (GLC Number):**NA**

RDS 755 chemistries time/Initial

Number Daily Renewals: 1 RDS 7/8/15

RDS 815 renewal time/Initials ☐ ——— renewal time/Initials

☐ ——— renewal time/Initials ☐ ——— renewal time/Initials

Food: YTC# ——— ☐ Feed 1.0 ml/replicate

Screens Cleaned: ☐ yes ☒ no

Replicate	Temperature (23± 1°C)*	pH	Dissolved Oxygen (mg/L)*	Specific Conductance (µmhos/cm)	Hardness (mg/L $CaCO_3$) 7/7/15	Alkalinity (mg/L $CaCO_3$) 7/7/15	Ammonia (as N) 7/7/15	Observations/ 10 organisms per replicate
Record Meter ID	46	203	175	175	N/A	203	4 mar	Init: DS 915
1	22.6	8.24	8.3	DS 7/8/15 8.24 304	136	102	0.38	9 /10
2	22.7	8.33	8.4	311	end: 9.7	end: 14.4		10 /10
3					start: 6.3	start: 9.3		10 /10
4					Titrant used (mL): 34	Titrant used (mL): 5.1		10 /10
5					Sample volume (mL): 25	Sample volume (mL): 50		10 /10
6								10 /10
7								10 /10
8								10 /10

Relative % Difference: RPD ≤15%

$$RPD = \frac{(S_1 - S_2)}{(S_1 + S_2)/2} \times 100$$

* Contact Laboratory Coordinator if Dissolved Oxygen level is < 2.5 mg/L or if Temperature is out of range.

*Alkalinity, hardness and ammonia analyzed from a composite sample of all 8 replicates.

Ammonia Reporting Limits:

RL = Reporting Limit (0.20 mg/L).

MDL = Minimum Detection Limit (0.02 mg/L) - last updated 12/2014.

U = Below MDL. J = ≥ MDL and < RL.

KEY:

AV: Animals Visible

NAV: No Animals Visible

FOV: Foreign Organism Visible

revised: June 2012

QC'd by: MLV

5135-00
Ecology & Environment
Hyalella azteca 28-Day Survival and Growth Whole Sediment Toxicity Test

Project Number:	**5135-00**	Project Name: **Ecology & Environment**	
GLC#:	**10505**	Test Photoperiod: **16:8**	
Sample ID:	**BG1-SED01**	Test System: **Sediment-100 mL and Overlying Water-175mL Manual Delivery**	
Test Species:	*Hyalella azteca*	Test Temperature: **23± 1°C**	
Date Addition of Sediment:	**6/9/2015**	Test Organism Source/Age:	**in house 7-8 days 6/4/2015**
Test Initiation Date:	**6/10/2015**	Test Termination Date:	**7/8/2015**

Test Day: **28**
Date: **7/8/2015**
Overlying Water: **Dechlor**
Overlying Water Batch ID (GLC Number):**NA**
RDS 755 chemistries time/Initial

Number Daily Renewals: 1 DS 7/8/15
DS 815 renewal time/Initials ☐ —— renewal time/Initials
☐ —— renewal time/Initials ☐ —— renewal time/Initials
Food: YTC# —— ☐ Feed 1.0 ml/replicate
Screens Cleaned: ☐ yes ☐ no

Replicate	Temperature (23± 1°C)*	pH	Dissolved Oxygen (mg/L)*	Specific Conductance (µmhos/cm)	Hardness (mg/L $CaCO_3$)	Alkalinity (mg/L $CaCO_3$)	Ammonia (as N)	Observations/ 10 organisms per replicate
					7/7/15	7/7/15	7/7/15	
Record Meter ID	40	203	175	175	N/A DS	203 DS	4 mw	Init: 950 DS
1	22.7	8.24	8.3	336	152 | 152	104 | 108	0.08 J	10 /10
2	22.6	8.21	8.2	324	18.0 | 21.8 end: 14.2	263 | 317 end: 244	dup 0.08 J	10 /10
3					14.2 | 18.0 start: 9.7	211 | 263 start: 166		9 /10
4					Titrant used (mL): 3.8 | 3.8	Titrant used (mL): 5.2 | 5.4		9 /10
5					Sample volume (mL): 25	Sample volume (mL): 50		10 /10
6					MP 7/7/15	MP 7/7/15		10 /10
7								10 /10
8								10 /10

Relative % Difference: RPD ≤15%

$$RPD = \frac{(S_1 - S_2)}{(S_1 + S_2)/2} \times 100 =$$

* Contact Laboratory Coordinator if Dissolved Oxygen level is < 2.5 mg/L or if Temperature is out of range.
*Alkalinity, hardness and ammonia analyzed from a composite sample of all 8 replicates.
Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L).
MDL = Minimum Detection Limit (0.02 mg/L) - last updated 12/2014.
U = Below MDL. J = ≥ MDL and < RL.

KEY:
AV: Animals Visible
NAV: No Animals Visible
FOV: Foreign Organism Visible

revised: June 2012

QC'd by: MLV

5135-00
Ecology & Environment
Hyalella azteca 28-Day Survival and Growth Whole Sediment Toxicity Test

Project Number:	**5135-00**	Project Name: **Ecology & Environment**	
GLC#:	**10506**	Test Photoperiod: **16:8**	
Sample ID:	**OU2-SED02**	Test System: **Sediment-100 mL and Overlying Water-175mL Manual Delivery**	
Test Species:	*Hyalella azteca*	Test Temperature: **23± 1°C**	
Date Addition of Sediment:	**6/9/2015**	Test Organism Source/Age:	**in house 7-8 days 6/4/2015**
Test Initiation Date:	**6/10/2015**	Test Termination Date:	**7/8/2015**

Test Day: **28**	7/9/15 MLV Number Daily Renewals: 2 1
Date: **7/8/2015**	DS 8r renewal time/Initials ☐ — renewal time/Initials
Overlying Water: **Dechlor**	☐ — renewal time/Initials ☐ — renewal time/Initials
Overlying Water Batch ID (GLC Number):NA	Food: YTC# — ☐ Feed 1.0 ml/replicate
DS 755 chemistries time/Initial	Screens Cleaned: ☐ yes ☒ no

Replicate	Temperature (23± 1°C)*	pH	Dissolved Oxygen (mg/L)*	Specific Conductance (µmhos/cm)	Hardness (mg/L $CaCO_3$) 7/7/15	Alkalinity (mg/L $CaCO_3$) 7/7/15	Ammonia (as N) 7/7/15	Observations/ 10 organisms per replicate
Record Meter ID	40	203	175	175	N/A	203	4 mw	Init: DS 1045
1	22.5	8.33	8.2	385	mp 7/7/15 180	mp 7/7/15 134	0.07 J	10 /10
2	22.5	8.41	8.2	366	end: 180 14.2	end: 21.1		10 /10
3					start: 142 9.7	start: 211 14.4		10 /10
4					Titrant used (mL): 45	Titrant used (mL): 6.7		10 /10
5					Sample volume (mL): 25	Sample volume (mL): 50		10 /10
6								10 /10
7								10 /10
8								10 /10

Relative % Difference: RPD ≤15%

$$RPD = \frac{(S_1 - S_2)}{(S_1 + S_2)/2} \times 100 =$$

* Contact Laboratory Coordinator if Dissolved Oxygen level is < 2.5 mg/L or if Temperature is out of range.
*Alkalinity, hardness and ammonia analyzed from a composite sample of all 8 replicates.
Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L).
MDL = Minimum Detection Limit (0.02 mg/L) - last updated 12/2014.
U – Below MDL. J = ≥ MDL and < RL.

KEY:
AV: Animals Visible
NAV: No Animals Visible
FOV: Foreign Organism Visible

revised: June 2012

QC'd by: MW

5135-00
Ecology & Environment
Hyalella azteca 28-Day Survival and Growth Whole Sediment Toxicity Test

Project Number:	**5135-00**	Project Name: **Ecology & Environment**	
GLC#:	**10513**	Test Photoperiod: **16:8**	
Sample ID:	**OU2-SED01**	Test System: **Sediment-100 mL and Overlying Water-175mL Manual Delivery**	
Test Species:	*Hyalella azteca*	Test Temperature: **23± 1°C**	
Date Addition of Sediment:	**6/9/2015**	Test Organism Source/Age:	**in house 7-8 days 6/4/2015**
Test Initiation Date:	**6/10/2015**	Test Termination Date:	**7/8/2015**

Test Day: **28**
Date: **7/8/2015**
Overlying Water: **Dechlor**
Overlying Water Batch ID (GLC Number): **NA**
☒ DS 755 chemistries time/Initial

Number Daily Renewals: 21
☒ DS 815 renewal time/Initials ☐ ——— renewal time/Initials
☐ ——— renewal time/Initials ☐ ——— renewal time/Initials
Food: YTC# ——— ☐ Feed 1.0 ml/replicate
Screens Cleaned: ☐ yes ☒ no

Replicate	Temperature (23± 1°C)*	pH	Dissolved Oxygen (mg/L)*	Specific Conductance (µmhos/cm)	Hardness (mg/L $CaCO_3$) 7/7/15	Alkalinity (mg/L $CaCO_3$) 7/7/15	Ammonia (as N) 7/7/15	Observations/ 10 organisms per replicate
Record Meter ID	40	203	175	175	N/A	203	4 mw	Init: DS 1145
1	22.6	8.22	8.2	323	148	100	0.07 J	10 /10
2	22.6	8.21	8.1	329	end: 25.5	end: 36.7		10 /10
3					start: 21.8	start: 31.7		7 /10
4					Titrant used (mL): 3.7	Titrant used (mL): 5.0		9 /10
5					Sample volume (mL): 25	Sample volume (mL): 50		9 /10
6								10 /10
7								10 /10
8								10 /10

Relative % Difference: RPD ≤15%

$$RPD = \left| \frac{(S_1 - S_2)}{(S_1 + S_2)/2} \right| \times 100 =$$

* Contact Laboratory Coordinator if Dissolved Oxygen level is < 2.5 mg/L or if Temperature is out of range.
*Alkalinity, hardness and ammonia analyzed from a composite sample of all 8 replicates.
Ammonia Reporting Limits:
RL = Reporting Limit (0.20 mg/L).
MDL = Minimum Detection Limit (0.02 mg/L) - last updated 12/2014.
U = Below MDL. J = ≥ MDL and < RL.

KEY:
AV: Animals Visible
NAV: No Animals Visible
FOV: Forcign Organism Visible

revised: June 2012

QC'd by: MLV

5135-00
Ecology & Environment
Hyalella azteca 28-Day Survival and Growth Whole Sediment Toxicity Test

Project Number:	**5135-00**	Project Name: **Ecology & Environment**	
GLC#:	**10514**	Test Photoperiod: **16:8**	
Sample ID:	**OU2-SED03**	Test System: **Sediment-100 mL and Overlying Water-175mL Manual Delivery**	
Test Species:	*Hyalella azteca*	Test Temperature: **23± 1°C**	
Date Addition of Sediment:	**6/9/2015**	Test Organism Source/Age:	**in house 7-8 days 6/4/2015**
Test Initiation Date:	**6/10/2015**	Test Termination Date:	**7/8/2015**

Test Day: **28**

Date: **7/8/2015**

Overlying Water: **Dechlor**

Overlying Water Batch ID (GLC Number): **NA**

DS 7/5 chemistries time/Initial

Number Daily Renewals: 2 | DS 7/8/15

DS 8/15 renewal time/Initials ☐ ——— renewal time/Initials

☐ ——— renewal time/Initials ☐ ——— renewal time/Initials

Food: YTC# ——— ☐ Feed 1.0 ml/replicate

Screens Cleaned: ☐ yes ☒ no

Replicate	Temperature (23± 1°C)*	pH	Dissolved Oxygen (mg/L)*	Specific Conductance (µmhos/cm)	Hardness (mg/L $CaCO_3$) 7/7/15	Alkalinity (mg/L $CaCO_3$) 7/7/15	Ammonia (as N) 7/7/15	Observations/ 10 organisms per replicate
Record Meter ID	40	203	175	175	N/A	203	4 mw	Init: DS 1230
1	22.6	8.16	7.8	321	148	98	0.07 J	5 /10
2	22.6	8.23	6.0	330	end: 29.2	end: 41.6		8 /10
3					start: 25.5	start: 36.7		6 /10
4					Titrant used (mL): 3.7	Titrant used (mL): 4.9		6 /10
5					Sample volume (mL): 25	Sample volume (mL): 50		9 /10
6								6 /10
7								6 /10
8								5 /10

Relative % Difference: RPD ≤15%

$$RPD = \frac{(S_1 - S_2)}{(S_1 + S_2)/2} \times 100 =$$

* Contact Laboratory Coordinator if Dissolved Oxygen level is < 2.5 mg/L or if Temperature is out of range.

*Alkalinity, hardness and ammonia analyzed from a composite sample of all 8 replicates.

Ammonia Reporting Limits:

RL = Reporting Limit (0.20 mg/L).

MDL = Minimum Detection Limit (0.02 mg/L) - last updated 12/2014.

U = Below MDL. J = ≥ MDL and < RL.

KEY:

AV: Animals Visible

NAV: No Animals Visible

FOV: Foreign Organism Visible

revised: June 2012

Project Name: Ecology & Environment
Project Number: 5135-00

Test Dates: 6/10/2015-7/08/2015
Test Type: 28 Day Whole Sediment Toxicity Survival and Growth
Test Species: Hyalella azteca

100% Data Entry

Date	Initials	Data Entered
7/14/2015	MLV	weight data

100% Data Quality Check

Date	Initials	Data QC'ed	Errors Found Y or N	Errors Corrected: Y or N
7/15/2015	KN	weight data	N	n/a

100% Error Corrected Quality Check

Date	Initials	Data QC'ed
n/a	n/a	n/a

Data QC 10%

Date	Initials	Data QC'ed
7/21/2015	mwg	

5135-00
Ecology & Environment
Hyalella azteca 28-Day WEIGHT DATA

QC'd by: DS

Project Number:	5135-00	Type/Model of Drying Oven: **Blue M**	
Project Name:	**Ecology & Environment**	Oven Temperature: **60 °C**	
GLC#:	**CS 128**	Drying Duration (Hours): **~24 hrs**	Dessicator: **# 128**
Sample ID:	**Laboratory Control**	Date/Time in: 7/8/15 1330	Date/Time in: 7/9/15 1450
Test Species:	***Hyalella azteca***	Date/Time out: 7/9/15 1445	Date/Time out: 7/14/15 1427
Test Dates:	**6/10/2015**	Technician's Initials: DS	Weigh Date / Initials: 7/14/15 MLV
	7/8/2015		

Replicate Number	A Number of Organisms at Test Initiation	B Dry Weight of Pan and Organisms (g)	C Dry Weight of Pan (g)	B-C Total Dry Weight of Organisms (g)	D Number of Organisms Weighed	B-C/D Average Weight (mg)	B-C/A Biomass Weight (mg)
1	10	0.84820	0.84260		10	#DIV/0!	
2	10	0.84550	0.84172		10	#DIV/0!	
3	10	0.84664	0.84082		10	#DIV/0!	
4	10	0.85426	0.84935		10	#DIV/0!	
5	10	0.85102	0.84572		10	#DIV/0!	
6	10	0.84393	0.83922		10	#DIV/0!	
7	10	0.84869	0.84329		10	#DIV/0!	
8	10	0.84753	0.84147		10	#DIV/0!	
						AVERAGE:	

Day 0 weights	80	0.84600	0.84391	0	80	Average at Day 0 (mg)	0

See Attached sheet for calculated weights.

5135-00
Ecology and Environment
Hyalella azteca 28-Day WEIGHT DATA

QC'd by: DS

Project Number:	**5135-00**	Type/Model of Drying Oven:	**Blue M**		
Project Name:	**Ecology and Environment**	Oven Temperature:	**60 °C**		
GLC#:	**CS 128**	Drying Duration (Hours):	**~ 24 hrs**	Dessicator:	**# 128**
Sample ID:	**Laboratory Control**	Date/Time in:	**7/8/15 1330**	Date/Time in:	**7/9/15 1450**
Test Species:	***Hyalella azteca***	Date/Time out:	**7/9/15 1445**	Date/Time out:	**7/14/15 1427**
Test Date:	**6/10/15 - 7/8/15**	Technician's Initials:	**DS**	Weigh Date / Initials:	**7/14/15 MLV**

Replicate Number	**A** Number of Organisms at Test Initiation	**B** Dry Weight of Pan and Organisms (g)	**C** Dry Weight of Pan (g)	**B-C** Total Dry Weight of Organisms (g)	**D** Number of Organisms Weighed	**B-C/D** Average Weight (mg)	**B-C/A** Biomass Weight (mg)
1	10	0.84820	0.84200	0.0062	10	0.62000	0.62000
2	10	0.84558	0.84172	0.00386	10	0.38600	0.38600
3	10	0.84664	0.84082	0.00582	10	0.58200	0.58200
4	10	0.85426	0.84935	0.00491	10	0.49100	0.49100
5	10	0.85102	0.84572	0.0053	10	0.53000	0.53000
6	10	0.84393	0.83922	0.00471	10	0.47100	0.47100
7	10	0.84869	0.84329	0.0054	10	0.54000	0.54000
8	10	0.84753	0.84147	0.00606	10	0.60600	0.60600
						AVERAGE:	

Day 0 weights	80	0.84600	0.84391	0.00209	80	Average at Day 0 (mg)	0.02612

5135-00
Ecology & Environment
Hyalella azteca 28-Day WEIGHT DATA

QC'd by: DS

Project Number:	5135-00	Type/Model of Drying Oven: **Blue M**		
Project Name:	**Ecology & Environment**	Oven Temperature: **60 °C**		
GLC#:	**Water Only**	Drying Duration (Hours): **~24 hrs**	Dessicator: **# 128**	
Sample ID:	**Secondary Control**	Date/Time in: 7/8/15 1330	Date/Time in: 7/9/15 1450	
Test Species:	***Hyalella azteca***	Date/Time out: 7/9/15 1445	Date/Time out: 7/14/15 1427	
Test Dates:	**6/10/2015**	Technician's Initials: DJ	Weigh Date / Initials: 7/14/15 MLV	
	7/8/2015			

Replicate Number	A Number of Organisms at Test Initiation	B Dry Weight of Pan and Organisms (g)	C Dry Weight of Pan (g)	B-C Total Dry Weight of Organisms (g)	D Number of Organisms Weighed	B-C/D Average Weight (mg)	B-C/A Biomass Weight (mg)
1	10	0.84612	0.84193	[redacted]	9	#DIV/0!	[redacted]
2	10	0.85120	0.84702		10	#DIV/0!	
3	10	0.85211	0.84685		10	#DIV/0!	
4	10	0.85348	0.84956		10	#DIV/0!	
5	10	0.84266	0.83798		10	#DIV/0!	
6	10	0.84766	0.84309		10	#DIV/0!	
7	10	0.84787	0.84287		10	#DIV/0!	
8	10	0.84775	0.84197		10	#DIV/0!	
						AVERAGE:	

Day 0 weights	80	See Control Page		0	80	Average at Day 0 (mg)	0

See Attached sheet for calculated weights.

5135-00
Ecology and Environment
Hyalella azteca 28-Day WEIGHT DATA

QC'd by: DS

Project Number:	**5135-00**	Type/Model of Drying Oven:	**Blue M**		
Project Name:	**Ecology and Environment**	Oven Temperature:	**60 °C**		
GLC#:	**Water Only**	Drying Duration (Hours):	**~ 24 hrs**	Dessicator:	**# 128**
Sample ID:	**Secondary Control**	Date/Time in:	**7/8/15 1330**	Date/Time in:	**7/9/15 1450**
Test Species:	***Hyalella azteca***	Date/Time out:	**7/9/15 1445**	Date/Time out:	**7/14/15 1427**
Test Date:	**6/10/15 - 7/8/15**	Technician's Initials:	**DS**	Weigh Date / Initials:	**7/14/15 MLV**

Replicate Number	**A** Number of Organisms at Test Initiation	**B** Dry Weight of Pan and Organisms (g)	**C** Dry Weight of Pan (g)	**B-C** Total Dry Weight of Organisms (g)	**D** Number of Organisms Weighed	**B-C/D** Average Weight (mg)	**B-C/A** Biomass Weight (mg)
1	10	0.84612	0.84193	0.00419	9	0.46556	0.41900
2	10	0.85120	0.84702	0.00418	10	0.41800	0.41800
3	10	0.85211	0.84685	0.00526	10	0.52600	0.52600
4	10	0.85348	0.84956	0.00392	10	0.39200	0.39200
5	10	0.84266	0.83798	0.00468	10	0.46800	0.46800
6	10	0.84766	0.84309	0.00457	10	0.45700	0.45700
7	10	0.84787	0.84287	0.005	10	0.50000	0.50000
8	10	0.84775	0.84197	0.00578	10	0.57800	0.57800
						AVERAGE:	

Day 0 weights	80	See Control Page		0	80	Average at Day 0 (mg)	0

5135-00
Ecology & Environment
Hyalella azteca 28-Day WEIGHT DATA

QC'd by: DS

Project Number:	5135-00	Type/Model of Drying Oven: **Blue M**	
Project Name:	**Ecology & Environment**	Oven Temperature: **60 °C**	
GLC#:	**10505**	Drying Duration (Hours): **~24 hrs**	Dessicator: **# 128**
Sample ID:	**BG1-SED01**	Date/Time in: 7/8/15 1330	Date/Time in: 7/9/15 1450
Test Species:	***Hyalella azteca***	Date/Time out: 7/9/15 1445	Date/Time out: 7/14/15 1427
Test Dates:	**6/10/2015**	Technician's Initials: DS	Weigh Date / Initials: 7/14/15 MLV
	7/8/2015		

Replicate Number	A Number of Organisms at Test Initiation	B Dry Weight of Pan and Organisms (g)	C Dry Weight of Pan (g)	B-C Total Dry Weight of Organisms (g)	D Number of Organisms Weighed	B-C/D Average Weight (mg)	B-C/A Biomass Weight (mg)
1	10	0.84736	0.84368		10	#DIV/0!	
2	10	0.84295	0.83860		10	#DIV/0!	
3	10	0.85044	0.84697		9	#DIV/0!	
4	10	0.84832	0.84444		9	#DIV/0!	
5	10	0.84776	0.84325		10	#DIV/0!	
6	10	0.84733	0.84360		10	#DIV/0!	
7	10	0.84252	0.83967		10	#DIV/0!	
8	10	0.84558	0.84192		10	#DIV/0!	
						AVERAGE:	

Day 0 weights	80	See Control Page		0	80	Average at Day 0 (mg)	0

See Attached sheet for calculated weights.

5135-00
Ecology and Environment
Hyalella azteca 28-Day WEIGHT DATA

QC'd by: DS

Project Number:	**5135-00**	Type/Model of Drying Oven: **Blue M**			
Project Name:	**Ecology and Environment**	Oven Temperature: **60 °C**			
GLC#:	**10505**	Drying Duration (Hours): **~ 24 hrs**		Dessicator: **# 128**	
Sample ID:	**BG1-SED01**	Date/Time in:	**7/8/15 1330**	Date/Time in:	**7/9/15 1450**
Test Species:	***Hyalella azteca***	Date/Time out:	**7/9/15 1445**	Date/Time out:	**7/14/15 1427**
Test Date:	**6/10/15 - 7/8/15**	Technician's Initials:	**DS**	Weigh Date / Initials:	**7/14/15 MLV**

Replicate Number	**A** Number of Organisms at Test Initiation	**B** Dry Weight of Pan and Organisms (g)	**C** Dry Weight of Pan (g)	**B-C** Total Dry Weight of Organisms (g)	**D** Number of Organisms Weighed	**B-C/D** Average Weight (mg)	**B-C/A** Biomass Weight (mg)
1	10	0.84736	0.84368	0.00368	10	0.36800	0.36800
2	10	0.84295	0.83860	0.00435	10	0.43500	0.43500
3	10	0.85044	0.84692	0.00352	9	0.39111	0.35200
4	10	0.84832	0.84444	0.00388	9	0.43111	0.38800
5	10	0.84776	0.84325	0.00451	10	0.45100	0.45100
6	10	0.84733	0.84360	0.00373	10	0.37300	0.37300
7	10	0.84252	0.83967	0.00285	10	0.28500	0.28500
8	10	0.84558	0.84192	0.00366	10	0.36600	0.36600
						AVERAGE:	

Day 0 weights	80	See Control Page		0	80	Average at Day 0 (mg)	0

Updated: 10/10/2011

GLEC
Great Lakes Environmental Center

5135-00
Ecology & Environment
Hyalella azteca 28-Day WEIGHT DATA

QC'd by: DS

Project Number:	5135-00	Type/Model of Drying Oven: **Blue M**			
Project Name:	**Ecology & Environment**	Oven Temperature: **60 °C**			
GLC#:	**10506**	Drying Duration (Hours): **~24 hrs**		Dessicator: **# 128**	
Sample ID:	**OU2-SED02**	Date/Time in:	7/8/15 1330	Date/Time in:	7/9/15 1450
Test Species:	***Hyalella azteca***	Date/Time out:	7/9/15 1445	Date/Time out:	7/14/15 1427
Test Dates:	**6/10/2015**	Technician's Initials:	DS	Weigh Date / Initials:	7/14/15 MLV
	7/8/2015				

Replicate Number	A Number of Organisms at Test Initiation	B Dry Weight of Pan and Organisms (g)	C Dry Weight of Pan (g)	B-C Total Dry Weight of Organisms (g)	D Number of Organisms Weighed	B-C/D Average Weight (mg)	B-C/A Biomass Weight (mg)
1	10	0.84563	0.84070	[redacted]	10	#DIV/0!	[redacted]
2	10	0.84772	0.84294		10	#DIV/0!	
3	10	0.85159	0.84612		10	#DIV/0!	
4	10	0.84641	0.84071		10	#DIV/0!	
5	10	0.84210	0.83722		10	#DIV/0!	
6	10	0.83687	0.83177		10	#DIV/0!	
7	10	0.84206	0.83506		10	#DIV/0!	
8	10	0.84699	0.84159		10	#DIV/0!	
						AVERAGE:	

Day 0 weights	80	See Control Page		0	80	Avcrage at Day 0 (mg)	0

See Attached sheet for calculated weights.

5135-00
Ecology and Environment
Hyalella azteca 28-Day WEIGHT DATA

QC'd by: DS

Project Number:	**5135-00**	Type/Model of Drying Oven: **Blue M**			
Project Name:	**Ecology and Environment**	Oven Temperature: **60 °C**			
GLC#:	**10506**	Drying Duration (Hours): **~ 24 hrs**		Dessicator: **# 128**	
Sample ID:	**OU2-SED02**	Date/Time in:	**7/8/15 1330**	Date/Time in:	**7/9/15 1450**
Test Species:	***Hyalella azteca***	Date/Time out:	**7/9/15 1445**	Date/Time out:	**7/14/15 1427**
Test Date:	**6/10/15 - 7/8/15**	Technician's Initials: **DS**		Weigh Date / Initials:	**7/14/15 MLV**

Replicate Number	**A** Number of Organisms at Test Initiation	**B** Dry Weight of Pan and Organisms (g)	**C** Dry Weight of Pan (g)	**B-C** Total Dry Weight of Organisms (g)	**D** Number of Organisms Weighed	**B-C/D** Average Weight (mg)	**B-C/A** Biomass Weight (mg)
1	10	0.84563	0.84070	0.00493	10	0.49300	0.49300
2	10	0.84772	0.84294	0.00478	10	0.47800	0.47800
3	10	0.85159	0.84612	0.00547	10	0.54700	0.54700
4	10	0.84641	0.84071	0.0057	10	0.57000	0.57000
5	10	0.84210	0.83722	0.00488	10	0.48800	0.48800
6	10	0.83687	0.83177	0.0051	10	0.51000	0.51000
7	10	0.84206	0.83506	0.007	10	0.70000	0.70000
8	10	0.84699	0.84159	0.0054	10	0.54000	0.54000
						AVERAGE:	

Day 0 weights	80	See Control Page		0	80	Average at Day 0 (mg)	0

Updated: 10/10/2011

5135-00
Ecology & Environment
Hyalella azteca 28-Day WEIGHT DATA

QC'd by: DS

Project Number:	5135-00	Type/Model of Drying Oven: **Blue M**			
Project Name:	**Ecology & Environment**	Oven Temperature: **60 °C**			
GLC#:	**10513**	Drying Duration (Hours): **~ 24 hrs**		Dessicator: **# 128**	
Sample ID:	**OU2-SED01**	Date/Time in:	7/8/15 1330	Date/Time in:	7/9/15 1450
Test Species:	***Hyalella azteca***	Date/Time out:	7/9/15 1445	Date/Time out:	7/14/15 1427
Test Dates:	**6/10/2015**	Technician's Initials:	DS	Weigh Date / Initials:	7/14/15 MLV
	7/8/2015				

Replicate Number	A Number of Organisms at Test Initiation	B Dry Weight of Pan and Organisms (g)	C Dry Weight of Pan (g)	B-C Total Dry Weight of Organisms (g)	D Number of Organisms Weighed	B-C/D Average Weight (mg)	B-C/A Biomass Weight (mg)
1	10	0.84526	0.83986		10	#DIV/0!	
2	10	0.84391	0.84004		10	#DIV/0!	
3	10	0.85615	0.85215		7	#DIV/0!	
4	10	0.84984	0.84573		9	#DIV/0!	
5	10	0.85298	0.84861		9	#DIV/0!	
6	10	0.84121	0.83561		10	#DIV/0!	
7	10	0.84443	0.83994		10	#DIV/0!	
8	10	0.84579	0.84116		10	#DIV/0!	
						AVERAGE:	

Day 0 weights	80	See Control Page		0	80	Average at Day 0 (mg)	0

See Attached sheet for calculated weights.

5135-00
Ecology and Environment
Hyalella azteca 28-Day WEIGHT DATA

QC'd by: DS

Project Number:	**5135-00**	Type/Model of Drying Oven:	**Blue M**		
Project Name:	**Ecology and Environment**	Oven Temperature:	**60 °C**		
GLC#:	**10513**	Drying Duration (Hours):	**~ 24 hrs**	Dessicator:	**# 128**
Sample ID:	**OU2-SED01**	Date/Time in:	**7/8/15 1330**	Date/Time in:	**7/9/15 1450**
Test Species:	***Hyalella azteca***	Date/Time out:	**7/9/15 1445**	Date/Time out:	**7/14/15 1427**
Test Date:	**6/10/15 - 7/8/15**	Technician's Initials:	**DS**	Weigh Date / Initials:	**7/14/15 MLV**

Replicate Number	**A** Number of Organisms at Test Initiation	**B** Dry Weight of Pan and Organisms (g)	**C** Dry Weight of Pan (g)	**B-C** Total Dry Weight of Organisms (g)	**D** Number of Organisms Weighed	**B-C/D** Average Weight (mg)	**B-C/A** Biomass Weight (mg)
1	10	0.84526	0.83986	0.0054	10	0.54000	0.54000
2	10	0.84391	0.84004	0.00387	10	0.38700	0.38700
3	10	0.85615	0.85215	0.004	7	0.57143	0.40000
4	10	0.84984	0.84573	0.00411	9	0.45667	0.41100
5	10	0.85298	0.84861	0.00437	9	0.48556	0.43700
6	10	0.84121	0.83561	0.0056	10	0.56000	0.56000
7	10	0.84443	0.83994	0.00449	10	0.44900	0.44900
8	10	0.84579	0.84116	0.00463	10	0.46300	0.46300
						AVERAGE:	

Day 0 weights	80	See Control Page		0	80	Average at Day 0 (mg)	0

Updated: 10/10/2011

5135-00
Ecology & Environment
Hyalella azteca 28-Day WEIGHT DATA

QC'd by: DS

Project Number:	5135-00	Type/Model of Drying Oven: **Blue M**	
Project Name:	**Ecology & Environment**	Oven Temperature: **60 °C**	
GLC#:	**10514**	Drying Duration (Hours): **~ 24 hrs**	Dessicator: **# 128**
Sample ID:	**OU2-SED03**	Date/Time in: 7/8/15 1330	Date/Time in: 7/9/15 1450
Test Species:	***Hyalella azteca***	Date/Time out: 7/9/15 1445	Date/Time out: 7/14/15 1427
Test Dates:	**6/10/2015**	Technician's Initials: JS	Weigh Date / Initials: 7/14/15 MLV
	7/8/2015		

Replicate Number	A Number of Organisms at Test Initiation	B Dry Weight of Pan and Organisms (g)	C Dry Weight of Pan (g)	B-C Total Dry Weight of Organisms (g)	D Number of Organisms Weighed	B-C/D Average Weight (mg)	B-C/A Biomass Weight (mg)
1	10	0.84201	0.84110	[redacted]	5	#DIV/0!	[redacted]
2	10	0.84789	0.84583		8	#DIV/0!	
3	10	0.84529	0.84428		6	#DIV/0!	
4	10	0.84775	0.84633		6	#DIV/0!	
5	10	0.84349	0.84130		9	#DIV/0!	
6	10	0.85074	0.84904		6	#DIV/0!	
7	10	0.84974	0.84856		6	#DIV/0!	
8	10	0.84018	0.83926		5	#DIV/0!	
						AVERAGE:	

Day 0 weights	80	See Control Page		0	80	Avcrage at Day 0 (mg)	0

See Attached sheet for calculated weights.

5135-00
Ecology and Environment
Hyalella azteca 28-Day WEIGHT DATA

QC'd by: DS

Project Number:	**5135-00**	Type/Model of Drying Oven:	**Blue M**		
Project Name:	**Ecology and Environment**	Oven Temperature:	**60 °C**		
GLC#:	**10514**	Drying Duration (Hours):	**~ 24 hrs**	Dessicator:	**# 128**
Sample ID:	**OU2-SED03**	Date/Time in:	**7/8/15 1330**	Date/Time in:	**7/9/15 1450**
Test Species:	***Hyalella azteca***	Date/Time out:	**7/9/15 1445**	Date/Time out:	**7/14/15 1427**
Test Date:	**6/10/15 - 7/8/15**	Technician's Initials:	**DS**	Weigh Date / Initials:	**7/14/15 MLV**

Replicate Number	**A** Number of Organisms at Test Initiation	**B** Dry Weight of Pan and Organisms (g)	**C** Dry Weight of Pan (g)	**B-C** Total Dry Weight of Organisms (g)	**D** Number of Organisms Weighed	**B-C/D** Average Weight (mg)	**B-C/A** Biomass Weight (mg)
1	10	0.84201	0.84110	0.00091	5	0.18200	0.09100
2	10	0.84789	0.84583	0.00206	8	0.25750	0.20600
3	10	0.84529	0.84428	0.00101	6	0.16833	0.10100
4	10	0.84775	0.84633	0.00142	6	0.23667	0.14200
5	10	0.84349	0.84130	0.00219	9	0.24333	0.21900
6	10	0.85074	0.84904	0.0017	6	0.28333	0.17000
7	10	0.84974	0.84856	0.00118	6	0.19667	0.11800
8	10	0.84018	0.83926	0.00092	5	0.18400	0.09200
						AVERAGE:	

Day 0 weights	80	See Control Page		0	80	Average at Day 0 (mg)	0

Appendix D2
Hyalella azteca
28-Day Statistical Data

- Survival
- weight

Test: EPA 100.1M-Hyalella azteca 28d Survival and Growth T Test ID: 5134ha715
Species: HA-Hyalella azteca Protocol: EPA 600/R-99/064
Sample ID: 18 mile creek Sample Type: -WHOLE SEDIMENT
Start Date: 6/10/2015 End Date: 7/8/2015 Lab ID: -GREAT LAKES ENVIRONMENTAL CENTER

Pos	ID	Rep	Group	Day 0	Day 4	Day 10	Day 28	Total Weight	Pan weight	Weigh	Weight Ct 28	Notes
	1	1	lab con	10			10	0.8482	0.842		10	
	2	2	lab con	10			10	0.84558	0.84172		10	
	3	3	lab con	10			10	0.84664	0.84082		10	
	4	4	lab con	10			10	0.85426	0.84935		10	
	5	5	lab con	10			10	0.85102	0.84572		10	
	6	6	lab con	10			10	0.84393	0.83922		10	
	7	7	lab con	10			10	0.84869	0.84329		10	
	8	8	lab con	10			10	0.84753	0.84147		10	
	9	1	water only	10			9	0.84612	0.84193		9	
	10	2	water only	10			10	0.8512	0.84702		10	
	11	3	water only	10			10	0.85211	0.84685		10	
	12	4	water only	10			10	0.85348	0.84956		10	
	13	5	water only	10			10	0.84266	0.83798		10	
	14	6	water only	10			10	0.84766	0.84309		10	
	15	7	water only	10			10	0.84787	0.84287		10	
	16	8	water only	10			10	0.84775	0.84197		10	
	17	1	BG1-SED01 10	10			10	0.84736	0.84368		10	
	18	2	BG1-SED01 10	10			10	0.84295	0.8386		10	
	19	3	BG1-SED01 10	10			9	0.85044	0.84692		9	
	20	4	BG1-SED01 10	10			9	0.84832	0.84444		9	
	21	5	BG1-SED01 10	10			10	0.84776	0.84325		10	
	22	6	BG1-SED01 10	10			10	0.84733	0.8436		10	
	23	7	BG1-SED01 10	10			10	0.84252	0.83967		10	
	24	8	BG1-SED01 10	10			10	0.84558	0.84192		10	
	25	1	OU2-SED02 10	10			10	0.84563	0.8407		10	
	26	2	OU2-SED02 10	10			10	0.84772	0.84294		10	
	27	3	OU2-SED02 10	10			10	0.85159	0.84612		10	
	28	4	OU2-SED02 10	10			10	0.84641	0.84071		10	
	29	5	OU2-SED02 10	10			10	0.8421	0.83722		10	
	30	6	OU2-SED02 10	10			10	0.83687	0.83177		10	
	31	7	OU2-SED02 10	10			10	0.84206	0.83506		10	
	32	8	OU2-SED02 10	10			10	0.84699	0.84159		10	
	33	1	OU2-SED01 10	10			10	0.84526	0.83986		10	
	34	2	OU2-SED01 10	10			10	0.84391	0.84004		10	
	35	3	OU2-SED01 10	10			7	0.85615	0.85215		7	
	36	4	OU2-SED01 10	10			9	0.84984	0.84573		9	
	37	5	OU2-SED01 10	10			9	0.85298	0.84861		9	
	38	6	OU2-SED01 10	10			10	0.84121	0.83561		10	
	39	7	OU2-SED01 10	10			10	0.84443	0.83994		10	
	40	8	OU2-SED01 10	10			10	0.84579	0.84116		10	
	41	1	OU2-SED03 10	10			5	0.84201	0.8411		5	
	42	2	OU2-SED03 10	10			8	0.84789	0.84583		8	
	43	3	OU2-SED03 10	10			6	0.84529	0.84428		6	
	44	4	OU2-SED03 10	10			6	0.84775	0.84633		6	
	45	5	OU2-SED03 10	10			9	0.84349	0.8413		9	
	46	6	OU2-SED03 10	10			6	0.85074	0.84904		6	
	47	7	OU2-SED03 10	10			6	0.84974	0.84856		6	
	48	8	OU2-SED03 10	10			5	0.84018	0.83926		5	

Comments: USACOE Ecology & Environmental 18 Mile Creek 28-day H. azteca survival

Hyalella azteca 28d Survival and Growth Test-28-Day Survival

Start Date: 6/10/2015	Test ID: 5134ha715	Sample ID:	18 mile creek
End Date: 7/8/2015	Lab ID: -GREAT LAKES ENVIRONMENTAL	Sample Type:	-WHOLE SEDIMENT
Sample Da	Protocol: EPA 600/R-99/064	Test Species:	HA-Hyalella azteca

Comments USACOE Ecology & Environmental 18 Mile Creek 28-day H. azteca survival

Conc-%	1	2	3	4	5	6	7	8
lab con	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
water only	0.9000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
BG1-SED01 10505	1.0000	1.0000	0.9000	0.9000	1.0000	1.0000	1.0000	1.0000
OU2-SED02 10506	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
OU2-SED01 10513	1.0000	1.0000	0.7000	0.9000	0.9000	1.0000	1.0000	1.0000
OU2-SED03 10514	0.5000	0.8000	0.6000	0.6000	0.9000	0.6000	0.6000	0.5000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
lab con	1.0000	1.0127	1.4120	1.4120	1.4120	0.000	8	*	
water only	0.9875	1.0000	1.3916	1.2490	1.4120	4.140	8		
BG1-SED01 10505	0.9750	0.9873	1.3713	1.2490	1.4120	5.501	8	60.00	47.00
OU2-SED02 10506	1.0000	1.0127	1.4120	1.4120	1.4120	0.000	8	68.00	47.00
OU2-SED01 10513	0.9375	0.9494	1.3187	0.9912	1.4120	11.484	8	56.00	47.00
*OU2-SED03 10514	0.6375	0.6456	0.9339	0.7854	1.2490	17.293	8	36.00	47.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.8984	0.919	-0.152	4.24634
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 0.33)	1	2.14479		
Hypothesis Test (1-tail, 0.05)				
Steel's Many-One Rank Test indicates significant differences				
Treatments vs lab con				

Hyalella azteca 28d Survival and Growth Test-28-day Average Growth

Start Date: 6/10/2015	Test ID: 5134ha715	Sample ID:	18 mile creek
End Date: 7/8/2015	Lab ID: -GREAT LAKES ENVIRONMENT/	Sample Type:	-WHOLE SEDIMENT
Sample Da	Protocol: EPA 600/R-99/064	Test Species:	HA-Hyalella azteca

Comments USACOE Ecology & Environmental 18 Mile Creek 28-day H. azteca survival and growth

Conc-%	1	2	3	4	5	6	7	8
lab con	0.6200	0.3860	0.5820	0.4910	0.5300	0.4710	0.5400	0.6060
water only	0.4656	0.4180	0.5260	0.3920	0.4680	0.4570	0.5000	0.5780
BG1-SED01 10505	0.3680	0.4350	0.3911	0.4311	0.4510	0.3730	0.2850	0.3660
OU2-SED02 10506	0.4930	0.4780	0.5470	0.5700	0.4880	0.5100	0.7000	0.5400
OU2-SED01 10513	0.5400	0.3870	0.5714	0.4567	0.4856	0.5600	0.4490	0.4630
OU2-SED03 10514	0.1820	0.2575	0.1683	0.2367	0.2433	0.2833	0.1967	0.1840

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
lab con	0.5282	1.1108	0.5282	0.3860	0.6200	14.732	8			
water only	0.4756	1.0000	0.4756	0.3920	0.5780	12.423	8			
*BG1-SED01 10505	0.3875	0.8149	0.3875	0.2850	0.4510	13.711	8	4.224	1.761	0.0587
OU2-SED02 10506	0.5408	1.1371	0.5408	0.4780	0.7000	13.299	8	-0.334	1.761	0.0660
OU2-SED01 10513	0.4891	1.0284	0.4891	0.3870	0.5714	12.972	8	1.103	1.761	0.0625
*OU2-SED03 10514	0.2190	0.4605	0.2190	0.1683	0.2833	19.053	8	9.907	1.761	0.0550

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.986964	0.919	0.144708588	0.46081
Bartlett's Test indicates equal variances (p = 0.55)	3.022631	9.487729		
The control means are not significantly different (p = 0.15)	1.525005	2.144787		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates significant differences Treatments vs lab con	0.054986	0.104091	0.143401	0.003963	5.5E-12	4, 35

Hyalella azteca 28d Survival and Growth Test-28-Day Biomass

Start Date: 6/10/2015	Test ID: 5134ha715	Sample ID:	18 mile creek
End Date: 7/8/2015	Lab ID: -GREAT LAKES ENVIRONMENT	Sample Type:	-WHOLE SEDIMENT
Sample Da	Protocol: EPA 600/R-99/064	Test Species:	HA-Hyalella azteca

Comments USACOE Ecology & Environmental 18 Mile Creek 28-day H. azteca survival and growth

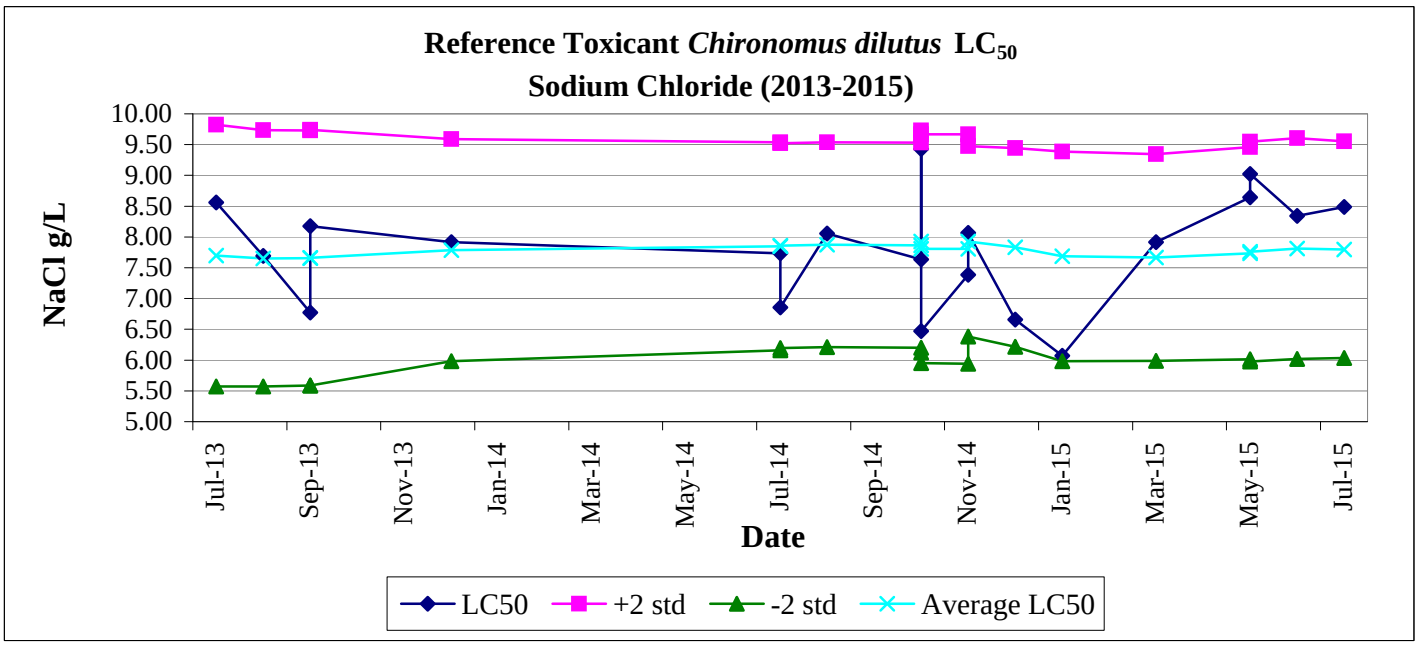
Conc-%	1	2	3	4	5	6	7	8
lab con	0.6200	0.3860	0.5820	0.4910	0.5300	0.4710	0.5400	0.6060
water only	0.4190	0.4180	0.5260	0.3920	0.4680	0.4570	0.5000	0.5780
BG1-SED01 10505	0.3680	0.4350	0.3520	0.3880	0.4510	0.3730	0.2850	0.3660
OU2-SED02 10506	0.4930	0.4780	0.5470	0.5700	0.4880	0.5100	0.7000	0.5400
OU2-SED01 10513	0.5400	0.3870	0.4000	0.4110	0.4370	0.5600	0.4490	0.4630
OU2-SED03 10514	0.0910	0.2060	0.1010	0.1420	0.2190	0.1700	0.1180	0.0920

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
lab con	0.5282	1.1245	0.5282	0.3860	0.6200	14.732	8	*		
water only	0.4698	1.0000	0.4698	0.3920	0.5780	13.285	8			
*BG1-SED01 10505	0.3772	0.8031	0.3772	0.2850	0.4510	13.541	8	4.588	1.761	0.0580
OU2-SED02 10506	0.5408	1.1511	0.5408	0.4780	0.7000	13.299	8	-0.334	1.761	0.0660
*OU2-SED01 10513	0.4559	0.9705	0.4559	0.3870	0.5600	13.936	8	2.038	1.761	0.0626
*OU2-SED03 10514	0.1424	0.3031	0.1424	0.0910	0.2190	35.780	8	11.734	1.761	0.0579

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.974097	0.919	0.37707	0.29315
Bartlett's Test indicates equal variances (p = 0.74)	1.952707	9.487729		
The control means are not significantly different (p = 0.12)	1.658722	2.144787		

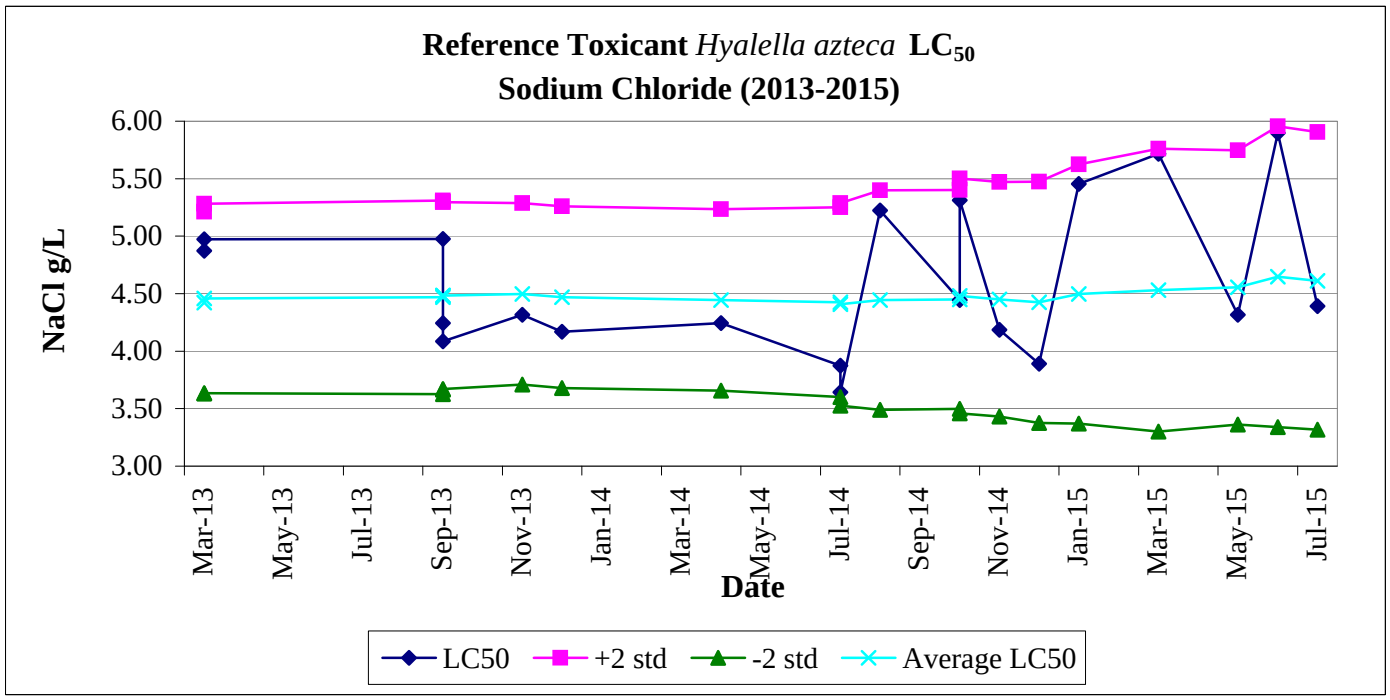
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates significant differences Treatments vs lab con	0.057921	0.109646	0.211746	0.00409375	3.2E-14	4, 35

Appendix E
Reference Toxicant Data



96-Hour Acute Toxicity Data for *Chironomus dilutus*

Date	Control Survival (%)	LC_{50} (g/L NaCl)	Average LC_{50} (g/L NaCl)	+2 std	-2 std
March 18, 2015	100.0	7.92	7.67	9.35	5.99
May 8, 2015	95.0	8.65	7.74	9.46	6.01
May 26, 2015	100.0	9.02	7.76	9.55	5.98
June 29, 2015	100.0	8.34	7.81	9.61	6.02
July 8, 2015	100.0	8.49	7.79	9.55	6.03



96-Hour Acute Toxicity Data for
Hyalella azteca

Date	Control Survival (%)	LC_{50} (g/L NaCl)	Average LC_{50} (g/L NaCl)	+2 std	-2 std
January 19, 2015	100.0	5.45	4.50	5.62	3.37
March 18, 2015	95.0	5.72	4.53	5.76	3.30
May 11, 2015	100.0	4.32	4.55	5.75	3.36
June 16, 2015	100.0	5.90	4.65	5.95	3.34
July 8, 2015	100.0	4.39	4.61	5.91	3.32

E

Surface Water Bioassay Laboratory Report

Great Lakes Environmental Center, Inc.

Applied Environmental Sciences
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739 Hastings St.
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OH 43212

614 487-1040
614 487-1920 fax

July 6, 2015

Lynne Kalmbach, Project Chemist
Ecology and Environment, Inc.
368 Pleasant View Dr.
Lancaster, New York 14086
Phone: 716-684-8060 Ext: 2614
Cell: 716-462-7863

RE: Chronic Toxicity Test Report Results for the 18 Mile Creek OU2
Surface Water Samples: BG1-SW01, OU2-SW01, OU2-SW02, OU2-SW03
Sample Collection Date: May 26, 2015
USEPA Contract Number EP-W-10-007
GLEC Project Number: 5135

Dear Ms. Kalmbach:

Great Lakes Environmental Center, Inc. (GLEC) has completed our analysis of the static renewal *Ceriodaphnia dubia* and fathead minnow chronic toxicity tests performed on four surface water samples that were collected from the 18 Mile Creek OU2. The surface water samples were designated: and were collected by Ecology and Environment personnel on May 26, 2015 (GLC Numbers: 10,509, 10,510, 10,511, and 10,512, respectively).

These tests were conducted following the guidelines outlined in, EPA's *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Third Edition, EPA-821-R-02-013 and Fourth Edition, EPA-821-R-02-012, *Methods for Measuring the Acute Toxicity of Effluent to Freshwater and Marine Organisms*, Fifth Edition and Great Lakes Environmental Center's Standard Operating Procedures.

Acute toxicity for the *C. dubia* and fathead minnows was determined from the chronic toxicity test using the 48 hour and 96 hour survival data. Dilute mineral water (DMW) was used as dilution water for the *C. dubia* tests and moderately hard reconstituted water (MH) was used as dilution water for the fathead minnow tests.

The four water samples were collected as grab samples and each sample was used to initiate a toxicity test within 36 hours of collection. The four water samples collected were used for the entire duration of the toxicity tests. Each toxicity test was initiated with an undiluted sample (i.e., 100%), four intermediate test concentrations (i.e., 6.25%, 12.5%, 25%, and 50%), and a dilution water control.

The four water samples: BG1-SW01, OU2-SW01, OU2-SW02, and OU2-SW03 samples were neither acutely nor chronically toxic to *C. dubia* or to fathead minnows.

The acute 48-hour *C. dubia* LC_{50} (Median Lethal Toxicant Concentration) estimates for the four water samples were all greater than 100 percent effluent, or 0 TU_a (acute toxic units). The acute 96-hour fathead minnow LC_{50} estimates were also all greater than 100 percent effluent, or 0 TU_a.

The chronic No-Observed-Effect-Concentrations (NOEC) for *C. dubia* reproduction and survival for the four samples were all 100 percent effluent, or 0 TU_c (chronic toxic units). Additionally, the chronic NOEC for fathead minnow growth and survival for the four samples were all 100 percent effluent, or 0 TU_c.

The chronic report forms are enclosed for your review. Copies of the raw data sheets and standard reference toxicant data for the chronic toxicity tests are included with this report in Appendices A and B, respectively.

If you have any questions, or if you would like additional information, please contact either myself or Dennis McCauley at (231) 941-2230, or John Barkach at (248) 538-0900. Thank you for the opportunity to provide this service to Ecology and Environment, Inc.. We look forward to continuing to provide our environmental services to you in the future.

Sincerely,

Mailee W. Garton

Mailee W. Garton
Laboratory Coordinator

MWG:mg

Enclosures

CERIODAPHNIA DUBIA CHRONIC TOXICITY TEST REPORT
BG1-SW01

1. NAME OF CLIENT	2. NPDES PERMIT #
Ecology and Environment	M I 0 0

3. PROJECT NAME:	4. SAMPLE ID:	5. RECEIVING WATER CONCENTRATION (if known)
18 Mile Creek OU2	**BG1-SW01**	

6. TEST LAB (Name and Address)

Great Lakes Environmental Center
739 Hastings Street, Traverse City, MI 49686

7. TEST START DATE	8. TEST END DATE	9. AGE RANGE OF ORGANISMS AT TEST START	10. REPORT DATE
05/27/2015	**06/02/2015**	**<24 hrs (8 hour range)**	**6/16/2015**

11. NAME OF PERSON CONDUCTING TEST	12. NAME/PHONE # OF PERSON WHO CAN ANSWER QUESTIONS ABOUT THIS REPORT
Michelle VanDenBrand **Kelly Stratton** **Mailee Garton** **Dan Smith**	**Mailee Garton/Dennis McCauley** **(231) 941-2230**

13. SAMPLE COLLECTION DATES	14. DATE RECEIVED	15. ARRIVAL TEMP (°C)
Sample 1: **05/26/2015 08:55**	Sample 1: **05/27/2015**	Sample 1: **2.0**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -
16. DATE OF FIRST USE	17. TOTAL RESIDUAL CHLORINE (mg/l)	18. AMMONIA (mg/l as N)
Sample 1: **05/27/2015 GLC# 10509**	Sample 1: **NM**	Sample 1: **ND**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -

19. WAS SAMPLE DECHLORINATED?	20. DESCRIBE DECHLORINATION (if any)
Sample 1: O YES ■ NO Sample 2: O YES ■ NO Sample 3: O YES ■ NO	

21. EFFLUENT SAMPLES WERE COLLECTED (check one) O BEFORE CHLORINATION O AFTER CHLORINATION

O AFTER CHLORINATION, BEFORE DECHLORINATION O AFTER DECHLORINATION ■ FACILITY DOES NOT CHLORINATE

22. DESCRIBE ANY DEVIATIONS FROM TEST METHODS (For example, pH-controlled test, reduced DO levels in test leading to aeration, sample exceeded holding time.)

23. EFFLUENT FILTERED?	24. STATE MESH SIZE OF FILTER (if filtered)
O YES ■ NO	

25. EFFLUENT SAMPLE TYPE (check one type for each sample)	26. IDENTIFY THE DILUENT (O_1) CONTROL
Sample 1: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE Sample 2: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE Sample 3: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE	**Moderately Hard-Dilute Mineral Water (DMW)#2274-2276** IDENTIFY THE SECONDARY (O_2) CONTROL (if used) **None**

27. SUMMARY OF DATA AND RESULTS - SURVIVAL AND REPRODUCTION

CONCENTRATION OF EFFLUENT (%)	O_1	O_2	6.25%	12.5%	25%	50%	100%
48-HOUR SURVIVAL (%)	100	-	100	100	100	100	100
6-DAY MEAN REPRODUCTION/FEMALE	19.1	-	17.7	17.2	20.4	20.2	20.3
6-DAY MEAN SURVIVAL (%)	100	-	100	100	100	100	100

28. 48-HOUR LC_{50} (%)	29. TU_a (acute toxic units)
>100%	**0**

30. 6-DAY CHRONIC VALUE (%)	31. NOEC	32. LOEC	33. TU_c (chronic toxic units)
>100%	**100%**	**>100%**	**0**

NM: Not Measured
ND: Non Detect

CERIODAPHNIA DUBIA CHRONIC TOXICITY TEST REPORT
OU2-SW01

1. NAME OF CLIENT	2. NPDES PERMIT #
Ecology and Environment	M I 0 0

3. PROJECT NAME:	4. SAMPLE ID:	5. RECEIVING WATER CONCENTRATION (if known)
18 Mile Creek OU2	**OU2-SW01**	

6. TEST LAB (Name and Address)

Great Lakes Environmental Center
739 Hastings Street, Traverse City, MI 49686

7. TEST START DATE	8. TEST END DATE	9. AGE RANGE OF ORGANISMS AT TEST START	10. REPORT DATE
05/27/2015	**06/02/2015**	**<24 hrs (8 hour range)**	**6/16/2015**

11. NAME OF PERSON CONDUCTING TEST	12. NAME/PHONE # OF PERSON WHO CAN ANSWER QUESTIONS ABOUT THIS REPORT
Michelle VanDenBrand **Kelly Stratton** **Mailee Garton** **Dan Smith**	**Mailee Garton/Dennis McCauley** **(231) 941-2230**

13. SAMPLE COLLECTION DATES	14. DATE RECEIVED	15. ARRIVAL TEMP (°C)
Sample 1: **05/26/2015 10:45**	Sample 1: **05/27/2015**	Sample 1: **0.7**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -
16. DATE OF FIRST USE	17. TOTAL RESIDUAL CHLORINE (mg/l)	18. AMMONIA (mg/l as N)
Sample 1: **05/27/2015 GLC# 10510**	Sample 1: **NM**	Sample 1: **0.50-quick check**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -

19. WAS SAMPLE DECHLORINATED?	20. DESCRIBE DECHLORINATION (if any)
Sample 1: O YES ■ NO Sample 2: O YES ■ NO Sample 3: O YES ■ NO	

21. EFFLUENT SAMPLES WERE COLLECTED (check one) O BEFORE CHLORINATION O AFTER CHLORINATION

O AFTER CHLORINATION, BEFORE DECHLORINATION O AFTER DECHLORINATION ■ FACILITY DOES NOT CHLORINATE

22. DESCRIBE ANY DEVIATIONS FROM TEST METHODS (For example, pH-controlled test, reduced DO levels in test leading to aeration, sample exceeded holding time.)

23. EFFLUENT FILTERED?	24. STATE MESH SIZE OF FILTER (if filtered)
O YES ■ NO	

25. EFFLUENT SAMPLE TYPE (check one type for each sample)	26. IDENTIFY THE DILUENT (O_1) CONTROL
Sample 1: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE Sample 2: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE Sample 3: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE	**Moderately Hard-Dilute Mineral Water (DMW)#2274-2276** IDENTIFY THE SECONDARY (O_2) CONTROL (if used) **None**

27. SUMMARY OF DATA AND RESULTS - SURVIVAL AND REPRODUCTION

CONCENTRATION OF EFFLUENT (%)	O_1	O_2	6.25%	12.5%	25%	50%	100%
48-HOUR SURVIVAL (%)	100	-	100	100	100	100	100
6-DAY MEAN REPRODUCTION/FEMALE	17.0	-	18.6	22.0	20.2	20.9	22.4
6-DAY MEAN SURVIVAL (%)	90	-	100	100	100	100	100

28. 48-HOUR LC_{50} (%)	29. TU_a (acute toxic units)
>100%	**0**

30. 6-DAY CHRONIC VALUE (%)	31. NOEC	32. LOEC	33. TU_c (chronic toxic units)
>100%	**100%**	**>100%**	**0**

NM: Not Measured
ND: Non Detect

CERIODAPHNIA DUBIA CHRONIC TOXICITY TEST REPORT
OU2-SW02

1. NAME OF CLIENT	2. NPDES PERMIT #
Ecology and Environment	M I 0 0

3. PROJECT NAME:	4. SAMPLE ID:	5. RECEIVING WATER CONCENTRATION (if known)
18 Mile Creek OU2	**OU2-SW02**	

6. TEST LAB (Name and Address)

Great Lakes Environmental Center
739 Hastings Street, Traverse City, MI 49686

7. TEST START DATE	8. TEST END DATE	9. AGE RANGE OF ORGANISMS AT TEST START	10. REPORT DATE
05/27/2015	**06/02/2015**	**<24 hrs (8 hour range)**	**6/23/2015**

11. NAME OF PERSON CONDUCTING TEST	12. NAME/PHONE # OF PERSON WHO CAN ANSWER QUESTIONS ABOUT THIS REPORT
Michelle VanDenBrand **Kelly Stratton** **Mailee Garton** **Dan Smith**	**Mailee Garton/Dennis McCauley** **(231) 941-2230**

13. SAMPLE COLLECTION DATES	14. DATE RECEIVED	15. ARRIVAL TEMP (°C)
Sample 1: **05/26/2015 13:00**	Sample 1: **05/27/2015**	Sample 1: **1.5**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -
16. DATE OF FIRST USE	17. TOTAL RESIDUAL CHLORINE (mg/l)	18. AMMONIA (mg/l as N)
Sample 1: **05/27/2015 GLC# 10511**	Sample 1: **NM**	Sample 1: **0.50-quick check**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -

19. WAS SAMPLE DECHLORINATED?	20. DESCRIBE DECHLORINATION (if any)
Sample 1: O YES ■ NO Sample 2: O YES ■ NO Sample 3: O YES ■ NO	

21. EFFLUENT SAMPLES WERE COLLECTED (check one) O BEFORE CHLORINATION O AFTER CHLORINATION

O AFTER CHLORINATION, BEFORE DECHLORINATION O AFTER DECHLORINATION ■ FACILITY DOES NOT CHLORINATE

22. DESCRIBE ANY DEVIATIONS FROM TEST METHODS (For example, pH-controlled test, reduced DO levels in test leading to aeration, sample exceeded holding time.)

23. EFFLUENT FILTERED?	24. STATE MESH SIZE OF FILTER (if filtered)
O YES ■ NO	

25. EFFLUENT SAMPLE TYPE (check one type for each sample)	26. IDENTIFY THE DILUENT (O_1) CONTROL
Sample 1: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE Sample 2: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE Sample 3: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE	**Moderately Hard-Dilute Mineral Water (DMW)#2274-2276** IDENTIFY THE SECONDARY (O_2) CONTROL (if used) **None**

27. SUMMARY OF DATA AND RESULTS - SURVIVAL AND REPRODUCTION

CONCENTRATION OF EFFLUENT (%)	O_1	O_2	6.25%	12.5%	25%	50%	100%
48-HOUR SURVIVAL (%)	100	-	100	100	100	100	100
6-DAY MEAN REPRODUCTION/FEMALE	19.2	-	18.3	20.3	19.6	22.1	23.4
6-DAY MEAN SURVIVAL (%)	100	-	100	100	90	100	100

28. 48-HOUR LC_{50} (%)	29. TU_a (acute toxic units)
>100%	**0**

30. 6-DAY CHRONIC VALUE (%)	31. NOEC	32. LOEC	33. TU_c (chronic toxic units)
>100%	**100%**	**>100%**	**0**

NM: Not Measured
ND: Non Detect

CERIODAPHNIA DUBIA CHRONIC TOXICITY TEST REPORT
OU2-SW03

1. NAME OF CLIENT	2. NPDES PERMIT #
Ecology and Environment	M I 0 0

3. PROJECT NAME:	4. SAMPLE ID:	5. RECEIVING WATER CONCENTRATION (if known)
18 Mile Creek OU2	**OU2-SW03**	

6. TEST LAB (Name and Address)

Great Lakes Environmental Center
739 Hastings Street, Traverse City, MI 49686

7. TEST START DATE	8. TEST END DATE	9. AGE RANGE OF ORGANISMS AT TEST START	10. REPORT DATE
05/27/2015	**06/02/2015**	**<24 hrs (8 hour range)**	**6/16/2015**

11. NAME OF PERSON CONDUCTING TEST	12. NAME/PHONE # OF PERSON WHO CAN ANSWER QUESTIONS ABOUT THIS REPORT
Michelle VanDenBrand **Kelly Stratton** **Mailee Garton** **Dan Smith**	**Mailee Garton/Dennis McCauley** **(231) 941-2230**

13. SAMPLE COLLECTION DATES	14. DATE RECEIVED	15. ARRIVAL TEMP (°C)
Sample 1: **05/26/2015 13:20**	Sample 1: **05/27/2015**	Sample 1: **1.0**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -
16. DATE OF FIRST USE	17. TOTAL RESIDUAL CHLORINE (mg/l)	18. AMMONIA (mg/l as N)
Sample 1: **05/27/2015 GLC# 10512**	Sample 1: **NM**	Sample 1: **0.25-quick check**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -

19. WAS SAMPLE DECHLORINATED?	20. DESCRIBE DECHLORINATION (if any)
Sample 1: O YES ■ NO Sample 2. O YES ■ NO Sample 3: O YES ■ NO	

21. EFFLUENT SAMPLES WERE COLLECTED (check one) O BEFORE CHLORINATION O AFTER CHLORINATION

O AFTER CHLORINATION, BEFORE DECHLORINATION O AFTER DECHLORINATION ■ FACILITY DOES NOT CHLORINATE

22. DESCRIBE ANY DEVIATIONS FROM TEST METHODS (For example, pH-controlled test, reduced DO levels in test leading to aeration, sample exceeded holding time.)

23. EFFLUENT FILTERED?	24. STATE MESH SIZE OF FILTER (if filtered)
O YES ■ NO	

25. EFFLUENT SAMPLE TYPE (check one type for each sample)	26. IDENTIFY THE DILUENT (O_1) CONTROL
Sample 1: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE Sample 2: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE Sample 3: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE	**Moderately Hard-Dilute Mineral Water (DMW)#2274-2276** IDENTIFY THE SECONDARY (O_2) CONTROL (if used) **None**

27. SUMMARY OF DATA AND RESULTS - SURVIVAL AND REPRODUCTION

CONCENTRATION OF EFFLUENT (%)	O_1	O_2	6.25%	12.5%	25%	50%	100%
48-HOUR SURVIVAL (%)	100	-	100	100	100	100	100
6-DAY MEAN REPRODUCTION/FEMALE	19.7	-	20.5	19.1	20.4	22.3	20.4
6-DAY MEAN SURVIVAL (%)	100	-	100	80	100	90	100

28. 48-HOUR LC_{50} (%)	29. TU_a (acute toxic units)
>100%	**0**

30. 6-DAY CHRONIC VALUE (%)	31. NOEC	32. LOEC	33. TU_c (chronic toxic units)
>100%	**100%**	**>100%**	**0**

NM: Not Measured
ND: Non Detect

FATHEAD MINNOW CHRONIC TOXICITY TEST REPORT
BG1-SW01

1. NAME OF FACILITY (on NPDES permit)	2. NPDES PERMIT #
Ecology and Environment	M I 0 0

3. PROJECT NAME:	4. SAMPLE ID:	5. RECEIVING WATER CONCENTRATION (if known)
18 Mile Creek OU2	**BG1-SW01**	

6. TEST LAB (Name and Address) **Great Lakes Environmental Center, 739 Hastings Street, Traverse City, MI 49686**

7. TEST START DATE	8. TEST END DATE	9. AGE RANGE OF ORGANISMS AT TEST START	10. REPORT DATE
05/27/2015	**06/03/2015**	**<24 hours ABS 5/27/15**	**6/23/2015**

11. NAME OF PERSON CONDUCTING TEST	12. NAME/PHONE # OF PERSON WHO CAN ANSWER QUESTIONS ABOUT THIS REPORT
Kelly Stratton, Mailee Garton, Mitch Mort, Maggie Petersen	**Mailee Garton/Dennis McCauley (231) 941 - 2230**

13. SAMPLE COLLECTION DATES	14. DATE RECEIVED	15. ARRIVAL TEMP (°C)
Sample 1: **05/26/2015 08:55**	Sample 1: **05/27/2015**	Sample 1: **2.0**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -
16. DATE OF FIRST USE	17. TOTAL RESIDUAL CHLORINE (mg/l)	18. AMMONIA (mg/l as N)
Sample 1: **05/27/2015 GLC# 10509**	Sample 1: **NM**	Sample 1: **ND**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -

19. WAS SAMPLE DECHLORINATED?	20. DESCRIBE DECHLORINATION (if any)
Sample 1: O YES ■ NO	
Sample 2: O YES ■ NO	
Sample 3: O YES ■ NO	

21. EFFLUENT SAMPLES WERE COLLECTED (check one) O BEFORE CHLORINATION O AFTER CHLORINATION O AFTER CHLORINATION, BEFORE DECHLORINATION O AFTER DECHLORINATION X FACILITY DOES NOT CHLORINATE

22. DESCRIBE ANY DEVIATIONS FROM TEST METHODS (For example, pH-controlled test, reduced DO levels in test leading to aeration, sample exceeded holding time.)

23. EFFLUENT FILTERED?	24. STATE MESH SIZE OF FILTER (if filtered)
O YES X NO	

25. EFFLUENT SAMPLE TYPE (check one type for each sample)	26. IDENTIFY THE DILUENT (O_1)
Sample 1: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE	CONTROL: **Moderately Hard Reconstituted Freshwater# 2455-2462**
Sample 2: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE	IDENTIFY THE SECONDARY (O_2) CONTROL (if used) **N/A**
Sample 3: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE	

27. SUMMARY OF DATA AND RESULTS - SURVIVAL AND GROWTH

CONCENTRATION OF EFFLUENT (%)	O_1 (diluent)	O_2 (if used)	12.5%	25%	50%	93%	100%
96-HOUR SURVIVAL (%)	**100**	-	**100**	**100**	**100**	**100**	**100**
7-DAY MEAN BIOMASS (mg/initial fish)	**0.437**	-	**0.467**	**0.502**	**0.491**	**0.488**	**0.533**
7-DAY MEAN SURVIVAL (%)	**100**	-	**100**	**100**	**100**	**100**	**100**

28. 96-HOUR LC_{50} (%)	29. TU_a (acute toxic units)
>100%	**0**

30. 7-DAY CHRONIC VALUE (%)	31. NOEC	32. LOEC	33. TU_c (chronic toxic units)
>100%	100%	>100%	0

ND: Not detected NM: Not Measured * significantly different from the dilution water control

FATHEAD MINNOW CHRONIC TOXICITY TEST REPORT
OU2-SW01

1. NAME OF FACILITY (on NPDES permit)	2. NPDES PERMIT #
Ecology and Environment	M I 0 0

3. PROJECT NAME:	4. SAMPLE ID:	5. RECEIVING WATER CONCENTRATION (if known)
18 Mile Creek OU2	**OU2-SW01**	

6. TEST LAB (Name and Address) **Great Lakes Environmental Center, 739 Hastings Street, Traverse City, MI 49686**

7. TEST START DATE	8. TEST END DATE	9. AGE RANGE OF ORGANISMS AT TEST START	10. REPORT DATE
05/27/2015	**06/03/2015**	**<24 hours ABS 5/27/15**	**6/23/2015**

11. NAME OF PERSON CONDUCTING TEST	12. NAME/PHONE # OF PERSON WHO CAN ANSWER QUESTIONS ABOUT THIS REPORT
Kelly Stratton, Mailee Garton, Mitch Mort, Maggie Petersen	**Mailee Garton/Dennis McCauley (231) 941 - 2230**

13. SAMPLE COLLECTION DATES	14. DATE RECEIVED	15. ARRIVAL TEMP (°C)
Sample 1: **05/26/2015 10:45**	Sample 1: **05/27/2015**	Sample 1: **0.7**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -
16. DATE OF FIRST USE	17. TOTAL RESIDUAL CHLORINE (mg/l)	18. AMMONIA (mg/l as N)
Sample 1: **05/27/2015 GLC# 10510**	Sample 1: **NM**	Sample 1: **0.50-quick check**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -

19. WAS SAMPLE DECHLORINATED?	20. DESCRIBE DECHLORINATION (if any)
Sample 1: O YES ■ NO	
Sample 2: O YES ■ NO	
Sample 3: O YES ■ NO	

21. EFFLUENT SAMPLES WERE COLLECTED (check one) O BEFORE CHLORINATION O AFTER CHLORINATION O AFTER CHLORINATION, BEFORE DECHLORINATION O AFTER DECHLORINATION X FACILITY DOES NOT CHLORINATE

22. DESCRIBE ANY DEVIATIONS FROM TEST METHODS (For example, pH-controlled test, reduced DO levels in test leading to aeration, sample exceeded holding time.)

23. EFFLUENT FILTERED?	24. STATE MESH SIZE OF FILTER (if filtered)
O YES X NO	

25. EFFLUENT SAMPLE TYPE (check one type for each sample)
Sample 1: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE
Sample 2: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE
Sample 3: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE

26. IDENTIFY THE DILUENT (O_1) CONTROL: **Moderately Hard Reconstituted Freshwater# 2456-2462**
IDENTIFY THE SECONDARY (O_2) CONTROL (if used) **N/A**

27. SUMMARY OF DATA AND RESULTS - SURVIVAL AND GROWTH

CONCENTRATION OF EFFLUENT (%)	O_1 (diluent)	O_2 (if used)	6.25%	12.5%	25%	50%	100%	
96-HOUR SURVIVAL (%)	**100**	-	**100**	**100**	**97.5**	**100**	**97.5**	
7-DAY MEAN BIOMASS (mg/initial fish)	**0.485**	-	**0.500**	**0.504**	**0.496**	**0.494**	**0.566**	
7-DAY MEAN SURVIVAL (%)	**100**	-	**100**	**100**	**97.5**	**96.6**	**97.5**	

28. 96-HOUR LC_{50} (%) **>100%**
29. TU_a (acute toxic units) **0**

30. 7-DAY CHRONIC VALUE (%)	31. NOEC	32. LOEC	33. TU_c (chronic toxic units)
>100%	100%	>100%	0

ND: Not detected NM: Not Measured * significantly different from the dilution water control

FATHEAD MINNOW CHRONIC TOXICITY TEST REPORT
OU2-SW02

1. NAME OF FACILITY (on NPDES permit)	2. NPDES PERMIT #
Ecology and Environment	M I 0 0

3. PROJECT NAME:	4. SAMPLE ID:	5. RECEIVING WATER CONCENTRATION (if known)
18 Mile Creek OU2	**OU2-SW02**	

6. TEST LAB (Name and Address) **Great Lakes Environmental Center, 739 Hastings Street, Traverse City, MI 49686**

7. TEST START DATE	8. TEST END DATE	9. AGE RANGE OF ORGANISMS AT TEST START	10. REPORT DATE
05/27/2015	**06/03/2015**	**<24 hours ABS 5/27/15**	**6/23/2015**

11. NAME OF PERSON CONDUCTING TEST	12. NAME/PHONE # OF PERSON WHO CAN ANSWER QUESTIONS ABOUT THIS REPORT
Kelly Stratton, Mailee Garton, Mitch Mort, Maggie Petersen	**Mailee Garton/Dennis McCauley (231) 941 - 2230**

13. SAMPLE COLLECTION DATES	14. DATE RECEIVED	15. ARRIVAL TEMP (°C)
Sample 1: **05/26/2015 13:00**	Sample 1: **05/27/2015**	Sample 1: **1.5**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -
16. DATE OF FIRST USE	**17. TOTAL RESIDUAL CHLORINE (mg/l)**	**18. AMMONIA (mg/l as N)**
Sample 1: **05/27/2015 GLC# 10511**	Sample 1: **NM**	Sample 1: **0.50-quick check**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -

19. WAS SAMPLE DECHLORINATED?	20. DESCRIBE DECHLORINATION (if any)
Sample 1: O YES ■ NO	
Sample 2: O YES ■ NO	
Sample 3: O YES ■ NO	

21. EFFLUENT SAMPLES WERE COLLECTED (check one) O BEFORE CHLORINATION O AFTER CHLORINATION

O AFTER CHLORINATION, BEFORE DECHLORINATION O AFTER DECHLORINATION X FACILITY DOES NOT CHLORINATE

22. DESCRIBE ANY DEVIATIONS FROM TEST METHODS (For example, pH-controlled test, reduced DO levels in test leading to aeration, sample exceeded holding time.)

23. EFFLUENT FILTERED?	24. STATE MESH SIZE OF FILTER (if filtered)
O YES X NO	

25. EFFLUENT SAMPLE TYPE (check one type for each sample)

Sample 1: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE

Sample 2: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE

Sample 3: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE

26. IDENTIFY THE DILUENT (O_1) CONTROL: **Moderately Hard Reconstituted Freshwater# 2456-2461**

IDENTIFY THE SECONDARY (O_2) CONTROL (if used) **N/A**

27. SUMMARY OF DATA AND RESULTS - SURVIVAL AND GROWTH

CONCENTRATION OF EFFLUENT (%)	O_1 (diluent)	O_2 (if used)	6.25%	12.5%	25%	50%	100%	
96-HOUR SURVIVAL (%)	**97.5**	-	**95.0**	**97.5**	**100**	**100**	**100**	
7-DAY MEAN BIOMASS (mg/initial fish)	**0.497**	-	**0.503**	**0.506**	**0.475**	**0.506**	**0.622**	
7-DAY MEAN SURVIVAL (%)	**97.5**	-	**95.0**	**97.5**	**100**	**100**	**100**	

28. 96-HOUR LC_{50} (%) **>100%**

29. TU_a (acute toxic units) **0**

30. 7-DAY CHRONIC VALUE (%)	31. NOEC	32. LOEC	33. TU_c (chronic toxic units)
>100%	100%	>100%	0

ND: Not detected NM: Not Measured * significantly different from the dilution water control

FATHEAD MINNOW CHRONIC TOXICITY TEST REPORT
OU2-SW03

1. NAME OF FACILITY (on NPDES permit)	2. NPDES PERMIT #
Ecology and Environment	M I 0 0

3. PROJECT NAME:	4. SAMPLE ID:	5. RECEIVING WATER CONCENTRATION (if known)
18 Mile Creek OU2	**OU2-SW03**	

6. TEST LAB (Name and Address) **Great Lakes Environmental Center, 739 Hastings Street, Traverse City, MI 49686**

7. TEST START DATE	8. TEST END DATE	9. AGE RANGE OF ORGANISMS AT TEST START	10. REPORT DATE
05/27/2015	**06/03/2015**	**<24 hours ABS 5/27/15**	**6/23/2015**

11. NAME OF PERSON CONDUCTING TEST	12. NAME/PHONE # OF PERSON WHO CAN ANSWER QUESTIONS ABOUT THIS REPORT
Kelly Stratton, Mailee Garton, Mitch Mort, Maggie Petersen	**Mailee Garton/Dennis McCauley (231) 941 - 2230**

13. SAMPLE COLLECTION DATES	14. DATE RECEIVED	15. ARRIVAL TEMP (°C)
Sample 1: **05/26/2015 13:20**	Sample 1: **05/27/2015**	Sample 1: **1.0**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -
16. DATE OF FIRST USE	17. TOTAL RESIDUAL CHLORINE (mg/l)	18. AMMONIA (mg/l as N)
Sample 1: **05/27/2015 GLC# 10512**	Sample 1: **NM**	Sample 1: **0.25-quick check**
Sample 2: -	Sample 2: -	Sample 2: -
Sample 3: -	Sample 3: -	Sample 3: -

19. WAS SAMPLE DECHLORINATED?	20. DESCRIBE DECHLORINATION (if any)
Sample 1: O YES ■ NO	
Sample 2: O YES ■ NO	
Sample 3: O YES ■ NO	

21. EFFLUENT SAMPLES WERE COLLECTED (check one) O BEFORE CHLORINATION O AFTER CHLORINATION O AFTER CHLORINATION, BEFORE DECHLORINATION O AFTER DECHLORINATION X FACILITY DOES NOT CHLORINATE

22. DESCRIBE ANY DEVIATIONS FROM TEST METHODS (For example, pH-controlled test, reduced DO levels in test leading to aeration, sample exceeded holding time.)

23. EFFLUENT FILTERED?	24. STATE MESH SIZE OF FILTER (if filtered)
O YES X NO	

25. EFFLUENT SAMPLE TYPE (check one type for each sample)	26. IDENTIFY THE DILUENT (O_1)
Sample 1: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE	CONTROL: **Moderately Hard Reconstituted Freshwater# 2455-2462**
Sample 2: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE	IDENTIFY THE SECONDARY (O_2) CONTROL (if used) **N/A**
Sample 3: O 24-HR COMPOSITE O GRAB/COMPOSITE (give # of grabs)____ ■ GRAB SAMPLE	

27. SUMMARY OF DATA AND RESULTS - SURVIVAL AND GROWTH

CONCENTRATION OF EFFLUENT (%)	O_1 (diluent)	O_2 (if used)	6.25%	12.5%	25%	50%	100%	
96-HOUR SURVIVAL (%)	**100**	-	**100**	**100**	**100**	**100**	**100**	
7-DAY MEAN BIOMASS (mg/initial fish)	**0.462**	-	**0.478**	**0.461**	**0.457**	**0.452**	**0.525**	
7-DAY MEAN SURVIVAL (%)	**100**	-	**100**	**100**	**100**	**100**	**100**	

28. 96-HOUR LC_{50} (%) **>100%**

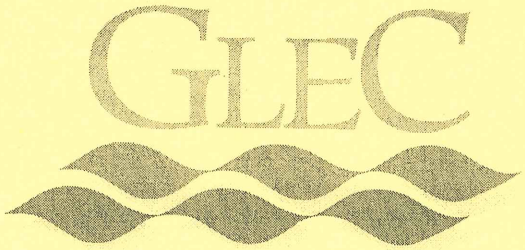
29. TU_a (acute toxic units) **0**

30. 7-DAY CHRONIC VALUE (%)	31. NOEC	32. LOEC	33. TU_c (chronic toxic units)
>100%	100%	>100%	0

ND: Not detected NM: Not Measured * significantly different from the dilution water control

Appendix A

Raw Data Sheets



Great Lakes Environmental Center

GREAT LAKES ENVIRONMENTAL CENTER, INC.

CHAIN OF CUSTODY RECORD

TRAVERSE CITY, MI - LABORATORY
739 Hastings Street
Traverse City, MI 49686

www.glec.com
Phone (231)941-2230
Fax (231)941-2240

Submitting Company: Ecology & Environment

Report Results To: Lynne Kalmbach

Address: 36 & Pleasant View Dr., Lancaster, NY 14086

Phone: 716-684-8060 E-mail: lkalmbach@ene.com

Project Name: 18mile creek ou2

Project Number: 5135-00

P.O.#:

Sampled by: initials ☐ GLEC ☒ Client BVE

#	GLEC No.	Sample Identification	Sample Information: Date	Time	Matrix	Grab or Composite	Preservative	Sample Containers: Type	Size	No.	Requested Analysis: 1000.1	1000.2	100.4	100.5		Hg				
1	10509	BG1-SW01	5/26/15	0855	SW	G	—	cube	1gal	5	X	X				2.0				
2	10510	OU2-SW01		1045	SW		—	"	"	5	X	X				0.7				
3	10513	OU2-SED01		1045	Sed		—	1gal	bucket	1			X	X		0.6				
4	10511	OU2-SW02		1300	SW		—	cube	1gal	5	X	X				1.5				
5	10514	OU2-SED03		1315	Sed		—	bucket	1gal	1			X	X		0.6				
6	10512	OU2-SW03		1320	SW		—	cube	1gal	5	X	X				1.0				
7																				
8																				

Client Notes:

RELEASED BY / ORGANIZATION	DATE	TIME	RECEIVED BY / ORGANIZATION	DATE	TIME
Print Name & Organization: Benjamin N. Cole / E+E	5/26/15	1800	Print Name & Organization: Michelle VanDenBrand, GLEC	5/27/15	1113
Signature:			Signature:	5/27/15	1113
Print Name & Organization			Print Name & Organization		
Signature			Signature		

FOR LAB USE ONLY

Temperature of Samples: 2.0, 0.7, 1.5, 1.0 °C ☒ Received on Wet Ice

Notes/Anomalies/Discrepancies: none

MATRIX CODES: S = SEDIMENT; SW = SURFACE WATER; E = EFFLUENT; GW = GROUNDWATER; WW = WASTEWATER; BT = BIOLOGICAL TISSUE; SL = SLUDGE; AO = AQUATIC ORGANISM

Sample

CHECK-IN FORM

CLIENT: Ecology + Environment PROJECT NUMBER: 5135-00

INITIAL SAMPLE CHEMISTRY (UPON RECEIPT)

DATE RECEIVED	5/27/15	5/27/15	5/27/15	MLV	INITIALS
SAMPLE ID	BG 1-SW01	OU 2-SW01	OU 2-SW02		
TYPE (W=water, SED=sediment, M=material)	W	W	W		
COLLECTION (G=grab, C=composite)	G	G	G		
GLC NUMBER	10509	10510	10511		
COLLECTION DATE	5/26/15	5/26/15	5/26/15		
COLLECTION TIME	0855	1045	1300		
TEMPERATURE (≤6 degrees Celsius[1])	2.0	0.7	1.5		
SAMPLE DESCRIPTION/OBSERVATIONS (clarity, color, odor)	clear	clear no odor	clear	MLV	

[1] If out of range see project manager

SAMPLE CHEMISTRY AT TEST TEMPERATURES

GLC NUMBER	10509	10510	10511	Meter ID	KS	INITIALS
TEMPERATURE (°C)	24.4	25.1	24.8	40		
pH (s.u.)	8.05	7.98	7.82	203		
DISSOLVED OXYGEN (mg/L)	10.4	10.0	9.6	175		
CONDUCTIVITY (µmhos/cm)	630	626	630	175		
HARDNESS (mg/L)	248	216	216	—		
ALKALINITY (mg/L)	128	244	116	203		
TOTAL CHLORINE (mg/L)[1]	NM	NM	NM			
TOTAL AMMONIA (mg/L)[1] as N	ND	.5	.5		KS	

[1] Check with project manager to see if necessary.

NM: Not Measured. ND: Non-detect

GLC#: 10509	GLC#: 10510	GLC#: 10511	GLC#: 10509	GLC#: 10510	GLC#: 10511
Hardness:	Hardness:	Hardness:	Alkalinity:	Alkalinity:	Alkalinity:
End mL: 8.1	End mL: 24.3	End mL: 18.9	End mL: 6.4	End mL: 24.1	End mL: 18.0
Start mL: 1.9	Start mL: 18.9	Start mL: 13.5	Start mL: 0.0	Start mL: 18.0	Start mL: 12.2
mL used: 6.2	mL used: 5.4	mL used: 5.4	mL used: 6.4	mL used: 6.1	mL used: 5.8
Sample Volume: 25	Sample Volume: 25	Sample Volume: 25	Sample Volume: 50	Sample Volume: 50	Sample Volume: 50

Sample

CHECK-IN FORM

CLIENT: Ecology + Environment PROJECT NUMBER: 5135-00

INITIAL SAMPLE CHEMISTRY (UPON RECEIPT)

DATE RECEIVED	5/27/15			MLV	INITIALS
SAMPLE ID	OU 2 - SW03				
TYPE (W=water, SED=sediment, M=material)	W				
COLLECTION (G=grab, C=composite)	G				
GLC NUMBER	10517				
COLLECTION DATE	5/26/15				
COLLECTION TIME 5/27/15 MLV	~~0800~~ 1320				
TEMPERATURE (≤6 degrees Celsius[1])	1.0				
SAMPLE DESCRIPTION/OBSERVATIONS (clarity, color, odor)	clear no odor			MLV	

[1] If out of range see project manager

SAMPLE CHEMISTRY AT TEST TEMPERATURES

				Meter ID		
GLC NUMBER	10517				KS	INITIALS
TEMPERATURE (°C)	25.0			40		
pH (s.u.)	7.81			203		
DISSOLVED OXYGEN (mg/L)	9.3			175		
CONDUCTIVITY (µmhos/cm)	637			125		
HARDNESS (mg/L)	216					
ALKALINITY (mg/L)	116			203		
TOTAL CHLORINE (mg/L)*	NM					
TOTAL AMMONIA (mg/L)* as N	2.5				KS	

*Check with project manager to see if necessary.

NM: Not Measured, ND: Non-detect

GLC#: 10512	GLC#:	GLC#:	GLC#: 10512	GLC#:	GLC#:
Hardness:	Hardness:	Hardness:	Alkalinity:	Alkalinity:	Alkalinity:
End mL: 13.5	End mL:	End mL:	End mL: 12.2	End mL:	End mL:
Start mL: 8.1	Start mL:	Start mL:	Start mL: 6.4	Start mL:	Start mL:
mL used: 5.4	mL used:	mL used:	mL used: 5.8	mL used:	mL used:
Sample Volume: 25	Sample Volume:	Sample Volume:	Sample Volume: 50	Sample Volume:	Sample Volume:

DAPHNID 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

BG1-SW01

TEST MATERIAL: Environmental Ecology | TYPE OF TEST: Regulatory | DILUTION WATER: DMW

PROJECT NUMBER: 5135-00 | INCUBATOR NUMBER: 38 | SHELF NUMBER: 1 | TEST TEMPERATURE: 25 ± 1°C

TEST SPECIES: *C. dubia* | LIGHT INTENSITY (ft-c): DAY 0/ 74.1 x 0.91 = 67.4 DAY | PHOTOPERIOD: 16:8

YOUNG SOURCE: In house (BD) DMW MH; 5/18/15 | DMW NUMBER: DAY 0/ 2274 DAY 1/ 2275 DAY 3 2276 | ALGAE NUMBER: DAY 0/ 1050 DAY / DAY /

YOUNG AGE: <24 hours; Within 8 hours | GLC NUMBER: DAY 0/ 13504 DAY / DAY / | YTC NUMBER: DAY 0/ 1698 DAY / DAY /

	0	1	2	3	4	5	6	7	8
DATE/TIME:	5/27/15	5/28/15	5/29/15	5/30/15	5/31/15	6/1/15	6/2/15	/	/
TECH INITIALS:	MLV 1314	MW 1016	MW 1034	DS 1107	DS 1014	KS 1241	KS 1030	/	/

TEST CONCENTRATION: DMW Control

DAY	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH 6.00 - 9.00 NEW	pH OLD	pH METER ID	DISSOLVED OXYGEN New: 6.0-10.0 Old:≤ 4.0 mg/L NEW	DO OLD	DO METER ID	TEMPERATURE ± 1 °C NEW	TEMP OLD	TEMP METER ID	SPECIFIC CONDUCTANCE (µS/cm) NEW	SC METER ID
0	+	+	+	+	+	+	+	+	+	+	7.77		203	8.3		175	25.8		175	174.2	175
1	+	+F	+	+	+	+	+F	+F	+F	+	8.05	8.23	203	8.1	8.4	175	24.7	24.7	175	173.6	175
2	de	de	de	de	de	de	de	de	de	de	7.99	8.02	203	8.0	8.8	175	24.9	24.9	40	177.2	175
3	tc4	tc4	tc4	tc4	tc4	tc4	tc4	tc3	tc4	tc4	7.96	8.41	203	8.1	9.0	175	25.2	25.0	175	173.2	175
4	tc6	tc6	tc6	tc	tc	tc	tc6	tc6	tc	tc	7.91	8.27	203	7.9	8.6	175	25.5	25.0	175	179.0	175
5	tc	tc	tc	tc7	tc6	tc6	tc	tc	tc5	tc5	8.14	8.34	203	7.8	8.6	175	25.9	25.2	175	174.7	175
6	tc11	tc6	tc10	tc9	tc11	tc9	tc10	tc9	tc10	tc8		8.38	203		8.5	175		25.5	42		
7																					
8																					

TEST CONCENTRATION: A 6.25%

DAY	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH NEW	pH OLD	pH METER ID	DO NEW	DO OLD	DO METER ID	TEMP NEW	TEMP OLD	TEMP METER ID	SC NEW	SC METER ID
0	+	+	+	+	+	+	+	+	+	+	8.01			8.0			25.8			205.1	
1	+	+F	+	+	+	+	+F	+F	+F	+	8.04	8.17		8.1	8.5		24.9	25.2		206.4	
2	de	de	de	de	+	de	de	de	de	de	8.00	8.23		8.2	8.8		24.9	24.9		209.4	
3	tc4	tc3	tc4	tc4	tc2	tc2	tc5	tc4	tc3	tc4	8.01	8.39		8.1	9.0		25.0	25.1		211.7	
4	tc	tc6	tc6	tc6	tc	tc6	tc6	tc6	tc	tc6	7.97	8.40		8.0	8.7		25.7	25.0		212.3	
5	tc6	+	+	+	tc5	tc	+	+	tc4	tc1°	8.11	8.35		7.9	8.6		25.1	25.0		209.9	
6	tc9	tc8	tc10	tc9	tc8	tc8	tc6	tc9	tc4°	tc10		8.23			8.3			25.2			
7																					
8																					

OBSERVATION KEY:

+ = Alive e = Eggs present F = Floater
- = Dead ° = Split brood SB = Stuck to bubble
P = Pale TE = Technician error

REVIEWED BY: Marlee W Shaver

DATE: 6/3/15

DAPHNID 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: Environmental Ecology

PROJECT NUMB: 5135-00

TEST SPECIES: *C. dubia*

	0	1	2	3	4	5	6	7	8
DATE/TIME:	5/27/15	5/28/15	5/29/15	5/30/15	5/31/15	6/1/15	6/2/15		
TECH INITIALS:	MLV 1314	MW 1016	MW 1034	DS 1107	DS 1014	KS 1241	KS 1038		

DAY	TEST CONCENTRATION: B 12.5% — REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH (6.00 - 9.00) NEW	pH OLD	DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 mg/L NEW	DO OLD	TEMPERATURE ± 1°C NEW	TEMP OLD	SP CONDUCTANCE (µS/cm) NEW
0	+	+	+	+	+	+	+	+	+	+	8.05		8.0		25.7		237.3
1	+	+	+	+	+	+	+ F	+ F	+ F	+	8.05	8.33	8.2	8.6	25.1	25.3	231.0
2	dc	dc	dc	dc	dc	dc	dc	dc	dc	dc	7.99	8.33	8.3	8.9	25.0	24.9	238.6
3	tc3	tc	tc4	tc3	tc4	tc3	tc4	tc	tc4	tc3	8.01	8.45	8.2	9.1	24.9	25.0	233.7
4	tc7	tc4	tc6	tc6	tc	tc	tc5	tc6	tc6	tc6	8.00	8.43	8.1	8.8	25.5	25.1	240.3
5	tc	tc5	tc	tc1°	tc5	tc7	tc	tc	tc	tc	8.07	8.39	7.9	8.6	25.7	25.2	237.1
6	tc5	tc7	tc10	tc9	tc9	tc10	tc2	tc10	tc12	tc4		8.23		8.5		25.0	
7																	
8																	
	TEST CONCENTRATION: C 25%																
0	+	+	+	+	+	+	+	+	+	+	8.05		8.0		25.7		304
1	+	+	+	+	+	+	+	+	+	+	8.03	8.36	8.3	8.7	25.1	25.3	304
2	dc	dc	dc	dc	dc	dc	dc	dc	dc	dc	7.97	8.37	8.5	8.9	25.0	25.1	307
3	tc4	tc4	tc4	tc4	tc4	tc4	tc4	tc4	tc4	tc4	8.02	8.45	8.2	9.1	24.8	25.0	302
4	tc7	tc	tc7	tc	tc	tc8	tc8	tc5	tc7	tc7	8.00	8.41	8.2	8.8	25.6	25.1	298.0
5	tc	tc4	tc	tc6	tc7	tc	tc	tc	tc	tc	8.05	8.41	8.0	8.8	25.9	25.6	297.1
6	tc12	tc13	tc10	tc9	tc11	tc12	tc6	tc5	tc10	tc9		8.35		8.6		24.9	
7																	
8																	

OBSERVATION KEY:

+ = Alive e = Eggs present F = Floater
- = Dead ° = Split brood SB = Stuck to bubble
P = Pale TE = Technician error

Revised: 3/19/2012

REVIEWED BY: Mallu Wyhaus

DATE: 6/2/15

DAPHNID 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TEST SPECIES: *C. dubia*

	0	1	2	3	4	5	6	7	8
DATE/TIME:	5/27/15	5/28/15	5/29/15	5/30/15	5/31/15	6/1/15	6/2/15		
TECH INITIALS:	MLV 1214	1016 [illegible]	MW 1034	DS 1107	DS 1014	KS 1241	KS 1130		

DAY	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH (6.00 - 9.00) NEW	pH OLD	DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 mg/L NEW	DISSOLVED OXYGEN OLD	TEMPERATURE ± 1°C NEW	TEMPERATURE ± 1°C OLD	SP CONDUCTANCE (µS/cm) NEW
TEST CONCENTRATION: D 50%																	
0	+	+	+	+	+	+	+	+	+	+	8.07		8.4		25.6		420
1	+	+	+	+	+	+	+F	+	+F	+	7.99	8.30	8.6	8.6	25.1	25.3	423
2	de	de	de	de	de	de	de	de	de	de	7.93	8.41	8.9	8.9	25.0	25.1	427
3	te 4	te3	te4	te4	te4	te4	te2	te4	te4	te4	8.04	8.46	8.5	9.1	24.7	25.1	419
4	te7	te6	te6	te7	te6	te	te6	te6	te5	te	8.00	8.46	8.8	8.8	25.3	25.1	417
5	*	*	*	*	*	te8	*	*	*	te5	8.00	8.45	8.2	8.8	25.5	25.4	422
6	te11	te9	te8	te12	te9	te15	te11	te10	te10	te8	\	8.39	\	9.0	\	24.5	\
7											\	\	\	\	\	\	\
8												\		\		\	
	TEST CONCENTRATION: E 100%																
0	+	+	+	+	+	+	+	+	+	+	8.03		8.9		25.6		647
1	+	+	+	+	+	+	+	+	+	+	7.91	8.37	9.0	8.6	24.8	25.1	650
2	de	de	de	de	de	de	de	de	de	de	7.88	8.43	9.0	9.0	25.1	25.1	654
3	te3	te3	te4	te4	te4	te2	te4	te2	te	te4	8.04	8.47	9.0	9.1	24.5	25.1	650
4	te7	te7	te	te	te5	te1°	te7	te6	te7	te	7.98	8.47	9.7	8.7	24.7	24.8	652
5	*	*	te8	te8	*	*6	*	*	*	te5	7.90	8.45	8.6	8.9	24.8	25.5	653
6	te14	te11	te9	te10	te7	te10	te13	te11	te12	te9	\	8.36	\	9.1	\	24.7	\
7											\	\	\	\	\	\	\
8												\		\		\	

OBSERVATION KEY:

+ = Alive e = Eggs present F = Floater
- = Dead ° = Split brood SB = Stuck to bubble
P = Pale TE = Technician error

Revised: 3/19/2012

REVIEWED BY: Mallie Wylan

DATE: 6/2/15

PARENTAL BLOCKAGE MAP FOR *C. dubia*

TEST MATERIAL:

Environmental Ecology

PROJECT NUMBER: 5135-00

TIME NEONATES PULLED: 1214

SOURCE BOARD: Bd 5/18/15

ESTIMATED AGE RANGE OF *C. dubia* NEONATES: born 5/26/15 between 1230 & 1500

DATE / INITIALS: 5/27/15 MLV

	REPLICATE									
TEST CONCENTRATION	1	2	3	4	5	6	7	8	9	10
DMW	cup: 2	cup: 3	cup: 4	cup: 6	cup: 7	cup: 9	cup: 10	cup: 12	cup: 13	cup: 14
A 6.25%										
B 12.5%										
C 25%										
D 50%										
E 100%										

C.dubia

Young Summary

Test Material/Client: Ecology Environmental

Tech Intitals: mwg

Project Number: 5135-00

QC Initials: KS

Test Dates: 5/27/15-6/2/15

GLC Numbers: 10509

Test Replicate	Test Concentrations						
	Primary Control	A	B	C	D	E	Secondary Control
1	21	19	15	23	22	24	
2	16	17	16	22	18	21	
3	20	20	20	21	18	21	
4	20	19	19	19	23	22	
5	21	15	18	22	19	16	
6	19	16	20	24	27	19	
7	20	14	11	18	19	24	
8	18	19	16	14	20	19	
9	19	17	22	21	19	19	
10	17	21	15	20	17	18	
Total Young	191	177	172	204	202	203	0
Number of Adults (do not include T.E. or males)	10	10	10	10	10	10	0
Average Young per Adult	19.1	17.7	17.2	20.4	20.2	20.3	#DIV/0!

KEY:
Θ: organism mortality
⅄: no young
T.E.: technician error
a: aborted young

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	5/27/2015	Test ID:	509cd515	Sample ID:	GLC# 10509 BG
End Date:	6/3/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:	2 MW 6/1/15	Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:	Ecology Environmental cd chronic reprod and survival May 2015				

Conc-%	1	2	3	4	5	6	7	8	9	10
con	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
con	1.0000	1.0000	0	10	10	10		
6.25	1.0000	1.0000	0	10	10	10	1.0000	0.0500
12.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500
25	1.0000	1.0000	0	10	10	10	1.0000	0.0500
50	1.0000	1.0000	0	10	10	10	1.0000	0.0500
100	1.0000	1.0000	0	10	10	10	1.0000	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test Treatments vs con	100	>100		0

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/27/2015	Test ID:	509cd515	Sample ID:	GLC# 10509 B6
End Date:	6/3/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:	5 Multi Isolates	Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:	Ecology Environmental cd chronic reprod and survival May 2015				

Conc-%	1	2	3	4	5	6	7	8	9	10
con	21.000	16.000	20.000	20.000	21.000	19.000	20.000	18.000	19.000	17.000
6.25	19.000	17.000	20.000	19.000	15.000	16.000	14.000	19.000	17.000	21.000
12.5	15.000	16.000	20.000	19.000	18.000	20.000	11.000	16.000	22.000	15.000
25	23.000	22.000	21.000	19.000	22.000	24.000	18.000	14.000	21.000	20.000
50	22.000	18.000	18.000	23.000	19.000	27.000	19.000	20.000	19.000	17.000
100	24.000	21.000	21.000	22.000	16.000	19.000	24.000	19.000	19.000	18.000

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
con	19.100	1.0000	19.100	16.000	21.000	8.709	10			
6.25	17.700	0.9267	17.700	14.000	21.000	12.787	10	1.179	2.287	2.715
12.5	17.200	0.9005	17.200	11.000	22.000	18.749	10	1.600	2.287	2.715
25	20.400	1.0681	20.400	14.000	24.000	14.094	10	-1.095	2.287	2.715
50	20.200	1.0576	20.200	17.000	27.000	14.906	10	-0.926	2.287	2.715
100	20.300	1.0628	20.300	16.000	24.000	12.730	10	-1.011	2.287	2.715

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.05)					0.6604		0.895		-0.0666	0.36146
Bartlett's Test indicates equal variances (p = 0.49)					4.39563		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test Treatments vs con	100	>100		0	2.71527	0.14216	19.79	7.05	0.0252	5, 54

GLEC

DAPHNID 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

New 6/2/15 ~~SW02~~ SW01 OU2

TEST MATERIAL: Environmental Ecology | TYPE OF TEST: Regulatory | DILUTION WATER: DMW

PROJECT NUMBER: 5135-00 | INCUBATOR NUMBER: 38 | SHELF NUMBER: 5 | TEST TEMPERATURE: 25 ± 1°C

TEST SPECIES: *C. dubia* | LIGHT INTENSITY (ft-c): DAY 0/ 97 1 X0915 88.4 DAY | PHOTOPERIOD: 16:8

YOUNG SOURCE: In house (BD) DMW MH: 5/13/15 | DMW NUMBER: DAY 0/ 2274 DAY 1/ 2275 DAY 3 2276 | ALGAE NUMBER: DAY 0/ 1050 DAY / DAY /

YOUNG AGE: <24 hours; Within 8 hours | GLC NUMBER: DAY 0/ 10510 DAY / DAY / | YTC NUMBER: DAY 0/ 69B DAY / DAY /

	0	1	2	3	4	5	6	7	8
DATE/TIME:	5/27/15	5/28/15	5/29/15	5/30/15	5/31/15	6/1/15	6/2/15		
TECH INITIALS:	ML✓ 1358	nw 1055	1140 nw	DS 1325	DS 1209	KS 1410	ML✓ 1237		

TEST CONCENTRATION: DMW Control

DAY	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH 6.00 - 9.00 NEW	pH OLD	pH METER ID	DISSOLVED OXYGEN New: 6.0-10.0 Old:≤ 4.0 mg/L NEW	DO OLD	DO METER ID	TEMPERATURE ± 1 °C NEW	TEMP OLD	TEMP METER ID	SPECIFIC CONDUCTANCE (µS/cm) NEW	SC METER ID
0	+	+	+	+	+	+	+	+	+	+	7.81		203	8.0		175	25.1		175	174.2	175
1	+	+	+	+	+	+	+	+	+	+	8.05	8.31	203	8.1	8.7	175	24.7	25.1	175	173.6	175
2	tc	tc	tc	tc	tc	+	tc	tc	tc	tc	7.99	8.36	203	8.0	8.9	175	24.9	24.7	40	177.2	175
3	tc3	tc4	tc4	tc4	tc3	+	tc	tc3	tc4	tc4	7.85	8.30	203	7.9	8.9	175	25.1	25.0	175	174.6	175
4	tc7	tc7	tc7	tc7	tc6	+	tc5	tc6	tc6	tc5	8.01	8.21	203	7.8	8.6	175	25.7	25.1	175	180	175
5	+	tc5	tc	tc	tc	+	tc8	tc	tc	tc	8.03	8.03	203	7.8	8.4	175	25.0	24.5	175	174.1	175
6	tc10	tc20	(-)	tc9	tc9	+	tc	tc7	tc9	tc9	—	8.09	203	—	8.4	175	—	25.0	42	—	—
7																					
8												—			—			—			

TEST CONCENTRATION: A 6.25%

DAY	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH NEW	pH OLD	pH METER ID	DISSOLVED OXYGEN NEW	DO OLD	DO METER ID	TEMPERATURE NEW	TEMP OLD	TEMP METER ID	SPECIFIC CONDUCTANCE NEW	SC METER ID
0	+	+	+	+	+	+	+	+	+	+	7.88			8.0			25.1			205.3	
1	+	+	+	+	+	+	+	+	+	+	8.03	8.36		8.7	8.7		24.9	25.1		208.3	
2	tc	tc	+	tc	tc	tc	tc	tc	tc	tc	8.07	8.34		8.5	8.9		24.7	24.7		209.1	
3	tc4	tc	+	tc3	tc4	tc4	tc4	tc4	tc3	tc	7.96	8.29		8.1	8.9		25.4	24.8		206.9	
4	tc7	tc7	+	tc2	tc8	tc6	tc6	tc6	tc4	tc6	7.98	8.31		8.1	8.7		25.6	24.7		209	
5	tc	tc9	+	tc	tc	tc	tc	tc	tc	tc6	8.09	8.34		7.8	8.7		25.1	24.8		203.1	
6	tc17	tc	+	tc11	tc17	tc17	tc9	tc11	tc7	tc	—	8.25		—	8.5		—	25.1		—	
7																					
8												—			—			—			

OBSERVATION KEY:

+ = Alive c = Eggs present F = Floater
- = Dead ° = Split brood SB = Stuck to bubble
P = Pale TE = Technician error

REVIEWED BY: Maile W Martin

DATE: 6/2/15

DAPHNID 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: Environmental Ecology

PROJECT NUMB: 5135-00

TEST SPECIES: *C. dubia*

	0	1	2	3	4	5	6	7	8
DATE/TIME:	5/27/15	5/28/15	5/29/15	5/30/15	5/31/15	6/1/15	6/2/15	/	/
TECH INITIALS:	MLV 1258	New 1055	1140 new	DS 1325	DS 1209	KS 1410	MLV 1237	/	/

DAY	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH (6.00 - 9.00) NEW	pH OLD	DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 mg/L NEW	DO OLD	TEMPERATURE ± 1°C NEW	TEMP OLD	SP CONDUCTANCE (µS/cm) NEW
TEST CONCENTRATION: B 12.5%																	
0	+	+	+	+	+	+	+	+	+	+	8.01		7.9		25.4		236.5
1	+F	+F	+	+	+	+	+	+	+	+	8.06	8.38	8.3	8.8	25.0	24.8	236.3
2	de	de	de	de	de	+	de	de	de	de	8.07	8.37	8.5	8.9	24.6	24.9	236.0
3	te3	te4	te4	te4	te4	+	te4	te3	te4	te4	7.95	8.40	8.4	9.1	25.4	24.8	234.9
4	te7	te7	te6	te6	te6	+	te7	te6	te6	te7	8.00	8.37	8.1	8.8	25.7	25.0	230.2
5	de	de	de	de	de	+	de	de	de	de	8.07	8.37	7.9	8.8	25.2	24.5	234.6
6	te15	te1°	te12	te13	te10	+	te12	te12	te10	te13	—	8.18	—	8.5	—	25.1	—
7																	
8												—		—		—	
TEST CONCENTRATION: C 25%																	
0	+	+	+	+	+	+	+	+	+	+	8.01		7.9		25.6		289.8
1	+	+F	+	+	+	+	+	+	+	+	8.03	8.39	8.4	8.8	25.1	24.8	293.9
2	de	de	de	de	de	+	de	de	de	de	8.00	8.39	8.5	8.9	24.6	25.0	289.3
3	te4	te3	te4	te4	te4	+	te3	te3	te3	te	7.96	8.44	8.4	9.1	25.2	24.8	295.9
4	te8	te6	te6	te7	te6	+	te6	te5	te	te5	7.96	8.42	8.2	8.9	25.6	24.7	292.9
5	te10	de	de	te9	te8	+	de	de	te6	te9	8.04	8.39	8.0	8.9	25.5	24.6	291.5
6	de	te9	te8	de	de	+	te11	te12	te10	te13	—	8.21	—	8.5	—	25.2	—
7																	
8												—		—		—	

OBSERVATION KEY:

+ = Alive e = Eggs present F = Floater
- = Dead ° = Split brood SB = Stuck to bubble
P = Pale TE = Technician error

Revised: 3/19/2012

REVIEWED BY: Marley W Hart

DATE: 6/2/15

DAPHNID 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TEST SPECIES: *C. dubia*

	0	1	2	3	4	5	6	7	8
DATE/TIME:	5/27/15	5/28/15	5/29/15	5/30/15	5/31/15	6/1/15	6/2/15	/	/
TECH INITIALS:	MLV 1758	MWR 1035	1140 MWR	DS 1335	DS 1209	ES 1410	MLV 1737	/	/

DAY	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH (6.00 - 9.00) NEW	pH OLD	DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 mg/L NEW	DO OLD	TEMPERATURE ± 1°C NEW	TEMP OLD	SP CONDUCTANCE (µS/cm) NEW
TEST CONCENTRATION: D 50%																	
0	+	+	+	+	+	+	+	+	+	+	8.00		8.1		25.4		401
1	+	+	+	+	+	+	+	+	+	+	7.97	8.39	8.6	8.8	25.1	24.8	407
2	de	de	de	de	de	+	de	de	de	de	7.96	8.40	8.7	8.9	24.5	24.9	411
3	tc4	tc4	tc3	tc3	tc3	+	tc4	tc4	tc4	tc3	7.92	8.45	8.5	9.3	25.2	25.0	403
4	tc7	tc8	tc8	tc8	tc8	+	tc6	tc7	tc6	tc7	7.93	8.40	8.6	8.9	25.4	24.8	399
5	de	de	de	de	de	+	de	de	de	de	7.97	8.42	8.4	8.9	25.9	24.3	404
6	de11	de	de12	de	de13	+	de10	de12	de12	de	—	8.26	—	8.6	—	25.1	—
7																	
8												—		—		—	
TEST CONCENTRATION: E 100%																	
0	+	+	+	+	+	+	+	+	+	+	7.91		8.5		24.8		618
1	+	+	+	+	+	+	+	+	+	+	7.88	8.41	9.1	8.9	25.1	24.8	619
2	de	de	de	de	de	+	de	de	de	de	7.90	8.40	9.4	8.9	24.5	24.9	630
3	tc4	tc4	tc	tc3	tc4	+	tc4	tc4	tc4	tc3	7.88	8.42	8.9	9.2	24.8	24.8	619
4	tc5	tc9	tc4	tc7	tc7	+	tc5	tc8	tc6	tc7	7.85	8.41	9.8	8.8	25.0	24.8	617
5	de9	de7	de12	de1°	de	+	de	de	de	de8	7.99	8.42	9.2	8.9	25.2	24.3	623
6	de15	de	de15	de13	de12	+	de13	de14	de10	de	—	8.31	—	8.6	—	25.1	—
7																	
8												—		—		—	

no algae

OBSERVATION KEY:

+ = Alive e = Eggs present F = Floater
- = Dead ° = Split brood SB = Stuck to bubble
P = Pale TE = Technician error

Revised: 3/19/2012

REVIEWED BY: Mandy Wheeler

DATE: 6/2/15

PARENTAL BLOCKAGE MAP FOR *C. dubia*

TEST MATERIAL:

Environmental Ecology

PROJECT NUMBER: 5135-00

TIME NEONATES PULLED: 1259

SOURCE BOARD: Bd 5/13/15

ESTIMATED AGE RANGE OF *C. dubia* NEONATES: born 5/26/15

DATE / INITIALS: 5/27/15 MLV

	REPLICATE									
TEST CONCENTRATION	1	2	3	4	5	6	7	8	9	10
DMW	cup: 2	cup: 3	cup: 5	cup: 8	cup: 10	cup: 15	cup: 24	cup: 27	cup: 28	cup: 30
A 6.25%										
B 12.5%										
C 25%										
D 50%										
E 100%										

C.dubia

Young Summary

Test Material/Client: Ecology Environmental

Tech Intitals: mwg

Project Number: 5135-00

QC Initials: MLV

Test Dates: 5/27/15-6/2/15

GLC Numbers: 10510

Test Replicate	Test Concentrations						
	Primary Control	A	B	C	D	E	Secondary Control
1	20	23	25	22	22	18	
2	18	16	20	18	18	20	
3	11 Θ	male	22	18	23	31	
4	20	16	23	20	18	24	
5	18	24	20	18 ~~20~~	24	23	
6	male	22	male	male	male	male	
7	13	19 ~~21~~	23	20	20	22	
8	16	21	21	20	23	26	
9	19	14	20	19	22	20	
10	18	12	24	27	18	18	
Total Young	153	167 ~~169~~	198	182 ~~184~~	188	202	0
Number of Adults (do not include T.E. or males)	9	9	9	9	9	9	0
Average Young per Adult	17.0	~~18.8~~ 18.6 6/11/15 MLV	22.0	~~20.4~~ 20.2 6/11/15 MLV	20.9	22.4	#DIV/0!

KEY:
Θ: organism mortality
-: no young
T.E.: technician error
a: aborted young

OK

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	5/27/2015	Test ID: 510cd515	Sample ID: GLC# 10510
End Date:	6/3/2015	Lab ID: -GREAT LAKES ENVIRONM	Sample Type: EFFLUENT
Sample Date:	27 May 15	Protocol: EPAFW02-EPA/821/R-02-01	Test Species: CD-Ceriodaphnia dubia
Comments:	Ecology Environmental OU2-SW-01 cd chronic reprod and survival May 20		

Conc-%	1	2	3	4	5	6	7	8	9	10
con	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
con	0.9000	1.0000	1	9	10	10		
6.25	1.0000	1.1111	0	10	10	10	0.5000	0.0500
12.5	1.0000	1.1111	0	10	10	10	0.5000	0.0500
25	1.0000	1.1111	0	10	10	10	0.5000	0.0500
50	1.0000	1.1111	0	10	10	10	0.5000	0.0500
100	1.0000	1.1111	0	10	10	10	0.5000	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		0
Treatments vs con				

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/27/2015	Test ID:	510cd515	Sample ID:	GLC# 10510
End Date:	6/2/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:	Ecology Environmental OU2-SW-01 cd chronic reprod and survival May 20				

Conc-%	1	2	3	4	5	6	7	8	9
con	20.000	18.000	11.000	20.000	18.000	13.000	16.000	19.000	18.000
6.25	23.000	16.000	16.000	24.000	22.000	19.000	21.000	14.000	12.000
12.5	25.000	20.000	22.000	23.000	20.000	23.000	21.000	20.000	24.000
25	22.000	18.000	18.000	20.000	18.000	20.000	20.000	19.000	27.000
50	22.000	18.000	23.000	18.000	24.000	20.000	23.000	22.000	18.000
100	18.000	20.000	31.000	24.000	23.000	22.000	26.000	20.000	18.000

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
con	17.000	1.0000	17.000	11.000	20.000	18.368	9			
6.25	18.556	1.0915	18.556	12.000	24.000	22.882	9	-1.019	2.295	3.502
12.5	22.000	1.2941	22.000	20.000	25.000	8.504	9	-3.277	2.295	3.502
25	20.222	1.1895	20.222	18.000	27.000	14.156	9	-2.112	2.295	3.502
50	20.889	1.2288	20.889	18.000	24.000	11.590	9	-2.549	2.295	3.502
100	22.444	1.3203	22.444	18.000	31.000	18.653	9	-3.568	2.295	3.502

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.05)	0.699	0.895	0.28302	0.25077
Bartlett's Test indicates equal variances (p = 0.21)	7.15219	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs con	100	>100		0	3.5018	0.20599	39.0519	10.4769	0.00624	5, 48

GLEC

DAPHNID 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OU2-SW02

TEST MATERIAL: Environmental Ecology | TYPE OF TEST: Regulatory | DILUTION WATER: DMW

PROJECT NUMBER: 5135-00 | INCUBATOR NUMBER: 38 | SHELF NUMBER: 4 | TEST TEMPERATURE: 25 ± 1°C

TEST SPECIES: *C. dubia* | LIGHT INTENSITY (ft-c): DAY 0/ 70.6 x0.91= 64.4 DAY | PHOTOPERIOD: 16:8

YOUNG SOURCE: In house; BD DMW MH: 5/18/15 | DMW NUMBER: DAY 0/ 2274 DAY 1/ 2275 DAY 3 2276 | ALGAE NUMBER: DAY 0/ 1050 DAY / DAY /

YOUNG AGE: <24 hours; Within 8 hours | GLC NUMBER: DAY 0/ 10511 DAY / DAY / | YTC NUMBER: DAY 0/ 609B DAY / DAY /

	0	1	2	3	4	5	6	7	8
DATE/TIME:	5/27/15	5/28/15	5/29/15	5/30/15	5/31/15	6/1/15	6/2/15	/	/
TECH INITIALS:	MLV 1241	RWR 1039	RWR 1110	DS 1229	DS 1140	KS 1544	MLV 1246	/	/

TEST CONCENTRATION: DMW Control

DAY	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH 6.00 - 9.00 NEW	pH OLD	pH METER ID	DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 mg/L NEW	DO OLD	DO METER ID	TEMPERATURE ± 1 °C NEW	TEMP OLD	TEMP METER ID	SPECIFIC CONDUCTANCE (µS/cm) NEW	SC METER ID
0	+	+	+	+	+	+	+	+	+	+	7.77		203	8.3		175	25.7		175	~~205.3~~ 174.3	175
1	+	+	+	+	+F	+	+	+	+	+	8.05	8.30	203	8.1	8.6	175	24.7	24.9	175	173.6	175
2	de	de	de	de	de	de	de	de	de	de	7.99	8.18	203	8.0	8.8	175	24.9	24.9	175	177.3	175
3	tc4	tc4	tc3	tc4	tc4	tc4	tc4	tc4	tc3	tc4	7.86	8.37	203	8.0	8.9	175	25.2	25.1	175	176.5	175
4	tc5	tc	tc	tc	tc7	tc7	tc	tc	tc6	tc7	8.01	8.31	203	8.0	8.7	175	25.8	24.8	175	174.9	175
5	tc10	tc7	tc7	tc6	tc	tc	tc7	tc7	tc	tc	7.97	7.99	203	7.8	8.1	175	25.9	24.8	175	176.8	175
6	tc7	tc10	tc10	tc9	tc10	tc9	tc10	tc6	tc8	tc8	—	8.06	203	—	8.6	175	—	24.6	42	—	—
7																					
8																					

TEST CONCENTRATION: A 6.25%

DAY	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH NEW	pH OLD	pH METER ID	DO NEW	DO OLD	DO METER ID	TEMP NEW	TEMP OLD	TEMP METER ID	SC NEW	SC METER ID
0	+	+	+	+	+	+	+	+	+	+	7.99			8.1			25.5			205.3	
1	+	+F	+	+	+	+	+PF	+	+	+F	8.07	8.31		8.3	8.6		24.6	24.7		202.9	
2	de	de	de	de	de	de	de	de	de	de	8.01	8.37		8.3	8.8		24.5	24.9		203.7	
3	tc4	tc4	tc	tc3	tc4	tc3	+	tc4	tc4	tc4	7.95	8.42		8.1	9.0		25.5	25.3		205.1	
4	tc	tc	tc4	tc6	tc6	tc5	+	tc6	tc7	tc6	8.01	8.31		8.0	8.8		25.6	24.7		204.9	
5	tc6	tc7	tc8	tc	tc	tc	tc	tc	tc	tc	8.06	8.20		7.9	8.5		25.7	25.0		202.6	
6	tc7	tc12	tc12	tc11	tc11	tc10	tc	tc9	tc10	tc8	—	8.20		—	8.6		—	24.4		—	
7																					
8												—			—			—			

OBSERVATION KEY:

+ = Alive e = Eggs present F = Floater
- = Dead ° = Split brood SB = Stuck to bubble
P = Pale TE = Technician error

REVIEWED BY: Mailu W Harton

DATE: 6/2/15

DAPHNID 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: Environmental Ecology

PROJECT NUMB: 5135-00

TEST SPECIES: *C. dubia*

	0	1	2	3	4	5	6	7	8
DATE/TIME:	5/27/15	5/28/15	5/29/15	5/30/15	5/31/15	6/1/15	6/2/15		
TECH INITIALS:	MLW 1241	MLW 1038	MLW 1110	DS 1329	DS 1140	KS 1344	MLW 1206		

TEST CONCENTRATION: B 12.5%

DAY	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH (6.00 - 9.00) NEW	pH OLD	DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 mg/L NEW	DISSOLVED OXYGEN OLD	TEMPERATURE ± 1°C NEW	TEMPERATURE OLD	SP CONDUCTANCE (µS/cm) NEW
0	+	+	+	+	+	+	+	+	+	+	8.01		8.1		25.7		233.9
1	+	+ F	+	+ F	+ F	+	+	+	+	+	8.04	8.35	8.3	8.6	24.8	24.6	238.5
2	de	de	de	de	de	de	+	de	de	de	7.95	8.30	8.3	8.8	24.6	24.9	238.9
3	tc3	tc4	tc4	tc4	tc3	tc3	tc	tc3	tc4	tc4	7.97	8.41	8.2	8.9	25.5	25.2	231.6
4	tc	tc6	tc5	tc	tc6	tc6	tc4	tc7	tc7	tc7	7.99	8.33	8.0	8.7	25.6	24.6	232.5
5	tc6	tc	tc	tc5	tc6	tc	tc7	tc	tc	tc	8.05	8.26	7.9	8.5	25.7	25.1	236
6	tc9	tc13	tc11	tc10	tc11	tc11	tc12	tc10	tc11	tc12	—	8.29	—	8.7	—	24.5	—
7																	
8												—		—		—	

TEST CONCENTRATION: C 25%

DAY	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH (6.00 - 9.00) NEW	pH OLD	DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 mg/L NEW	DISSOLVED OXYGEN OLD	TEMPERATURE ± 1°C NEW	TEMPERATURE OLD	SP CONDUCTANCE (µS/cm) NEW
0	+	+	+	+	+	+	+	+	+	+	7.98		8.1		25.7		294.2
1	+	+	+ F	+	+	+ F	+	+	+ F	+	8.02	8.36	8.3	8.7	24.9	24.6	290.7
2	de	de	de	de	de	tc	de	de	tc	tc	7.97	8.36	8.5	8.9	24.7	24.9	302
3	tc3	tc3	tc4	tc4	tc3	tc4	tc2	tc4	tc4	tc4	7.94	8.45	8.3	8.9	25.4	25.2	296.2
4	tc7	tc	tc5	tc8	tc	tc6	tc	tc	tc6	tc6	7.95	8.36	8.1	8.7	25.4	24.6	293.9
5	tc	tc6	tc	tc8 UA/15	tc5	tc	tc5	tc6	tc	tc	7.99	8.28	8.0	8.6	25.5	24.6	294.1
6	tc	tc11	tc11	tc12	tc9	tc10	tc11	tc8	tc11	⊖9	—	8.29	—	8.9	—	24.7	—
7																	
8												—		—		—	

OBSERVATION KEY:

+ = Alive e = Eggs present F = Floater
- = Dead ° = Split brood SB = Stuck to bubble
P = Pale TE = Technician error

Revised: 3/19/2012

REVIEWED BY: Mailu W Hatton

DATE: 6/2/15

DAPHNID 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TEST SPECIES: *C. dubia*

	0	1	2	3	4	5	6	7	8
DATE/TIME:	5/27/15	5/28/15	5/29/15	5/30/15	5/31/15	6/1/15	6/2/15	/	/
TECH INITIALS:	MLV 1241	MWW 1038	MWW 1110	DS 1229	DS 1142	KS 1344	MLV 1206	/	/

DAY	TEST CONCENTRATION: D 50% — REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH (6.00 - 9.00) NEW	pH OLD	DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 mg/L NEW	DO OLD	TEMPERATURE ± 1°C NEW	TEMP OLD	SP CONDUCTANCE (µS/cm) NEW
0	+	+	+	+	+	+	+	+	+	+	7.92		8.1		25.7		400
1	+	+	+F	+	+	+	+	+	+	+	7.94	8.40	8.7	8.7	24.9	24.6	404
2	tc	tc	tc	tc	tc	tc	tc	+	tc	tc	7.93	8.37	8.7	8.9	24.7	25.1	414
3	tc4	tc4	tc4	tc4	tc4	tc3	tc4	tc	tc4	tc4	7.91	8.41	8.6	8.9	25.3	25.1	405
4	tc	tc7	tc	tc7	tc6	tc	tc7	tc4	tc7	tc6	7.89	8.36	8.5	8.6	26.2	24.6	403
5	tc4	tc	tc2	tc	tc	tc9	tc	tc9	tc10	tc1°	7.92	8.33	8.1	8.6	25.8	24.6	405
6	tc10	tc11	tc11	tc13	tc12	tc10	tc13	tc11	tc	tc12	—	8.33	—	8.9	—	24.6	—
7																	
8												—		—		—	
	TEST CONCENTRATION: E 100%																
0	+	+	+	+	+	+	+	+	+	+	7.88		8.3		25.6		621
1	+	+	+	+	+	+	+	+	+	+	7.82	8.39	8.9	8.7	24.9	24.6	623
2	tc	tc	tc	tc	tc	tc	tc	tc	tc	tc	7.89	8.36	8.9	8.9	24.7	25.0	634
3	tc	tc	tc4	tc	tc	tc4	tc4	tc4	tc4	tc4	7.86	8.42	9.3	8.9	24.9	25.1	625
4	tc	tc4	tc7	tc5	tc4	tc	tc8	tc6	tc5	tc6	7.78	8.41	9.5	8.7	24.7	24.6	620
5	tc8	tc7	tc	tc10	tc9	tc7	tc	tc	tc1°	tc8	7.80	8.40	8.7	8.6	25.5	25.1	622
6	tc12	tc13	tc14	tc14	tc12	tc14	tc15	tc11	tc10	tc	—	8.38	—	9.0	—	24.3	—
7																	
8												—		—		—	

OBSERVATION KEY:

+ = Alive c = Eggs present F = Floater
- = Dead ° = Split brood SB = Stuck to bubble
P = Pale TE = Technician error

Revised: 3/19/2012

REVIEWED BY: Mailu W Kaaru

DATE: 6/2/15

PARENTAL BLOCKAGE MAP FOR *C. dubia*

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TIME NEONATES PULLED: 1241

SOURCE BOARD: DMW 5/18/15

ESTIMATED AGE RANGE OF *C. dubia* NEONATES: born 5/26/15 between 1230 & 1500

DATE / INITIALS: 5/27/15 MLV

	REPLICATE									
TEST CONCENTRATION	1	2	3	4	5	6	7	8	9	10
	cup: 31	cup: 35	cup: 40	cup: 42	cup: 43	cup: 44	cup: 49	cup: 50	cup: 52	cup: 54
DMW	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
A 6.25%	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
B 12.5%	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
C 25%	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
D 50%	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
E 100%	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

C.dubia

Young Summary

Test Material/Client: Ecology Environmental

Tech Intitals: mwg

Project Number: 5135-00

QC Initials: KS

Test Dates: 5/27/15-6/2/15

GLC Numbers: 10511

Test Replicate	Test Concentrations						
	Primary Control	A	B	C	D	E	Secondary Control
1	17	17	18	17	22	20	
2	21	23	23	20	22	24	
3	20	24	20	21	17	25	
4	19	20	19	24	24	29	
5	21	21	15	17	22	25	
6	20	18	20	20	22	25	
7	21	2	23	19	24	27	
8	17	19	20	18	24	21	
9	17	21	22	21	21	20	
10	19	18	23	19 Θ	23	18	
Total Young	192	183	203	196	221	234	0
Number of Adults (do not include T.E. or males)	10	10	10	10	10	10	0
Average Young per Adult	19.2	18.3	20.3	19.6	22.1	23.4	#DIV/0!

KEY:
Θ: organism mortality
NY: no young
T.E.: technician error
a: aborted young

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	5/27/2015	Test ID:	511cd515	Sample ID:	GLC# 10511
End Date:	6/3/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:	2 mar 6/15/15	Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:	Ecology Environmental OU2-SW-02 cd chronic reprod and survival May 20				

Conc-%	1	2	3	4	5	6	7	8	9	10
con	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
con	1.0000	1.0000	0	10	10	10		
6.25	1.0000	1.0000	0	10	10	10	1.0000	0.0500
12.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500
25	0.9000	0.9000	1	9	10	10	0.5000	0.0500
50	1.0000	1.0000	0	10	10	10	1.0000	0.0500
100	1.0000	1.0000	0	10	10	10	1.0000	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		0
Treatments vs con				

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/27/2015	Test ID:	511cd515	Sample ID:	GLC# 10511
End Date:	6/3/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:	3 Nov 14/15/15	Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:	Ecology Environmental OU2-SW-02 cd chronic reprod and survival May 20				

Conc-%	1	2	3	4	5	6	7	8	9	10
con	17.000	21.000	20.000	19.000	21.000	20.000	21.000	17.000	17.000	19.000
6.25	17.000	23.000	24.000	20.000	21.000	18.000	2.000	19.000	21.000	18.000
12.5	18.000	23.000	20.000	19.000	15.000	20.000	23.000	20.000	22.000	23.000
25	17.000	20.000	21.000	24.000	17.000	20.000	19.000	18.000	21.000	19.000
50	22.000	22.000	17.000	24.000	22.000	22.000	24.000	24.000	21.000	23.000
100	20.000	24.000	25.000	29.000	25.000	25.000	27.000	21.000	20.000	18.000

			Transform: Untransformed					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
con	19.200	1.0000	19.200	17.000	21.000	8.784	10		
6.25	18.300	0.9531	18.300	2.000	24.000	33.592	10	109.50	75.00
12.5	20.300	1.0573	20.300	15.000	23.000	12.730	10	120.00	75.00
25	19.600	1.0208	19.600	17.000	24.000	10.810	10	108.00	75.00
50	22.100	1.1510	22.100	17.000	24.000	9.407	10	145.00	75.00
100	23.400	1.2188	23.400	18.000	29.000	14.967	10	138.50	75.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.05)	1.14808	0.895	-2.1797	10.0935
Bartlett's Test indicates unequal variances (p = 5.19E-04)	22.0191	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		0
Treatments vs con				

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/27/2015	Test ID: 511cd515	Sample ID: GLC# 10511
End Date:	6/3/2015	Lab ID: -GREAT LAKES ENVIRONM	Sample Type: EFFLUENT
Sample Date:	2 PMW WKS	Protocol: EPAFW02-EPA/821/R-02-01	Test Species: CD-Ceriodaphnia dubia
Comments:	Ecology Environmental OU2-SW-02 cd chronic reprod and survival May 20		

Conc-%	1	2	3	4	5	6	7	8	9	10
con	17.000	21.000	20.000	19.000	21.000	20.000	21.000	17.000	17.000	19.000
6.25	17.000	23.000	24.000	20.000	21.000	18.000	2.000	19.000	21.000	18.000
12.5	18.000	23.000	20.000	19.000	15.000	20.000	23.000	20.000	22.000	23.000
25	17.000	20.000	21.000	24.000	17.000	20.000	19.000	18.000	21.000	19.000
50	22.000	22.000	17.000	24.000	22.000	22.000	24.000	24.000	21.000	23.000
100	20.000	24.000	25.000	29.000	25.000	25.000	27.000	21.000	20.000	18.000

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
con	19.200	1.0000	19.200	17.000	21.000	8.784	10			
6.25	18.300	0.9531	18.300	2.000	24.000	33.592	10	0.596	2.287	3.453
12.5	20.300	1.0573	20.300	15.000	23.000	12.730	10	-0.729	2.287	3.453
25	19.600	1.0208	19.600	17.000	24.000	10.810	10	-0.265	2.287	3.453
50	22.100	1.1510	22.100	17.000	24.000	9.407	10	-1.921	2.287	3.453
100	23.400	1.2188	23.400	18.000	29.000	14.967	10	-2.782	2.287	3.453

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.05)					1.14808		0.895		-2.1797	10.0935
Bartlett's Test indicates unequal variances (p = 5.19E-04)					22.0191		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test					3.45251	0.17982	36.6967	11.3981	0.0129	5, 54
Treatments vs con										

PMSD Only

GLEC

DAPHNID 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OU2-SW03

TEST MATERIAL: Environmental Ecology | TYPE OF TEST: Regulatory | DILUTION WATER: DMW

PROJECT NUMBER: 5135-00 | INCUBATOR NUMBER: 38 | SHELF NUMBER: 3 | TEST TEMPERATURE: 25 ± 1°C

TEST SPECIES: *C. dubia* | LIGHT INTENSITY (ft-c): DAY 0/ 131.0 x0.91= 119.2 DAY | PHOTOPERIOD: 16:8

YOUNG SOURCE: In house; (BD) DMW MH; 5/18/15 | DMW NUMBER: DAY 0/ 2274 DAY 1/ 2275 DAY 3 2276 | ALGAE NUMBER: DAY 0/ 1050 DAY / DAY /

YOUNG AGE: <24 hours; Within 8 hours | GLC NUMBER: DAY 0/ 10513 DAY / DAY / | YTC NUMBER: DAY 0/ 69B DAY / DAY /

	0	1	2	3	4	5	6	7	8
DATE/TIME:	5/27/15	5/28/15	5/29/15	5/30/15	5/31/15	6/1/15	6/2/15		
TECH INITIALS:	MLV 1730	MWS 1030	MWS 1055	DS 1146	DS 1052	YS 1305	MLV 1117		

TEST CONCENTRATION: DMW Control

DAY	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH 6.00 - 9.00 NEW	pH OLD	pH METER ID	DISSOLVED OXYGEN New: 6.0-10.0 Old:≤ 4.0 mg/L NEW	DO OLD	DO METER ID	TEMPERATURE ± 1 °C NEW	TEMP OLD	TEMP METER ID	SPECIFIC CONDUCTANCE (µS/cm) NEW	SC METER ID
0	+	+	+	+	+	+	+	+	+	+	7.71		203	8.3		175	25.8		175	174.2	175
1	+	+	+	+	+	+	+	+	+	+	8.05	8.24	203	8.1	8.7	175	24.7	25.0	175	173.6	175
2	dc	dc	dc	dc	dc	dc	dc	dc	dc	dc	8.00	8.23	203	8.0	8.7	175	24.9	25.2	40	177.2	175
3	tc4	tc3	tc5	tc4	tc4	tc4	tc4	tc3	tc3	tc3	8.00	8.54	203	8.00	9.1	175	25.4	25.1	175	174.2	175
4	tc	tc6	tc6	tc7	tc	tc	tc7	tc6	tc7	tc8	8.01	8.49	203	8.2	8.6	175	25.7	25.1	175	174.2	175
5	tc6	tc	tc1	tc	tc5	tc5	tc	tc	tc	tc	8.06	8.19	203	7.8	8.6	175	25.7	25.2	*175 42	177.0	175
6	tc7	tc5	tc10	tc10	tc10	tc10	tc10	tc11	tc11	tc9	—	8.27	203	—	8.7	175	—	24.9	42	—	
7																					
8																					

TEST CONCENTRATION: A 6.25%

DAY	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH NEW	pH OLD	pH METER ID	DISSOLVED OXYGEN NEW	DO OLD	DO METER ID	TEMPERATURE NEW	TEMP OLD	TEMP METER ID	SPECIFIC CONDUCTANCE NEW	SC METER ID
0	+	+	+	+	+	+	+	+	+	+	8.03			8.2			24.9			207.9	
1	+	+	+	+	+	+	+	+	+	+	8.02	8.40		8.1	8.8		24.7	25.0		205.6	
2	dc	dc	dc	dc	dc	dc	dc	dc	dc	dc	8.01	8.35		8.3	8.8		25.1	25.2		214.7	
3	tc4	tc4	tc4	tc4	tc4	tc4	tc4	tc4	tc3	tc2	8.00	8.53		8.0	9.2		25.4	25.0		210.9	
4	tc7	tc7	tc7	tc7	tc6	tc6	tc6	tc8	tc5	tc7	8.02	8.47		8.0	8.8		25.6	25.1		205.3	
5	dc	dc	tc10	dc	dc	dc	dc	dc	dc	dc	8.07	8.44		7.9	9.0		26.0	25.4		203.8	
6	tc11	tc10	dc	tc9	tc11	tc12	tc11	tc11	tc8	tc9	—	8.31		—	8.6		—	25.0		—	
7																					
8												—			—			—			

OBSERVATION KEY:

+ = Alive e = Eggs present F = Floater
- = Dead ° = Split brood SB = Stuck to bubble
P = Pale TE = Technician error

REVIEWED BY: Mandy Wharton

DATE: 6/2/15

DAPHNID 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL Environmental Ecology

PROJECT NUMBER:

TEST SPECIES: *C. dubia*

	0	1	2	3	4	5	6	7	8
DATE/TIME:	5/27/15	5/28/15	5/29/15	5/30/15	5/31/15	6/1/15	6/2/15	/	/
TECH INITIALS:	MLW 1230	MLW 1030	1055 MLW	DS 1148	DS 1052	KS 1305	MLW 1117	/	/

DAY	TEST CONCENTRATION: B 12.5% — REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH (6.00 - 9.00) NEW	pH OLD	DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 mg/L NEW	DO OLD	TEMPERATURE ± 1°C NEW	TEMP OLD	SP CONDUCTANCE (µS/cm) NEW
0	+	+	+	+	+	+	+	+	+	+	8.00		8.0		25.7		232.7
1	+ F	+	+	+	+	+	+	+	+	+	8.05	8.47	8.3	8.9	24.7	24.9	231.1
2	+	+	+	+	+	+	+	+	+	+	8.04	8.37	8.4	8.8	24.7	25.2	239.8
3	+c4	+c4	+c3	+c4	+c4	+c4	+c3	+c4	+c3	+	7.99	8.53	8.2	9.2	25.3	25.0	238.7
4	+c6	+c6	+c6	+c5	+c7	+c7	+c7	+c8	+c7	+	8.01	8.48	8.0	8.8	25.5	25.2	227.9
5	(-)	+c10	+	+	+ 6/2/15 MLW	+	+	+	+	+	8.04	8.45	7.9	9.1	25.5	25.3	235.7
6	|	+c11	+c10	+c9	+c13	+c10	+c12	(-)3	+c11	+	—	8.31	—	8.7	—	25.0	—
7	↓	—	—	—	—	—	—	↓	—	—	—	—	—	—	—	—	—
8		—	—	—	—	—	—		—	—		—		—		—	
	TEST CONCENTRATION: C 25%																
0	+	+	+	+	+	+	+	+	+	+	7.98		8.0		25.7		292.0
1	+	+ F	+	+	+	+	+	+	+	+	7.99	8.44	8.2	8.9	24.7	25.2	290.0
2	+	+	+	+	+	+	+	+	+	+	7.99	8.36	8.6	8.8	24.8	25.2	293.2
3	+c4	+c4	+c4	+c4	+c3	+c4	+c	+c4	+c4	+c4	7.97	8.55	8.3	9.3	25.2	25.0	291.4
4	+c6	+c5	+c6	+c7	+c	+c8	+c3	+c5	+c6	+c	7.98	8.119	8.1	8.9	25.5	25.2	295.7
5	+	+	+	+	+6	+	+7	+	+	+5	8.01	8.50	8.0	9.2	25.5	25.0	293.3
6	+12	+10	+10	+11	+11	+10	+9	+10	+11	+11	—	8.75	—	8.6	—	25.0	—
7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—	—	—	—		—		—		—	

OBSERVATION KEY:

+ = Alive c = Eggs present F = Floater
- = Dead ° = Split brood SB = Stuck to bubble
P = Pale TE = Technician error

Revised: 3/19/2012

REVIEWED BY: Mailee Wilson

DATE: 6/2/15

DAPHNID 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER:

TEST SPECIES: *C. dubia*

	0	1	2	3	4	5	6	7	8
DATE/TIME:	5/27/15	5/28/15	5/29/15	5/30/15	5/31/15	6/1/15	6/2/15	/	/
TECH INITIALS:	MLV 1730	NWS 1030	1055 NWS	DS 1146	DS 1052	KS 1506	MLV 1117	/	/

DAY	TEST CONCENTRATION: D 50% — REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	pH (6.00 - 9.00) NEW	pH OLD	DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 mg/L NEW	DO OLD	TEMPERATURE ± 1°C NEW	TEMP OLD	SP CONDUCTANCE (µS/cm) NEW
0	+	+	+	+	+	+	+	+	+	+	7.95		8.1		25.7		407
1	+	+	+ F	+ F	+	+	+	+	+	+	7.91	8.44	8.4	8.9	24.9	25.2	407
2	de	de	de	de	de	de	de	de	de	+	7.93	8.40	8.6	8.9	24.7	25.1	407
3	te3	te4	te4	te4	te4	te4	te4	te4	te3	te3	7.94	8.51	8.6	9.3	25.0	25.0	404
4	te6	te6	te6	te7	te8	te7	te7	te6	te8	te	7.94	8.47	8.5	8.9	25.3	25.2	404
5	de	de	de	de	de	de	de	de	de	de6	7.94	8.51	8.1	9.2	25.9	24.8	407
6	⊖12	te13	te12	te12	te14	te11	te12	te12	te13	te8	—	8.39	—	8.7	—	25.0	—
7	↓																
8												—		—		—	
	TEST CONCENTRATION: E 100%																
0	+	+	+	+	+	+	+	+	+	+	7.80		8.5		25.7		631
1	+	+	+	+	+	+	+	+	+	+	7.81	8.43	8.8	8.9	24.7	25.2	625
2	de	de	de	de	de	de	de	de	de	de	7.81	8.41	8.7	8.9	24.7	25.1	635
3	te3	te4	te4	te4	te4	te4	te	te4	te4	te3	7.87	8.48	9.4	9.2	24.5	25.0	630
4	te8	te7	te7	te8	te8	te8	+	te7	te7	te7	7.82	8.45	9.3	8.9	24.7	25.2	625
5	te10	de	de7	de	de	de9	de	de	de	de	7.83	8.49	8.6	9.2	25.2	24.8	631
6	de	te11	de	te12	te13	de	+	te14	te13	te14	—	8.37	—	8.6	—	24.8	—
7																	
8												—		—		—	

OBSERVATION KEY:

+ = Alive e = Eggs present F = Floater
- = Dead ° = Split brood SB = Stuck to bubble
P = Pale TE = Technician error

Revised: 3/19/2012

REVIEWED BY: Mailu Wilson

DATE: 6/2/15

PARENTAL BLOCKAGE MAP FOR *C. dubia*

Environmental Ecology

TEST MATERIAL:

PROJECT NUMBER: 5135-00

TIME NEONATES PULLED: 1229

SOURCE BOARD: Bd 5/18/15

ESTIMATED AGE RANGE OF *C. dubia* NEONATES: born 5/26/15 between 1730 & 1500

DATE / INITIALS: MLV 5/27/15

	REPLICATE									
TEST CONCENTRATION	1	2	3	4	5	6	7	8	9	10
DMW	cup: 16	cup: 17	cup: 19	cup: 20	cup: 22	cup: 23	cup: 24	cup: 26	cup: 27	cup: 29
A 6.25%	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
B 12.5%										
C 25%										
D 50%										
E 100%	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

C.dubia

Young Summary

Test Material/Client: Ecology Environmental

Tech Intitals: mwg

Project Number: 5135-00

QC Initials: MLV

Test Dates: 5/27/15-6/2/15

GLC Numbers: 10512

Test Replicate	Test Concentrations						
	Primary Control	A	B	C	D	E	Secondary Control
1	17	22	10 Θ	22	21 Θ	21	
2	14	21	22	19	23	22	
3	22	21	19	20	22	18	
4	21	20	18	22	23	24	
5	19	21	24	20	26	25	
6	22	22	21	22	22	21	
7	21	21	22	19	23	0	
8	20	23	15 Θ	19	22	25	
9	21	16	21	21	24	24	
10	20	18	male	20	17	24	
Total Young	**197**	**205**	**172**	**204**	**223**	**204**	**0**
Number of Adults (do not include T.E. or males)	**10**	**10**	**9**	**10**	**10**	**10**	**0**
Average Young per Adult	**19.7**	**20.5**	**19.1**	**20.4**	**22.3**	**20.4**	**#DIV/0!**

KEY:
Θ: organism mortality
Ø: no young
T.E.: technician error
a: aborted young

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	5/27/2015	Test ID:	512cd515	Sample ID:	GLC# 10512
End Date:	6/3/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:	Ecology Environmental OU2-SW-03 cd chronic reprod and survival May 20				

Conc-%	1	2	3	4	5	6	7	8	9	10
con	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean		Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	
con	1.0000	1.0000	1.0472	0	10	10	10			
6.25	1.0000	1.0000	1.0472	0	10	10	10	1.0000	0.0500	0.11521
12.5	0.8000	0.8000	0.94248	2	8	10	10	0.2368	0.0500	0.11521
25	1.0000	1.0000	1.0472	0	10	10	10	1.0000	0.0500	0.11521
50	0.9000	0.9000	0.99484	1	9	10	10	0.5000	0.0500	0.11521
100	1.0000	1.0000	1.0472	0	10	10	10	1.0000	0.0500	0.11521

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		0
Treatments vs con				

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/27/2015	Test ID: 512cd515	Sample ID: GLC# 10512
End Date:	6/3/2015	Lab ID: -GREAT LAKES ENVIRONM	Sample Type: EFFLUENT
Sample Date:		Protocol: EPAFW02-EPA/821/R-02-01	Test Species: CD-Ceriodaphnia dubia
Comments:	Ecology Environmental OU2-SW-03 cd chronic reprod and survival May 20		

Conc-%	1	2	3	4	5	6	7	8	9	10
con	17.000	14.000	22.000	21.000	19.000	22.000	21.000	20.000	21.000	20.000
6.25	22.000	21.000	21.000	20.000	21.000	22.000	21.000	23.000	16.000	18.000
12.5	10.000	22.000	19.000	18.000	24.000	21.000	22.000	15.000	21.000	
25	22.000	19.000	20.000	22.000	20.000	22.000	19.000	19.000	21.000	20.000
50	21.000	23.000	22.000	23.000	26.000	22.000	23.000	22.000	24.000	17.000
100	21.000	22.000	18.000	24.000	25.000	21.000	0.000	25.000	24.000	24.000

			Transform: Untransformed					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
con	19.700	1.0000	19.700	14.000	22.000	12.673	10		
6.25	20.500	1.0406	20.500	16.000	23.000	10.089	10	116.00	74.00
12.5	19.111	0.9701	19.111	10.000	24.000	22.574	9	91.50	61.00
25	20.400	1.0355	20.400	19.000	22.000	6.201	10	108.00	74.00
50	22.300	1.1320	22.300	17.000	26.000	10.367	10	140.00	74.00
100	20.400	1.0355	20.400	0.000	25.000	36.770	10	129.00	74.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.05)	1.56906	0.895	-3.119	14.8919
Bartlett's Test indicates unequal variances (p = 1.79E-06)	34.6206	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Wilcoxon Rank Sum Test Treatments vs con	100	>100		0

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/27/2015	Test ID:	512cd515	Sample ID:	GLC# 10512
End Date:	6/3/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	CD-Ceriodaphnia dubia
Comments:	Ecology Environmental OU2-SW-03 cd chronic reprod and survival May 20				

Conc-%	1	2	3	4	5	6	7	8	9	10
con	17.000	14.000	22.000	21.000	19.000	22.000	21.000	20.000	21.000	20.000
6.25	22.000	21.000	21.000	20.000	21.000	22.000	21.000	23.000	16.000	18.000
12.5	10.000	22.000	19.000	18.000	24.000	21.000	22.000	15.000	21.000	
25	22.000	19.000	20.000	22.000	20.000	22.000	19.000	19.000	21.000	20.000
50	21.000	23.000	22.000	23.000	26.000	22.000	23.000	22.000	24.000	17.000
100	21.000	22.000	18.000	24.000	25.000	21.000	0.000	25.000	24.000	24.000

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
con	19.700	1.0000	19.700	14.000	22.000	12.673	10			
6.25	20.500	1.0406	20.500	16.000	23.000	10.089	10	-0.457	2.288	4.006
12.5	19.111	0.9701	19.111	10.000	24.000	22.574	9	0.327	2.288	4.116
25	20.400	1.0355	20.400	19.000	22.000	6.201	10	-0.400	2.288	4.006
50	22.300	1.1320	22.300	17.000	26.000	10.367	10	-1.485	2.288	4.006
100	20.400	1.0355	20.400	0.000	25.000	36.770	10	-0.400	2.288	4.006

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.05)					1.56906		0.895		-3.119	14.8919
Bartlett's Test indicates unequal variances (p = 1.79E-06)					34.6206		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test Treatments vs con					4.00591	0.20335	11.2036	15.3281	0.60344	5, 53

PMSD Only

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

B61-SW01

TEST MATERIAL: Environmental Ecology | TYPE OF TEST: Regulatory | DILUTION WATER: Mod Hard

PROJECT NUMBER: 5135-00 | INCUBATOR NUMBER: 34 | SHELF NUMBER: 1 | TEST TEMPERATURE: 25 ± 1°C

TEST SPECIES: *P. promelas* | LIGHT INTENSITY (ft-c): DAY 0/ 78.5 & 91 DAY | PHOTOPERIOD: 16:8

FRY AGE/SOURCE: <24 hours; ABS 5.27.15 | NUMBER FRY/CHAMBER: 10

TREATMENT LEVEL: Mod Hard Control

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD / NUMBER ALIVE				pH 6.00 - 9.00			DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)			TEMPERATURE ±1 (°C)			SP CONDUCTANCE (µS/cm)		Mod Hard # / GLC #	AM Feeding Time / PM Feeding Time
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	METER ID	NEW	OLD	METER ID	NEW	OLD	METER ID	NEW	METER ID		
5/27/15 1229	0	KS	0/10	0/10	0/10	0/10	7.96		203	8.3		175	24.4		175	342	175	MH# 2455 GLC# 10509	1545 NW
5/28/15 1134	1	NW	0/10	0/10	0/10	0/10	7.91	7.74	203	8.3	7.4	175	24.4	24.6	42	331	175	MH# 2456 GLC# 10509	830 MP. 1515 NW
5/29/15 1204	2	KS	0/10	0/10	0/10	0/10	7.86	7.63	203	8.4	7.4	175	25.0	24.6	42	336	175	MH# 2457 GLC# 10509	842 KS 1505 MGM
5/30/15 1122	3	MGM	0/10	0/10	0/10	0/10	7.78	7.60	203	8.4	7.6	175	24.2	25.5	42	334	175	MH# 2458 GLC# 10509	750 DS 1632 MGM
5/31/15 1104	4	MP.	0/10	0/10	0/10	0/10	7.94	7.83	203	8.4	7.4	175	24.5	25.0	42	334	175	MH# 2459 GLC# 10509	750 DS 1415 MP.
6/1/15 1142	5	MP.	0/10	0/10	0/10	0/10	7.87	7.77	203	8.3	7.2	175	24.8	25.0	42	346	175	MH# 2460 GLC# 10509	MGM 0838 KS 1605
6/2/15 1125	6	MGM	0/10	0/10	0/10	0/10	7.95	7.71	203	8.4	7.4	175	24.6	25.1	42	332	175	MH# 2461 GLC# 10509	855 MGM 1524 MP.
6/3/15 1015	7	KS	0/10	0/10	0/10	0/10		7.76	203		7.3	175		25.1	42				

OBSERVATION KEY

N = Normal | PM = Particulate Matter
P = Pale | Err = Erratic Swimming
Imm = Immobilized | TE = Technician error

REVIEWED BY: Maile Wyhrer

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: Environmental Ecology BG1-SW01

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: A 6.25 %

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1229	0	KS	0/10	0/10	0/10	0/10	8.02		8.3		24.7		356
5/28/15 1134	1	MWW	0/10	0/10	0/10	0/10	7.97	7.70	8.3	7.4	24.4	24.6	349
5/29/15 1204	2	KS	0/10	0/10	0/10	0/10	7.94	7.64	8.4	6.9	24.7	24.5	319
5/30/15 1226	3	MWH	0/10	0/10	0/10	0/10	7.88	7.71	8.4	7.4	24.3	25.4	350
5/31/15 1104	4	MD.	0/10	0/10	0/10	0/10	7.96	7.79	8.3	7.1	24.5	25.3	352
6/1/15 1142	5	MD.	0/10	0/10	0/10	0/10	7.90	7.79	8.3	7.2	25.0	25.0	363
6/2/15 1125	6	MWH	0/10	0/10	0/10	0/10	7.96	7.80	8.3	7.6	25.0	25.1	349
6/3/15 1025	7	KS	0/10 6/3/15 KS	0/10	0/10	0/10		7.68		6.8		24.1	

OBSERVATION KEY

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REVIEWED BY: Mary Wyburn

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: Environmental Ecology BG1-SW01

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: B 12.5%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE REP 1	REP 2	REP 3	REP 4	pH 6.00 - 9.00 NEW	pH OLD	DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L) NEW	DO OLD	TEMPERATURE ±1 (°C) NEW	TEMP OLD	SP CONDUCTANCE (µS/cm) NEW
5/27/15 1229	0	KS	0/10	0/10	0/10	0/10	8.02		8.2		24.7		377
5/28/15 1134	1	MW	0/10	0/10	1 Err 0/10	0/10	7.94	7.75	8.4	7.0	24.4	24.5	367
5/29/15 1204	2	KS	0/10	0/10 1 err	1 Err 0/10	0/10	7.92	7.66	8.4	6.9	24.5	24.6	372
5/30/15 1222	3	MGM	0/10	0/10	0/10 1P	0/10	7.93	7.74	8.4	7.2	24.5	25.2	372
5/31/15 1104	4	MP.	0/10	0/10	0/10	0/10	7.95	7.82	8.3	7.1	24.6	25.2	372
6/1/15 1142	5	MP.	0/10	0/10	0/10	0/10	7.93	7.81	8.4	7.1	24.9	24.9	383
6/2/15 1125	6	MGM	0/10	0/10	0/10	0/10	7.96	7.85	8.3	7.8	25.0	25.1	368
6/3/15 1025	7	KS	0/10	0/10	0/10	0/10		7.76		7.0		25.1	

OBSERVATION KEY

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Imm = Immobilized	TE = Technician error

REVIEWED BY: Mailee W Hsu

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: Environmental Ecology BGI-SW01

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: C 25%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1229	0	KS	0/10	0/10	0/10	0/10	8.02		8.2		24.7		416
5/28/15 1134	1	MW	0/10	0/10	0/10	0/10	7.96	7.81	8.6	7.1	24.6	24.7	414
5/29/15 1200	2	KS	0/10	0/10	0/10	0/10	7.97	7.79	8.5	7.0	24.4	24.0	415
5/30/15 1222	3	MM	0/10	0/10	0/10	0/10 ip	7.96	7.90	8.4	7.5	24.5	25.0	411
5/31/15 1104	4	MP	0/10	0/10	0/10	0/10 ip	7.97	7.98	8.3	7.4	24.6	25.2	411
6/1/15 1142	5	MP	0/10	0/10	0/10	0/10	7.93	7.88	8.3	7.0	25.1	25.2	423
6/2/15 1125	6	MM	0/10	0/10	0/10	0/10 ip	7.96	7.86	8.3	7.7	24.9	25.0	410
6/3/15 1025	7	KS	0/10	0/10	0/10	0/10 ip		7.87		7.3		25.1	

OBSERVATION KEY

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Imm = Immobilized	TE = Technician error

REVIEWED BY: Marie Wyka

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: Environmental Ecology BB1-SW01

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: D 50%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1129	0	KS	0/10	0/10	0/10	0/10	8.01		8.7		24.8		493
5/28/15 1134	1	MW	0/10	0/10	0/10	0/10	7.97	7.84	8.7	7.1	24.6	24.7	492
5/29/15 1204	2	RS	0/10	0/10	0/10	0/10	8.01	7.92	8.4	7.3	24.5	24.8	494
5/30/15 1222	3	MGM	0/10	0/10	0/10	0/10	8.04	8.01	8.3	7.7	24.7	25.2	492
5/31/15 1104	4	MP	0/10	0/10	0/10	0/10	8.01	8.07	8.3	7.6	24.7	25.0	490
6/1/15 1142	5	MP	0/10	0/10	0/10	0/10	7.96	8.06	8.3	7.4	24.9	25.1	498
6/2/15 1125	6	MGM	0/10	0/10	0/10	0/10	7.96	7.93	8.4	7.5	24.6	25.2	489
6/3/15 1025	7	RS	0/10	0/10	0/10	0/10		8.14		8.0		25.3	

OBSERVATION KEY

N = Normal	PM = Particulate Matter
P = Pale	Err = Erratic Swimming
Imm = Immobilized	TE = Technician error

REVIEWED BY: Mallee Weber

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: Environmental Ecology BE1-SW01

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: E 100%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1229	0	KS	0/10	0/10	0/10	0/10	8.00		8.6		25.0		649
5/28/15 1134	1	MW	0/10	0/10	0/10	0/10	7.92	7.90	8.9	7.1	24.8	24.7	654
5/29/15 1200	2	KS	0/10	0/10	0/10	0/10	7.96	8.02	9.5	7.5	24.6	25.0	659
5/30/15 1222	3	MW	0/10	0/9 TE	0/10	0/10	8.05	8.24	8.6	8.3	24.7	25.4	653
5/31/15 1104	4	MP	0/10	0/9	0/10	0/10	7.98	8.40	8.5	7.6	24.7	25.2	651
6/1/15 1142	5	MP	0/10	0/9	0/10	0/10	7.90	8.42	8.7	8.5	24.8	25.3	656
6/2/15 1125	6	MW	0/10	0/9	0/10	0/10	7.91	8.57	8.4	8.9	24.7	25.3	653
6/3/15 1225	7	KS	0/10	0/9	0/10	0/10		8.57		10.9		25.5	

6/3/15 KS

OBSERVATION KEY

N = Normal	PM = Particulate Matter
P = Pale	Err = Erratic Swimming
Imm = Immobilized	TE = Technician error

REVIEWED BY: Mark W Hoy

DATE: 6/9/15

GLEC

FATHEAD MINNOW CHRONIC TOXICITY TEST - WEIGHT DATA

BG1-SW01 10509

TEST MATERIAL: Envirc. Eidway
PROJECT NUMBER: 5135-00
TEST SPECIES: *Pimephales promelas*
TEST DATE: 5/27/15 - 6/3/15
WEIGH DATE: 6/8/15
TECH INITIALS: MM
QC INITIALS: MW

MODEL OF DRYING OVEN: Blue M
OVEN TEMPERATURE (°C): 60
DRYING DURATION (Hours): 24
DATE/TIME IN: 6/3/15 1349
DATE/TIME OUT: 6/4/15 1400

DESSICATOR #: 186
DATE/TIME IN: 6/4/15 1400
DATE/TIME OUT: 6/8/15 1143

Treatment Level	Replicate	A Weight of Pan and Fry (g)	B Weight of Oven-Dried Pan (g)	C Number of Fry Weighed
Control	1	0.82909	0.82475	10
	2	0.84349	0.83916	10
	3	0.84646	0.84235	10
	4	0.84163	0.84193	10
A 6.25%	1	0.83879	0.83390	10
	2	0.83681	0.83190	10
	3	0.82407	0.81949	10
	4	0.83801	0.83370	10
B 12.5%	1	0.84212	0.83693	10
	2	0.82796	0.82290	10
	3	0.83855	0.83393	10
	4	0.82633	0.82112	10
C 25%	1	0.83080	0.82574	10
	2	0.84052	0.83572	10
	3	0.82700	0.82187	10
	4	0.83942	0.83477	10
D 50%	1	0.84409	0.83985	10
	2	0.84470	0.83975	10
	3	0.84526	0.83999	10
	4	0.85228	0.84721	10
E 100%	1	0.83128	0.82614	10
	2	0.83640	0.83104	9 T.E
	3	0.83061	0.82555	10
	4	0.84791	0.84274	10

Test Material/Client: BG1-SW01 Environmental Ecology

Tech Intitals: MWG

Project Number: 5135-00

QC Initials: MD. 6/9/15

Test Dates: 5/27/2015-6/3/2015

GLC Numbers: 10509

Pos ID	Rep	Group	Conc.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total Wgt(mg)	Tare Wgt (mg)	Wgt Count
1	1	MH control	con	10				10			10	0.82909	0.82475	10
2	2	MH control	con	10				10			10	0.84349	0.83916	10
3	3	MH control	con	10				10			10	0.84646	0.84235	10
4	4	MH control	con	10				10			10	0.84663	0.84193	10
5	1	A	6.25%	10				10			10	0.83879	0.83390	10
6	2	A	6.25%	10				10			10	0.83681	0.83190	10
7	3	A	6.25%	10				10			10	0.82407	0.81949	10
8	4	A	6.25%	10				10			10	0.83801	0.83370	10
9	1	B	12.50%	10				10			10	0.84212	0.83693	10
10	2	B	12.50%	10				10			10	0.82796	0.82290	10
11	3	B	12.50%	10				10			10	0.83855	0.83393	10
12	4	B	12.50%	10				10			10	0.82633	0.82112	10
13	1	C	25%	10				10			10	0.83080	0.82574	10
14	2	C	25%	10				10			10	0.84052	0.83572	10
15	3	C	25%	10				10			10	0.82700	0.82187	10
16	4	C	25%	10				10			10	0.83942	0.83477	10
17	1	D	50%	10				10			10	0.84409	0.83985	10
18	2	D	50%	10				10			10	0.84470	0.83975	10
19	3	D	50%	10				10			10	0.84526	0.83999	10
20	4	D	50%	10				10			10	0.85228	0.84721	10
21	1	E	100%	10				10			10	0.83128	0.82614	10
22	2	E	100%	9				9			9	0.83640	0.83104	9
23	3	E	100%	10				10			10	0.83061	0.82555	10
24	4	E	100%	10				10			10	0.84791	0.84274	10

Test: LF-Larval Fish Growth and Survival Test		Test ID: 509fh515	
Species: PP-Pimephales promelas		Protocol: EPAFW02-EPA/821/R-02-013	
Sample ID: GLC # 10509		Sample Type: EFFLUENT	
Start Date: 5/27/2015	End Date: 6/3/2015	Lab ID: -GREAT LAKES ENVIRONMENTAL CENTER	

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total Wgt pa	Wgt of pan(n	Wgt Count 7 day
	1	1	MH con	10				10			10	0.82909	0.82475	10
	2	2	MH con	10				10			10	0.84349	0.83916	10
	3	3	MH con	10				10			10	0.84646	0.84235	10
	4	4	MH con	10				10			10	0.84663	0.84193	10
	5	1	6.25	10				10			10	0.83879	0.8339	10
	6	2	6.25	10				10			10	0.83681	0.8319	10
	7	3	6.25	10				10			10	0.82407	0.81949	10
	8	4	6.25	10				10			10	0.83801	0.8337	10
	9	1	12.5	10				10			10	0.84212	0.83693	10
	10	2	12.5	10				10			10	0.82796	0.8229	10
	11	3	12.5	10				10			10	0.83855	0.83393	10
	12	4	12.5	10				10			10	0.82633	0.82112	10
	13	1	25	10				10			10	0.8308	0.82574	10
	14	2	25	10				10			10	0.84052	0.83572	10
	15	3	25	10				10			10	0.827	0.82187	10
	16	4	25	10				10			10	0.83942	0.83477	10
	17	1	50	10				10			10	0.84409	0.83985	10
	18	2	50	10				10			10	0.8447	0.83975	10
	19	3	50	10				10			10	0.84526	0.83999	10
	20	4	50	10				10			10	0.85228	0.84721	10
	21	1	100	10				10			10	0.83128	0.82614	10
	22	2	100	9				9			9	0.8364	0.83104	9
	23	3	100	10				10			10	0.83061	0.82555	10
	24	4	100	10				10			10	0.84791	0.84274	10

Comments: Ecology Envoronmental BG1-SW01 FHM chronic growth and survival May 201

Reviewed by: MLV

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/27/2015	Test ID:	509fh515	Sample ID:	GLC # 10509
End Date:	6/3/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP-Pimephales promelas

Comments: Ecology Envoronmental BG1-SW01 FHM chronic growth and survival May 201

Conc-%	1	2	3	4
MH con	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000

why not 0.90? (see previous 2 pages)

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
MH con	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4		
6.25	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00
12.5	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00
25	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00
50	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00
100	1.0000	1.0000	1.4098	1.4033	1.4120	0.307	4	16.00	10.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.46508	0.916	-3.0206	13.9892
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		0
Treatments vs MH con				

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	5/27/2015	Test ID:	509fh515	Sample ID:	GLC # 10509
End Date:	6/3/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP-Pimephales promelas
Comments:	Ecology Envoronmental BG1-SW01 FHM chronic growth and survival May 201				

Conc-%	1	2	3	4
MH con	0.4340	0.4330	0.4110	0.4700 ok
6.25	0.4890	0.4910	0.4580	0.4310
12.5	0.5190	0.5060	0.4620	0.5210
25	0.5060	0.4800	0.5130	0.4650
50	0.4240	0.4950	0.5270	0.5070
100	0.5140	0.5956	0.5060	0.5170

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
MH con	0.4370 ok	1.0000	0.4370	0.4110	0.4700	5.590	4			
6.25	0.4673	1.0692	0.4673	0.4310	0.4910	6.100	4	-1.307	2.410	0.0558
12.5	0.5020	1.1487	0.5020	0.4620	0.5210	5.475	4	-2.808	2.410	0.0558
25	0.4910	1.1236	0.4910	0.4650	0.5130	4.563	4	-2.333	2.410	0.0558
50	0.4883	1.1173	0.4883	0.4240	0.5270	9.180	4	-2.214	2.410	0.0558
100	0.5331	1.2200	0.5331	0.5060	0.5956	7.853	4	-4.154	2.410	0.0558

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)					0.98604		0.916		-0.101	0.00201
Bartlett's Test indicates equal variances (p = 0.81)					2.2541		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test Treatments vs MH con	100	>100		0	0.05578	0.12764	0.00421	0.00107	0.01391	5, 18

GLEC

[redacted]

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OU2-5W01

TEST MATERIAL: Environmental Ecology | TYPE OF TEST: Regulatory | DILUTION WATER: Mod Hard

PROJECT NUMBER: 5135-00 | INCUBATOR NUMBER: 34 | SHELF NUMBER: 2 | TEST TEMPERATURE: 25 ± 1°C

TEST SPECIES: *P. promelas* | LIGHT INTENSITY (ft-c): DAY 0/ 95 \ 8.9 DAY | PHOTOPERIOD: 16:8

FRY AGE/SOURCE: <24 hours; ABS 5/27/15 | NUMBER FRY/CHAMBER: 10

TREATMENT LEVEL: Mod Hard Control

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD / NUMBER ALIVE				pH 6.00 - 9.00			DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)			TEMPERATURE ±1 (°C)			SP CONDUCTANCE (µS/cm)		Mod Hard # / AM Feeding Time	
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	METER ID	NEW	OLD	METER ID	NEW	OLD	METER ID	NEW	METER ID	GLC # / PM Feeding Time	
5/27/15 1200	0	KS	0/10	0/10	0/10	0/10	7.86	[redacted]	203	8.5	[redacted]	175	24.4	[redacted]	175	328	175	MH# 2456	[redacted]
																		GLC# 10510	1545 MW
5/28/15 1150	1	MW	0/10	0/10	0/10	0/10	7.91	7.77	203	8.3	7.4	175	24.4	24.6	42	331	175	MH# 2456	0800 MP
																		GLC# 10510	1515 MW
5/29/15 1248	2	KS	0/10	0/10	0/10	0/10	7.54	7.74	203	8.5	7.3	175	24.1	24.8	42	342	175	MH# 2457	842 KS
																		GLC# 10510	1505 MGM
5/30/15 1302	3	MGM	0/10 10	0/10	0/9 T.E	0/10	7.77	7.92	203	8.4	7.5	175	24.7	25.6	42	332	175	MH# 2458	750 DS
																		GLC# 10510	1632 MGM
5/31/15 1140	4	MP.	0/10 Km.	0/10	0/9	0/10	7.84	7.90	203	8.3	7.4	175	24.5	25.1	40	333	175	MH# 2459	750 DS
																		GLC# 10510	1415 MP
6/1/15 1216	5	MP	0/10	0/10	0/9	0/10	7.85	7.77	203	8.3	6.9	175	25.0	25.5	42	346	175	MH# 2460	MW 838
																		GLC# 10510	KS 1605
6/2/15 1208	6	MGM	0/10 10	0/10	9/9	0/10	8.03	7.87	203	8.4	7.5	175	24.6	25.4	42	323	175	MH# 2462	855 MGM
																		GLC# 10510	1524 MP
6/3/15 1150	7	KS	0/10	0/10	0/9	0/10	[redacted]	7.88	203	[redacted]	7.3	175	[redacted]	25.2	42	[redacted]	[redacted]	[redacted]	[redacted]

OBSERVATION KEY

N = Normal	PM = Particulate Matter
P = Pale	Err = Erratic Swimming
Imm = Immobilized	TE = Technician error

REVIEWED BY: Maile Wyker

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OUZ-SW01

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: A 6.25 %

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1300	0	KS	0/10	0/10	0/10	0/10	7.87		8.5		24.4		347
5/28/15 1150	1	MW	0/10	0/10	0/10	0/10	7.95	7.78	8.3	7.0	24.7	24.8	354
5/29/15 1148	2	KS	0/10	0/10	0/10	0/10	7.84	7.66	8.6	7.0	24.7	24.7	355
5/30/15 1302	3	MM	T.E. 0/9	0/10	0/10	0/9 T.E. mum	7.89	7.86	8.4	7.6	24.7	25.1	348
5/31/15 1140	4	MP	0/9	0/10	0/10	0/9	7.96	7.87	8.4	7.3	24.7 6 time 5/31/15	25.2	349
6/1/15 1216	5	MP	0/9	0/10	0/10	0/9	7.91	7.92	8.4	7.4	24.6	25.2	361
6/2/15 1209	6	MM	0/9	0/10	0/10	0/9	8.04	7.94	8.5	7.6	24.5	24.8	345
6/3/15 1150	7	KS	0/9	0/10	0/10	0/9		7.88		7.5		25.0	

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Imm = Immobilized	TE = Technician error

REVIEWED BY: Mailee W. Lee

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OU2-5001

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: B 12.5%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15	0		0/10	0/10	0/10	0/10	7.84		8.4		24.4		369
5/28/15 1150	1	mw	0/10	0/10	0/10	0/10	7.92	7.79	8.5	7.1	24.4	24.6	369
5/29/15 1248	2	KS	0/10	0/10	0/10	0/10	7.99	7.72	8.5	7.0	24.8	24.7	371
5/30/15 1302	3	MWM	0/10 1imm	0/10	0/10	0/10	7.97	7.89	8.4	7.6	24.6	25.0	368
5/31/15 1140	4	MD.	0/10 1Err.	0/10	D/9 Temp. Stress	0/10	7.97	7.94	8.3	7.5	24.6	25.1	367
6/1/15 1216	5	MD.	0/10 1Err.	0/10	0/9	0/10	7.95	7.97	8.3	7.5	25.0	25.2	379
6/2/15 1209	6	MWM	0/10 1P/1imm	0/10	0/9	0/10	8.02	7.93	8.4	7.6	24.6	24.8	362
6/3/15 1150	7	KS	0/10	0/10	0/9	0/10		7.85		7.5		25.0	

OBSERVATION KEY

N = Normal	PM = Particulate Matter
P = Pale	Err = Erratic Swimming
Imm = Immobilized	TE = Technician error

REVIEWED BY: Mark Wyler

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: OUZ-SW01 Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: C 25%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE REP 1	REP 2	REP 3	REP 4	pH 6.00 - 9.00 NEW	pH OLD	DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L) NEW	DO OLD	TEMPERATURE ±1 (°C) NEW	TEMP OLD	SP CONDUCTANCE (µS/cm) NEW
5/27/15 1300	0	KS	0/10	0/10	0/10	0/10	7.84		8.3		24.5		407
5/28/15 1150	1	MW	0/10	0/10	0/10	0/10	7.91	7.84	8.5	7.2	24.4	24.6	408
5/29/15 1245	2	KS	0/10	0/10	0/10	0/10	7.87	7.75	8.6	7.0	24.7	24.7	410
5/30/15 1302	3	MM	0/10	0/10	0/10	0/10	7.96	7.92	8.4	7.7	24.7	25.1	404
5/31/15 1140	4	MP.	1/9	0/10	0/10	0/10	7.96	8.06	8.3	7.8	24.6	24.8	404
6/1/15 1216	5	MP.	0/9	0/10	0/10	0/10	7.93	8.00	8.3	7.6	25.1	25.1	413
6/2/15 1208	6	MM	0/9	0/10	0/10	0/10	7.97	7.96	8.7	7.7	24.5	25.0	401
6/3/15 1150	7	KS	0/9	0/10	0/10	0/10		7.94		7.0		24.9	

OBSERVATION KEY

N = Normal
P = Pale
Imm = Immobilized
PM = Particulate Matter
Err = Erratic Swimming
TE = Technician error

REVIEWED BY: Mailee Wyka

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OU2-SW01

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: D 50%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1300	0	KS	0/10	0/10	0/10	0/10	7.90		8.3		24.7		471
5/28/15 1150	1	MWS	0/10	0/10 Err	0/10	0/10	7.89	7.92	8.9 PM 5 bubbles	7.4	24.5	24.7	477
5/29/15 1248	2	KS	0/10	0/10 1P	0/10	0/10	7.91	7.89	8.4	7.3	24.9	24.7	482
5/29/15 1302	3	MWM	0/10	0/10 1P	0/10 1P/Err	0/10	7.98	8.09	8.3	8.1	24.7	25.1	477
5/30/15 1440	4	MP	0/10	0/10 1P	0/10	2/8	7.97	8.26	8.3	8.3	24.6	24.9	476
6/1/15 1216	5	MP	0/10	0/10	0/10	1/7 1 Imm	7.96	8.09	8.3	7.7	25.0	25.1	482
6/2/15 1209	6	MWM	0/10	1/9	0/10 1P	3/4	7.93	8.04	9.0	7.8	24.5	25.0	471
6/3/15 1150	7	KS	0/10	0/9	0/10 1P	0/4 *		8.22		8.3		25.1	

OBSERVATION KEY

N = Normal	PM = Particulate Matter
P = Pale	Err = Erratic Swimming
Imm = Immobilized	TE = Technician error

* rep 4 not used due to possible contamination -MWS 6/15/15

REVIEWED BY: Maile Wyt

DATE: 6/9/15

Revised: 2/3/2012

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OUZ-SU01

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: E 100%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1300	0	KS	0/10	0/10	0/10	0/10	7.88		8.3		24.9		621
5/28/15 1150	1	MW	0/10	0/10	0/10	0/10	7.90	8.05	9.1	7.5	24.6	24.9	625
5/29/15 1245	2	KS	0/10	0/10	0/10	0/10	7.96	8.16	9.4	8.1	24.8	25.0	631
5/30/15 1302	3	MBM	0/10	0/10	1/9	0/9 T.E	8.00	8.45	8.5	9.1	24.7	25.3	622
5/31/15 1140	4	NP	0/10	0/10	0/9	0/9	7.93	8.45	8.6	9.1	24.7	25.0	618
6/1/15 1210	5	NP	0/10	0/10	0/9	0/9	7.88	8.25	8.9	7.8	25.0	24.6	626
6/2/15 1209	6	MBM	0/10	0/10	0/9	0/9	7.95	8.27	8.5	8.4	24.5	25.0	617
6/3/15 1152	7	KS	0/10	0/10	0/9	0/9		8.55		9.8		25.2	

OBSERVATION KEY

N = Normal	PM = Particulate Matter
P = Pale	Err = Erratic Swimming
Imm = Immobilized	TE = Technician error

REVIEWED BY: Marla Wykes

DATE: 6/9/15

GLEC

FATHEAD MINNOW CHRONIC TOXICITY TEST - WEIGHT DATA

OU2-SW01

TEST MATERIAL: Envir. Ecology 10510	MODEL OF DRYING OVEN: Blue M
PROJECT NUMBER: 5135-00	OVEN TEMPERATURE (°C): 60
TEST SPECIES: *Pimephales promelas*	DRYING DURATION (Hours): 24
TEST DATE: 5/27/15 - 6/3/15	DATE/TIME IN: 6/3/15 1349
WEIGH DATE: 6/8/15	DATE/TIME OUT: 6/4/15 1400
TECH INITIALS: MP	
QC INITIALS: MLV	DESSICATOR #: 186
	DATE/TIME IN: 6/4/15 1400
	DATE/TIME OUT: 6/8/15 1245

Treatment Level	Replicate	A Weight of Pan and Fry (g)	B Weight of Oven-Dried Pan (g)	C Number of Fry Weighed	
Control	1	0.846603	0.841316	10	
	2	0.833293	0.828314	10	
	3	0.845545	0.840460	9 ITE	
	4	0.838688	0.834403	10	
A 6.25%	1	0.833222	0.827752	9 ITE	
	2	0.833338	0.829225	10	
	3	0.844300	0.837668	10	
	4	0.831886	0.827707	9 ITE	
B 12.5%	1	0.834480 MP 6/8/15	0.839169	10	
	2	0.838890	0.834091	10	
	3	0.850035	0.845332	9 ITE	
	4	0.851137	0.846672	10	
C 25%	1	0.850140	0.845661	9	
	2	0.840889	0.835884	10	
	3	0.840928	0.835660	10	
	4	0.859930	0.853998	10	
D 50%	1	0.837332	0.832333	10	
	2	0.846618	0.841107	9	
	3	0.822052	0.815820 MP 6/8/15	10	
	4	0.842237	0.837921	4	Not used due to possible Beaker Contamination MLV 6/15/15
E 100%	1	0.849459	0.844424	10	
	2	0.854111	0.848452	10	
	3	0.836337	0.830165	9	
	4	0.843450	0.838311	9 ITE	

Test Material/Client: ou2-sw01 Environmental Ecology

Tech Intitals: MWG

Project Number: 5135-00

QC Initials: MP Lelalis

Test Dates: 5/27/2015-6/3/2015

GLC Numbers: 10510

Pos ID	Rep	Group	Conc.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total Wgt(mg)	Tare Wgt (mg)	Wgt Count
1	1	MH control	con	10				10			10	0.84603	0.84136	10
2	2	MH control	con	10				10			10	0.83283	0.82814	10
3	3	MH control	con	9				9			9	0.84545	0.84060	9
4	4	MH control	con	10				10			10	0.88680 3848	0.83403	10
5	1	A	6.25%	9				9			9	0.83222	0.82752	9
6	2	A	6.25%	10				10			10	0.83338	0.82925	10
7	3	A	6.25%	10				10			10	0.84300	0.83768	10
8	4	A	6.25%	9				9			9	0.83186	0.82707	9
9	1	B	12.50%	10				10			10	0.84480	0.83969	10
10	2	B	12.50%	10				10			10	0.83890	0.83409	10
11	3	B	12.50%	9				9			9	0.85035	0.84532	9
12	4	B	12.50%	10				10			10	0.85137	0.84672	10
13	1	C	25%	10				9			9	0.85040	0.84561	10
14	2	C	25%	10				10			10	0.84089	0.83584	10
15	3	C	25%	10				10			10	0.84028	0.83560	10
16	4	C	25%	10				10			10	0.85930	0.85398	10
17	1	D	50%	10				10			10	0.83732	0.83233	10
18	2	D	50%	10				10			9	0.84618	0.84107	10
19	3	D	50%	10				10			10	0.82052	0.81581	10
20	4	D	50%	10				8			4	0.84237	0.83921	10
21	1	E	100%	10				10			10	0.84959	0.84424	10
22	2	E	100%	10				10			10	0.85411	0.84852	10
23	3	E	100%	10				9			9	0.83637	0.83065	10
24	4	E	100%	9				9			9	0.84350	0.83811	9

50% Rep 4 Not used for Stats due to possible Beaker Contamination -mw 6/15/15

why not 9?

Test: LF-Larval Fish Growth and Survival Test		Test ID: 510fh515	
Species: PP-Pimephales promelas		Protocol: EPAFW02-EPA/821/R-02-013	
Sample ID: GLC # 10510		Sample Type: EFFLUENT	
Start Date: 5/27/2015	End Date: 6/3/2015	Lab ID: -GREAT LAKES ENVIRONMENTAL CENTER	

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total Wgt pa	Wgt of pan(n	Wgt Count 7 day
	1	1	MH con	10				10			10	0.84603	0.84136	10
	2	2	MH con	10				10			10	0.83283	0.82814	10
	3	3	MH con	9				9			9	0.84545	0.8406	9
	4	4	MH con	10				10			10	0.83868	0.83403	10
	5	1	6.25	9				9			9	0.83222	0.82752	9
	6	2	6.25	10				10			10	0.83338	0.82925	10
	7	3	6.25	10				10			10	0.843	0.83768	10
	8	4	6.25	9				9			9	0.83186	0.82707	9
	9	1	12.5	10				10			10	0.8448	0.83969	10
	10	2	12.5	10				10			10	0.8389	0.83409	10
	11	3	12.5	9				9			9	0.85035	0.84532	9
	12	4	12.5	10				10			10	0.85137	0.84672	10
	13	1	25	10				9			9	0.8504	0.84561	10
	14	2	25	10				10			10	0.84089	0.83584	10
	15	3	25	10				10			10	0.84028	0.8356	10
	16	4	25	10				10			10	0.8593	0.85398	10
	17	1	50	10				10			10	0.83732	0.83233	10
	18	2	50	10				10			9	0.84618	0.84107	10
	19	3	50	10				10			10	0.82052	0.81581	10
	20	1	100	10				10			10	0.84959	0.84424	10
	21	2	100	10				10			10	0.85411	0.84852	10
	22	3	100	10				9			9	0.83637	0.83065	10
	23	4	100	9				9			9	0.8435	0.83811	9

Comments: Ecology Envoronmental OU2-SW01 FHM chronic growth and survival May 201

one rep omitted

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/27/2015	Test ID:	510fh515	Sample ID:	GLC # 10510
End Date:	6/3/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP-Pimephales promelas

Comments: Ecology Envoronmental OU2-SW01 FHM chronic growth and survival May 201

Conc-%	1	2	3	4
MH con	1.0000	1.0000	1.0000	1.0000 ok
6.25	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000 why not 9
25	0.9000	1.0000	1.0000	1.0000
50	1.0000	0.9000	1.0000	
100	1.0000	1.0000	0.9000	1.0000

how come these differ if survival is 100% (as 1.0) in all 4 replicates?

			Transform: Arcsin Square Root					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
MH con	1.0000	1.0000	1.4098	1.4033	1.4120	0.307	4			
6.25	1.0000	1.0000	1.4077	1.4033	1.4120	0.356	4	0.053	2.567	0.1052
12.5	1.0000	1.0000	1.4098	1.4033	1.4120	0.307	4	0.000	2.567	0.1052
25	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	0.941	2.567	0.1052
50	0.9667	0.9667	1.3577	1.2490	1.4120	6.930	3	1.178	2.567	0.1136
100	0.9750	0.9750	1.3691	1.2490	1.4120	5.854	4	0.994	2.567	0.1052

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.75726	0.914	-1.5511	1.90385
Bartlett's Test indicates unequal variances (p = 1.53E-06)	34.9679	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test Treatments vs MH con	100	>100		0	0.04349	0.04463	0.00213	0.00336	0.67626	5, 17

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	5/27/2015	Test ID:	510fh515	Sample ID:	GLC # 10510
End Date:	6/3/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP-Pimephales promelas

Comments: Ecology Envoronmental OU2-SW01 FHM chronic growth and survival May 201

Conc-%	1	2	3	4
MH con	0.4670	0.4690	0.5389	0.4650
6.25	0.5222	0.4130	0.5320	0.5322
12.5	0.5110	0.4810	0.5589	0.4650
25	0.4790	0.5050	0.4680	0.5320
50	0.4990	0.5110	0.4710	
100	0.5350	0.5590	0.5720	0.5989

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
MH con	0.4850	1.0000	0.4850	0.4650	0.5389	7.419	4			
6.25	0.4999	1.0307	0.4999	0.4130	0.5322	11.622	4	-0.554	2.567	0.0690
12.5	0.5040	1.0392	0.5040	0.4650	0.5589	8.191	4	-0.707	2.567	0.0690
25	0.4960	1.0227	0.4960	0.4680	0.5320	5.762	4	-0.410	2.567	0.0690
50	0.4937	1.0179	0.4937	0.4710	0.5110	4.158	3	-0.300	2.567	0.0745
100	0.5662	1.1675	0.5662	0.5350	0.5989	4.703	4	-3.024	2.567	0.0690

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.95644	0.914	-0.4344	0.60606
Bartlett's Test indicates equal variances (p = 0.68)	3.14391	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test Treatments vs MH con	100	>100		0	0.06896	0.1422	0.00344	0.00144	0.08211	5, 17

[redacted]

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OU2-SW02

TEST MATERIAL: Environmental Ecology | TYPE OF TEST: Regulatory | DILUTION WATER: Mod Hard

PROJECT NUMBER: 5135-00 | INCUBATOR NUMBER: 34 | SHELF NUMBER: 3 | TEST TEMPERATURE: 25 ± 1°C

TEST SPECIES: *P. promelas* | LIGHT INTENSITY (ft-c): DAY 0/ 79.2 X.91 DAY | PHOTOPERIOD: 16:8

FRY AGE/SOURCE: <24 hours; ABS 5-27-15 | NUMBER FRY/CHAMBER: 10

TREATMENT LEVEL: Mod Hard Control

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD / NUMBER ALIVE				pH 6.00 - 9.00			DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)			TEMPERATURE ±1 (°C)			SP CONDUCTANCE (µS/cm)		Mod Hard # / GLC #	AM Feeding Time / PM Feeding Time
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	METER ID	NEW	OLD	METER ID	NEW	OLD	METER ID	NEW	METER ID		
5/27/15 1340	0	KS	0/10	0/10	0/10	0/10	7.86	[redacted]	203	8.5	[redacted]	175	24.4	[redacted]	175	328	175	MH# 2456 GLC# 10511	[redacted] 1545 mw
5/28/15 1227	1	mw	0/10	0/10	0/10	1/9	7.91	7.73	203	8.3	7.7	175	24.9	24.5	42	331	175	MH# 2456 GLC# 10511	0800 mf 1515 mw
5/29/15 1331	2	KS	0/10	0/10	0/10	0/9	7.76	7.64	203	8.6	7.7	175	24.1	24.7	42	336	175	MH# 2457 GLC# 10511	842 KS 1505 mom
5/30/15 1348	3	mom	0/10	0/10	0/10	0/9	7.57	7.70	203	8.4	7.6	175	24.6	24.3	42	333	175	MH# 2458 GLC# 10511	DS 750 1632 mom
5/31/15 1225	4	MP.	0/10	0/10	0/10	0/9	7.84	7.84	203	8.3	7.5	175	24.3	25.2	40	334	175	*MH# 24559 GLC# 10511	DS 750 1415 MP
6/1/15 1251	5	MP.	0/10	0/10	0/10	0/9	7.86	7.67	203	8.3	6.6	KS	25.0	25.1	175	344	175	MH# 24560 GLC# 10511	mom 838 KS 1605
6/2/15 1255	6	mom	0/10	0/10	0/10	0/9	7.94	7.61	203	8.5	7.3	175	24.7	25.6	42	334	175	MH# 2461 GLC# 10511	855 mom 1524 MP.
6/3/15 1250	7	KS	0/10	0/10	0/10	0/9	[redacted]	7.70	203	[redacted]	6.9	175	[redacted]	25.2	42	[redacted]	[redacted]	[redacted]	[redacted]

* MP. 5/31/15

OBSERVATION KEY

N = Normal	PM = Particulate Matter
P = Pale	Err = Erratic Swimming
Imm = Immobilized	TE = Technician error

REVIEWED BY: Mallie C Hazen

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OUZ-SW02

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: A 6.25 %

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1340	0	KS	0/10	0/10	0/10	0/10	7.87		8.4		24.3		346
5/28/15 1333	1	mw	0/10	0/10	0/8	0/10	7.85	7.76	8.3	7.5	24.1	24.5	348
5/29/15 1331	2	KS	0/10	0/10	0/8	0/10	7.90	7.64	8.5	6.7	24.5	24.5	354
5/30/15 1346	3	mbm	0/10	0/10 IP	0/8	0/10	7.82	7.77	8.4	7.5	24.6	24.7	350
5/31/15 1225	4	MP.	0/10	0/10	0/8	0/10	7.84	7.89	8.3	7.5	24.4	25.1	349
6/1/15 1251	5	MP	0/10	0/10	0/8	0/10	7.88	7.71	8.3	6.6	25.4	24.9	361
6/2/15 1255	6	mbm	0/10	0/10	0/8	0/10	8.02	7.80	8.5	7.5	25.3	25.2	349
6/3/15 1250	7	KS	0/10	0/10	0/8	0/10		7.95		7.8		24.8	

OBSERVATION KEY

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REVIEWED BY: Mabel W Thurman

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OU2-SW02

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: B 12.5%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1340	0	KS	0/10	0/10	0/10	0/10	7.87		8.3		24.6		362
5/28/15 1232	1	MWM	0/10	0/10	1 Err 0/10	0/10	7.87	7.88	8.3	7.6	24.3	24.7	365
5/29/15 1331	2	KS	0/10	0/10	0/10	0/10	7.90	7.79	8.5	7.3	24.7	24.4	372
5/30/15 1348	3	MWM	0/10	0/10	1/9 1 imm	0/10	7.85	7.85	8.3	7.7	24.6	24.7	~~350~~ 368
5/31/15 1225	4	MD.	0/10	0/10	0/9	0/10	7.83	7.94	8.3	7.6	24.7	25.1	368
6/1/15 1251	5	MD.	0/10	0/10	0/9	0/10	7.89	7.76	8.2	6.9	25.5	24.7	378
6/2/15 1255	6	MWM	0/10	0/10	0/9 1P	0/10	8.00	7.88	8.4	7.5	25.2	25.1	366
6/3/15 1250	7	KS	0/10	0/10	0/9 1P	0/10		7.91		7.9		24.7	

5/30/15 MWM

OBSERVATION KEY

N = Normal	PM = Particulate Matter
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Imm = Immobilized	TE = Technician error

REVIEWED BY: Maile W. Horton

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: OU2-SW02 Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: C 25%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE REP 1	REP 2	REP 3	REP 4	pH 6.00 - 9.00 NEW	pH OLD	DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L) NEW	DO OLD	TEMPERATURE ±1 (°C) NEW	TEMP OLD	SP CONDUCTANCE (µS/cm) NEW
5/27/15 1540	0	KS	0/10	0/10	0/10	0/10	7.85		8.3		24.4		400
5/28/15 1223	1	mm	0/10	0/10	0/10	0/10	7.84	7.96	8.3	7.6	24.4	24.6	401
5/29/15 1331	2	KS	0/10	0/10	0/10	0/10	7.94	7.80	8.5	7.3	24.4	24.4	409
5/30/15 1348	3	MGM	0/10 IP	0/10	0/10	0/10	7.93	7.97	8.4	7.9	24.6	24.8	403
5/31/15 1225	4	MM.	0/10	0/10	0/10	0/10	7.85	8.07	8.2	7.8	24.7	25.0	402
6/1/15 1251	5	MM.	0/10	0/10	0/10	0/10	7.91	7.90	8.2	7.3	25.4	24.6	413
6/2/15 1255	6	MGM	0/10 IP	0/10	0/10	0/10	7.98	7.98	8.3	7.8	24.8	25.0	406
6/3/15 1250	7	KS	0/10	0/10	0/10	0/10		8.08		8.1		24.7	

OBSERVATION KEY

N = Normal
P = Pale
Imm = Immobilized
PM = Particulate Matter
Err = Erratic Swimming
TE = Technician error

REVIEWED BY: Mallu W. Hunter

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OU2-SW02

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: D 50%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1340	0	KS	0/10	0/10	0/10	0/10	7.80		8.4		25.0		473
5/28/15 1227	1	MW	0/10	0/10	0/10	0/10	7.86	8.10	8.6	7.7	24.5	24.4	476
5/29/15 1331	2	KS	0/10	0/10	0/10	0/10	7.98	7.89	8.4	7.4	24.4	24.5	482
5/30/15 1348	3	MGM	0/10	0/10	0/10	0/10	7.95	8.08	8.4	8.2	24.6	24.6	479
5/31/15 1225	4	MP.	0/10	0/9 TE MP. 5/31/15	0/10	0/10	7.83	8.13	8.3	7.9	24.8	25.1	476
6/1/15 1251	5	MP	0/10	0/9	0/10	0/10	7.95	7.96	8.2	7.3	25.4	24.6	480
6/2/15 1255	6	MGM	0/10	0/9	0/10	0/10	7.94	8.05	8.3	7.9	24.8	25.1	474
6/3/15 1250	7	KS	0/10	0/9	0/10	0/10		8.21		8.4		24.8	

OBSERVATION KEY

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P = Pale	Err = Erratic Swimming
Imm = Immobilized	TE = Technician error

REVIEWED BY: Marla Wilson

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

QU2-SW02

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: E 100%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1340	0	KS	0/10	0/10	0/10	0/10	7.77		8.8		25.0		626
5/28/15 1227	1	mm	0/10	0/10	0/10	0/10	7.85	8.12	7.8	7.8	24.7	24.6	628
5/29/15 1331	2	KS	0/10	0/10	0/10	0/10	7.95	8.17	8.7	8.1	24.3	24.5	636
5/30/15 1348	3	MGM	0/10	0/9 T.E. 1P	0/10	0/9 T.E.	7.94	8.42	8.6	9.3	24.7	24.8	627
5/31/15 1225	4	MP.	0/10	0/9	0/10	0/9	7.76	8.40	8.3	8.7	24.7	25.1	621
6/1/15 1251	5	MP	0/10	0/9	0/10	0/9	7.82	8.23	8.7	7.9	25.1	24.7	625
6/2/15 1255	6	MGM	0/10	0/9 1P	0/10	0/9	7.86	8.38	9.1	8.7	24.5	25.6	621
6/3/15 1250	7	KS	0/10	0/9 1P	0/10	0/9		8.50		9.2		25.0	

OBSERVATION KEY

N = Normal	PM = Particulate Matter
P = Pale	Err = Erratic Swimming
Imm = Immobilized	TE = Technician error

REVIEWED BY: Mailee W Hoon

DATE: 6/9/15

GLEC

FATHEAD MINNOW CHRONIC TOXICITY TEST - WEIGHT DATA

OUZ-SWOZ 10511

TEST MATERIAL: Enviro Ecology	MODEL OF DRYING OVEN: Blue M
PROJECT NUMBER: 5135-00	OVEN TEMPERATURE (°C): 60
TEST SPECIES: *Pimephales promelas*	DRYING DURATION (Hours): 24
TEST DATE: 5/27/15 - 6/3/15	DATE/TIME IN: 6/3/15 1349
WEIGH DATE: 6/8/15	DATE/TIME OUT: 6/4/15 1400
TECH INITIALS: MP.	
QC INITIALS: MLV	DESSICATOR #: 186
	DATE/TIME IN: 6/4/15 1400
	DATE/TIME OUT: 6/8/15 1327

Treatment Level	Replicate	A Weight of Pan and Fry (g)	B Weight of Oven-Dried Pan (g)	C Number of Fry Weighed
Control	1	0.841060	0.836360	10
	2	0.833888	0.833560	10
	3	0.841000	0.83629	10
	4	0.84912	0.843960	9
A 6.25%	1	0.846900	0.84200	10
	2	0.850000	0.845114	10
	3	0.827070	0.821888	8
	4	0.837040	0.831880	10
B 12.5%	1	0.860277	0.857667	10
	2	0.873444	0.860798	10
	3	0.860256	0.858000	9
	4	0.858668	0.853560	10
C 25%	1	0.851630	0.847060	10
	2	0.832839	0.823260	10
	3	0.854668	0.850090	10
	4	0.848425	0.843530	10
D 50%	1	0.843980	0.839460	10
	2	0.827890	0.822850	9 ITE
	3	0.840770	0.835720	10
	4	0.829000	0.823920	10
E 100%	1	0.836570	0.83119	10
	2	0.843830	0.839839	9 ITE
	3	0.853260	0.846710	10
	4	0.842840	0.836630	9 ITE

Test Material/Client: ou2-sw02 Environmental Ecology

Tech Intitals: MWG

Project Number: 5135-00

QC Initials: MP. Gelais

Test Dates: 5/27/2015-6/3/2015

GLC Numbers: 10511

Pos ID	Rep	Group	Conc.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total Wgt(mg)	Tare Wgt (mg)	Wgt Count	
1	1	MH control	con	10				10			10	0.84106	0.83636	10	
2	2	MH control	con	10				10			10	0.83888	0.83356	10	
3	3	MH control	con	10				10			10	0.84100	0.83629	10	
4	4	MH control	con	10				9			9	0.84912	0.84396	10	why not 9?
5	1	A	6.25%	10				10			10	0.84690	0.84200	10	
6	2	A	6.25%	10				10			10	0.85000	0.84514	10	
7	3	A	6.25%	10				8			8	0.82707	0.82188	10	why not 8?
8	4	A	6.25%	10				10			10	0.83704	0.83188	10	
9	1	B	12.50%	10				10			10	0.86277	0.85767	10	
10	2	B	12.50%	10				10			10	0.87344	0.86798	10	
11	3	B	12.50%	10				9			9	0.86256	0.85800	10	why not 9?
12	4	B	12.50%	10				10			10	0.85868	0.85356	10	
13	1	C	25%	10				10			10	0.85163	0.84706	10	
14	2	C	25%	10				10			10	0.82839	0.82326	10	
15	3	C	25%	10				10			10	0.85468	0.85009	10	
16	4	C	25%	10				10			10	0.84825	0.84353	10	
17	1	D	50%	10				10			10	0.84398	0.83946	10	
18	2	D	50%	9				9			9	0.82789	0.82285	9	
19	3	D	50%	10				10			10	0.84077	0.83572	10	
20	4	D	50%	10				10			10	0.82900	0.82392	10	
21	1	E	100%	10				10			10	0.83657	0.83119	10	
22	2	E	100%	9				9			9	0.84383	0.83839	9	
23	3	E	100%	10				10			10	0.85326	0.84671	10	
24	4	E	100%	9				9			9	0.84284	0.83663	9	

Test: LF-Larval Fish Growth and Survival Test		Test ID: 511fh515	
Species: PP-Pimephales promelas		Protocol: EPAFW02-EPA/821/R-02-013	
Sample ID: GLC # 10511		Sample Type: EFFLUENT	
Start Date: 5/27/2015	End Date: 6/3/2015	Lab ID: -GREAT LAKES ENVIRONMENTAL CENTER	

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total Wgt pa	Wgt of pan(n	Wgt Count 7 day
	1	1	MH con	10				10			10	0.84106	0.83636	10
	2	2	MH con	10				10			10	0.83888	0.83356	10
	3	3	MH con	10				10			10	0.841	0.83629	10
	4	4	MH con	10				9			9	0.84912	0.84396	10
	5	1	6.25	10				10			10	0.8469	0.842	10
	6	2	6.25	10				10			10	0.85	0.84514	10
	7	3	6.25	10				8			8	0.82707	0.82188	10
	8	4	6.25	10				10			10	0.83704	0.83188	10
	9	1	12.5	10				10			10	0.86277	0.85767	10
	10	2	12.5	10				10			10	0.87344	0.86798	10
	11	3	12.5	10				9			9	0.86256	0.858	10
	12	4	12.5	10				10			10	0.85868	0.85356	10
	13	1	25	10				10			10	0.85163	0.84706	10
	14	2	25	10				10			10	0.82839	0.82326	10
	15	3	25	10				10			10	0.85468	0.85009	10
	16	4	25	10				10			10	0.84825	0.84353	10
	17	1	50	10				10			10	0.84398	0.83946	10
	18	2	50	9				9			9	0.82789	0.82285	9
	19	3	50	10				10			10	0.84077	0.83572	10
	20	4	50	10				10			10	0.829	0.82392	10
	21	1	100	10				10			10	0.83657	0.83119	10
	22	2	100	9				9			9	0.84383	0.83839	9
	23	3	100	10				10			10	0.85326	0.84671	10
	24	4	100	9				9			9	0.84284	0.83663	9

Comments: Ecology Envoronmental OU2-SW02 FHM chronic growth and survival May 201

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/27/2015	Test ID:	511fh515	Sample ID:	GLC # 10511
End Date:	6/3/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP-Pimephales promelas
Comments:	Ecology Envoronmental OU2-SW02 FHM chronic growth and survival May 201				

Conc-%	1	2	3	4
MH con	1.0000	1.0000	1.0000	0.9000
6.25	1.0000	1.0000	0.8000	1.0000
12.5	1.0000	1.0000	0.9000	1.0000
25	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
MH con	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4		
6.25	0.9500	0.9744	1.3358	1.1071	1.4120	11.411	4	17.50	10.00
12.5	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	18.00	10.00
25	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00
50	1.0000	1.0256	1.4098	1.4033	1.4120	0.307	4	18.50	10.00
100	1.0000	1.0256	1.4077	1.4033	1.4120	0.356	4	17.00	10.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.74987	0.916	-1.9981	4.75286
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		0
Treatments vs MH con				

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	5/27/2015	Test ID:	511fh515	Sample ID:	GLC # 10511
End Date:	6/3/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP-Pimephales promelas
Comments:	Ecology Envoronmental OU2-SW02 FHM chronic growth and survival May 201				

Conc-%	1	2	3	4
MH con	0.4700	0.5320	0.4710	0.5160
6.25	0.4900	0.4860	0.5190	0.5160
12.5	0.5100	0.5460	0.4560	0.5120
25	0.4570	0.5130	0.4590	0.4720
50	0.4520	0.5600	0.5050	0.5080
100	0.5380	0.6044	0.6550	0.6900

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
MH con	0.4972	1.0000	0.4972	0.4700	0.5320	6.350	4			
6.25	0.5027	1.0111	0.5027	0.4860	0.5190	3.412	4	-0.194	2.410	0.0684
12.5	0.5060	1.0176	0.5060	0.4560	0.5460	7.352	4	-0.308	2.410	0.0684
25	0.4752	0.9558	0.4752	0.4570	0.5130	5.477	4	0.776	2.410	0.0684
50	0.5063	1.0181	0.5063	0.4520	0.5600	8.713	4	-0.317	2.410	0.0684
100	0.6219	1.2506	0.6219	0.5380	0.6900	10.617	4	-4.393	2.410	0.0684

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.98342	0.916	-0.2694	0.23591
Bartlett's Test indicates equal variances (p = 0.38)	5.33436	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs MH con	100	>100		0	0.06837	0.13749	0.01085	0.00161	0.00106	5, 18

GLEC

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

TEST MATERIAL: OU2-SW03 Environmental Ecology | TYPE OF TEST: Regulatory | DILUTION WATER: Mod Hard

PROJECT NUMBER: 5135-00 | INCUBATOR NUMBER: 34 | SHELF NUMBER: 4 | TEST TEMPERATURE: 25 ± 1°C

TEST SPECIES: *P. promelas* | LIGHT INTENSITY (ft-c): DAY 0/ 59.8 & 91 DAY | PHOTOPERIOD: 16:8

FRY AGE/SOURCE: <24 hours; ABS 5.27.15 | NUMBER FRY/CHAMBER: 10

TREATMENT LEVEL: Mod Hard Control

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD / NUMBER ALIVE				pH 6.00 - 9.00			DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)			TEMPERATURE ±1 (°C)			SP CONDUCTANCE (µS/cm)		Mod Hard # / AM Feeding Time
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	METER ID	NEW	OLD	METER ID	NEW	OLD	METER ID	NEW	METER ID	GLC # / PM Feeding Time
5/27/15 1429	0	KS	0/10	0/10	0/10	0/10	7.96		203	8.3		175	24.4		175	342	175	MH# 10513 GLC# 2455 1545 MW
5/28/15 1338	1	MW	0/10	0/10	0/10	0/10	7.91	7.80	203	8.3	7.5	175	24.4	24.5	42	331	175	MH# 2456 GLC# 10512 CEC COMP 1515 MW
5/29/15 1440	2	KS	0/10	0/10	0/10	0/10	7.84	7.74	203	8.5	7.3	175	24.5	24.8	42	339	175	MH# 2458 GLC# 10512 *342 KS 1511 KS
5/30/15 1438	3	MM	0/10	0/10 1P	0/10	0/10	7.77	7.83	203	~~7.7~~ 8.5 5/31/15 MW	7.4	175	24.4	25.0	42	335	175	MH# 2459 GLC# 10512 DS 750 1632 MM
5/31/15 1302	4	MP	0/10	0/10	0/10	0/10	7.80	7.94	203	8.5	7.6	175	24.1	25.1	40	344	175	MH# 24160 GLC# 10512 DS 750 1415 MP
6/1/15 1434	5	KS	0/10	0/10	0/10	0/10	8.00	7.66	203	8.4	6.6	175	24.6	24.7	175	337	175	MH# 24161 GLC# 10512 MM 838 KS 1603
6/2/15 1345	6	MP	0/10	0/10	0/10	0/10	7.99	7.91	203	8.4	7.7	175	24.5	25.4	42	329	175	MH# 24162 GLC# 10512 855 MM 1524 MP
6/3/15 1352	7	KS	0/10	0/10	0/10	0/10		7.84	203		7.3	175		25.3	42			

OBSERVATION KEY

N = Normal | PM = Particulate Matter
P = Pale | Err = Erratic Swimming
Imm = Immobilized | TE = Technician error

REVIEWED BY: Mailei Wharton

DATE: 6/9/15

GLEC

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OU2-SW03

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: A 6.25 %

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1429	0	KS	0/10	0/10	0/10	0/10	7.91		8.3		24.7		355
5/28/15 1238	1	new	0/10	0/10	0/10	0/10	7.81	7.81	8.3	7.5	24.4	24.5	354
5/29/15 1440	2	KS	0/10	0/10	0/10	0/10	7.93	7.76	8.4	7.3	24.4	24.4	355
5/30/15 1438	3	MM	0/10	0/10	0/10 1F	0/10	7.92	7.82	8.5	7.5	24.4	24.7	351
5/31/15 1302	4	MP.	0/10	0/10	0/10	0/10	7.89	7.90	8.4	7.5	24.2	24.8	359
6/1/15 1434	5	KS	0/10	0/10	0/10	0/10	8.05	7.77	8.4	6.9	24.6	24.6	353
6/2/15 1345	6	MP.	0/10	0/10	0/10	0/10	8.01	7.90	8.4	7.5	24.10	24.8	347
6/3/15 1352	7	KS	0/10	0/10	0/10	0/10		7.84		7.4		24.8	

OBSERVATION KEY

N = Normal	PM = Particulate Matter
P = Pale	Err = Erratic Swimming
Imm = Immobilized	TE = Technician error

REVIEWED BY: Marla Wilkerson

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OU2- SW03

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: B 12.5%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1429	0	KS	0/10	0/10	0/10	0/10	7.91		8.3		24.6		374
5/28/15 1238	1	MW	0/10	0/10	0/10	0/10	7.85	7.76	8.4	7.3	24.6		373
5/29/15 1440	2	KS	0/10	0/10	0/10	0/10	7.90	7.75	8.4	7.4	24.2	24.5	374
5/30/15 1438	3	MBM	0/10	0/10	0/10	0/10	7.96	7.80	8.5	7.4	24.4	24.7	370
5/31/15 1302	4	MP.	0/10	0/10	0/10	0/10	7.93	7.86	8.4	7.3	24.2	24.7	378
6/1/15 1434	5	KS	0/10	0/10	0/10	0/10	8.00	7.74	8.5	6.9	24.4	24.3	372
6/2/15 1245	6	MP.	0/10	0/10	0/10	0/10	8.02	7.84	8.4	7.5	24.3	25.0	368
6/3/15 1352	7	KS	0/10	0/10	0/10	0/10		7.76		7.2		24.9	

OBSERVATION KEY

N = Normal	PM = Particulate Matter
P = Pale	Err = Erratic Swimming
Imm = Immobilized	TE = Technician error

Revised: 2/3/2012

REVIEWED BY: Mailee W Lee

DATE: 6/9/15

GLEC

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OUZ-SW03

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: C 25%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1429	0	KS	0/10	0/10	0/10	0/10	7.88		8.4		24.7		410
5/28/15 1238	1	mw	0/10	0/10	0/10	0/10	7.87	7.90	8.4	7.2	24.6	24.5	409
5/29/15 1440	2	KS	0/10	0/10	0/10	0/10	7.95	7.74	8.4	7.2	24.2	24.3	410
5/30/15 ~~1348~~	3	MGM	0/10 IP	0/10	0/10	0/10 *	7.98	7.70	8.5	7.4	24.5	24.5	409
5/31/15 1302	4	mp.	0/10	0/10	0/10	0/10	7.93	7.91	8.4	7.3	24.3	24.8	417
6/1/15 1434	5	KS	0/10	0/10	0/10	0/10	8.03	7.82	8.3	6.9	24.8	24.6	412
6/2/15 1345	6	mp.	0/10	0/10	0/10	0/10	7.99	7.90	8.4	7.4	24.5	24.7	407
6/3/15 1352	7	KS	0/10	0/10	0/10	0/10		7.80		7.3		24.8	

5/30/15 MGM 1438

OBSERVATION KEY

N = Normal
P = Pale
Imm = Immobilized
PM = Particulate Matter
Err = Erratic Swimming
TE = Technician error

*5/30/15 MGM "1" Fish Sucked to top of tube, but was able to save

Revised: 2/3/2012

REVIEWED BY: Mailee Wyborn

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

QUZ-SW03

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: D 50%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1429	0	KS	0/10	0/10	0/10	0/10	7.85		8.5		24.7		483
5/28/15 1238	1	MWS	0/10	0/10	0/10	0/10	7.87	7.93	8.4	7.4	24.6	24.5	482
5/29/15 1440	2	KS	0/10	0/10	0/10	0/10	7.96	7.79	8.5	7.1	24.7	24.4	486
5/30/15 1435	3	MGM	0/10	0/10	0/10	0/10	7.98	7.98	8.5	7.5	24.5	24.4	484
5/31/15 1302	4	MP	0/10	0/10	0/10	0/10	7.93	7.99	8.4	7.3	24.3	24.4	484
6/1/15 1434	5	KS	0/10	0/10	0/10	0/10	7.98	7.98	8.4	7.2	24.6	24.2	484
6/2/15 1345	6	MP	0/10	0/10	0/10	0/10	7.95	7.97	8.5	7.6	24.1	25.1	482
6/3/15 1352	7	KS	0/10	0/10	0/10	0/10		7.87		7.2		25.0	

OBSERVATION KEY

N = Normal	PM = Particulate Matter
P = Pale	Err = Erratic Swimming
Imm = Immobilized	TE = Technician error

Revised: 2/3/2012

REVIEWED BY: Maile Weber

DATE: 6/9/15

FATHEAD MINNOW 7-DAY STATIC RENEWAL CHRONIC TOXICITY TEST

OU2-SW03

TEST MATERIAL: Environmental Ecology

PROJECT NUMBER: 5135-00

TREATMENT LEVEL: E 100%

DATE / TIME	TEST DAY	INITIALS	NUMBER DEAD/NUMBER ALIVE				pH 6.00 - 9.00		DISSOLVED OXYGEN New: 6.0-10.0 Old: ≤ 4.0 (mg/L)		TEMPERATURE ±1 (°C)		SP CONDUCTANCE (µS/cm)
			REP 1	REP 2	REP 3	REP 4	NEW	OLD	NEW	OLD	NEW	OLD	NEW
5/27/15 1429	0	LS	0/10	0/10	0/10	0/10	7.74		8.7		24.7		631
5/28/15 1238	1	MW	0/10	0/10	0/10	0/10	7.82	8.08	7.1	7.5	24.8	24.6	627
5/29/15 1440	2	KS	0/10	0/10	0/10	0/10	7.84	8.00	9.5	7.3	25.0	24.8	635
5/30/15 1438	3	MM	0/10	0/10	0/10	0/10	7.97	8.10	8.6	7.7	24.6	24.5	633
5/31/15 1302	4	MP	0/10	0/10	0/10	0/10	7.88	8.17	8.4	7.6	24.3	24.9	629
6/1/15 1434	5	KS	0/10	0/10	0/10	0/10	7.80	8.08	8.6	7.3	24.8	24.2	636
6/2/15 1345	6	MP	0/10	0/10	0/10	0/10	7.89	8.10	8.4	7.8	24.4	25.1	634
6/3/15 1252	7	KS	0/10	0/10	0/10	0/10		8.12		7.7		25.2	

OBSERVATION KEY

N = Normal	PM = Particulate Matter
P = Pale	Err = Erratic Swimming
Imm = Immobilized	TE = Technician error

Revised: 2/3/2012

REVIEWED BY: Mandy Wilson

DATE: 6/9/15

GLEC

FATHEAD MINNOW CHRONIC TOXICITY TEST - WEIGHT DATA

OU2-SW03 10512

TEST MATERIAL: Environ. Ecology	MODEL OF DRYING OVEN: Blue M
PROJECT NUMBER: 5135-00	OVEN TEMPERATURE (°C): 60
TEST SPECIES: *Pimephales promelas*	DRYING DURATION (Hours): 24
TEST DATE: 5/27/15 - 6/3/15	DATE/TIME IN: 6/3/15 1349
WEIGH DATE: 6/8/15	DATE/TIME OUT: 6/4/15 1400
TECH INITIALS: MD.	
QC INITIALS: MLV	DESSICATOR #: 1810
	DATE/TIME IN: 6/4/15 1400
	DATE/TIME OUT: 6/8/15 1402

Treatment Level	Replicate	A Weight of Pan and Fry (g)	B Weight of Oven-Dried Pan (g)	C Number of Fry Weighed
Control	1	0.83714	0.832609	10
	2	0.84418	0.839160	10
	3	0.84912	0.844442	10
	4	0.82111	0.816637	10
A 6.25%	1	0.838051	0.833888	10
	2	0.83 849 (MD 6/4/15) (~~0.83376~~)	0.825888	10
	3	0.85797	0.853112	10
	4	0.816271	0.857167	10
B 12.5%	1	0.85775	0.85273	10
	2	0.83379	0.82934	10
	3	0.84043	0.835916	10
	4	0.84568	0.84117	10
C 25%	1	0.85104	0.846184	10
	2	0.837747	0.833274	10
	3	0.84399 (MD 6/8/15)	0.838394	10
	4	0.816911	0.816480	10
D 50%	1	0.84195	0.837111	10
	2	0.856650	0.855245	10
	3	0.84433	0.83958	10
	4	0.852888	0.848345	10
E 100%	1	0.835509	0.832953	10
	2	0.837751	0.833238	10
	3	0.84037	0.835531	10
	4	0.838167	0.833344	10

Test Material/Client: ou2-sw03 Environmental Ecology

Tech Intitals: MWG

Project Number: 5135-00

QC Initials: MD 6/9/15

Test Dates: 5/27/2015-6/3/2015

GLC Numbers: 10512

Pos ID	Rep	Group	Conc.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total Wgt(mg)	Tare Wgt (mg)	Wgt Count
1	1	MH control	con	10				10			10	0.83714	0.83269	10
2	2	MH control	con	10				10			10	0.84418	0.83960	10
3	3	MH control	con	10				10			10	0.84912	0.84442	10
4	4	MH control	con	10				10			10	0.82111	0.81637	10
5	1	A	6.25%	10				10			10	0.83851	0.83388	10
6	2	A	6.25%	10				10			10	0.83049	0.82588	10
7	3	A	6.25%	10				10			10	0.85797	0.85312	10
8	4	A	6.25%	10				10			10	0.86271	0.85767	10
9	1	B	12.50%	10				10			10	0.85775	0.85273	10
10	2	B	12.50%	10				10			10	0.83379	0.82934	10
11	3	B	12.50%	10				10			10	0.84043	0.83596	10
12	4	B	12.50%	10				10			10	0.84568	0.84117	10
13	1	C	25%	10				10			10	0.85104	0.84684	10
14	2	C	25%	10				10			10	0.83747	0.83274	10
15	3	C	25%	10				10			10	0.84399	0.83894	10
16	4	C	25%	10				10			10	0.86911	0.86480	10
17	1	D	50%	10				10			10	0.84195	0.83711	10
18	2	D	50%	10				10			10	0.85650	0.85245	10
19	3	D	50%	10				10			10	0.84433	0.83958	10
20	4	D	50%	10				10			10	0.85288	0.84845	10
21	1	E	100%	10				10			10	0.83509	0.82953	10
22	2	E	100%	10				10			10	0.83751	0.83238	10
23	3	E	100%	10				10			10	0.84037	0.83531	10
24	4	E	100%	10				10			10	0.83867	0.83344	10

Test: LF-Larval Fish Growth and Survival Test		Test ID: 512fh515	
Species: PP-Pimephales promelas		Protocol: EPAFW02-EPA/821/R-02-013	
Sample ID: GLC # 10512		Sample Type: EFFLUENT	
Start Date: 5/27/2015	End Date: 6/3/2015	Lab ID: -GREAT LAKES ENVIRONMENTAL CENTER	

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total Wgt pa	Wgt of pan(n	Wgt Count 7 day
	1	1	MH con	10				10			10	0.83714	0.83269	10
	2	2	MH con	10				10			10	0.84418	0.8396	10
	3	3	MH con	10				10			10	0.84912	0.84442	10
	4	4	MH con	10				10			10	0.82111	0.81637	10
	5	1	6.25	10				10			10	0.83851	0.83388	10
	6	2	6.25	10				10			10	0.83049	0.82588	10
	7	3	6.25	10				10			10	0.85797	0.85312	10
	8	4	6.25	10				10			10	0.86271	0.85767	10
	9	1	12.5	10				10			10	0.85775	0.85273	10
	10	2	12.5	10				10			10	0.83379	0.82934	10
	11	3	12.5	10				10			10	0.84043	0.83596	10
	12	4	12.5	10				10			10	0.84568	0.84117	10
	13	1	25	10				10			10	0.85104	0.84684	10
	14	2	25	10				10			10	0.83747	0.83274	10
	15	3	25	10				10			10	0.84399	0.83894	10
	16	4	25	10				10			10	0.86911	0.8648	10
	17	1	50	10				10			10	0.84195	0.83711	10
	18	2	50	10				10			10	0.8565	0.85245	10
	19	3	50	10				10			10	0.84433	0.83958	10
	20	4	50	10				10			10	0.85288	0.84845	10
	21	1	100	10				10			10	0.83509	0.82953	10
	22	2	100	10				10			10	0.83751	0.83238	10
	23	3	100	10				10			10	0.84037	0.83531	10
	24	4	100	10				10			10	0.83867	0.83344	10

Comments: Ecology Envoronmental OU2-SW03 FHM chronic growth and survival May 201

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/27/2015	Test ID:	512fh515	Sample ID:	GLC # 10512
End Date:	6/3/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP-Pimephales promelas
Comments:	Ecology Envoronmental OU2-SW03 FHM chronic growth and survival May 201				

Conc-%	1	2	3	4
MH con	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
MH con	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4		
6.25	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00
12.5	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00
25	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00
50	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00
100	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00

Auxiliary Tests				Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)				1	0.916		
Equality of variance cannot be confirmed							
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**			
Steel's Many-One Rank Test	100	>100		0			
Treatments vs MH con							

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	5/27/2015	Test ID:	512fh515	Sample ID:	GLC # 10512
End Date:	6/3/2015	Lab ID:	-GREAT LAKES ENVIRONM	Sample Type:	EFFLUENT
Sample Date:		Protocol:	EPAFW02-EPA/821/R-02-01	Test Species:	PP-Pimephales promelas
Comments:	Ecology Envoronmental OU2-SW03 FHM chronic growth and survival May 201				

Conc-%	1	2	3	4
MH con	0.4450	0.4580	0.4700	0.4740
6.25	0.4630	0.4610	0.4850	0.5040
12.5	0.5020	0.4450	0.4470	0.4510
25	0.4200	0.4730	0.5050	0.4310
50	0.4840	0.4050	0.4750	0.4430
100	0.5560	0.5130	0.5060	0.5230

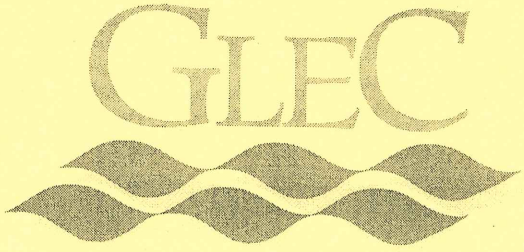
			Transform: Untransformed					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
MH con	0.4618	1.0000	0.4618	0.4450	0.4740	2.831	4			
6.25	0.4783	1.0357	0.4783	0.4610	0.5040	4.249	4	-0.840	2.410	0.0474
12.5	0.4613	0.9989	0.4613	0.4450	0.5020	5.915	4	0.025	2.410	0.0474
25	0.4573	0.9903	0.4573	0.4200	0.5050	8.568	4	0.229	2.410	0.0474
50	0.4517	0.9783	0.4517	0.4050	0.4840	7.923	4	0.509	2.410	0.0474
100	0.5245	1.1359	0.5245	0.5060	0.5560	4.219	4	-3.193	2.410	0.0474

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.96584	0.916	0.24078	-0.5744
Bartlett's Test indicates equal variances (p = 0.58)	3.80799	15.0863		

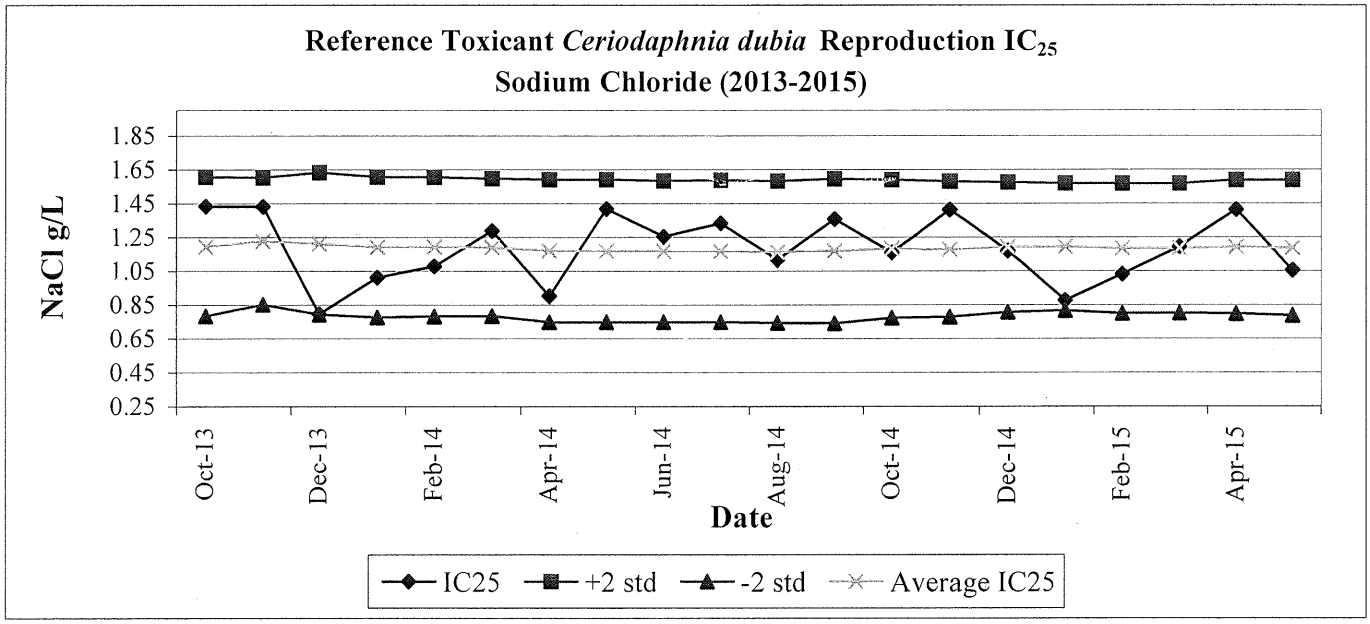
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs MH con	100	>100		0	0.04736	0.10256	0.00291	0.00077	0.01637	5, 18

Appendix B

Reference Toxicant Data

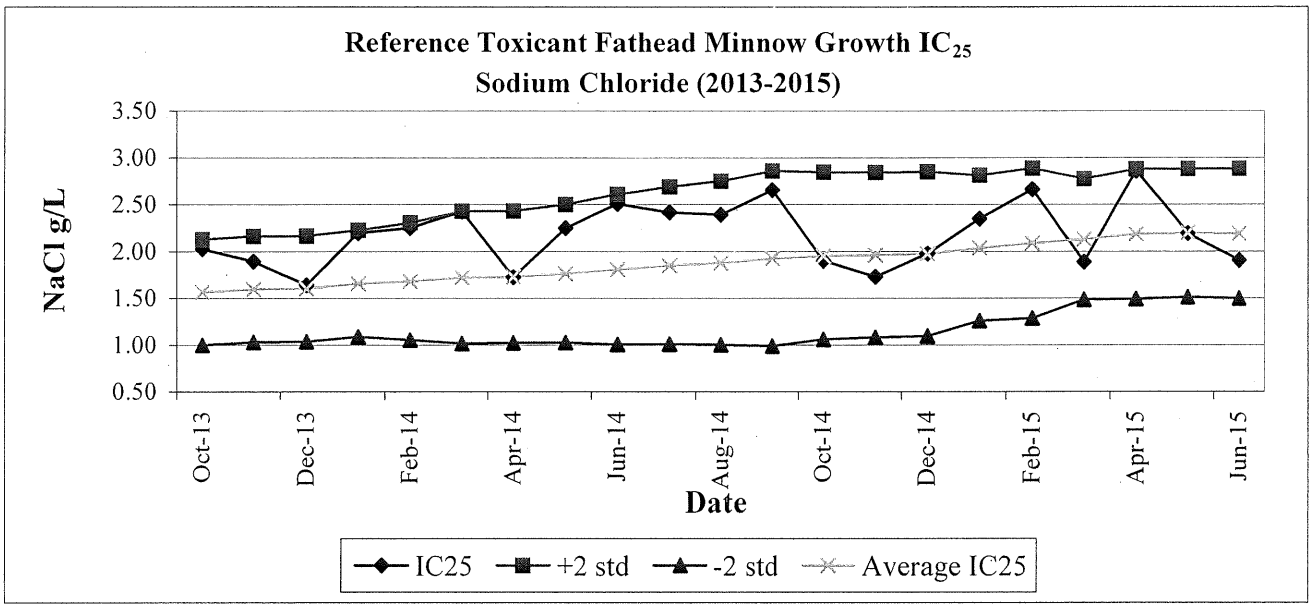


Great Lakes Environmental Center



7-Day Reproduction Toxicity Data for *Ceriodaphnia dubia*

Date	Control Survival (%)	Control Reproduction (mean)	IC_{25} (g/L NaCl)	Average IC_{25} (g/L NaCl)	+2 std	-2 std
January 1, 2015	100.0	29.9	0.88	1.19	1.57	0.82
February 3, 2015	90.0	22.8	1.03	1.18	1.57	0.80
March 10, 2015	100.0	18.6	1.19	1.18	1.57	0.80
April 23, 2015	100.0	24.2	1.41	1.19	1.59	0.80
May 21, 2015	100.0	19.2	1.05	1.19	1.59	0.79



7-Day Reproduction Toxicity Data for Fathead Minnow

Date	Control Survival (%)	Control Growth (mean)	IC_{25} (g/L NaCl)	Average IC_{25} (g/L NaCl)	+2 std	-2 std
February 2, 2015	100.0	0.400	2.66	2.09	2.89	1.28
March 17, 2015	100.0	0.489	1.89	2.13	2.77	1.48
April 10, 2015	100.0	0.504	2.85	2.18	2.88	1.49
May 11, 2015	100.0	0.413	2.19	2.20	2.88	1.51
June 1, 2015	97.5	0.451	1.90	2.19	2.88	1.50

F

ProUCL Output Summaries

Exposure point concentrations (EPCs) for contaminants in surface soil (0 to 12 inches below ground surface) and surface sediment (0 to 6 inches below the sediment-water interface) were calculated from the available data using ProUCL version 5 software. ProUCL version 5 also was used for outlier analysis and to create probability plots for the purpose to examining dataset distributions. For contaminant datasets with no outliers, the 95% upper confidence limit (UCL) on the average concentration was used as the EPC in the Baseline Ecological Risk Assessment (BERA). For datasets with outliers, the weighted average of the 95% UCL and outliers was used as the BERA EPC. This appendix provides a summary of the ProUCL output for surface sediment (see Tables F-1 and F-2) and surface soil (see Tables F-3 and F-4), including the 95% UCL for each dataset, outliers for each dataset, and calculation of the weighted average of the 95% UCL and outliers for datasets with outliers. Because sample size was limited for surface water and fish tissue, 95% UCLs were not calculated for these media. Instead, the maximum detected concentration of each contaminant was used as the EPC in the BERA.

Table F-1. Summary of ProUCL Output for Surface Sediment (0 to 6 inches), Baseline Ecological Risk Assessment (BERA), Eighteenmile Creek Operable Unit 2, Lockport, New York.

Analyte	Units	Number of Observations	Number of Detections	Mean of Detected	SD of Detected	Maximum Detected	Distribution (detects only)	UCL Statistic	UCL	Final EPC	EPC Source	Number of Outliers
Metals												
Aluminum	mg/kg	11	11	7215	2862	10600	Normal	95% Students-t UCL	8778	8778	95% UCL	0
Antimony	mg/kg	9	6	2.34	1.906	5.6	Normal	95% KM (t) UCL	2.783	5.39	Table F-2	2
Antimony	mg/kg	11	8	6.03	7.086	18.9	Approx. Normal	95% KM (t) UCL	8.044	8.044	95% UCL	0
Arsenic	mg/kg	87	87	5.645	2.793	14.4	Approx. lognormal	95% Modified-t UCL	6.15	7.19	Table F-2	4
Arsenic	mg/kg	91	91	6.704	6.26	50.5	Not Discernible	95% Chebyshev (Mean, Sd) UCL	9.565	9.565	95% UCL	0
Barium	mg/kg	10	10	86.12	39.34	138	Normal	95% Students-t UCL	108.9	125.1	Table F-2	1
Barium	mg/kg	11	11	104.4	71.14	287	Approx. Normal	95% Students-t UCL	143.3	143.3	95% UCL	0
Beryllium	mg/kg	11	11	0.417	0.154	0.68	Normal	95% Students-t UCL	0.502	0.502	95% UCL	0
Cadmium	mg/kg	11	10	1.329	0.574	2.2	Normal	95% KM (t) UCL	1.573	1.573	95% UCL	0
Chromium	mg/kg	88	88	26.93	17.77	84	Gamma	95% Approximate Gamma UCL	30.24	33.6	Table F-2	3
Chromium	mg/kg	91	91	30.42	25.87	146	Lognormal	95% Chebyshev (Mean, Sd) UCL	42.24	42.24	95% UCL	0
Cobalt	mg/kg	9	9	7.8	1.194	9.9	Normal	95% Students-t UCL	8.54	7.5	Table F-2	2
Cobalt	mg/kg	11	11	6.882	2.308	9.9	Approx. Normal	95% Students-t UCL	8.143	8.143	95% UCL	0
Copper	mg/kg	84	84	172.5	174.6	814	Lognormal	95% Chebyshev (Mean, Sd) UCL	255.5	476.2	Table F-2	7
Copper	mg/kg	91	91	399.6	1024	7900	Not Discernible	95% Chebyshev (Mean, Sd) UCL	867.3	867.3	95% UCL	0
Iron	mg/kg	11	11	19709	4786	26800	Normal	95% Students-t UCL	22,324	22,324	95% UCL	0
Lead	mg/kg	90	90	355	296.9	1430	Gamma	95% Approximate Gamma UCL	410.3	801.9	Table F-2	4
Lead	mg/kg	94	94	749	2699	25400	Approx. lognormal	95% Chebyshev (Mean, Sd) UCL	1963	1963	95% UCL	0
Manganese	mg/kg	10	10	461.7	157.6	789	Gamma	95% Adjusted Gamma UCL	581.1	672.8	Table F-2	1
Manganese	mg/kg	11	11	564.3	371.6	1590	Approx. lognormal	95% Students-t UCL	767.3	767.3	95% UCL	0
Mercury	mg/kg	12	12	0.874	0.732	2.5	Normal	95% Students-t UCL	1.253	1.63	Table F-2	1
Mercury	mg/kg	13	13	1.283	1.635	6.2	Gamma	95% Adjusted Gamma UCL	2.583	2.583	95% UCL	0
Nickel	mg/kg	11	11	25.93	9.545	38	Normal	95% Students-t UCL	31.14	31.14	95% UCL	0
Selenium	mg/kg	11	5	0.95	0.409	1.5	Normal	95% KM (t) UCL	0.866	0.866	95% UCL	0
Silver	mg/kg	11	10	1.119	0.671	2.4	Normal	95% KM (t) UCL	1.421	1.421	95% UCL	0
Thallium	mg/kg	10	7	0.18	0.0173	0.2	Normal	95% KM (t) UCL	0.197	0.48	Table F-2	1
Thallium	mg/kg	11	8	0.57	1.103	3.3	Not Discernible	97.5% KM (Chebyshev) UCL	2.266	2.266	95% UCL	0
Vanadium	mg/kg	11	11	14.26	4.37	18.7	Normal	95% Students-t UCL	16.65	16.65	95% UCL	0
Zinc	mg/kg	86	86	408.7	335.2	1600	Lognormal	95% Chebyshev (Mean, Sd) UCL	566.3	963.3	Table F-2	5
Zinc	mg/kg	91	91	814.4	2549	23600	Not Discernible	95% Chebyshev (Mean, Sd) UCL	1979	1979.0	95% UCL	0
Total PCBs												
Aroclor Sum (ND = 0)	mg/kg	90	79	3.567	5.86	25.9	Not Discernible	97.5% KM (Chebyshev) UCL	6.827	17.3	Table F-2	7
Aroclor Sum (ND = 0)	mg/kg	97	86	15.67	53.86	390	Not Discernible	97.5% KM (Chebyshev) UCL	46.2	46.2	95% UCL	0
Aroclor Sum (ND=0.5DL)	mg/kg	91	80	7.002	11.59	51.8	Approx. Normal	97.5% KM (Chebyshev) UCL	13.48	35.6	Table F-2	6
Aroclor Sum (ND=0.5DL)	mg/kg	97	86	32.46	148.90	1315	Not Discernible	97.5% KM (Chebyshev) UCL	118	118.0	95% UCL	0
Pesticides												
Aldrin	mg/kg	26	7	0.00872	0.0150	0.042	Gamma	95% GROS Adjusted Gamma UCL	0.0131	0.075	Table F-2	3
alpha-BHC	mg/kg	26	8	0.0059	0.0033	0.0086	Not Discernible	95% KM (BCA) UCL	0.0029	0.010	Table F-2	3
Endosulfan I	mg/kg	24	7	0.00347	0.0023	0.0071	Normal	95% KM (t) UCL	0.00179	0.024	Table F-2	5
beta-BHC	mg/kg	27	5	0.0527	0.056	0.14	Normal	95% KM (t) UCL	0.0216	0.19	Table F-2	2
Endosulfan II	mg/kg	27	5	0.0033	0.0031	0.008	Normal	95% KM (t) UCL	0.0013	0.013	Table F-2	2
cis-Chlordane	mg/kg	27	6	0.0104	0.0062	0.017	Normal	95% KM (t) UCL	0.00418	0.011	Table F-2	2
Σ DDT	mg/kg	26	16	0.0533	0.070	0.2	Gamma	95% Adjusted Gamma KM-UCL	0.0691	0.167	Table F-2	3
delta-BHC	mg/kg	27	6	0.00905	0.0106	0.024	Approx. Normal	95% KM (t) UCL	0.00418	0.031	Table F-2	2
Dieldrin	mg/kg	27	12	0.0322	0.0492	0.14	Lognormal	97.5% KM (Chebyshev) UCL	0.0586	0.129	Table F-2	2
Endosulfan sulfate	mg/kg	28	4	0.0224	0.0404	0.083	Approx. Normal	95% KM (t) UCL	0.009	0.019	Table F-2	1
Endrin	mg/kg	27	4	0.008	0.0058	0.013	Normal	95% KM (t) UCL	0.00254	0.036	Table F-2	2

Table F-1. Summary of ProUCL Output for Surface Sediment (0 to 6 inches), Baseline Ecological Risk Assessment (BERA), Eighteenmile Creek Operable Unit 2, Lockport, New York.

Analyte	Units	Number of Observations	Number of Detections	Mean of Detected	SD of Detected	Maximum Detected	Distribution (detects only)	UCL Statistic	UCL	Final EPC	EPC Source	Number of Outliers
Endrin aldehyde	mg/kg	29	4	0.0609	0.0729	0.15	Normal	95% KM (t) UCL	0.02	0.02	95% UCL	0
Endrin ketone	mg/kg	29	4	0.419	0.788	1.6	Approx. Normal	95% KM (t) UCL	0.164	0.164	95% UCL	0
gamma-BHC (lindane)	mg/kg	25	11	0.0102	0.0094	0.029	Normal	95% KM (t) UCL	0.00738	0.047	Table F-2	4
Heptachlor	mg/kg	28	4	0.089	0.161	0.33	Approx. Normal	95% KM (t) UCL	0.0354	0.053	Table F-2	1
Heptachlor epoxide	mg/kg	28	6	0.0075	0.0083	0.023	Normal	95% KM (t) UCL	0.00325	0.018	Table F-2	1
Methoxychlor	mg/kg	27	8	0.0435	0.0387	0.12	Normal	95% KM (t) UCL	0.0228	0.094	Table F-2	2
trans-Chlordane	mg/kg	25	5	0.0144	0.0062	0.021	Normal	95% KM (t) UCL	0.00534	0.059	Table F-2	4
PAHs												
HPAHs Sum(ND = 0)	mg/kg	26	26	8.575	11.1	37.77	Gamma	95% Adjusted Gamma UCL	14.61	161.9	Table F-2	3
HPAHs Sum(ND = 0)	mg/kg	29	29	156.4	707.3	3813	Lognormal	97.5% KM (Chebyshev) UCL	976.6	976.6	95% UCL	0
HPAHs Sum (ND = 0.5DL)	mg/kg	25	25	8.873	11.3	37.77	Gamma	95% Adjusted Gamma UCL	14.48	168.9	Table F-2	4
HPAHs Sum (ND = 0.5DL)	mg/kg	29	29	164.1	706.7	3813	Lognormal	97.5% KM (Chebyshev) UCL	983.7	983.7	95% UCL	0
LPAHs Sum (ND = 0)	mg/kg	26	25	1.596	2.16	7.32	Gamma	95% KM (Chebyshev) UCL	3.364	67.3	Table F-2	3
LPAHs Sum (ND = 0)	mg/kg	29	28	68.03	311	1645	Not Discernible	99% KM (Chebyshev) UCL	631.1	631.1	95% UCL	0
LPAHs Sum (ND = 0.5DL)	mg/kg	25	24	2.758	3.16	9.94	Not Discernible	97.5% KM (Chebyshev) UCL	6.578	76.4	Table F-2	4
LPAHs Sum (ND = 0.5DL)	mg/kg	29	28	75.6	311	1645	Not Discernible	99% KM (Chebyshev) UCL	639	639.0	95% UCL	0
Total PAHs (ND = 0)	mg/kg	26	26	10.11	13.1	43.36	Gamma	95% Adjusted Gamma UCL	17.3	228.6	Table F-2	3
Total PAHs (ND = 0)	mg/kg	29	29	222.1	1013	5458	Lognormal	97.5% KM (Chebyshev) UCL	1397	1397	95% UCL	0
Total PAHs (ND = 0.5DL)	mg/kg	25	25	11.58	13.9	43.54	Lognormal	95% Chebyshev (Mean, Sd) UCL	23.72	247.6	Table F-2	4
Total PAHs (ND = 0.5DL)	mg/kg	29	29	237.1	1013.0	5458	Lognormal	97.5% KM (Chebyshev) UCL	1411	1411	95% UCL	0
SVOCs												
2-Methylphenol	mg/kg	23	2	0.19	0.042	0.22	Not Discernible	95% KM (t) UCL	0.0497	0.22	Max. detect	0
4-Methylphenol	mg/kg	23	4	1.565	1.446	3.7	Normal	95% KM (t) UCL	0.631	0.631	95% UCL	0
Benzyl butyl phthalate	mg/kg	23	2	0.237	0.231	0.4	Not discernible	99% KM (Chebyshev) UCL	0.263	0.4	Max. detect	0
Bis(2-ethylhexyl)phthalate	mg/kg	21	7	0.866	0.653	1.9	Normal	95% KM (t) UCL	0.517	4.5	Table F-2	2
Bis(2-ethylhexyl)phthalate	mg/kg	23	9	4.745	9.095	28	Gamma	95% Adjusted Gamma KM-UCL	9.816	9.816	95% UCL	0
Carbazole	mg/kg	21	16	0.31	0.561	2.3	Approx. Gamma	95% Adjusted Gamma KM-UCL	0.66	10.3	Table F-2	2
Carbazole	mg/kg	23	18	9.997	37.600	160	Approx. lognormal	99% KM (Chebyshev) UCL	77.39	77.39	95% UCL	0
Dibenzofuran	mg/kg	21	11	0.21	0.466	1.6	Lognormal	97.5% KM (Chebyshev) UCL	0.594	12.0	Table F-2	2
Dibenzofuran	mg/kg	23	13	11.72	38.640	140	Not Discernible	99% KM (Chebyshev) UCL	68.19	68.2	95% UCL	0
Di-n-octylphthalate	mg/kg	23	4	0.0103	0.0022	0.013	Normal	95% KM (t) UCL	0.00391	0.00391	95% UCL	0
Total Organic Carbon (TOC)												
TOC	%	27	27	5.375	2.8540	11	Normal	95% Students-t UCL	6.312	6.776	Table F-2	1

Key:

BERA = baseline ecological risk assessment

UCL = upper confidence limit

KM = Kaplan-Meier

Shading = selected for use in BERA.

Table F-2. Calculation of Final Sediment EPC for Contaminant Datasets with Outliers, Eighteenmile Creek OU2 BERA.

Analyte	UCL (from Table F-1)		Outlier (mg/kg)							Final
	Value (mg/kg)	N	1	2	3	4	5	6	7	EPC[a]
Metals										
Antimony	2.783	9	18.9	15.3						5.4
Arsenic	6.15	87	50.5	26.9	25	16.6				7.2
Barium	108.9	10	287							125
Chromium	30.24	88	146	131	121					33.6
Cobalt	8.54	9	3	2.5						7.5
Copper	255.5	84	7900	4800	2640	2290	1720	1370	1150	476
Lead	410.3	90	25400	6840	3170	3040				802
Manganese	581.1	10	1590							673
Mercury	1.253	12	6.2							1.63
Thallium	0.197	10	3.3							0.48
Zinc	566.3	86	23600	5190	4710	3180	2280			963
PCBs										
Aroclor Sum (ND = 0)	6.827	90	390	237	201	84.7	66	49	37.7	17.3
Aroclor Sum (ND=0.5DL)	13.48	91	1315	328.5	314.5	108.5	85.82	79		35.6
PAHs										
HPAHs Sum(ND = 0)	14.61	26	3813	407.2	93.8					162
HPAHs Sum (ND = 0.5DL)	14.48	25	3813	407.2	223.5	93.8				169
LPAHs Sum (ND = 0)	3.364	26	1645	191.8	27.99					67.3
LPAHs Sum (ND = 0.5DL)	6.578	25	1645	191.8	185.7	27.99				76.4
Total PAHs (ND = 0)	17.3	26	5458	599	121.8					229
Total PAHs (ND = 0.5DL)	23.72	25	5458	599	409.2	121.8				248
Pesticides										
Aldrin	0.0131	26	1.5	0.19	0.155					0.075
alpha-BHC	0.0029	26	0.155	0.041	0.018					0.010
Endosulfan I	0.00179	24	0.17	0.155	0.15	0.15	0.027			0.024
beta-BHC	0.0216	27	2.9	2						0.189
Endosulfan II	0.0013	27	0.305	0.034						0.013
cis-Chlordane	0.00418	27	0.155	0.052						0.011
Σ DDT	0.0691	26	1.385	0.85	0.81					0.167
delta-BHC	0.00418	27	0.64	0.155						0.031
Dieldrin	0.0586	27	1.8	0.37						0.129
Endosulfan sulfate	0.009	28	0.305							0.019
Endrin	0.00254	27	0.53	0.44						0.036
gamma-BHC (lindane)	0.00738	25	0.61	0.3	0.16	0.155				0.047
Heptachlor	0.0354	28	0.55							0.053
Heptachlor epoxide	0.00325	28	0.43							0.018
Methoxychlor	0.0228	27	1.6	0.52						0.094
trans-Chlordane	0.00534	25	0.75	0.58	0.16	0.155				0.059
SVOCs										
Bis(2-ethylhexyl)phthalate	0.517	7	28	8.5						4.5
Carbazole	0.66	16	160	15						10.3
Dibenzofuran	0.594	11	140	10						12.0
Total Organic Carbon (TOC)										
TOC	6.312	27	19.3							6.776

Key:
BERA = baseline ecological risk assessment
EPC = exposure point concentration
N = number of observations
OU2 = Operable Unit 2
UCL = upper confidence limit
Shading = used in BERA (see Table F-1)

Notes:
a = Weighted average of UCL and outliers. Weighing factors are number of observations (N) for UCL and 1 for each outlier.

Table F-3. Summary of ProUCL Output for Surface Soil (0 to 1 foot), Baseline Ecological Risk Assessment, Eighteenmile Creek Operable Unit 2, Lockport, New York.

Analyte	Units	Number of Observations	Number of Detections	Mean of Detected	SD of Detected	Maximum Detected	Distribution (detects only)	UCL Statistic	UCL	EPC	EPC Source	Number of Outliers Removed
Metals												
Antimony	mg/kg	108	67	20.34	37.6	166	Not Discernible	97.5% KM (Chebyshev) UCL	31.4	31.4	97.5% UCL	0
Arsenic	mg/kg	105	105	12.85	9.043	40.1	Lognormal	95% Chebyshev (Mean, Sd) UCL	16.7	19.6	Table F-4	6
Arsenic	mg/kg	111	111	15.95	16.23	103	Lognormal	95% Chebyshev (Mean, Sd) UCL	22.66	22.66	95% UCL	0
Barium	mg/kg	104	103	227.4	337.8	1550	Not Discernible	95% KM (Chebyshev) UCL	369.2	457.7	Table F-4	4
Barium	mg/kg	108	107	321.9	599	3900	Not Discernible	95% KM (Chebyshev) UCL	569.4	569.4	95% UCL	0
Beryllium	mg/kg	95	93	0.453	0.192	1.1	Lognormal	95% KM (BCA) UCL	0.479	0.516	Table F-4	3
Beryllium	mg/kg	98	96	0.492	0.306	2.5	Approx. lognormal	95% KM (BCA) UCL	0.537	0.537	95% UCL	0
Cadmium	mg/kg	108	98	3.856	7.553	37.9	Not Discernible	97.5% KM (Chebyshev) UCL	7.877	7.877	95% UCL	0
Chromium	mg/kg	108	108	33.22	40.81	186	Not Discernible	95% Chebyshev (Mean, Sd) UCL	50.33	59.6	Table F-4	3
Chromium	mg/kg	111	111	42.95	73	505	Not Discernible	95% Chebyshev (Mean, Sd) UCL	73.15	73.15	95% UCL	0
Cobalt	mg/kg	104	103	7.568	4.257	20.5	Lognormal	95% KM (BCA) UCL	8.301	9.177	Table F-4	4
Cobalt	mg/kg	108	107	8.479	6.443	43.9	Lognormal	95% KM (BCA) UCL	9.458	9.458	95% UCL	0
Copper	mg/kg	106	106	274.9	582.3	3500	Approx. lognormal	95% Chebyshev (Mean, Sd) UCL	521.4	1400.3	Table F-4	5
Copper	mg/kg	111	111	1165	5376	51000	Not Discernible	95% Chebyshev (Mean, Sd) UCL	3389	3389	95% UCL	0
Lead	mg/kg	113	113	610.3	951.5	4340	Approx. lognormal	95% Chebyshev (Mean, Sd) UCL	1000	1176.3	Table F-4	3
Lead	mg/kg	116	116	796.7	1487	8600	Lognormal	95% Chebyshev (Mean, Sd) UCL	1398	1398	95% UCL	0
Manganese	mg/kg	105	105	617.4	460.9	2060	Gamma	95% Approximate Gamma UCL	704.6	761.9	Table F-4	3
Manganese	mg/kg	108	108	677.1	580.4	3310	Gamma	95% Approximate Gamma UCL	777	777	95% UCL	0
Mercury	mg/kg	104	99	0.867	1.772	8	Lognormal	97.5% KM (Chebyshev) UCL	1.89	2.33	Table F-4	4
Mercury	mg/kg	108	103	1.364	3.163	21.5	Approx. lognormal	97.5% KM (Chebyshev) UCL	3.166	3.166	97.5% UCL	0
Nickel	mg/kg	102	102	31.66	32.44	152	Approx. lognormal	95% Chebyshev (Mean, Sd) UCL	45.66	68.07	Table F-4	6
Nickel	mg/kg	108	108	54.85	115.2	909	Not Discernible	95% Chebyshev (Mean, Sd) UCL	103.2	103.2	95% UCL	0
Selenium	mg/kg	104	36	2.27	1.615	5.8	Not Discernible	95% KM (t) UCL	1.302	1.623	Table F-4	4
Selenium	mg/kg	108	40	3.041	2.833	11.5	Not Discernible	95% KM (t) UCL	1.762	1.762	95% UCL	0
Silver	mg/kg	101	56	1.371	2.197	9.6	Not Discernible	95% KM (Chebyshev) UCL	1.543	4.613	Table F-4	7
Silver	mg/kg	108	63	6.653	17.09	80.6	Not Discernible	97.5% KM (Chebyshev) UCL	11.98	11.98	97.5% UCL	0
Thallium	mg/kg	108	17	7.871	10.29	32.7	Gamma	95% Approximate Gamma KM-UCL	2.657	2.657	95% UCL	0
Vanadium	mg/kg	105	105	14.99	6.289	35	Gamma	95% Approximate Gamma UCL	16.04	17.27	Table F-4	3
Vanadium	mg/kg	108	108	16.24	10.95	103	Lognormal	95% Modified-t UCL	18.08	18.08	95% UCL	0
Zinc	mg/kg	112	112	1209	3154	21900	Lognormal	95% Chebyshev (Mean, Sd) UCL	2508	2508	95% UCL	0
Total PCBs												
Aroclor Sum (ND = 0)	mg/kg	118	60	0.643	1.118	4.7	Not Discernible	97.5% KM (Chebyshev) UCL	0.828	5.40	Table F-4	6
Aroclor Sum (ND = 0)	mg/kg	124	66	9.242	48.97	390	Not Discernible	97.5% KM (Chebyshev) UCL	25.13	25.13	97.5% UCL	0
Aroclor Sum (ND=0.5DL)	mg/kg	117	59	0.899	1.442	6.075	Approx. lognormal	95% KM (Chebyshev) UCL	0.936	6.49	Table F-4	7
Aroclor Sum (ND=0.5DL)	mg/kg	124	66	11.33	52.2	399.8	Not Discernible	97.5% KM (Chebyshev) UCL	27.65	27.65	97.5% UCL	0
Pesticides												
Aldrin	mg/kg	51	7	0.00404	0.00307	0.0096	Normal	95% KM (t) UCL	0.00124	0.00124	95% UCL	0
alpha-BHC	mg/kg	51	9	0.00581	0.00303	0.0093	Normal	95% KM (t) UCL	0.00202	0.00202	95% UCL	0
alpha-Endosulfan	mg/kg	49	8	0.00558	0.00514	0.016	Normal	95% KM (t) UCL	0.0019	0.0041	Table F-4	1
beta-BHC	mg/kg	50	2	0.00839	0.0108	0.016	Not Discernible	99% KM (Chebyshev) UCL	0.00541	0.00636	Table F-4	1
beta-Endosulfan	mg/kg	51	8	0.00834	0.0118	0.036	Approx. Normal	95% KM (t) UCL	0.0031	0.0031	95% UCL	0
cis-Chlordane	mg/kg	51	5	0.00756	0.00752	0.018	Normal	95% KM (t) UCL	0.00182	0.00182	95% UCL	0
Σ DDT	mg/kg	50	36	0.0515	0.0552	0.278	Gamma	95% Approximate Gamma KM-UCL	0.0537	0.184	Table F-4	1
delta-BHC	mg/kg	51	9	0.0026	0.00284	0.0085	Gamma	95% Approximate Gamma KM-UCL	0.00128	0.00128	95% UCL	0

Table F-3. Summary of ProUCL Output for Surface Soil (0 to 1 foot), Baseline Ecological Risk Assessment, Eighteenmile Creek Operable Unit 2, Lockport, New York.

Analyte	Units	Number of Observations	Number of Detections	Mean of Detected	SD of Detected	Maximum Detected	Distribution (detects only)	UCL Statistic	UCL	EPC	EPC Source	Number of Outliers Removed
Dieldrin	mg/kg	49	8	0.0133	0.00427	0.023	Approx. Normal	95% KM (t) UCL	0.00408	0.01706	Table F-4	2
Endosulfan sulfate	mg/kg	51	3	0.0108	0.0124	0.025	Normal	95% KM (t) UCL	0.00198	0.00198	95% UCL	0
Endrin	mg/kg	50	7	0.0092	0.00667	0.02	Normal	95% KM (t) UCL	0.00267	0.00654	Table F-4	1
Endrin aldehyde	mg/kg	50	3	0.0156	0.0124	0.03	Approx. Normal	95% KM (t) UCL	0.00264	0.004494	Table F-4	1
Endrin ketone	mg/kg	51	8	0.00694	0.00446	0.017	Approx. Normal	95% KM (t) UCL	0.00211	0.00211	95% UCL	0
gamma-BHC (lindane)	mg/kg	51	7	0.0033	0.00355	0.011	Approx. Normal	95% KM (t) UCL	0.00119	0.00119	95% UCL	0
Methoxychlor	mg/kg	50	13	0.0628	0.0508	0.18	Approx. Normal	95% KM (t) UCL	0.0285	0.0358	Table F-4	1
trans-Chlordane	mg/kg	51	4	0.0329	0.0449	0.1	Approx. Normal	95% KM (t) UCL	0.00658	0.00658	95% UCL	0
PAHs												
HPAHs Sum (ND = 0)	mg/kg	60	56	11.08	19.67	93.74	Lognormal	97.5% KM (Chebyshev) UCL	26.15	45.08	Table F-4	3
HPAHs Sum (ND = 0)	mg/kg	63	59	32.06	123.6	924	Lognormal	97.5% KM (Chebyshev) UCL	124.5	124.5	97.5% UCL	0
HPAHs Sum (ND = 0.5DL)	mg/kg	59	56	15.15	24.58	126	Lognormal	95% KM (Chebyshev) UCL	28.58	56.87	Table F-4	4
HPAHs Sum (ND = 0.5DL)	mg/kg	63	59	39.57	130.9	942	Lognormal	97.5% KM (Chebyshev) UCL	138	138	97.5% UCL	0
LPAHs Sum (ND = 0)	mg/kg	57	53	1.602	2.279	9.2	Lognormal	97.5% KM (Chebyshev) UCL	3.428	14.59	Table F-4	6
LPAHs Sum (ND = 0)	mg/kg	63	57	11.36	58.08	435.3	Lognormal	97.5% KM (Chebyshev) UCL	54.01	54.01	97.5% UCL	0
LPAHs Sum (ND = 0.5DL)	mg/kg	56	53	6.123	7.759	33.95	Not Discernible	95% KM (Chebyshev) UCL	10.55	29.37	Table F-4	7
LPAHs Sum (ND = 0.5DL)	mg/kg	63	57	16.55	58.35	435.3	Not Discernible	97.5% KM (Chebyshev) UCL	59.48	59.48	97.5% UCL	0
Total Organic carbon (TOC)												
TOC	%	10	10	14.56	10.2	36	Approx. Normal	95% Student's t-UCL	20.47	20.47	95% UCL	0

Key:

BERA = baseline ecological risk assessment

Shading = selected for use in BERA.

Table F-4. Calculation of Final Surface Soil EPC for Contaminant Datasets with Outliers, Eighteenmile Creek OU2 BERA.

Analyte	UCL (from Table F-3)		Outlier (mg/kg)							Final EPC[a]
	Value (mg/kg)	N	1	2	3	4	5	6	7	
Metals										
Arsenic	16.7	105	103	81.2	66	63.2	59.6	47.5		19.6
Barium	369.2	104	3900	2440	2360	2330				458
Beryllium	0.479	95	2.5	1.4	1.2					0.516
Chromium	50.33	108	505	411	264					59.6
Cobalt	8.301	104	43.9	34.9	25	24				9.177
Copper	521.4	106	51000	17600	15900	8250	7410			1400
Lead	1000	113	8600	7610	7240					1176.3
Manganese	704.6	105	3310	2630	2360					761.9
Mercury	1.89	104	21.5	11.6	10.8	10.8				2.33
Nickel	45.66	102	909	549	392	373	289	182		68.07
Selenium	1.302	104	11.5	10.7	10	7.7				1.62
Silver	1.543	101	80.6	66.2	65.6	49.8	48.2	19.2	12.8	4.61
Vanadium	16.04	105	103	39.8	38.1					17.3
Total PCBs										
Aroclor Sum (ND = 0)	0.828	118	390	80	38	28.4	23	12		5.40
Aroclor Sum (ND=0.5DL)	0.936	117	399.75	140	56	38.189	30.85	15	14.89	6.49
Pesticides										
alpha-Endosulfan	0.0019	49	0.11							0.0041
beta-BHC	0.00541	50	0.054							0.0064
Σ DDT	0.0537	50	6.7							0.1840
Dieldrin	0.00408	49	0.45	0.22						0.017
Endrin	0.00267	50	0.2							0.00654
Endrin aldehyde	0.00264	50	0.097							0.00449
Methoxychlor	0.0285	50	0.4							0.03578
PAHs										
HPAHs Sum(ND = 0)	26.15	60	924	221.1	126					45.08
HPAHs Sum (ND = 0.5DL)	28.58	59	942	410	323.4	221.1				56.87
LPAHs Sum (ND = 0)	3.428	57	435.3	82	79	67.1	33.95	26.32		14.59
LPAHs Sum (ND = 0.5DL)	10.55	56	435.3	287	276.5	77	71.8	67.1	44.51	29.37

Key:
BERA = baseline ecological risk assessment
EPC = exposure point concentration
N = number of observations
OU2 = Operable Unit 2
UCL = upper confidence limit

Notes:
a = Weighted average of UCL and outliers. Weighing factors are number of observations (N) for UCL and 1 for each outlier.
Shading = selected for use in BERA.

G Site Photographs

This appendix includes photographs of aquatic and riparian habitats and other features of the OU2 site taken in September 2007. Brief descriptions of the photographs also are included.

Photo 1 **Upstream end of west branch of Eighteenmile Creek near NYS barge canal. The rectangular conduit conveys water from the barge canal to the creek.**

Photo 2 **Looking downstream from the upstream end of the west branch. This photograph was taken at the same location as Photo 1, only facing in the opposite direction.**

Photo 3 **West branch of Eighteenmile Creek. Photograph was taken 200 feet downstream from the start of the west branch.**

Photo 4 **Tree-of-heaven (*Ailanthus altissima*) growing in riparian zone along west branch.**

Photo 5 **Engineered basin located between NYS barge canal and upstream end of west branch. The engineered basin is located on the NYS Canal Corporation property. At the time of the site visit, water was leaking past the green gate into this basin and then into the creek.**

Photo 6 **Engineered basin located between NYS barge canal and upstream end of west branch. The engineered basin is located on the NYS Canal Corporation property. At the time of the site visit, water was leaking past the green gate into this basin and then into the creek.**

Photo 7 **Old stone structure near upstream end of east branch.**

Photo 8 **Upstream end of east branch of Eighteenmile Creek near NYS barge canal. At the time of the site visit, water flow in the east branch appeared to be about two times greater than in the west branch, and the flow velocity was greater. A blue heron was observed in the creek channel in this area, despite the swift current.**

Photo 9 Looking downstream on the east branch from the top of the stone structure shown in Photo 7.

Photo 10 Downstream view of east branch of Eighteenmile Creek from top of stone structure shown in Photo 7.

Photo 11 **Junction of east and west branches of Eighteenmile Creek immediately upstream of Clinton Street. The concrete structure at the right side of the photograph is part of the Clinton Street bridge, under which the creek flows.**

Photo 12 **Downstream view (wide angle) of Eighteenmile Creek from Clinton Street bridge.**

Photo 13 **Downstream view of Eighteenmile Creek from Clinton Street bridge. Signs of fishing (bait containers, lure boxes, etc.) were observed on the right bank where the creek channel becomes wider and flow velocity decreases. The Clinton Street dam can be seen in the background behind the willow tree that has fallen into the creek channel.**

Photo 14 **Eighteenmile Creek flowing under Clinton Street bridge.**

Photo 15 View of Clinton Street dam (upstream side) from west bank of Eighteenmile Creek. The dam lies about 500 feet downstream from Clinton Street.

Photo 16 View of Clinton Street dam (downstream side) from west bank of Eighteenmile Creek.

Photo 17 **Downstream view of Eighteenmile Creek from the storm sewer crossing that is located about 100 feet downstream from the Clinton Street Dam. In this area, the larger trees in the riparian zone form a nearly closed canopy above the creek channel.**

Photo 18 **Eighteenmile Creek near the abandoned Flintkote Plant.**

Photo 19 West channel of Eighteenmile Creek downstream from William Street, near the abandoned Flintkote Plant. About 90% of the creek water flows down the west channel.

Photo 20 East channel of Eighteenmile Creek near the abandoned Flintkote Plant. Only 10% of the creek water flows down the east channel. Much debris appears to have been pushed into the east channel from the Flintkote Plant, which is located beyond the left side of the photograph.

Photo 21 **Herbaceous and woody vegetation on the island near the abandoned Flintkote Plant.**

Photo 22 **Close-up of white snakeroot (*Ageratina altissima*), a common herbaceous plant on the island near the Flintkote Plant.**

Photo 23 Close-up of white snakeroot (*Ageratina altissima*), a common herbaceous plant on the island near the Flintkote Plant.

Photo 24 Sewer pipe crossing Eighteenmile Creek near transect 17.

Photo 25 **Buttons on the west bank of the creek at transect 17.**

Photo 26 **Close-up of buttons found on the west bank of Eighteenmile Creek at transect 17.**

Photo 27 Close-up of buttons found on the west bank of Eighteenmile Creek at transect 17.

Photo 28 Looking upstream on Eighteenmile Creek from the abandoned Flintkote Plant.

Photo 29 Looking upstream on Eighteenmile Creek from the abandoned Flintkote Plant (wide-angle view).

Photo 30 Woody vegetation between Mill Street and Eighteenmile Creek near the United Paperboard Company property.

Photo 31 **NYS Canal Corporation property adjacent to Upson Park. West branch of Eighteenmile creek starts in forested ravine to the left of the Canal Corporation property.**

Photo 32 **Gravel covered area in Upson Park. The west branch of Eighteenmile creek lies in the forested ravine to the right of the gravel-covered area.**

Photo 33 Gravel-covered area in Upson Park.

H

Lumbriculus Bioaccumulation Test Laboratory Report

TOXICOLOGICAL EVALUATION
OF SEDIMENT SAMPLES

Eighteen Mile Creek Site
OU 2 Remedial Investigation/Feasibility Study
Lockport, New York

Contract No. W912DQ-11-D-3006
Task Order No. 1003239-0009

Lumbriculus variegatus 28 Day Bioaccumulation Evaluation

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TOXICOLOGICAL TESTING OF SEDIMENT SAMPLES:

Eighteen Mile Creek Site
OU 2 Remedial Investigation/Feasibility Study
Lockport, New York

***Lumbriculus variegatus* 28 Day Bioaccumulation Evaluation**

1.0 INTRODUCTION

This project was designed to evaluate the potential uptake of compounds of concern from sediment samples collected from the Eighteen Mile Creek Site located in Lockport, New York in support of the OU 2 Remedial Investigation/Feasibility Study. Samples were provided by Ecology and Environment, Incorporated (E&E), Lancaster, New York. Testing involved conduct of a 28 day exposure assay using the oligochaete, *Lumbriculus variegatus* following programs and protocols developed by the ASTM (2013) and US EPA (2000). Exposure assays and tissue metals analyses were performed at EnviroSystems, Incorporated (ESI), Hampton, New Hampshire. Tissues were shipped to Australian Laboratory Services (ALS), Kelso, Washington for body burden analysis of pesticides, PCB Aroclors, polyaromatic hydrocarbons, percent moisture and lipids.

2.0 METHODS AND MATERIALS

2.1 General Methods, Biological Evaluations

Toxicological and analytical protocols used in this program follow procedures outlined in *Standard Guide for Determination of the Bioaccumulation of Sediment-Associated Contaminants by Benthic Invertebrates* (ASTM Method E 1688-10, 2013), *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates* (US EPA 2000), and *Standard Methods for the Examination of Water and Wastewater*, 22nd Edition (APHA 2012). These protocols provide standard approaches for physical and chemical analysis and for the evaluation of toxicological effects of sediments on aquatic invertebrates.

2.2 Test Species

L. variegatus were obtained from Aquatic Research Organisms (ARO), Hampton, New Hampshire. The lot of organisms was held for 24 hours under similar conditions as testing prior to test initiation. A portion of the lot was also retained for pre-exposure tissue analyses, and these data may be found in the chemistry data package included under separate cover.

2.3 Test Samples and Laboratory Control Sediment

Sediment samples collected for this project were received at ESI under chain of custody. Once received, samples were inspected to determine integrity, given unique sample numbers and logged into the laboratory sample management database. Samples were stored in a refrigerator maintained at 4±2°C. A listing of sample sites, sample collection, and receipt information is summarized in Table 1. An aliquot of each sample was analyzed for loss on ignition (percent carbon) to estimate the level of organic carbon. These results are provided in Table 2 and in the data appendix. In addition, aliquots of the sediment were shipped to ChemTech Consulting Group for subsequent chemical analysis, and the chain of custody records can be found in the Data Appendix.

The control substrate was an artificial sediment prepared according to guidance presented in the USEPA and ASTM methods. Formulated sediment consists of approximately 97.5% sand (by weight) mixed thoroughly, by means of a commercial mixer, with approximately 2.5% organic matter (by weight). Organic matter used consists of what is recovered from midge larvae cultures maintained at ESI.

Overlying water for the sediment toxicity tests was moderately hard synthetic reconstituted laboratory water prepared at ESI according to protocol (US EPA 2002). This water has been used to successfully culture freshwater organisms since 1992.

2.4 *Lumbriculus variegatus* 96 Hour Screening Assay

As per the ASTM protocol, a 96 hour screening assay was completed to determine if any of the samples resulted in acute toxicity. The screening assay was conducted prior to the 28 day exposure assay, and coincided with the pre-assay monitoring period. The screening assay employed 4 replicates per sample, and a control, with 10 organisms per replicate. Vessels used for the screening assay were 250 mL beakers. Test vessels were loaded with approximately 50 mL of sediment from each respective sample, and approximately 150 mL of overlying water. Dissolved oxygen and pH were measured on Day 0 in one replicate, and survival was recorded at 96 hours in all replicates. The results of the screening assay are presented in Table 3.

2.5 *Lumbriculus variegatus* 28 Day Sediment Exposure

A representative aliquot of sediment was loaded to an approximate depth of 5-6cm into fiberglass trays. The tray dimensions were 23 $^{3}/_{8}$" x 12" x 6", modified for flow-through testing. Overlying water was immediately added to each tray, and the flow was set at a target rate of 24 to 28 mL/minute, resulting in approximately 2 volume additions of water each day. Placement locations were generated by the CETIS™ v1.8.6.6 (Comprehensive Environmental Toxicity Information System) software program. The block randomized position assignments are included in the data appendix. The test chambers were maintained in a limited access, temperature controlled room. Temperature in the room was set to 23°C, and was recorded on an hourly frequency using a temperature logger placed in a surrogate vessel. The photoperiod in the test chamber was set at 16:8 hour light:dark. Lighting was supplied by cool white fluorescent bulbs.

L. variegatus were indiscriminately selected from the pool of organisms and weighed wet. Approximately 60 grams wet weight of *L. variegatus* were added to each replicate. Each treatment group included 3 replicates.

The overlying water dissolved oxygen, pH, salinity, specific conductance and temperature were measured daily in all test chambers. Dissolved oxygen levels were maintained at a minimum level of $\geq$2.5 mg/L by providing aeration to all chambers from the start of the assay. The overlying water was measured for alkalinity, ammonia, and hardness levels on days 0, 7, 14, 21 and 28. The total organic carbon of the overlying water was measured on days 0 and 28. Overlying water quality data are provided in Table 4, and records are available in Appendix A. Organisms were not fed during the exposure period.

After 28 days exposure, *L. variegatus* were recovered from the test sediments. Organisms were rinsed with deionized water, and all replicates for each sample were combined to obtain total recovered wet weights. These data are presented in Table 5. Worms were then allocated into two jars prior to being frozen. One jar was then transferred to ESI's chemistry group for body burden analysis for metals, and the other jar was transferred to ALS for subsequent analysis, and the chain of custody records can be found in the Data Appendix.

2.6 Tissue Body Burden Analysis - Metals

Worm tissues were digested whole in hot nitric acid followed by hot hydrochloric acid for a total of 1 hour. After digestion, the samples were brought to a final volume with Milli-Q® water and filtered at 0.45 µm. The filtered digestates were analyzed using EPA SW-846 Method 6020, Inductively Coupled Plasma - Mass Spectrometry (ICP-MS).

2.7 Quality Control

As part of the laboratory quality control program, reference toxicant evaluations are conducted on a regular basis for each test species. These results provide relative health and response data while allowing for

comparison with historic data sets. Results were within two standard deviations of the historic mean for the species, and are summarized in Table 6.

Quality Control data from the chemical analysis are provided in the chemistry data package provided under separate cover.

3.0 RESULTS AND DISCUSSION

3.1 Final Wet Weights

At the end of the 28 day exposure period, the total wet weight for worms recovered from the laboratory control was 89.7 g, with individual project site samples ranging from 49.0 to 69.4 g (Table 5). The weight of worms recovered from all treatments, (laboratory control and project sites), were sufficient for chemical analysis.

3.2 Protocol Deviations

Review of data associated with the 28-day sediment exposure documented a temperature deviation from the protocol. Test acceptability criteria requires a mean temperature of 23±1°C, with maximum temporary fluctuations within 23±3°C. Temperature data collected during overlying water quality measurements recorded a mean temperature of 22.5°C with a range of 19.1 to 25.7°C. Readings dropped below the minimum allowable temperature of 20°C on days 1, 2, and 5. However, the temperature data collected by the hourly data logger assigned to the assay documented a mean temperature of 22.2°C with a range of 20.1 to 24.3°C, all within the range specified by the method. It is the opinion of ESI's study director that this deviation observed in the daily overlying water quality measurements did not adversely affect the outcome of the assay.

3.3 Summary

This program utilized protocols developed by the US EPA and ASTM to assess the potential uptake of chemicals from exposure to sediments from the Eighteen Mile Creek site in freshwater oligochaetes. Laboratory bench sheets, analytical reports and associated statistical support data are included in Appendix A.

4.0 REFERENCES

APHA. 2012. *Standard Methods for the Examination of Water and Wastewater*, 22nd Edition. Washington D.C.

ASTM. 2013. *Standard Guide for Determination of the Bioaccumulation of Sediment-Associated Contaminants by Benthic Invertebrates*. E 1688-10. West Conshohocken, PA.

US EPA. 2000. *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates*. Second Edition. Method 100.3 *Lumbriculus variegatus* Bioaccumulation Tests for Sediments. EPA/600/R-99/064.

Table 1. Summary of Sample Collection and Receipt Information. *Lumbriculus variegatus* 28 Day Bioaccumulation Evaluation. Eighteen Mile Creek, Lockport, NY. February 2016.

		Sample Collected		Sample Received	
ESI Code	Field ID	Date	Time	Date	Time
27030-001	OU2-SED04	01/25/16	1030	01/28/16	0830
27030-010	OU2-SED05	01/26/16	0900	01/28/16	0830
27030-011	OU2-SED06	01/26/16	1315	01/28/16	0830
27030-012	OU2-SED07	01/26/16	1415	01/28/16	0830
27030-013	OU2-SED09	01/26/16	1605	01/28/16	0830
27030-016	OU2-SED08	01/26/16	1510	01/28/16	0830

Table 2. Loss on Ignition Data. *Lumbriculus variegatus* 28 Day Bioaccumulation Evaluation. Eighteen Mile Creek, Lockport, NY. February 2016.

Field ID	Sample Code	Loss on Ignition (%)
Lab Control	27030-000	2.3 [a]
OU2-SED04	27030-001	18
OU2-SED05	27030-010	39
OU2-SED06	27030-011	17
OU2-SED07	27030-012	19
OU2-SED09	27030-013	20
OU2-SED08	27030-016	20

Notes:
[a] Loss on ignition value was generated on 8/10/15 for the same sediment formulation used in this assay.

Table 3. Summary of 96 Hour Screening Assay Results. *Lumbriculus variegatus* 28 Day Bioaccumulation Evaluation. Eighteen Mile Creek, Lockport, NY. February 2016.

Field ID	Sample Code	Day 0 DO (mg/L)	Day 0 pH (SU)	96 Hour Survival
Lab Control	27030-000	8.7	7.72	100%
OU2-SED04	27030-001	4.1	7.30	97.5%
OU2-SED05	27030-010	5.8	7.66	100%
OU2-SED06	27030-011	6.3	7.40	97.5%
OU2-SED07	27030-012	5.4	7.64	100% [a]
OU2-SED09	27030-013	5.8	7.68	100%
OU2-SED08	27030-016	4.7	7.59	92.5%

Notes:
[a] A leech was observed in replicate B of sample OU2-SED07, in which 4 worms were missing, therefore it was assumed for data summary purposes that the leech ingested the worms.

Table 4. Summary of Overlying Water Quality Measurements. *Lumbriculus variegatus* 28 Day Bioaccumulation Evaluation. Eighteen Mile Creek, Lockport, NY. February 2016.

ESI Code	Field ID	Sample Number	Day	Temp [a] (°C)	Alkalinity (mg/L)	Hardness (mg/L)	Ammonia (mg/L)
27030-100	Laboratory Control	000	0	20.9	74	110	1.1
27030-001	OU2-SED04	001	0	20.5	70	110	<0.1
27030-010	OU2-SED05	002	0	20.5	75	110	<0.1
27030-011	OU2-SED06	003	0	20.0	72	110	<0.1
27030-012	OU2-SED07	004	0	20.0	75	110	<0.1
27030-013	OU2-SED09	005	0	20.0	83	120	<0.1
27030-016	OU2-SED08	006	0	20.9	75	120	<0.1
27030-100	Laboratory Control	000	7	23.9	81	110	0.47
27030-001	OU2-SED04	001	7	23.5	92	140	0.3
27030-010	OU2-SED05	002	7	23.1	92	130	0.12
27030-011	OU2-SED06	003	7	22.9	83	120	0.12
27030-012	OU2-SED07	004	7	22.9	90	130	0.4
27030-013	OU2-SED09	005	7	22.7	92	140	0.3
27030-016	OU2-SED08	006	7	23.9	86	130	0.13
27030-100	Laboratory Control	000	14	24.6	72	100	0.23
27030-001	OU2-SED04	001	14	24.2	75	110	<0.1
27030-010	OU2-SED05	002	14	24.0	76	110	<0.1
27030-011	OU2-SED06	003	14	23.4	79	120	<0.1
27030-012	OU2-SED07	004	14	23.5	79	120	<0.1
27030-013	OU2-SED09	005	14	23.3	81	120	0.14
27030-016	OU2-SED08	006	14	24.7	79	120	0.1
27030-100	Laboratory Control	000	21	22.0	65	96	0.12
27030-001	OU2-SED04	001	21	21.8	72	110	<0.1
27030-010	OU2-SED05	002	21	22.0	71	100	<0.1
27030-011	OU2-SED06	003	21	21.5	79	120	<0.1
27030-012	OU2-SED07	004	21	21.5	80	120	0.12
27030-013	OU2-SED09	005	21	21.4	70	120	0.15
27030-016	OU2-SED08	006	21	21.6	76	120	<0.1
27030-100	Laboratory Control	000	28	22.3	68	98	<0.1
27030-001	OU2-SED04	001	28	22.4	77	110	<0.1
27030-010	OU2-SED05	002	28	22.4	78	110	<0.1
27030-011	OU2-SED06	003	28	21.7	82	120	<0.1
27030-012	OU2-SED07	004	28	22.1	75	110	<0.1
27030-013	OU2-SED09	005	28	21.5	84	120	<0.1
27030-016	OU2-SED08	006	28	22.2	77	110	<0.1

Note:
[a] Reported readings for temperature are from replicate 1. Additional water quality data are provided in Appendix A.

Table 5. Summary of Recovered Wet Weights. *Lumbriculus variegatus* 28 Day Bioaccumulation Evaluation. Eighteen Mile Creek, Lockport, NY. February 2016.

Field ID	Sample Code	Total Recovered Wet Weight (g)	Reserved for Trace Metals (g)	Reserved for Organic Analysis (g)
Lab Control	27030-000	89.7	21.9	67.8
OU2-SED04	27030-001	66.1	5.4	60.7
OU2-SED05	27030-010	66.8	5.4	61.4
OU2-SED06	27030-011	69.4	5.3	64.1
OU2-SED07	27030-012	49.0	5.0	44.0
OU2-SED09	27030-013	65.2	5.1	60.1
OU2-SED08	27030-016	65.2	5.1	60.1

Table 6. Summary of Reference Toxicant Data. *Lumbriculus variegatus* 28 Day Bioaccumulation Evaluation. Eighteen Mile Creek, Lockport, NY. February 2016.

Date	Organism Lot	Endpoint	Value	Historic Mean/ Central Tendency	Acceptable Range	Reference Toxicant
Lumbriculus variegatus						
03/01/16	99LvARO030116	LC-50	0.31	0.33 [a]	0.21 - 0.45 [a]	Cadmium (mg/L)

Note:
[a] Values based on the results of 9 assays.

APPENDIX A: RAW DATA & SUPPORT DOCUMENTATION

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Daily Checklist; Daily Observations; Daily Flow Rates	7
Organism History Record	1
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ENVIROSYSTEMS, INCORPORATED

***Lumbriculus variegatus* Screening Assay**

Study: 27036 **Client:** Ecology and Environment, Inc. **Project:** 18 Mile Creek

Sample ID	Replicate	DO (mg/L) 0	pH (SU) 0	SURVIVAL 0	24	48	72	96	Comments
Laboratory Control	A	8.7	7.72	10				10	
	B			10				10	
	C			10				10	
	D			10				10	
27030-001 OU2-SED04	A	4.1	7.30	10				10	
	B			10				10	
	C			10				10	
	D			10				9	
27030-010 OU2-SED05	A	5.8	7.66	10				10	
	B			10				10	
	C			10				10	
	D			10				10	
27030-011 OU2-SED06	A	6.3	7.40	10				9	
	B			10				10	
	C			10				10	
	D			10				10	
27030-012 OU2-SED07	A	5.4	7.64	10				10	
	B			10				6	leach in sample
	C			10				10	
	D			10				10	
27030-013 OU2-SED09	A	5.8	7.68	10				10	
	B			10				10	
	C			10				10	
	D			10				10	
27030-016 OU2-SED08	A	4.7	7.59	10				9	
	B			10				10	
	C			10				9	
	D			10				9	
Date:		02/05/16		02/05/16	02/06/16	02/07	02/08	02/09	
Time:		1425		1430	0730	0850	0830	1230	
Initials:		BG		BG	BG	BP	BP	JTP	
Temperature (°C):		24		24	24	24	24	24	

Aquatic Research Organisms

DATA SHEET 99LvAR00205I6

I. Organism History

Species Lumbriculus variegatus

Source: Lab reared ✓ Hatchery reared _____ Field collected _____

Hatch date mixed ages Receipt date _____

Lot number 020516LV Strain ARO

Brood origination USFWS MO

II. Water Quality

Temperature 20 °C Salinity — ppt D.O. SAT ppm

pH 7.4 su Hardness ≈100 ppm Alkalinity ≈170 ppm

III. Culture Conditions

Freshwater ✓ Saltwater _____ Other _____

Recirculating _____ Flow through ✓ Static renewal _____

DIET: Flake food _____ Phytoplankton _____ Trout chow ✓

Artemia _____ Rotifers _____ YCT _____ Other _____

Prophylactic treatments: _____

Comments: _____

_____

IV. Shipping Information

Client: ESI # of Organisms (SS) ~~2-5-16~~ 500

Carrier: PICKUP Date shipped 2-5-16

Biologist: Stan Smitski

PO BOX 1271 HAMPTON NH 03843-1271 (603) 926-1650 AROFISH@AOL.COM

Pre-Assay Monitoring
Lumbriculus variegatus Bioaccumulation Sediment Assay

Study: 27036 **Client: Ecology and Environment, Inc.** **Project: Eighteen Mile Creek**

Day	Date	Initials	Flow Rate Checked	Notes
0	02/05/16	BG		Sediment loaded, overlying water added.
1	02/06/16	BG		
2	02/07/16	BP		Samples put on air
3	02/08/16	BP		
4	02/09/16	BP		
5	~~02~~			
6				
7				
8				
9				
10				
11				
12				
13				
14				

Notes: 23 °C

F3 BP 02/09/16

Sample Key

Client: Ecology and Environment, Inc.
Project: Eighteen Mile Creek
Assay: *Lumbriculus variegatus* 28 Day

ESI Code	Field ID	Sample Number	Sampled		Received	
27030-100	Laboratory Control	000				
27030-001	OU2-SED04	001	01/25/16	1030	01/28/16	830
27030-010	OU2-SED05	002	01/26/16	900	01/28/16	830
27030-011	OU2-SED06	003	01/26/16	1315	01/28/16	830
27030-012	OU2-SED07	004	01/26/16	1415	01/28/16	830
27030-013	OU2-SED09	005	01/26/16	1605	01/28/16	830
27030-016	OU2-SED08	006	01/26/16	1510	01/28/16	830

Bioaccumulation Evaluation - Trace Metals Uptake **EnviroSystems, Inc.**

Start Date: 10 Feb-16 12:00 **Species:** Lumbriculus variegatus **Sample Code:** 27030-100; 000
End Date: 09 Mar-16 12:00 **Protocol:** US ACE NED RIM (2004) **Sample Source:** Eighteen Mile Creek, Lockport, NY
Sample Date: 05 Feb-16 08:35 **Material:** Laboratory Control Sediment **Sample Station:** Laboratory Control Sediment

Sample	Rep	Pos	Body Burden	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Notes
27030-013; 005	1	1										
27030-011; 003	1	2										
27030-012; 004	1	3										
27030-010; 002	1	4										
27030-001; 001	1	5										
27030-100; 000	1	6										
27030-016; 006	1	7										
27030-013; 005	2	8										
27030-011; 003	2	9										
27030-016; 006	2	10										
27030-012; 004	2	11										
27030-001; 001	2	12										
27030-010; 002	2	13										
27030-100; 000	2	14										
27030-010; 002	3	15										
27030-013; 005	3	16										
27030-011; 003	3	17										
27030-001; 001	3	18										
27030-012; 004	3	19										
27030-016; 006	3	20										
27030-100; 000	3	21										

Lumbriculus variegatus Bioaccumulation Sediment Assay

Study: 27036 **Client: Ecology and Environment, Inc.** **Project: Eighteen Mile Creek**

Day	Date	Water Qualities Measured, Flow Rate Monitored and Observations Recorded		Notes
		Check	Initial	
0	02/10/16	✓	BG	Low temps observed adjusting to resolve issue
1	02/11/16	✓	BP	Low temps observed heating added to batch water
2	02/12/16	✓	BG	Low temps observed insulated pipes leading to test from holding tank.
3	02/13/16	✓	BG	Low temps observed temp turned up in room.
4	02/14/16	✓	BP	low temps observed batch H_2O temp increased
5	2/15/16	✓	BP	
6	2/16/16	✓	BP	
7	02/17/16	✓	BG	
8	02/18/16	✓	BG	
9	02/19/16	✓	BG	
10	02/20/16	✓	BG	
11	02/21/16	✓	BP	
12	02/22/16	✓	BP	
13	02/23/16	✓	BP	
14	02/24/16	✓	BG	High temps observed batch H_2O temp decreased.
15	02/25/16	✓	BP	
16	02/26/16	✓	BG	
17	02/27/16	✓	BG	
18	02/28/16	✓	BP	
19	02/29/16	✓	BP	Sample 00C Rep 2 organisms bunched along sides
20	03/01/16	✓	BP	
21	03/02/16	✓	BG/HK	
22	03/03/16	✓	BP	
23	03/04/16	✓	BG	
24	03/05/16	✓	BG	
25	03/06/16	✓	BP	
26	03/07/16	✓	BP	
27	03/08/16	✓	BG	
28	03/09/16	✓	BG	

Alkalinity, Hardness & Ammonia on Days 0, 7, 14, 21, 28 **TOC on Days 0 and 28**	**Day 0**	**Initial:** BG
	Day 7	**Initial:** BG
	Day 14	**Initial:** BG
	Day 21	**Initial:** BG / HK
	Day 28	**Initial:** JTP / DG

Notes: **23 °C** **Overlying Water = MHR**

(EW) DG 02/12/16 Batch W-993 Bulk MHR made and added to W-990.

(EW) BG 02/24/16 Rep 2I moved to other side of TCR and boards placed on bottom rack to prevent heat loss.

Daily Observations for *Lumbriculus variegatus* Study 27036

Ecology and Environment, Inc. - Eighteen Mile Creek

Sample Number	Rep	Pos	DAY 1	2	3	4	5	6	7	8	9	10	11	12	13	14
005	1	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓
003	1	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
004	1	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
002	1	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
001	1	5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
000	1	6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
006	1	7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
005	2	8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
003	2	9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
006	2	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
004	2	11	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
001	2	12	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
002	2	13	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
000	2	14	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
002	3	15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
005	3	16	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
003	3	17	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
001	3	18	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
004	3	19	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
006	3	20	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
000	3	21	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Initial	BP	BG	BG	BP	BP	BP	BG	BG	BG	BG	BP	BP	BP	BG
		Date	02/11/16	02/12/16	02/13	02/14	2/15	2/16	2/17	02/18	02/19	02/20	02/21	02/22	02/23	02/24

Observation Codes:

- ✓ tank checked and animals appear normal
- **A** animals observed appear abnormal
- **X** dead animals observed (indicate how many either by number, percentage or volume)
- **-** tank checked and animals cannot be seen
- **C** indicates that a comment has been entered on the "Miscellaneous Project Notes" page

Daily Observations for *Lumbriculus variegatus* Study 27036

Ecology and Environment, Inc. - Eighteen Mile Creek

Sample Number	Rep	Pos	DAY 15	16	17	18	19	20	21	22	23	24	25	26	27
005	1	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
003	1	2	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
004	1	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
002	1	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
001	1	5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
000	1	6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
006	1	7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
005	2	8	✓	✓	✓	✓	✓	✓	–	✓	–	✓	✓	✓	✓
003	2	9	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓
006	2	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
004	2	11	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
001	2	12	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
002	2	13	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
000	2	14	✓	✓	✓	✓	C	✓	✓	✓	✓	✓	✓	✓	✓
002	3	15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
005	3	16	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
003	3	17	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
001	3	18	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
004	3	19	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
006	3	20	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
000	3	21	✓	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓
Initial			BP	BG	BG	BP	BP	BP	BG / HK	BG	BG	BG	BP	BP	BG
Date			02/25/16	02/26/16	02/27	02/29	02/29	03/01	03/02	03/03	03/04	03/05	03/06	03/07	03/08

Observation Codes:

- ✓ tank checked and animals appear normal
- **A** animals observed appear abnormal
- **X** dead animals observed (indicate how many either by number, percentage or volume)
- **-** tank checked and animals cannot be seen
- **C** indicates that a comment has been entered on the "Miscellaneous Project Notes" page

Daily Flow Rates for *Lumbriculus variegatus* Study 27036

Ecology and Environment, Inc. - Eighteen Mile Creek

Sample Number	Rep	Pos	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
			Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted
005	1	1	24	28	23	28	42	28	28	28	26	26	24	25	25	25
003	1	2	20	28	25	25	34	26	26	26	24	27	20	27	26	26
004	1	3	18	28	20	27	28	28	33	25	20	26	26	26	26	26
002	1	4	24	26	22	26	26	26	25	25	24	27	26	26	25	25
001	1	5	20	28	20	29	32	26	36	26	24	29	27	27	16	26
000	1	6	20	28	28	28	44	28	28	28	26	26	26	26	27	27
006	1	7	28	28	27	27	32	26	24	26	26	26	14	27	26	26
005	2	8	24	28	26	26	28	28	28	28	27	27	18	28	25	25
003	2	9	32	26	27	27	36	26	14	25	26	26	26	26	24	24
006	2	10	28	28	20	27	20	28	27	27	18	26	27	27	20	27
004	2	11	20	30	24	26	28	28	24	26	20	27	14	26	26	26
001	2	12	16	28	26	26	26	26	25	25	25	25	25	25	27	27
002	2	13	36	28	27	27	28	28	28	28	27	27	18	25	26	26
000	2	14	20	28	24	24	42	26	38	26	26	26	19	28	25	25
002	3	15	20	26	26	26	40	26	40	25	20	28	26	26	19	27
005	3	16	20	28	25	25	34	28	28	28	24	26	26	26	21	27
003	3	17	12	30	26	26	26	26	25	25	25	25	14	27	10	28
001	3	18	24	28	20	28	32	28	26	26	27	27	19	27	20	26
004	3	19	20	28	27	27	26	26	32	27	26	26	18	28	25	25
006	3	20	22	28	25	25	36	26	30	28	19	26	19	27	26	26
000	3	21	20	28	27	27	20	26	25	25	32	27	26	26	24	24
Date			02/10	02/10	02/11	02/11	02/12	02/12	02/13	02/13	02/14	02/14	2/15	2/15	2/16	2/16
Initial			DE	BG	BP	BP	DE	BG	BG	BG	BP	BP	BP	BP	BP	BP

Daily Flow Rates for *Lumbriculus variegatus* Study 27036

Ecology and Environment, Inc. - Eighteen Mile Creek

Sample Number	Rep	Pos	Day 7		Day 8		Day 9		Day 10		Day 11		Day 12		Day 13	
			Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted
005	1	1	28	28	8	24	26	26	20	28	27	27	18	26	25	25
003	1	2	32	27	12	26	38	27	25	25	26	26	10	27	27	27
004	1	3	26	26	20	28	25	25	26	26	20	26	19	26	23	27
002	1	4	15	26	16	25	22	28	36	25	25	25	26	26	25	25
001	1	5	25	25	20	27	20	28	25	25	25	25	26	26	24	24
000	1	6	20	28	21	28	25	25	18	26	26	26	25	25	19	27
006	1	7	21	28	24	24	26	26	25	25	24	26	24	24	26	26
005	2	8	26	26	20	26	14	27	32	25	26	26	18	26	26	26
003	2	9	25	25	17	26	24	29	26	26	27	26	26	26	15	27
006	2	10	26	26	20	28	20	28	28	28	20	26	25	25	18	26
004	2	11	26	26	15	25	16	28	17	27	15	27	24	24	10	27
001	2	12	28	28	12	28	18	27	9	28	28	28	27	27	26	26
002	2	13	16	25	20	28	8	28	26	26	27	27	27	27	24	24
000	2	14	27	27	19	27	20	27	21	29	22	26	18	27	27	27
002	3	15	26	26	10	25	25	25	15	26	26	26	26	26	24	24
005	3	16	34	25	22	28	26	26	25	25	18	27	18	26	25	25
003	3	17	26	26	9	28	5	27	17	28	10	26	10	27	11	27
001	3	18	28	28	25	25	20	28	19	25	19	27	12	28	26	26
004	3	19	27	27	26	26	25	25	26	26	19	27	26	26	25	25
006	3	20	20	28	17	26	19	26	27	27	26	27	27	27	14	14
000	3	21	25	25	25	25	20	28	16	27	26	26	25	25	25	25
Date			02/17	02/17	02/18	02/18	02/19	02/19	02/20	02/20	02/21	02/21	02/22	02/22	02/23	02/23
Initial			BG	BG	BG	BG	BG	BG	BG	BG	BP	BP	BP	BP	BP	BP

Daily Flow Rates for *Lumbriculus variegatus* Study 27036

Ecology and Environment, Inc. - Eighteen Mile Creek

Sample Number	Rep	Pos	Day 14		Day 15		Day 16		Day 17		Day 18		Day 19		Day 20	
			Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted
005	1	1	20	28	28	28	26	26	21	28	28	28	24	24	18	25
003	1	2	25	25	25	25	19	28	18	27	26	26	25	25	24	24
004	1	3	17	26	24	24	15	28	17	28	27	27	20	25	26	26
002	1	4	32	25	24	24	25	25	25	25	25	25	24	24	20	26
001	1	5	36	28	27	27	22	27	11	26	27	27	28	28	10	24
000	1	6	27	27	26	26	26	26	25	25	20	26	20	28	27	27
006	1	7	27	27	18	27	25	25	18	28	27	27	24	24	25	25
005	2	8	21	28	27	27	27	27	14	27	19	27	20	26	26	26
003	2	9	19	27	19	26	25	25	20	27	20	28	17	28	14	27
006	2	10	22	28	24	24	31	26	25	25	25	25	10	27	10	28
004	2	11	26	26	10	28	15	25	26	26	16	28	26	26	10	26
001	2	12	25	25	25	25	19	28	21	28	24	24	8	28	9	27
002	2	13	27	27	26	26	20	26	17	28	19	28	17	26	26	26
000	2	14	29	25	20	26	16	25	19	27	27	27	26	26	24	24
002	3	15	26	26	11	25	10	25	10	25	24	24	25	25	25	25
005	3	16	34	26	26	26	28	28	27	27	17	28	26	26	24	24
003	3	17	25	25	24	24	20	26	19	26	16	27	27	27	26	26
001	3	18	27	27	11	26	17	28	32	27	26	26	24	24	19	26
004	3	19	25	25	25	25	15	27	17	28	27	27	26	26	17	25
006	3	20	28	28	27	27	20	28	21	26	27	27	20	26	26	26
000	3	21	14	27	24	24	29	25	26	26	25	25	24	24	20	28
Date			02/24/16	02/24/16	02/25/16	02/25/16	02/26	02/26	02/27	02/27	02/28	02/28	02/29	02/29	03/01	~~03/01~~
Initial			BG	BG	BP	BP	BG	BG	BG	BG	BP	BP	BP	BP	BP	BP

BP
03/01

Daily Flow Rates for *Lumbriculus variegatus* Study 27036

Ecology and Environment, Inc. - Eighteen Mile Creek

Sample Number	Rep	Pos	Day 21		Day 22		Day 23		Day 24		Day 25		Day 26		Day 27	
			Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted
005	1	1	20	26	24	26	14	28	26	26	27	27	26	26	26	26
003	1	2	20	26	21	28	16	26	22	28	25	25	25	25	15	27
004	1	3	8	28	20	26	26	26	22	26	24	24	20	26	21	27
002	1	4	26	26	26	26	22	28	16	28	28	28	19	27	26	26
001	1	5	48	28	29	26	22	28	26	26	26	26	10	28	26	26
000	1	6	28	28	20	28	22	28	10	26	27	27	27	27	28	28
006	1	7	16	28	15	28	22	26	22	28	19	28	26	26	26	26
005	2	8	20	24/28	25	28	18	26	26	26	17	28	28	27	20	28
003	2	9	20	26	26	26	22	26	36	26	25	25	26	26	21	27
006	2	10	26	26	26	26	26	26	22	26	27	27	19	27	26	26
004	2	11	22	28	28	28	~~30~~ 32	~~28~~ 28 (E3) 26 03/04	28	28	19	26	26	26	17	25
001	2	12	22	28	26	26	28	28	22	28	18	27	21	27	25	25
002	2	13	16	26	26	26	28	28	26	26	29	28	26	26	26	26
000	2	14	18	26	14	28	22	28	28	28	18	28	27	27	21	28
002	3	15	34	28	19	26	28	28	26	26	26	26	20	26	18	26
005	3	16	30	26	21	26	28	28	26	26	24	24	10	24	26	26
003	3	17	24	26	32	28	36	26	26	26	25	25	25	25	20	28
001	3	18	28	28	29	26	26	26	12	26	10	24	24	24	25	25
004	3	19	22	28	27	28	28	28	26	2~~8~~6	(E3) 26 03/06 14	24	26	26	20	28
006	3	20	26	26	26	26	30	28	22	28	28	28	24	24	26	26
000	3	21	24	26	28	28	22	28	14	28	10	24	25	25	26	26
Date			03/02/16	03/02/16	03/03/16	03/03/16	03/04	03/04	03/05	03/05	03/06	03/06	03/07	03/07	03/08	03/08
Initial			BG/HK	BG/HK	EH NP	EH NP	BG	BG	BG	BG	BP	BP	bp	bp	BG	BG

(E3) 26 03/02

ESI Study No.: 27036
CLIENT: Ecology & Environment
PROJECT: Eighteen Mile Creek
ASSAY: Lumbriculus variegatus Bioaccumulation Evaluation
TASK: Recovered Wet Weights

Field ID	ESI Code	Total Recovered Wet Weight (Grams)	Reserved for Trace Metals (Grams)	Reserved for Organic Analysis (Grams)
Lab Control	27030-400	89.7	21.9	67.8
OU2-SED04	27030-401	66.1	5.4	60.7
OU2-SED05	27030-402	66.8	5.4	61.4
OU2-SED06	27030-403	69.4	5.3	64.1
OU2-SED07	27030-404	49.0	5.0	44.0
OU2-SED09	27030-405	65.2	5.1	60.1
OU2-SED08	27030-406	65.2	5.1	60.1
Pre-tissue L.v.	27030-407	NA	NA	NA

99LvAR0020916

Aquatic Research Organisms

DATA SHEET

I. Organism History

Species Lumbriculus variegatus

Source: Lab reared ✓ Hatchery reared _____ Field collected _____

Hatch date 11-15 Receipt date _____

Lot number 110015 LV Strain _____

Brood origination Rochester NY

II. Water Quality

Temperature >20 °C Salinity ~1 ppt D.O. — ppm

pH 7.2 su Hardness — ppm Alkalinity — ppm

III. Culture Conditions

Freshwater _____ Saltwater _____ Other _____

Recirculating _____ Flow through _____ Static renewal _____

DIET: Flake food _____ Phytoplankton _____ Trout chow _____

Artemia _____ Rotifers _____ YCT _____ Other _____

Prophylactic treatments: _____

Comments: _____

_____

IV. Shipping Information

Client: EST # of Organisms 1500+

Carrier: _____ Date shipped 2-9-16

Biologist: Mark Rosenquist

PO BOX 1271 HAMPTON NH 03843-1271 (603) 926-1650 AROFISH@AOL.COM

Final Tissue Weight Record (*L.v.*)

Study: 27036

Client: Ecology and Enviroment, Inc

Project: Eighteen Mile Creek

Field ID	ESI Code	Jar Weight (g)	Quantity Removed For Metals (g)	Final Weight (g)
LAB	27030-100; 000	116.4	21.9	67.8
OU2-SED04	27030-001; 001	120.5	5.4	60.7
OU2-SED05	27030-010; 002	120.3	5.4	61.4
OU2-SED06	27030-011; 003	120.2	5.3	64.1
OU2-SED07	27030-012; 004	119.1	5.0	44
OU2-SED09	27030-013; 005	120.2	5.1	60.1
OU2-SED08	27030-016; 006	116.5	5.1	60.1

Recorded by:	JTP
Date:	**03/10/16**
Scale ID:	Mettler Top Loader PJ4000

Notes:

P:\General Projects\RPT-Active\ERA 27030 E&E 18 Mile Creek\Lv Worm weight measurement sheet.wpd

Sample Reading Order for Water Quality Measurements

Study: 27036

Client: Ecology and Environment, Inc.

Project: Eighteen Mile Creek

Reading Number	ESI Code	Sample Number	Replicate	Position
1	27030-013	005	1	1
2	27030-011	003	1	2
3	27030-012	004	1	3
4	27030-010	002	1	4
5	27030-001	001	1	5
6	27030-100	000	1	6
7	27030-016	006	1	7
8	27030-013	005	2	8
9	27030-011	003	2	9
10	27030-016	006	2	10
11	27030-012	004	2	11
12	27030-001	001	2	12
13	27030-010	002	2	13
14	27030-100	000	2	14
15	27030-010	002	3	15
16	27030-013	005	3	16
17	27030-011	003	3	17
18	27030-001	001	3	18
19	27030-012	004	3	19
20	27030-016	006	3	20
21	27030-100	000	3	21

STUDY: 27036
CLIENT: Ecology and Enviroment, Inc.
PROJECT: Eighteen Mile Creek
ASSAY: *Lumbriculus variegatus* Bioaccumulation Sediment Assay
TASK: Daily Water Quality Measurments

	Temp	DO	pH	SpCond	Salinity
Mean:	22.5	7.48		374	0.18
Minimum:	19.1	4.53	6.45	305	0.15
Maximum:	25.7	8.92	8.88	574	0.28

ESI Code	Replicate	Day	DateTime M/D/Y	Temp C	DO mg/L	pH SU	SpCond uS/cm	Salinity ppt
27030-100; 000	1	1	2/10/2016 08:19:39	20.9	7.73	7.83	348.2	0.17
27030-001; 001	1	1	2/10/2016 08:19:08	20.5	8.23	7.88	358.3	0.17
27030-010; 002	1	1	2/10/2016 08:18:26	20.5	8.24	7.92	348.8	0.17
27030-011; 003	1	1	2/10/2016 08:17:26	20	7.91	8.06	374.1	0.18
27030-012; 004	1	1	2/10/2016 08:18:06	20	8.36	7.96	345	0.17
27030-013; 005	1	1	2/10/2016 08:17:05	20	8	8.17	377.6	0.18
27030-016; 006	1	1	2/10/2016 08:20:03	20.9	8.14	7.86	343	0.16
27030-100; 000	2	1	2/10/2016 08:22:28	19.1	8.51	7.77	454.2	0.22
27030-001; 001	2	1	2/10/2016 08:21:47	19.7	8.45	7.88	339.6	0.16
27030-010; 002	2	1	2/10/2016 08:22:03	19.7	8.45	7.88	336.8	0.16
27030-011; 003	2	1	2/10/2016 08:20:48	21.2	8.05	7.87	360.3	0.17
27030-012; 004	2	1	2/10/2016 08:21:31	19.9	8.35	7.89	347.6	0.17
27030-013; 005	2	1	2/10/2016 08:20:21	20.7	8.06	7.89	336.7	0.16
27030-016; 006	2	1	2/10/2016 08:21:06	21.5	7.92	7.86	361.1	0.17
27030-100; 000	3	1	2/10/2016 08:24:52	19.3	8.55	7.89	339.3	0.16
27030-001; 001	3	1	2/10/2016 08:23:46	20.3	8.13	7.86	388.2	0.19
27030-010; 002	3	1	2/10/2016 08:22:47	19.9	8.36	7.88	372.4	0.18
27030-011; 003	3	1	2/10/2016 08:23:26	19.9	8.36	7.81	477.8	0.23
27030-012; 004	3	1	2/10/2016 08:24:07	20.7	7.95	7.86	348.9	0.17
27030-013; 005	3	1	2/10/2016 08:23:06	20	8.27	7.86	384.5	0.18
27030-016; 006	3	1	2/10/2016 08:24:29	20.6	8.05	7.75	548	0.27
27030-100; 000	1	2	2/11/2016 09:23:33	21	7.01	8.05	326.6	0.16
27030-001; 001	1	2	2/11/2016 09:23:10	20.5	7.38	8.17	346	0.17
27030-010; 002	1	2	2/11/2016 09:22:56	20.5	7.9	8.23	355.2	0.17
27030-011; 003	1	2	2/11/2016 09:22:28	20	7.21	8.43	358.8	0.17
27030-012; 004	1	2	2/11/2016 09:22:42	20	8.11	8.32	348.1	0.17
27030-013; 005	1	2	2/11/2016 09:22:05	20.1	7.71	8.65	409.5	0.2
27030-016; 006	1	2	2/11/2016 09:23:50	20.9	7.71	8.03	344.4	0.16
27030-100; 000	2	2	2/11/2016 09:25:42	19.3	7.75	7.84	357.7	0.17
27030-001; 001	2	2	2/11/2016 09:25:12	19.7	7.77	7.89	344.8	0.16
27030-010; 002	2	2	2/11/2016 09:25:27	19.7	7.89	7.87	353.8	0.17
27030-011; 003	2	2	2/11/2016 09:24:23	21.1	7.48	7.98	344.9	0.16
27030-012; 004	2	2	2/11/2016 09:24:57	20	7.14	7.92	356.9	0.17
27030-013; 005	2	2	2/11/2016 09:24:03	21	7.45	7.98	381.7	0.18
27030-016; 006	2	2	2/11/2016 09:24:38	21.7	7.46	7.92	370.9	0.18
27030-100; 000	3	2	2/11/2016 09:27:34	19.2	8.35	7.8	339.5	0.16
27030-001; 001	3	2	2/11/2016 09:26:42	20.3	7.61	7.84	345.1	0.17
27030-010; 002	3	2	2/11/2016 09:25:59	19.9	8.05	7.85	360.5	0.17
27030-011; 003	3	2	2/11/2016 09:26:27	19.9	8.14	7.85	354.2	0.17
27030-012; 004	3	2	2/11/2016 09:26:59	20.8	6.21	7.8	359	0.17
27030-013; 005	3	2	2/11/2016 09:26:13	20.1	7.9	7.83	381.6	0.18
27030-016; 006	3	2	2/11/2016 09:27:15	20.6	7.15	7.74	421.4	0.2
27030-100; 000	1	3	2/12/2016 13:43:08	22.4	7.94	7.67	335.8	0.16
27030-001; 001	1	3	2/12/2016 13:42:48	21.9	8.18	7.71	341.5	0.16

ESI Code	Replicate	Day	DateTime M/D/Y	Temp C	DO mg/L	pH SU	SpCond uS/cm	Salinity ppt
27030-010; 002	1	3	2/12/2016 13:42:30	22	8.28	7.73	340.2	0.16
27030-011; 003	1	3	2/12/2016 13:41:56	21.4	8.47	7.77	343.4	0.16
27030-012; 004	1	3	2/12/2016 13:42:12	21.5	8.47	7.73	348.4	0.17
27030-013; 005	1	3	2/12/2016 13:41:40	21.5	8.42	7.79	361.5	0.17
27030-016; 006	1	3	2/12/2016 13:43:34	22.6	8.03	7.69	345.6	0.16
27030-100; 000	2	3	2/12/2016 13:45:38	20.9	8.37	7.67	348.5	0.17
27030-001; 001	2	3	2/12/2016 13:45:08	21.5	8.11	7.7	342.5	0.16
27030-010; 002	2	3	2/12/2016 13:45:24	21.7	8.08	7.69	342.8	0.16
27030-011; 003	2	3	2/12/2016 13:44:07	22.6	8.08	7.73	347.7	0.17
27030-012; 004	2	3	2/12/2016 13:44:50	21.8	7.8	7.69	358.2	0.17
27030-013; 005	2	3	2/12/2016 13:43:50	22.5	7.93	7.7	368.7	0.18
27030-016; 006	2	3	2/12/2016 13:44:23	23.1	7.87	7.73	343.9	0.16
27030-100; 000	3	3	2/12/2016 13:47:46	21.3	8.38	7.68	335	0.16
27030-001; 001	3	3	2/12/2016 13:46:45	21.7	7.73	7.68	352.7	0.17
27030-010; 002	3	3	2/12/2016 13:45:55	21.5	8.2	7.68	353.4	0.17
27030-011; 003	3	3	2/12/2016 13:46:29	21.5	8.26	7.7	354.3	0.17
27030-012; 004	3	3	2/12/2016 13:47:08	22.1	7.17	7.64	355.5	0.17
27030-013; 005	3	3	2/12/2016 13:46:14	21.5	8.06	7.68	370.3	0.18
27030-016; 006	3	3	2/12/2016 13:47:27	21.7	7.69	7.63	385.4	0.18
27030-100; 000	1	4	2/13/2016 07:54:48	22.9	7.24	7.82	349.4	0.17
27030-001; 001	1	4	2/13/2016 07:54:32	22.5	7.89	7.91	343.8	0.16
27030-010; 002	1	4	2/13/2016 07:54:17	22.1	8.08	7.92	363.1	0.17
27030-011; 003	1	4	2/13/2016 07:53:29	21.8	8.26	8.06	339.9	0.16
27030-012; 004	1	4	2/13/2016 07:53:59	21.9	8.26	7.98	338.9	0.16
27030-013; 005	1	4	2/13/2016 07:53:10	21.8	8.16	8.11	359	0.17
27030-016; 006	1	4	2/13/2016 07:55:05	22.9	7.76	7.83	374.7	0.18
27030-100; 000	2	4	2/13/2016 07:57:22	20.9	8.19	7.81	343	0.16
27030-001; 001	2	4	2/13/2016 07:56:49	21.1	7.96	7.8	372.2	0.18
27030-010; 002	2	4	2/13/2016 07:57:05	21.3	7.98	7.81	363.4	0.17
27030-011; 003	2	4	2/13/2016 07:55:39	22.9	7.83	7.86	364.5	0.17
27030-012; 004	2	4	2/13/2016 07:56:30	21.4	7.41	7.8	385.7	0.18
27030-013; 005	2	4	2/13/2016 07:55:20	22.7	7.67	7.85	375.9	0.18
27030-016; 006	2	4	2/13/2016 07:56:03	23.2	7.74	7.87	346.9	0.17
27030-100; 000	3	4	2/13/2016 07:59:31	21.7	8.23	7.81	322.5	0.15
27030-001; 001	3	4	2/13/2016 07:58:34	22	7.76	7.81	340.9	0.16
27030-010; 002	3	4	2/13/2016 07:57:40	21.3	8.16	7.78	378	0.18
27030-011; 003	3	4	2/13/2016 07:58:19	21.4	8.23	7.81	368	0.18
27030-012; 004	3	4	2/13/2016 07:58:51	22.5	7.18	7.76	350.6	0.17
27030-013; 005	3	4	2/13/2016 07:58:03	21.9	7.88	7.81	353	0.17
27030-016; 006	3	4	2/13/2016 07:59:10	21.8	7.53	7.72	406	0.19
27030-100; 000	1	5	2/14/2016 09:02:38	22	6.98	7.78	348	0.17
27030-001; 001	1	5	2/14/2016 09:02:25	21.5	7.48	7.86	342.9	0.16
27030-010; 002	1	5	2/14/2016 09:02:12	21.3	7.78	7.83	374.8	0.18
27030-011; 003	1	5	2/14/2016 09:01:44	20.8	7.12	7.9	337.3	0.16
27030-012; 004	1	5	2/14/2016 09:01:57	20.8	8.04	7.88	335.8	0.16
27030-013; 005	1	5	2/14/2016 09:01:32	20.7	7.97	7.91	350.7	0.17
27030-016; 006	1	5	2/14/2016 09:02:52	22.1	7.39	7.79	393.2	0.19
27030-100; 000	2	5	2/14/2016 09:04:37	19.7	8.22	7.85	343.3	0.16
27030-001; 001	2	5	2/14/2016 09:04:12	20.3	7.81	7.8	390.6	0.19
27030-010; 002	2	5	2/14/2016 09:04:24	20.3	7.94	7.83	368.7	0.18
27030-011; 003	2	5	2/14/2016 09:03:21	22.1	7.19	7.85	370.1	0.18
27030-012; 004	2	5	2/14/2016 09:04:00	20.6	7.09	7.78	401.1	0.19
27030-013; 005	2	5	2/14/2016 09:03:04	21.8	7.31	7.81	384.5	0.18
27030-016; 006	2	5	2/14/2016 09:03:39	22.6	6.59	7.84	385.6	0.18
27030-100; 000	3	5	2/14/2016 09:06:16	20.3	8.29	7.84	317.9	0.15
27030-001; 001	3	5	2/14/2016 09:05:37	20.9	7.2	7.85	338.4	0.16

ESI Code	Replicate	Day	DateTime M/D/Y	Temp C	DO mg/L	pH SU	SpCond uS/cm	Salinity ppt
27030-010; 002	3	5	2/14/2016 09:04:51	20.3	8.17	7.8	395.5	0.19
27030-011; 003	3	5	2/14/2016 09:05:24	20.3	8.07	7.83	369.4	0.18
27030-012; 004	3	5	2/14/2016 09:05:51	21.4	6.29	7.8	348.6	0.17
27030-013; 005	3	5	2/14/2016 09:05:09	20.8	6.04	7.84	359.7	0.17
27030-016; 006	3	5	2/14/2016 09:06:01	21	6.33	7.72	430.8	0.21
27030-100; 000	1	6	2/15/2016 08:56:46	22.5	6.61	8.11	305.1	0.15
27030-001; 001	1	6	2/15/2016 08:56:27	22.3	6.66	8.26	351.1	0.17
27030-010; 002	1	6	2/15/2016 08:56:13	22	7.74	8.36	358.3	0.17
27030-011; 003	1	6	2/15/2016 08:55:45	21.6	7.68	8.68	341.6	0.16
27030-012; 004	1	6	2/15/2016 08:56:02	21.7	7.9	8.47	341.9	0.16
27030-013; 005	1	6	2/15/2016 08:55:32	21.6	7.72	8.88	358.4	0.17
27030-016; 006	1	6	2/15/2016 08:56:59	22.7	7.46	8.07	367.4	0.18
27030-100; 000	2	6	2/15/2016 08:58:22	20.3	8.16	7.86	347.4	0.17
27030-001; 001	2	6	2/15/2016 08:58:03	21.1	7.78	7.86	364.1	0.17
27030-010; 002	2	6	2/15/2016 08:58:12	21	7.94	7.87	355	0.17
27030-011; 003	2	6	2/15/2016 08:57:23	22.8	5.31	7.99	349.5	0.17
27030-012; 004	2	6	2/15/2016 08:57:53	21.5	7.43	7.87	349	0.17
27030-013; 005	2	6	2/15/2016 08:57:12	22.5	6.97	8.02	363.7	0.17
27030-016; 006	2	6	2/15/2016 08:57:40	23.4	5.21	7.88	385.6	0.18
27030-100; 000	3	6	2/15/2016 08:59:37	20.2	8.54	7.83	327.3	0.16
27030-001; 001	3	6	2/15/2016 08:59:05	21.4	7.62	7.84	344	0.16
27030-010; 002	3	6	2/15/2016 08:58:32	21.1	8.07	7.86	357.5	0.17
27030-011; 003	3	6	2/15/2016 08:58:53	21.1	7.94	7.84	359.2	0.17
27030-012; 004	3	6	2/15/2016 08:59:14	21.9	7.48	7.81	352.3	0.17
27030-013; 005	3	6	2/15/2016 08:58:43	21.4	7.65	7.84	354.1	0.17
27030-016; 006	3	6	2/15/2016 08:59:23	21.6	7.59	7.79	362.1	0.17
27030-100; 000	1	7	2/16/2016 09:12:55	23.9	6.47	8.03	359.4	0.17
27030-001; 001	1	7	2/16/2016 09:12:41	23.5	6.36	8.13	369	0.18
27030-010; 002	1	7	2/16/2016 09:12:27	23.1	7.22	8.19	379	0.18
27030-011; 003	1	7	2/16/2016 09:11:59	22.9	6.03	8.37	358.1	0.17
27030-012; 004	1	7	2/16/2016 09:12:14	22.9	7.25	8.29	355.9	0.17
27030-013; 005	1	7	2/16/2016 09:11:44	22.7	7.1	8.46	387.8	0.19
27030-016; 006	1	7	2/16/2016 09:13:09	23.9	6.96	8.01	381	0.18
27030-100; 000	2	7	2/16/2016 09:14:54	21.8	7.54	7.87	359.3	0.17
27030-001; 001	2	7	2/16/2016 09:14:28	22.2	7.01	7.85	380.6	0.18
27030-010; 002	2	7	2/16/2016 09:14:41	22.3	7.45	7.86	367.8	0.18
27030-011; 003	2	7	2/16/2016 09:13:44	24	6.29	7.93	365.2	0.17
27030-012; 004	2	7	2/16/2016 09:14:14	22.6	6.78	7.87	370.6	0.18
27030-013; 005	2	7	2/16/2016 09:13:30	23.8	4.71	7.95	410.5	0.2
27030-016; 006	2	7	2/16/2016 09:13:57	24.4	5.11	7.89	396.1	0.19
27030-100; 000	3	7	2/16/2016 09:16:24	21.5	8	7.86	339.2	0.16
27030-001; 001	3	7	2/16/2016 09:15:45	23	6.84	7.86	359.6	0.17
27030-010; 002	3	7	2/16/2016 09:15:07	22.5	7.51	7.86	372.9	0.18
27030-011; 003	3	7	2/16/2016 09:15:33	22.5	7.43	7.85	374.2	0.18
27030-012; 004	3	7	2/16/2016 09:15:58	23.4	6.31	7.82	369.9	0.18
27030-013; 005	3	7	2/16/2016 09:15:24	22.8	7.17	7.85	374.6	0.18
27030-016; 006	3	7	2/16/2016 09:16:07	23.1	6.93	7.8	381.6	0.18
27030-100; 000	1	8	2/17/2016 08:55:05	24	6.99	7.99	358.3	0.17
27030-001; 001	1	8	2/17/2016 08:54:42	23.5	7.55	8.04	380.2	0.18
27030-010; 002	1	8	2/17/2016 08:54:25	23.2	7.58	8.05	395.4	0.19
27030-011; 003	1	8	2/17/2016 08:53:44	22.8	7.83	8.12	366.3	0.17
27030-012; 004	1	8	2/17/2016 08:54:08	22.9	7.8	8.08	368.9	0.18
27030-013; 005	1	8	2/17/2016 08:53:24	22.7	7.24	8.13	394.1	0.19
27030-016; 006	1	8	2/17/2016 08:55:34	23.9	7.46	8	379.4	0.18
27030-100; 000	2	8	2/17/2016 08:58:26	21.9	7.75	7.88	374.1	0.18

ESI Code	Replicate	Day	DateTime M/D/Y	Temp C	DO mg/L	pH SU	SpCond uS/cm	Salinity ppt
27030-001; 001	2	8	2/17/2016 08:57:35	22.3	7.53	7.9	398.6	0.19
27030-010; 002	2	8	2/17/2016 08:57:54	22.3	7.81	7.92	380.5	0.18
27030-011; 003	2	8	2/17/2016 08:56:10	23.8	7.58	8	380.6	0.18
27030-012; 004	2	8	2/17/2016 08:57:12	22.7	7.1	7.94	389.1	0.19
27030-013; 005	2	8	2/17/2016 08:55:53	23.7	7.24	7.99	393.4	0.19
27030-016; 006	2	8	2/17/2016 08:56:29	24.2	7.22	7.97	400.9	0.19
27030-100; 000	3	8	2/17/2016 09:01:10	21.6	8.24	7.85	351.3	0.17
27030-001; 001	3	8	2/17/2016 09:00:15	23	7.38	7.85	373.1	0.18
27030-010; 002	3	8	2/17/2016 08:58:54	22.5	7.83	7.88	386.3	0.18
27030-011; 003	3	8	2/17/2016 08:59:56	22.5	7.86	7.86	393.6	0.19
27030-012; 004	3	8	2/17/2016 09:00:35	23.4	6.64	7.8	382.7	0.18
27030-013; 005	3	8	2/17/2016 08:59:28	22.9	7.5	7.84	389.5	0.19
27030-016; 006	3	8	2/17/2016 09:00:50	23.1	7.27	7.78	403	0.19
27030-100; 000	1	9	2/18/2016 09:04:15	23.6	6.95	8	365.8	0.17
27030-001; 001	1	9	2/18/2016 09:03:51	23.1	7.38	8.04	388.4	0.19
27030-010; 002	1	9	2/18/2016 09:03:21	22.8	7.56	8.07	379.8	0.18
27030-011; 003	1	9	2/18/2016 09:02:40	22.2	7.67	8.08	400.3	0.19
27030-012; 004	1	9	2/18/2016 09:03:01	22.4	7.72	8.08	376	0.18
27030-013; 005	1	9	2/18/2016 09:02:20	22.2	7.44	8.08	405.4	0.19
27030-016; 006	1	9	2/18/2016 09:04:37	23.5	7.35	7.99	387.6	0.19
27030-100; 000	2	9	2/18/2016 09:07:28	21.3	7.74	7.9	392.7	0.19
27030-001; 001	2	9	2/18/2016 09:06:49	21.7	7.51	7.91	417.2	0.2
27030-010; 002	2	9	2/18/2016 09:07:12	21.8	7.81	7.92	394	0.19
27030-011; 003	2	9	2/18/2016 09:05:18	23.5	7.5	8	392.7	0.19
27030-012; 004	2	9	2/18/2016 09:06:03	22.2	7.06	7.94	409.7	0.2
27030-013; 005	2	9	2/18/2016 09:04:59	23.3	7.25	7.96	403.3	0.19
27030-016; 006	2	9	2/18/2016 09:05:36	24	7.2	7.98	410.5	0.2
27030-100; 000	3	9	2/18/2016 09:10:03	21.1	8.27	7.9	357.8	0.17
27030-001; 001	3	9	2/18/2016 09:08:51	22.6	7.3	7.88	386.1	0.18
27030-010; 002	3	9	2/18/2016 09:07:46	22.1	7.89	7.92	402	0.19
27030-011; 003	3	9	2/18/2016 09:08:32	22.1	7.86	7.89	415.6	0.2
27030-012; 004	3	9	2/18/2016 09:09:15	23	6.94	7.83	398.4	0.19
27030-013; 005	3	9	2/18/2016 09:08:10	22.4	7.45	7.87	409.7	0.2
27030-016; 006	3	9	2/18/2016 09:09:30	22.7	7.22	7.81	424.3	0.2
27030-100; 000	1	10	2/19/2016 08:54:21	23.4	7.28	7.17	361	0.17
27030-001; 001	1	10	2/19/2016 08:53:59	23	7.64	7.14	393.6	0.19
27030-010; 002	1	10	2/19/2016 08:53:42	22.8	7.8	7.1	379.6	0.18
27030-011; 003	1	10	2/19/2016 08:52:50	22.2	7.96	6.85	373.8	0.18
27030-012; 004	1	10	2/19/2016 08:53:09	22.2	7.97	6.95	390.4	0.19
27030-013; 005	1	10	2/19/2016 08:51:52	22.1	7.9	6.54	397.8	0.19
27030-016; 006	1	10	2/19/2016 08:55:01	23.5	7.52	7.23	399.1	0.19
27030-100; 000	2	10	2/19/2016 08:57:16	21.2	8.09	7.43	378.4	0.18
27030-001; 001	2	10	2/19/2016 08:56:33	21.8	7.91	7.39	384.2	0.18
27030-010; 002	2	10	2/19/2016 08:56:50	21.6	8.18	7.4	393.4	0.19
27030-011; 003	2	10	2/19/2016 08:55:34	23.4	7.69	7.3	397.1	0.19
27030-012; 004	2	10	2/19/2016 08:56:15	21.9	7.46	7.34	411.2	0.2
27030-013; 005	2	10	2/19/2016 08:55:19	23.3	7.23	7.25	405.1	0.19
27030-016; 006	2	10	2/19/2016 08:55:52	23.8	7.46	7.33	389.1	0.19
27030-100; 000	3	10	2/19/2016 08:59:36	20.6	8.63	7.51	367.4	0.18
27030-001; 001	3	10	2/19/2016 08:58:38	22.1	7.14	7.45	415.1	0.2
27030-010; 002	3	10	2/19/2016 08:57:32	21.9	8.2	7.45	389.6	0.19
27030-011; 003	3	10	2/19/2016 08:58:22	22	8.05	7.47	414.5	0.2
27030-012; 004	3	10	2/19/2016 08:58:56	22.8	6.58	7.4	439.5	0.21
27030-013; 005	3	10	2/19/2016 08:57:50	22.1	7.77	7.43	422.9	0.2
27030-016; 006	3	10	2/19/2016 08:59:14	22.5	7.53	7.44	417.9	0.2

ESI Code	Replicate	Day	DateTime M/D/Y	Temp C	DO mg/L	pH SU	SpCond uS/cm	Salinity ppt
27030-100; 000	1	11	2/20/2016 07:48:43	23.6	7.22	7.32	346.1	0.16
27030-001; 001	1	11	2/20/2016 07:48:18	23.2	7.42	7.3	384.3	0.18
27030-010; 002	1	11	2/20/2016 07:47:47	23	7.72	7.26	368.4	0.18
27030-011; 003	1	11	2/20/2016 07:46:40	22.6	7.46	7.04	361.7	0.17
27030-012; 004	1	11	2/20/2016 07:47:12	22.5	7.81	7.14	384.8	0.18
27030-013; 005	1	11	2/20/2016 07:46:19	22.6	7.37	6.96	395.3	0.19
27030-016; 006	1	11	2/20/2016 07:49:05	23.7	7.26	7.29	393.2	0.19
27030-100; 000	2	11	2/20/2016 07:51:26	21.6	7.98	7.49	374.2	0.18
27030-001; 001	2	11	2/20/2016 07:50:50	22	7.69	7.44	374.7	0.18
27030-010; 002	2	11	2/20/2016 07:51:07	21.9	7.92	7.46	399.5	0.19
27030-011; 003	2	11	2/20/2016 07:49:41	23.8	7.42	7.36	389.3	0.19
27030-012; 004	2	11	2/20/2016 07:50:32	22.2	7.16	7.37	422.9	0.2
27030-013; 005	2	11	2/20/2016 07:49:23	23.5	6.94	7.29	398.7	0.19
27030-016; 006	2	11	2/20/2016 07:50:10	24.1	7.08	7.38	373.4	0.18
27030-100; 000	3	11	2/20/2016 07:53:37	20.9	8.5	7.6	372.4	0.18
27030-001; 001	3	11	2/20/2016 07:52:43	22.5	6.86	7.5	452.8	0.22
27030-010; 002	3	11	2/20/2016 07:51:42	22.2	8.08	7.53	394.1	0.19
27030-011; 003	3	11	2/20/2016 07:52:23	22.3	7.95	7.54	433.2	0.21
27030-012; 004	3	11	2/20/2016 07:53:00	23.1	6.38	7.45	482.9	0.23
27030-013; 005	3	11	2/20/2016 07:52:08	22.5	7.54	7.51	432	0.21
27030-016; 006	3	11	2/20/2016 07:53:18	23	7.33	7.51	429.6	0.21
27030-100; 000	1	12	2/21/2016 09:10:17	24.5	6.9	6.71	348.1	0.17
27030-001; 001	1	12	2/21/2016 09:09:59	24.1	7.01	6.63	390.4	0.19
27030-010; 002	1	12	2/21/2016 09:09:43	23.9	7.33	6.57	372.7	0.18
27030-011; 003	1	12	2/21/2016 09:09:16	23.5	7.17	6.48	368.7	0.18
27030-012; 004	1	12	2/21/2016 09:09:29	23.4	7.46	6.5	396.1	0.19
27030-013; 005	1	12	2/21/2016 09:09:02	23.4	7.28	6.45	410.5	0.2
27030-016; 006	1	12	2/21/2016 09:10:30	24.5	6.87	6.73	399.2	0.19
27030-100; 000	2	12	2/21/2016 09:12:09	22.4	7.4	7.1	396	0.19
27030-001; 001	2	12	2/21/2016 09:11:48	22.8	7.17	7.08	391	0.19
27030-010; 002	2	12	2/21/2016 09:11:59	22.8	7.2	7.07	432.8	0.21
27030-011; 003	2	12	2/21/2016 09:11:02	24.5	7.23	6.86	397.6	0.19
27030-012; 004	2	12	2/21/2016 09:11:35	23	5.94	6.95	465.8	0.22
27030-013; 005	2	12	2/21/2016 09:10:49	24.3	5.41	6.77	403.1	0.19
27030-016; 006	2	12	2/21/2016 09:11:15	24.7	7.09	6.94	374.3	0.18
27030-100; 000	3	12	2/21/2016 09:13:37	21.6	8.23	7.36	383.4	0.18
27030-001; 001	3	12	2/21/2016 09:12:59	23.4	6.63	7.22	501	0.24
27030-010; 002	3	12	2/21/2016 09:12:24	23.1	7.27	7.18	429.2	0.21
27030-011; 003	3	12	2/21/2016 09:12:50	23.1	7.37	7.22	477.8	0.23
27030-012; 004	3	12	2/21/2016 09:13:09	23.9	5.64	7.17	529	0.25
27030-013; 005	3	12	2/21/2016 09:12:37	23.3	7	7.18	469	0.23
27030-016; 006	3	12	2/21/2016 09:13:21	23.8	6.78	7.25	452.6	0.22
27030-100; 000	1	13	2/22/2016 09:04:28	24.1	6.56	6.89	350.9	0.17
27030-001; 001	1	13	2/22/2016 09:04:10	23.8	6.6	6.83	400.5	0.19
27030-010; 002	1	13	2/22/2016 09:03:53	23.5	6.53	6.8	378.5	0.18
27030-011; 003	1	13	2/22/2016 09:03:05	23.1	6.58	6.58	374	0.18
27030-012; 004	1	13	2/22/2016 09:03:31	22.9	7.04	6.68	412.7	0.2
27030-013; 005	1	13	2/22/2016 09:02:50	22.8	6.31	6.54	426	0.2
27030-016; 006	1	13	2/22/2016 09:04:42	24.1	6.76	6.89	414.1	0.2
27030-100; 000	2	13	2/22/2016 09:06:31	21.7	6.53	7.15	430.9	0.21
27030-001; 001	2	13	2/22/2016 09:06:02	22.2	6.89	7.08	427.2	0.2
27030-010; 002	2	13	2/22/2016 09:06:16	22.3	6.76	7.11	469.6	0.23
27030-011; 003	2	13	2/22/2016 09:05:14	24.3	6.51	6.99	406.6	0.19
27030-012; 004	2	13	2/22/2016 09:05:48	22.7	4.53	6.99	511	0.25
27030-013; 005	2	13	2/22/2016 09:04:59	24	6.23	6.94	413.6	0.2
27030-016; 006	2	13	2/22/2016 09:05:30	24.4	5.79	7.05	380.9	0.18

ESI Code	Replicate	Day	DateTime M/D/Y	Temp C	DO mg/L	pH SU	SpCond uS/cm	Salinity ppt
27030-100; 000	3	13	2/22/2016 09:08:20	21.1	7.95	7.42	394	0.19
27030-001; 001	3	13	2/22/2016 09:07:25	22.8	6.1	7.26	547	0.26
27030-010; 002	3	13	2/22/2016 09:06:46	22.6	7.28	7.24	465	0.22
27030-011; 003	3	13	2/22/2016 09:07:11	22.6	6.97	7.26	522	0.25
27030-012; 004	3	13	2/22/2016 09:07:49	23.4	5.05	7.22	574	0.28
27030-013; 005	3	13	2/22/2016 09:06:59	22.8	6.42	7.25	521	0.25
27030-016; 006	3	13	2/22/2016 09:08:03	23.1	6.32	7.32	473.3	0.23
27030-100; 000	1	14	2/23/2016 08:56:17	24.6	7.89	7.11	337.4	0.16
27030-001; 001	1	14	2/23/2016 08:55:59	24.2	6.15	7.05	359.4	0.17
27030-010; 002	1	14	2/23/2016 08:55:42	24	8.38	7.06	348.3	0.17
27030-011; 003	1	14	2/23/2016 08:55:11	23.4	8.32	7.1	366.7	0.17
27030-012; 004	1	14	2/23/2016 08:55:25	23.5	8.61	7.06	360.8	0.17
27030-013; 005	1	14	2/23/2016 08:54:56	23.3	8.04	7.27	379.4	0.18
27030-016; 006	1	14	2/23/2016 08:56:37	24.7	5.69	7.21	381.6	0.18
27030-100; 000	2	14	2/23/2016 08:58:51	22.4	7.85	7.47	357.1	0.17
27030-001; 001	2	14	2/23/2016 08:58:21	23	7.42	7.44	358	0.17
27030-010; 002	2	14	2/23/2016 08:58:36	23	7.85	7.46	349.1	0.17
27030-011; 003	2	14	2/23/2016 08:57:29	24.7	7.52	7.33	362.6	0.17
27030-012; 004	2	14	2/23/2016 08:58:03	23.3	7.19	7.4	356.6	0.17
27030-013; 005	2	14	2/23/2016 08:57:14	24.4	6.95	7.26	373.8	0.18
27030-016; 006	2	14	2/23/2016 08:57:43	25.2	5.94	7.35	371.6	0.18
27030-100; 000	3	14	2/23/2016 09:00:49	21.9	8.11	7.6	340.7	0.16
27030-001; 001	3	14	2/23/2016 08:59:59	23.4	7.25	7.54	357.9	0.17
27030-010; 002	3	14	2/23/2016 08:59:05	23.2	7.79	7.52	348.3	0.17
27030-011; 003	3	14	2/23/2016 08:59:42	23.3	7.56	7.52	370.2	0.18
27030-012; 004	3	14	2/23/2016 09:00:13	24	7.04	7.54	358.8	0.17
27030-013; 005	3	14	2/23/2016 08:59:24	23.5	6.64	7.51	378.9	0.18
27030-016; 006	3	14	2/23/2016 09:00:31	23.8	7.08	7.55	371.5	0.18
27030-100; 000	1	15	2/24/2016 08:45:41	25.2	7.43	7.33	330.7	0.16
27030-001; 001	1	15	2/24/2016 08:45:13	25	7.57	7.3	345.7	0.16
27030-010; 002	1	15	2/24/2016 08:44:55	24.7	7.8	7.26	338.3	0.16
27030-011; 003	1	15	2/24/2016 08:44:24	24.2	7.71	7.16	356.8	0.17
27030-012; 004	1	15	2/24/2016 08:44:41	24.3	7.87	7.2	354.9	0.17
27030-013; 005	1	15	2/24/2016 08:44:04	24.1	7.66	7.1	357.4	0.17
27030-016; 006	1	15	2/24/2016 08:46:04	25.2	7.34	7.34	355.7	0.17
27030-100; 000	2	15	2/24/2016 08:49:01	23.2	7.77	7.55	341.3	0.16
27030-001; 001	2	15	2/24/2016 08:48:27	23.7	7.63	7.5	348.7	0.17
27030-010; 002	2	15	2/24/2016 08:48:44	23.7	7.88	7.54	342.4	0.16
27030-011; 003	2	15	2/24/2016 08:46:42	25.3	7.42	7.41	363	0.17
27030-012; 004	2	15	2/24/2016 08:48:07	24	7.43	7.47	354.1	0.17
27030-013; 005	2	15	2/24/2016 08:46:21	25.1	7.31	7.35	366.4	0.17
27030-016; 006	2	15	2/24/2016 08:47:36	25.7	6.66	7.41	360.5	0.17
27030-100; 000	3	15	2/24/2016 08:51:08	22.5	8.26	7.64	335.7	0.16
27030-001; 001	3	15	2/24/2016 08:50:14	24.1	7.35	7.58	351.5	0.17
27030-010; 002	3	15	2/24/2016 08:49:17	23.8	7.86	7.56	346.4	0.16
27030-011; 003	3	15	2/24/2016 08:49:57	24	7.65	7.57	364.6	0.17
27030-012; 004	3	15	2/24/2016 08:50:29	24.7	7.17	7.57	353.3	0.17
27030-013; 005	3	15	2/24/2016 08:49:38	24.1	7.48	7.55	356.9	0.17
27030-016; 006	3	15	2/24/2016 08:50:44	24.6	7.29	7.57	353	0.17
27030-100; 000	1	16	2/25/2016 08:51:01	24.4	7.74	6.98	331.6	0.16
27030-001; 001	1	16	2/25/2016 08:50:46	24	7.65	6.95	351.3	0.17
27030-010; 002	1	16	2/25/2016 08:50:29	23.8	8.44	6.92	349.9	0.17
27030-011; 003	1	16	2/25/2016 08:49:51	23.4	8.43	6.88	358.5	0.17
27030-012; 004	1	16	2/25/2016 08:50:07	23.4	8.78	6.87	357.7	0.17
27030-013; 005	1	16	2/25/2016 08:49:36	23.4	8.92	6.96	350.9	0.17

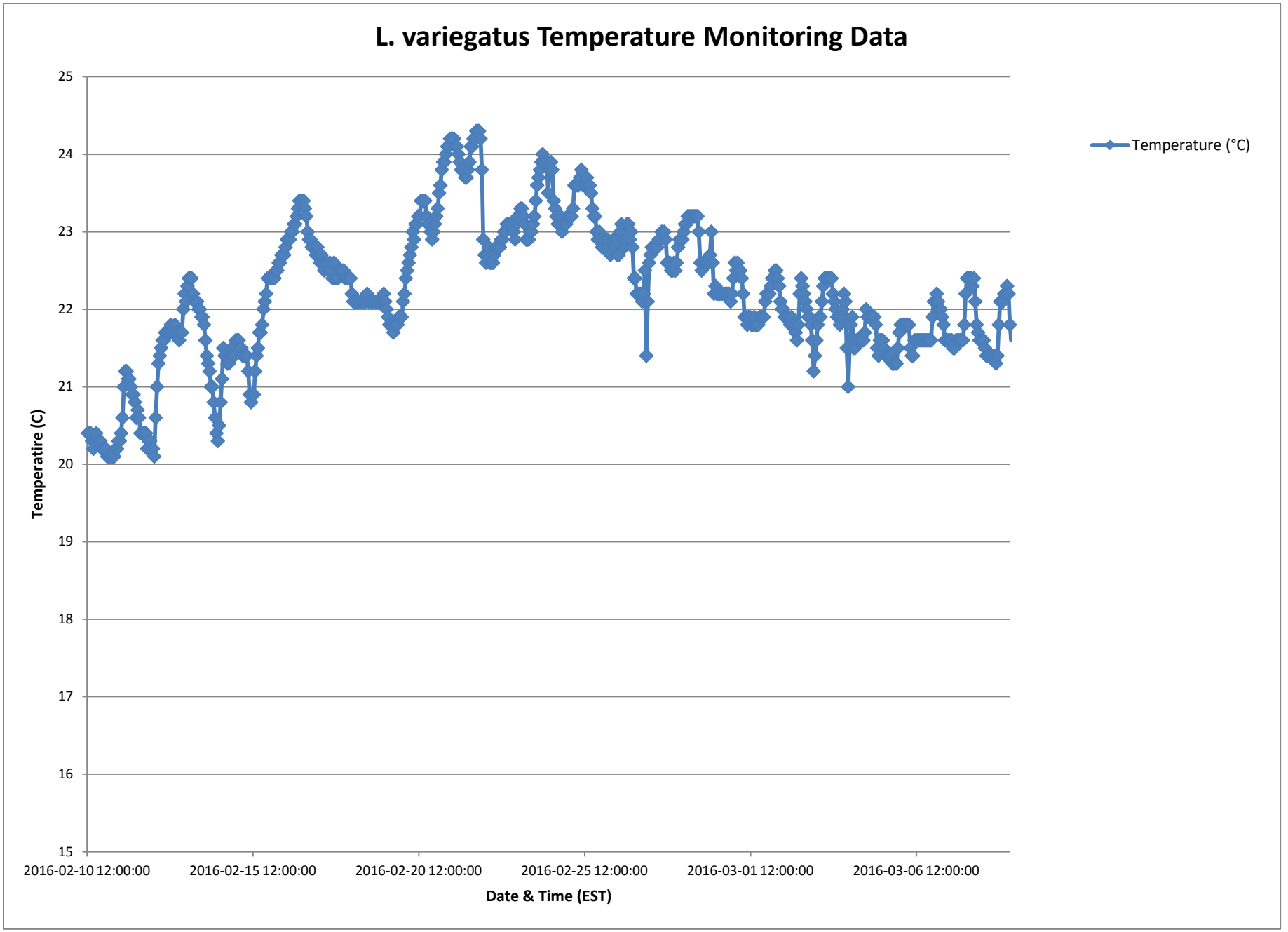
ESI Code	Replicate	Day	DateTime M/D/Y	Temp C	DO mg/L	pH SU	SpCond uS/cm	Salinity ppt
27030-016; 006	1	16	2/25/2016 08:51:14	24.3	7.74	7	345.1	0.16
27030-100; 000	2	16	2/25/2016 08:52:53	23	7.67	7.32	339.2	0.16
27030-001; 001	2	16	2/25/2016 08:52:25	23.3	7.64	7.22	350.9	0.17
27030-010; 002	2	16	2/25/2016 08:52:39	23.2	7.85	7.28	344.4	0.16
27030-011; 003	2	16	2/25/2016 08:51:44	24.3	7.36	7.06	350.5	0.17
27030-012; 004	2	16	2/25/2016 08:52:12	23.4	7.53	7.15	356.5	0.17
27030-013; 005	2	16	2/25/2016 08:51:29	24.2	5.35	7.01	357.6	0.17
27030-016; 006	2	16	2/25/2016 08:51:57	24.5	7.41	7.12	343.6	0.16
27030-100; 000	3	16	2/25/2016 08:54:32	23.3	7.76	7.51	329.5	0.16
27030-001; 001	3	16	2/25/2016 08:53:47	23.6	7.4	7.41	353.1	0.17
27030-010; 002	3	16	2/25/2016 08:53:08	23.3	7.84	7.37	349.7	0.17
27030-011; 003	3	16	2/25/2016 08:53:36	23.3	7.49	7.37	369.5	0.18
27030-012; 004	3	16	2/25/2016 08:54:00	23.9	7.13	7.42	356.6	0.17
27030-013; 005	3	16	2/25/2016 08:53:24	23.6	6.85	7.35	357.6	0.17
27030-016; 006	3	16	2/25/2016 08:54:15	23.9	6.99	7.44	356.8	0.17
27030-100; 000	1	17	2/26/2016 08:28:20	23.8	6.92	7.54	323.8	0.15
27030-001; 001	1	17	2/26/2016 08:28:02	23.3	7.09	7.54	344.9	0.16
27030-010; 002	1	17	2/26/2016 08:27:38	23.1	7.26	7.54	338	0.16
27030-011; 003	1	17	2/26/2016 08:26:48	22.5	7.24	7.45	360.4	0.17
27030-012; 004	1	17	2/26/2016 08:27:22	22.5	7.37	7.51	361.7	0.17
27030-013; 005	1	17	2/26/2016 08:26:30	22.5	7.22	7.42	350	0.17
27030-016; 006	1	17	2/26/2016 08:28:39	23.6	7.01	7.55	341.7	0.16
27030-100; 000	2	17	2/26/2016 08:30:56	22	7.51	7.63	333.3	0.16
27030-001; 001	2	17	2/26/2016 08:30:21	22.4	7.34	7.6	346.6	0.17
27030-010; 002	2	17	2/26/2016 08:30:38	22.3	7.5	7.62	343.2	0.16
27030-011; 003	2	17	2/26/2016 08:29:16	23.7	6.85	7.56	350.2	0.17
27030-012; 004	2	17	2/26/2016 08:30:05	22.7	7.14	7.58	350.5	0.17
27030-013; 005	2	17	2/26/2016 08:28:55	23.4	7	7.55	349.5	0.17
27030-016; 006	2	17	2/26/2016 08:29:36	23.9	6.87	7.58	342.3	0.16
27030-100; 000	3	17	2/26/2016 08:34:16	22.2	7.7	7.69	319.8	0.15
27030-001; 001	3	17	2/26/2016 08:32:44	22.8	7.09	7.66	348.7	0.17
27030-010; 002	3	17	2/26/2016 08:31:15	22.5	7.57	7.64	348.6	0.17
27030-011; 003	3	17	2/26/2016 08:32:13	22.3	7.51	7.65	375.7	0.18
27030-012; 004	3	17	2/26/2016 08:33:19	23.2	6.87	7.63	356	0.17
27030-013; 005	3	17	2/26/2016 08:31:54	22.8	7.23	7.65	352.5	0.17
27030-016; 006	3	17	2/26/2016 08:33:57	22.9	7.13	7.65	351.8	0.17
27030-100; 000	1	18	2/27/2016 08:12:49	23.3	7.89	7.37	322.4	0.15
27030-001; 001	1	18	2/27/2016 08:12:26	22.9	8.15	7.37	344.7	0.16
27030-010; 002	1	18	2/27/2016 08:11:51	22.8	8.21	7.32	339	0.16
27030-011; 003	1	18	2/27/2016 08:11:06	22.2	8.53	7.26	345.2	0.16
27030-012; 004	1	18	2/27/2016 08:11:32	22.3	8.51	7.29	345.7	0.16
27030-013; 005	1	18	2/27/2016 08:10:31	21.9	8.67	7.19	357.2	0.17
27030-016; 006	1	18	2/27/2016 08:13:05	23.1	8	7.38	342.2	0.16
27030-100; 000	2	18	2/27/2016 08:15:23	21.5	8.28	7.5	332.7	0.16
27030-001; 001	2	18	2/27/2016 08:14:48	22	8.13	7.47	351	0.17
27030-010; 002	2	18	2/27/2016 08:15:05	21.7	8.3	7.49	349.1	0.17
27030-011; 003	2	18	2/27/2016 08:13:46	23.1	7.99	7.39	346.6	0.17
27030-012; 004	2	18	2/27/2016 08:14:32	22.2	7.97	7.45	353	0.17
27030-013; 005	2	18	2/27/2016 08:13:28	23	7.18	7.33	351.8	0.17
27030-016; 006	2	18	2/27/2016 08:14:05	23.2	7.98	7.44	332.1	0.16
27030-100; 000	3	18	2/27/2016 08:17:55	21.4	8.47	7.58	317.7	0.15
27030-001; 001	3	18	2/27/2016 08:16:59	22.1	7.85	7.55	354.5	0.17
27030-010; 002	3	18	2/27/2016 08:15:43	21.9	8.38	7.52	353.3	0.17
27030-011; 003	3	18	2/27/2016 08:16:40	21.8	8.14	7.54	391.5	0.19
27030-012; 004	3	18	2/27/2016 08:17:18	22.6	7.3	7.51	367.5	0.18
27030-013; 005	3	18	2/27/2016 08:16:13	22.1	8.06	7.53	352.8	0.17

ESI Code	Replicate	Day	DateTime M/D/Y	Temp C	DO mg/L	pH SU	SpCond uS/cm	Salinity ppt
27030-016; 006	3	18	2/27/2016 08:17:37	22.1	7.94	7.53	361.3	0.17
27030-100; 000	1	19	2/28/2016 08:52:18	23.3	7.33	6.79	320.3	0.15
27030-001; 001	1	19	2/28/2016 08:52:02	23	7.2	6.77	345.4	0.16
27030-010; 002	1	19	2/28/2016 08:51:45	22.9	7.38	6.75	339.9	0.16
27030-011; 003	1	19	2/28/2016 08:51:07	22.2	7.77	6.78	348.1	0.17
27030-012; 004	1	19	2/28/2016 08:51:31	22.4	7.65	6.74	348.7	0.17
27030-013; 005	1	19	2/28/2016 08:50:49	22	7.97	6.96	366.5	0.18
27030-016; 006	1	19	2/28/2016 08:52:33	23.1	7.38	6.81	342.5	0.16
27030-100; 000	2	19	2/28/2016 08:54:31	21.7	7.61	7.24	334.4	0.16
27030-001; 001	2	19	2/28/2016 08:54:00	22.1	7.55	7.11	357.6	0.17
27030-010; 002	2	19	2/28/2016 08:54:14	22	7.78	7.18	356.1	0.17
27030-011; 003	2	19	2/28/2016 08:53:06	23.2	7.29	6.92	353.5	0.17
27030-012; 004	2	19	2/28/2016 08:53:40	22.4	7.39	7.02	359.1	0.17
27030-013; 005	2	19	2/28/2016 08:52:49	23	7.02	6.85	356.1	0.17
27030-016; 006	2	19	2/28/2016 08:53:21	23.3	6.5	6.97	340.6	0.16
27030-100; 000	3	19	2/28/2016 08:56:30	21.9	7.79	7.52	316	0.15
27030-001; 001	3	19	2/28/2016 08:55:42	22.2	7.25	7.42	367.6	0.18
27030-010; 002	3	19	2/28/2016 08:54:47	22.2	7.9	7.3	359.9	0.17
27030-011; 003	3	19	2/28/2016 08:55:25	22	7.77	7.37	419	0.2
27030-012; 004	3	19	2/28/2016 08:56:00	22.9	6.53	7.4	387.8	0.19
27030-013; 005	3	19	2/28/2016 08:55:07	22.4	7.04	7.35	362.7	0.17
27030-016; 006	3	19	2/28/2016 08:56:13	22.5	7.42	7.44	369.7	0.18
27030-100; 000	3	19	2/28/2016 08:56:30	21.9	7.79	7.52	316	0.15
27030-001; 001	1	20	2/29/2016 08:57:23	23.3	8.01	6.54	346	0.16
27030-010; 002	1	20	2/29/2016 08:57:08	23.2	8.53	6.5	332.8	0.16
27030-011; 003	1	20	2/29/2016 08:56:31	22.5	8.89	6.35	347.8	0.17
27030-012; 004	1	20	2/29/2016 08:56:52	22.6	8.75	6.41	361	0.17
27030-013; 005	1	20	2/29/2016 08:56:13	22.4	9.1	6.35	338.3	0.16
27030-016; 006	1	20	2/29/2016 08:57:57	23.5	7.64	6.65	341.6	0.16
27030-100; 000	2	20	2/29/2016 08:59:54	22	7.98	7.12	316.3	0.15
27030-100; 000	1	20	2/29/2016 08:57:41	23.5	7.8	6.6	317.9	0.15
27030-001; 001	2	20	2/29/2016 08:59:26	22.5	7.78	7	348.1	0.17
27030-010; 002	2	20	2/29/2016 08:59:39	22.4	7.88	7.05	340.6	0.16
27030-011; 003	2	20	2/29/2016 08:58:27	23.3	7.68	6.78	335.2	0.16
27030-012; 004	2	20	2/29/2016 08:59:11	22.9	6.83	6.93	336.2	0.16
27030-013; 005	2	20	2/29/2016 08:58:11	23.4	6.3	6.7	343.8	0.16
27030-016; 006	2	20	2/29/2016 08:58:50	23.6	6.35	6.88	332.1	0.16
27030-100; 000	3	20	2/29/2016 09:01:43	22.1	8.06	7.33	315.3	0.15
27030-001; 001	3	20	2/29/2016 09:00:53	22.6	7.47	7.23	347.9	0.17
27030-010; 002	3	20	2/29/2016 09:00:08	22.7	7.97	7.14	332.4	0.16
27030-011; 003	3	20	2/29/2016 09:00:38	22.8	7.79	7.22	332.4	0.16
27030-012; 004	3	20	2/29/2016 09:01:08	23.2	7.32	7.25	336.3	0.16
27030-013; 005	3	20	2/29/2016 09:00:24	22.7	7.1	7.15	360.6	0.17
27030-016; 006	3	20	2/29/2016 09:01:23	22.7	7.54	7.28	344.9	0.16
27030-100; 000	1	21	3/1/2016 08:57:24	22	8.38	6.73	316.1	0.15
27030-001; 001	1	21	3/1/2016 08:57:07	21.8	8.72	6.65	339.7	0.16
27030-010; 002	1	21	3/1/2016 08:56:41	22	9.03	6.56	326	0.16
27030-011; 003	1	21	3/1/2016 08:56:13	21.5	8.07	6.47	352	0.17
27030-012; 004	1	21	3/1/2016 08:56:28	21.5	8.88	6.49	352	0.17
27030-013; 005	1	21	3/1/2016 08:55:55	21.4	9.29	6.5	344.4	0.16
27030-016; 006	1	21	3/1/2016 08:57:38	21.6	8.49	6.75	346.4	0.17
27030-100; 000	2	21	3/1/2016 08:59:40	21.2	8.31	7.19	319.1	0.15
27030-001; 001	2	21	3/1/2016 08:59:10	21.9	8.21	7.09	334.9	0.16
27030-010; 002	2	21	3/1/2016 08:59:25	21.7	8.39	7.15	329.6	0.16
27030-011; 003	2	21	3/1/2016 08:58:20	21.9	8.26	6.93	340	0.16

ESI Code	Replicate	Day	DateTime M/D/Y	Temp C	DO mg/L	pH SU	SpCond uS/cm	Salinity ppt
27030-012; 004	2	21	3/1/2016 08:58:54	22	8.04	7.03	332.7	0.16
27030-013; 005	2	21	3/1/2016 08:58:01	21.7	8.04	6.86	343.2	0.16
27030-016; 006	2	21	3/1/2016 08:58:36	22.3	7.47	7	332.1	0.16
27030-100; 000	3	21	3/1/2016 09:01:35	21.5	8.43	7.37	317	0.15
27030-001; 001	3	21	3/1/2016 09:00:49	21.9	7.98	7.31	328.3	0.16
27030-010; 002	3	21	3/1/2016 08:59:54	21.8	8.39	7.22	323.2	0.15
27030-011; 003	3	21	3/1/2016 09:00:32	21.8	8.32	7.29	336.3	0.16
27030-012; 004	3	21	3/1/2016 09:01:03	22	7.94	7.32	333.5	0.16
27030-013; 005	3	21	3/1/2016 09:00:11	21.9	8.01	7.23	335	0.16
27030-016; 006	3	21	3/1/2016 09:01:21	21.8	7.91	7.34	330.9	0.16
27030-100; 000	1	22	3/2/2016 09:14:58	22.4	8.12	7.49	311.2	0.15
27030-001; 001	1	22	3/2/2016 09:14:26	22.3	8.06	7.48	337.8	0.16
27030-010; 002	1	22	3/2/2016 09:13:49	22.4	8.37	7.49	323.5	0.15
27030-011; 003	1	22	3/2/2016 09:12:37	22.1	7.64	7.3	350.9	0.17
27030-012; 004	1	22	3/2/2016 09:13:24	22	8.33	7.41	360.3	0.17
27030-013; 005	1	22	3/2/2016 09:11:20	22	8.41	7.39	346.2	0.17
27030-016; 006	1	22	3/2/2016 09:15:28	22.1	8.09	7.5	346	0.17
27030-100; 000	2	22	3/2/2016 09:21:38	21.8	8.23	7.54	317.4	0.15
27030-001; 001	2	22	3/2/2016 09:20:48	22.2	8.3	7.49	331.3	0.16
27030-010; 002	2	22	3/2/2016 09:21:07	22.1	8.33	7.54	329.1	0.16
27030-011; 003	2	22	3/2/2016 09:17:28	22.3	7.85	7.39	337.9	0.16
27030-012; 004	2	22	3/2/2016 09:20:25	22.3	7.99	7.45	329.2	0.16
27030-013; 005	2	22	3/2/2016 09:16:02	22.2	7.03	7.43	342.9	0.16
27030-016; 006	2	22	3/2/2016 09:19:37	22.6	6.31	7.36	326.8	0.16
27030-100; 000	3	22	3/2/2016 09:24:33	21.9	8.39	7.69	316.6	0.15
27030-001; 001	3	22	3/2/2016 09:23:11	22.2	8.13	7.6	324.7	0.15
27030-010; 002	3	22	3/2/2016 09:21:57	22.2	8.4	7.56	323.3	0.15
27030-011; 003	3	22	3/2/2016 09:22:50	22.2	8.29	7.59	333.5	0.16
27030-012; 004	3	22	3/2/2016 09:23:32	22.3	8.04	7.6	332.7	0.16
27030-013; 005	3	22	3/2/2016 09:22:28	22.2	8.22	7.57	330	0.16
27030-016; 006	3	22	3/2/2016 09:23:57	22.1	8.16	7.64	327.3	0.16
27030-100; 000	1	23	3/3/2016 08:56:46	21.7	7.79	7.01	313.4	0.15
27030-001; 001	1	23	3/3/2016 08:56:29	21.6	8	7.01	332.8	0.16
27030-010; 002	1	23	3/3/2016 08:56:11	21.7	7.98	7.03	326	0.16
27030-011; 003	1	23	3/3/2016 08:55:43	21.3	7.94	7.11	340.4	0.16
27030-012; 004	1	23	3/3/2016 08:55:58	21.5	7.99	7.05	332	0.16
27030-013; 005	1	23	3/3/2016 08:55:27	21.2	8.07	7.31	341.7	0.16
27030-016; 006	1	23	3/3/2016 08:57:04	21.6	7.91	7.02	329.9	0.16
27030-100; 000	2	23	3/3/2016 08:59:18	21	8.11	7.22	313.3	0.15
27030-001; 001	2	23	3/3/2016 08:58:46	21.6	7.93	7.15	327.3	0.16
27030-010; 002	2	23	3/3/2016 08:59:00	21.5	8.06	7.19	326.1	0.16
27030-011; 003	2	23	3/3/2016 08:57:37	21.7	7.83	7.05	332.8	0.16
27030-012; 004	2	23	3/3/2016 08:58:33	21.6	7.4	7.12	329.5	0.16
27030-013; 005	2	23	3/3/2016 08:57:19	21.6	5.12	7.01	337.5	0.16
27030-016; 006	2	23	3/3/2016 08:57:52	22	7.42	7.09	330.1	0.16
27030-100; 000	3	23	3/3/2016 09:00:52	21.2	8.08	7.35	312.7	0.15
27030-001; 001	3	23	3/3/2016 09:00:10	21.4	7.93	7.3	326.6	0.16
27030-010; 002	3	23	3/3/2016 08:59:29	21.3	8.24	7.23	312.1	0.15
27030-011; 003	3	23	3/3/2016 08:59:58	21.5	8.19	7.27	336.3	0.16
27030-012; 004	3	23	3/3/2016 09:00:24	21.7	7.37	7.31	329.1	0.16
27030-013; 005	3	23	3/3/2016 08:59:41	21.4	8.01	7.24	333.5	0.16
27030-016; 006	3	23	3/3/2016 09:00:39	21.4	4.64	7.31	331.4	0.16
27030-100; 000	1	24	3/4/2016 08:45:24	23	7.65	7.34	312.1	0.15
27030-001; 001	1	24	3/4/2016 08:44:53	22.8	7.79	7.31	332.1	0.16
27030-010; 002	1	24	3/4/2016 08:44:32	22.6	8.02	7.28	326.3	0.16

ESI Code	Replicate	Day	DateTime M/D/Y	Temp C	DO mg/L	pH SU	SpCond uS/cm	Salinity ppt
27030-011; 003	1	24	3/4/2016 08:43:56	21.8	7.98	7.18	345.1	0.16
27030-012; 004	1	24	3/4/2016 08:44:16	22.2	8.01	7.25	333.1	0.16
27030-013; 005	1	24	3/4/2016 08:43:37	21.6	8.11	7.13	344.8	0.16
27030-016; 006	1	24	3/4/2016 08:46:15	23	7.77	7.41	332.1	0.16
27030-100; 000	2	24	3/4/2016 08:50:40	21.4	8.24	7.57	314	0.15
27030-001; 001	2	24	3/4/2016 08:49:48	22.1	8.13	7.55	324.1	0.15
27030-010; 002	2	24	3/4/2016 08:50:15	22.2	8.14	7.58	320.6	0.15
27030-011; 003	2	24	3/4/2016 08:48:07	22.7	7.66	7.43	335.7	0.16
27030-012; 004	2	24	3/4/2016 08:49:16	22.4	7.94	7.55	320.8	0.15
27030-013; 005	2	24	3/4/2016 08:47:06	22.7	7.33	7.38	341.9	0.16
27030-016; 006	2	24	3/4/2016 08:48:30	22.9	7.88	7.48	329.1	0.16
27030-100; 000	3	24	3/4/2016 08:53:42	21.2	8.34	7.62	313.2	0.15
27030-001; 001	3	24	3/4/2016 08:52:45	21.9	8.09	7.61	324.1	0.15
27030-010; 002	3	24	3/4/2016 08:51:07	22	8.32	7.59	321.1	0.15
27030-011; 003	3	24	3/4/2016 08:52:28	22.3	8.14	7.61	325.1	0.15
27030-012; 004	3	24	3/4/2016 08:53:04	22.7	7.82	7.61	323.6	0.15
27030-013; 005	3	24	3/4/2016 08:51:56	22.2	7.97	7.58	330.6	0.16
27030-016; 006	3	24	3/4/2016 08:53:22	22	8.15	7.62	323.9	0.15
27030-100; 000	1	25	3/5/2016 09:28:14	22.3	8.31	7.19	311	0.15
27030-001; 001	1	25	3/5/2016 09:27:52	22.3	8.37	7.16	330.7	0.16
27030-010; 002	1	25	3/5/2016 09:27:25	22.3	8.56	7.11	325	0.15
27030-011; 003	1	25	3/5/2016 09:26:46	21.6	8.48	6.95	343.4	0.16
27030-012; 004	1	25	3/5/2016 09:27:03	21.9	8.62	7.02	335.5	0.16
27030-013; 005	1	25	3/5/2016 09:26:24	21.4	8.25	6.9	332.7	0.16
27030-016; 006	1	25	3/5/2016 09:28:29	22.1	8.45	7.2	329.5	0.16
27030-100; 000	2	25	3/5/2016 09:31:14	21.2	8.45	7.41	314.3	0.15
27030-001; 001	2	25	3/5/2016 09:30:28	21.5	8.57	7.36	327.7	0.16
27030-010; 002	2	25	3/5/2016 09:30:54	21.7	8.51	7.4	323.2	0.15
27030-011; 003	2	25	3/5/2016 09:29:17	22	8.28	7.25	334.2	0.16
27030-012; 004	2	25	3/5/2016 09:29:59	21.9	8.34	7.32	324.5	0.15
27030-013; 005	2	25	3/5/2016 09:28:58	22	7.58	7.2	344.2	0.16
27030-016; 006	2	25	3/5/2016 09:29:40	22.3	8.04	7.29	331.5	0.16
27030-100; 000	3	25	3/5/2016 09:33:08	21.2	8.59	7.5	311.7	0.15
27030-001; 001	3	25	3/5/2016 09:32:21	21.4	8.36	7.46	328.4	0.16
27030-010; 002	3	25	3/5/2016 09:31:32	21.6	8.59	7.42	323.6	0.15
27030-011; 003	3	25	3/5/2016 09:32:05	21.5	8.55	7.44	340	0.16
27030-012; 004	3	25	3/5/2016 09:32:36	21.9	8.21	7.46	326.6	0.16
27030-013; 005	3	25	3/5/2016 09:31:50	21.7	8.39	7.42	332.7	0.16
27030-016; 006	3	25	3/5/2016 09:32:51	21.5	8.47	7.48	327.6	0.16
27030-100; 000	1	26	3/6/2016 08:59:41	22.2	7.84	7.4	315.6	0.15
27030-001; 001	1	26	3/6/2016 08:59:24	22.2	7.78	7.38	338.6	0.16
27030-010; 002	1	26	3/6/2016 08:59:11	22.2	8.01	7.37	329.7	0.16
27030-011; 003	1	26	3/6/2016 08:58:40	21.5	6.65	7.28	349.6	0.17
27030-012; 004	1	26	3/6/2016 08:58:58	21.9	7.84	7.32	340.4	0.16
27030-013; 005	1	26	3/6/2016 08:58:22	21.3	7.64	7.31	338.5	0.16
27030-016; 006	1	26	3/6/2016 08:59:57	22.1	7.23	7.4	336.9	0.16
27030-100; 000	2	26	3/6/2016 09:01:52	21	8.29	7.52	318.8	0.15
27030-001; 001	2	26	3/6/2016 09:01:22	21.4	8.32	7.48	330.1	0.16
27030-010; 002	2	26	3/6/2016 09:01:38	21.7	8.27	7.51	327.9	0.16
27030-011; 003	2	26	3/6/2016 09:00:31	21.9	7.26	7.43	340	0.16
27030-012; 004	2	26	3/6/2016 09:01:04	21.8	7.77	7.44	330	0.16
27030-013; 005	2	26	3/6/2016 09:00:13	21.8	6.68	7.4	344.5	0.16
27030-016; 006	2	26	3/6/2016 09:00:45	22.5	4.64	7.4	369.6	0.18
27030-100; 000	3	26	3/6/2016 09:03:27	21.1	8.46	7.6	315.7	0.15
27030-001; 001	3	26	3/6/2016 09:02:49	21.3	8.25	7.57	334.9	0.16
27030-010; 002	3	26	3/6/2016 09:02:05	21.5	8.37	7.53	329.3	0.16

ESI Code	Replicate	Day	DateTime M/D/Y	Temp C	DO mg/L	pH SU	SpCond uS/cm	Salinity ppt
27030-011; 003	3	26	3/6/2016 09:02:38	21.5	8.36	7.55	343.3	0.16
27030-012; 004	3	26	3/6/2016 09:03:04	21.8	7.93	7.57	331.6	0.16
27030-013; 005	3	26	3/6/2016 09:02:21	21.7	8.26	7.54	334.5	0.16
27030-016; 006	3	26	3/6/2016 09:03:14	21.4	8.27	7.58	329.6	0.16
27030-100; 000	1	27	3/7/2016 08:52:15	22.4	9.41	7.08	316.8	0.15
27030-001; 001	1	27	3/7/2016 08:51:57	22.3	9.45	7.06	339.7	0.16
27030-010; 002	1	27	3/7/2016 08:51:43	22.3	9.74	7.07	331.6	0.16
27030-011; 003	1	27	3/7/2016 08:51:13	21.7	9.72	7.11	353.2	0.17
27030-012; 004	1	27	3/7/2016 08:51:30	22.1	9.6	7.06	342.8	0.16
27030-013; 005	1	27	3/7/2016 08:50:54	21.5	9.97	7.3	343.4	0.16
27030-016; 006	1	27	3/7/2016 08:52:28	22.2	9.61	7.08	335.1	0.16
27030-100; 000	2	27	3/7/2016 08:54:21	21.2	9.5	7.35	320.9	0.15
27030-001; 001	2	27	3/7/2016 08:53:50	21.6	9.54	7.28	335.6	0.16
27030-010; 002	2	27	3/7/2016 08:54:06	21.9	9.48	7.33	328.7	0.16
27030-011; 003	2	27	3/7/2016 08:53:07	22.1	9.19	7.17	341	0.16
27030-012; 004	2	27	3/7/2016 08:53:39	21.9	9.41	7.26	334.6	0.16
27030-013; 005	2	27	3/7/2016 08:52:48	22	9.41	7.13	347.4	0.17
27030-016; 006	2	27	3/7/2016 08:53:21	22.4	9.11	7.22	332.4	0.16
27030-100; 000	3	27	3/7/2016 08:56:06	21.3	8.92	7.52	316.9	0.15
27030-001; 001	3	27	3/7/2016 08:55:23	21.5	8.67	7.47	340.4	0.16
27030-010; 002	3	27	3/7/2016 08:54:36	21.6	9.55	7.39	333.6	0.16
27030-011; 003	3	27	3/7/2016 08:55:09	21.6	9.23	7.45	346.8	0.17
27030-012; 004	3	27	3/7/2016 08:55:39	22	7.8	7.45	338.3	0.16
27030-013; 005	3	27	3/7/2016 08:54:53	21.8	9.2	7.42	335.8	0.16
27030-016; 006	3	27	3/7/2016 08:55:53	21.7	8.57	7.49	330.2	0.16
27030-100; 000	1	28	3/8/2016 08:48:40	22.3	7.45	7.18	317.2	0.15
27030-001; 001	1	28	3/8/2016 08:48:22	22.4	7.22	7.13	342.5	0.16
27030-010; 002	1	28	3/8/2016 08:47:59	22.4	7.64	7.09	333.6	0.16
27030-011; 003	1	28	3/8/2016 08:47:20	21.7	7.38	6.9	359.9	0.17
27030-012; 004	1	28	3/8/2016 08:47:42	22.1	7.62	7	346.3	0.17
27030-013; 005	1	28	3/8/2016 08:46:40	21.5	7.66	6.78	345.4	0.16
27030-016; 006	1	28	3/8/2016 08:48:59	22.2	7.56	7.22	336.7	0.16
27030-100; 000	2	28	3/8/2016 08:51:38	21.3	7.11	7.45	322.7	0.15
27030-001; 001	2	28	3/8/2016 08:51:01	21.6	7.81	7.43	340.6	0.16
27030-010; 002	2	28	3/8/2016 08:51:18	21.9	7.71	7.46	330.5	0.16
27030-011; 003	2	28	3/8/2016 08:49:53	22.1	7.64	7.33	341.3	0.16
27030-012; 004	2	28	3/8/2016 08:50:43	21.9	7.51	7.41	339.8	0.16
27030-013; 005	2	28	3/8/2016 08:49:28	22	7.56	7.27	347.4	0.17
27030-016; 006	2	28	3/8/2016 08:50:19	22.4	7.51	7.39	333	0.16
27030-100; 000	3	28	3/8/2016 08:53:56	21.4	7.87	7.55	317.4	0.15
27030-001; 001	3	28	3/8/2016 08:52:54	21.5	7.45	7.5	345	0.16
27030-010; 002	3	28	3/8/2016 08:51:59	21.7	7.77	7.46	338.7	0.16
27030-011; 003	3	28	3/8/2016 08:52:33	21.7	7.77	7.51	350.5	0.17
27030-012; 004	3	28	3/8/2016 08:53:16	22	6	7.41	359.7	0.17
27030-013; 005	3	28	3/8/2016 08:52:18	21.8	7.75	7.49	336.7	0.16
27030-016; 006	3	28	3/8/2016 08:53:36	21.7	7.61	7.53	331.6	0.16


L. variegatus Temperature Monitoring Data
Temperature (°C)
Temperatire (C)
25
24
23
22
21
20
19
18
17
16
15
2016-02-10 12:00:00
2016-02-15 12:00:00
2016-02-20 12:00:00
2016-02-25 12:00:00
2016-03-01 12:00:00
2016-03-06 12:00:00
Date & Time (EST)

Report Name:	MicroPoint1 Statistics
Report Date:	Mar 30, 2016 01:18:51 PM EDT
File Name:	P:\GENERAL PROJECTS\RPT-active\ERA 27030 E&E 18 Mile Creek\27030 L variegatus\ Teletemp Data\Lv Teletemp Data 100216-090316.csv
Title:	Untitled Dataset
Device:	MicroPoint1 - Temperature Recorder
Hardware Revision:	REV2 (64K)
Serial Number:	M35457
Device ID:	Temp
Data Start Date:	Feb 10, 2016 12:36:03 PM EST
Data End Date:	Mar 09, 2016 07:36:03 AM EST
Reading Rate:	1 Hour
Readings:	54 to 721 of 1229
Last Calibration Date:	Oct 21, 2015
Next Calibration Date:	Oct 21, 2016

Channel 1 - Temperature

Minimum	.....	20.1 °C
Maximum	.....	24.3 °C
Average	.....	22.23503 °C
Standard Deviation	.....	0.9016396 °C
Mean Kinetic Temperature	.....	22.2786 °C

Device Name:	**MicroPoint1**
Device Description:	**Temperature Recorder**
Serial Number:	**M35457**
Device ID:	**Temp**

Reading Number	Date and Time (EST)	Channel 1 Temperature (°C)
1	2016-02-10 12:36:03	20.4
2	2016-02-10 13:36:03	20.4
3	2016-02-10 14:36:03	20.4
4	2016-02-10 15:36:03	20.3
5	2016-02-10 16:36:03	20.2
6	2016-02-10 17:36:03	20.3
7	2016-02-10 18:36:03	20.4
8	2016-02-10 19:36:03	20.3
9	2016-02-10 20:36:03	20.3
10	2016-02-10 21:36:03	20.3
11	2016-02-10 22:36:03	20.2
12	2016-02-10 23:36:03	20.2
13	2016-02-11 00:36:03	20.2
14	2016-02-11 01:36:03	20.2
15	2016-02-11 02:36:03	20.1
16	2016-02-11 03:36:03	20.1
17	2016-02-11 04:36:03	20.1
18	2016-02-11 05:36:03	20.1
19	2016-02-11 06:36:03	20.1
20	2016-02-11 07:36:03	20.1
21	2016-02-11 08:36:03	20.2
22	2016-02-11 09:36:03	20.2
23	2016-02-11 10:36:03	20.3
24	2016-02-11 11:36:03	20.3
25	2016-02-11 12:36:03	20.4
26	2016-02-11 13:36:03	20.6
27	2016-02-11 14:36:03	21
28	2016-02-11 15:36:03	21.2
29	2016-02-11 16:36:03	21.2
30	2016-02-11 17:36:03	21.1
31	2016-02-11 18:36:03	21.1
32	2016-02-11 19:36:03	21
33	2016-02-11 20:36:03	20.9
34	2016-02-11 21:36:03	20.9
35	2016-02-11 22:36:03	20.8
36	2016-02-11 23:36:03	20.6
37	2016-02-12 00:36:03	20.7
38	2016-02-12 01:36:03	20.6
39	2016-02-12 02:36:03	20.4

40	2016-02-12 03:36:03	20.4
41	2016-02-12 04:36:03	20.4
42	2016-02-12 05:36:03	20.4
43	2016-02-12 06:36:03	20.4
44	2016-02-12 07:36:03	20.2
45	2016-02-12 08:36:03	20.3
46	2016-02-12 09:36:03	20.3
47	2016-02-12 10:36:03	20.2
48	2016-02-12 11:36:03	20.2
49	2016-02-12 12:36:03	20.1
50	2016-02-12 13:36:03	20.6
51	2016-02-12 14:36:03	21
52	2016-02-12 15:36:03	21.3
53	2016-02-12 16:36:03	21.4
54	2016-02-12 17:36:03	21.5
55	2016-02-12 18:36:03	21.6
56	2016-02-12 19:36:03	21.6
57	2016-02-12 20:36:03	21.7
58	2016-02-12 21:36:03	21.7
59	2016-02-12 22:36:03	21.7
60	2016-02-12 23:36:03	21.7
61	2016-02-13 00:36:03	21.8
62	2016-02-13 01:36:03	21.7
63	2016-02-13 02:36:03	21.7
64	2016-02-13 03:36:03	21.8
65	2016-02-13 04:36:03	21.7
66	2016-02-13 05:36:03	21.7
67	2016-02-13 06:36:03	21.6
68	2016-02-13 07:36:03	21.7
69	2016-02-13 08:36:03	21.7
70	2016-02-13 09:36:03	22
71	2016-02-13 10:36:03	22.2
72	2016-02-13 11:36:03	22.1
73	2016-02-13 12:36:03	22.3
74	2016-02-13 13:36:03	22.4
75	2016-02-13 14:36:03	22.4
76	2016-02-13 15:36:03	22.4
77	2016-02-13 16:36:03	22.2
78	2016-02-13 17:36:03	22.1
79	2016-02-13 18:36:03	22.1
80	2016-02-13 19:36:03	22.1
81	2016-02-13 20:36:03	22
82	2016-02-13 21:36:03	22
83	2016-02-13 22:36:03	21.9
84	2016-02-13 23:36:03	21.9
85	2016-02-14 00:36:03	21.8
86	2016-02-14 01:36:03	21.6

87	2016-02-14 02:36:03	21.4
88	2016-02-14 03:36:03	21.3
89	2016-02-14 04:36:03	21.2
90	2016-02-14 05:36:03	21
91	2016-02-14 06:36:03	21
92	2016-02-14 07:36:03	20.8
93	2016-02-14 08:36:03	20.6
94	2016-02-14 09:36:03	20.4
95	2016-02-14 10:36:03	20.3
96	2016-02-14 11:36:03	20.5
97	2016-02-14 12:36:03	20.8
98	2016-02-14 13:36:03	21.1
99	2016-02-14 14:36:03	21.5
100	2016-02-14 15:36:03	21.4
101	2016-02-14 16:36:03	21.4
102	2016-02-14 17:36:03	21.3
103	2016-02-14 18:36:03	21.3
104	2016-02-14 19:36:03	21.4
105	2016-02-14 20:36:03	21.5
106	2016-02-14 21:36:03	21.4
107	2016-02-14 22:36:03	21.4
108	2016-02-14 23:36:03	21.6
109	2016-02-15 00:36:03	21.6
110	2016-02-15 01:36:03	21.6
111	2016-02-15 02:36:03	21.5
112	2016-02-15 03:36:03	21.5
113	2016-02-15 04:36:03	21.4
114	2016-02-15 05:36:03	21.4
115	2016-02-15 06:36:03	21.4
116	2016-02-15 07:36:03	21.4
117	2016-02-15 08:36:03	21.2
118	2016-02-15 09:36:03	20.9
119	2016-02-15 10:36:03	20.8
120	2016-02-15 11:36:03	20.9
121	2016-02-15 12:36:03	20.9
122	2016-02-15 13:36:03	21.2
123	2016-02-15 14:36:03	21.4
124	2016-02-15 15:36:03	21.5
125	2016-02-15 16:36:03	21.7
126	2016-02-15 17:36:03	21.7
127	2016-02-15 18:36:03	21.8
128	2016-02-15 19:36:03	22
129	2016-02-15 20:36:03	22.1
130	2016-02-15 21:36:03	22.2
131	2016-02-15 22:36:03	22.4
132	2016-02-15 23:36:03	22.4
133	2016-02-16 00:36:03	22.4

134	2016-02-16 01:36:03	22.4
135	2016-02-16 02:36:03	22.4
136	2016-02-16 03:36:03	22.4
137	2016-02-16 04:36:03	22.5
138	2016-02-16 05:36:03	22.5
139	2016-02-16 06:36:03	22.6
140	2016-02-16 07:36:03	22.6
141	2016-02-16 08:36:03	22.7
142	2016-02-16 09:36:03	22.7
143	2016-02-16 10:36:03	22.7
144	2016-02-16 11:36:03	22.8
145	2016-02-16 12:36:03	22.9
146	2016-02-16 13:36:03	22.9
147	2016-02-16 14:36:03	22.9
148	2016-02-16 15:36:03	23
149	2016-02-16 16:36:03	23
150	2016-02-16 17:36:03	23.1
151	2016-02-16 18:36:03	23.1
152	2016-02-16 19:36:03	23.2
153	2016-02-16 20:36:03	23.3
154	2016-02-16 21:36:03	23.4
155	2016-02-16 22:36:03	23.4
156	2016-02-16 23:36:03	23.4
157	2016-02-17 00:36:03	23.4
158	2016-02-17 01:36:03	23.3
159	2016-02-17 02:36:03	23.2
160	2016-02-17 03:36:03	23
161	2016-02-17 04:36:03	22.9
162	2016-02-17 05:36:03	22.9
163	2016-02-17 06:36:03	22.8
164	2016-02-17 07:36:03	22.8
165	2016-02-17 08:36:03	22.8
166	2016-02-17 09:36:03	22.7
167	2016-02-17 10:36:03	22.8
168	2016-02-17 11:36:03	22.7
169	2016-02-17 12:36:03	22.6
170	2016-02-17 13:36:03	22.7
171	2016-02-17 14:36:03	22.6
172	2016-02-17 15:36:03	22.5
173	2016-02-17 16:36:03	22.6
174	2016-02-17 17:36:03	22.6
175	2016-02-17 18:36:03	22.5
176	2016-02-17 19:36:03	22.6
177	2016-02-17 20:36:03	22.5
178	2016-02-17 21:36:03	22.4
179	2016-02-17 22:36:03	22.6
180	2016-02-17 23:36:03	22.4

181	2016-02-18 00:36:03	22.4
182	2016-02-18 01:36:03	22.4
183	2016-02-18 02:36:03	22.5
184	2016-02-18 03:36:03	22.5
185	2016-02-18 04:36:03	22.5
186	2016-02-18 05:36:03	22.5
187	2016-02-18 06:36:03	22.4
188	2016-02-18 07:36:03	22.4
189	2016-02-18 08:36:03	22.4
190	2016-02-18 09:36:03	22.4
191	2016-02-18 10:36:03	22.4
192	2016-02-18 11:36:03	22.2
193	2016-02-18 12:36:03	22.1
194	2016-02-18 13:36:03	22.1
195	2016-02-18 14:36:03	22.1
196	2016-02-18 15:36:03	22.1
197	2016-02-18 16:36:03	22.1
198	2016-02-18 17:36:03	22.1
199	2016-02-18 18:36:03	22.1
200	2016-02-18 19:36:03	22.1
201	2016-02-18 20:36:03	22.1
202	2016-02-18 21:36:03	22.1
203	2016-02-18 22:36:03	22.2
204	2016-02-18 23:36:03	22.1
205	2016-02-19 00:36:03	22.1
206	2016-02-19 01:36:03	22.1
207	2016-02-19 02:36:03	22.1
208	2016-02-19 03:36:03	22.1
209	2016-02-19 04:36:03	22.1
210	2016-02-19 05:36:03	22.1
211	2016-02-19 06:36:03	22.1
212	2016-02-19 07:36:03	22.1
213	2016-02-19 08:36:03	22.1
214	2016-02-19 09:36:03	22.1
215	2016-02-19 10:36:03	22.2
216	2016-02-19 11:36:03	22.1
217	2016-02-19 12:36:03	22
218	2016-02-19 13:36:03	21.9
219	2016-02-19 14:36:03	21.8
220	2016-02-19 15:36:03	21.8
221	2016-02-19 16:36:03	21.8
222	2016-02-19 17:36:03	21.7
223	2016-02-19 18:36:03	21.8
224	2016-02-19 19:36:03	21.8
225	2016-02-19 20:36:03	21.8
226	2016-02-19 21:36:03	21.9
227	2016-02-19 22:36:03	21.9

228	2016-02-19 23:36:03	21.9
229	2016-02-20 00:36:03	22.1
230	2016-02-20 01:36:03	22.2
231	2016-02-20 02:36:03	22.4
232	2016-02-20 03:36:03	22.5
233	2016-02-20 04:36:03	22.6
234	2016-02-20 05:36:03	22.7
235	2016-02-20 06:36:03	22.8
236	2016-02-20 07:36:03	23
237	2016-02-20 08:36:03	22.9
238	2016-02-20 09:36:03	23.1
239	2016-02-20 10:36:03	23.1
240	2016-02-20 11:36:03	23.2
241	2016-02-20 12:36:03	23.2
242	2016-02-20 13:36:03	23.4
243	2016-02-20 14:36:03	23.4
244	2016-02-20 15:36:03	23.4
245	2016-02-20 16:36:03	23.4
246	2016-02-20 17:36:03	23.2
247	2016-02-20 18:36:03	23.1
248	2016-02-20 19:36:03	23.1
249	2016-02-20 20:36:03	23
250	2016-02-20 21:36:03	22.9
251	2016-02-20 22:36:03	23
252	2016-02-20 23:36:03	23.1
253	2016-02-21 00:36:03	23.2
254	2016-02-21 01:36:03	23.3
255	2016-02-21 02:36:03	23.5
256	2016-02-21 03:36:03	23.6
257	2016-02-21 04:36:03	23.8
258	2016-02-21 05:36:03	23.9
259	2016-02-21 06:36:03	23.9
260	2016-02-21 07:36:03	24
261	2016-02-21 08:36:03	24.1
262	2016-02-21 09:36:03	24.1
263	2016-02-21 10:36:03	24.2
264	2016-02-21 11:36:03	24.2
265	2016-02-21 12:36:03	24.2
266	2016-02-21 13:36:03	24.2
267	2016-02-21 14:36:03	24.1
268	2016-02-21 15:36:03	24.1
269	2016-02-21 16:36:03	24
270	2016-02-21 17:36:03	23.9
271	2016-02-21 18:36:03	23.8
272	2016-02-21 19:36:03	23.8
273	2016-02-21 20:36:03	23.8
274	2016-02-21 21:36:03	23.7

275	2016-02-21 22:36:03	23.7
276	2016-02-21 23:36:03	23.8
277	2016-02-22 00:36:03	23.9
278	2016-02-22 01:36:03	24.1
279	2016-02-22 02:36:03	24.1
280	2016-02-22 03:36:03	24.2
281	2016-02-22 04:36:03	24.2
282	2016-02-22 05:36:03	24.3
283	2016-02-22 06:36:03	24.3
284	2016-02-22 07:36:03	24.3
285	2016-02-22 08:36:03	24.2
286	2016-02-22 09:36:03	23.8
287	2016-02-22 10:36:03	22.9
288	2016-02-22 11:36:03	22.7
289	2016-02-22 12:36:03	22.6
290	2016-02-22 13:36:03	22.7
291	2016-02-22 14:36:03	22.8
292	2016-02-22 15:36:03	22.6
293	2016-02-22 16:36:03	22.6
294	2016-02-22 17:36:03	22.6
295	2016-02-22 18:36:03	22.7
296	2016-02-22 19:36:03	22.8
297	2016-02-22 20:36:03	22.8
298	2016-02-22 21:36:03	22.8
299	2016-02-22 22:36:03	22.8
300	2016-02-22 23:36:03	22.9
301	2016-02-23 00:36:03	22.9
302	2016-02-23 01:36:03	23
303	2016-02-23 02:36:03	23
304	2016-02-23 03:36:03	23.1
305	2016-02-23 04:36:03	23.1
306	2016-02-23 05:36:03	23.1
307	2016-02-23 06:36:03	23.1
308	2016-02-23 07:36:03	23.1
309	2016-02-23 08:36:03	23
310	2016-02-23 09:36:03	22.9
311	2016-02-23 10:36:03	23.1
312	2016-02-23 11:36:03	23.2
313	2016-02-23 12:36:03	23.2
314	2016-02-23 13:36:03	23.3
315	2016-02-23 14:36:03	23.3
316	2016-02-23 15:36:03	23.2
317	2016-02-23 16:36:03	23.1
318	2016-02-23 17:36:03	22.9
319	2016-02-23 18:36:03	22.9
320	2016-02-23 19:36:03	22.9
321	2016-02-23 20:36:03	23

322	2016-02-23 21:36:03	23
323	2016-02-23 22:36:03	23.1
324	2016-02-23 23:36:03	23.2
325	2016-02-24 00:36:03	23.4
326	2016-02-24 01:36:03	23.6
327	2016-02-24 02:36:03	23.7
328	2016-02-24 03:36:03	23.8
329	2016-02-24 04:36:03	23.9
330	2016-02-24 05:36:03	24
331	2016-02-24 06:36:03	23.9
332	2016-02-24 07:36:03	23.9
333	2016-02-24 08:36:03	23.9
334	2016-02-24 09:36:03	23.5
335	2016-02-24 10:36:03	23.8
336	2016-02-24 11:36:03	23.9
337	2016-02-24 12:36:03	23.8
338	2016-02-24 13:36:03	23.4
339	2016-02-24 14:36:03	23.3
340	2016-02-24 15:36:03	23.2
341	2016-02-24 16:36:03	23.1
342	2016-02-24 17:36:03	23.1
343	2016-02-24 18:36:03	23.2
344	2016-02-24 19:36:03	23
345	2016-02-24 20:36:03	23.1
346	2016-02-24 21:36:03	23.1
347	2016-02-24 22:36:03	23.1
348	2016-02-24 23:36:03	23.2
349	2016-02-25 00:36:03	23.2
350	2016-02-25 01:36:03	23.2
351	2016-02-25 02:36:03	23.2
352	2016-02-25 03:36:03	23.3
353	2016-02-25 04:36:03	23.6
354	2016-02-25 05:36:03	23.6
355	2016-02-25 06:36:03	23.6
356	2016-02-25 07:36:03	23.6
357	2016-02-25 08:36:03	23.7
358	2016-02-25 09:36:03	23.8
359	2016-02-25 10:36:03	23.6
360	2016-02-25 11:36:03	23.6
361	2016-02-25 12:36:03	23.6
362	2016-02-25 13:36:03	23.7
363	2016-02-25 14:36:03	23.6
364	2016-02-25 15:36:03	23.6
365	2016-02-25 16:36:03	23.5
366	2016-02-25 17:36:03	23.3
367	2016-02-25 18:36:03	23.2
368	2016-02-25 19:36:03	23.2

369	2016-02-25 20:36:03	23
370	2016-02-25 21:36:03	22.9
371	2016-02-25 22:36:03	23
372	2016-02-25 23:36:03	22.9
373	2016-02-26 00:36:03	22.8
374	2016-02-26 01:36:03	22.8
375	2016-02-26 02:36:03	22.9
376	2016-02-26 03:36:03	22.9
377	2016-02-26 04:36:03	22.9
378	2016-02-26 05:36:03	22.8
379	2016-02-26 06:36:03	22.7
380	2016-02-26 07:36:03	22.8
381	2016-02-26 08:36:03	22.9
382	2016-02-26 09:36:03	22.8
383	2016-02-26 10:36:03	22.9
384	2016-02-26 11:36:03	22.7
385	2016-02-26 12:36:03	22.7
386	2016-02-26 13:36:03	23
387	2016-02-26 14:36:03	23.1
388	2016-02-26 15:36:03	22.9
389	2016-02-26 16:36:03	22.8
390	2016-02-26 17:36:03	22.9
391	2016-02-26 18:36:03	23.1
392	2016-02-26 19:36:03	23.1
393	2016-02-26 20:36:03	22.9
394	2016-02-26 21:36:03	23
395	2016-02-26 22:36:03	22.8
396	2016-02-26 23:36:03	22.4
397	2016-02-27 00:36:03	22.4
398	2016-02-27 01:36:03	22.2
399	2016-02-27 02:36:03	22.2
400	2016-02-27 03:36:03	22.2
401	2016-02-27 04:36:03	22.2
402	2016-02-27 05:36:03	22.1
403	2016-02-27 06:36:03	22.2
404	2016-02-27 07:36:03	22.5
405	2016-02-27 08:36:03	21.4
406	2016-02-27 09:36:03	22.1
407	2016-02-27 10:36:03	22.6
408	2016-02-27 11:36:03	22.7
409	2016-02-27 12:36:03	22.8
410	2016-02-27 13:36:03	22.8
411	2016-02-27 14:36:03	22.8
412	2016-02-27 15:36:03	22.8
413	2016-02-27 16:36:03	22.8
414	2016-02-27 17:36:03	22.9
415	2016-02-27 18:36:03	22.9

416	2016-02-27 19:36:03	23
417	2016-02-27 20:36:03	23
418	2016-02-27 21:36:03	23
419	2016-02-27 22:36:03	22.9
420	2016-02-27 23:36:03	22.6
421	2016-02-28 00:36:03	22.6
422	2016-02-28 01:36:03	22.6
423	2016-02-28 02:36:03	22.5
424	2016-02-28 03:36:03	22.5
425	2016-02-28 04:36:03	22.6
426	2016-02-28 05:36:03	22.5
427	2016-02-28 06:36:03	22.6
428	2016-02-28 07:36:03	22.8
429	2016-02-28 08:36:03	22.9
430	2016-02-28 09:36:03	22.9
431	2016-02-28 10:36:03	22.9
432	2016-02-28 11:36:03	23
433	2016-02-28 12:36:03	23.1
434	2016-02-28 13:36:03	23.1
435	2016-02-28 14:36:03	23.2
436	2016-02-28 15:36:03	23.2
437	2016-02-28 16:36:03	23.2
438	2016-02-28 17:36:03	23.2
439	2016-02-28 18:36:03	23.2
440	2016-02-28 19:36:03	23.2
441	2016-02-28 20:36:03	23.2
442	2016-02-28 21:36:03	23.2
443	2016-02-28 22:36:03	23
444	2016-02-28 23:36:03	22.6
445	2016-02-29 00:36:03	22.5
446	2016-02-29 01:36:03	22.6
447	2016-02-29 02:36:03	22.6
448	2016-02-29 03:36:03	22.6
449	2016-02-29 04:36:03	22.6
450	2016-02-29 05:36:03	22.6
451	2016-02-29 06:36:03	22.7
452	2016-02-29 07:36:03	23
453	2016-02-29 08:36:03	22.6
454	2016-02-29 09:36:03	22.2
455	2016-02-29 10:36:03	22.3
456	2016-02-29 11:36:03	22.2
457	2016-02-29 12:36:03	22.2
458	2016-02-29 13:36:03	22.2
459	2016-02-29 14:36:03	22.2
460	2016-02-29 15:36:03	22.2
461	2016-02-29 16:36:03	22.2
462	2016-02-29 17:36:03	22.2

463	2016-02-29 18:36:03	22.2
464	2016-02-29 19:36:03	22.2
465	2016-02-29 20:36:03	22.2
466	2016-02-29 21:36:03	22.1
467	2016-02-29 22:36:03	22.2
468	2016-02-29 23:36:03	22.4
469	2016-03-01 00:36:03	22.6
470	2016-03-01 01:36:03	22.5
471	2016-03-01 02:36:03	22.6
472	2016-03-01 03:36:03	22.5
473	2016-03-01 04:36:03	22.5
474	2016-03-01 05:36:03	22.4
475	2016-03-01 06:36:03	22.2
476	2016-03-01 07:36:03	21.9
477	2016-03-01 08:36:03	21.9
478	2016-03-01 09:36:03	21.8
479	2016-03-01 10:36:03	21.9
480	2016-03-01 11:36:03	21.9
481	2016-03-01 12:36:03	21.8
482	2016-03-01 13:36:03	21.8
483	2016-03-01 14:36:03	21.9
484	2016-03-01 15:36:03	21.8
485	2016-03-01 16:36:03	21.8
486	2016-03-01 17:36:03	21.8
487	2016-03-01 18:36:03	21.9
488	2016-03-01 19:36:03	21.9
489	2016-03-01 20:36:03	21.9
490	2016-03-01 21:36:03	21.9
491	2016-03-01 22:36:03	22.1
492	2016-03-01 23:36:03	22.2
493	2016-03-02 00:36:03	22.2
494	2016-03-02 01:36:03	22.2
495	2016-03-02 02:36:03	22.3
496	2016-03-02 03:36:03	22.4
497	2016-03-02 04:36:03	22.4
498	2016-03-02 05:36:03	22.5
499	2016-03-02 06:36:03	22.5
500	2016-03-02 07:36:03	22.4
501	2016-03-02 08:36:03	22.3
502	2016-03-02 09:36:03	22.1
503	2016-03-02 10:36:03	22
504	2016-03-02 11:36:03	22
505	2016-03-02 12:36:03	21.9
506	2016-03-02 13:36:03	21.9
507	2016-03-02 14:36:03	21.9
508	2016-03-02 15:36:03	21.9
509	2016-03-02 16:36:03	21.8

510	2016-03-02 17:36:03	21.9
511	2016-03-02 18:36:03	21.8
512	2016-03-02 19:36:03	21.8
513	2016-03-02 20:36:03	21.7
514	2016-03-02 21:36:03	21.6
515	2016-03-02 22:36:03	21.8
516	2016-03-02 23:36:03	22.2
517	2016-03-03 00:36:03	22.4
518	2016-03-03 01:36:03	22.3
519	2016-03-03 02:36:03	22.2
520	2016-03-03 03:36:03	22.1
521	2016-03-03 04:36:03	22
522	2016-03-03 05:36:03	21.9
523	2016-03-03 06:36:03	21.9
524	2016-03-03 07:36:03	21.8
525	2016-03-03 08:36:03	21.6
526	2016-03-03 09:36:03	21.2
527	2016-03-03 10:36:03	21.4
528	2016-03-03 11:36:03	21.6
529	2016-03-03 12:36:03	21.8
530	2016-03-03 13:36:03	21.9
531	2016-03-03 14:36:03	21.9
532	2016-03-03 15:36:03	22.1
533	2016-03-03 16:36:03	22.3
534	2016-03-03 17:36:03	22.4
535	2016-03-03 18:36:03	22.4
536	2016-03-03 19:36:03	22.4
537	2016-03-03 20:36:03	22.4
538	2016-03-03 21:36:03	22.4
539	2016-03-03 22:36:03	22.4
540	2016-03-03 23:36:03	22.2
541	2016-03-04 00:36:03	22.1
542	2016-03-04 01:36:03	22
543	2016-03-04 02:36:03	21.9
544	2016-03-04 03:36:03	21.9
545	2016-03-04 04:36:03	21.8
546	2016-03-04 05:36:03	21.9
547	2016-03-04 06:36:03	22
548	2016-03-04 07:36:03	22.2
549	2016-03-04 08:36:03	22.1
550	2016-03-04 09:36:03	21.5
551	2016-03-04 10:36:03	21
552	2016-03-04 11:36:03	21.5
553	2016-03-04 12:36:03	21.8
554	2016-03-04 13:36:03	21.9
555	2016-03-04 14:36:03	21.5
556	2016-03-04 15:36:03	21.5

557	2016-03-04 16:36:03	21.6
558	2016-03-04 17:36:03	21.6
559	2016-03-04 18:36:03	21.6
560	2016-03-04 19:36:03	21.6
561	2016-03-04 20:36:03	21.6
562	2016-03-04 21:36:03	21.6
563	2016-03-04 22:36:03	21.7
564	2016-03-04 23:36:03	22
565	2016-03-05 00:36:03	21.9
566	2016-03-05 01:36:03	21.9
567	2016-03-05 02:36:03	21.9
568	2016-03-05 03:36:03	21.9
569	2016-03-05 04:36:03	21.9
570	2016-03-05 05:36:03	21.9
571	2016-03-05 06:36:03	21.8
572	2016-03-05 07:36:03	21.5
573	2016-03-05 08:36:03	21.4
574	2016-03-05 09:36:03	21.6
575	2016-03-05 10:36:03	21.6
576	2016-03-05 11:36:03	21.6
577	2016-03-05 12:36:03	21.5
578	2016-03-05 13:36:03	21.4
579	2016-03-05 14:36:03	21.4
580	2016-03-05 15:36:03	21.4
581	2016-03-05 16:36:03	21.4
582	2016-03-05 17:36:03	21.4
583	2016-03-05 18:36:03	21.3
584	2016-03-05 19:36:03	21.3
585	2016-03-05 20:36:03	21.3
586	2016-03-05 21:36:03	21.3
587	2016-03-05 22:36:03	21.5
588	2016-03-05 23:36:03	21.7
589	2016-03-06 00:36:03	21.8
590	2016-03-06 01:36:03	21.8
591	2016-03-06 02:36:03	21.8
592	2016-03-06 03:36:03	21.8
593	2016-03-06 04:36:03	21.8
594	2016-03-06 05:36:03	21.8
595	2016-03-06 06:36:03	21.8
596	2016-03-06 07:36:03	21.5
597	2016-03-06 08:36:03	21.4
598	2016-03-06 09:36:03	21.4
599	2016-03-06 10:36:03	21.6
600	2016-03-06 11:36:03	21.6
601	2016-03-06 12:36:03	21.6
602	2016-03-06 13:36:03	21.6
603	2016-03-06 14:36:03	21.6

604	2016-03-06 15:36:03	21.6
605	2016-03-06 16:36:03	21.6
606	2016-03-06 17:36:03	21.6
607	2016-03-06 18:36:03	21.6
608	2016-03-06 19:36:03	21.6
609	2016-03-06 20:36:03	21.6
610	2016-03-06 21:36:03	21.6
611	2016-03-06 22:36:03	21.6
612	2016-03-06 23:36:03	21.9
613	2016-03-07 00:36:03	22.1
614	2016-03-07 01:36:03	22.1
615	2016-03-07 02:36:03	22.2
616	2016-03-07 03:36:03	22.1
617	2016-03-07 04:36:03	22
618	2016-03-07 05:36:03	22
619	2016-03-07 06:36:03	21.9
620	2016-03-07 07:36:03	21.8
621	2016-03-07 08:36:03	21.6
622	2016-03-07 09:36:03	21.6
623	2016-03-07 10:36:03	21.6
624	2016-03-07 11:36:03	21.6
625	2016-03-07 12:36:03	21.6
626	2016-03-07 13:36:03	21.6
627	2016-03-07 14:36:03	21.5
628	2016-03-07 15:36:03	21.5
629	2016-03-07 16:36:03	21.6
630	2016-03-07 17:36:03	21.6
631	2016-03-07 18:36:03	21.6
632	2016-03-07 19:36:03	21.6
633	2016-03-07 20:36:03	21.6
634	2016-03-07 21:36:03	21.6
635	2016-03-07 22:36:03	21.8
636	2016-03-07 23:36:03	22.2
637	2016-03-08 00:36:03	22.4
638	2016-03-08 01:36:03	22.4
639	2016-03-08 02:36:03	22.4
640	2016-03-08 03:36:03	22.4
641	2016-03-08 04:36:03	22.3
642	2016-03-08 05:36:03	22.4
643	2016-03-08 06:36:03	22.1
644	2016-03-08 07:36:03	21.8
645	2016-03-08 08:36:03	21.7
646	2016-03-08 09:36:03	21.6
647	2016-03-08 10:36:03	21.6
648	2016-03-08 11:36:03	21.6
649	2016-03-08 12:36:03	21.6
650	2016-03-08 13:36:03	21.5

651	2016-03-08 14:36:03	21.4
652	2016-03-08 15:36:03	21.4
653	2016-03-08 16:36:03	21.4
654	2016-03-08 17:36:03	21.4
655	2016-03-08 18:36:03	21.4
656	2016-03-08 19:36:03	21.4
657	2016-03-08 20:36:03	21.4
658	2016-03-08 21:36:03	21.3
659	2016-03-08 22:36:03	21.4
660	2016-03-08 23:36:03	21.8
661	2016-03-09 00:36:03	22.1
662	2016-03-09 01:36:03	22.1
663	2016-03-09 02:36:03	22.1
664	2016-03-09 03:36:03	22.2
665	2016-03-09 04:36:03	22.2
666	2016-03-09 05:36:03	22.3
667	2016-03-09 06:36:03	22.2
668	2016-03-09 07:36:03	21.8
669	2016-03-09 08:36:03	21.6
670	2016-03-09 09:36:03	21.8
671	2016-03-09 10:36:03	21.9
672	2016-03-09 11:36:03	21.9
673	2016-03-09 12:36:03	22

STUDY: 27030
CLIENT: Ecology & Environment, Inc.
PROJECT: 18 Mile Creek Toxicity Ecological Risk Evaluation
ASSAY: Lumbriculus variegatus, oligochaete, Bioaccumulation Evaluation
TASK: Overlying Water Alkalinity Summary
METHOD: EPA 310.2

ESI Code	Field ID	Sample Number	Day	Lab ID	Matrix	Result	QLimit	Units	Sampled	Analyzed
27030-100	Laboratory Control	000	00	27036-100	Water	74	2	mg/L	02/10/16 0930	02/12/16
27030-001	OU2-SED04	001	00	27036-101	Water	70	2	mg/L	02/10/16 0930	02/12/16
27030-010	OU2-SED05	002	00	27036-102	Water	75	2	mg/L	02/10/16 0930	02/12/16
27030-011	OU2-SED06	003	00	27036-103	Water	72	2	mg/L	02/10/16 0930	02/12/16
27030-012	OU2-SED07	004	00	27036-104	Water	75	2	mg/L	02/10/16 0930	02/12/16
27030-013	OU2-SED09	005	00	27036-105	Water	83	2	mg/L	02/10/16 0930	02/12/16
27030-016	OU2-SED08	006	00	27036-106	Water	75	2	mg/L	02/10/16 0930	02/12/16
27016	MHR W-990	-	00	27036-107	Water	64	2	mg/L	02/10/16 0930	02/12/16
27030-100	Laboratory Control	000	07	27036-200	Water	81	2	mg/L	02/17/16 0915	03/02/16
27030-001	OU2-SED04	001	07	27036-201	Water	92	2	mg/L	02/17/16 0915	03/02/16
27030-010	OU2-SED05	002	07	27036-202	Water	92	2	mg/L	02/17/16 0915	03/02/16
27030-011	OU2-SED06	003	07	27036-203	Water	83	2	mg/L	02/17/16 0915	03/02/16
27030-012	OU2-SED07	004	07	27036-204	Water	90	2	mg/L	02/17/16 0915	03/02/16
27030-013	OU2-SED09	005	07	27036-205	Water	92	2	mg/L	02/17/16 0915	03/02/16
27030-016	OU2-SED08	006	07	27036-206	Water	86	2	mg/L	02/17/16 0915	03/02/16
27016	MHR W-990	-	07	27036-207	Water	74	2	mg/L	02/17/16 0915	03/02/16
27030-100	Laboratory Control	000	14	27036-300	Water	72	2	mg/L	02/24/16 0940	03/02/16
27030-001	OU2-SED04	001	14	27036-301	Water	75	2	mg/L	02/24/16 0940	03/02/16
27030-010	OU2-SED05	002	14	27036-302	Water	76	2	mg/L	02/24/16 0940	03/02/16
27030-011	OU2-SED06	003	14	27036-303	Water	79	2	mg/L	02/24/16 0940	03/02/16
27030-012	OU2-SED07	004	14	27036-304	Water	79	2	mg/L	02/24/16 0940	03/02/16
27030-013	OU2-SED09	005	14	27036-305	Water	81	2	mg/L	02/24/16 0940	03/02/16
27030-016	OU2-SED08	006	14	27036-306	Water	79	2	mg/L	02/24/16 0940	03/02/16
27016	MHR W-990	-	14	27036-307	Water	69	2	mg/L	02/24/16 0940	03/02/16
27030-100	Laboratory Control	000	21	27036-400	Water	65	2	mg/L	03/02/16 0955	03/14/16
27030-001	OU2-SED04	001	21	27036-401	Water	72	2	mg/L	03/02/16 0955	03/14/16
27030-010	OU2-SED05	002	21	27036-402	Water	71	2	mg/L	03/02/16 0955	03/14/16
27030-011	OU2-SED06	003	21	27036-403	Water	79	2	mg/L	03/02/16 0955	03/14/16
27030-012	OU2-SED07	004	21	27036-404	Water	80	2	mg/L	03/02/16 0955	03/14/16
27030-013	OU2-SED09	005	21	27036-405	Water	70	2	mg/L	03/02/16 0955	03/14/16
27030-016	OU2-SED08	006	21	27036-406	Water	76	2	mg/L	03/02/16 0955	03/14/16
27016	MHR W-990	-	21	27036-407	Water	62	2	mg/L	03/02/16 0955	03/14/16

27030-010	OU2-SED05	002	00	27036-102	Water	75	2	mg/L	02/10/16 0930	02/12/16
27030-011	OU2-SED06	003	00	27036-103	Water	72	2	mg/L	02/10/16 0930	02/12/16
27030-100	Laboratory Control	000	28	27036-500	Water	68	2	mg/L	03/09/16 0720	03/14/16
27030-001	OU2-SED04	001	28	27036-501	Water	77	2	mg/L	03/09/16 0720	03/14/16
27030-010	OU2-SED05	002	28	27036-502	Water	78	2	mg/L	03/09/16 0720	03/14/16
27030-011	OU2-SED06	003	28	27036-503	Water	82	2	mg/L	03/09/16 0720	03/14/16
27030-012	OU2-SED07	004	28	27036-504	Water	75	2	mg/L	03/09/16 0720	03/14/16
27030-013	OU2-SED09	005	28	27036-505	Water	84	2	mg/L	03/09/16 0720	03/14/16
27030-016	OU2-SED08	006	28	27036-506	Water	77	2	mg/L	03/09/16 0720	03/14/16
27016	MHR W-990	-	28	27036-507	Water	67	2	mg/L	03/09/16 0720	03/14/16

STUDY: 27030
CLIENT: Ecology & Environment, Inc.
PROJECT: 18 Mile Creek Toxicity Ecological Risk Evaluation
ASSAY: Lumbriculus variegatus, oligochaete, Bioaccumulation Evaluation
TASK: Overlying Water Hardness Summary
METHOD: SW846 3rd Ed. 6020

ESI Code	Field ID	Sample Number	Day	Lab ID	Matrix	Result	QLimit	Units	Sampled	Analyzed
27030-100	Laboratory Control	000	00	27036-108	Water	110	0.3	mg/L	02/10/16 0930	02/12/16
27030-001	OU2-SED04	001	00	27036-109	Water	110	0.3	mg/L	02/10/16 0930	02/12/16
27030-010	OU2-SED05	002	00	27036-110	Water	110	0.3	mg/L	02/10/16 0930	02/12/16
27030-011	OU2-SED06	003	00	27036-111	Water	110	0.3	mg/L	02/10/16 0930	02/12/16
27030-012	OU2-SED07	004	00	27036-112	Water	110	0.3	mg/L	02/10/16 0930	02/12/16
27030-013	OU2-SED09	005	00	27036-113	Water	120	0.3	mg/L	02/10/16 0930	02/12/16
27030-016	OU2-SED08	006	00	27036-114	Water	120	0.3	mg/L	02/10/16 0930	02/12/16
27016	MHR W-990	-	00	27036-115	Water	95	0.3	mg/L	02/10/16 0930	02/12/16
27030-100	Laboratory Control	000	07	27036-208	Water	110	0.3	mg/L	02/17/16 0915	03/02/16
27030-001	OU2-SED04	001	07	27036-209	Water	140	0.3	mg/L	02/17/16 0915	03/02/16
27030-010	OU2-SED05	002	07	27036-210	Water	130	0.3	mg/L	02/17/16 0915	03/02/16
27030-011	OU2-SED06	003	07	27036-211	Water	120	0.3	mg/L	02/17/16 0915	03/02/16
27030-012	OU2-SED07	004	07	27036-212	Water	130	0.3	mg/L	02/17/16 0915	03/02/16
27030-013	OU2-SED09	005	07	27036-213	Water	140	0.3	mg/L	02/17/16 0915	03/02/16
27030-016	OU2-SED08	006	07	27036-214	Water	130	0.3	mg/L	02/17/16 0915	03/02/16
27016	MHR W-990	-	07	27036-215	Water	110	0.3	mg/L	02/17/16 0915	03/02/16
27030-100	Laboratory Control	000	14	27036-308	Water	100	0.3	mg/L	02/24/16 0940	03/02/16
27030-001	OU2-SED04	001	14	27036-309	Water	110	0.3	mg/L	02/24/16 0940	03/02/16
27030-010	OU2-SED05	002	14	27036-310	Water	110	0.3	mg/L	02/24/16 0940	03/02/16
27030-011	OU2-SED06	003	14	27036-311	Water	120	0.3	mg/L	02/24/16 0940	03/02/16
27030-012	OU2-SED07	004	14	27036-312	Water	120	0.3	mg/L	02/24/16 0940	03/02/16
27030-013	OU2-SED09	005	14	27036-313	Water	120	0.3	mg/L	02/24/16 0940	03/02/16
27030-016	OU2-SED08	006	14	27036-314	Water	120	0.3	mg/L	02/24/16 0940	03/02/16
27016	MHR W-990	-	14	27036-315	Water	100	0.3	mg/L	02/24/16 0940	03/02/16
27030-100	Laboratory Control	000	21	27036-408	Water	96	0.3	mg/L	03/02/16 0955	03/14/16
27030-001	OU2-SED04	001	21	27036-409	Water	110	0.3	mg/L	03/02/16 0955	03/14/16
27030-010	OU2-SED05	002	21	27036-410	Water	100	0.3	mg/L	03/02/16 0955	03/14/16
27030-011	OU2-SED06	003	21	27036-411	Water	120	0.3	mg/L	03/02/16 0955	03/14/16
27030-012	OU2-SED07	004	21	27036-412	Water	120	0.3	mg/L	03/02/16 0955	03/14/16
27030-013	OU2-SED09	005	21	27036-413	Water	120	0.3	mg/L	03/02/16 0955	03/14/16
27030-016	OU2-SED08	006	21	27036-414	Water	120	0.3	mg/L	03/02/16 0955	03/14/16
27016	MHR W-990	-	21	27036-415	Water	95	0.3	mg/L	03/02/16 0955	03/14/16

27030-010	OU2-SED05	002	00	27036-110	Water	110	0.3	mg/L	02/10/16 0930	02/12/16
27030-011	OU2-SED06	003	00	27036-111	Water	110	0.3	mg/L	02/10/16 0930	02/12/16
27030-100	Laboratory Control	000	28	27036-508	Water	98	0.3	mg/L	03/09/16 0720	03/14/16
27030-001	OU2-SED04	001	28	27036-509	Water	110	0.3	mg/L	03/09/16 0720	03/14/16
27030-010	OU2-SED05	002	28	27036-510	Water	110	0.3	mg/L	03/09/16 0720	03/14/16
27030-011	OU2-SED06	003	28	27036-511	Water	120	0.3	mg/L	03/09/16 0720	03/14/16
27030-012	OU2-SED07	004	28	27036-512	Water	110	0.3	mg/L	03/09/16 0720	03/14/16
27030-013	OU2-SED09	005	28	27036-513	Water	120	0.3	mg/L	03/09/16 0720	03/14/16
27030-016	OU2-SED08	006	28	27036-514	Water	110	0.3	mg/L	03/09/16 0720	03/14/16
27016	MHR W-990	-	28	27036-515	Water	96	0.3	mg/L	03/09/16 0720	03/14/16

STUDY: 27030
CLIENT: Ecology & Environment, Inc.
PROJECT: 18 Mile Creek Toxicity Ecological Risk Evaluation
ASSAY: Lumbriculus variegatus, oligochaete, Bioaccumulation Evaluation
TASK: Overlying Water Ammonia Summary
METHOD: SM 4500-NH3 G

ESI Code	Field ID	Sample Number	Day	Lab ID	Matrix	Result	QLimit	Units	Sampled	Analyzed
27030-100	Laboratory Control	000	00	27036-116	Water	1.1	0.1	mg/L as N	02/12/16	02/11/16
27030-001	OU2-SED04	001	00	27036-117	Water	ND	0.1	mg/L as N	02/12/16	02/11/16
27030-010	OU2-SED05	002	00	27036-118	Water	ND	0.1	mg/L as N	02/12/16	02/23/16
27030-011	OU2-SED06	003	00	27036-119	Water	ND	0.1	mg/L as N	02/12/16	02/23/16
27030-012	OU2-SED07	004	00	27036-120	Water	ND	0.1	mg/L as N	02/12/16	02/23/16
27030-013	OU2-SED09	005	00	27036-121	Water	ND	0.1	mg/L as N	02/12/16	02/23/16
27030-016	OU2-SED08	006	00	27036-122	Water	ND	0.1	mg/L as N	02/12/16	02/23/16
27016	MHR W-990	-	00	27036-123	Water	ND	0.1	mg/L as N	02/12/16	02/23/16
27030-100	Laboratory Control	000	07	27036-216	Water	0.47	0.1	mg/L as N	03/02/16	02/23/16
27030-001	OU2-SED04	001	07	27036-217	Water	0.3	0.1	mg/L as N	03/02/16	02/23/16
27030-010	OU2-SED05	002	07	27036-218	Water	0.12	0.1	mg/L as N	03/02/16	02/23/16
27030-011	OU2-SED06	003	07	27036-219	Water	0.12	0.1	mg/L as N	03/02/16	02/23/16
27030-012	OU2-SED07	004	07	27036-220	Water	0.4	0.1	mg/L as N	03/02/16	02/23/16
27030-013	OU2-SED09	005	07	27036-221	Water	0.3	0.1	mg/L as N	03/02/16	02/23/16
27030-016	OU2-SED08	006	07	27036-222	Water	0.13	0.1	mg/L as N	03/02/16	02/23/16
27016	MHR W-990	-	07	27036-223	Water	ND	0.1	mg/L as N	03/02/16	02/23/16
27030-100	Laboratory Control	000	14	27036-316	Water	0.23	0.1	mg/L as N	03/02/16	03/01/16
27030-001	OU2-SED04	001	14	27036-317	Water	ND	0.1	mg/L as N	03/02/16	03/01/16
27030-010	OU2-SED05	002	14	27036-318	Water	ND	0.1	mg/L as N	03/02/16	03/01/16
27030-011	OU2-SED06	003	14	27036-319	Water	ND	0.1	mg/L as N	03/02/16	03/01/16
27030-012	OU2-SED07	004	14	27036-320	Water	ND	0.1	mg/L as N	03/02/16	03/01/16
27030-013	OU2-SED09	005	14	27036-321	Water	0.14	0.1	mg/L as N	03/02/16	03/01/16
27030-016	OU2-SED08	006	14	27036-322	Water	0.1	0.1	mg/L as N	03/02/16	03/01/16
27016	MHR W-990	-	14	27036-323	Water	ND	0.1	mg/L as N	03/02/16	03/16/16
27030-100	Laboratory Control	000	21	27036-416	Water	0.12	0.1	mg/L as N	03/14/16	03/16/16
27030-001	OU2-SED04	001	21	27036-417	Water	ND	0.1	mg/L as N	03/14/16	03/16/16
27030-010	OU2-SED05	002	21	27036-418	Water	ND	0.1	mg/L as N	03/14/16	03/16/16
27030-011	OU2-SED06	003	21	27036-419	Water	ND	0.1	mg/L as N	03/14/16	03/16/16
27030-012	OU2-SED07	004	21	27036-420	Water	0.12	0.1	mg/L as N	03/14/16	03/16/16
27030-013	OU2-SED09	005	21	27036-421	Water	0.15	0.1	mg/L as N	03/14/16	03/16/16
27030-016	OU2-SED08	006	21	27036-422	Water	ND	0.1	mg/L as N	03/14/16	03/16/16
27016	MHR W-990	-	21	27036-423	Water	ND	0.1	mg/L as N	03/14/16	03/16/16

27030-010	OU2-SED05	002	00	27036-118	Water	ND	0.1	mg/L as N	02/12/16	02/23/16
27030-011	OU2-SED06	003	00	27036-119	Water	ND	0.1	mg/L as N	02/12/16	02/23/16
27030-100	Laboratory Control	000	28	27036-516	Water	ND	0.1	mg/L as N	03/14/16	03/16/16
27030-001	OU2-SED04	001	28	27036-517	Water	ND	0.1	mg/L as N	03/14/16	03/16/16
27030-010	OU2-SED05	002	28	27036-518	Water	ND	0.1	mg/L as N	03/14/16	03/16/16
27030-011	OU2-SED06	003	28	27036-519	Water	ND	0.1	mg/L as N	03/14/16	03/16/16
27030-012	OU2-SED07	004	28	27036-520	Water	ND	0.1	mg/L as N	03/14/16	03/16/16
27030-013	OU2-SED09	005	28	27036-521	Water	ND	0.1	mg/L as N	03/14/16	03/16/16
27030-016	OU2-SED08	006	28	27036-522	Water	ND	0.1	mg/L as N	03/14/16	03/16/16
27016	MHR W-990	-	28	27036-523	Water	ND	0.1	mg/L as N	03/14/16	03/16/16

STUDY: 27030
CLIENT: Ecology & Environment, Inc.
PROJECT: 18 Mile Creek Toxicity Ecological Risk Evaluation
ASSAY: Lumbriculus variegatus, oligochaete, Bioaccumulation Evaluation
TASK: Overlying Water Total Organic Carbon Summary
METHOD: SM 5310 C

ESI Code	Field ID	Sample Number	Day	Lab ID	Result	Matrix	QLimit	Units	Sampled	Analyzed
27030-100	Laboratory Control	000	00	27036-124	1.1	Water	0.4	mg/L	02/10/16 0930	02/11/16
27030-001	OU2-SED04	001	00	27036-125	ND	Water	0.4	mg/L	02/10/16 0930	02/11/16
27030-010	OU2-SED05	002	00	27036-126	0.5	Water	0.4	mg/L	02/10/16 0930	02/11/16
27030-011	OU2-SED06	003	00	27036-127	0.6	Water	0.4	mg/L	02/10/16 0930	02/11/16
27030-012	OU2-SED07	004	00	27036-128	0.5	Water	0.4	mg/L	02/10/16 0930	02/11/16
27030-013	OU2-SED09	005	00	27036-129	0.6	Water	0.4	mg/L	02/10/16 0930	02/11/16
27030-016	OU2-SED08	006	00	27036-130	0.5	Water	0.4	mg/L	02/10/16 0930	02/11/16
27016	MHR W-990	-	00	27036-131	ND	Water	0.4	mg/L	02/10/16 0930	02/11/16
27030-100	Laboratory Control	000	28	27036-524	ND	Water	0.4	mg/L	03/09/16 0720	03/10/16
27030-001	OU2-SED04	001	28	27036-525	0.6	Water	0.4	mg/L	03/09/16 0720	03/10/16
27030-010	OU2-SED05	002	28	27036-526	0.5	Water	0.4	mg/L	03/09/16 0720	03/10/16
27030-011	OU2-SED06	003	28	27036-527	0.7	Water	0.4	mg/L	03/09/16 0720	03/10/16
27030-012	OU2-SED07	004	28	27036-528	0.5	Water	0.4	mg/L	03/09/16 0720	03/10/16
27030-013	OU2-SED09	005	28	27036-529	0.8	Water	0.4	mg/L	03/09/16 0720	03/10/16
27030-016	OU2-SED08	006	28	27036-530	0.5	Water	0.4	mg/L	03/09/16 0720	03/10/16
27016	MHR W-990	-	28	27036-531	ND	Water	0.4	mg/L	03/09/16 0720	03/10/16

STUDY: 27030
CLIENT: Ecology & Environment, Inc.
PROJECT: 18 Mile Creek Toxicity Ecological Risk Evaluation
ASSAY: Lumbriculus variegatus, oligochaete, Bioaccumulation Evaluation
TASK: Loss on Ignition Summary
METHOD: SM4500 5310 Ed. 22

ESI Code	Field ID	Sample Number	Matrix	Result	QLimit	Units	Sampled	Analyzed
27030-500	Formulated Lab Sediment	000	Solid	2.3	0.5	%	08/10/15 1250	09/25/15
27030-001	OU2-SED04	001	Solid	18	0.5	%	01/25/16 1030	02/06/16 0820
27030-010	OU2-SED05	002	Solid	39	0.5	%	01/26/16 0900	02/06/16 0820
27030-011	OU2-SED06	003	Solid	17	0.5	%	01/26/16 1315	02/06/16 0820
27030-012	OU2-SED07	004	Solid	19	0.5	%	01/26/16 1415	02/06/16 0820
27030-013	OU2-SED09	005	Solid	20	0.5	%	01/26/16 1605	02/06/16 0820
27030-016	OU2-SED08	006	Solid	20	0.5	%	01/26/16 1510	02/06/16 0820

SAMPLE RECEIPT AND CONDITION DOCUMENTATION

STUDY NO:	27030		
SDG No:			
Project:	Eighteen Mile Creek Soil and Sediment Toxicity Investigation		
Delivered via:	**ESI**		
Date and Time Received:	01/28/16 0830	Date and TIme Logged into Lab:	01/29/16 0830
Received By:	DW	Logged into Lab by:	RAM
Air bill / Way bill:	No	Air bill included in folder if received?	NA
Cooler on ice/packs:	Yes	Custody Seals present?	NA
Cooler Blank Temp (C) at arrival:	NA	Custody Seals intact?	NA
Number of COC Pages:	2		
COC Serial Number(s):			
COC Complete:	Yes	Does the info on the COC match the samples?	Yes
Sampled Date:	Yes	Were samples received within holding time?	Yes
Field ID complete:	Yes	Were all samples properly labeled?	Yes
Sampled Time:	Yes	Were proper sample containers used?	Yes
Analysis request:	Yes	Were samples received intact? (none broken or leaking)	Yes
COC Signed and dated:	Yes	Were sample volumes sufficient for requested analysis?	Yes
Were all samples received?	Yes	Were VOC vials free of headspace?	NA
Client notification/authorization:	Not required	pH Test strip ID number:	NA

Field ID	Lab ID	Mx	Analysis Requested	Bottle	Req'd Pres'n	Verified Pres'n
OU2-SED04	27030-001	S	Subsample: Chems; Lv28D	2x5 gallon	4C	
OU2-SS20	27030-002	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SS21	27030-003	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SS15	27030-004	S	Subsample: Chems; Ef28D	4x1 gallon	4C	
OU2-SS22	27030-005	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SS18	27030-006	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SS19	27030-007	S	Subsample: Chems; Ef28D	4x1 gallon	4C	
OU2-SS23	27030-008	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SS24	27030-009	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SED05	27030-010	S	Subsample: Chems; Lv28D	2x5 gallon	4C	
OU2-SED06	27030-011	S	Subsample: Chems; Lv28D	2x5 gallon	4C	
OU2-SED07	27030-012	S	Subsample: Chems; Lv28D	2x5 gallon	4C	
OU2-SED09	27030-013	S	Subsample: Chems; Lv28D	2x5 gallon	4C	
OU2-SS17	27030-014	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SS16	27030-015	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SED08	27030-016	S	Subsample: Chems; Lv28D	2x5 gallon	4C	

Notes and qualifications:

see project specific documents

ESI
EnviroSystems, Inc.
1 Lafayette Road
P.O. Box 778
Hampton, N.H. 03843
Voice: 603-926-3345
FAX: 603-926-3521

ESI Job No: 4575 27030

CHAIN OF CUSTODY DOCUMENTATION

Client: Ecology & Environment	Contact: Renee McIsaac (ESI)	Project Name: Eighteenmile Creek	Page 1 of 2
Report to: Lynne Parker	Address: 368 Pleasant View Dr	Project Number:	
Invoice to:	Address: Lancaster, NY 14086	Project Manager:	
Voice: 716.684.8060	Fax:	email: lparker@ene.com	P.O. No: Quote No:

Protocol: RCRA SDWA NPDES USCOE Other

Lab Number (assigned by lab)	Your Field ID: (must agree with container)	Date Sampled	Time Sampled	Sampled By	Grab or com-posit (G/C)	Container Size (ml.)	Container Type (P/G/T)	Field Preser-vation	Matrix S=Solid W=Water	Filter N=Not needed F=Done in field L=Lab to do	Analyses Requested\ Special Instructions:
-001	OU2-SED04	1/25/16	1030	JZ		2-5gal			Sed		EPA Method 100.3 Lumbriculus variegatus
-002	OU2-SS20	1/25/16	1340	JZ		3-1gal			Soil		ASTM E1676-12 Eisenia fetida
-003	OU2-SS21	1/25/16	1355	SC		3-1gal			Soil		
-004	OU2-SS15	1/25/16	1435	SC		4-1gal			Soil		
-005	OU2-SS22	1/25/16	1500	SC		3-1gal			Soil		
-006	OU2-SS18	1/25/16	1500	JZ		3-1gal			Soil		
-007	OU2-SS19	1/25/16	1545	JZ		4-1gal			Soil		
-008	OU2-SS23	1/25/16	1610	SC		3-1gal			Soil		
-009	OU2-SS24	1/25/16	1540	SC		3-1gal			Soil		
-010	OU2-SED05	1/26/16	0900	JZ		2-5gal			Sed		EPA 100.3
-011	OU2-SED06	1/26/16	1315	JZ		2-5gal			Sed		
-012	OU2-SED07	1/26/16	1415	JZ		2-5gal			Sed		

Relinquished By: Lynne Parker Date: 1/28/16 Time: 0830
Received By: Date: 1-28-16 Time: 0830

Relinquished By: Date: Time:
Received at Lab By: Date: Time:

Comments:

COC Doc No:

Sample Delivery Group No: Page of

ESI
EnviroSystems, Inc.
1 Lafayette Road
P.O. Box 778
Hampton, N.H. 03843
Voice: 603-926-3345
FAX: 603-926-3521

ESI Job No: 4576 27030

CHAIN OF CUSTODY DOCUMENTATION

Client: Ecology & Environment	Contact: Renee McIsaac (ESI)	Project Name: Eighteenmile Creek	Page 2 of 2
Report to: Lynne Parker	Address: 368 Pleasant View Dr.	Project Number:	
Invoice to:	Address: Lancaster, NY 14086	Project Manager:	
Voice: 716-684-8060	Fax:	email: lparker@ene.com	P.O. No: Quote No:

Protocol: RCRA SDWA NPDES USCOE Other

Lab Number (assigned by lab)	Your Field ID: (must agree with container)	Date Sampled	Time Sampled	Sampled By	Grab or composit (G/C)	Container Size (ml.)	Container Type (P/G/T)	Field Preservation	Matrix S=Solid W=Water	Filter N=Not needed F=Done in field L=Lab to do	Analyses Requested\ Special Instructions:
-013	OU2-SED09	1/26/16	~~1405~~ 1605 LP 1/26/16	JZ		2-5gal			Sed		EPA 100.3
-014	OU2-SS17	1/26/16	1420	SC		3-1gal			Soil		ASTM E1676-12
-015	OU2-SS16	1/26/16	1435	SC		3-1gal			Soil		↓
-016	OU2-SED08	1/26/16	~~1310~~ 1510 LP 1/24/16	JZ		2-5gal			Sed		EPA 100.3

LP 1/28/16

Relinquished By: Lynne Parker	Date: 1/28/16 Time: 0830	Received By: [signature]	Date: 1-28-16 Time: 0830
Relinquished By:	Date: Time:	Received at Lab By:	Date: Time:

Comments: OU2 - SED 08 buckets still say 1310 for sample time. JTP

COC Doc No:

Sample Delivery Group No: Page of

USEPA CLP COC (REGION COPY)

DateShipped:
CarrierName: FedEx
AirbillNo: 871820153196

CHAIN OF CUSTODY RECORD

Eighteenmile Creek Phase 3/NY
Case #: 45921
Cooler #: 2

No: 2-012716-131809-0005

Lab: Chemtech Consulting Group
Lab Contact: Divya Mehta
Lab Phone: 908-789-8900

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
A269-0037	BBG01	Sediment/ Justin Zoladz	Composite	PAH(21), PEST(21), ARO(21)	1038 (None), 1040 (None), 1041 (None) (3)	OU2-SED04	01/25/2016 10:30	Field Sample
A269-0038	BBG02	Sediment/ Justin Zoladz	Composite	ARO(21), PEST(21), PAH(21)	1042 (None), 1043 (None), 1044 (None) (6)	OU2-SED05	01/26/2016 09:00	Field Sample
A269-0039	BBG03	Sediment/ Justin Zoladz	Composite	PAH(21), PEST(21), ARO(21)	1046 (None), 1048 (None), 1049 (None) (3)	OU2-SED06	01/26/2016 13:15	Field Sample
A269-0040	BBG04	Sediment/ Justin Zoladz	Composite	PEST(21), PAH(21), ARO(21)	1050 (None), 1051 (None), 1053 (None) (3)	OU2-SED07	01/26/2016 14:15	Field Sample
A269-0041	BBG05	Sediment/ Justin Zoladz	Composite	ARO(21), PEST(21), PAH(21)	1055 (None), 1056 (None), 1057 (None) (3)	OU2-SED08	01/26/2016 15:10	Field Sample
A269-0042	BBG06	Sediment/ Justin Zoladz	Composite	ARO(21), PEST(21), PAH(21)	1059 (None), 1060 (None), 1061 (None) (3)	OU2-SED09	01/26/2016 16:05	Field Sample
A269-0044	BBG08	Sediment/ Justin Zoladz	Composite	PEST(21), PAH(21), ARO(21)	1066 (None), 1067 (None), 1068 (None) (3)	OU2-SED11	01/25/2016 10:30	Field Duplicate

Sample(s) to be used for Lab QC: A269-0038 Tag 1042, A269-0038 Tag 1043, A269-0038 Tag 1044	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: PAH=CLP PAH, PEST=CLP Pesticides, ARO=CLP Aroclors	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Renee Ashley Mulvaney (ESI)	02/02/16 1500			

USEPA CLP COC (REGION COPY)

DateShipped:
CarrierName: FedEx
AirbillNo: 871820153211

CHAIN OF CUSTODY RECORD

Eighteenmile Creek Phase 3/NY
Case #: 45921
Cooler #: 4

No: 2-012716-132514-0007

Lab: Chemtech Consulting Group
Lab Contact: Divya Mehta
Lab Phone: 908-789-8900

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
A269-0050	BBG14	Soil/ Justin Zoladz	Composite	PAH(21), ARO(21), PEST(21)	1090 (None), 1092 (None), 1093 (None) (3)	OU2-SS20	01/25/2016 13:40	Field Sample
A269-0051	BBG15	Soil/ Justin Zoladz	Composite	PAH(21), PEST(21), ARO(21)	1095 (None), 1096 (None), 1097 (None) (3)	OU2-SS21	01/25/2016 13:55	Field Sample
A269-0052	BBG16	Soil/ Justin Zoladz	Composite	PAH(21), ARO(21), PEST(21)	1098 (None), 1100 (None), 1101 (None) (3)	OU2-SS22	01/25/2016 15:00	Field Sample
A269-0053	BBG17	Soil/ Justin Zoladz	Composite	ARO(21), PEST(21), PAH(21)	1102 (None), 1103 (None), 1105 (None) (3)	OU2-SS23	01/25/2016 16:10	Field Sample
A269-0054	BBG18	Soil/ Justin Zoladz	Composite	ARO(21), PEST(21), PAH(21)	1107 (None), 1108 (None), 1109 (None) (3)	OU2-SS24	01/25/2016 15:40	Field Sample
A269-0055	BBG19	Soil/ Justin Zoladz	Composite	PAH(21), ARO(21), PEST(21)	1110 (None), 1112 (None), 1113 (None) (3)	OU2-SS25	01/25/2016 15:45	Field Duplicate

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: PAH=CLP PAH, ARO=CLP Aroclors, PEST=CLP Pesticides	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Renee Ashley Mecham (ESI)	02/02/16 1500			

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

321529

Client	Project Manager	Date	Chain of Custody Number
Ecology? Environment	Marcia Galloway / Lynne Parker	1/25/16	293970
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 2 of 2**
368 Pleasant View Dr	716 684 8060		
City / State / Zip Code	**Site Contact**	**Lab Contact**	**Analysis (Attach list if more space is needed)**
Lancaster / NY / 14086			
Project Name and Location (State)	**Carrier/Waybill Number**		
	FedEx: 8718 2015 3233 3364 1/26/16		
Contract/Purchase Order/Quote No.			
P-1601011			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	TCL: Lloyd Kahn	Special Instructions/ Conditions of Receipt
OU2-SS20	1/25/16	1340				X	1						X	
OU2-SS21	1/25/16	1355				X	1						X	
OU2-SS22	1/25/16	1500				X	1						X	
OU2-SS23	1/25/16	1610				X	1						X	
OU2-SS24	1/25/16	1540				X	1						X	
OU2-SS25	1/25/16	1545				X	1						X	

LD 1/26/16

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☒ 21 Days ☐ Other _____

QC Requirements (Specify)

1. Relinquished By	Date	Time	1. Received By	Date	Time
Renee Ashley Muhsam (ESI)	02/02/16	1500			
2. Relinquished By	Date	Time	2. Received By	Date	Time
3. Relinquished By	Date	Time	3. Received By	Date	Time

Comments

Samples were subsampled by ESI and sent to the DESA Regional Laboratory, 2890 Woodbridge Ave, Edison, NJ 08837

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client: Ecology & Environment	Project Manager: Marcia Galloway / Lynne Parker	Date: 1/25/16	Chain of Custody Number: 284432
Address: 368 Pleasant View Dr	Telephone Number (Area Code)/Fax Number: 716 684 8060	Lab Number:	Page 1 of 2
City: Lancaster / State: NY / Zip Code: 14086	Site Contact:	Lab Contact:	
Project Name and Location (State):	Carrier/Waybill Number: FedEx: 8718 2015 3233 (~~3369~~) LP 1/26/16		
Contract/Purchase Order/Quote No.: P-1601011			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil		Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis: TOC; Lloyd Kahn	Special Instructions/ Conditions of Receipt
OU2-SED04	1/25/16	1030			X		LP 1/26/16	1						X	MS/MSD LP 1/26/16
OU2-SED05	1/26/16	0900			X		LP 1/26/16	2						X	MS/MSD
OU2-SED06	1/26/16	1315			X			1						X	
OU2-SED07	1/26/16	1415			X			1						X	
OU2-SED08	1/26/16	1510			X			1						X	
OU2-SED09	1/26/16	1605			X			1						X	
OU2-SED11	1/25/16	1030			X			1						X	
OU2-SS15	1/25/16	1435				X		2						X	MS/MSD
OU2-SS16	1/26/16	1435				X		1						X	
OU2-SS17	1/26/16	1420				X		1						X	
OU2-SS18	1/25/16	1500				X		1						X	
OU2-SS19	1/25/16	1545				X		1						X	

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☒ 21 Days ☐ Other _____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By: Russell Culley/Macisaac (ESI)	02/02/16	1500	1. Received By		
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

Samples were subsampled by ESI and sent to the DESA Regional Laboratory, 2890 Woodbridge Ave, Edison, NJ 08837.

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

USEPA CLP COC (REGION COPY)
DateShipped:
CarrierName: FedEx
AirbillNo: 871820153185

CHAIN OF CUSTODY RECORD
Eighteenmile Creek Phase 3/NY
Case #: 45921
Cooler #: 1

No: 2-012716-130536-0004
Lab: Chemtech Consulting Group
Lab Contact: Divya Mehta
Lab Phone: 908-789-8900

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
A269-0037	MBBG01	Sediment/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1039 (None) (1)	OU2-SED04	01/25/2016 10:30	Field Sample
A269-0038	MBBG02	Sediment/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1045 (None) (2)	OU2-SED05	01/26/2016 09:00	Field Sample
A269-0039	MBBG03	Sediment/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1047 (None) (1)	OU2-SED06	01/26/2016 13:15	Field Sample
A269-0040	MBBG04	Sediment/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1052 (None) (1)	OU2-SED07	01/26/2016 14:15	Field Sample
A269-0041	MBBG05	Sediment/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1054 (None) (1)	OU2-SED08	01/26/2016 15:10	Field Sample
A269-0042	MBBG06	Sediment/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1058 (None) (1)	OU2-SED09	01/26/2016 16:05	Field Sample
A269-0044	MBBG08	Sediment/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1069 (None) (1)	OU2-SED11	01/25/2016 10:30	Field Duplicate
A269-0045	MBBG09	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1073 (None) (2)	OU2-SS15	01/25/2016 14:35	Field Sample
A269-0046	MBBG10	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1076 (None) (1)	OU2-SS16	01/26/2016 14:35	Field Sample
A269-0047	MBBG11	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1079 (None) (1)	OU2-SS17	01/26/2016 14:20	Field Sample

Sample(s) to be used for Lab QC: A269-0038 Tag 1045, A269-0045 Tag 1073	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Renee Ashley Muilsaac (ESI)	02/02/16 1500			

USEPA CLP COC (REGION COPY)

DateShipped:
CarrierName: FedEx
AirbillNo: 871820153185

CHAIN OF CUSTODY RECORD

Eighteenmile Creek Phase 3/NY
Case #: 45921
Cooler #: 1

No: 2-012716-130536-0004

Lab: Chemtech Consulting Group
Lab Contact: Divya Mehta
Lab Phone: 908-789-8900

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
A269-0048	MBBG12	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1084 (None) (1)	OU2-SS18	01/25/2016 15:00	Field Sample
A269-0049	MBBG13	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1089 (None) (1)	OU2-SS19	01/25/2016 15:45	Field Sample
A269-0050	MBBG14	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1091 (None) (1)	OU2-SS20	01/25/2016 13:40	Field Sample
A269-0051	MBBG15	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1094 (None) (1)	OU2-SS21	01/25/2016 13:55	Field Sample
A269-0052	MBBG16	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1099 (None) (1)	OU2-SS22	01/25/2016 15:00	Field Sample
A269-0053	MBBG17	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1104 (None) (1)	OU2-SS23	01/25/2016 16:10	Field Sample
A269-0054	MBBG18	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1106 (None) (1)	OU2-SS24	01/25/2016 15:40	Field Sample
A269-0055	MBBG19	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1111 (None) (1)	OU2-SS25	01/25/2016 15:45	Field Duplicate

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Renee Ashley Michaels (ESI)	02/02/16 1500			

USEPA CLP COC (REGION COPY)

DateShipped:
CarrierName: FedEx
AirbillNo: 871820153200

CHAIN OF CUSTODY RECORD

Eighteenmile Creek Phase 3/NY
Case #: 45921
Cooler #: 3

No: 2-012716-132246-0006

Lab: Chemtech Consulting Group
Lab Contact: Divya Mehta
Lab Phone: 908-789-8900

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
A269-0045	BBG09	Soil/ Justin Zoladz	Composite	ARO(21), PEST(21), PAH(21)	1070 (None), 1071 (None), 1072 (None) (6)	OU2-SS15	01/25/2016 14:35	Field Sample
A269-0046	BBG10	Soil/ Justin Zoladz	Composite	PAH(21), PEST(21), ARO(21)	1074 (None), 1075 (None), 1077 (None) (3)	OU2-SS16	01/26/2016 14:35	Field Sample
A269-0047	BBG11	Soil/ Justin Zoladz	Composite	PAH(21), ARO(21), PEST(21)	1078 (None), 1080 (None), 1081 (None) (3)	OU2-SS17	01/26/2016 14:20	Field Sample
A269-0048	BBG12	Soil/ Justin Zoladz	Composite	PEST(21), PAH(21), ARO(21)	1082 (None), 1083 (None), 1085 (None) (3)	OU2-SS18	01/25/2016 15:00	Field Sample
A269-0049	BBG13	Soil/ Justin Zoladz	Composite	PEST(21), ARO(21), PAH(21)	1086 (None), 1087 (None), 1088 (None) (3)	OU2-SS19	01/25/2016 15:45	Field Sample

Sample(s) to be used for Lab QC: A269-0045 Tag 1070, A269-0045 Tag 1071, A269-0045 Tag 1072

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: ARO=CLP Aroclors, PEST=CLP Pesticides, PAH=CLP PAH

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Reed Ashley Medsaas ESI	02/02/16 1500			

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Express

FedEx Tracking Number 8718 2015 3185

Form ID No. 0215

MUR31

Sender's Copy

1 From *Please print and press hard.*

Date

Sender's FedEx Account Number SENDER'S FEDEX ACCT NUMBER ONLY 0142-0678-7

Sender's Name ZACK Phone (716) 684-8060

Company ECOLOGY & ENVIRONMENT INC

Address 368 PLEASANT VIEW DR

Dept./Floor/Suite/Room

City LANCASTER State NY ZIP 14086-1397

2 Your Internal Billing Reference 1003239.0009.03.01
First 24 characters will appear on invoice.

3 To

Recipient's Name Snehal Mehta Phone (908) 789-8900

Company Chemtech Consulting Group - CHM

Address 284 Sheffield Sheet
We cannot deliver to P.O. boxes or P.O. ZIP codes. Dept./Floor/Suite/Room

Address
Use this line for the HOLD location address or for continuation of your shipping address.

City Mountainside State NJ ZIP 07092

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0417518457

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- ☐ FedEx First Overnight — Earliest next business morning delivery to select locations.*
- ☐ FedEx 2Day — Second business day.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx Express Saver — Next business afternoon.* Saturday Delivery NOT available.

4b Express Freight Service ** To most locations. *Packages over 150 lbs.*

- ☐ FedEx 1Day Freight — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected. FedEx 1Day Freight Booking No. CALL 1.800.332.0807
- ☐ FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

5 Packaging * Declared value limit $500.

☐ FedEx Envelope* ☐ FedEx Pak* Includes FedEx Small Pak and FedEx Large Pak. ☐ FedEx Box ☐ FedEx Tube ☒ Other

6 Special Handling and Delivery Signature Options

☐ SATURDAY Delivery
NOT available for FedEx Standard Overnight, FedEx Express Saver, or FedEx 3Day Freight.

☐ No Signature Required — Package may be left without obtaining a signature for delivery.
☐ Direct Signature — Someone at recipient's address may sign for delivery. *Fee applies.*
☐ Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. For residential deliveries only. *Fee applies.*

Does this shipment contain dangerous goods?
One box must be checked.

☒ No ☐ Yes As per attached Shipper's Declaration. ☐ Yes Shipper's Declaration not required. ☐ Dry Ice Dry Ice, 9, UN 1845 _____ x _____ kg

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging or placed in a FedEx Express Drop Box. ☐ Cargo Aircraft Only

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FedEx Acct. No. / Credit Card No. Exp. Date

Total Packages	Total Weight	Total Declared Value†
1	47.0 lbs.	$ _____ .00

†Our liability is limited to $100 unless you declare a higher value. See back for details. By using this Airbill you agree to the service conditions on the back of this Airbill and in the current FedEx Service Guide, including terms that limit our liability.

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FedEx. US Airbill
Express

FedEx Tracking Number 8718 2015 3196

Form ID No. 0215

MUR31

Sender's Copy

1 From *Please print and press hard.*

Date

Sender's FedEx Account Number SENDER'S FEDEX ACCT NUMBER ONLY 0142-0678-7

Sender's Name ZACK Phone (716) 684-8060

Company ECOLOGY & ENVIRONMENT INC

Address 368 PLEASANT VIEW DR

Dept./Floor/Suite/Room

City LANCASTER State NY ZIP 14086-1397

2 Your Internal Billing Reference 1003239.0009.03.01
First 24 characters will appear on invoice.

3 To

Recipient's Name Snehal Mehta Phone (908) 789-8900

Company Chemtech Consulting Group - CHM

Address 284 Sheffield Sheet
We cannot deliver to P.O. boxes or P.O. ZIP codes. Dept./Floor/Suite/Room

Address
Use this line for the HOLD location address or for continuation of your shipping address.

City Mountainside State NJ ZIP 07092

HOLD Weekday ☐ FedEx location address REQUIRED. NOT available for FedEx First Overnight.

HOLD Saturday ☐ FedEx location address REQUIRED. Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

0417518457

4a Express Package Service * To most locations. *Packages up to 150 lbs.*

- ☐ FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☒ FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.
- ☐ FedEx First Overnight — Earliest next business morning delivery to select locations.*
- ☐ FedEx 2Day — Second business day.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx Express Saver — Next business afternoon.* Saturday Delivery NOT available.

4b Express Freight Service ** To most locations. *Packages over 150 lbs.*

- ☐ FedEx 1Day Freight — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected. FedEx 1Day Freight Booking No. CALL 1.800.332.0807
- ☐ FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

5 Packaging * Declared value limit $500.

☐ FedEx Envelope* ☐ FedEx Pak* Includes FedEx Small Pak and FedEx Large Pak. ☐ FedEx Box ☐ FedEx Tube ☒ Other

6 Special Handling and Delivery Signature Options

☐ SATURDAY Delivery
NOT available for FedEx Standard Overnight, FedEx Express Saver, or FedEx 3Day Freight.

☐ No Signature Required — Package may be left without obtaining a signature for delivery.
☐ Direct Signature — Someone at recipient's address may sign for delivery. *Fee applies.*
☐ Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. For residential deliveries only. *Fee applies.*

Does this shipment contain dangerous goods?
One box must be checked.

☒ No ☐ Yes As per attached Shipper's Declaration. ☐ Yes Shipper's Declaration not required. ☐ Dry Ice Dry Ice, 9, UN 1845 _____ x _____ kg

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging or placed in a FedEx Express Drop Box. ☐ Cargo Aircraft Only

7 Payment *Bill to:*

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☒ Sender Acct. No. in Section 1 will be billed. ☐ Recipient ☐ Third Party ☐ Credit Card ☐ Cash/Check

FedEx Acct. No. / Credit Card No. Exp. Date

Total Packages	Total Weight	Total Declared Value†
1	54 lbs.	$ _____ .00

†Our liability is limited to $100 unless you declare a higher value. See back for details. By using this Airbill you agree to the service conditions on the back of this Airbill and in the current FedEx Service Guide, including terms that limit our liability.

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FedEx Tracking Number 8718 2015 3211

MUR31

Form ID No. 0215

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1 From *Please print and press hard.*

Date

Sender's FedEx Account Number SENDER'S FEDEX ACCT NO. 0142-0678-7

Sender's Name ZACK Phone (716) 684-8060

Company ECOLOGY & ENVIRONMENT INC

Address 368 PLEASANT VIEW DR Dept./Floor/Suite/Room

City LANCASTER State NY ZIP 14086-1397

2 Your Internal Billing Reference First 24 characters will appear on invoice. 1003239.0009.03.01

3 To

Recipient's Name Shehal Mehta Phone (908) 789 8900

Company Chemtech Consulting Group - CHM

Address 284 Sheffield Sheet Dept./Floor/Suite/Room

We cannot deliver to P.O. boxes or P.O. ZIP codes.

HOLD Weekday FedEx location address REQUIRED. NOT available for FedEx First Overnight.

HOLD Saturday FedEx location address REQUIRED. Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

Address

Use this line for the HOLD location address or for continuation of your shipping address.

City Mountainside State NJ ZIP 07092

0417518457

4a Express Package Service * To most locations. *Packages up to 150 lbs.*

- ☐ FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☒ FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.
- ☐ FedEx First Overnight — Earliest next business morning delivery to select locations.*
- ☐ FedEx 2Day — Second business day.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx Express Saver — Next business afternoon.* Saturday Delivery NOT available.

4b Express Freight Service ** To most locations. *Packages over 150 lbs.*

- ☐ FedEx 1Day Freight — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected. FedEx 1Day Freight Booking No. CALL 1.800.332.0807
- ☐ FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

5 Packaging * Declared value limit $500.

- ☐ FedEx Envelope*
- ☐ FedEx Pak* — Includes FedEx Small Pak and FedEx Large Pak.
- ☐ FedEx Box
- ☐ FedEx Tube
- ☒ Other

6 Special Handling and Delivery Signature Options

- ☐ SATURDAY Delivery — NOT available for FedEx Standard Overnight, FedEx Express Saver, or FedEx 3Day Freight.
- ☐ No Signature Required — Package may be left without obtaining a signature for delivery.
- ☐ Direct Signature — Someone at recipient's address may sign for delivery. *Fee applies.*
- ☐ Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. For residential deliveries only. *Fee applies.*

Does this shipment contain dangerous goods? One box must be checked.

- ☒ No
- ☐ Yes — As per attached Shipper's Declaration.
- ☐ Yes — Shipper's Declaration not required.
- ☐ Dry Ice — Dry Ice, 9, UN 1845 ____ x ____ kg

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging or placed in a FedEx Express Drop Box. ☐ Cargo Aircraft Only

7 Payment *Bill to:*

Enter FedEx Acct. No. or Credit Card No. below.

- ☒ Sender — Acct. No. in Section 1 will be billed.
- ☐ Recipient
- ☐ Third Party
- ☐ Credit Card
- ☐ Cash/Check

FedEx Acct. No. / Credit Card No. Exp. Date

Total Packages: 1 Total Weight: 41.6 lbs. Total Declared Value†: $ ____ .00

†Our liability is limited to $100 unless you declare a higher value. See back for details. By using this Airbill you agree to the service conditions on the back of this Airbill and in the current FedEx Service Guide, including terms that limit our liability.

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FedEx Tracking Number 8718 2015 3200

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Form ID No. 0215

Sender's Copy

1 From *Please print and press hard.*

Date

Sender's FedEx Account Number SENDER'S FEDEX ACCT NO. 0142-0678-7

Sender's Name ZACK Phone (716) 684-8060

Company ECOLOGY & ENVIRONMENT INC

Address 368 PLEASANT VIEW DR Dept./Floor/Suite/Room

City LANCASTER State NY ZIP 14086-1397

2 Your Internal Billing Reference First 24 characters will appear on invoice. 1003239.0009.03.01

3 To

Recipient's Name Shehal Mehta Phone (908) 789-8900

Company Chemtech Consulting Group - CHM

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- ☐ Yes — Shipper's Declaration not required.
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Date

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Sender's Name ZACK Phone (716) 684-8060

Company ECOLOGY & ENVIRONMENT INC

Address 368 PLEASANT VIEW DR Dept./Floor/Suite/Room

City LANCASTER State NY ZIP 14086-1397

2 Your Internal Billing Reference First 24 characters will appear on invoice. 1003239.0009.03.01

3 To

Recipient's Name Ness Tirol Phone (732) 321 4431

Company DESA Regional Laboratory

Address 2890 Woodbridge Ave Dept./Floor/Suite/Room
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Address
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City Edison State NJ ZIP 08837

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HOLD Saturday ☐ FedEx location address REQUIRED. Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

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4a Express Package Service * To most locations. *Packages up to 150 lbs.*

- ☐ FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
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- ☐ FedEx First Overnight — Earliest next business morning delivery to select locations.*
- ☐ FedEx 2Day — Second business day.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx Express Saver — Next business afternoon.* Saturday Delivery NOT available.

4b Express Freight Service ** To most locations. *Packages over 150 lbs.*

- ☐ FedEx 1Day Freight — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected. FedEx 1Day Freight Booking No. CALL 1.800.332.0807
- ☐ FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

5 Packaging * Declared value limit $500.

☐ FedEx Envelope* ☐ FedEx Pak* Includes FedEx Small Pak and FedEx Large Pak. ☐ FedEx Box ☐ FedEx Tube ☒ Other

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Does this shipment contain dangerous goods?

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☒ No ☐ Yes As per attached Shipper's Declaration. ☐ Yes Shipper's Declaration not required. ☐ Dry Ice Dry Ice, 9, UN 1845 ____ x ____ kg

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Total Packages	Total Weight	Total Declared Value†
1	35.6 lbs.	$ .00

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K1602618

CHAIN OF CUSTODY RECORD

ENVIROSYSTEMS, INCORPORATED

ESI Study Number: 27030

P.O. Box 778, Hampton, New Hampshire 03842

Customer Services: Phone # (603) 926-3345
Fax # (603) 926-3521

PAGE: 1 OF 2

CLIENT:	CONTACT:	PROJECT NAME:	P.O. #
Envirosystems, Inc.	Kirk Cram	18 Mile Creek	
REPORT TO: Kirk Cram	ADDRESS: 1 Lafayette Road, Building 6, Hampton, NH 03842		PHONE: 603-926-3345 x209
INVOICE TO:	ADDRESS:		SAMPLED BY: ESI

Program Requirements: ☐ NPDES ☐ RCRA ☐ USACE ☐ EPA ☐ OTHER

SAMPLE #	YOUR FIELD IDENTIFICATION (MUST AGREE WITH CONTAINER)	DATE SAMPLED	TIME SAMPLED	COMPOSITE /GRAB	E-EFFLUENT D-DILUENT O-OTHER	CONTAINER #/VOL/TYPE	FIELD PRESERVED	ANALYSIS REQUESTED (SPECIAL INSTRUCTIONS, CAUTIONS, ETC.)
300	Laboratory Control	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
301	OU-SS20	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
302	OU-SS21	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
303	OU-SS15	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
304	OU-SS22	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
305	OU-SS18	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
306	OU-SS19	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
307	OU-SS23	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
308	OU-SS24	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
309	OU-SS17	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
310	OU-SS16	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
311	Pre-tissue *E.f.*	02/07/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
Kirk Cram	03/14/16	1400		3/15/16	1015

ATTN: Kurt Clarkson

K1602618

CHAIN OF CUSTODY RECORD

ENVIROSYSTEMS, INCORPORATED

ESI Study Number: 27030

P.O. Box 778, Hampton, New Hampshire 03842

Customer Services: Phone # (603) 926-3345
Fax # (603) 926-3521

PAGE: 2 OF 2

CLIENT:	CONTACT:	PROJECT NAME:	P.O. #
Envirosystems, Inc.	Kirk Cram	18 Mile Creek	
REPORT TO: Kirk Cram	ADDRESS: 1 Lafayette Road, Building 6, Hampton, NH 03842		PHONE: 603-926-3345 x209
INVOICE TO:	ADDRESS:		SAMPLED BY: ESI

Program Requirements: ☐ NPDES ☐ RCRA ☐ USACE ☐ EPA ☐ OTHER

SAMPLE #	YOUR FIELD IDENTIFICATION (MUST AGREE WITH CONTAINER)	DATE SAMPLED	TIME SAMPLED	COMPOSITE /GRAB	E-EFFLUENT D-DILUENT O-OTHER	CONTAINER #/VOL/TYPE	FIELD PRESERVED	ANALYSIS REQUESTED (SPECIAL INSTRUCTIONS, CAUTIONS, ETC.)
400	Laboratory Control	03/10/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
401	OU2-SED04	03/10/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
402	OU2-SED05	03/10/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
403	OU2-SED06	03/10/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
404	OU2-SED07	03/10/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
405	OU2-SED09	03/10/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
406	OU2-SED10	03/10/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
407	Pre-tissue *L.v.*	02/09/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
Kirk Cram	03/14/16	1400		3/15/16	1015

ATTN: Kurt Clarkson

PC Kurt

Cooler Receipt and Preservation Form

Client Enviro systems Service Request K16 2618

Received: 3/15/16 Opened: 3/15/16 By: M Unloaded: 3/15/16 By: M

1. Samples were received via? *Mail* *Fed Ex* (*UPS*) *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) (*Cooler*) *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA (Y) N If yes, how many and where? 1 front
   If present, were custody seals intact? (Y) N If present, were they signed and dated? (Y) N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID NA	Tracking Number NA	Filed
-20.0	NA	—	—	-0.1	365	27030	1Z4R724R0150665121	

4. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* (*Wet Ice*) (*Dry Ice*) *Sleeves* Box
5. Were custody papers properly filled out (ink, signed, etc.)? NA (Y) N
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA (Y) N
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA (Y) N
8. Did all sample labels and tags agree with cu ody papers? *Indicate major discrepancies in the table on page 2.* NA (Y) N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA (Y) N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* (NA) Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* (NA) Y N
12. Was C12/Res negative? (NA) Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: _____

ALS Environmental
1317 South 13th Avenue
Kelso, WA 98626

Confirmation of Sample Receipt

To:	Ken Simon	**From:**	Kurt Clarkson
Email:	ksimon@envirosystems.com	**Email:**	Kurt.Clarkson@alsglobal.com
Fax:		**Fax:**	360-636-1068
Phone:	603-926-3345	**Phone:**	360-577-7222 x3356

Samples for analysis have been received by ALS Environmental on 3/15/16 and assigned our Service Request number **K1602618**. **Please verify the following information and notify me of any corrections as soon as possible.**

The estimated completion date for this work is: **4/5/16**

Client: EnviroSystems, Inc.
Project: 18 Mile Creek/ESI Study Number: 27030

EDD Required: Yes

Tier: IV

Report To: Ken Simon
EnviroSystems, Inc.
One Lafayette Road
Hampton, NH 03842

Billing Address: Ken Simon
EnviroSystems, Inc.
One Lafayette Road
Hampton, NH 03842

Comments:

Thank you for your business!

A - Test is Authorized H - Test is On Hold HP - Test is On Hold Pending Input P - Test is Authorized for Prep Only C - Test has been Cancelled * - Test has assigned QC

				8081B Pest OC	8082A PCB	8270D PAH SIM	Frz Dry Frz Dry	Grind Grind	Homogen Homogen	Lipids LIPIDS
K1602618-001	Laboratory Control	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-002	OU-SS20	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-003	OU-SS21	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-004	OU-SS15	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-005	OU-SS22	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-006	OU-SS18	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-007	OU-SS19	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-008	OU-SS23	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-009	OU-SS24	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-010	OU-SS17	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-011	OU-SS16	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-012	Pre-tissue E.f.	Animal Tissue	2/ 7/16	HP	HP	HP	A	A	A	HP
K1602618-013	Laboratory Control	Animal Tissue	3/10/16	HP	HP	HP	A	A	A	HP
K1602618-014	OU2-SED04	Animal Tissue	3/10/16	HP	HP	HP	A	A	A	HP

				8081B Pest OC	8082A PCB	8270D PAH SIM	Frz Dry Frz Dry	Grind Grind	Homogen Homogen	Lipids LIPIDS
K1602618-015	OU2-SED05	Animal Tissue	3/10/16	HP	HP	HP	A	A	A	HP
K1602618-016	OU2-SED06	Animal Tissue	3/10/16	HP	HP	HP	A	A	A	HP
K1602618-017	OU2-SED07	Animal Tissue	3/10/16	HP	HP	HP	A	A	A	HP
K1602618-018	OU2-SED09	Animal Tissue	3/10/16	HP	HP	HP	A	A	A	HP
K1602618-019	OU2-SED08	Animal Tissue	3/10/16	HP	HP	HP	A	A	A	HP
K1602618-020	Pre-tissue L.v.	Animal Tissue	2/ 9/16	HP	HP	HP	A	A	A	HP

Test Comments:

Group	Test/Method	Samples	Comments
Semivoa GCMS	8270D/PAH SIM	1-20	LJ 18000

Assay Review Checklist

START DATE: 02/10/16 **STUDY#:** 27036

END DATE: 03/09/16 **CLIENT:** Ecology & Environment

PROJECT: 18 Mile Creek

ASSAY: 28 day *L. variegatus*

Analyst Data Review	Date	Initials	Comments
Chains of Custody Complete	04/12/16	BP	
Sample Receipt Complete	04/12/16	BP	
Organism Culture Sheet(s)	04/12/16	BP	
Bench Sheets Complete (dates, times, initials, etc...)	04/12/16	BP	
Water Quality Data Complete	04/12/16	BP	
Weights Reported	04/12/16	BP	
Assay Acceptability Review	NA		

Technical Report Review	Date	Initials	Comments
Statistical Analysis Complete	NA		
Statistical Analysis Reviewed	↓		
Data Acceptability Review	NA		
Supporting Chemistry Report	4/5/16	—	
Draft Report	4/11/16	NR	
Final Report Reviewed	04/04-05/16	—	
QA Audit/Review Complete	4/13/16	KTAS	
Final Report Printed - PDF	4/13/16	NR	chem data package to be delivered under separate cover
Executive Summary / Chems Sent	NA		
Report E-mailed / Faxed	4/13/16	NR	
Report Logged Out / Invoice Sent			

Earthworm Bioaccumulation Test Laboratory Report

TOXICOLOGICAL EVALUATION
OF SOIL SAMPLES

Eighteen Mile Creek Site
OU 2 Remedial Investigation/Feasibility Study
Lockport, New York

Contract No. W912DQ-11-D-3006
Task Order No. 1003239-0009

Eisenia fetida 28 Day Survival and Bioaccumulation Evaluation

Prepared For:

Ecology and Environment, Incorporated
368 Pleasant View Drive
Lancaster, New York 14086

Prepared By:

EnviroSystems, Incorporated
1 Lafayette Road
Hampton, New Hampshire 03842

February 2016
Reference Number: 27030Ef

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TOXICOLOGICAL EVALUATION
OF SOIL SAMPLES

Eighteen Mile Creek Site
OU 2 Remedial Investigation/Feasibility Study
Lockport, New York

***Eisenia fetida* 28 Day Survival and Bioaccumulation Evaluation**

1.0 INTRODUCTION

This report presents the results of a chronic exposure toxicity test completed on soil samples collected from the Eighteen Mile Creek Site located in Lockport, New York in support of the OU 2 Remedial Investigation/Feasibility Study. Samples were provided by Ecology and Environment, Incorporated (E&E), Lancaster, New York. Testing was based on programs and protocols developed by the ASTM (2011) and US EPA (1989). The toxicity of the samples was assessed by conducting 28 day exposure assays with the earthworm, *Eisenia fetida*. Toxicity tests and tissue metals analyses were performed at EnviroSystems, Incorporated (ESI), Hampton, New Hampshire. Tissues were shipped to Australian Laboratory Services (ALS), Kelso, Washington for body burden analysis of pesticides, PCB Aroclors, polyaromatic hydrocarbons, percent moisture and lipids.

Toxicity tests expose groups of organisms to environmental samples, a laboratory control and field reference sites for a specified period to assess potential impacts on a variety of endpoints, such as survival or bioaccumulation potential. Analysis of variance techniques are used to determine the relative impact of the samples as compared to the laboratory control and/or field reference sites. The endpoints for this study were body burden and survival.

2.0 MATERIALS AND METHODS

2.1 General Methods, Biological Evaluations

Toxicological and analytical protocols used in this program follow procedures outlined in *Standard Methods for the Examination of Water and Wastewater*, 22nd Edition (APHA 2012)*, Standard Guide for Conducting Laboratory Soil Toxicity or Bioaccumulation Tests With the Lumbricid Earthworm Eisenia Fetida and the Enchytraeid Potworm Enchytraeus albidus* (ASTM 2011), and *Protocol for Short Term Toxicity Screening of Hazardous Waste Sites* (EPA 1989). These protocols provide standard approaches for physical and chemical analysis and for the evaluation of toxicological effects of soils on terrestrial organisms.

2.2 Test Species

E. fetida were originally obtained from The Worm Farm, Durham, California and held in culture at ESI for several months prior to testing. Worms used in the assays were adults with a well-developed clitellum and having a wet weight between 300 and 500 mg. Prior to the test, a representative group of worms were rinsed with deionized water, blotted dry, and weighed to the nearest 0.1 mg to determine the mean initial weight, and these data are included in the data appendix. A portion of the lot was also retained for pre-exposure tissue analyses, and these data may be found along with the chemistry data package provided under separate cover.

2.3 Test Samples

Soil samples received for analysis were inspected to determine integrity, given unique sample numbers and logged into the laboratory sample management database. Once logged in, the samples were placed in a secure storage area maintained at 4±2 °C. A listing of sample sites, sample collection, and receipt information is summarized in Table 1. An aliquot of each sample was analyzed for loss on ignition (percent carbon) to estimate the level of organic carbon and soil pH. In addition, aliquots of the soil were shipped to ChemTech Consulting Group for subsequent chemical analysis. The soil characteristics are provided in Table 2 and in the Data Appendix, and the chain of custody records can be found in the Data Appendix..

The control substrate was Coast of Maine Cow Manure Compost (A-4181) that was sieved through a 4mm screen and then hydrated using deionized water.

2.4 *Eisenia fetida* 28 Day Toxicological and Bioaccumulation Evaluation

Endpoints for the 28 day exposure study were body burden (bioaccumulation) and survival. Test chambers for the assay were 9 cm diameter by 30 cm tall acrylic cylinders. The bottom of the cylinders were sealed with 200 µm mesh Nitex® screen attached using silicone adhesive. The top of the cylinder was covered with Parafilm® with holes to allow ventilation. Prior to adding soil, the cylinders were filled with rinsed crushed stone to a depth of approximately 1.5-2 cm. Cylinders were then filled with enough soil to exceed a loading rate of 16 mg soil/individual test organism/day of exposure, which was equivalent to approximately 300 mL of soil for survival replicates and 600 mL of soil for the bioaccumulation replicates. Each individual cylinder was then placed in a shallow plastic dish. Deionized water was added to each dish to a depth approximately equal to the top of the crushed stone. The water levels were checked and maintained throughout the assay. On day 16, some desiccation was noted in test replicates. As a corrective action for this, the shallow plastic dishes were replaced with 1 L beakers to allow for more water volume retention to keep the soils appropriately saturated.

Before the addition of organisms, test chambers were randomized using the CETIS™, version 1.8.6.6, (Comprehensive Environmental Toxicity Information System) software program. Worms with well developed clitilum were randomly assigned to test vessels. The test utilized 5 replicates with 10 worms per replicate for the survival endpoint and 3 replicates with approximately 40 grams of worms per replicate added for the bioaccumulation endpoint. Cylinders were placed in an incubator set to 25°C. During the exposure period, incubator temperature was checked daily for the duration of the assay and hourly using a data logger. Lighting was set at 24 hours illumination and light intensity was maintained at 100-1000 Lux. The worms were not fed during the assay.

After placing worms in the test chambers with soil, all worms burrowed within 1 hour. General observation were made and recorded daily, including when watering took place and if any instances of worms not burrowing or actively attempting to avoid the sample occured. After 28 days exposure, chambers were uncovered and the contents removed onto trays. Living worms were removed from the soil, counted for the survival endpoint from the first 5 replicates, rinsed with deionized water to remove soil particles and placed in a petri dish lined with moistened filter paper overnight to allow for depuration. Living worms from the 3 replicates for bioaccumulation were removed from the soil and placed in tri-pour containers lined with damp paper towel and allowed to depurate overnight. After the depuration period, worms from all 8 replicates were rinsed again with deionized water to remove soil particles, blotted dry and combined to obtain the total wet weight of organisms recovered to the nearest 0.1 milligram for each sample location. Total recovered wet weights are summarized in Table 3. Worms were then allocated into two jars prior to being frozen. One jar was then transferred to ESI's chemistry group for body burden analysis for metals, and the other jar was transferred to ALS for subsequent analysis, and the chain of custody records can be found in the Data Appendix.

2.5 Tissue Body Burden Analysis - Metals

Worm tissues were digested whole in hot nitric acid followed by hot hydrochloric acid for a total of 1 hour. After digestion, the samples were brought to a final volume with Milli-Q® water and filtered at 0.45 µm. The filtered digestates were analyzed using EPA SW-846 Method 6020, Inductively Coupled Plasma - Mass Spectrometry (ICP-MS).

2.6 Statistical Analysis

Data from the first 5 replicates were analyzed using CETIS™ software to evaluate differences in survival between worms exposed to the test soils and those exposed to the laboratory control soil. The data sets were then evaluated to determine normality of distribution and homogeneity of sample variance. Subsequently, data sets were also evaluated using the appropriate parametric or non-parametric Analysis of Variance (ANOVA) statistic. Statistical comparisons were made based on survival data recorded upon assay termination on day 28. Pair-wise comparisons were made using the appropriate statistical evaluation. The statistical difference was evaluated at $\alpha = 0.05$.

2.7 Quality Control

As part of the ongoing laboratory quality control program, reference toxicant evaluations are conducted monthly, or whenever new batches of organisms are received for testing purposes. These results provide relative health and response data while allowing for comparison with historic data sets. Results were within two standard deviations of the historic mean for the species and are summarized in Table 4.

Quality Control data from the chemical analysis are provided in the chemical data package provided under separate cover.

3.0 RESULTS AND DISCUSSION

3.1 Exposure Conditions

Based on daily observations, the mean temperature during the assay was 24.1°C with a range of 24 to 25°C. Confirmation temperature data collected using a data logger documented a mean temperature of 23.5°C with a range of 23.2 to 23.7°C. The acceptable temperature required by protocol is a mean value of 22±1°C with maximum limits of 19 to 25°C.

3.2 Survival and Wet Weight

The results presented in Table 5 show that at the end of the 28 day exposure period, the laboratory control had a mean survival of100% (CV = 0%), which meets ESI's protocol acceptability criterion of ≥90% for survival. The total wet weight for worms recovered from the laboratory control was 120.86 g, with individual project site samples ranging from 78.0 to 115.2 g (Table 3). The weight of worms recovered from all treatments, (laboratory control and project sites), were sufficient for chemical analysis.

3.3 Protocol Deviations

Review of data generated during the 28-day exposure period documented one deviation from ESI's protocol. Hourly temperature data collected during the assay documented that the mean temperature during the 28-day exposure period was 23.5°C. Protocol dictates incubation should be set at 22±1°C, but not to exceed 19 - 25°C for the assay duration. The incubator was set to 25°C and ranged from 24 - 25°C. While testing temperatures were not maintained at that lower range, they did not exceed the maximum for the testing protocol over the course of the study. Based on the ASTM method protocol guidance, it is the opinion of ESI's Study Director that this deviation had no significant negative impact on the outcome of the bioaccumulation evaluation.

3.4 Summary

This program utilized protocols developed by the US EPA and ASTM to assess the potential toxicological and bioaccumulation impacts of exposure to soils from the Eighteen Mile Creek site on soil invertebrates. Comparisons were made between worms exposed to project site soils and the laboratory control sample. Results presented in Table 5 indicate that the survival of invertebrates exposed to soil from site samples OU2-SS18 (005), OU2-SS23 (007) and OU2-SS17 (009) was significantly reduced as compared to the laboratory control. However, when statistical outliers were removed from the analysis, two of these sites (OU2-SS18 and OU2-SS23) were no longer significantly reduced. Laboratory bench sheets, analytical reports and associated statistical support data are included in Appendix A.

4.0 REFERENCES

APHA. 2012. *Standard Methods for the Examination of Water and Wastewater*, 22nd Edition. Washington D.C.

ASTM. 2011. Volume 11.06. *Standard Guide for Conducting Laboratory Soil Toxicity or Bioaccumulation Tests With the Lumbricid Earthworm Eisenia Fetida and the Enchytraeid Potworm Enchytraeus albidus.* E1676-04

US EPA. 1989. *Protocol for Short Term Toxicity Screening of Hazardous Waste Sites*. EPA/600/3-88/029.

Table 1. Summary of Sample Collection and Receipt Information. *Eisenia fetida* 28 Day Bioaccumulation Evaluation. Eighteen Mile Creek, Lockport, NY. February 2016.

Field ID	Sample Code	Sample Number	Sample Collected Date	Sample Collected Time	Sample Received Date	Sample Received Time
OU2-SS20	27030-002	001	01/25/16	1340	01/28/16	0830
OU2-SS21	27030-003	002	01/25/16	1355	01/28/16	0830
OU2-SS15	27030-004	003	01/25/16	1435	01/28/16	0830
OU2-SS22	27030-005	004	01/25/16	1500	01/28/16	0830
OU2-SS18	27030-006	005	01/25/16	1500	01/28/16	0830
OU2-SS19	27030-007	006	01/25/16	1545	01/28/16	0830
OU2-SS23	27030-008	007	01/25/16	1610	01/28/16	0830
OU2-SS24	27030-009	008	01/25/16	1540	01/28/16	0830
OU2-SS17	27030-014	009	01/26/16	1420	01/28/16	0830
OU2-SS16	27030-015	010	01/26/16	1435	01/28/16	0830

Table 2. Summary of Soil Characteristics. *Eisenia fetida* 28 Day Bioaccumulation Evaluation. Eighteen Mile Creek, Lockport, NY. February 2016.

Field ID	Sample Code	Soil pH (SU)	Loss on Ignition (%)
Lab Control	27030-000	5.58	64 [a]
OU2-SS20	27030-002	6.14	30
OU2-SS21	27030-003	7.71	17
OU2-SS15	27030-004	7.64	20
OU2-SS22	27030-005	8.04	16
OU2-SS18	27030-006	5.71	23
OU2-SS19	27030-007	7.87	20
OU2-SS23	27030-008	7.83	33
OU2-SS24	27030-009	6.75	29
OU2-SS17	27030-014	7.32	40
OU2-SS16	27030-015	7.74	23

Notes:
[a] Loss on ignition value was generated on 2/4/16 for the same soil formulation used in this assay.

Table 3. Summary of Recovered Wet Weights. *Eisenia fetida* 28 Day Bioaccumulation Evaluation. Eighteen Mile Creek, Lockport, NY. February 2016.

Field ID	Sample Code	Total Recovered Wet Weight (g)	Reserved for Trace Metals (g)	Reserved for Organic Analysis (g)
Lab Control	27030-000	120.86	13.82	107.04
OU2-SS20	27030-002	88.92	11.85	77.07
OU2-SS21	27030-003	105.75	13.51	92.24
OU2-SS15	27030-004	103.97	12.50	91.47
OU2-SS22	27030-005	115.17	11.47	103.70
OU2-SS18	27030-006	90.26	10.77	79.49
OU2-SS19	27030-007	97.25	14.80	82.45
OU2-SS23	27030-008	93.37	14.58	78.79
OU2-SS24	27030-009	88.05	12.97	75.08
OU2-SS17	27030-014	77.99	6.99	71.00
OU2-SS16	27030-015	93.81	9.27	84.54

Table 4. Reference Toxicant Evaluation. *Eisenia fetida* 28 Day Bioaccumulation Evaluation. Eighteen Mile Creek, Lockport, NY. February 2016.

Date	Endpoint		Value	Historic Mean/ Central Tendency	Acceptable Range	Reference Toxicant
Eisenia fetida						
02/22/16	Survival	LC-50	579	1484	0 - 3836	Cadmium (mg/L)

Table 5. *Eisenia fetida* Day 28 Survival Summary and Statistical Analysis. *Eisenia fetida* 28 Day Bioaccumulation Evaluation. Eighteen Mile Creek, Lockport, NY. February 2016.

				Survival			
Field ID	ESI Code	Sample Number	Reps	Mean	Minimum	Maximum	CV
Laboratory Control	27030-000	000	5	100%	100%	100%	0%
OU2-SS20	27030-002	001	5	100%	100%	100%	0%
OU2-SS21	27030-003	002	5	58%	0%	100%	92%
OU2-SS15	27030-004	003	5	98%	90%	100%	5%
OU2-SS22	27030-005	004	5	96%	90%	100%	6%
OU2-SS18	27030-006	005	5	72%	0%	100%	58%
OU2-SS19	27030-007	006	5	40%	0%	100%	137%
OU2-SS23	27030-008	007	5	72%	0%	100%	58%
OU2-SS24	27030-009	008	5	98%	90%	100%	5%
OU2-SS17	27030-014	009	5	70%	60%	90%	18%
OU2-SS16	27030-015	010	5	84%	60%	100%	26%

				Survival Statistically Significant as Compared to:
Field ID	ESI Code	Sample Number	Mean Survival	Laboratory Control (000)
Laboratory Control	27030-000	000	100%	-
OU2-SS20	27030-002	001	100%	No
OU2-SS21	27030-003	002	58%	No
OU2-SS15	27030-004	003	98%	No / No
OU2-SS22	27030-005	004	96%	No
OU2-SS18	27030-006	005	72%	Yes [a] / No
OU2-SS19	27030-007	006	40%	Yes
OU2-SS23	27030-008	007	72%	Yes [a] / No
OU2-SS24	27030-009	008	98%	No / No
OU2-SS17	27030-014	009	70%	Yes / Yes
OU2-SS16	27030-015	010	84%	No

Note: "Yes / Yes" and "No / No" indicates that there was no difference in a statistical outcome when an outlier was excluded.

[a] Indicates that a statistical outlier was removed from the analysis.

APPENDIX A:
RAW DATA AND STATISTICAL SUPPORT

Contents	Number of Pages
E. fetida 28-Day Soil Toxicity Test	
Test Sample Key	1
Daily Temperature and Daily Observation Bench Sheets	6
Organism Receipt Data Sheet	1
Eisenia fetida Survival Recovery Records	3
Representative Initial Wet Weights	1
Recovered Wet Weights	1
CETIS Work Sheet, Survival Summary and Statistical Analysis Reports	21
Support Documentation	
Soil pH Record	1
Loss on Ignition Data	1
Test Soil Preparation Notes	3
Temperature Graph and Summary	17
E-mail Correspondence	0
Sample Receipt Documents	3
Chain of Custody Records for Samples Sent for Analysis	16
Assay Review Checklist	1
Total Appendix Pages	76

Sample Key

Client: Ecology and Environment, Inc.
Project: Eighteen Mile Creek
Assay: *Eisenia fetida* 28 Day

ESI Code	Field ID	Sample Number	Sampled		Received	
27030-000	Laboratory Control	000				
27030-002	OU2-SS20	001	01/25/16	1340	01/28/16	830
27030-003	OU2-SS21	002	01/25/16	1355	01/28/16	830
27030-004	OU2-SS15	003	01/25/16	1435	01/28/16	830
27030-005	OU2-SS22	004	01/25/16	1500	01/28/16	830
27030-006	OU2-SS18	005	01/25/16	1500	01/28/16	830
27030-007	OU2-SS19	006	01/25/16	1545	01/28/16	830
27030-008	OU2-SS23	007	01/25/16	1610	01/28/16	830
27030-009	OU2-SS24	008	01/25/16	1540	01/28/16	830
27030-014	OU2-SS17	009	01/26/16	1420	01/28/16	830
27030-015	OU2-SS16	010	01/26/16	1435	01/28/16	830

Eisenia fetida 28 Day Assay

STUDY: 27030 **CLIENT: Ecology and Environment, Inc.** **Project: Eighteen Mile Creek**

Day	Date	Temp (°C)	Light (Lux)	Rotate (✔)	General Observations	Initials
0	~~02~~ 02/08	25	846		All (E.D) worms borrowed after 1hr after	BP
1	02/09	25	870	✓		BP
2	02/10	25	904	✓		BG
3	02/11	25	833	✓		BP
4	02/12	24	898	✓		BG
5	02/13	24	856	✓		BG
6	02/14	24	908	✓		BP
7	2/15	24	919	✓	DI added to select chambers	BP
8	2/16	24	879	✓		BP
9	02/17	24	737	✓		BG
10	02/18	24	961	✓		BG
11	02/19	24	1041	✓	DI added to all chambers	BG
12	02/20	24	947	✓		BG
13	02/21	24	982	✓	DI added to select chambers	BP
14	02/22	24	898	✓		BP
15	02/23	24	912	✓	DI added to select chambers	BP
16	02/24	24	883	✓	DI added to all chambers	BG
17	02/25	24	977	✓		BP
18	02/26	24	1129	✓		BG
19	02/27	24	1090	✓		BG
20	02/28	24	998	✓		BP
21	02/29	24	977	✓		BP
22	03/01	24	1014	✓		BP
23	03/02	24	1115	✓		BG
24	03/03	24	1121	✓		BP
25	03/04	24	1123	✓		BG
26	03/05	24	1196	✓		BG
27	03/06	24	948	✓		BP
28	03/07	24	959			BP

Data Logger ID: Teletemp MicroPoint I #N 07126 Light Meter ID: CP3272

NOTES: During the assay the temperature is observed daily and recorded hourly by the Data Logger.
Make sure there is sufficient moisture in columns, add water to dishes as necessary.

(E.D) 02/08 BP All worms borrowed after 1 hour from addition

(E.D) 02/24 BG Desiccation of test chambers noted and chambers placed in 1L beakers to assist in retention of moisture in the soil.

27030 General Observations Ecology & Environmental 18 Mile Creek Eisenia fetida

Day 16 - JTP/BG - 02/24/16

Replicate	Observation
3	Worm found below the chamber, re-added to soil
14	Fungus/mold, “white cotton candy” looking
19	Worms on surface, 1 noted desiccated
20	Fungus/mold, “white cotton candy” looking, 1 worm noted desiccated
21	Fungus/mold, “white cotton candy” looking
24	Fungus/mold, “white cotton candy” looking
27	Worms on surface
30	Worms on surface
36	Worms on surface
54	Worms on surface
55	Worms on surface

1 worm found desiccated in the tub holding replicate #’s 26-36

Pos	Sample Code	DAY 17	18	19	20	21	22	23	24	25	26	27
1	27030-000; 000	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
2	27030-015; 010	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
3	27030-002; 001	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
4	27030-006; 005	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
5	27030-007; 006	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
6	27030-009; 008	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
7	27030-014; 009	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
8	27030-003; 002	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
9	27030-004; 003	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
10	27030-005; 004	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
11	27030-008; 007	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
12	27030-009; 008	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
13	27030-004; 003	✓	W	✓	✓	✓	✓	✓	✓	✓	✓	✓
14	27030-014; 009	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
15	27030-002; 001	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
16	27030-015; 010	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
17	27030-003; 002	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
18	27030-000; 000	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
19	27030-006; 005	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
20	27030-008; 007	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
21	27030-007; 006	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
22	27030-005; 004	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
23	27030-009; 008	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
24	27030-007; 006	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
25	27030-000; 000	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
26	27030-003; 002	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
27	27030-015; 010	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
28	27030-006; 005	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
	Date/Initials	02/25/16	02/26/16 BG	02/27/16 BG	02/28/16 BP	02/29/16 BP	03/01/16 BP	03/02/16 DG/HK	03/03/16 BP	03/04/16 BG	03/05/16	03/06/16 BP

		DAY										
Pos	Sample Code	17	18	19	20	21	22	23	24	25	26	27
29	27030-005; 004	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
30	27030-008; 007	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
31	27030-002; 001	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
32	27030-014; 009	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
33	27030-004; 003	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
34	27030-006; 005	✓	W	✓	✓	✓	✓	W	✓	✓	✓	✓
35	27030-015; 010	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
36	27030-005; 004	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
37	27030-008; 007	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
38	27030-002; 001	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
39	27030-014; 009	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
40	27030-007; 006	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
41	27030-000; 000	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
42	27030-003; 002	✓	✓	✓	✓	✓	✓	ID	✓	✓	✓	✓
43	27030-004; 003	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
44	27030-009; 008	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
45	27030-004; 003	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
46	27030-005; 004	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
47	27030-003; 002	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
48	27030-000; 000	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
49	27030-014; 009	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
50	27030-015; 010	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
51	27030-008; 007	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
52	27030-002; 001	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
53	27030-009; 008	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
54	27030-007; 006	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
55	27030-006; 005	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
56	27030-000; 000	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
Date/Initials		02/25/16	02/26/16 BP	02/27/16 BP	02/28/16 BP	02/29/16 BP	03/01/16 BP	03/02/16 DP/HK	03/03/16 BP	03/04/16 BP	03/05/16 BP	03/06/16 BP

		DAY										
Pos	Sample Code	17	18	19	20	21	22	23	24	25	26	27
57	27030-008; 007	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
58	27030-015; 010	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
59	27030-009; 008	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
60	27030-002; 001	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
61	27030-014; 009	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
62	27030-004; 003	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
63	27030-007; 006	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
64	27030-006; 005	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
65	27030-005; 004	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
66	27030-003; 002	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
67	27030-002; 001	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
68	27030-000; 000	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
69	27030-014; 009	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
70	27030-005; 004	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
71	27030-006; 005	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
72	27030-007; 006	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
73	27030-009; 008	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
74	27030-003; 002	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
75	27030-008; 007	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
76	27030-015; 010	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
77	27030-004; 003	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
78	27030-006; 005	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
79	27030-007; 006	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
80	27030-005; 004	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
81	27030-000; 000	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
82	27030-015; 010	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
83	27030-008; 007	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
84	27030-009; 008	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
	Date/Initials	02/25/16	02/26/16 BP	02/27/16 BG	02/29/16 BP	02/29/16 BP	03/01/16 BP	03/02/16 BG/HK	03/03/16 BP	03/04/16 BP	03/05/16 BP	03/06/16 BP

Pos	Sample Code	DAY 17	18	19	20	21	22	23	24	25	26	27
85	27030-003; 002	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
86	27030-002; 001	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
87	27030-014; 009	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
88	27030-004; 003	✓	✓	✓	✓	✓	✓	W	✓	✓	✓	✓
	Date/Initials	02/25/16	02/26/16 TJK	02/27/16 BG	02/29/16 BP	02/29/16 BP	03/01/16 BP	03/02/16 BG/HK	03/03/16 BP	03/04/16 BG	03/05/16 BP	03/06/16 BP

Ecology and Environmental
18 Mile Creek

Eisenia fetida Survival & Bioaccumulation Study 27030

Observation Codes:

S Worms observed on the surface
D Dead/desiccated worms
W Water added
✓ Column looks normal

Additional Assay Notes:

THE WORM FARM
9033 LESQUON RD
DURHAM, CA 95938
(530) 636 9009
MID: 881882903999198
Client ID: 0682290399919803
Term Num.: 0001

Phone Order Sale

XXXXXX9771 Exp: XX/XX
Entry Method: Keyed CNP
USD$ 339.00
10:29:55
Appr Code: 087126
Batch#: 000082
A
465336665950312
MVKV
823634

THR 4
DLR COPY
PY FOR STATEMENT
FICATION

ours

stoffice

THE WORM FARM

WALK-IN

9033 Esquon Road
Durham, CA 95938
Info@TheWormFarm.net
www.TheWormFarm.net

Ship Date 2015-12-02 11:32:56

99ES TWF 120315

TE ROAD BLD 6
R@ENVIROSYSTEMS.COM

J, NH

	Qty Ordered	Qty Shipped	Unit Cost	Total Cost
	10.00	10.00	24.00	240.00

:s _____

lected _____

Tax Rate	%
Estimated Hours per Deliver	1.00
Delivery Rate	90.00
Material & Delivery	330.00
Deposit	330.00
Total Due	$.00

SHIPPING

THE WORM FARM

Eisenia fetida Survival Recovery Records - Ecology & Environment - 18 Mile Creek

Pos	Sample Code	# Alive	Initials	Notes
1	27030-000; 000	10	JTP	
2	27030-015; 010	10		
3	27030-002; 001	10		
4	27030-006; 005	10		
5	27030-007; 006	10		Slightly saturated
6	27030-009; 008	9		
7	27030-014; 009	9		
8	27030-003; 002	9		slightly saturated
9	27030-004; 003	10		
10	27030-005; 004	9		
11	27030-008; 007	10		Bit dry
12	27030-009; 008	10	EH	
13	27030-004; 003	10		
14	27030-014; 009	7		
15	27030-002; 001	10		
16	27030-015; 010	10		
17	27030-003; 002	0		Not that dry, some mold
18	27030-000; 000	10		
19	27030-006; 005	8		one worm dried to side of column
20	27030-008; 007	0		very wet, moldy
21	27030-007; 006	0		very wet

22	27030-005; 004	9	EH	
23	27030-009; 008	10	EH	
24	27030-007; 006	0		
25	27030-000; 000	10		
26	27030-003; 002	0		
27	27030-015; 010	6		
28	27030-006; 005	10		
29	27030-005; 004	10		
30	27030-008; 007	7		
31	27030-002; 001	10		
32	27030-014; 009	6		
33	27030-004; 003	9		
34	27030-006; 005	8		Dry
35	27030-015; 010	6		Dry
36	27030-005; 004	10		
37	27030-008; 007	10		
38	27030-002; 001	10		
39	27030-014; 009	7		
40	27030-007; 006	10		very wet
41	27030-000; 000	10		
42	27030-003; 002	10		wet
43	27030-004; 003	10		
44	27030-009; 008	10		

45	27030-004; 003	10	JTP	
46	27030-005; 004	10		
47	27030-003; 002	10		Wet
48	27030-000; 000	10		
49	27030-014; 009	6		
50	27030-015; 010	10		Wet
51	27030-008; 007	9		wet
52	27030-002; 001	10		
53	27030-009; 008	10		
54	27030-007; 006	0		wet, white film on top.
55	27030-006; 005	0		wet, hair like white film on top

Eisenia fetida 28 Day Assay

Study: 27030

Client: Ecology and Environment, Inc.

Project: Eighteen Mile Creek

SAMPLE	Worm Count	WET WEIGHT (G)
Start Worms	1	0.3530
	2	0.3407
	3	0.2320
	4	0.4367
	5	0.3105
	6	0.4002
	7	0.2686
	8	0.2359
	9	0.2632
	10	0.2906
INITIALS: TBG		
DATE: 02/09/16		

NOTES:

Average wet weight per worm: 0.31314 g

Number of worms per replicate: 10

Average wet weight per replicate: 3.1314 g

Average wet weight of soil per replicate: 0.1909 kg

Loading rate (g worm/kg soil): 16.4039 worm/kg soil

Balance ID: OHAUS Discovery Serial #: 1124024313

Alternate Balance ID: _____ Serial #: _____

P:\General Projects\FORMS\LABFORMS\Soil and Sediment Tests\Eisenia fetida Assays\Start Worm Wet Weight 2015.wpd

Final Tissue Weight Record

Study: 27030

Client: Ecology and Enviroment, Inc

Project: Eighteen Mile Creek

Field ID	ESI Code	Total Weight (grams)	Quantity Removed For Metals (grams)
LAB	27030-000; 000	120.86	13.82
OU2-SS20	27030-002; 001	88.92	11.85
OU2-SS21	27030-003; 002	105.75	13.51
OU2-SS15	27030-004; 003	103.97	12.50
OU2-SS22	27030-005; 004	115.17	11.47
OU2-SS18	27030-006; 005	90.26	10.77
OU2-SS19	27030-007; 006	97.25	14.80
OU2-SS23	27030-008; 007	93.37	14.58
OU2-SS24	27030-009; 008	88.05	12.97
OU2-SS17	27030-014; 009	77.99	6.99
OU2-SS16	27030-015; 010	93.81	9.27

Recorded by:	BG
Date:	**03/08/16**
Scale ID:	1303

Notes:

P:\General Projects\RPT-Active\ERA 27030 E&E 18 Mile Creek\Worm weight measurement sheet.wpd

Eisenia fetida 28 day
Survival and Bioaccumulation Assay

CETIS Worksheets, Summary Sheets and Analytical Reports

Bioaccumulation Evaluation - Survival Endpoint **EnviroSystems, Inc.**

Start Date: 08 Feb-16 12:00 **Species:** Eisenia fetida **Sample Code:** 27030-000; 000
End Date: 07 Mar-16 12:00 **Protocol:** US ACE NED RIM (2004) **Sample Source:** Eighteen Mile Creek, Lockport, NY
Sample Date: 02 Feb-16 12:00 **Material:** Laboratory Control Soil **Sample Station:** Laboratory Control Soil

Sample Code	Rep	Pos	# Exposed	# Survived	Notes
27030-000; 000	1	1	10	10	
27030-015; 010	1	2	10	10	
27030-002; 001	1	3	10	10	
27030-006; 005	1	4	10	10	
27030-007; 006	1	5	10	10	
27030-009; 008	1	6	10	9	
27030-014; 009	1	7	10	9	
27030-003; 002	1	8	10	9	
27030-004; 003	1	9	10	10	
27030-005; 004	1	10	10	9	
27030-008; 007	1	11	10	10	
27030-009; 008	2	12	10	10	
27030-004; 003	2	13	10	10	
27030-014; 009	2	14	10	7	
27030-002; 001	2	15	10	10	
27030-015; 010	2	16	10	10	
27030-003; 002	2	17	10	0	
27030-000; 000	2	18	10	10	
27030-006; 005	2	19	10	8	
27030-008; 007	2	20	10	0	
27030-007; 006	2	21	10	0	
27030-005; 004	2	22	10	9	
27030-009; 008	3	23	10	10	
27030-007; 006	3	24	10	0	
27030-000; 000	3	25	10	10	
27030-003; 002	3	26	10	0	
27030-015; 010	3	27	10	6	
27030-006; 005	3	28	10	10	
27030-005; 004	3	29	10	10	
27030-008; 007	3	30	10	7	
27030-002; 001	3	31	10	10	
27030-014; 009	3	32	10	6	
27030-004; 003	3	33	10	9	
27030-006; 005	4	34	10	8	
27030-015; 010	4	35	10	6	
27030-005; 004	4	36	10	10	
27030-008; 007	4	37	10	10	
27030-002; 001	4	38	10	10	
27030-014; 009	4	39	10	7	
27030-007; 006	4	40	10	10	

Sample Code	Rep	Pos	# Exposed	# Survived	Notes
27030-000; 000	4	41	10	10	
27030-003; 002	4	42	10	10	
27030-004; 003	4	43	10	10	
27030-009; 008	4	44	10	10	
27030-004; 003	5	45	10	10	
27030-005; 004	5	46	10	10	
27030-003; 002	5	47	10	10	
27030-000; 000	5	48	10	10	
27030-014; 009	5	49	10	6	
27030-015; 010	5	50	10	10	
27030-008; 007	5	51	10	9	
27030-002; 001	5	52	10	10	
27030-009; 008	5	53	10	10	
27030-007; 006	5	54	10	0	
27030-006; 005	5	55	10	0	
27030-000; 000	6	56	10		
27030-008; 007	6	57	10		
27030-015; 010	6	58	10		
27030-009; 008	6	59	10		
27030-002; 001	6	60	10		
27030-014; 009	6	61	10		
27030-004; 003	6	62	10		
27030-007; 006	6	63	10		
27030-006; 005	6	64	10		
27030-005; 004	6	65	10		
27030-003; 002	6	66	10		
27030-002; 001	7	67	10		
27030-000; 000	7	68	10		
27030-014; 009	7	69	10		
27030-005; 004	7	70	10		
27030-006; 005	7	71	10		
27030-007; 006	7	72	10		
27030-009; 008	7	73	10		
27030-003; 002	7	74	10		
27030-008; 007	7	75	10		
27030-015; 010	7	76	10		
27030-004; 003	7	77	10		
27030-006; 005	8	78	10		
27030-007; 006	8	79	10		
27030-005; 004	8	80	10		
27030-000; 000	8	81	10		
27030-015; 010	8	82	10		
27030-008; 007	8	83	10		
27030-009; 008	8	84	10		
27030-003; 002	8	85	10		
27030-002; 001	8	86	10		

Sample Code	Rep	Pos	# Exposed	# Survived	Notes
27030-014; 009	8	87	10		
27030-004; 003	8	88	10		

Bioaccumulation Evaluation - Survival Endpoint **EnviroSystems, Inc.**

Batch ID:	06-3519-1897	**Test Type:**	Survival	**Analyst:**	Renee McIsaac
Start Date:	08 Feb-16 12:00	**Protocol:**	US ACE NED RIM (2004)	**Diluent:**	Not Applicable
Ending Date:	07 Mar-16 12:00	**Species:**	Eisenia fetida	**Brine:**	Not Applicable
Duration:	28d 0h	**Source:**	In-House Culture	**Age:**	

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-002; 001	06-5680-7217	25 Jan-16 13:40	28 Jan-16 08:30	13d 22h		
27030-003; 002	20-2659-5103	25 Jan-16 13:55	28 Jan-16 08:30	13d 22h		
27030-004; 003	18-8672-3847	25 Jan-16 14:35	28 Jan-16 08:30	13d 21h		
27030-005; 004	06-0267-7461	25 Jan-16 15:00	28 Jan-16 08:30	13d 21h		
27030-006; 005	20-2169-1561	25 Jan-16 15:00	28 Jan-16 08:30	13d 21h		
27030-007; 006	14-8171-5780	25 Jan-16 15:45	28 Jan-16 08:30	13d 20h		
27030-008; 007	08-6977-0728	25 Jan-16 16:10	28 Jan-16 08:30	13d 20h		
27030-009; 008	04-6767-4860	25 Jan-16 15:40	28 Jan-16 08:30	13d 20h		
27030-014; 009	11-5370-4685	26 Jan-16 14:20	28 Jan-16 08:30	12d 22h		
27030-015; 010	11-7664-1709	26 Jan-16 14:35	28 Jan-16 08:30	12d 21h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-002; 001	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS20; 27030-002		
27030-003; 002	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS21; 27030-003		
27030-004; 003	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS15; 27030-004		
27030-005; 004	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS22; 27030-005		
27030-006; 005	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS18; 27030-006		
27030-007; 006	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS19; 27030-007		
27030-008; 007	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS23; 27030-008		
27030-009; 008	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS24; 27030-009		
27030-014; 009	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS17; 27030-014		
27030-015; 010	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS16; 27030-015		

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	0	0	0.0%	0.0%
27030-002; 001	5	1	1	1	1	1	0	0	0.0%	0.0%
27030-003; 002	5	0.58	0	1	0	1	0.237	0.531	91.6%	42.0%
27030-004; 003	5	0.98	0.924	1	0.9	1	0.02	0.0447	4.56%	2.0%
27030-005; 004	5	0.96	0.892	1	0.9	1	0.0245	0.0548	5.71%	4.0%
27030-006; 005	5	0.72	0.205	1	0	1	0.185	0.415	57.6%	28.0%
27030-007; 006	5	0.4	0	1	0	1	0.245	0.548	137.0%	60.0%
27030-008; 007	5	0.72	0.198	1	0	1	0.188	0.421	58.4%	28.0%
27030-009; 008	5	0.98	0.924	1	0.9	1	0.02	0.0447	4.56%	2.0%
27030-014; 009	5	0.7	0.548	0.852	0.6	0.9	0.0548	0.122	17.5%	30.0%
27030-015; 010	5	0.84	0.568	1	0.6	1	0.098	0.219	26.1%	16.0%

Bioaccumulation Evaluation - Survival Endpoint **EnviroSystems, Inc.**

Proportion Survived Detail

Sample Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
27030-000; 000	1	1	1	1	1			
27030-002; 001	1	1	1	1	1			
27030-003; 002	0.9	0	0	1	1			
27030-004; 003	1	1	0.9	1	1			
27030-005; 004	0.9	0.9	1	1	1			
27030-006; 005	1	0.8	1	0.8	0			
27030-007; 006	1	0	0	1	0			
27030-008; 007	1	0	0.7	1	0.9			
27030-009; 008	0.9	1	1	1	1			
27030-014; 009	0.9	0.7	0.6	0.7	0.6			
27030-015; 010	1	1	0.6	0.6	1			

Bioaccumulation Evaluation - Survival Endpoint — **EnviroSystems, Inc.**

Analysis ID: 03-5990-5547 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:24 **Analysis:** Nonparametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-002; 001	06-5680-7217	25 Jan-16 13:40	28 Jan-16 08:30	13d 22h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-002; 001	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS20; 27030-002		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Angular (Corrected)	NA	C > T	NA	NA	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-002; 001	27.5	NA	1	8	1.0000	Exact	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0	0	1	65500	<0.0001	Significant Effect
Error	0	0	8			
Total	0		9			

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-002; 001	5	1	1	1	1	1	1	0	0.0%	0.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-002; 001	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%

Bioaccumulation Evaluation - Survival Endpoint — **EnviroSystems, Inc.**

Analysis ID: 04-1042-7052 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:24 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-003; 002	20-2659-5103	25 Jan-16 13:55	28 Jan-16 08:30	13d 22h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-003; 002	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS21; 27030-003		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	42.3%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-003; 002	1.81	1.86	0.549	8	0.0541	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	1.63	2.29	0.8244	No Outliers Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.7125921	0.7125921	1	3.27	0.1081	Non-Significant Effect
Error	1.742576	0.2178219	8			
Total	2.455168		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	5.48	13.7	0.0578	Equal Variances
Variances	Levene Equality of Variance	76.4	11.3	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.841	0.741	0.0457	Normal Distribution

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-003; 002	5	0.58	0	1	0.9	0	1	0.237	91.6%	42.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-003; 002	5	0.878	0.0586	1.7	1.25	0.159	1.41	0.295	75.2%	37.8%

Bioaccumulation Evaluation - Survival Endpoint — **EnviroSystems, Inc.**

Analysis ID: 06-8537-7537 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:24 **Analysis:** Nonparametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-004; 003	18-8672-3847	25 Jan-16 14:35	28 Jan-16 08:30	13d 21h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-004; 003	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS15; 27030-004		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Angular (Corrected)	NA	C > T	NA	NA	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-004; 003	20	NA	1	7	1.0000	Exact	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0	0	1	65500	<0.0001	Significant Effect
Error	0	0	7			
Total	0		8			

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-004; 003	4	1	1	1	1	1	1	0	0.0%	0.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-004; 003	4	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%

Bioaccumulation Evaluation - Survival Endpoint — **EnviroSystems, Inc.**

Analysis ID: 18-8692-3276 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:24 **Analysis:** Nonparametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-004; 003	18-8672-3847	25 Jan-16 14:35	28 Jan-16 08:30	13d 21h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-004; 003	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS15; 27030-004		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	4.74%	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-004; 003	25	NA	1	8	0.5000	Exact	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	2.68	2.29	0.0004	Outlier Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.002655933	0.002655933	1	1	0.3466	Non-Significant Effect
Error	0.02124747	0.002655933	8			
Total	0.0239034		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	1	13.7	0.3559	Equal Variances
Variances	Levene Equality of Variance	7.11	11.3	0.0285	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.625	0.741	0.0001	Non-normal Distribution

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-004; 003	5	0.98	0.924	1	1	0.9	1	0.02	4.56%	2.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-004; 003	5	1.38	1.29	1.47	1.41	1.25	1.41	0.0326	5.28%	2.31%

Bioaccumulation Evaluation - Survival Endpoint — **EnviroSystems, Inc.**

Analysis ID: 18-1664-4099 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:25 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-005; 004	06-0267-7461	25 Jan-16 15:00	28 Jan-16 08:30	13d 21h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-005; 004	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS22; 27030-005		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	5.33%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-005; 004	1.63	1.86	0.074	8	0.0706	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	1.64	2.29	0.8052	No Outliers Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.01062373	0.01062373	1	2.67	0.1411	Non-Significant Effect
Error	0.0318712	0.0039839	8			
Total	0.04249493		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	3	13.7	0.1340	Equal Variances
Variances	Levene Equality of Variance	96	11.3	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.814	0.741	0.0215	Normal Distribution

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-005; 004	5	0.96	0.892	1	1	0.9	1	0.0245	5.71%	4.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-005; 004	5	1.35	1.24	1.46	1.41	1.25	1.41	0.0399	6.63%	4.62%

Bioaccumulation Evaluation - Survival Endpoint — **EnviroSystems, Inc.**

Analysis ID: 15-3399-4068 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:25 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-006; 005	20-2169-1561	25 Jan-16 15:00	28 Jan-16 08:30	13d 21h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-006; 005	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS18; 27030-006		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	9.03%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-006; 005	1.97	1.89	0.146	7	0.0446	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.05163563	0.05163563	1	3.89	0.0892	Non-Significant Effect
Error	0.09294413	0.01327773	7			
Total	0.1445798		8			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Distribution	Shapiro-Wilk W Normality	0.833	0.701	0.0489	Normal Distribution

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-006; 005	4	0.9	0.716	1	0.9	0.8	1	0.0577	12.8%	10.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-006; 005	4	1.26	0.98	1.54	1.26	1.11	1.41	0.088	14.0%	10.8%

Bioaccumulation Evaluation - Survival Endpoint — **EnviroSystems, Inc.**

Analysis ID: 03-1489-7986 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:25 **Analysis:** Nonparametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-006; 005	20-2169-1561	25 Jan-16 15:00	28 Jan-16 08:30	13d 21h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-006; 005	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS18; 27030-006		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	30.7%	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-006; 005	20	NA	1	8	0.0833	Exact	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	2.56	2.29	0.0038	Outlier Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.347066	0.347066	1	2.61	0.1446	Non-Significant Effect
Error	1.062356	0.1327946	8			
Total	1.409422		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	3.81	13.7	0.0989	Equal Variances
Variances	Levene Equality of Variance	5.62	11.3	0.0453	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.703	0.741	0.0010	Non-normal Distribution

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-006; 005	5	0.72	0.205	1	0.8	0	1	0.185	57.6%	28.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-006; 005	5	1.04	0.4	1.68	1.11	0.159	1.41	0.23	49.6%	26.4%

Bioaccumulation Evaluation - Survival Endpoint — **EnviroSystems, Inc.**

Analysis ID: 01-2130-7621 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:25 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-007; 006	14-8171-5780	25 Jan-16 15:45	28 Jan-16 08:30	13d 20h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-007; 006	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS19; 27030-007		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	44.4%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-007; 006	2.45	1.86	0.571	8	0.0200	CDF	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	1.64	2.29	0.8052	No Outliers Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.41354	1.41354	1	6	0.0400	Significant Effect
Error	1.88472	0.23559	8			
Total	3.29826		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	3	13.7	0.1340	Equal Variances
Variances	Levene Equality of Variance	96	11.3	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.814	0.741	0.0215	Normal Distribution

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-007; 006	5	0.4	0	1	0	0	1	0.245	137.0%	60.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-007; 006	5	0.66	-0.192	1.51	0.159	0.159	1.41	0.307	104.0%	53.3%

Bioaccumulation Evaluation - Survival Endpoint **EnviroSystems, Inc.**

Analysis ID: 18-8596-7511 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:25 **Analysis:** Nonparametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-008; 007	08-6977-0728	25 Jan-16 16:10	28 Jan-16 08:30	13d 20h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-008; 007	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS23; 27030-008		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	10.1%	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-008; 007	15	NA	1	7	<0.0001	Exact	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.04734129	0.04734129	1	2.8	0.1383	Non-Significant Effect
Error	0.1184677	0.01692396	7			
Total	0.165809		8			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	5.13	13.7	0.0642	Equal Variances
Variances	Levene Equality of Variance	9.97	12.2	0.0160	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.763	0.701	0.0076	Non-normal Distribution

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-008; 007	4	0.9	0.675	1	0.95	0.7	1	0.0707	15.7%	10.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-008; 007	4	1.27	0.95	1.58	1.33	0.991	1.41	0.0994	15.7%	10.3%

Bioaccumulation Evaluation - Survival Endpoint — **EnviroSystems, Inc.**

Analysis ID: 21-1752-9847 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:25 **Analysis:** Nonparametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-008; 007	08-6977-0728	25 Jan-16 16:10	28 Jan-16 08:30	13d 20h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-008; 007	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS23; 27030-008		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	31.4%	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-008; 007	20	NA	1	8	0.0833	Exact	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	2.53	2.29	0.0055	Outlier Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.3374811	0.3374811	1	2.46	0.1557	Non-Significant Effect
Error	1.09932	0.137415	8			
Total	1.436801		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	3.46	13.7	0.1122	Equal Variances
Variances	Levene Equality of Variance	7.17	11.3	0.0280	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.739	0.741	0.0026	Non-normal Distribution

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-008; 007	5	0.72	0.198	1	0.9	0	1	0.188	58.4%	28.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-008; 007	5	1.04	0.394	1.7	1.25	0.159	1.41	0.234	50.2%	26.0%

Bioaccumulation Evaluation - Survival Endpoint — **EnviroSystems, Inc.**

Analysis ID: 14-1591-1878 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:25 **Analysis:** Nonparametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-009; 008	04-6767-4860	25 Jan-16 15:40	28 Jan-16 08:30	13d 20h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-009; 008	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS24; 27030-009		

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Angular (Corrected)	NA	C > T	NA	NA	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-009; 008	20	NA	1	7	1.0000	Exact	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0	0	1	65500	<0.0001	Significant Effect
Error	0	0	7			
Total	0		8			

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-009; 008	4	1	1	1	1	1	1	0	0.0%	0.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-009; 008	4	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%

Bioaccumulation Evaluation - Survival Endpoint — **EnviroSystems, Inc.**

Analysis ID: 15-3847-9989 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:25 **Analysis:** Nonparametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-009; 008	04-6767-4860	25 Jan-16 15:40	28 Jan-16 08:30	13d 20h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-009; 008	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS24; 27030-009		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	4.74%	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-009; 008	25	NA	1	8	0.5000	Exact	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	2.68	2.29	0.0004	Outlier Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.002655933	0.002655933	1	1	0.3466	Non-Significant Effect
Error	0.02124747	0.002655933	8			
Total	0.0239034		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	1	13.7	0.3559	Equal Variances
Variances	Levene Equality of Variance	7.11	11.3	0.0285	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.625	0.741	0.0001	Non-normal Distribution

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-009; 008	5	0.98	0.924	1	1	0.9	1	0.02	4.56%	2.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-009; 008	5	1.38	1.29	1.47	1.41	1.25	1.41	0.0326	5.28%	2.31%

Bioaccumulation Evaluation - Survival Endpoint — **EnviroSystems, Inc.**

Analysis ID: 13-0784-3614 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:26 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-014; 009	11-5370-4685	26 Jan-16 14:20	28 Jan-16 08:30	12d 22h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-014; 009	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS17; 27030-014		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	5.2%	

Unequal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-014; 009	15.6	2.35	0.071	3	0.0003	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.4980152	0.4980152	1	316	<0.0001	Significant Effect
Error	0.01104169	0.001577385	7			
Total	0.5090569		8			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	1.91E+16	13.7	<0.0001	Unequal Variances
Variances	Levene Equality of Variance	2.48E+16	12.2	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.833	0.701	0.0489	Normal Distribution

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-014; 009	4	0.65	0.558	0.742	0.65	0.6	0.7	0.0289	8.88%	35.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-014; 009	4	0.939	0.842	1.04	0.939	0.886	0.991	0.0303	6.46%	33.5%

Bioaccumulation Evaluation - Survival Endpoint — **EnviroSystems, Inc.**

Analysis ID: 11-0977-0038 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:26 **Analysis:** Nonparametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-014; 009	11-5370-4685	26 Jan-16 14:20	28 Jan-16 08:30	12d 22h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-014; 009	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS17; 27030-014		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	7.76%	

Wilcoxon Rank Sum Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-014; 009	15	NA	0	8	0.0040	Exact	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	2.51	2.29	0.0074	Outlier Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.4229469	0.4229469	1	38.4	0.0003	Significant Effect
Error	0.08813459	0.01101682	8			
Total	0.5110815		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	4.86	13.7	0.0697	Equal Variances
Variances	Levene Equality of Variance	5.09	11.3	0.0541	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.704	0.741	0.0010	Non-normal Distribution

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-014; 009	5	0.7	0.548	0.852	0.7	0.6	0.9	0.0548	17.5%	30.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-014; 009	5	1	0.816	1.19	0.991	0.886	1.25	0.0664	14.8%	29.1%

Bioaccumulation Evaluation - Survival Endpoint — **EnviroSystems, Inc.**

Analysis ID: 02-0789-5029 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 09 Mar-16 9:26 **Analysis:** Parametric-Two Sample **Official Results:** Yes

Sample Code	Sample ID	Sample Date	Receive Date	Sample Age	Client Name	Project
27030-000; 000	07-3046-2427	02 Feb-16 12:00	02 Feb-16 12:00	6d 0h	Ecology and Environment, In	Ecological Risk Asse
27030-015; 010	11-7664-1709	26 Jan-16 14:35	28 Jan-16 08:30	12d 21h		

Sample Code	Material Type	Sample Source	Station Location	Latitude	Longitude
27030-000; 000	Laboratory Control S	Eighteen Mile Creek, Lockport, N	Laboratory Control Soil		
27030-015; 010	Soil	Eighteen Mile Creek, Lockport, N	OU2-SS16; 27030-015		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	15.0%	

Equal Variance t Two-Sample Test

Sample Code	vs	Sample Code	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
27030-000; 000		27030-015; 010	1.63	1.86	0.24	8	0.0706	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	1.64	2.29	0.8052	No Outliers Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1106447	0.1106447	1	2.67	0.1411	Non-Significant Effect
Error	0.3319342	0.04149177	8			
Total	0.4425789		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	3	13.7	0.1340	Equal Variances
Variances	Levene Equality of Variance	96	11.3	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.814	0.741	0.0215	Normal Distribution

Proportion Survived Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1	1	1	1	1	1	0	0.0%	0.0%
27030-015; 010	5	0.84	0.568	1	1	0.6	1	0.098	26.1%	16.0%

Angular (Corrected) Transformed Summary

Sample Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
27030-000; 000	5	1.41	1.41	1.41	1.41	1.41	1.41	0	0.0%	0.0%
27030-015; 010	5	1.2	0.844	1.56	1.41	0.886	1.41	0.129	24.0%	14.9%

Soil pH Measurement Record

Study: 27030

Client: Ecology and Enviroment, Inc

Project: Eighteen Mile Creek

Batch #: 1

Field ID	ESI Code	Grams of Soil	mL's of Milli-Q	pH (SU
LAB	27030-000; 000	20.0	20	5.58
OU2-SS20	27030-002; 001	20.0		6.19
OU2-SS21	27030-003; 002	20.7		7.71
OU2-SS15	27030-004; 003	20.7		7.64
OU2-SS22	27030-005; 004	19.7		8.04
OU2-SS18	27030-006; 005	20.4		5.71
OU2-SS19	27030-007; 006	19.6		7.87
OU2-SS23	27030-008; 007	20.1		7.83
OU2-SS24	27030-009; 008	20.3		6.75
OU2-SS17	27030-014; 009	19.7		7.32
OU2-SS16	27030-015; 010	19.8	↓	7.74

Recorded by:	**BP**
Date:	**03/07/16**
pH Meter ID:	1097

Notes:

Duplicate for Sample 27030-015;010 - pH 7.74

P:\General Projects\RPT-Active\ERA 27030 E&E 18 Mile Creek\Soil pH Measurement sheet.wpd

STUDY: 27030
CLIENT: Ecology & Environment, Inc.
PROJECT: 18 Mile Creek Toxicity Ecological Risk Evaluation
ASSAY: *Eisenia fetida* Bioaccumulation Evaluation
TASK: Loss on Ignition Summary
METHOD: SM4500 5310 Ed. 22

ESI Code	Field ID	Sample Number	Matrix	Result	QLimit	Units	Sampled	Analyzed
27030-000	Schoodic Blend Compost	000	Solid	64	0.5	%	02/04/16 1250	02/06/16 0820
27030-002	OU2-SS20	001	Solid	30	0.5	%	01/25/16 1340	02/06/16 0820
27030-003	OU2-SS21	002	Solid	17	0.5	%	01/25/16 1355	02/06/16 0820
27030-004	OU2-SS15	003	Solid	20	0.5	%	01/25/16 1435	02/06/16 0820
27030-005	OU2-SS22	004	Solid	16	0.5	%	01/25/16 1500	02/06/16 0820
27030-006	OU2-SS18	005	Solid	23	0.5	%	01/25/16 1500	02/06/16 0820
27030-007	OU2-SS19	006	Solid	20	0.5	%	01/25/16 1545	02/06/16 0820
27030-008	OU2-SS23	007	Solid	33	0.5	%	01/25/16 1610	02/06/16 0820
27030-009	OU2-SS24	008	Solid	29	0.5	%	01/25/16 1540	02/06/16 0820
27030-014	OU2-SS17	009	Solid	40	0.5	%	01/26/16 1420	02/06/16 0820
27030-015	OU2-SS16	010	Solid	23	0.5	%	01/26/16 1435	02/06/16 0820

Test Sample Preparation Notes

Study: 27030

Client: Ecology and Environment, Inc.

Project: Eighteen Mile Creek

Field ID	Receipt Number	Sample Number	Date Time Initials	Sample aliquots were sieved, combined, homogenized and sub-sampled for chemical analysis. (TOC, Metals, PAHs, Pesticides, Aroclors)
OU2-SS15	27030-004	003	01/29/16 BG	(Sub-sampled for MS/MSD) Start Sieve @ 1248, end sieve @ 1358. 4mm sieve used to sieve 4 total gallons. Excluded 2/3 gallon of rocks and some roots.
OU2-SS16	27030-015	010	01/29/16 JTP	Start sieve @ 1020, End Sieve @ 1110. 4 mm sieve used 3 gallons total, 1 gallon excluded, small sticks, lots of rocks.
OU2-SS17	27030-014	009 **	01/29/16 JTP	Start Sieve @ 1250, End Sieve @ 1400. 4mm Sieve used 3 gallon buckets ≈ 3/4 full AT START. ≈ 2 1/4 - 2 1/2 total Sieved, ≈ 1 gallon excluded
OU2-SS18 *	27030-006	005	01/29/16 BG	Start Sieve @ 1142, end sieve @ 1237. 4mm sieve size for 3 gallons. Excluded 1.5 gallons of roots and rocks.
OU2-SS19 B	27030-007	006	02/02/16 EB	Start sieve @ 09:20, ended @ 094. 4mm sieve for 4 gallons ≈ 2 gallons of rocks excluded
			↓	(Sub-sampled for duplicate analysis as "OU2-SS25")
OU2-SS20	27030-002	001	02/01/16 JTP	Start Sieve @ 1245, End Sieve @ 1325. 4 mm Sieve used. 3 gallons at Start, 1 1/4 gallon excluded. Large rocks, roots, sticks, leaves.
OU2-SS21 A	27030-003	002	01/29/16 JTP	Start Sieve @ 1423, End Sieve @ 1540. 4mm Sieve used ≈ 2/3 full (3) gallon buckets at start, ≈ 1 gallon recovered and 1/2 gallon excluded. Rocks, sticks
OU2-SS22	27030-005	004	02/01/16 JTP	Start Sieve @ 1430, End Sieve @ 1530. 4 MM Sieve used ≈ 1 gallon excluded. Sticks, rocks, fiberous material
OU2-SS23	27030-008	(E10) 007 JTP 01/29/16	01/29/16 BG	Start sieve @ 1453, end sieve @ 1611. 4mm sieve used to sieve 3 gallons. 1 gallon plus 200mL excluded of rocks, glass, and roots.
OU2-SS24	27030-009	(E10) 008	01/29/16 JTP	Start Sieve @ 1135, End Sieve @ 1230. 4MM Sieve used 3 gallons total, ≈ 1 1/2 Liter excluded. Roots & rocks.

* Sample jars for Aroclors and Pesticides not completely full due to limited sample volume. RAM 01/29/16

** lots of glass, rocks, metal and rubber, trash, sticks and roots excluded.

(E10) Sample number 008 and 007 were recorded incorrectly. Notes recorded for 007 reflect Sample 008 and vise versa. 01/29/16 JTP

A - Due to limited Sample volume, all containers were only partially filled. RAM 01/29/16

B - Due to limited Sample volume, the bottles for TOC and metals analysis were only partially filled. 02/02/16 RAM

Test Sample Preparation Notes

Study: 27030

Client: Ecology and Environment, Inc.

Project: Eighteen Mile Creek

Field ID	Receipt Number	Sample Number	Date Time Initials	Sample aliquots were sieved, combined, homogenized and sub-sampled for chemical analysis. (TOC, Metals, PAHs, Pesticides, Aroclors)
27030-001	OU2-SED04	001	02/01/16 BP	(Sub-sampled for duplicate analysis as "OU2-SED11") Sieved 12:32 → 1329 1cm sieve, 1 gallon excluded sticks, rocks
			↓	↓
27030-010	OU2-SED05	002	02/02/16 BP	(Sub-sampled for MS/MSD) Sieved 1cm 1132 - 1229 (E3) BP 02/02 1 Gallon excluded rocks & vegetative matter
27030-011	OU2-SED06	003	02/02/16 BP	Sieved 1cm 0932 → 1048 2 gallon excluded. sticks, leaves, rocks, Trash (Glass & wrappers)
27030-012	OU2-SED07	004	02/02/16 BP	Sieved 1cm 1342 - 1426 2.5 gallon excluded sticks, rocks pieces of plastic & fabric
27030-016	OU2-SED08	006	1/29/16 DD	Start sieve @ 12:19pm. End sieve at 2:50pm. 1cm sieve used. Approximately 10 gallons to start and about 8 gallons collected. Excluded sticks, bark, isopods, rocks
27030-013	OU2-SED09	005	02/01/16 BP	Sieved 1cm sieve 1432 → 1515 Dark colored, high moisture 1 1/2 gallon excluded Sticks, leaves, rocks shells

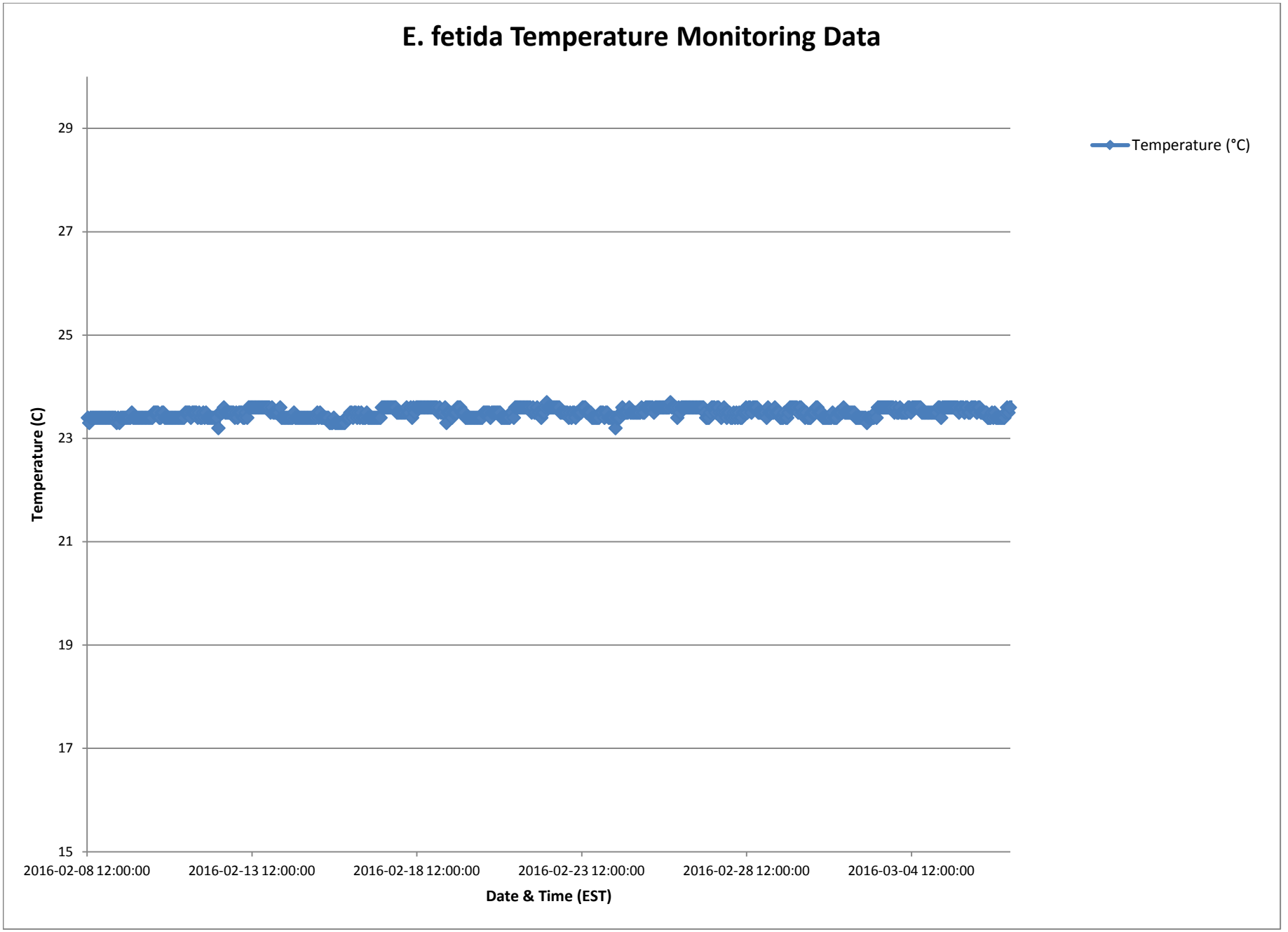
Additional Test Sample Preparation Notes

Study: 27030

Client: Ecology and Environment, Inc.

Project: Eighteen Mile Creek

Field ID	Receipt Number	Sample Number	Date/Time/Initials/Notes
OU2-SS15	27030-004	003	Dried from 0950 02/03/16 - 1020 02/04/16. Completely consumed. JTP
OU2-SS16	27030-015	010	Dried from 1040 02/03/16 - 0850 02/04/16. Some sample remains. JTP
OU2-SS17	27030-014	009	Dried from 1045 02/03/16 - 0840 02/04/16. Completely consumed. JTP
OU2-SS18	27030-006	005	Dried from 1120 02/03/16 - 1130 02/04/16. Completely consumed. JTP
OU2-SS19	27030-007	006	Dried from 1005 02/03/16 - 1040 02/04/16. Some sample remains. JTP
OU2-SS20	27030-002	001	Dried from 1050 02/03/16 - 1110 02/04/16. Completely consumed. JTP
OU2-SS21	27030-003	002	Dried from 0930 02/03/16 - 0915 02/04/16. Some sample remains. JTP
OU2-SS22	27030-005	004	Dried from 1000 02/03/16 - 1000 02/04/16. Some sample remains. JTP
OU2-SS23	27030-008	007	Dried from 1020 02/03/16 - 1055 02/04/16. Some sample remains. JTP
OU2-SS24	27030-009	008	Dried from 1115 02/03/16 - 0905 02/04/16. Some sample remains. JTP


E. fetida Temperature Monitoring Data
Temperature (°C)
Temperature (C)
29
27
25
23
21
19
17
15
2016-02-08 12:00:00
2016-02-13 12:00:00
2016-02-18 12:00:00
2016-02-23 12:00:00
2016-02-28 12:00:00
2016-03-04 12:00:00
Date & Time (EST)

Report Name:	MicroPoint1 Statistics
Report Date:	Mar 30, 2016 01:45:33 PM EDT
File Name:	
Title:	Untitled Dataset
Device:	MicroPoint1 - Temperature Recorder
Hardware Revision:	REV2 (64K)
Serial Number:	N07126
Device ID:	Temp
Data Start Date:	Feb 08, 2016 12:34:21 PM EST
Data End Date:	Mar 07, 2016 11:34:21 AM EST
Reading Rate:	1 Hour
Readings:	6 to 677 of 1229
Last Calibration Date:	Oct 21, 2015
Next Calibration Date:	Oct 21, 2016

Channel 1 - Temperature

Minimum	.....	23.2 °C
Maximum	.....	23.7 °C
Average	.....	23.49003 °C
Standard Deviation	.....	0.08754985 °C
Mean Kinetic Temperature	.....	23.49044 °C

Device Name:	**MicroPoint1**
Device Description:	**Temperature Recorder**
Serial Number:	**N07126**
Device ID:	**Temp**

Reading Number	Date and Time (EST)	Channel 1 Temperature (°C)
1	2016-02-08 12:34:21	23.4
2	2016-02-08 13:34:21	23.3
3	2016-02-08 14:34:21	23.4
4	2016-02-08 15:34:21	23.4
5	2016-02-08 16:34:21	23.4
6	2016-02-08 17:34:21	23.4
7	2016-02-08 18:34:21	23.4
8	2016-02-08 19:34:21	23.4
9	2016-02-08 20:34:21	23.4
10	2016-02-08 21:34:21	23.4
11	2016-02-08 22:34:21	23.4
12	2016-02-08 23:34:21	23.4
13	2016-02-09 00:34:21	23.4
14	2016-02-09 01:34:21	23.4
15	2016-02-09 02:34:21	23.4
16	2016-02-09 03:34:21	23.4
17	2016-02-09 04:34:21	23.4
18	2016-02-09 05:34:21	23.4
19	2016-02-09 06:34:21	23.4
20	2016-02-09 07:34:21	23.4
21	2016-02-09 08:34:21	23.4
22	2016-02-09 09:34:21	23.3
23	2016-02-09 10:34:21	23.4
24	2016-02-09 11:34:21	23.3
25	2016-02-09 12:34:21	23.4
26	2016-02-09 13:34:21	23.4
27	2016-02-09 14:34:21	23.4
28	2016-02-09 15:34:21	23.4
29	2016-02-09 16:34:21	23.4
30	2016-02-09 17:34:21	23.4
31	2016-02-09 18:34:21	23.4
32	2016-02-09 19:34:21	23.4
33	2016-02-09 20:34:21	23.5
34	2016-02-09 21:34:21	23.4
35	2016-02-09 22:34:21	23.4
36	2016-02-09 23:34:21	23.4
37	2016-02-10 00:34:21	23.4
38	2016-02-10 01:34:21	23.4
39	2016-02-10 02:34:21	23.4

40	2016-02-10 03:34:21	23.4
41	2016-02-10 04:34:21	23.4
42	2016-02-10 05:34:21	23.4
43	2016-02-10 06:34:21	23.4
44	2016-02-10 07:34:21	23.4
45	2016-02-10 08:34:21	23.4
46	2016-02-10 09:34:21	23.4
47	2016-02-10 10:34:21	23.4
48	2016-02-10 11:34:21	23.4
49	2016-02-10 12:34:21	23.5
50	2016-02-10 13:34:21	23.5
51	2016-02-10 14:34:21	23.5
52	2016-02-10 15:34:21	23.5
53	2016-02-10 16:34:21	23.4
54	2016-02-10 17:34:21	23.4
55	2016-02-10 18:34:21	23.5
56	2016-02-10 19:34:21	23.5
57	2016-02-10 20:34:21	23.4
58	2016-02-10 21:34:21	23.4
59	2016-02-10 22:34:21	23.4
60	2016-02-10 23:34:21	23.4
61	2016-02-11 00:34:21	23.4
62	2016-02-11 01:34:21	23.4
63	2016-02-11 02:34:21	23.4
64	2016-02-11 03:34:21	23.4
65	2016-02-11 04:34:21	23.4
66	2016-02-11 05:34:21	23.4
67	2016-02-11 06:34:21	23.4
68	2016-02-11 07:34:21	23.4
69	2016-02-11 08:34:21	23.4
70	2016-02-11 09:34:21	23.4
71	2016-02-11 10:34:21	23.4
72	2016-02-11 11:34:21	23.5
73	2016-02-11 12:34:21	23.5
74	2016-02-11 13:34:21	23.5
75	2016-02-11 14:34:21	23.5
76	2016-02-11 15:34:21	23.4
77	2016-02-11 16:34:21	23.5
78	2016-02-11 17:34:21	23.5
79	2016-02-11 18:34:21	23.5
80	2016-02-11 19:34:21	23.5
81	2016-02-11 20:34:21	23.4
82	2016-02-11 21:34:21	23.5
83	2016-02-11 22:34:21	23.4
84	2016-02-11 23:34:21	23.4
85	2016-02-12 00:34:21	23.5
86	2016-02-12 01:34:21	23.4

87	2016-02-12 02:34:21	23.5
88	2016-02-12 03:34:21	23.4
89	2016-02-12 04:34:21	23.4
90	2016-02-12 05:34:21	23.4
91	2016-02-12 06:34:21	23.4
92	2016-02-12 07:34:21	23.4
93	2016-02-12 08:34:21	23.4
94	2016-02-12 09:34:21	23.4
95	2016-02-12 10:34:21	23.4
96	2016-02-12 11:34:21	23.2
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547	2016-03-02 06:34:21	23.5
548	2016-03-02 07:34:21	23.5
549	2016-03-02 08:34:21	23.5
550	2016-03-02 09:34:21	23.5
551	2016-03-02 10:34:21	23.6
552	2016-03-02 11:34:21	23.5
553	2016-03-02 12:34:21	23.5
554	2016-03-02 13:34:21	23.5
555	2016-03-02 14:34:21	23.5
556	2016-03-02 15:34:21	23.5

557	2016-03-02 16:34:21	23.5
558	2016-03-02 17:34:21	23.5
559	2016-03-02 18:34:21	23.5
560	2016-03-02 19:34:21	23.4
561	2016-03-02 20:34:21	23.4
562	2016-03-02 21:34:21	23.4
563	2016-03-02 22:34:21	23.4
564	2016-03-02 23:34:21	23.4
565	2016-03-03 00:34:21	23.4
566	2016-03-03 01:34:21	23.4
567	2016-03-03 02:34:21	23.4
568	2016-03-03 03:34:21	23.3
569	2016-03-03 04:34:21	23.4
570	2016-03-03 05:34:21	23.4
571	2016-03-03 06:34:21	23.4
572	2016-03-03 07:34:21	23.4
573	2016-03-03 08:34:21	23.4
574	2016-03-03 09:34:21	23.5
575	2016-03-03 10:34:21	23.4
576	2016-03-03 11:34:21	23.6
577	2016-03-03 12:34:21	23.6
578	2016-03-03 13:34:21	23.6
579	2016-03-03 14:34:21	23.6
580	2016-03-03 15:34:21	23.6
581	2016-03-03 16:34:21	23.6
582	2016-03-03 17:34:21	23.6
583	2016-03-03 18:34:21	23.6
584	2016-03-03 19:34:21	23.6
585	2016-03-03 20:34:21	23.6
586	2016-03-03 21:34:21	23.6
587	2016-03-03 22:34:21	23.6
588	2016-03-03 23:34:21	23.5
589	2016-03-04 00:34:21	23.6
590	2016-03-04 01:34:21	23.5
591	2016-03-04 02:34:21	23.5
592	2016-03-04 03:34:21	23.6
593	2016-03-04 04:34:21	23.5
594	2016-03-04 05:34:21	23.5
595	2016-03-04 06:34:21	23.5
596	2016-03-04 07:34:21	23.5
597	2016-03-04 08:34:21	23.5
598	2016-03-04 09:34:21	23.6
599	2016-03-04 10:34:21	23.6
600	2016-03-04 11:34:21	23.5
601	2016-03-04 12:34:21	23.6
602	2016-03-04 13:34:21	23.6
603	2016-03-04 14:34:21	23.6

604	2016-03-04 15:34:21	23.6
605	2016-03-04 16:34:21	23.6
606	2016-03-04 17:34:21	23.6
607	2016-03-04 18:34:21	23.6
608	2016-03-04 19:34:21	23.5
609	2016-03-04 20:34:21	23.5
610	2016-03-04 21:34:21	23.5
611	2016-03-04 22:34:21	23.5
612	2016-03-04 23:34:21	23.5
613	2016-03-05 00:34:21	23.5
614	2016-03-05 01:34:21	23.5
615	2016-03-05 02:34:21	23.5
616	2016-03-05 03:34:21	23.5
617	2016-03-05 04:34:21	23.5
618	2016-03-05 05:34:21	23.5
619	2016-03-05 06:34:21	23.5
620	2016-03-05 07:34:21	23.6
621	2016-03-05 08:34:21	23.6
622	2016-03-05 09:34:21	23.4
623	2016-03-05 10:34:21	23.6
624	2016-03-05 11:34:21	23.6
625	2016-03-05 12:34:21	23.6
626	2016-03-05 13:34:21	23.6
627	2016-03-05 14:34:21	23.6
628	2016-03-05 15:34:21	23.6
629	2016-03-05 16:34:21	23.6
630	2016-03-05 17:34:21	23.6
631	2016-03-05 18:34:21	23.6
632	2016-03-05 19:34:21	23.6
633	2016-03-05 20:34:21	23.6
634	2016-03-05 21:34:21	23.6
635	2016-03-05 22:34:21	23.5
636	2016-03-05 23:34:21	23.6
637	2016-03-06 00:34:21	23.6
638	2016-03-06 01:34:21	23.6
639	2016-03-06 02:34:21	23.5
640	2016-03-06 03:34:21	23.6
641	2016-03-06 04:34:21	23.6
642	2016-03-06 05:34:21	23.5
643	2016-03-06 06:34:21	23.5
644	2016-03-06 07:34:21	23.6
645	2016-03-06 08:34:21	23.6
646	2016-03-06 09:34:21	23.6
647	2016-03-06 10:34:21	23.6
648	2016-03-06 11:34:21	23.5
649	2016-03-06 12:34:21	23.6
650	2016-03-06 13:34:21	23.6

651	2016-03-06 14:34:21	23.5
652	2016-03-06 15:34:21	23.5
653	2016-03-06 16:34:21	23.5
654	2016-03-06 17:34:21	23.5
655	2016-03-06 18:34:21	23.5
656	2016-03-06 19:34:21	23.4
657	2016-03-06 20:34:21	23.4
658	2016-03-06 21:34:21	23.4
659	2016-03-06 22:34:21	23.5
660	2016-03-06 23:34:21	23.4
661	2016-03-07 00:34:21	23.5
662	2016-03-07 01:34:21	23.4
663	2016-03-07 02:34:21	23.4
664	2016-03-07 03:34:21	23.4
665	2016-03-07 04:34:21	23.4
666	2016-03-07 05:34:21	23.4
667	2016-03-07 06:34:21	23.4
668	2016-03-07 07:34:21	23.4
669	2016-03-07 08:34:21	23.5
670	2016-03-07 09:34:21	23.6
671	2016-03-07 10:34:21	23.5
672	2016-03-07 11:34:21	23.6
673	2016-03-07 12:34:21	23.7

SAMPLE RECEIPT AND CONDITION DOCUMENTATION

STUDY NO:	27030		
SDG No:			
Project:	Eighteen Mile Creek Soil and Sediment Toxicity Investigation		
Delivered via:	**ESI**		
Date and Time Received:	01/28/16 0830	Date and TIme Logged into Lab:	01/29/16 0830
Received By:	DW	Logged into Lab by:	RAM
Air bill / Way bill:	No	Air bill included in folder if received?	NA
Cooler on ice/packs:	Yes	Custody Seals present?	NA
Cooler Blank Temp (C) at arrival:	NA	Custody Seals intact?	NA
Number of COC Pages:	2		
COC Serial Number(s):			
COC Complete:	Yes	Does the info on the COC match the samples?	Yes
Sampled Date:	Yes	Were samples received within holding time?	Yes
Field ID complete:	Yes	Were all samples properly labeled?	Yes
Sampled Time:	Yes	Were proper sample containers used?	Yes
Analysis request:	Yes	Were samples received intact? (none broken or leaking)	Yes
COC Signed and dated:	Yes	Were sample volumes sufficient for requested analysis?	Yes
Were all samples received?	Yes	Were VOC vials free of headspace?	NA
Client notification/authorization:	Not required	pH Test strip ID number:	NA

Field ID	Lab ID	Mx	Analysis Requested	Bottle	Req'd Pres'n	Verified Pres'n
OU2-SED04	27030-001	S	Subsample: Chems; Lv28D	2x5 gallon	4C	
OU2-SS20	27030-002	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SS21	27030-003	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SS15	27030-004	S	Subsample: Chems; Ef28D	4x1 gallon	4C	
OU2-SS22	27030-005	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SS18	27030-006	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SS19	27030-007	S	Subsample: Chems; Ef28D	4x1 gallon	4C	
OU2-SS23	27030-008	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SS24	27030-009	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SED05	27030-010	S	Subsample: Chems; Lv28D	2x5 gallon	4C	
OU2-SED06	27030-011	S	Subsample: Chems; Lv28D	2x5 gallon	4C	
OU2-SED07	27030-012	S	Subsample: Chems; Lv28D	2x5 gallon	4C	
OU2-SED09	27030-013	S	Subsample: Chems; Lv28D	2x5 gallon	4C	
OU2-SS17	27030-014	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SS16	27030-015	S	Subsample: Chems; Ef28D	3x1 gallon	4C	
OU2-SED08	27030-016	S	Subsample: Chems; Lv28D	2x5 gallon	4C	

Notes and qualifications:

see project specific documents

ESI
EnviroSystems, Inc.
1 Lafayette Road
P.O. Box 778
Hampton, N.H. 03843
Voice: 603-926-3345
FAX: 603-926-3521

ESI Job No: 4575 27030

CHAIN OF CUSTODY DOCUMENTATION

Client: Ecology & Environment	Contact: Renee McIsaac (ESI)	Project Name: Eighteenmile Creek	Page 1 of 2
Report to: Lynne Parker	Address: 368 Pleasant View Dr	Project Number:	
Invoice to:	Address: Lancaster, NY 14086	Project Manager:	
Voice: 716.684.8060	Fax:	email: lparker@ene.com	P.O. No: Quote No:

Protocol: RCRA SDWA NPDES USCOE Other

Lab Number (assigned by lab)	Your Field ID: (must agree with container)	Date Sampled	Time Sampled	Sampled By	Grab or com-posit (G/C)	Container Size (ml.)	Container Type (P/G/T)	Field Preser-vation	Matrix S=Solid W=Water	Filter N=Not needed F=Done in field L=Lab to do	Analyses Requested\ Special Instructions:
-001	OU2-SED04	1/25/16	1030	JZ		2-5gal			Sed		EPA Method 100.3 Lumbriculus variegatus
-002	OU2-SS20	1/25/16	1340	JZ		3-1gal			Soil		ASTM E1676-12 Eisenia fetida
-003	OU2-SS21	1/25/16	1355	SC		3-1gal			Soil		
-004	OU2-SS15	1/25/16	1435	SC		4-1gal			Soil		
-005	OU2-SS22	1/25/16	1500	SC		3-1gal			Soil		
-006	OU2-SS18	1/25/16	1500	JZ		3-1gal			Soil		
-007	OU2-SS19	1/25/16	1545	JZ		4-1gal			Soil		
-008	OU2-SS23	1/25/16	1610	SC		3-1gal			Soil		
-009	OU2-SS24	1/25/16	1540	SC		3-1gal			Soil		
-010	OU2-SED05	1/26/16	0900	JZ		2-5gal			Sed		EPA 100.3
-011	OU2-SED06	1/26/16	1315	JZ		2-5gal			Sed		
-012	OU2-SED07	1/26/16	1415	JZ		2-5gal			Sed		

Relinquished By: Lynne Parker Date: 1/28/16 Time: 0830
Received By: Date: 1-28-16 Time: 0830

Relinquished By: Date: Time:
Received at Lab By: Date: Time:

Comments:

COC Doc No:

Sample Delivery Group No: Page of

ESI
EnviroSystems, Inc.
1 Lafayette Road
P.O. Box 778
Hampton, N.H. 03843
Voice: 603-926-3345
FAX: 603-926-3521

ESI Job No: 4576 27030

CHAIN OF CUSTODY DOCUMENTATION

Client: Ecology & Environment	Contact: Renee McIsaac (ESI)	Project Name: Eighteenmile Creek	Page 2 of 2
Report to: Lynne Parker	Address: 368 Pleasant View Dr.	Project Number:	
Invoice to:	Address: Lancaster, NY 14086	Project Manager:	
Voice: 716-684-8060	Fax:	email: lparker@ene.com	P.O. No: Quote No:

Protocol: RCRA SDWA NPDES USCOE Other

Lab Number (assigned by lab)	Your Field ID: (must agree with container)	Date Sampled	Time Sampled	Sampled By	Grab or composit (G/C)	Container Size (ml.)	Container Type (P/G/T)	Field Preservation	Matrix S=Solid W=Water	Filter N=Not needed F=Done in field L=Lab to do	Analyses Requested\ Special Instructions:
-013	OU2-SED09	1/26/16	~~1405~~ 1605 LP 1/26/16	JZ		2-5gal			Sed		EPA 100.3
-014	OU2-SS17	1/26/16	1420	SC		3-1gal			Soil		ASTM E1676-12
-015	OU2-SS16	1/26/16	1435	SC		3-1gal			Soil		↓
-016	OU2-SED08	1/26/16	~~1310~~ 1510 LP 1/24/16	JZ		2-5gal			Sed		EPA 100.3

LP 1/28/16

Relinquished By: Lynne Parker	Date: 1/28/16 Time: 0830	Received By: [signature]	Date: 1-28-16 Time: 0830
Relinquished By:	Date: Time:	Received at Lab By:	Date: Time:

Comments: OU2 - SED 08 buckets still say 1310 for sample time. JTP

COC Doc No:

Sample Delivery Group No: Page of

USEPA CLP COC (REGION COPY)

DateShipped:
CarrierName: FedEx
AirbillNo: 871820153196

CHAIN OF CUSTODY RECORD

Eighteenmile Creek Phase 3/NY
Case #: 45921
Cooler #: 2

No: 2-012716-131809-0005

Lab: Chemtech Consulting Group
Lab Contact: Divya Mehta
Lab Phone: 908-789-8900

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
A269-0037	BBG01	Sediment/ Justin Zoladz	Composite	PAH(21), PEST(21), ARO(21)	1038 (None), 1040 (None), 1041 (None) (3)	OU2-SED04	01/25/2016 10:30	Field Sample
A269-0038	BBG02	Sediment/ Justin Zoladz	Composite	ARO(21), PEST(21), PAH(21)	1042 (None), 1043 (None), 1044 (None) (6)	OU2-SED05	01/26/2016 09:00	Field Sample
A269-0039	BBG03	Sediment/ Justin Zoladz	Composite	PAH(21), PEST(21), ARO(21)	1046 (None), 1048 (None), 1049 (None) (3)	OU2-SED06	01/26/2016 13:15	Field Sample
A269-0040	BBG04	Sediment/ Justin Zoladz	Composite	PEST(21), PAH(21), ARO(21)	1050 (None), 1051 (None), 1053 (None) (3)	OU2-SED07	01/26/2016 14:15	Field Sample
A269-0041	BBG05	Sediment/ Justin Zoladz	Composite	ARO(21), PEST(21), PAH(21)	1055 (None), 1056 (None), 1057 (None) (3)	OU2-SED08	01/26/2016 15:10	Field Sample
A269-0042	BBG06	Sediment/ Justin Zoladz	Composite	ARO(21), PEST(21), PAH(21)	1059 (None), 1060 (None), 1061 (None) (3)	OU2-SED09	01/26/2016 16:05	Field Sample
A269-0044	BBG08	Sediment/ Justin Zoladz	Composite	PEST(21), PAH(21), ARO(21)	1066 (None), 1067 (None), 1068 (None) (3)	OU2-SED11	01/25/2016 10:30	Field Duplicate

Sample(s) to be used for Lab QC: A269-0038 Tag 1042, A269-0038 Tag 1043, A269-0038 Tag 1044

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: PAH=CLP PAH, PEST=CLP Pesticides, ARO=CLP Aroclors

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Renee Ashley Mulvaney (ESI)	02/02/16 1500			

USEPA CLP COC (REGION COPY)

DateShipped:
CarrierName: FedEx
AirbillNo: 871820153211

CHAIN OF CUSTODY RECORD

Eighteenmile Creek Phase 3/NY
Case #: 45921
Cooler #: 4

No: 2-012716-132514-0007

Lab: Chemtech Consulting Group
Lab Contact: Divya Mehta
Lab Phone: 908-789-8900

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
A269-0050	BBG14	Soil/ Justin Zoladz	Composite	PAH(21), ARO(21), PEST(21)	1090 (None), 1092 (None), 1093 (None) (3)	OU2-SS20	01/25/2016 13:40	Field Sample
A269-0051	BBG15	Soil/ Justin Zoladz	Composite	PAH(21), PEST(21), ARO(21)	1095 (None), 1096 (None), 1097 (None) (3)	OU2-SS21	01/25/2016 13:55	Field Sample
A269-0052	BBG16	Soil/ Justin Zoladz	Composite	PAH(21), ARO(21), PEST(21)	1098 (None), 1100 (None), 1101 (None) (3)	OU2-SS22	01/25/2016 15:00	Field Sample
A269-0053	BBG17	Soil/ Justin Zoladz	Composite	ARO(21), PEST(21), PAH(21)	1102 (None), 1103 (None), 1105 (None) (3)	OU2-SS23	01/25/2016 16:10	Field Sample
A269-0054	BBG18	Soil/ Justin Zoladz	Composite	ARO(21), PEST(21), PAH(21)	1107 (None), 1108 (None), 1109 (None) (3)	OU2-SS24	01/25/2016 15:40	Field Sample
A269-0055	BBG19	Soil/ Justin Zoladz	Composite	PAH(21), ARO(21), PEST(21)	1110 (None), 1112 (None), 1113 (None) (3)	OU2-SS25	01/25/2016 15:45	Field Duplicate

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key: PAH=CLP PAH, ARO=CLP Aroclors, PEST=CLP Pesticides	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Renee Ashley Mattson (ESI)	02/02/16 1500			

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

321529

Client	Project Manager	Date	Chain of Custody Number
Ecology? Environment	Marcia Galloway / Lynne Parker	1/25/16	293970
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 2 of 2**
368 Pleasant View Dr	716 684 8060		
City / State / Zip Code	**Site Contact**	**Lab Contact**	**Analysis (Attach list if more space is needed)**
Lancaster / NY / 14086			
Project Name and Location (State)	**Carrier/Waybill Number**		
	FedEx: 8718 2015 3233 ~~3364~~ LD 1/26/16		
Contract/Purchase Order/Quote No.			
P-1601011			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	TCL: Lloyd Kahn	Special Instructions/ Conditions of Receipt
OU2-SS20	1/25/16	1340				X	1						X	
OU2-SS21	1/25/16	1355				X	1						X	
OU2-SS22	1/25/16	1500				X	1						X	
OU2-SS23	1/25/16	1610				X	1						X	
OU2-SS24	1/25/16	1540				X	1						X	
OU2-SS25	1/25/16	1545				X	1						X	

LD 1/26/16

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☒ 21 Days ☐ Other _____

QC Requirements (Specify)

1. Relinquished By	Date	Time	1. Received By	Date	Time
Renee Ashley Muhsam (ESI)	02/02/16	1500			
2. Relinquished By	Date	Time	2. Received By	Date	Time
3. Relinquished By	Date	Time	3. Received By	Date	Time

Comments

Samples were subSampled by ESI and sent to the DESA Regional Laboratory, 2890 Woodbridge Ave, Edison, NJ 08837

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Ecology & Environment	Marcia Galloway / Lynne Parker	1/25/16	284432
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page** 1 of 2
368 Pleasant View Dr	716 684 8060		
City / **State** / **Zip Code**	**Site Contact**	**Lab Contact**	
Lancaster / NY / 14086			
Project Name and Location (State)	**Carrier/Waybill Number**		
	FedEx: 8718 2015 3233 ~~3369~~ LP 1/26/16		
Contract/Purchase Order/Quote No.			
P-1601011			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil		Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis: TOC; Lloyd Kahn	Special Instructions/ Conditions of Receipt
OU2-SED04	1/25/16	1030			X		LP 1/26/16	1						X	MS/MSD LP 1/26/16
OU2-SED05	1/26/16	0900			X		LP 1/26/16	2						X	MS/MSD
OU2-SED06	1/26/16	1315			X			1						X	
OU2-SED07	1/26/16	1415			X			1						X	
OU2-SED08	1/26/16	1510			X			1						X	
OU2-SED09	1/26/16	1605			X			1						X	
OU2-SED11	1/25/16	1030			X			1						X	
OU2-SS15	1/25/16	1435				X		2						X	MS/MSD
OU2-SS16	1/26/16	1435				X		1						X	
OU2-SS17	1/26/16	1420				X		1						X	
OU2-SS18	1/25/16	1500				X		1						X	
OU2-SS19	1/25/16	1545				X		1						X	

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☒ 21 Days ☐ Other_____

QC Requirements (Specify)

1. Relinquished By	Date	Time	1. Received By	Date	Time
Russell Culley/Mackenzie (ESI)	02/02/16	1500			
2. Relinquished By	Date	Time	2. Received By	Date	Time
3. Relinquished By	Date	Time	3. Received By	Date	Time

Comments

Samples were subsampled by ESI and sent to the DESA Regional Laboratory, 2890 Woodbridge Ave, Edison, NJ 08837.

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

USEPA CLP COC (REGION COPY)
DateShipped:
CarrierName: FedEx
AirbillNo: 871820153185

CHAIN OF CUSTODY RECORD
Eighteenmile Creek Phase 3/NY
Case #: 45921
Cooler #: 1

No: 2-012716-130536-0004
Lab: Chemtech Consulting Group
Lab Contact: Divya Mehta
Lab Phone: 908-789-8900

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
A269-0037	MBBG01	Sediment/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1039 (None) (1)	OU2-SED04	01/25/2016 10:30	Field Sample
A269-0038	MBBG02	Sediment/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1045 (None) (2)	OU2-SED05	01/26/2016 09:00	Field Sample
A269-0039	MBBG03	Sediment/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1047 (None) (1)	OU2-SED06	01/26/2016 13:15	Field Sample
A269-0040	MBBG04	Sediment/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1052 (None) (1)	OU2-SED07	01/26/2016 14:15	Field Sample
A269-0041	MBBG05	Sediment/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1054 (None) (1)	OU2-SED08	01/26/2016 15:10	Field Sample
A269-0042	MBBG06	Sediment/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1058 (None) (1)	OU2-SED09	01/26/2016 16:05	Field Sample
A269-0044	MBBG08	Sediment/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1069 (None) (1)	OU2-SED11	01/25/2016 10:30	Field Duplicate
A269-0045	MBBG09	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1073 (None) (2)	OU2-SS15	01/25/2016 14:35	Field Sample
A269-0046	MBBG10	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1076 (None) (1)	OU2-SS16	01/26/2016 14:35	Field Sample
A269-0047	MBBG11	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1079 (None) (1)	OU2-SS17	01/26/2016 14:20	Field Sample

Sample(s) to be used for Lab QC: A269-0038 Tag 1045, A269-0045 Tag 1073	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Renee Ashley Muilsaac (ESI)	02/02/16 1500			

USEPA CLP COC (REGION COPY)

DateShipped:
CarrierName: FedEx
AirbillNo: 871820153185

CHAIN OF CUSTODY RECORD

Eighteenmile Creek Phase 3/NY
Case #: 45921
Cooler #: 1

No: 2-012716-130536-0004

Lab: Chemtech Consulting Group
Lab Contact: Divya Mehta
Lab Phone: 908-789-8900

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
A269-0048	MBBG12	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1084 (None) (1)	OU2-SS18	01/25/2016 15:00	Field Sample
A269-0049	MBBG13	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1089 (None) (1)	OU2-SS19	01/25/2016 15:45	Field Sample
A269-0050	MBBG14	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1091 (None) (1)	OU2-SS20	01/25/2016 13:40	Field Sample
A269-0051	MBBG15	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1094 (None) (1)	OU2-SS21	01/25/2016 13:55	Field Sample
A269-0052	MBBG16	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1099 (None) (1)	OU2-SS22	01/25/2016 15:00	Field Sample
A269-0053	MBBG17	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1104 (None) (1)	OU2-SS23	01/25/2016 16:10	Field Sample
A269-0054	MBBG18	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1106 (None) (1)	OU2-SS24	01/25/2016 15:40	Field Sample
A269-0055	MBBG19	Soil/ Justin Zoladz	Composite	CLP ICP-MS TAL Metals + Hg(21)	1111 (None) (1)	OU2-SS25	01/25/2016 15:45	Field Duplicate

Special Instructions:	**Shipment for Case Complete? N**
	Samples Transferred From Chain of Custody #
Analysis Key	

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Renee Ashley Mcbrearty (ESI)	02/02/16 1500			

USEPA CLP COC (REGION COPY)

DateShipped:
CarrierName: FedEx
AirbillNo: 871820153200

CHAIN OF CUSTODY RECORD

Eighteenmile Creek Phase 3/NY
Case #: 45921
Cooler #: 3

No: 2-012716-132246-0006

Lab: Chemtech Consulting Group
Lab Contact: Divya Mehta
Lab Phone: 908-789-8900

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
A269-0045	BBG09	Soil/ Justin Zoladz	Composite	ARO(21), PEST(21), PAH(21)	1070 (None), 1071 (None), 1072 (None) (6)	OU2-SS15	01/25/2016 14:35	Field Sample
A269-0046	BBG10	Soil/ Justin Zoladz	Composite	PAH(21), PEST(21), ARO(21)	1074 (None), 1075 (None), 1077 (None) (3)	OU2-SS16	01/26/2016 14:35	Field Sample
A269-0047	BBG11	Soil/ Justin Zoladz	Composite	PAH(21), ARO(21), PEST(21)	1078 (None), 1080 (None), 1081 (None) (3)	OU2-SS17	01/26/2016 14:20	Field Sample
A269-0048	BBG12	Soil/ Justin Zoladz	Composite	PEST(21), PAH(21), ARO(21)	1082 (None), 1083 (None), 1085 (None) (3)	OU2-SS18	01/25/2016 15:00	Field Sample
A269-0049	BBG13	Soil/ Justin Zoladz	Composite	PEST(21), ARO(21), PAH(21)	1086 (None), 1087 (None), 1088 (None) (3)	OU2-SS19	01/25/2016 15:45	Field Sample

Sample(s) to be used for Lab QC: A269-0045 Tag 1070, A269-0045 Tag 1071, A269-0045 Tag 1072

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: ARO=CLP Aroclors, PEST=CLP Pesticides, PAH=CLP PAH

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	Reed Ashley Medsaas ESI	02/02/16 1500			

FedEx. US Airbill
Express

FedEx Tracking Number: 8718 2015 3185

Form ID No. 0215

MUR31

Sender's Copy

1 From *Please print and press hard.*

Date

Sender's FedEx Account Number: SENDER'S FEDEX ACCT NO. 0142-0678-7

Sender's Name: ZACK Phone: (716) 684-8060

Company: ECOLOGY & ENVIRONMENT INC

Address: 368 PLEASANT VIEW DR

Dept./Floor/Suite/Room:

City: LANCASTER State: NY ZIP: 14086-1397

2 Your Internal Billing Reference First 24 characters will appear on invoice. 1003239.0009.03.01

3 To

Recipient's Name: Snehal Mehta Phone: (908) 789-8900

Company: Chemtech Consulting Group - CHM

Address: 284 Sheffield Sheet

We cannot deliver to P.O. boxes or P.O. ZIP codes.

Dept./Floor/Suite/Room:

Address:

Use this line for the HOLD location address or for continuation of your shipping address.

City: Mountainside State: NJ ZIP: 07092

HOLD Weekday: FedEx location address REQUIRED. NOT available for FedEx First Overnight.

HOLD Saturday: FedEx location address REQUIRED. Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

0417518457

4a Express Package Service * To most locations. *Packages up to 150 lbs.*

- ☐ FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☒ FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.
- ☐ FedEx First Overnight — Earliest next business morning delivery to select locations.*
- ☐ FedEx 2Day — Second business day.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx Express Saver — Next business afternoon.* Saturday Delivery NOT available.

4b Express Freight Service ** To most locations. *Packages over 150 lbs.*

- ☐ FedEx 1Day Freight — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected. FedEx 1Day Freight Booking No.: CALL 1.800.332.0807
- ☐ FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

5 Packaging * Declared value limit $500.

- ☐ FedEx Envelope*
- ☐ FedEx Pak* — Includes FedEx Small Pak and FedEx Large Pak.
- ☐ FedEx Box
- ☐ FedEx Tube
- ☒ Other

6 Special Handling and Delivery Signature Options

- ☐ SATURDAY Delivery — NOT available for FedEx Standard Overnight, FedEx Express Saver, or FedEx 3Day Freight.
- ☐ No Signature Required — Package may be left without obtaining a signature for delivery.
- ☐ Direct Signature — Someone at recipient's address may sign for delivery. *Fee applies.*
- ☐ Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. For residential deliveries only. *Fee applies.*

Does this shipment contain dangerous goods? One box must be checked.

- ☒ No
- ☐ Yes — As per attached Shipper's Declaration.
- ☐ Yes — Shipper's Declaration not required.
- ☐ Dry Ice — Dry ice, 9, UN 1845 ____ x ____ kg
- ☐ Cargo Aircraft Only

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging or placed in a FedEx Express Drop Box.

7 Payment *Bill to:* Enter FedEx Acct. No. or Credit Card No. below.

- ☒ Sender — Acct. No. in Section 1 will be billed.
- ☐ Recipient
- ☐ Third Party
- ☐ Credit Card
- ☐ Cash/Check

FedEx Acct. No. / Credit Card No. Exp. Date

Total Packages	Total Weight	Total Declared Value†
1	47.0 lbs.	$ ____ .00

†Our liability is limited to $100 unless you declare a higher value. See back for details. By using this Airbill you agree to the service conditions on the back of this Airbill and in the current FedEx Service Guide, including terms that limit our liability.

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FedEx. US Airbill
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FedEx Tracking Number: 8718 2015 3196

Form ID No. 0215

MUR31

Sender's Copy

1 From *Please print and press hard.*

Date

Sender's FedEx Account Number: SENDER'S FEDEX ACCT NO. 0142-0678-7

Sender's Name: ZACK Phone: (716) 684-8060

Company: ECOLOGY & ENVIRONMENT INC

Address: 368 PLEASANT VIEW DR

Dept./Floor/Suite/Room:

City: LANCASTER State: NY ZIP: 14086-1397

2 Your Internal Billing Reference First 24 characters will appear on invoice. 1003239.0009.03.01

3 To

Recipient's Name: Snehal Mehta Phone: (908) 789-8900

Company: Chemtech Consulting Group - CHM

Address: 284 Sheffield Sheet

We cannot deliver to P.O. boxes or P.O. ZIP codes.

Dept./Floor/Suite/Room:

Address:

Use this line for the HOLD location address or for continuation of your shipping address.

City: Mountainside State: NJ ZIP: 07092

HOLD Weekday: FedEx location address REQUIRED. NOT available for FedEx First Overnight.

HOLD Saturday: FedEx location address REQUIRED. Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

0417518457

4a Express Package Service * To most locations. Packages up to 150 lbs.

- ☐ FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☒ FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.
- ☐ FedEx First Overnight — Earliest next business morning delivery to select locations.*
- ☐ FedEx 2Day — Second business day.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx Express Saver — Next business afternoon.* Saturday Delivery NOT available.

4b Express Freight Service ** To most locations. Packages over 150 lbs.

- ☐ FedEx 1Day Freight — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected. FedEx 1Day Freight Booking No.: CALL 1.800.332.0807
- ☐ FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

5 Packaging * Declared value limit $500.

- ☐ FedEx Envelope*
- ☐ FedEx Pak* — Includes FedEx Small Pak and FedEx Large Pak.
- ☐ FedEx Box
- ☐ FedEx Tube
- ☒ Other

6 Special Handling and Delivery Signature Options

- ☐ SATURDAY Delivery — NOT available for FedEx Standard Overnight, FedEx Express Saver, or FedEx 3Day Freight.
- ☐ No Signature Required — Package may be left without obtaining a signature for delivery.
- ☐ Direct Signature — Someone at recipient's address may sign for delivery. *Fee applies.*
- ☐ Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. For residential deliveries only. *Fee applies.*

Does this shipment contain dangerous goods? One box must be checked.

- ☒ No
- ☐ Yes — As per attached Shipper's Declaration.
- ☐ Yes — Shipper's Declaration not required.
- ☐ Dry Ice — Dry ice, 9, UN 1845 ____ x ____ kg
- ☐ Cargo Aircraft Only

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging or placed in a FedEx Express Drop Box.

7 Payment *Bill to:* Enter FedEx Acct. No. or Credit Card No. below.

- ☒ Sender — Acct. No. in Section 1 will be billed.
- ☐ Recipient
- ☐ Third Party
- ☐ Credit Card
- ☐ Cash/Check

FedEx Acct. No. / Credit Card No. Exp. Date

Total Packages	Total Weight	Total Declared Value†
1	54 lbs.	$ ____ .00

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FedEx Tracking Number: 8718 2015 3211

MUR31

Form ID No. 0215

Sender's Copy

1 From *Please print and press hard.*

Date

Sender's FedEx Account Number: SENDER'S FEDEX ACCT NO ONLY 0142-0678-7

Sender's Name: ZACK Phone (716) 684-8060

Company: ECOLOGY & ENVIRONMENT INC

Address: 368 PLEASANT VIEW DR

Dept./Floor/Suite/Room

City: LANCASTER State: NY ZIP: 14086-1397

2 Your Internal Billing Reference
First 24 characters will appear on invoice.
1003239.0009.03.01

3 To

Recipient's Name: Shehal Mehta Phone (908) 789 8900

Company: Chemtech Consulting Group - CHM

Address: 284 Sheffield Sheet
We cannot deliver to P.O. boxes or P.O. ZIP codes.
Dept./Floor/Suite/Room

Address
Use this line for the HOLD location address or for continuation of your shipping address.

City: Mountainside State: NJ ZIP: 07092

HOLD Weekday
FedEx location address REQUIRED. NOT available for FedEx First Overnight.

HOLD Saturday
FedEx location address REQUIRED. Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

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4a Express Package Service * To most locations. *Packages up to 150 lbs.*

- ☐ FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☒ FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.
- ☐ FedEx First Overnight — Earliest next business morning delivery to select locations.*
- ☐ FedEx 2Day — Second business day.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx Express Saver — Next business afternoon.* Saturday Delivery NOT available.

4b Express Freight Service ** To most locations. *Packages over 150 lbs.*

- ☐ FedEx 1Day Freight — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected. FedEx 1Day Freight Booking No. CALL 1.800.332.0807
- ☐ FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

5 Packaging * Declared value limit $500.

- ☐ FedEx Envelope*
- ☐ FedEx Pak* — Includes FedEx Small Pak and FedEx Large Pak.
- ☐ FedEx Box
- ☐ FedEx Tube
- ☒ Other

6 Special Handling and Delivery Signature Options

- ☐ SATURDAY Delivery — NOT available for FedEx Standard Overnight, FedEx Express Saver, or FedEx 3Day Freight.
- ☐ No Signature Required — Package may be left without obtaining a signature for delivery.
- ☐ Direct Signature — Someone at recipient's address may sign for delivery. *Fee applies.*
- ☐ Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. For residential deliveries only. *Fee applies.*

Does this shipment contain dangerous goods?
One box must be checked.

- ☒ No
- ☐ Yes — As per attached Shipper's Declaration.
- ☐ Yes — Shipper's Declaration not required.
- ☐ Dry Ice — Dry Ice, 9, UN 1845 ____ x ____ kg

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging or placed in a FedEx Express Drop Box.

☐ Cargo Aircraft Only

7 Payment *Bill to:*

Enter FedEx Acct. No. or Credit Card No. below.

- ☒ Sender — Acct. No. in Section 1 will be billed.
- ☐ Recipient
- ☐ Third Party
- ☐ Credit Card
- ☐ Cash/Check

FedEx Acct. No. / Credit Card No. Exp. Date

Total Packages	Total Weight	Total Declared Value†
1	41.6 lbs.	$ .00

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FedEx Tracking Number: 8718 2015 3200

MUR31

Form ID No. 0215

Sender's Copy

1 From *Please print and press hard.*

Date

Sender's FedEx Account Number: SENDER'S FEDEX ACCT NO ONLY 0142-0678-7

Sender's Name: ZACK Phone (716) 684-8060

Company: ECOLOGY & ENVIRONMENT INC

Address: 368 PLEASANT VIEW DR

Dept./Floor/Suite/Room

City: LANCASTER State: NY ZIP: 14086-1397

2 Your Internal Billing Reference
First 24 characters will appear on invoice.
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3 To

Recipient's Name: Shehal Mehta Phone (908) 789-8900

Company: Chemtech Consulting Group - CHM

Address: 284 Sheffield Sheet
We cannot deliver to P.O. boxes or P.O. ZIP codes.
Dept./Floor/Suite/Room

Address
Use this line for the HOLD location address or for continuation of your shipping address.

City: Mountainside State: NJ ZIP: 07092

HOLD Weekday
FedEx location address REQUIRED. NOT available for FedEx First Overnight.

HOLD Saturday
FedEx location address REQUIRED. Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

0417518457

4a Express Package Service * To most locations. *Packages up to 150 lbs.*

- ☐ FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☒ FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.
- ☐ FedEx First Overnight — Earliest next business morning delivery to select locations.*
- ☐ FedEx 2Day — Second business day.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx Express Saver — Next business afternoon.* Saturday Delivery NOT available.

4b Express Freight Service ** To most locations. *Packages over 150 lbs.*

- ☐ FedEx 1Day Freight — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected. FedEx 1Day Freight Booking No. CALL 1.800.332.0807
- ☐ FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

5 Packaging * Declared value limit $500.

- ☐ FedEx Envelope*
- ☐ FedEx Pak* — Includes FedEx Small Pak and FedEx Large Pak.
- ☐ FedEx Box
- ☐ FedEx Tube
- ☒ Other

6 Special Handling and Delivery Signature Options

- ☐ SATURDAY Delivery — NOT available for FedEx Standard Overnight, FedEx Express Saver, or FedEx 3Day Freight.
- ☐ No Signature Required — Package may be left without obtaining a signature for delivery.
- ☐ Direct Signature — Someone at recipient's address may sign for delivery. *Fee applies.*
- ☐ Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. For residential deliveries only. *Fee applies.*

Does this shipment contain dangerous goods?
One box must be checked.

- ☒ No
- ☐ Yes — As per attached Shipper's Declaration.
- ☐ Yes — Shipper's Declaration not required.
- ☐ Dry Ice — Dry Ice, 9, UN 1845 ____ x ____ kg

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging or placed in a FedEx Express Drop Box.

☐ Cargo Aircraft Only

7 Payment *Bill to:*

Enter FedEx Acct. No. or Credit Card No. below.

- ☒ Sender — Acct. No. in Section 1 will be billed.
- ☐ Recipient
- ☐ Third Party
- ☐ Credit Card
- ☐ Cash/Check

FedEx Acct. No. / Credit Card No. Exp. Date

Total Packages	Total Weight	Total Declared Value†
1	43.4 lbs.	$ .00

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FedEx Tracking Number 8718 2015 3233

MUR31

Form ID No. 0215

Sender's Copy

1 From *Please print and press hard.*

Date

Sender's FedEx Account Number 0142-0678-7

Sender's Name ZACK Phone (716) 684-8060

Company ECOLOGY & ENVIRONMENT INC

Address 368 PLEASANT VIEW DR Dept./Floor/Suite/Room

City LANCASTER State NY ZIP 14086-1397

2 Your Internal Billing Reference First 24 characters will appear on invoice. 1003239.0009.03.01

3 To

Recipient's Name Ness Tirol Phone (732) 321 4431

Company DESA Regional Laboratory

Address 2890 Woodbridge Ave Dept./Floor/Suite/Room
We cannot deliver to P.O. boxes or P.O. ZIP codes.

Address
Use this line for the HOLD location address or for continuation of your shipping address.

City Edison State NJ ZIP 08837

HOLD Weekday ☐ FedEx location address REQUIRED. NOT available for FedEx First Overnight.

HOLD Saturday ☐ FedEx location address REQUIRED. Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

0417518457

4a Express Package Service * To most locations. *Packages up to 150 lbs.*

- ☐ FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☒ FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.
- ☐ FedEx First Overnight — Earliest next business morning delivery to select locations.*
- ☐ FedEx 2Day — Second business day.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx Express Saver — Next business afternoon.* Saturday Delivery NOT available.

4b Express Freight Service ** To most locations. *Packages over 150 lbs.*

- ☐ FedEx 1Day Freight — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected. FedEx 1Day Freight Booking No. CALL 1.800.332.0807
- ☐ FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- ☐ FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

5 Packaging * Declared value limit $500.

☐ FedEx Envelope* ☐ FedEx Pak* Includes FedEx Small Pak and FedEx Large Pak. ☐ FedEx Box ☐ FedEx Tube ☒ Other

6 Special Handling and Delivery Signature Options

☐ SATURDAY Delivery NOT available for FedEx Standard Overnight, FedEx Express Saver, or FedEx 3Day Freight.

☐ No Signature Required — Package may be left without obtaining a signature for delivery.
☐ Direct Signature — Someone at recipient's address may sign for delivery. *Fee applies.*
☐ Indirect Signature — If no one is available at recipient's address, someone at a neighboring address may sign for delivery. For residential deliveries only. *Fee applies.*

Does this shipment contain dangerous goods?

One box must be checked.

☒ No ☐ Yes As per attached Shipper's Declaration. ☐ Yes Shipper's Declaration not required. ☐ Dry Ice Dry Ice, 9, UN 1845 ____ x ____ kg

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging or placed in a FedEx Express Drop Box.

☐ Cargo Aircraft Only

7 Payment *Bill to:*

Enter FedEx Acct. No. or Credit Card No. below.

☒ Sender Acct. No. in Section 1 will be billed. ☐ Recipient ☐ Third Party ☐ Credit Card ☐ Cash/Check

FedEx Acct. No. or Credit Card No. Exp. Date

Total Packages	Total Weight	Total Declared Value†
1	35.6 lbs.	$ ____ .00

†Our liability is limited to $100 unless you declare a higher value. See back for details. By using this Airbill you agree to the service conditions on the back of this Airbill and in the current FedEx Service Guide, including terms that limit our liability.

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K1602618

CHAIN OF CUSTODY RECORD

ENVIROSYSTEMS, INCORPORATED

ESI Study Number: 27030

P.O. Box 778, Hampton, New Hampshire 03842

Customer Services: Phone # (603) 926-3345
Fax # (603) 926-3521

PAGE: 1 OF 2

CLIENT:	CONTACT:	PROJECT NAME:	P.O. #
Envirosystems, Inc.	Kirk Cram	18 Mile Creek	
REPORT TO: Kirk Cram	ADDRESS: 1 Lafayette Road, Building 6, Hampton, NH 03842		PHONE: 603-926-3345 x209
INVOICE TO:	ADDRESS:		SAMPLED BY: ESI

Program Requirements: ☐ NPDES ☐ RCRA ☐ USACE ☐ EPA ☐ OTHER

SAMPLE #	YOUR FIELD IDENTIFICATION (MUST AGREE WITH CONTAINER)	DATE SAMPLED	TIME SAMPLED	COMPOSITE /GRAB	E-EFFLUENT D-DILUENT O-OTHER	CONTAINER #/VOL/TYPE	FIELD PRESERVED	ANALYSIS REQUESTED (SPECIAL INSTRUCTIONS, CAUTIONS, ETC.)
300	Laboratory Control	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
301	OU-SS20	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
302	OU-SS21	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
303	OU-SS15	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
304	OU-SS22	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
305	OU-SS18	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
306	OU-SS19	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
307	OU-SS23	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
308	OU-SS24	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
309	OU-SS17	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
310	OU-SS16	03/08/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
311	Pre-tissue *E.f.*	02/07/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
Kirk Cram	03/14/16	1400		3/15/16	1015

ATTN: Kurt Clarkson

K1602618

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PAGE: 2 OF 2

CLIENT:	CONTACT:	PROJECT NAME:	P.O. #
Envirosystems, Inc.	Kirk Cram	18 Mile Creek	
REPORT TO: Kirk Cram	ADDRESS: 1 Lafayette Road, Building 6, Hampton, NH 03842		PHONE: 603-926-3345 x209
INVOICE TO:	ADDRESS:		SAMPLED BY: ESI

Program Requirements: ☐ NPDES ☐ RCRA ☐ USACE ☐ EPA ☐ OTHER

SAMPLE #	YOUR FIELD IDENTIFICATION (MUST AGREE WITH CONTAINER)	DATE SAMPLED	TIME SAMPLED	COMPOSITE /GRAB	E-EFFLUENT D-DILUENT O-OTHER	CONTAINER #/VOL/TYPE	FIELD PRESERVED	ANALYSIS REQUESTED (SPECIAL INSTRUCTIONS, CAUTIONS, ETC.)
400	Laboratory Control	03/10/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
401	OU2-SED04	03/10/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
402	OU2-SED05	03/10/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
403	OU2-SED06	03/10/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
404	OU2-SED07	03/10/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
405	OU2-SED09	03/10/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
406	OU2-SED10	03/10/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture
407	Pre-tissue *L.v.*	02/09/16	N/A	C	Tissue	1 x 4oz Amber G	Frozen	PCB Aroclors, PAHs, Pesticides, % Lipids, % Moisture

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
Kirk Cram	03/14/16	1400		3/15/16	1015

ATTN: Kurt Clarkson

PC Kurt

Cooler Receipt and Preservation Form

Client Enviro systems Service Request K16 2618

Received: 3/15/16 Opened: 3/15/16 By: M Unloaded: 3/15/16 By: M

1. Samples were received via? *Mail* *Fed Ex* (*UPS*) *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) (*Cooler*) *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA (Y) N If yes, how many and where? 1 front
   If present, were custody seals intact? (Y) N If present, were they signed and dated? (Y) N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID NA	Tracking Number NA	Filed
-20.0	NA	—	—	-0.1	365	27030	1Z4R724R0150665121	

4. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* (*Wet Ice*) (*Dry Ice*) *Sleeves* Box
5. Were custody papers properly filled out (ink, signed, etc.)? NA (Y) N
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA (Y) N
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA (Y) N
8. Did all sample labels and tags agree with cu ody papers? *Indicate major discrepancies in the table on page 2.* NA (Y) N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA (Y) N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* (NA) Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* (NA) Y N
12. Was C12/Res negative? (NA) Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: _____

ALS Environmental
1317 South 13th Avenue
Kelso, WA 98626

Confirmation of Sample Receipt

To:	Ken Simon	**From:**	Kurt Clarkson
Email:	ksimon@envirosystems.com	**Email:**	Kurt.Clarkson@alsglobal.com
Fax:		**Fax:**	360-636-1068
Phone:	603-926-3345	**Phone:**	360-577-7222 x3356

Samples for analysis have been received by ALS Environmental on 3/15/16 and assigned our Service Request number **K1602618**. **Please verify the following information and notify me of any corrections as soon as possible.**

The estimated completion date for this work is: **4/5/16**

Client: EnviroSystems, Inc.
Project: 18 Mile Creek/ESI Study Number: 27030

EDD Required: Yes

Tier: IV

Report To: Ken Simon
EnviroSystems, Inc.
One Lafayette Road
Hampton, NH 03842

Billing Address: Ken Simon
EnviroSystems, Inc.
One Lafayette Road
Hampton, NH 03842

Comments:

Thank you for your business!

A - Test is Authorized H - Test is On Hold HP - Test is On Hold Pending Input P - Test is Authorized for Prep Only C - Test has been Cancelled * - Test has assigned QC

				8081B Pest OC	8082A PCB	8270D PAH SIM	Frz Dry Frz Dry	Grind Grind	Homogen Homogen	Lipids LIPIDS
K1602618-001	Laboratory Control	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-002	OU-SS20	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-003	OU-SS21	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-004	OU-SS15	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-005	OU-SS22	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-006	OU-SS18	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-007	OU-SS19	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-008	OU-SS23	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-009	OU-SS24	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-010	OU-SS17	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-011	OU-SS16	Animal Tissue	3/ 8/16	HP	HP	HP	A	A	A	HP
K1602618-012	Pre-tissue E.f.	Animal Tissue	2/ 7/16	HP	HP	HP	A	A	A	HP
K1602618-013	Laboratory Control	Animal Tissue	3/10/16	HP	HP	HP	A	A	A	HP
K1602618-014	OU2-SED04	Animal Tissue	3/10/16	HP	HP	HP	A	A	A	HP

				8081B Pest OC	8082A PCB	8270D PAH SIM	Frz Dry Frz Dry	Grind Grind	Homogen Homogen	Lipids LIPIDS
K1602618-015	OU2-SED05	Animal Tissue	3/10/16	HP	HP	HP	A	A	A	HP
K1602618-016	OU2-SED06	Animal Tissue	3/10/16	HP	HP	HP	A	A	A	HP
K1602618-017	OU2-SED07	Animal Tissue	3/10/16	HP	HP	HP	A	A	A	HP
K1602618-018	OU2-SED09	Animal Tissue	3/10/16	HP	HP	HP	A	A	A	HP
K1602618-019	OU2-SED08	Animal Tissue	3/10/16	HP	HP	HP	A	A	A	HP
K1602618-020	Pre-tissue L.v.	Animal Tissue	2/ 9/16	HP	HP	HP	A	A	A	HP

Test Comments:

Group	Test/Method	Samples	Comments
Semivoa GCMS	8270D/PAH SIM	1-20	LJ 18000

Assay Review Checklist

START DATE: 02/08/16 **STUDY#:** 27030

END DATE: 03/07/16 **CLIENT:** Ecology & Environment

PROJECT: 18 Mile Creek

ASSAY: 28 day *E. fetida*

Analyst Data Review	Date	Initials	Comments
Chains of Custody Complete	04/12/16	BP	
Sample Receipt Complete	04/12/16	BP	
Organism Culture Sheet(s)	04/12/16	BP	
Bench Sheets Complete (dates, times, initials, etc...)	04/12/16	BP	
Water Quality Data Complete	NA		
Weights Reported	04/12/16	BP	
Assay Acceptability Review	3/9/16	NR	

Technical Report Review	Date	Initials	Comments
Statistical Analysis Complete	3/9/16	NR	
Statistical Analysis Reviewed	03/31/16	JTP	
Data Acceptability Review	3/9/16	NR	
Supporting Chemistry Report	4/5/16	km	
Draft Report	4/1/16	NR	
Final Report Reviewed	04/05/16	km	
QA Audit/Review Complete	4/13/16	TMS	
Final Report Printed - PDF	4/13/16	NR	chem data package to be delivered under separate cover
Executive Summary / Chems Sent	NA		
Report E-mailed / Faxed	4/13/16	NR	
Report Logged Out / Invoice Sent			